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Notes on *Candelabrum australe* (Briggs, 1928) (Hydrozoa, Anthoathecatae)

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Candelabrum australe is a rare species known only from southern Australian waters and is reported for the first time from New Zealand. The large cap-shaped hydranth is very active. The cnidome comprises at least nine size-classes of nematocysts in four morphological categories. The hydranth is bisexual, the sexes borne separately on stout branched blastostyles from which lobate actinula larvae are released.

Keywords *Candelabrum australe*, southern Australia, New Zealand, active hydranth, cnidome, bisexual, actinula larva.

Introduction

Two species of *Candelabrum* (*Myriothela australis* Briggs, 1928 and *Myriothela harrisoni* Briggs, 1928) are known from south-eastern Australia. Briggs (1928; 1929; 1930) gave detailed histological descriptions of both species. His pale flesh-pink specimens of *Candelabrum australe* were attached to the thalli of seaweed drifted on the beach at Maroubra Bay, New South Wales but were in poor condition; *Candelabrum harrisoni* occurred in numbers hanging from the underside of rocks in the shallow sublittoral at Bulli, south of Sydney, New South Wales.

Candelabrum australe was first recorded from Port Phillip, Victoria, by Ralph (1966). Since then it has been reported occasionally from the same locality by scuba divers and tide pool collectors. There are two preserved specimens of *C. australe* in the Ralph collection held in the National Museum of New Zealand (NMNZ no. 1216), collected in 1969 from the Banks Peninsula near Christchurch in the South Island.

A fully grown specimen of *C. australe* was observed in southern Port Phillip Bay by the author in June 2007 on the thallus of the brown kelp *Ecklonia radiata* in shallow water 2 m deep. Two months later (August 2007) it was photographed *in situ* and collected for laboratory examination. Mid-winter water temperature at the time of collection was 10°C.

Segonzac and Vervoort (1995) reviewed the then known 18 species of the genus *Candelabrum*. Since then, Shuchert (1996) described but did not name an infertile, juvenile specimen of a putative new species from New Zealand. Hewitt and Goddard (2001) described a new species, *Candelabrum fritchmanii* from the Pacific coast of the USA, bringing to 20 the known species of *Candelabrum*. Briggs (1928) made only passing mention of the nematocysts of *C. australe* and Manton (1940) and Hewitt and Goddard (2001) provided accounts of the cnidome of several species of *Candelabrum*.

Observations of living material in the present study now supplement Briggs' (1928; 1929) descriptions of *C. australe* and provide detailed information on the cnidome of the species.

Family Candelabridae de Blainville, 1830

Solitary hydroids; hydranth elongated, body cylindrical to tapering, divided into 3 regions: a basal region (hydrorhiza), a mid-region (blastostyle) and an elongate body with a circular distal mouth. Hydrorhiza short, stout with tubular or root-like adhesive processes, with or without perisarc; body with thickened mesolamella and gastrodermal villi and numerous scattered, capitate tentacles, simple or compound; gonophores developing directly on hydranth or on blastostyles in a budding zone below body.

Candelabrum australe (Briggs 1928)

Myriothela australis Briggs, 1928: 307, pl. 32, pl. 33, fig. 3, pl. 34, figs 1–4.—Briggs 1929: 244, figs 1–4, pls 42–44.—Briggs, 1939: 10.–Manton, 1940: 280 *et seq.* fig. 8a.—Dakin, Bennett and Pope, 1948: 208.–Ralph, 1866: 158, 162.

Candelebrum australe —Segonzac and Vervoort, 1995: 35.—Hewitt and Goddard, 2001: 2280.

Description. Living material (supplementing Briggs 1928). Contracted hydroid cap-like in appearance, the gonophore-bearing blastostyle region forming a decorative circular basal rim and the body a tapering crown.

