

NOTES ON THE EUROPEAN SPECIES OF *ELEDONE*

WITH ESPECIAL REFERENCE TO EGGS AND LARVAE

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SYNOPSIS

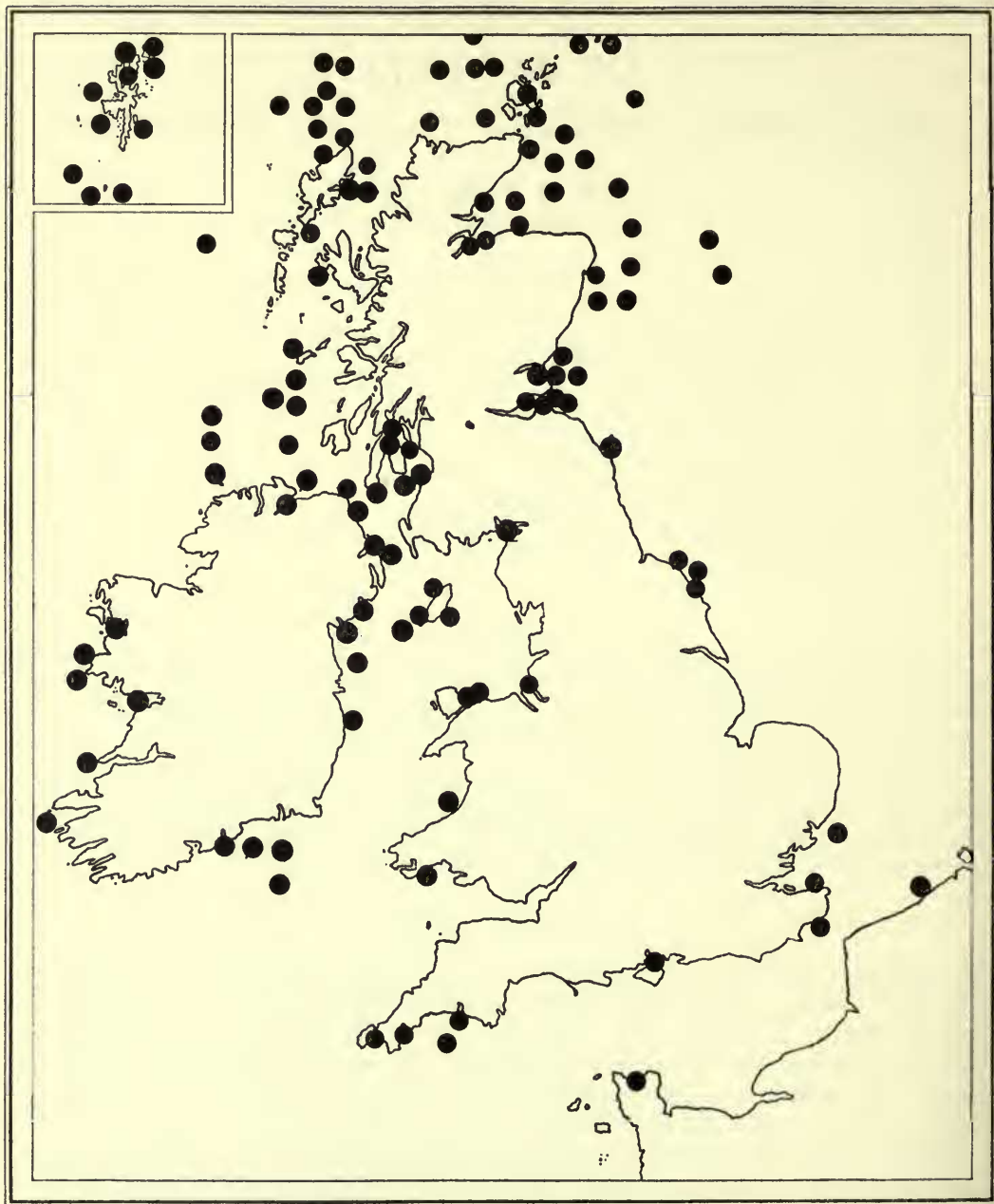
The newly hatched larvae of the Lesser Octopus, *Eledone cirrhosa* (Lamarck), are described and figured for the first time from material collected by the Fishery Board for Scotland. Records of eggs and spawning have been brought together and additional ones listed. The eggs and larvae of this species are compared with those of the Mediterranean *E. moschata* and the distribution of both species reviewed. *E. moschata* occurs throughout the Mediterranean and its distribution outside is limited to neighbouring coasts, north and south of the Straits of Gibraltar. The records show that *E. cirrhosa* occurs in the western Mediterranean and along the western coasts of Europe to Iceland, the Faroes and northwards to Trondhjem on the Norwegian coast. The characteristics of the two species are compared.

