On a Species of the Crawling Medusa, Eleutheria, from the Cape of Good Hope (Cnidonema capensis, g. et sp. n.) and the Southern Eleutheriæ.

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With Plate 30.

I. Medusa.

The crawling or creeping Medusa Eleutheria is one of the most interesting of the Cœlenterates. While the tentacles are modified into ambulatory organs and suggest a possible mode of transition between the fixed polyp and the free-swimming medusa, the sub-umbrellar cavity is more complex than in the ordinary medusa, being, it is said, modified into a large brood-cavity, which in one species, at least, extends over the stomach. Unfortunately, the animal is rather rare, so that of the two species of the Northern Hemisphere only one has been traced to its hydroid form (Hinks, 1861), and there is still some doubt as to the differences between the species. In more recent years three new species have been described by Browne from the Southern Hemisphere, from the Falkland Islands, Wandle Island and McMurdo Bay, and Vanhöffen procured a species from Kerguelen, from an examination of which he concludes that all the species from the Southern Hemisphere are identical.

It is of special interest, therefore, to find that a species occurs at the Cape of Good Hope, which at certain times and places can not only be procured in fair abundance, but can be readily kept in confinement, thus affording an opportunity of observing its habits, which are little known.

Occurrence.

The animal was first observed in a tank of the Government Marine Laboratory, near Cape Town, shortly after a number of crawfish had been put in, and was thought to have been brought in with them. On a later occasion it appeared in a smaller tank, and had apparently been carried in with the supply water. A search was then made on the sea-shore, where at first only one was found, but on another occasion about twenty were found at the bottom of a large basin in which sea-weed from low water (spring tide) had been left for some hours. Curiously enough, weed procured from the same spot the following day produced no specimens. In spite of their apparently delicate organisation they were found in localities most exposed to the breaking waves.

Habits.

The most striking feature in the behaviour of the animal is, of course, its method of locomotion. It may remain stationary for several days, but it is usually very active. When it was lightly touched on one side the crawling, or rather walking, movement could be readily observed; the tentacles on the side opposite the source of irritation were released and applied at a point further from the body, which was then moved in this direction. Progression was assisted by a reverse movement of the tentacles on the other side. When viewed from the side during this process, it was seen that the whole body was raised from the substratum, so that the movement was more that of walking than creeping or crawling. If the irritation was applied to the other side of the body the direction of movement was reversed, so that the animal could be made to move in any direction. There was always a tendency, however, to move off to the under side of the weed or other object on which it rested. This active movement was more marked in the early stages; the older and mature individuals remained, as a rule, stationary.

The adhesive power of the tentacles is a relatively powerful one, for the jet of water, playing on the animal in the tank, was frequently strong. In fact the animals seem to prefer being in such a strong current as on one or two occasions they moved off from quiet, though apparently sufficiently aërated water, to the strongest part of the current. The animal could not be picked up by a pipette without first releasing the tentacles one by one. Often it remained adherent by one tentacle only. When placed on its back the animal had great difficulty in recovering its right position.

The tentacles exhibited another movement which was almost constant and very characteristic. This consisted of a sudden jerking upwards, so that the upper nematocyst-bearing branch was thrown over the body, the lower or sucker-bearing branch meanwhile loosening its hold on the substratum and sharing in the upward movement. This movement was kept up when the animal was stationary, and differed from the slow and more deliberate movement in walking. It may have some protective function, as by it the clusters of nematocysts on the upper side of the tentacles were thrown over the upper surface of the body.

The feeding action of the animal was observed. This consists of a slow movement of the mouth over the surface of the substratum under the body of the animal, apparently for the purpose of securing small particles of a vegetable or animal nature. A much more active method of procuring food was, however, observed on one or two occasions. Thus, in one, whose tentacles were in a state of great activity, it was observed, on closer examination, that a small animal, apparently a copepod, had been captured, and was held by the tentacles clustered round it. The manubrium was extended beyond the edge of the umbrella and the mouth was applied to this object. In another case a similar activity was observed, and here it was a small larval chætopod that had been captured. Such a chætopod is usually *a* very active animal and it made freq ient attempts to escape, brit on each occasion, when the hea l was protruded, the nematocyst-dusters were brought sh rply to bear on it, driving it back, On another occasion, hc wever, an Eleutheria, which had been observed to be pe fectly healthy, was observed, *a* few hours later, surrounded b nbont half a dozen larval chmtopods, which were devouring the remains of its disintegrated body.

