

**A REDESCRIPTION OF *EDWARDSIA BEAUTEMPSI*
AND *E. TIMIDA*
(ACTINIARIA: EDWARDSIDAE)**

by

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Résumé

E. beautempsi Quatrefages 1842 est l'espèce type du genre *Edwardsia*, anémone de mer fouisseuse. Cette espèce n'a jamais été formellement identifiée depuis sa première description bien que, de façon erronée, beaucoup d'auteurs l'aient supposée identique à *E. callimorpha* (Gosse).

La présente note fournit une redescription de *E. beautempsi* et d'une autre espèce décrite par Quatrefages, *E. timida*, provenant de sa localité d'origine, les Iles Chausey en Normandie. Les mentions antérieures des deux espèces sont passées en revue et la position de plusieurs espèces, peut-être synonymes, est discutée.

Introduction

The genus *Edwardsia* was established by Quatrefages (1842), for three species of burrowing sea anemones discovered by him in the Iles Chausey, Normandy, France. The first of these, *E. beautempsi*, is the type-species by subsequent designation (Carlgren, 1949); the other two species, *E. timida* and *E. harassi*, have been shown to be identical (Dixon, 1886).

It is unfortunate that Quatrefages' descriptions, although excellent by contemporary standards, do not permit satisfactory definitions of his species by modern criteria. Consequently, some confusion has arisen regarding the true identity of these species, particularly *E. beautempsi*, which has never been positively identified since. The latter has frequently been identified with the British species *E. callimorpha* (Gosse, 1853), (Andres, 1884; Haddon, 1889; Faurot, 1895; Nafilyan, 1912); but Stephenson (1935) points out that "whatever *E. beautempsi* really was (and we may never know), it was almost certainly not *E. callimorpha*". Delphy (1938) suggested that the only way to settle the issue would be to obtain specimens from the original locality, but although he declared his intention of doing this he apparently never did.

In April 1976, I visited Chausey, taking advantage of the good spring tides, and was able to collect two species of *Edwardsia* from the locality given by Quatrefages (Grand Epail). These proved to be readily identifiable from Quatrefages' description as *E. beautempsi* and *E. timida*.

The aim of this paper is to provide a comprehensive description of these species, together with an appraisal of related species, some of which have proved to be synonymous.

Locality - Iles Chausey

The Chausey archipelago (spelt "Chansey" by Haddon, 1889 and Carlgren, 1949) is located in the gulf of Saint-Malo about 12 km W. of Granville, Normandy. At low water a large sandy plateau, about 11 km E./W. and 4.4 km N./S. is exposed, from which rise numerous granite rocks and islets. The vertical tidal range may reach 15 metres on spring tides. The locality given by Quatrefages, Grand Epail (48° 52' 33" N., 1° 50'16" W.), is a large outcrop of rock on the S.W. side of Grand Ile, the only inhabited island.

Edwardsia beautempsi was found to be common in the coarse sand and fine gravel to the N. and W. of Grand Epail. It appears to be a true littoral form occurring as high on the beach as LWNT, but was not found below about MLWST. *E. timida* was abundant in the same locality and right down to ELWST. The latter species was also very common in the region of les Grosettes, a group of rocks about 3.5 km E. of Grand Ile; *E. beautempsi* was not found here.

Other Actiniaria found on Chausey were: *Actinia equina*, *Anemonia sulcata*, *Tealia felina*, *Aiptasia couchii*, *Calliactis parasitica*, *Actinothoe sphyrodeta*, *Cereus pedunculatus*, the burrowing forms *Peachia hastata*, *Halcompa* sp, and *Isoedwardsia lucifuga*. The Ceriantharian *Cerianthus lloydi* was present in abundance.

Material and Methods

Specimens were studied in both the living state and by means of serial sections and dissection. The anemones were relaxed using a 1:1 solution of 7.5 percent Magnesium chloride: sea water (Batham, Pantin and Robson, 1960) after preliminary narcotisation using menthol crystals floated on the surface. Specimens for sectioning were fixed in Bouin's solution, prepared by the usual paraffin wax method and stained with Masson's trichrome.

Study of nematocysts was carried out on freshly relaxed specimens and all measurements are of undischarged capsules. Terminology used for these follows that of Weill (1934), as modified by Carlgren (1940).

Four specimens of each species have been deposited in the British Museum (Natural History):

E. beautempsi, regd. no. 1977. 1. 31. 1.

E. timida, regd. no. 1977. 1. 31. 2.

The following generic description is modified from Carlgren (1949, p. 22).

Genus *Edwardsia* Quatrefages 1842 (p. 68)

Edwardsidae (sensu Carlgren, 1949) with column divisible into physa, scapus, scapulus and capitulum. Physa never with periderm (cuticle) or nemathybomes; morphologically and functionally differentiated from the scapus. Scapus long, always with periderm and nemathybomes, the latter being externally opening cavities sunk in the mesogloea which contain nematocyst batteries. Eight perfect mesenteries (macrocnemes) and at least four imperfect ones (microcnemes), the latter very weak and restricted to the most distal part of the column. Gonads, filaments, parietal and retractor

muscles on the macrocnemes only. Parietals well developed; retractors strong, diffuse to circumscribed diffuse. Cnidom: spirocysts, basitrichs, microbasic b- and p-mastigophores.

Edwardsia beautempsii Quatrefages 1842 (p. 69)

Description

Form of an expanded, but not buried, individual. Tentacles 16, in two cycles of eight; long and tapering evenly to a blunt point; the exocoelic (outer) tentacles are distinctly longer and stouter at the base than the endocoelic ones. Oral disc rather small, its diameter less than the scapulus, the central part elevated into a cone (hypostome) with the mouth at the summit (Plate I, A). Capitulum narrow and inconspicuous; scapulus short, cylindrical, narrowing slightly towards the disc and furrowed by the mesenteric insertions. Scapus a long cylinder, covered by a thin soft periderm which ends raggedly at the junctions with scapulus and physa. The nemathybomes are not easily visible in life; they form a neat single row along the centre of each macrocoele, on the cream stripes described below. Physa small, with numerous adhesive patches, no cinclides.