I. INTRODUCTION

In this paper some new observations are made on the eggs and larvae of the Lesser Octopus (*Eledone cirrhosa* Lamarck) and our previous knowledge of its reproduction and distribution is summarized. Early naturalists confused this species with *Eledone moschata* (Lamarck) and it has been deemed desirable to bring together what is known of the eggs and larvae, as well as the distribution of both species to enable a summary of the differences between the species to be presented.¹

Although *Eledone cirrhosa* is much more widely distributed in North European waters than the Common Octopus (*Octopus vulgaris* Lamarck), it is surprising that so little is known about its habits and life history. Its morphology and anatomy was the subject of a memoir by Isgrove (1909).

¹ The larva of a South African Eledonid, *Pareledone nigra*, has recently been described by me (see Rees, 1954).



TEXT-FIG. 1.—The recorded distribution of *Eledone cirrhosa* in inshore waters. Trawling records from the central North Sea are not included. The sources of all the records are given in the bibliography.

II. *ELEDONE CIRRHOSA* (LAMARCK)(a) *Spawning*

The spawning of *Eledone cirrhosa* in captivity was first noted by Joubin (1888) who observed it in an aquarium at Banyuls in the month of June. According to Joubin there were about 30 groups of eggs (and traces of another 30) most of them being eaten by the female. Each bunch contained 5–19 eggs, the greatest number being laid first. The eggs were white in colour, each being 7–8 mm. in length.

Spawning of *Eledone* was also noted by Gravely (1908) in an aquarium tank at Port Erin, Isle of Man, in July. He noted that eggs were about 7 mm. by 2.5 mm. in diameter and that one to four bunches of eggs were laid almost every day for about a month, after which spawning was less regular and was soon over.

Isgrove (1909) states that one *Eledone* lays about 800 eggs and that these are spawned in groups of 25–30 eggs. Egg clusters 4–7 cm. long were collected in Aberdeen market by Bowman; the full sized ova were 8–9 mm. in length and about 4.0 mm. in diameter at the broad end (Russell, 1922). It now seems that these eggs are a little too large to be those of *E. cirrhosa*, but their identity cannot be known for certain until we have some information on the eggs of *Graneledone verrucosa* (Verrill); this species replaces *E. cirrhosa* to the north of the Faroes.

Spawning in aquaria has been noted at Plymouth in January (Marine Biological Association, 1931) and in July (Isgrove, 1909); at Port Erin in July (as noted by Gravely) and in September (Moore, 1937, p. 196). A female captured on the Dogger Bank spawned in the Heligoland aquarium in January (Hertling, 1936, p. 294) Stephen (1944, p. 252) mentions several clusters of ova from N.N.W. of Ronas Voe, Shetland (position, 60° 42' N., 1° 46' W.) trawled on 4th April, 1927, and, as the embryos were well developed it can be assumed that spawning occurred in February or early March.

From this it appears that *Eledone* may spawn all the year round, and this is borne out by records of larvae, noted by Stephen (1944, p. 251). He observed that although larvae were present all the year in the plankton catches of the Fishery Board for Scotland, they were more frequent during the period May to August; this suggests maximum spawning in April, May, June and July. As to whether this period of more intensive spawning is linked with the known seasonal migration of *Eledone* into inshore waters we have insufficient evidence. Even the kind of haunt chosen for spawning in nature is not known for certain, but it appears that *Eledone* does not brood over its eggs, nor does it seem to lay them in shells or pots, as does *Octopus vulgaris*, for it has never been taken with its eggs.

(b) *Egg masses*

Apart from eggs seen in aquaria, *Eledone* spawn is rarely taken and only two positive records are known to me, the batches trawled near Ronas Voe in the Shetlands (Stephen, 1944) and a very large cluster from the Eddystone Grounds off Plymouth in the collections of the Plymouth Laboratory.