European Eleutheriæ are not known to swim, but Vallentin (1910) states t iat the Falkland species is able to do so. The Gape specie: was never observed to swim.

External Characters of the Body.

The breadth of the largest male was 3·3 mm., the Iargest female 2.24 mm. These large specimens, however, were rare, and most, were less than I mm. down to ·27 mm.—the diameter of the newly-detached bud. In life the body is usually flattened, the height bei ıg about one-third of the breadth. In preserved material there is much variation, some being almost spherical in shap . None were so flattened as is E. hodgsoni.

In colour the body is mostly a dark recldish-brown by transmitted light, being of a somewhat bright red by reflected light. This is due tc pigment-granules lodged in the stomach and circular canal, but absent in the radial canals. 'Thus in the younger specimens there appeared a circular brown patch in the centr of tlie disc; in tho older this assumed a hexagonal shape witl six radiations, which in still older specimens became enlarg ed into saccular structures extending almost to the circular ca ıal (Pl. 30, figs. 1, 2, 5).

The exumbrellar surfa :e also had a distinctive colour, which lies above and partly co ceals the brown pigment mentioned. It, however, varied cons derably in pattern. This was *a* pure white, which usually dis ıppeared in the preservative. 1t was best seen by reflected lig ıt, and consisted in the well-developed condition of a hexagon l rıng above the stomach produced into six radiating lines to the circular canal (Pl. 30, figs. I and 2). In other cases the hex: gonal ring was absent and only the radiations were present, and these were sometimes reduced to patches halfway between the apex and the margin of the body. Some cases were observed in which the white colour covered almost the entire upper surface, and others in which it assumed a ring-like forni.

Another and entirely different pigment pattern was found in some largo individuals, which proved on being sectioned to be mature.' In thew the gonads, which are of a clear whitish colour, estend round and above the brown stomach, concealing it all except a small circular patch in the centre, from which there are six thin, radiating lines—the only part of the stomach visible.

The ocelli were of a dark brown colour, usually surrounded by a pure white circle of pigment. In sections the ocelli showed scattered pigment-spots, but no lens.

External Characters of the Tentacles.

The number of the tentacles varies very considerably—from six in the youngest to about forty in the largest. Though they are apparently irregularly arranged with no reference to the radial canals in the larger specimens, they are quite regular in younger forms. In the newly-detached bud there are six (sometimes eight) long tentacles, arising from tho semi-circular canal, opposite the ends of the six radial canals. Between them there are sometimes smaller tentacles. The subsequent origin and growth of additional tentacles, however, does not appear to be regular, as they are frequently seen in numbers which are not multiples of six or eight.

Each of the tentacles is divided into two branches, one long, upper branch and a shorter lower branch, about the length of the main stem of tlic tentacle (Pl. 30, fig. 1). Tho upper branch is' about three times the length of the lower branch in the living and fully expanded condition. It, however, contracts much more in preservative, and is then only about the length of the lower branch. In some preserved specimens the main stem is much longer than either of the branches, being about two and a-half times their length. This fact may be of importance, as the chief difference between the two northern species, according to Hartlaub and Mayer, is the relative length of the branches and main stem of the tentacle. None of the living or preserved specimens, however, showed such a wide difference in this respect as is indicated in the figures of those species.

An important point in the specific determination of the southern Eleutheria is the position of the clusters of nematocysts on the tentacles, and this was therefore specially noted both in the living and preserved condition. In all, the position, but not the number of nematocyst-clusters, was constant. There was always a knob-like terminal cluster, and immediately behind it a cluster on the upper or aboral side of the tentacle. This latter, however, in large specimens extended down on each side of the tentacle. In the younger specimens it was entirely dorsal in position. Towards the base of the tentacle another and smaller cluster occurred, but entirely on the ventral or oral side of the arm. A fourth occurred at some greater distance, again entirely on the dorsal or aboral side. These were all on the upper branch of the tentacle. A fifth and much smaller cluster appeared in most specimens on the dorsal or aboral side of the main stem. In some large individuals, however, this last was entirely absent. None were ever observed on the lower branch.