Size. Overall length about 6-7cm, diameter about 4mm, tentacles fully extended about 1.5cm. When comfortably buried in sand the column becomes greatly elongated and consequently the body wall, including the periderm, becomes very transparent. In this state, the total length may be up to about 16cm.

Colour. Tentacles colourless and transparent with a few blackish spots on the lower part, arranged laterally; each tentacle is tipped with an elongate bi-coloured spot — cream/yellow distally and orange/brown proximally. Disc with an opaque blotch of white, cream, yellow or dull orange, occupying the hypostome and extending onto the bases of the directive tentacles and the two immediately adjacent to the ventral directive (Plate I, B). This mark is bordered by an irregular broken ring of dark brown and is often streaked with the same colour. Peripheral to the brown ring is a diffuse blotch of yellowish buff on the base of each exocoelic tentacle. On each mesentery, inside the angle of disc and capitulum, is a conspicuous spot of blackish brown, larger on the macrocnemes. Actinopharynx cream to dull orange.

Column translucent, tinted with pink or buff; along the centre of each macrocoele is a broad longitudinal cream stripe; this extends from the capitulum, through scapulus and scapus, to the physa where it fades away. On the capitulum, this stripe is divided by the transparent insertions of the microcnemes and continues a little way onto the aboral side of each exocoelic tentacle; on the scapulus, it is bordered by irregular streaks of purplish brown or buff. The periderm of the scapus is sandy buff, sufficiently translucent to allow the cream stripes to show through. The physa is translucent whitish.

Variation. The large opaque spot on the disc may be absent or only faintly indicated, allowing the colour of the actinopharynx to show through; this produces a very different effect from the form described above (see Plate I, C). On such specimens one or both directive radii may be opaque white or yellow. The tentacles, in addition to the markings already described, are often spotted with creamy white, varying in extent and tending to form transverse bars on the outer part. This form (Plate I, C) bears a superficial resemblance to *E. callimorpha*.

The constant features are the brown spots on mesenteries and tentacles, the bi-coloured tip of the latter and the cream stripes on the column which are very conspicuous and apparently unique to this species.

Anatomy. This follows the normal plan for *Edwardsia* described by Carlgren (1921). The tentacles and mesenteries are arranged as in Fig. 4, A which is a common arrangement in forms with 16 tentacles. The nemathybomes form small rounded tubercles, very even in size, arranged in eight longitudinal rows — one in the centre of each macrocoel. The actinopharynx is slightly shorter than the scapulus and has a single fairly distinct siphonoglyph. The eight endodermal ridges on the actinopharynx are continuous with the so-called cnidoglandular tracts of the mesenteric filaments. Just above the point where these arise (the lower edge of the actinopharynx), the ciliated tracts begin. These are very short, less than 2mm, and are transversely pleated as usual. They are not "discontinuous" — that is, they do not reappear lower down. The gonads arise a little below the ciliated tracts and, like them,

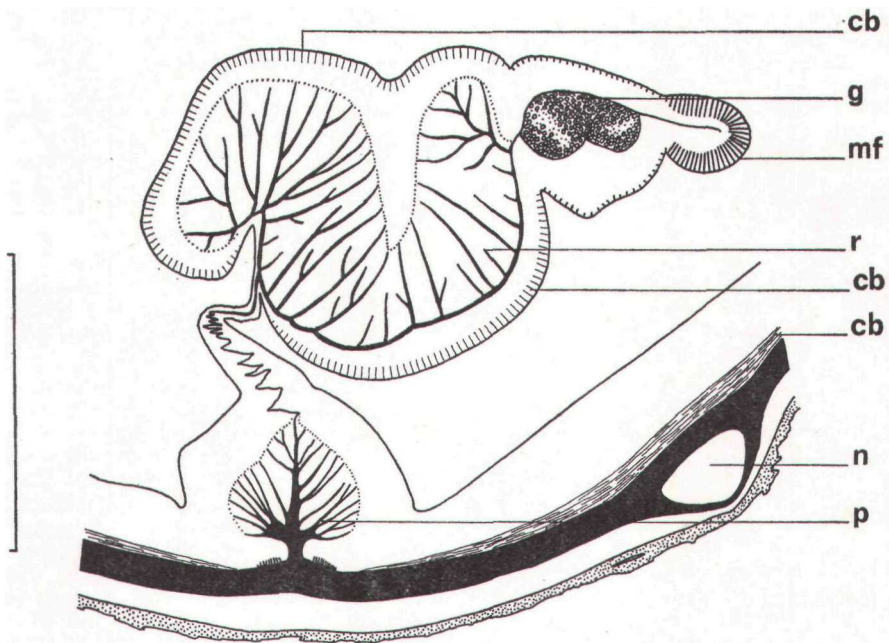


FIG. 1

Edwardsia beautempsii:

Transverse section of scapus in region of gonads to show the form of the retractor and parietal muscles. Scale = 0.25 mm.

c : circular muscle; cb : ciliated band (see pp. 6, 7); g : gonad; mf : mesenteric filament; n : nemathybome; p : parietal muscle; r : retractor muscle. Mesogloea black, periderm stippled.

are transversely pleated; they disappear in about the lower third of the column where they are replaced by the digestive tract. The two tracts do not overlap.

The retractor muscles (Fig. 1) run between these various tracts and the outer part of the mesentery. They have about 20-26 mesogloal processes, mostly branched in the outer part. The endoderm surrounding the retractors is definitely thickened and densely ciliated, forming a band along each side of the mesentery from the actinopharynx to the digestive region. These ciliated bands (which are different from the ciliated tracts) produce a strong current flowing towards the oral end. The parietal muscles are of normal development, with about 7-11 simple or branched processes on each side. The endodermal circular muscle of the scapus is well developed, forming numerous low processes in longitudinal section. These processes become abruptly weaker on the physa which is

further differentiated by a thickening of the endoderm and an increase in the number of gland cells present in it. Presumably, these gland cells are concerned with adhesion as, in freshly dug specimens, there are always sand grains stuck to the physa. There is no trace of cinclides in either living or sectioned material.