The large egg mass from the Eddystone Grounds contains a very large number of undeveloped eggs. The stalks of the eggs are very short and the largest eggs are 6.7

mm. in length by 2.4 mm. in width. Some eggs are extremely small, being only 2.85–3.6 mm. in length by 1.0–1.5 mm. in diameter (Pl. 9).

The small egg-cluster from Ronas Voe contains embryos in an advanced stage of development. The eggs themselves are 6.65–6.79 mm. in length by 2.94–3.29 mm. in width. There is still a large yolk mass, but the embryos are well formed. Chromatophores are developing the arms, head and body and the *Köllikersche buschel* are clearly seen on the head and mantle (Pl. 10, figs. 1–4). At this size (3 mm. in ventral mantle length) the single row of suckers on the subequal arms are formed.

A third cluster in the British Museum is without any particulars; the eggs are poorly preserved and resemble those from Ronas Voe.

Records of larvae of *E. cirrhosa* are few. Lo Bianco (1909) found young *Eledone* in the plankton in the Bay of Naples; those found in April had a length (? total length) of 40 mm. and those found in October a length of 120 mm. He gives no adequate description and there is no certainty as to which species he had. Scottish records of larvae are given by Russell (1922) and Stephen (1944). Russell noted that the arms are much shorter in proportion to the body (3 : 5) in the young, the back is smooth and covered with large chromatophores and the body is generally surrounded by a thick, soft, translucent cuticle.

In the Bay of Biscay area Bouxin and Legendre (1936, p. 24) found seven specimens ranging from 21–33 mm. in length in the stomachs of *germon* in positions approximately 90–100 miles to the south-west of Glenans and at about 250 miles to the south-west (that is, near Cape Finisterre).

A new description is therefore needed and is given below.

(c) *Description of the larvae*

Dr. A. C. Stephen has kindly allowed me to examine a series of 18 larvae, from the catches of the Fishery Board for Scotland, which were reported by him in 1944.

It has already been noted that larvae still in the eggs may reach a ventral mantle length of 3 mm. in large eggs. In small eggs this length would presumably be less, so that planktonic larvae of approximately this size can be regarded as having been taken within a few days of hatching.

The young larva (Pl. 10, figs. 5–6) has much the same shape as the larva of *Octopus vulgaris* (the only species it could be confused with in British waters) with its short arms and rather squat mantle. In details, however, there are big differences, the most noticeable feature being the arrangement of the chromatophores on the mantle. Here the entire mantle is uniformly covered with large reddish brown chromatophores, and these are also prominent on the head and arms. On the latter there is a single row and those of the central portion of the head are deep-seated. Overlying these in the transparent outer integument are other fainter reddish brown chromatophores, which increase in number and size with growth. The outer integument of the eye is silvery and sometimes has a greenish hue.¹

The arms are subequal and do not have the thin cirriform tips seen in very young larvae of *Octopus vulgaris*. No. 12 (Table I) has 6–7 fully formed suckers on each arm

¹ All references to colour mean colour of preserved specimens in alcohol.

with the clear rudiments of 8-9 more at the tip of the arm. A slightly larger specimen (No. 13) has 9 suckers on each arm and about 8 rudiments at the tip.

The largest larva available (No. 19) has about 28 suckers plus rudiments at the tip. The first proximal sucker has a diameter of 0.56, the second, third and fourth have a diameter of 0.7, 0.84 and 1.05 respectively. Suckers 5-7 are the largest and then they diminish in size distally. The web is subequal reaching to the 7th-8th suckers, that is, to about one-third of the length of the tentacles. This specimen taken on 27th November, 1930, was recorded from square E 13 b by Stephen (1944).

This late larva has developed a mantle fin-ridge as in the adult. The ventral mantle is smooth but the dorsal mantle and head are both covered with tubercles. The larval chromatophores are still discernible because of their large size, but the areas in between have become covered with a large number of small chromatophores.

As noted above, the arms of the larval *Eledone* are quite short at hatching from the egg and they are usually not so long as the ventral mantle (Table I). Growth of the arms of the planktonic larvae is more rapid than mantle length (Figs. 3 and 4) and is also reflected in the relation of mantle length to total length (Fig. 2).