The development of these nematocyst-clusters is of interest. The first to appear (in the bud) is the terminal cluster, and this was sometimes the condition found in a free bud, so that this species passes through a stage similar to that of the adults of the Northern Hemisphere, which have a terminal cluster of nematocysts on the upper branch. Soon after the appearance of the terminal cluster a second arises close behind it, and the others at later stages.

Macroscopically the tentacles do not appear to be pigmented, but grains of yellowish pigment are seen in the endodermal cells under the microscope, and these are grouped together in little heaps under the bases of the nematocyst-clusters, where also patches of white were seen.

Nematocyst Ring.

This is a very prominent feature in Eleutheria, and consists of a thick cushion of nematocysts in the form of a ring, under the circular canal, apparently in all species except E. hodgsoni. It is, in all the sections of the Cape, and apparently of the Kerguelen species, distinctly marked off from the base of the tentacles, with which it has no connection (Pl. 30, figs. 3 and 4, *n.r*).

Velum.

Eleutheria has been described by some early observers as devoid of a velum. This is due to the fact that the velum often fits closely round the manubrium, and lies appressed to the body. It may always be readily made out, however, in sections, sometimes being closely applied to the manubrium, at others drawn out into a tubular or funnel-shaped structure, extending well beyond the mouth (Pl. 30, fig. 3, *vel.*). In one case it appeared to be pertly fused to the manubrium. In Eleutheria it has apparently become transformed from an accessory locomotory organ into an organ whose chief function is the closing up and protecting of the large cavity of the gonads.

Alimentary Tract.

The stomach is a wide sac occupying at its widest the greater part of the body. It is produced into six wide pouches, the sides of which when fully developed are more or less rectangular in sections (Pl. 30, fig. 5). Above and below this part the pouches become smaller, and appear in the form of slight diverticula of an angular shape. The radial canals join the stomach at the wider parts (Pl. 30, fig. 5, *r.c.* 3). The cells of the walls of the stomach are laden with granular material, and consist of glandular cells and nematocysts, but no ova, which are said to have been found in similar gastric pouches in Cladonema.

In younger and smaller animals the stomach is also wide, but the diverticula are small and acute, giving the whole a star-like appearance in sections. In still earlier stages the stomach is also wide, but with thinner walls, and sometimes with no diverticula.

The lower or manubrial part of the alimentary tract showed a marked development of muscular tissue. As has been noted it is in a very motile part, and may be protruded to a very considerable extent. If the animal is placed on its back the main stem of the manubrium, as it moves about from side to side, may be seen to have six thick strands, more pronounced in its middle and distal portions, but fading away towards its upper parts. Transverse sections of the manubrium, near the mouth, show that these strands are of a muscular nature and arranged here in the shape of a star with six rays. Between the rays are nematocyst cells. Towards the upper part of the manubrium a slit appears in the centre of these rays, giving rise to a star-shaped space—the lumen of the manubrium. These rays become wider, and ultimately expand into the six diverticula of the stomach. Near the stomach they become much reduced, and spread out on its inner surface. Meanwhile the other cells of this part of the body, largely composed of nematocyst cells, become much more numerous.

Radial Canals.

The radial canals were six in number in all the sections made, and they appeared to be so in all other specimens, though they could not be seen clearly in the living or preserved whole specimens, as they are unpigmented or slightly so. As already noted, there is in the mature individual an appearance of pigmented radial canals, but this is due to the gonads spreading over the stomach, which can then be seen only as brown radial lines between them.

Circular Canal.

The circular canal is wide, and contains pigment-granules on its inner side only. The inner margin of this ring of pigment is well defined; the outer is irregular, with projections, which, however, do not extend into the tentacles, as figured in Vanhöffen's species, except in the young forms, in which the endodermal part of the tentacles is of a reddish-brown colour, similar to that of the circular canal. The projections mentioned do not occur in the adult opposite the tentacles, but opposite the spaces between them.

Gonads.

The gonads in the mature condition are very well developed, in contrast to the condition in *Eleutheria dichotoma*, and when fully developed they occupy almost the whole of the large sub-umbrellar cavity, extending from the velum upwards alongside of the stomach and to a considerable extent above it (Pl. 30, figs. 3 and 4), as indicated by sections.

They are separated from each other by partitions formed of a double layer of ectoderm, so that they may be described as occupying six pouches or vertical diverticula of the sub-umbrella (Pl. 30, figs. 5, 6, 7). These pouches extend from the circular canal towards the apex of the body, as may be seen in the living animal and in sections. They do not, however, fuse together at their apex to form a brood pouch, and there is a central area above the stomach, about equal to half the diameter of the animal, quite devoid of gonads.