Hydrorhiza comprising numerous short stolons covered by perisarc radiating from below the base of the hydranth but obscured by the living animal; stolons terminating in small

Table 1. Nematocysts of *Candelabrum australe*

Nematocyst	Capsule	Dimensions	Shaft	Tube/thread	Body tentacle	Blastostyle tentacle
Desmoneme (fig. 3A)	Elongate ovoid	18–20 x 12–15	-	Long, strongly coiled1	****	Absent
Desmoneme (fig. 3B)	Elongate ovoid	10–12 x 7–9	-	Coiled	***	*
Stenotele (fig. 3C)	Ovoid	21 x 13	Undischarged	-	*	Absent
Stenotele (fig. 3D)	Ovoid	15 x 13	Length 12 μm	-	****	Absent
Stenotele (fig. 3E)	Round	15 x 11	Thick, length 10 μm	-	***	*
Stenotele (fig. 3F)	Ovoid	12 x 10	Undischarged	-	**	**
Merotrichous isorhiza (fig. 3G)	Ovoid	19–22 x 14–16	-	Long, spinous2	**	****
Merotrichous Isorhiza? (fig. 3H)	Paddle-shape	8–9 x 5–6	Undischarged	-	**	*
Mesotele (fig. 3I)	Leaf-shaped	18–21 x 7–9	Length 18 μm, spinous3	Moderately long	**	***

Order of abundance of nematocysts: **** (very abundant) to * (rare).

Notes. a. The shafts of the largest desmonemes are long and thick, with spines lining the proximal inner 3rd of the coil. b. Nematocysts identified here as merotrichous isorhizas may belong to 3 distinct size-classes or to 1 class with a capsule very variable in size. Those on the blastostyle tentacles are somewhat larger, extremely abundant and densely packed along the surface of the tentacle; when disturbed, an immensely long thread (tubule) much longer than those of the body tentacles is ejected. The thread is smooth proximally followed by a finely spinous section c. 30 μm long, then a very long smooth distal thread. c. The shafts of the mesoteles are long and spindle-shaped with a moderately swollen spinous head and long thread.

The living hydroid is dark orange in colour showing paler longitudinal bands when the body is extended; mature female gonophores paler yellow; apices of the blastostyle tentacles and the apical cap of mature gonophores with a dark brown granular band.

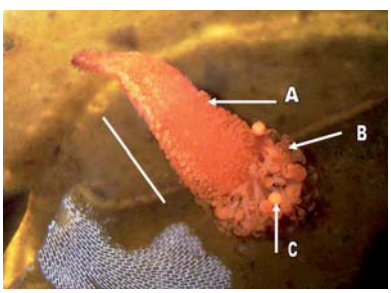

Figure 1. *Candelabrum australe*. Laboratory photograph of partially extended hydranth on *Ecklonia radiata* thallus. A, capitate body tentacles; B, blastostyle tentacles; C, mature gonophore. Scale bar: 2 cm.

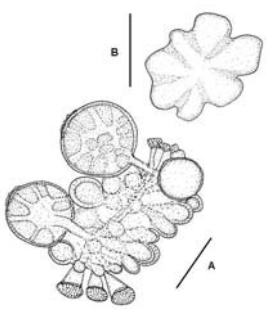

Figure 2 A, female blastostyle with clusters of tentacles and young and mature gonophores containing larvae. B, actinula larva several hours after liberation. Scale bar: A, 2 mm; B, 0.5 mm.

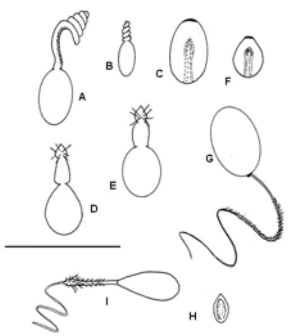

Figure 3 A, large desmoneme from body tentacles. B, small desmoneme. C–F, stenoteles. G, large merotrichous isorhiza. H, small ?merotrichous isorhiza. I, mesotele. Scale bar: 30 μm.

circular disks firmly attached to the algal thallus; hydrorhiza entirely covered by a thin greyish layer of mucus. Body not extending into the blastostyle region.

Body tentacles capitate, globular, numbering about 1500 (Briggs 1928), crowded together on the contracted hydranth but separated when body expanded; tentacles borne on stout transparent peduncles and richly armed with nematocysts. Blastostyles crowded on lower body, bearing clusters of 6–10 apically flattened tentacles on stout peduncles; tentacles armed with 100s of large nematocysts.

Hydranth bisexual, gonophores fixed sporosacs, male and female gonophores borne separately on stout branched blastostyles among clusters of tentacles; blastostyles comprising numerous developing and mature gonophores; mature gonophores of both sexes spherical, c. 1 mm in diameter with a flattened circular apical cap. Several larvae visible inside

mature female gonophores. Actinula larvae were liberated after 36 hours in the laboratory; larvae flattened, typically lobate but variable in shape, capable of slow, barely perceptible movement.