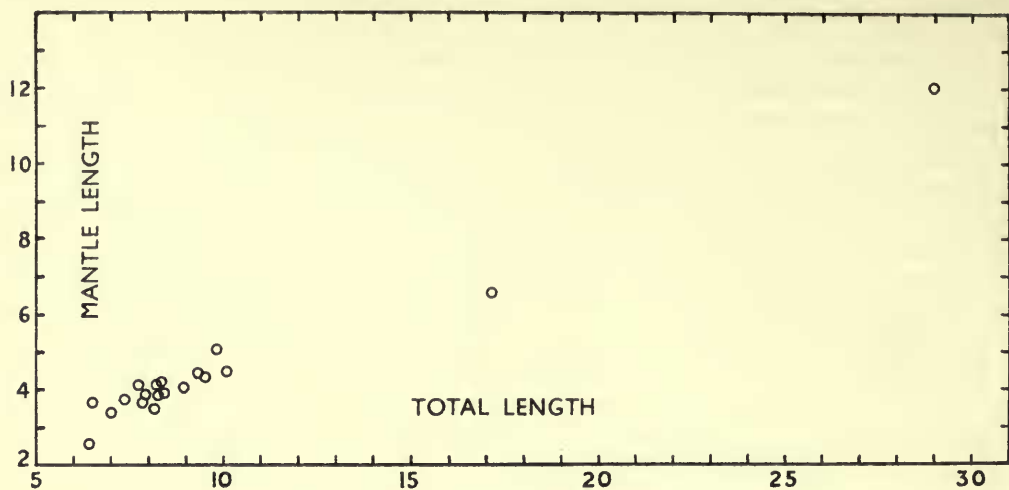
TABLE I.—*Larvae Collected by the Fishery Board for Scotland*

	No.									
	1.	2.	3.	4.	5.	6.	7.	8.	9.	10.
Total length	6.5	7.0	6.45	7.9	8.95	8.25	8.2	8.12	8.34	7.84
Dorsal mantle length (to eye)	3.9	4.2	3.85	4.2	4.9	4.7	4.83	4.4	5.05	4.55
Ventral mantle length	3.65	3.35	2.52	3.85	4.06	3.85	4.06	3.43	4.2	3.64
Head width	2.8	3.0	2.8	3.5	3.55	3.5	3.57	3.5	3.43	3.5
Mantle width	3.15	3.2	3.55	3.85	3.78	3.64	4.4	3.99	3.64	4.2
Diameter of eye	0.8	1.05	1.05	1.05	1.1	1.2	1.2	1.26	1.05	1.4
Length of arms	2.45	2.8	2.5	3.08	3.5	3.15	3.15	3.15	2.8	2.8
Diameter of suckers	0.2	0.3	0.22	0.32	0.3	0.38	0.34	0.3	0.38	0.32

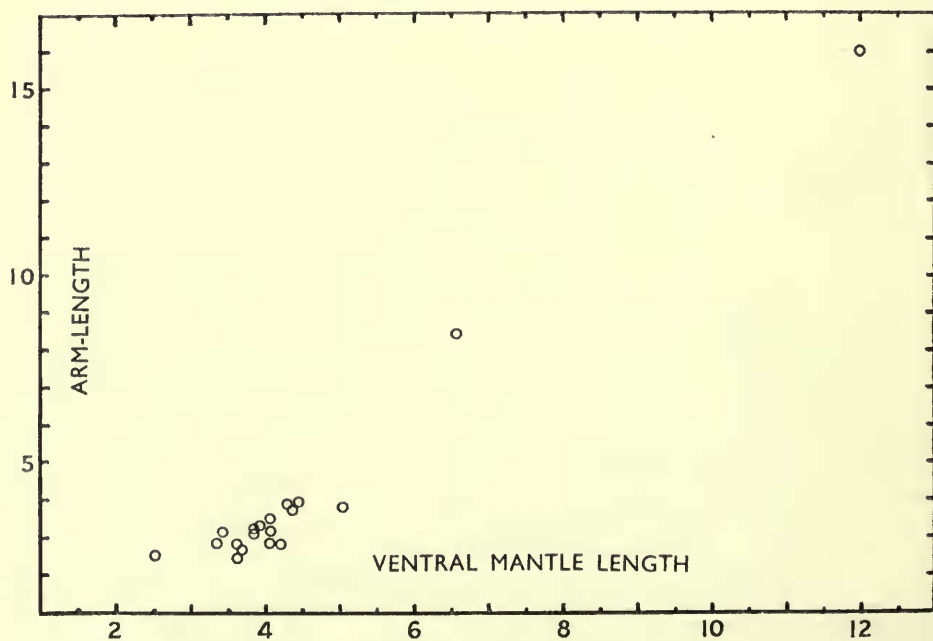
	No.								
	11.	12.	13.	14.	15.	16.	17.	18.	19.
Total length	8.4	7.35	9.31	10.08	7.7	9.45	9.87	17.15	29.0
Dorsal mantle length (to eye)	4.97	4.62	5.11	5.39	4.76	5.25	5.95	7.7	13.0
Ventral mantle length	3.92	3.71	4.41	4.48	4.06	4.34	5.04	6.58	12.0
Head width	3.5	3.71	3.99	4.55	3.78	4.13	4.2	6.3	9.0
Mantle width	3.85	4.06	4.62	4.9	4.2	4.76	4.69	7.14	10.0
Diameter of eye	1.26	1.26	1.4	1.4	1.3	1.6	1.5	2.2	3.5
Length of arms	3.22	2.66	3.71	3.92	2.94	3.85	3.8	8.4	16.0
Diameter of suckers	0.3	0.32	0.4	0.4	0.3	0.4	0.4	0.7	1.12-1.2