Cnidom. Measurements of the nematocysts from nine specimens are given in Table 1. The abundant spirocysts of the tentacles are not included as they are not considered to be of any systematic value.

TABLE 1

Measurements of the nematocysts from nine specimens of *Edwardsia beautempsi*, two specimens of *E. callimorpha* (*from Stephenson 1935) and *E. longicornis*, from Carlgren 1921 and 1940. All measurements in μ .

	<i>E. beautempsi</i>	<i>E. callimorpha</i>	<i>E. longicornis</i>
<i>Nemathybomes</i>			
microbasic			
b-mastigophores	39-65 x 4.5-6.0	97-154 x 5.0-7.0	36-84 x 3.5-5.0
microbasic			
b-mastigophores	45-64 x 2.5-3.0	69-95 x about 3.0	36-65 x 2.0-2.5
<i>Actinopharynx</i>			
microbasic			
p-mastigophores	20-38 x 5.0-8.5	27-37 x 5.0-7.5	26-30 x 7.0
basitrichs	15-43 x 2.0-4.0	15-39 x 2.0-4.0	{ 14-17 x 2.0 25-29 x 2.5-3.0
<i>Digestive region of Mesenteric filaments</i>			
microbasic			
p-mastigophores	17-34 x 4.5-8.0	19-33 x 4.0-7.0	19-24 x 4.5
microbasic			
b-mastigophores	25-38 x 4.0-6.5	25-37 x 4.0-6.0	? absent
basitrichs	14-26 x 2.5-3.0	16-34 x 2.0-3.0	20-23 x about 4.0
<i>Tentacles</i>			
basitrichs	15-27 x 2.5-3.5	17-26 x 2.0-2.5*	17-23 x 2.0-2.5
<i>Scapulus</i>			
basitrichs	9-13 x 2.5-3.0	10-12 x 1.5*	10-11 x about 2.5

The nematocysts from the nemathybomes of *Edwardsia* spp. are conventionally classified as microbasic b-mastigophores (Carlgren, 1940; 1949), a category of sparse and rather erratic distribution in the Actiniaria. However, recent research using the electron microscope suggests that this category may not be distinct from the basitrichs (Westfall, 1965; Schmidt, 1969) although at present only the b-mastigophores of *Metridium* have been studied. Until the nematocysts of *Edwardsia* can be examined in this way, it is perhaps more convenient to retain Carlgren's classification.

There are two varieties of these b-mastigophores in the nemathybomes of *E. beautempsi* (Fig. 2, E, F). The thin variety has a curious form of armament on the basal shaft which was first described by Carlgren (1940) for *E. longicornis*. There are also b-mastigophores present in the digestive tract of the mesenteric filaments; these have not been described before from *Edwardsia* but perhaps they have been overlooked as they resemble the p-mastigophores in shape and size. The different nematocysts of *E. beautempsi* and *timida* are illustrated in Fig. 2.

The cnidoms of two specimens of *E. callimorpha* were examined for comparison. The categories present and their distribution were identical with *E. beautempsi* but significant differences in size were found (see Table I).