Whether or not such partitions between the gonads exist in other southern Eleutheria is not known, except in the case of the male of Vanhöffen's species. The females of this species do not appear to have them, though Vanhöffen suspects they may be present in the young females.

As to the nature and origin of the pouches in the Cape species, they are obviously associated with the comparatively short radial canals, which enter the stomach at a low level. The enlargement of the sub-umbrellar space has therefore been upwards between the radial canals. This is illustrated in Pl. 30, fig. 5, which is a transversc section of a large male. The section, being somewhat oblique, shows a radial canal (*r.c.* 1) at its point of origin from the circular canal (*c.c.*). The radial canal to the right (*r.c.* 2) is free from tlie circular canal, while that above (*r.c.* 3) is at the point where it enters the stomach. At the upper part of the figure the section passes above the radial canal, which therefore does not appear here, but in its place there is the double fold of the ectoderm, lining the sub-umbrellar space. These have come in contact over the radial canals (Pl. 30, figs. 5, 6 and 7, *s.e.p.*).

This does not agree with the condition found in the Kerguelen species, for here, according to Vanhöffen, the radial canals are continued up on the outside of the septa, which therefore cannot have arisen by the ectoderm of the sub-umbrella cavity meeting over the radial canals (1911, p. 203, Pl. 30, fig. 5, c.).

Asexual Reproduction.

Budding is a very frequent occurrence, but only in the earlier and smaller stages of the medusa. In them half-a-dozen buds at various stages may be seen arising from the circular canal, between the tentacles and ring of nematocysts. The process is fairly rapid, buds being separated off from an individual observed, at the rate of one in every two or three days. Budding may begin early, as in one individual ·42 mm. in diameter a bud ·17 mm. in diameter was given off.

Relation of the Cape Eleutheria to other species.

The northern species of Eleutheria are readily distinguishable from the southern by the fact that the former have a single terminal cluster of nematocysts in the upper branch of the tentacles. In all the southern species there are additional clusters in the course of the branch between its distal end and the point where it joins the main stem. There seems to be still some donbt as to the two European forms being specifically distinct from each other. Hartlaub (1889), and Mayer (1910), following him, state that. the chief distinction between E. dichotoma and E. claparedii is that in the latter the branches of the teiitacles are much shorter (cf. variation in this respect noted in the Cape species), while Browne (1910) states that E. claparedii differs from E. dichotoma in having "both branches of the tentacles terminating with clusters of nematocysts." He adds that "it is quite probable tliat it is only an abnormal form of E. dichotoma with some nematocysts in the adhesive disc" (cf. the variation in nematocyst-clusters noted in the adult, of the Cape species!. Hæckel (1879, p. 106) gets over this difficulty by supposing that the alleged presence of nematocyst-clusters on the lower branch, noted by Quatrefages (1842), was founded on a mistaken observation.

Similar difficulties have been encountered in distinguishing tlie southern Elentheria. The first representative of these was described by Browne (1902) from a single specimen, found by Vallentin in Stanley Harbour, Falkland Islands. He named the species E. vallentini, and amongst other characters mentioned that the gonads occupy the whole of the upper part of the umbrella above the stomach, and the nematocyst of the tentacles are iu "two or three clusters on the upper (aboral) side, and occasionally on the under side."

He also (1910) recognised that the animal describer1 by Bedot (1908) as Wandelia chnrcoti, taken off Wandel Island, was a species of Elentheria which he called E. charcoti, characterised by the fact that the radial canals have slender lateral branches, the clusters of the nematocysts being, not oral and aboral in position, but lateral.

Browne (1910) recognised another species obtained in the National Antarctic Expedition, naming it E. hodgsoni characterised by ten to twelve clusters of nematocysts arranged as in E. charcoti, but distinguished from this and the other species by having an incomplete ring of nematocysts under the edge of the bell.

Finally, in 1911, another Eleutheria was found by the German Deep Sea Expedition at Kerguelen, and described by Vanhöffen (1911). He considers that all the three species described by Browne, together with his own, are identical, the supposed differences being due to mistaken observations.