III. *ELEDONE MOSCHATA* (LAMARCK)(a) *Egg masses and larvae*

We know less about the spawning and larval stages of this species than we do of *Eledone cirrhosa*. Korschelt (1893) described an egg-mass found on a *Pinna* shell at



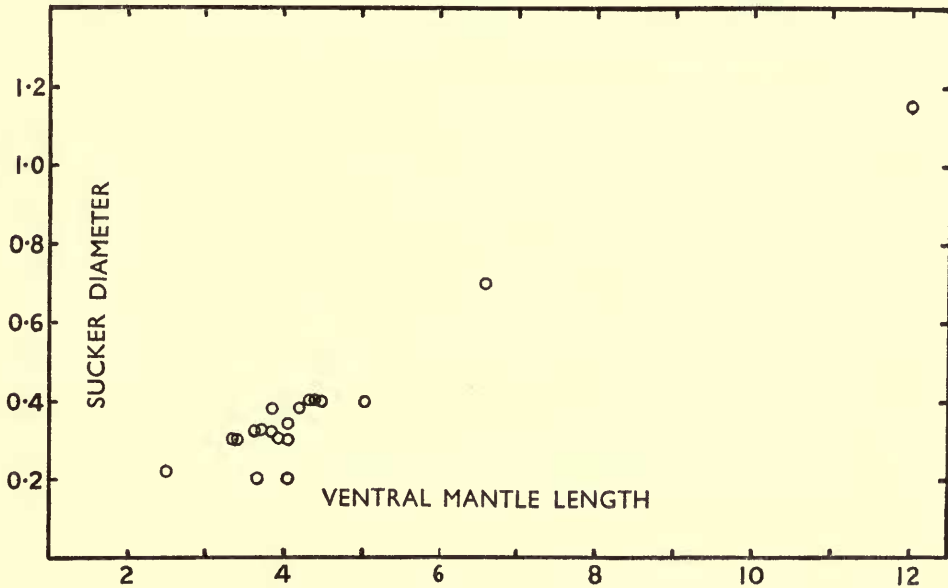
TEXT-FIG. 2.—The relation of mantle length to total length in larvae of *Eledone cirrhosa*. Measurements are in mm.



TEXT-FIG. 3.—The relation of arm length to ventral mantle length in larvae of *Eledone cirrhosa*. Measurements are in mm.

Rovigno in the Adriatic. He gave the total number of eggs as 65-70; this mass was made up of small clusters of 2-4 eggs joined to the main mass by a common stalk. The eggs (excluding stalk) were 15 μ m. in length, that is, the same length as the eggs figured by Jatta (1896, tav 7, fig. 3).

Korschelt was under the impression that he had the eggs of *E. aldrovandi* (i.e., *cirrhosa*), but this mistaken view was corrected with the identification of the large eggs with *E. moschata* by Jatta and confirmation by Gravely (1908) that the smaller eggs belonged to *E. cirrhosa*. There have been embryological studies on development



TEXT-FIG. 4.—The relation of sucker diameter to ventral mantle length in larvae of *Eledone cirrhosa*. Measurements are in mm.

in the egg (Sacarrao, 1943, 1945, 1951 and 1952) but there is no detailed description of the newly hatched larva. Sketches of juvenile *Eledone* have been published by Jatta (1896, tav 7, figs. 5 and 10), while Naef (1923) gives a drawing of a post-larval *E. moschata* from Trieste. A new description is much needed.