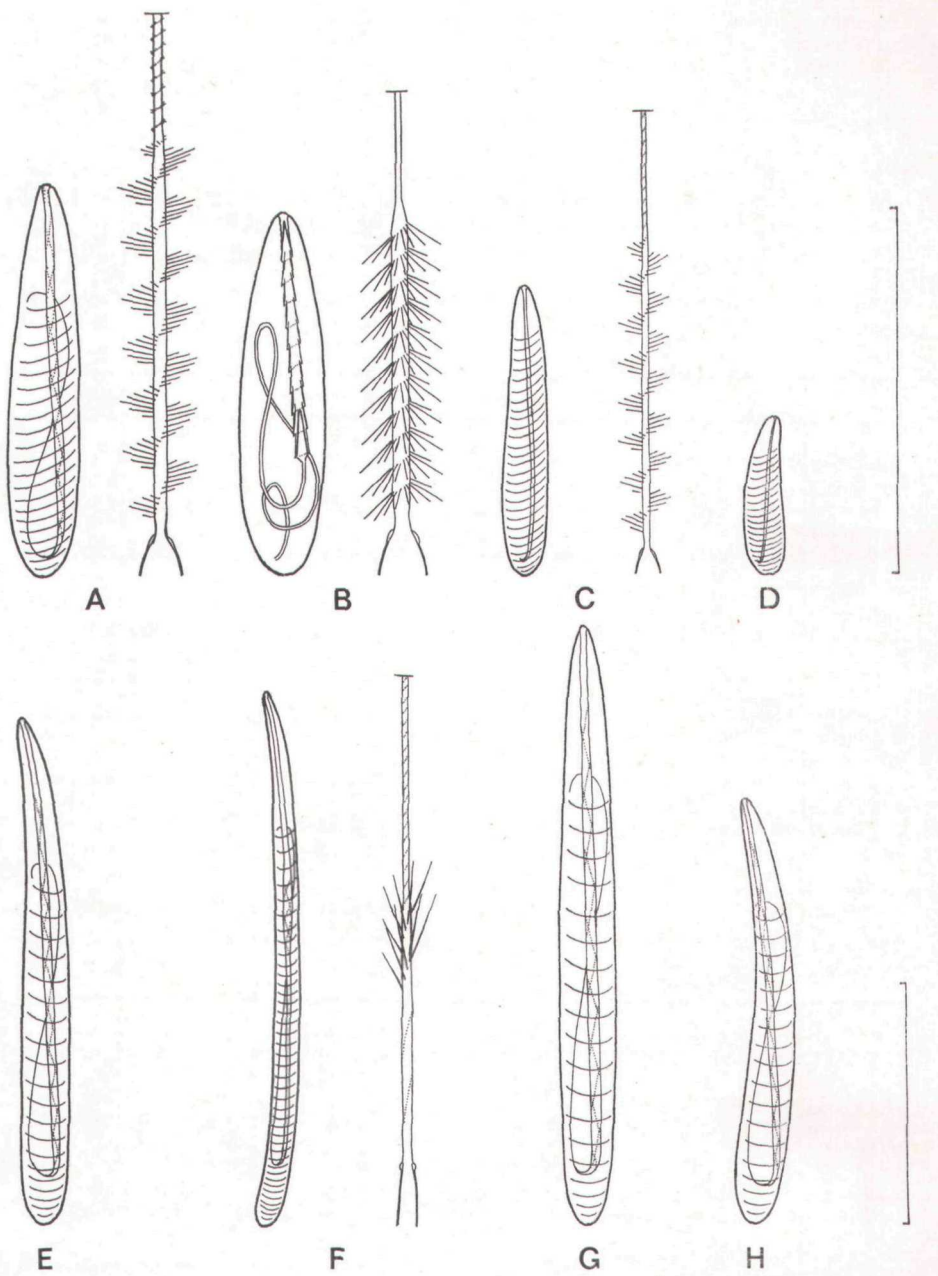


FIG. 2

Semi-diagrammatic drawings of nematocysts from various tissues of *Edwardsia beaufempsi* and *E. timida* with (in A, B, C, F) the distal part of the discharged thread. Only approximately to scale, scales = 25 μ .

A : b-mastigophores from digestive tracts of mesenteries - both species;
 B : p-mastigophores from digestive tracts (both spp.) and actinopharynx
 (*E. beaufempsi* only); C : basitrichs from tentacles, actinopharynx and digestive
 tracts — both spp.; D : basitrichs from scapulus — both spp.; E, F : the two
 types of b-mastigophores from nemathybomes of *E. beaufempsi*; G, H : the
 two types of b-mastigophores from nemathybomes of *E. timida*.

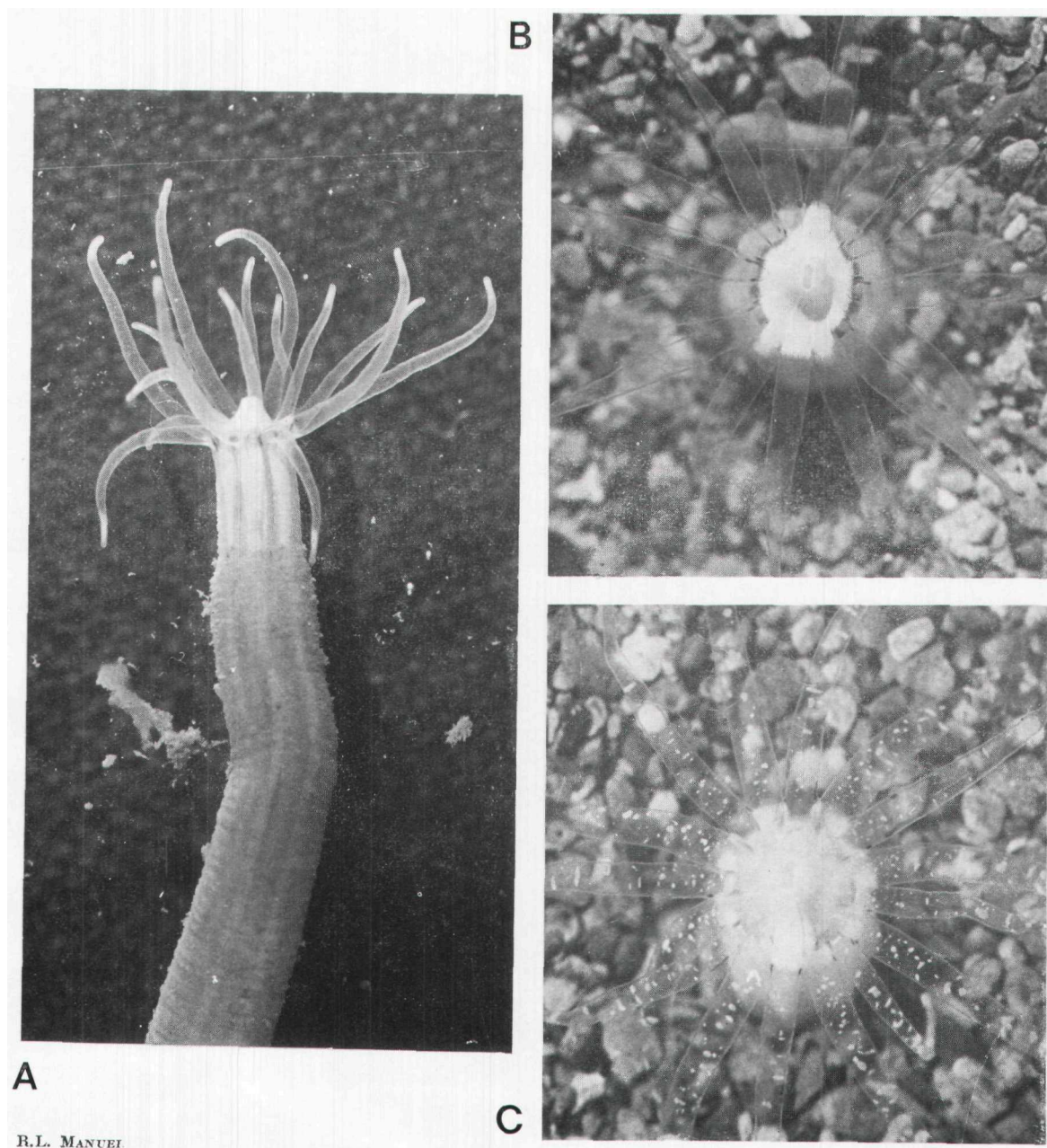


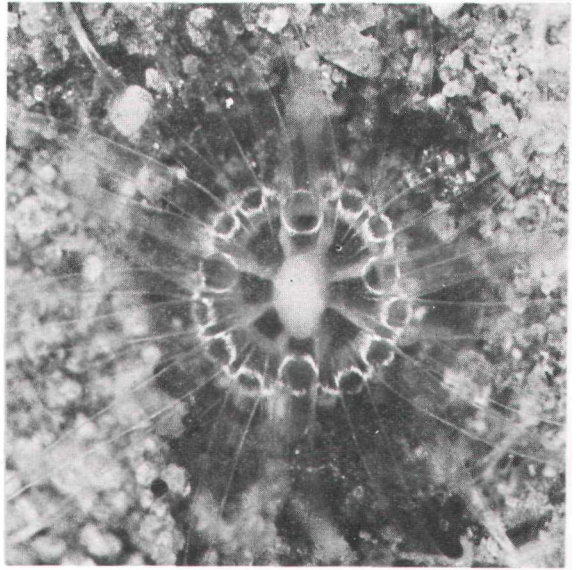
PLATE I

Edwardsia beautempsii, Chausey.