Thus he thinks that as Browne examined only a single specimen of E. vallentini, a mistake could easily have arisen as to the position of the clusters of nematocysts. The fact, however, that in the Cape species the clusters of nematocysts are, in all cases, in the position described by Browne, seems to indicate that his statement cannot be set aside merely on the ground that a mistake could easily have been made.

With regard to E. charcoti, Vanhöffen doubts, that its distinctive feature, the branching of the radial canals, is a fact. He has seen and sketched in the living animal an appearance which, he thinks, might have given rise to the supposition that the radial canals are branched, but this was not confirmed by sections. It is probable that this pigmentation is of the same nature as the white pigment described in the living Cape species; it usually disappears in preservative and was not seen in sections. Browne does not state exactly on what evidence he makes his statement, but it will be erring on the safe side to accept it until disproved by sections.

E. hodgsoni is distinguished from all other species by its interrupted band of nematocysts, these being isolated patches on the basal portions of the tentacles according to Browne. This Vanhöffen doubts, as the tentacles are very crowded together, so that there is scarcely any space between them. In the Cape species, and apparently also in the Kerguelen species, this band is well separated from the bases of the tentacles.

Vanhöffen states, as a further argument for the identity of the species of Eleutheria in the Southern Hemisphere, that it would be very strange if the Falkland Island species should differ from that from Kerguelen, both having been found on the kelp (Macrocystis) which is carried in the Antarctic current round the south polar continent. This is not very convincing evidence, but may also be taken for what it is worth as evidence that the Cape species, which was not found on this weed, is distinct.

On the whole, in absence of definite evidence to the contrary it may be advisable to retain Browne's species provisionally, and, if so, we must regard Vanhöffen's species as a fourth, which may be called E. kerguelenensis. The Cape Species, which may be designated E. capeusis, agrees with E. vallentini, and, like it, differs from all other species in having the clusters of nematocysts oral or aboral in position; it differs from it, however, markedly in that the gonads do not occupy the whole of the upper part of the umbrella above the stomach, as they do, according to Browne, in E. vallentini.

With regard to the placing of these species under one genus, it may be noted that an apparently important character of the genus Eleutheria, which seems to be of more fundamental significance than the character of the tentacles, is the presence of a brood-pouch above the stomach along with the reduction of the gonads, as described by Hartlaub (1889), who regarded it as one of the characteristics of the genus, and of such importance that its absence, if proved, in the only other Eleutheria then known (E. claparedii) would necessitate the establishment of a new genus. This suggestion has not been accepted by later authors, who have definitely described forms in which it is absent. The reconsideration of this, however, seemed to be desirable in view of the fact that in the mature female of the Cape species there is probably no brood-cavity at all, and certainly none above the stomach, and it appeared to be necessary to establish a new genus for the reception of such forms. The subsequent discovery, however, of the hydroid threw a new light on the above question, and at the same time disclosed further reasons for separating the two groups generically.

II. The Hydroid Stage.

The preceding description of the medusoid form of the animal was completed before the hydroid from which it arises was found, and it may be as well to leave it in its present form, with a few necessary alterations, in order to indicate the position with regard to our knowledge of the southern "Eleutheria," and how this has been altered by the characters which tho polyp proves to possess.

The cleterniination of tho hydroid, which seemed at first, a difficult matter, proved ultimately to be very simple. A small hydroid-like Hydranthea was very abundant in the tank, in which the medusa mas mostly found, and this was suspected to be the parent stock, but no definite evidence was procured. A smaller vessel, kept for another purpose, and in which the medusæ had appeared in two successive summers, was then carefully examined, and a beautiful, bot inconspicuous and small Cladonema-like hydroid was found, with buds in all, stages, one just set free, arid two crawling about slightly larger. As the medusoid form of Cladonema is in some respects closely related to Eleutheria, as has been pointed out by Haeckel, it was obvious that this would prove of importance in clearing up some difficulties mentioned in the inquiry.

This hydroid (Pl. 30, fig. 8) may Erst be briefly described. The hydranth is of varying length, the longest being about a millimetre and a half; at its broadest part, just below tlie upper tentacles, it is about ·2 mm., narrowing clown to ·12 mm. at it5 proximal end. Coloration is not conspicuous, except in the endodermal parts, which are of a slightly reddish colour. The medusoid buds were of tlie same colour, bat much more conspicuous. The rounded heads of the distal tentacles were of a transparent white colour. The animal could only be clearly recognised under the microscope on account of its small size and the fnct that it is usually concealed by adhering débris.