IV. DISTRIBUTION OF THE EUROPEAN SPECIES

Eledone cirrhosa (Lamarck) is found in the Mediterranean, but its full distribution there is not known. It appears to be a common species in the western part, but there are no records for the eastern Mediterranean. Under the name *Eledone aldrovandi* there are numerous records for the western Mediterranean (Jatta, 1896), but there are no records east of Dalmatia (Robson, 1932, p. 266) and according to Ninni (1884) it does not penetrate to the head of the Adriatic.

In the Atlantic *E. cirrhosa* has a much less restricted distribution than *E. moschata*.

It is a common species on the European continental shelf extending to southern Iceland, the Faroes (Brunn, 1945, p. 8) and the west coast of Norway. In the open areas of the shelf it appears not to extend beyond the line Iceland-Faroes-Bergen, but is a common species southwards of this line. On the Norwegian coast itself it reaches Ostnesfjord in the Lofotens, but is said to be scarce north of the Trondhjemsfjord (Grieg, 1933).

Its distribution in inshore British waters as recorded in the literature on cephalopods is plotted on Map I, and, quite apart from the fact that such maps tend to reflect areas worked by biologists, the species appears to be scarcer in the southern North Sea than elsewhere. Records from trawling grounds offshore have not as a rule been plotted (those from the North Sea trawling grounds are given by Grimpe, 1925), and it has not been possible to search for all the occasional records buried in the transactions of local natural history societies.

Eledone moschata (Lamarck) is a Mediterranean species which ranges from Istanbul (Digby, 1949), the Syrian coast (Gruvel, 1931) and Palestine (Bodenheimer, 1937) to the adjoining region of the Atlantic. Korschelt (1893, p. 68) implies that it is the common *Eledone* of the Adriatic and it has also been found commonly at Naples (Jatta, 1896, and Naef, 1923), the Gulf of Marseilles (Vayssière, 1917) and Monaco (Boone, 1933) to quote only a few of the more recent records. Outside the Mediterranean the species appears to be rare and records are few. The "Talisman" took a female specimen in the Bay of Cadiz from a depth of 60 m. (Fischer & Joubin 1907, p. 328), while Adam (1941, p. 140) reported the first specimen from the African Coast (Baie du Levrier, Port-E'tienne, Mauritania).

There are no authentic records from northern Europe; Nielsen's *Eledone moschata* from the Faroes (1930) proved on re-examination to be *E. cirrhosa* (Brunn, 1945, p. 9).

V. THE DIFFERENCES BETWEEN *ELEDONE CIRRHOSA* AND *E. MOSCHATA*

The main differences between the species are tabulated below.

<i>Eledone cirrhosa</i>	<i>Eledone moschata</i>
No musk odour.	. Musk odour.
Skin with warts on dorsum.	. Skin smooth.
Ridge along edge of mantle.	. No pallial ridge.
The seven non-hectocotylized arms of the male carry close-pressed, flattened suckers, forming cirri at the tips of the arms.	. The seven non-hectocotylized arms carry a double series of transverse lamellae at their tips.
The two retractor muscles of the gills are fused at their base and form a "Y"	. The two retractor muscles of the gills are inserted separately.
Spermatophore with spines. ¹	. Spermatophore without spines.
Colour of adult: Light yellowish brown with diffuse rust-brown patches on the back. Ventral mantle pale ivory or pinkish yellow with a greenish iridescent sheen.	. Colour of adult: Greyish brown colour with darker almost black patches on the dorsal side. Preserved animal is grey to dark grey with numerous dark patches.
Eggs, Pyriform, ca. 7 × 2.5 mm. in clusters of about 30.	. Eggs sausage-shaped ca. 15 × 4 mm. in clusters of two to four.

¹ Fort (1941) creates a new genus *Acantheledone* for *E. cirrhosa* laying particular stress on this character.

Eledone cirrhosa (cont.)

Newly hatched young *ca.* 3.0 mm. in ventral mantle length.

Parasites :

Dicyemenea eledones (Wagner, 1857).
Chromidina coronata (Foettinger, 1881).

Eledone moschata (cont.)

Newly hatched young probably *ca.* 8 mm. in ventral mantle length.

Parasites :

D. eledones.
D. moschatum Whitman, 1882.

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