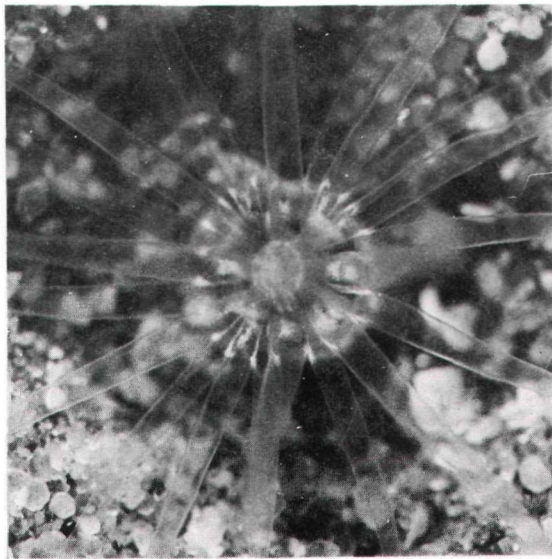
A : upper half of a specimen of the typical form, expanded but not buried, x 3 1/2.
 B : disc of the typical form; C : a common variation with spotted tentacles
 and pale disc. B and C oriented as in Fig. 4 A, x 5.



A



B



C

R.L. MANUEL

PLATE II

Edwardsia tímida, Strangford Lough, to show common variations, oriented as in Fig. 4 B-D.

A : disc of specimen with 24 tentacles, x 6 ; B : specimen with 28 tentacles, x 6 ; C : specimen with 22 tentacles, x 8. In C, a pair of tentacles, in the right ventro-lateral macrocoele is lacking, otherwise the arrangement is as in A.

Diagnosis of *Edwardsia beautempsi*

Edwardsia with 16 tentacles arranged in two cycles of eight. Nemathybomes arranged in eight longitudinal rows; their nematocysts measuring 39-65 X 4.5-6.0 μ and 45-64 X 2.5-3.0 μ . Retractors with 20-26 processes. Colouration in life includes eight longitudinal cream stripes on the column and a bi-coloured spot (yellow and orange) at the tip of each tentacle.

Affinities

Edwardsia beautempsi belongs to a group of *Edwardsia* species characterised by the possession of 16 tentacles—probably always in two cycles—and having tuberculate nemathybomes in eight longitudinal rows. The members of this group do not differ greatly, the main species characters being the sizes of the nematocysts from the nemathybomes and details of colouration. The cross-sectional form of the parietal and retractor muscles is also usually considered to differ between species, mainly regarding the number of processes present (Carlgren, 1921).

E. callimorpha can be distinguished morphologically from *E. beautempsi* by the larger nematocysts of the nemathybomes (see Table I) and by the more strongly developed retractor muscles which may have up to 40 mesogloal processes. Externally, the colour pattern of *E. callimorpha* never includes the cream stripes on the scapus (although they are present on the scapulus) and the tentacles are always profusely spotted with cream and reddish brown. Some specimens of *E. beautempsi* also have spotted tentacles but, in these, the brown spots are restricted to the lateral basal parts. The pattern of brown arches on the disc of *E. callimorpha* never occurs in *E. beautempsi*. For further details of the former species, see Stephenson (1935).

Of the other species in this group *E. longicornis* Carlgren 1921, from shallow waters around Scandinavia, appears to be closest to *E. beautempsi*. Indeed, the recorded characters of this species do not differ significantly and the two may be identical. However, a re-examination of *E. longicornis*, particularly of living specimens, is necessary before this can be definitely ascertained. The cnidom of this species, which is remarkably similar to that of *E. beautempsi*, is included in Table I.

Records of the occurrence of *E. beautempsi* from British waters (Haddon, 1889; Gosse, 1860) almost certainly refer to *E. callimorpha*. Other records, from Northern France (Faurot, 1895; Nafilyan, 1912; Wietrzykowski, 1915), could refer to either of these species. An *Edwardsia* from Roscoff has been identified as *E. callimorpha* (Teissier, 1965).

Edwardsia timida Quatrefages 1842 (p. 70)

Edwardsia harassi Quatrefages 1842, p. 71; *Edwardsiella harassii* Andres 1884, p. 94; *Edwardsiella timida* Andres 1844, p. 96; *Edwardsia timida* Dixon 1886, p. 100; Haddon 1889, p. 329; (non *Edwardsia timida* Walton and Rees 1913, p. 60, probably = *E. callimorpha*). ?*Milne-Edwardsia dixonii* Carlgren 1921, p. 59; *Edwardsia delapiae* Carlgren and Stephenson 1928, p. 23, *pro parte*; *Edwardsia callianthus* Rawlinson 1935, p. 129.

Description

Form of an expanded, but not buried, individual. Disc flattish in expansion, hypostome small, becoming prominent in partial contraction. Tentacles long and slender, the endocoelic ones definitely thicker and perhaps longer than the exocoelic ones; arranged in three cycles, always with four in the inner cycle. In mature specimens, they number 20-28. Capitulum indistinct; scapulus cylindrical, slightly furrowed by insertions of macrocnemes. Scapus very long, cylindrical, broadest in the lower third, covered with a thin bark-like periderm of rather crisp consistency. Nemathybomes small and very numerous, scattered irregularly on the macrocoeles, not forming raised tubercles; they are not visible in life. Physa small, capable of being tightly contracted into a small rosette; with adhesive patches and a few cinclides, probably one to each macrocoele, at its extremity.

Size. Overall length about 6-7cm, diameter 4-5mm, longest tentacles about 1.5cm. This species, like *E. beautempsi*, becomes greatly elongate when buried, up to about 20cm overall.