There are usually three capitate tentaclcs below tlie prominent conical or rounded hypostome. These tentacles are short and stout, about ·25 mm. in length in the individual measured when fully expanded. In one only of the specimens (about twenty) examined were these teritaclcs four in number. About a millimetre from the distal end of the polyp is a circle of non-capitate tentacles, thinner and usually longer than the other tentacles. They arc usually six in number, bnt four were also observed. Pl. 30, fig. 8, is drawn from a living individual, with a large medusoid bud; its dinicnsions are somewhat different from those stated, and the teiitacles are somewhat contracted.

The hydrocaulus was in the specimen measured about 2 rnm. in length. The length may vary, however, considerably, ancl it niay bc straight or bent in various ways. The perisarc is thin and transparent towards its distal end.

The hydrorhiza is sometimes closely applied to and penetrates tlic substratum, or it may be free for a considerable portion'of its length. It is of about tlie same diameter as the hydrocaulus ; the perisarc is of a yellowish-brown colour, is fairly tough, arid coated with débris of various sorts.

The buds arise at or slightly above the level of the lower tentacles. One, two or three may be seen at one time in this position in all stages of growth. They are well advanced before they are set free, and the tentacles, which are then in active niotion, show a well-developed nematocyst-cluster at the end of the upper branch of tlie tentacle, with the rudiment of a second beginning behind it on the aboral side in some.

Except for tlie reduced number of tentacles the hydroid closely resembles tlie genus *Cladonema*, and we may now consider the significance of this in relation to some of the characters of the species of *Eleutheria*.

Although tlic southern differ markedly from tlic northern species, as, for instance, in the absence of a brood-pouch above the stomach and the character of tlie tentacles, which, moreover, closely resemble those of the young medusa of Cladonema, Browne (1902, 1910) and Chun (1900) seemed to have no hesitation in referring them to the genus Eleutheria. Vanhöffen (1911), however, had sonic suspicion of the affinities of these forms with Cladonema, as he at first (1911) narned the unknown polyp-, to which the southern Elentheria probably belonged, Cladonema vallentini, as, according to the form and arrangement of its tentacles, it belonged to this genus and not to Clavatella (the hydroid of the northern Eleutheria). His further examination of the medusa, however, led him to abandon this suspected affinity to Cladonema, and he returned to the genus Eleutheria on the following grounds of resemblance: simple mouth without stinging teutaeles; simple division of tentacles into two branches; ring-shaped mass of nematocysts under the margin of the bell and the utilisation of the sub-umbrellar space as a brood-cavity. Two objections to this are that there is no special brood-chamber above the stomach as iu Eleutheria, as described by Hartlaub (1886), and that there is no conclusive evidence that the sub-umbrellar space functions as a brood-cavity in the southern form—in fact, there is evidence to the contrary in tlie Cape species.

His first suspicions therefore prove to have been justified, but there is some difficulty as to placing this Cape medusa and hydroid (probably along with other southern "Eleutheria") in the genus Cladonema The reduced number of capitate tentacles in the hydroid and tlie increased number of non-capitate tentacles may not be of great significance, and are not constant, but the oral tentacles, terminating in nematocyst knobs, found in the medusa of Cladonema and not in tlie southern Eleutheria, presents a more serious difficulty. The presence or absence of tlio oral tentacles has, indeed, been used (Mayer, 1910) to separate the family of the Cladonemidæ iuto two sub-families, and though this is avoided in Günther's classification, this character is still used to separate genera of the sub-families into groups.

In view of the present generic classification of the *Cladonemidæ* it seems, therefore, necessary to distinguish this representative of the family both from *Eleutheria* and *Cladonema*, and, to mark a distinctive feature, namely, the existence of several clusters of nematocysts on the upper branch of tho tentacle, it may be called *Cnidonema*. The following list of outstanding features in the three genera will indicate their differences and similarities.

Genus *Eleutheria*, Quatrefages.

Medusa :

Adapted for crawling or walking.

Brood-pouch above stomach.

Gonads reduced, lodged in brood-pouch.

Hermaphrodite.

Radial canals simple, four to six in number.

Tentacles of the same number as radial canals, dichotomous; upper branch with one terminal nematocyst-cluster.

No oral tentacles,

Thick nematocyst ring under margin of bell.