At least 9 size-classes of nematocysts in 4 morphological categories in the cnidome of the hydranth, all size-classes occurring in the body tentacles and 6 size-classes in the blastostyle tentacles. Data on the nematocysts are summarized in Table 1.

Remarks. The common brown kelp *Ecklonia radiata* grows in depths of 1–20 m in southern Australia and is likely the seaweed upon which Briggs found his New South Wales specimens of *Candelabrum australe*. The New Zealand material provided no information about substrate but *E. radiata* is also a common coastal kelp near Christchurch in the South Island. Although the few southern Australian records of *C. australe* suggest it is a rare species, it is probably widely distributed in the abundant *Ecklonia* habitat.

The smooth, long-lived *Ecklonia* thallus would provide an excellent substrate for attachment of a large hydroid lacking a firm hydrocaulus. The hydrorhiza is strongly adherent to the alga by radiating disk-like stolonal plugs. At the site of attachment to the algal thallus there is a distinct light-coloured aureole indicating reaction of the hydrorhizal mucus sheath with the alga.

The tapering body of the hydranth is remarkably extensile and prehensile, extending rapidly from 2–6 cm, sweeping back and forth over the algal substrate somewhat reminiscent of an elephant's trunk. It is highly sensitive to stimulus, contracting rapidly when touched. Authors' descriptions of species of *Candelabrum* report a small circular mouth but this is probably an artifact of preservation. In contrast, the mouth of living *C australe* is widely open when actively exploring the substrate.

Briggs (1929) gave a detailed description of the development of the gonophores and formation of the egg of *C. australe* but as his specimens were almost dead, he could not provide information on larval development. Schuchert (1996) observed a juvenile specimen of an undescribed species of *Candelabrum* from New Zealand. The specimen moved about slowly for several weeks in the laboratory before adhering to a suitable surface. In the present laboratory study, following liberation, several flesh-pink larvae of *C. australe* moved sluggishly for several hours on the *Ecklonia* substrate before attaching by a plug of mucus. Rapid adherence of the larva to the algal substrate would be a vital adaptation in strong water movement of the *Ecklonia* habitat.

Several morphological categories of nematocysts comprising the cnidome of *Candelabrum* have been noted by authors: Jaderholm (1905), Manton (1940), Millard (1975), Segonzac and Vervoort (1995), Hewitt and Goddard (2001). Manton (1940) provides a broad classification and illustration of the cnidome of *Candelabrum penola (*Manton, 1940), *Candelabrum capensis* (Manton, 1940) and *Candelabrum cocksii* (Vigurs, 1849) including heteronemes (= mesoteles), stenoteles, desmonemes and haplonemes (= meretrichous isorhizas). Millard (1975) figures the nematocysts comprising the cnidome of *C. capensis* and *C. tentaculata* (Millard, 1966) and Hewitt and Goddard (2001) tabulate the cnidome of known species of the genus. The cnidome of *C. australe* comprises the same morphological categories of nematocysts as reported by these authors.

Examination of the gross morphological features of the New Zealand material confirmed its identity as *C. australe*, thus extending the range of the species from 34–44°S and across the Tasman Sea. As none of the nematocysts were discharged in the New Zealand material and the cnidome had deteriorated in preservation, no detailed examination of the nematocysts was possible.

The arrangement of the body desmoneme tentacles of *C. australe* is such that they would provide little assistance in capturing and passing prey to the mouth; their function is clearly that of defence. Laboratory observations indicated that the large active mouth of the hydranth is capable of engulfing prey, suggesting the species could possibly be regarded as a grazer rather than a static predator.

In contrast to the body tentacles, the cnidome of the blastostyles is overwhelmingly dominated by meretrichous isorhizas aggressively armed with extraordinarily long barbed threads capable of entangling large predators of the gonophores.

Manton (1940) postulated that the hydranth of *C. penola* may be long-lived, taking some years to reach maturity. Longevity would be advantageous for a large and active hydranth, allowing time for investment of energy in growth, feeding and reproduction. Such longevity requires a firm, equally long-lived substrate such as *Ecklonia* for settlement and growth. While the life-span of *C. australe* is still unknown, it spans several years, as the same 2 individuals were regularly observed over a period of at least 3 years on an *Ecklonia* plant in a shallow tide pool at Port Phillip Heads (R. Burn, pers. com.).

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