Colour. Disc, tentacles, capitulum and scapus translucent, colourless or tinted with pinkish or brownish buff. The disc may be devoid of any pattern but usually possesses some or all of the following elements executed in chalky white: a ring around the mouth; a crescent around each endocoelic tentacle base, incomplete on the outer part; a bar across the base of each exocoelic tentacle which connects the crescents (Plate II, A, B). The radii on the disc may be partly or completely filled in by a stippling of the same chalky white (Plate II, A). Alternatively, some specimens have only a white ring around the mouth and a few radial streaks of the same between the tentacle bases (Plate II, C). Rarely, there are dull brown irregular blotches on the disc. Tentacles are always tipped with white or pink/buff, occasionally with a fine white line on the aboral side where, at the base, there is often a spot or bar between the ends of the crescents on the endocoelic tentacles. Actinopharynx orange or yellowish, clearly visible through disc and scapulus. Scapulus unmarked or with longitudinal or transverse white markings, variable but regular in form. These usually combine to form one or two broken rings. Scapus beneath the periderm translucent buff, physa whitish, the periderm itself rust coloured or buff becoming blackish above.

Anatomy. The general structure of *E. timida* has been described by Rawlinson (1935 as *E. callianthus*), to which the following notes may be added.

The ciliated tracts are longer than in *E. beautempsi* but still short. On some specimens at least they are obsolete on the directive macrocnemes. The ciliated *bands* on the retractor muscles are rather weak. The

retractors themselves (Fig. 3) have about 20-33 mostly simple processes. The parietal muscles have about 6-10 processes on each side which are often branched and thickened distally.

The arrangement of tentacles and mesenteries conforms to a simple plan within which there is some variation. The inner cycle of four

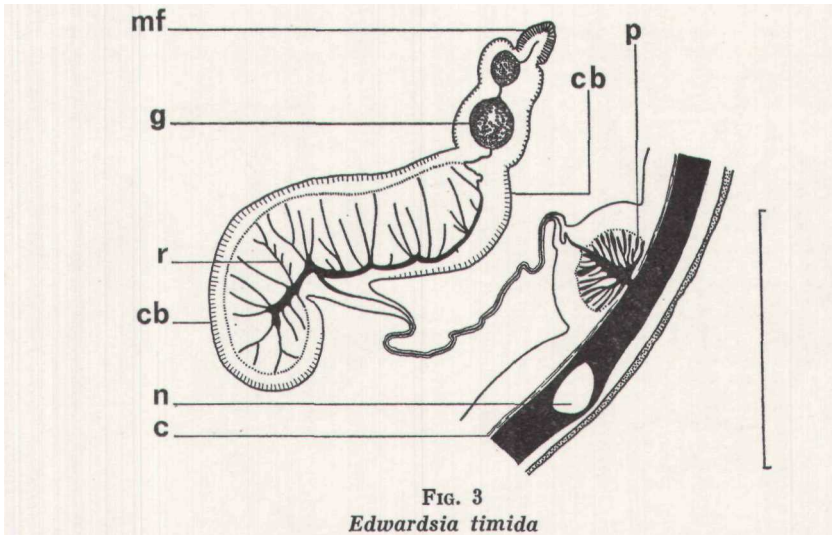


FIG. 3
Edwardsia timida

Transverse section of scapus in region of gonads showing the form of the retractor and parietal muscles. Scale = 0.25mm.

c : circular muscle; cb : ciliated band; g : gonad; mf : mesenteric filament; n : nematocyst; p : parietal muscle; r : retractor muscle. Mesogloea black, periderm stippled.

TABLE II

Measurements of nematocysts from *Edwardsia timida* from Chausey; *E. callianthus* from Menai Straits (after Rawlinson 1935) and from Strangford Lough. All measurements in μ .

	<i>E. timida</i> (Chausey)	<i>E. callianthus</i> (Menai Straits)	<i>E. callianthus</i> (Strangford Lough)
<i>Nemathybomes</i>			
microbasic			
b-mastigophores	52-75 x 4.5-7.0	} 26-71.7 x 2.1-7.3	58-69 x 5.0-6.0
microbasic			
b-mastigophores	32-48 x 3.5-5.0		29-46 x 4.0-5.0
<i>Actinopharynx</i>			
basitrichs	16-35 x 2.0-4.0	} 17.7-36.5 x 2.0-4.7 7-11 x 1.0-2.5	20-40 x about 2.5
<i>Digestive region of Mesenteric filaments</i>			
microbasic			
p-mastigophores	20-30 x 4.5-6.0		26-36 x 4.0-5.0
microbasic			
b-mastigophores	24-39 x 4.0-5.5		27-42 x 4.0-5.0
basitrichs	17-25 x 2.0-3.0		19-30 x about 2.5
<i>Tentacles</i>			
basitrichs	14-25 x 2.0-4.0	14-29 x 2.0-5.2	15-27 x 2.5-3.5
<i>Scapulus</i>			
basitrichs	8-18 x about 2.5	8-16 x 2.0-3.5	8-14 x about 2.5

tentacles consists of the two directives and the two endocoelic tentacles next to the dorso-lateral macrocnemes; the second cycle consists of the remaining endocoelic tentacles and the third of all the exocoelic tentacles. The plan of a specimen with 16 tentacles (the lowest number seen) is shown in Fig. 4 b. This is similar to that of *E. beautempsii* (Fig. 4 A) in general plan but the cyclic arrangement is different. Fig. 4 (C and D) shows the normal arrangement for specimens with 24 and 28 tentacles respectively. Between the 16 and 24 tentacled stages odd pairs of tentacles may be added to any dorso- or ventro-lateral macrocoele at