Hydroid :

With one verticil of capitate tentacles only.

Genus *Cnidonema*, g. n.

Medusa :

Adapted for crawling or walking.

No brood-pouch above stomach.

Gonads well developed, in ectodermal inter-radial pockets around stomach.

Sexes separate.

Radial canals usually six.

Tentacles numerous, increasing with age, and not corresponding to number of radial canals, dichotomous;

tlic upper branch with several clusters of nematocysts in addition to a terminal cluster.

No oral tentacles.

Thick nematocyst ring under margin of bell.

Hydroid :

With one verticil of three capitate tentacles, and a second of six non-capitate tentacles.

Genus Cladonema, Dujardin.

Medusa :

Not adapted for crawling or walking.

No brood-pouch above stomach.

Gonads around stomach continuous.

Sexes separate, occasionally hermaphrodite.

Radial canals simple, or more or less fused together, eight to ten in number.

Tentacles of the same number as radial canals, branched, or with simple or branched appendages.

Four or five oral tentacles terminating in spherical masses of nematocysts.

No thick nematocyst ring under margin of bell.

Hydroid :

With one verticil of four capitate tentacles, and a second of four non-capitate tentacles.

With regard to the inclusion of all the described species of the southern Eleutheria under the genus Cnidonema as here defined there are certain difficulties, which, however, are not serious, and may disappear with a fuller knowledge of the species. Thus the existence of ectodermal pockets in which the gonads are partly lodged has not been described in Browne's species, and only in the male in Vanhöffen's, and the hydroid form is only known in the case of the Cape species. The following key to the various species indicates the chief differences between them as they have been described.

I. Nematocyst clusters oral and aboral in position :

A. Gonads entirely above stomach

1. C. vallentini (Browne).

B. Gonads not entirely above stomach

2. *C. capensis*, n. sp.

II. Nematocyst clusters lateral in positiou :

A. Radial canals branched . 3. *C. charcoti* (Browne).

B. Radial canals riot branched.

A′. Complete nematocyst ring

4. *C. kerguelensis*, n. sp.

B′. Incomplete nematocyst ring

5. *C. hodgsoni* (Browne).

Further. information is, however, required with regard to these specific-differences.

There are also some interesting points which are worthy of attention, such as the origin of the gonads, said to be ectodermal in *Eleatheria*, and endodermal at least in one species of *Cladonema*. Whether the sub-umbrellar space serves as a brood-cavity in which tlie young are developed is still questionable. There is evidence also that the tentacles appear in a definite order in development. The development of the Cape species, which can be readily procured, will probably throw some light on these points.

Summary.

(1) A species of "*Eleutheria*" is found in fair abundance at certain times and places at the Cape of Good Hope.

(2) It can readily be kept in confinement, and some of its habits are noted.

(3) The chief characteristics of the species are described and compared with those of other southern species.

(4) Its hydroid form has been found, and proves to be very similar to that of *Cladonema* (*Stauridia*), not of *Eleutheria* (*Clavatella*).

(5) It differs, however, from *Cladonema* chiefly in the absence of oral tentacles, and a new genus (*Cnidonema*) is proposed for the reception of this and probably all the other southern *Eleutheria*, the hydroid forms of which, however, are not yet known.

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5

EXPLANATION OF PLATE 30,

Illustrating Dr. J. D. F. Gilchrist's paper "On a Species of the Crawling Medusa, Eleutheria, from tho Capo of Good Hope (Cnidonema capensis, g. et sp. n.) and the Southern Eleutheriæ."

[Sections (figs. 3–7) arc magnified to the scale shown with fig. 3. The magnification of other figures is indicated by the scde accompanying them.]

REFERENCE LETTERS.

c.c. Circular canal. *m.* Mouth. *n.r.* Ring of nematocysts. *ov.* Ovary. *r.c.* Radial canal. *sep.* Septum, separating gonads. *s.um.c.* Sub-umbrellar cavity. *t.* Testis. *vel.* Velum.