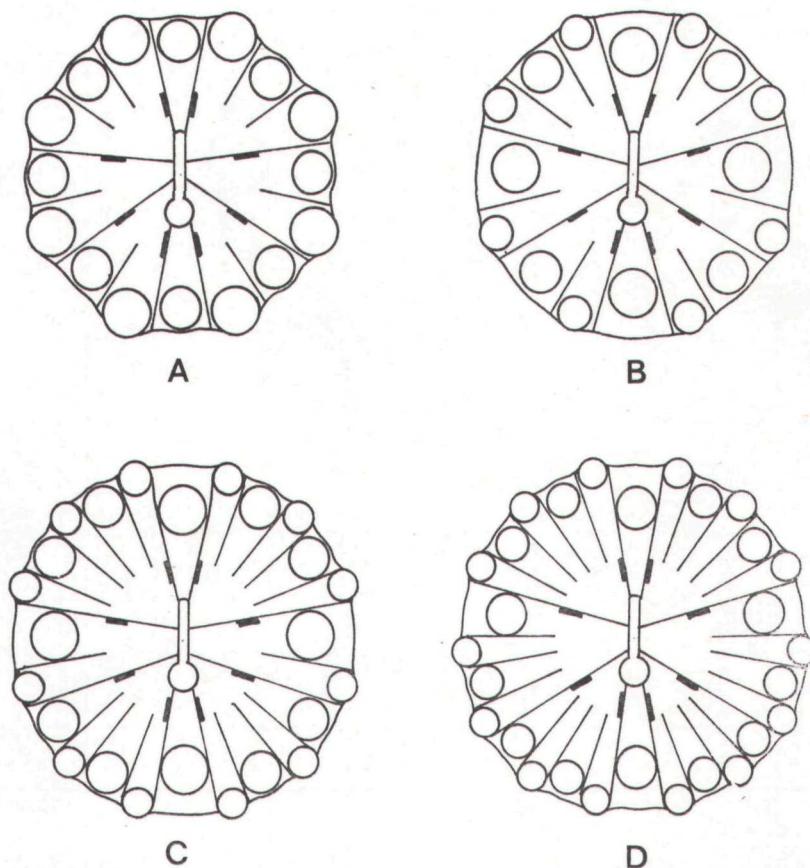


FIG. 4

Diagrams showing the arrangement of tentacles and mesenteries in *Edwardsia beautempsii* (A) and *E. timida* (B, C, D) at 16, 24 and 28 tentacled stages respectively. The tentacles are represented by small circles, the exocoelic ones breaking the edge of the disc. The cycles are differentiated by varying sizes of circle as they occur in life, but not necessarily to scale. The position of the retractor muscles is indicated by the thickenings on the macrocnemes. Compare with Plates.

random; but between the 24 and 28 tentacled stages an extra pair is added to each lateral macrocoele. No specimens were found with more than 28 tentacles but, to judge from a figure by Stephenson (1935, Fig. 53), the number may perhaps reach 36 if the arrangement in the right half of this figure were duplicated on the left.

The nemathybomes are small and almost completely sunken in the mesogloea; they are scattered at random on the macrocoeles but do not occur on the mesenteric insertions. It appears that they may sometimes

be greatly reduced in number and size, or even absent. I have a series of sections from the scapus of a specimen from Strangford Lough in which no nemathybomes are present, the nematocysts of the scapus occurring instead in small groups in the ectoderm. In two other sectioned specimens from the same locality, there are very few nemathybomes, of very small size. The specimens are otherwise perfectly typical. A possible explanation of this peculiarity is that the specimens have been maintained in aquaria for some time (up to two years) and that the loss or reduction of the nemathybomes is due to a dietary or environmental deficiency. It is well known that anemones may suffer loss of colour, cuticle and even tentacles when kept in inadequate conditions, and this phenomenon may be of a similar nature.

The measurements of the nematocysts of this species are given in Table 2. There are two varieties of b-mastigophores in the nemathybomes (Fig. 2 G and H), either of which may be strongly curved. There are no p-mastigophores in the actinopharynx; otherwise the cnidom is similar in type to that of *E. beaitempsi*.

Diagnosis of *Edwardsia timida*

Edwardsia with up to 32 (or more?) tentacles, commonly 20-28; arranged in three cycles, with four in the innermost cycle. Nema-
thybomes small, scattered; their nematocysts measuring about 52-75 X 4.5-7.0 μ , and 26-50 X 3.5-5.0 μ . Nematocysts of the actinopharynx basitrichs only (no microbasic p-mastigophores). Retractors with about 20-33 processes. Physa with cinclides.

Affinities

E. harassi Quatrefages 1842, has been shown by Dixon (1886) to be synonymous with *E. timida*. The differences observed by Quatrefages were due to differing states of expansion, etc. *E. harassi* is recorded from the Channel Island of Herm (Koehler, 1886) but the description is so brief that the validity of this record must be doubtful.

A record of *E. timida* from Plymouth (Walton and Rees, 1913) almost certainly refers to *E. callimorpha*.

During the course of preparing this study, it has become apparent that *E. callianthus* Rawlinson 1935, from the Menai Straits, is identical with *E. timida*. Rawlinson's description agrees in all essential points with the above, except that the nematocysts of the nemathybomes are not differentiated into two varieties. I have examined a preserved specimen from the type locality (Church Island) and in this two varieties of b-mastigophore, similar to those described for *E. timida*, were present. They measured 57-70 X 5.5-6.5 μ and 35-50 X 3.5-4.5 μ , which agrees very well with *E. timida*. I therefore include *E. callianthus* as a synonym of *E. timida*.

E. callianthus is also recorded from Strangford Lough, N. Ireland (Williams, 1954). I have been able to examine a series of preserved specimens from this locality, kindly sent to me by P.J.S.

Boaden, and also a number of living examples from the collection of the late D. Huxtable. I understand that these specimens were also supplied by Boaden. All were perfectly typical examples of *E. timida* with the exception that a few of them had reduced or absent nemathybomes (see p. 493).

E. callianthus was reported to be viviparous, producing larvae during the winter (Rawlinson, 1935, p. 144). No evidence of viviparity has been found in specimens from Chausey or Strangford Lough, although specimens from the latter locality have been maintained in aquaria for several years.

Dixon (1886) gave a detailed description of two anemones from Malahide, Co. Dublin, which he identified as *E. timida*. In an appendix, he lists the characters of six other specimens which he later found. Haddon (1889) notes that he examined these alive and agreed with Dixon's identification. In all external characters these were identical with *E. timida*, except for specimen (a), which had an abnormal tentacle arrangement.

Haddon (1889, pl. 36, fig. 3) figures a cross-section of a retractor muscle of "*E. timida*". Unfortunately, he does not say where the specimen originated but it was almost certainly one of Dixon's as, in the same paper, Haddon gives only two localities for the species — Malahide and "Chansey". Carlgren (Carlgren and Stephenson, 1928) re-examined Haddon's slides of this specimen and noted that the form of the retractor muscles resembled that of *E. delapiae* described in the same paper. The figure (Fig. 12) given by Carlgren also matches *E. timida* very well, as does Haddon's. The specimen had scattered nemathybomes with nematocysts measuring 60-67X5 μ and 43X2 μ . On this basis, Carlgren identified Haddon's specimen as *E. delapiae*. However, the rather small size (for *E. delapiae*) of the smaller nematocysts, which Carlgren attributes to possible shrinkage during fixation, resembles more closely that of *E. timida*, especially considering that such shrinkage would affect width more than length. Also, if this were one of Dixon's specimens, it would have had at least 18 (—24) tentacles but *E. delapiae* has only 16. As the true characters of *E. timida* were not known at this time, it is reasonable to assume that this specimen was really *E. timida*.

Carlgren (Carlgren and Stephenson, 1928) described three of the specimens from Malahide, sent to him by Dixon, as *Milne-Edwardsia dixonii*, a name first proposed by Carlgren in 1921. (*Milne-Edwardsia* is preoccupied but is used here as *Fagesia* Delphy 1938, proposed as a replacement name, is also preoccupied—Crowell 1976). This removal to a new genus was hardly justified, although the specimens apparently lacked nemathybomes. Many of the features of Dixon's specimens—a true physa, no ectodermal ridges on the scapulus, the habitat "amongst mud and stones", and the ability to burrow—are typical of *Edwardsia* and contrary to the characters of *Milne-Edwardsia*. In fact *M. dixonii*, as described by Carlgren, does not fit into any known genus, although it is only excluded from *Edwardsia* by the lack of nemathybomes. Possibly these were overlooked by Carlgren or they may perhaps have been absent, as in the specimen described on page 492. The anemone was

otherwise so much like *Edwardsia* that such a possibility seems likely.

The other described characters of *M. dixonii* can be reconciled with *E. timida*. In particular the nematocysts of the scapus, measuring 25-31X5-6 (7) μ , although small, are just within the range of *E. timida*; the figures given of weak retractor muscles (Carlgren and Stephenson, 1928, Figs. 16, 17, 18) were of sections taken high up on the column, where their form is always weaker than lower down.

It was suggested by Carlgren (in Stephenson, 1935) that there may have been two externally identical species, one an *Edwardsia*, the other a *Milne-Edwardsia*, present amongst Dixon's specimens, to which Stephenson suggested the possibility of a third (*E. callianthus*) being present. This is rather an unlikely explanation. I prefer to conclude that only one species, *Edwardsia timida*, was present. If Haddon's specimen of the latter was from Malahide, as seems likely, this would support my view, as does the fact that *E. timida* has since been recorded from two other localities in the Irish Sea. Therefore, *M. dixonii* is included here as a probable synonym of *E. timida*.

Three other species possess the general characters of *E. timida* and must be considered as possible synonyms.

E. finmarchicus Carlgren 1921, from Northern Norway, has only one type of nematocyst present in the nemathybomes, measuring (26) 36-48 (62) X 3.0-3.5 (4) μ and the retractor muscles are very strongly developed with up to 50 mesogloal processes. This species is probably distinct.

E. sipunculoides Stimpson 1853, from Alaska and N.E. North America, has many similarities of colouration, except that some specimens have spotted tentacles (Verrill, 1922). The nematocysts of the nemathybomes are of two sizes, 65-74X6* and 41-50X3.5 μ ;; the retractor muscles are a little stronger than in *E. timida*, with 30-40 processes (Carlgren, 1933). There are up to 36 tentacles, arranged in two cycles, according to Verrill (1922).

This species is similar to *E. timida* in many respects but, due to its geographical separation, it is probably best left distinct until a more complete description is available.

E. danica Carlgren 1921, is a small species (up to 2.5 cm long) from S. Scandinavia. Carlgren (1921) gives the nematocysts of the nemathybomes as 24-42X(2.5) 3-3.5 (4) μ , and 46-72X4-5 μ , "the latter sometimes very sparse (or absent?)". The parietal and retractor muscles are weak, the latter with no more than about 20 processes; tentacles 14-20.

A description by Ax and Schilke (1964) adds little to Carlgren's account. The tentacles are said to be arranged in only two cycles, but details of the colouration given do not differ substantially from *E. timida*. This species is distinguished from *E. timida* by its small size, weaker musculature and low number of tentacles.

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Summary

The type species of *Edwardsia*, a genus of burrowing sea anemone, is *E. beauteupsi* Quatrefages 1842. This species has never been positively identified since it was first described, although many authors have incorrectly assumed it to be identical with *E. callimorpha* (Gosse).

This paper provides a redescription of *E. beauteupsi* and another of Quatrefages' species, *E. timida*, from the original locality, lies Chausey, Normandy. Previous records of both species are reviewed and the status of several possibly synonymous species is discussed.

Zusammenfassung

Die Gattungstypus von *Edwardsia*, eine Gattung von wühlender Aktinien, ist *E. beauteupsi* Quatrefages 1842. Diese Art ist noch wie mit Sicherheit identifiziert worden, seitdem sie zuerst beschreiben worden ist, obwohl viele Autoren irrtümlich angenommen haben, dass sie identisch mit *E. callimorpha* ist.

Dieser Artikel gibt eine neue Beschreibung von *E. beauteupsi* und eine andere Beschreibung von der Quatrefages Art, *E. timida*, aus der ursprünglichen Gegend, lies Chausey, Normandie. Frühere Aufzeichnungen von beiden Arten werden besprochen und der Status von möglicherweise verschiedenen gleichnamigen Arten wird untersucht.

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