Fig. 1.—Immature and actively crawling medusa

Fig. 2.—Mature and more stationary medusa viewed from above, with tentacles fully expanded

Fig. 3.—Female medusa ; vertical section passing through the radial canals

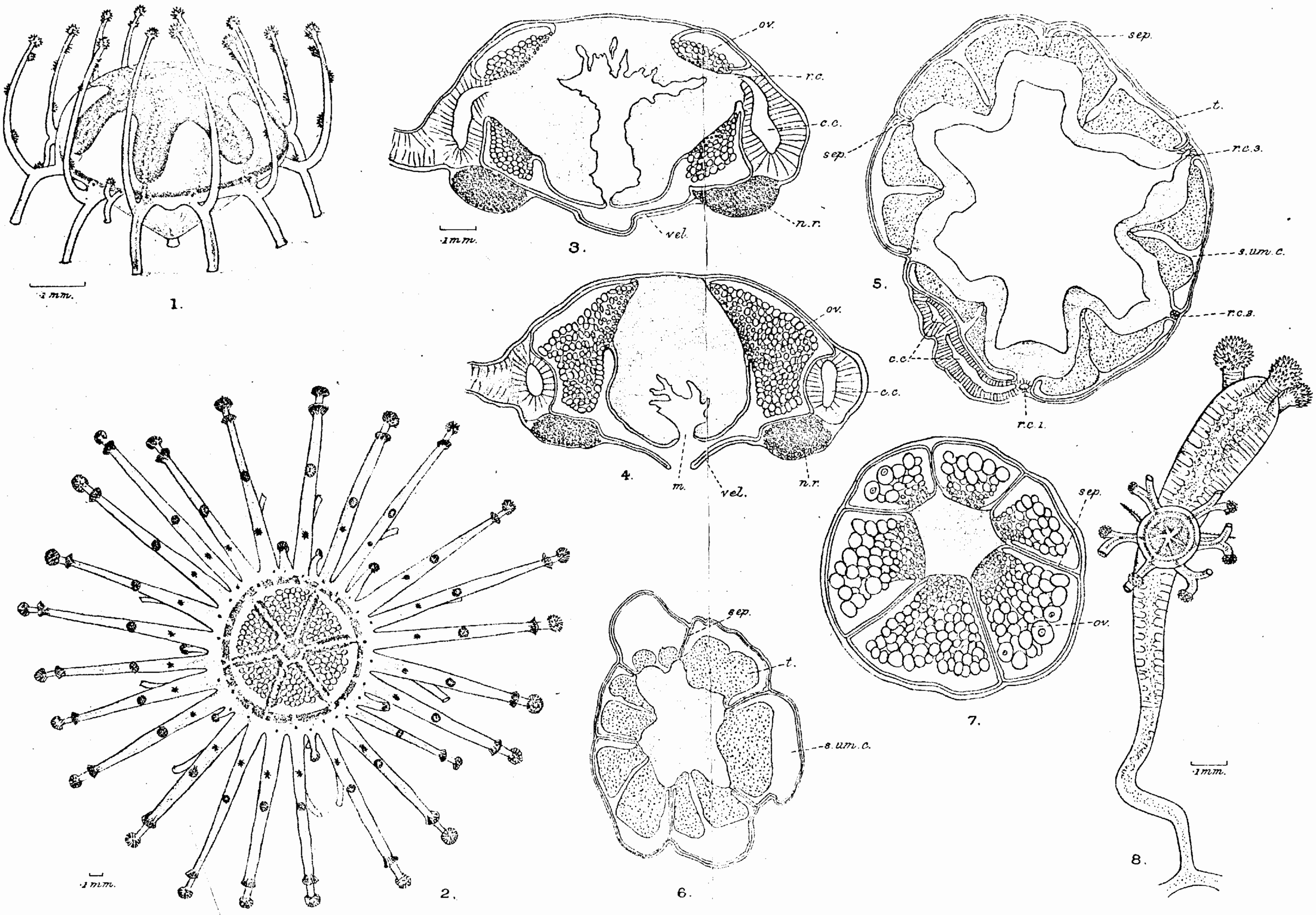
Fig. 4—Female medusa, vertical section passing through inter-radial region.

Fig. 5.—Male medusa ; oblique section passing through the circular canal, the radial canals ancl septa. *r.c.* 1. A radial canal where it joins the circular canal. *r.c.* 2 A radial canal at a higher level. *r.c.* 3. A radial canal entering the stomach. *sep.* Septa separating tlic gonads at a level above the radial canals.

Fig. 6 —Male medusa ; transversc section above stomach.

Fig. 7.—Female medusa ; transverse section above stomach

Fig. 8.—Hydroid stage with a fully-formed medusoid bud.



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