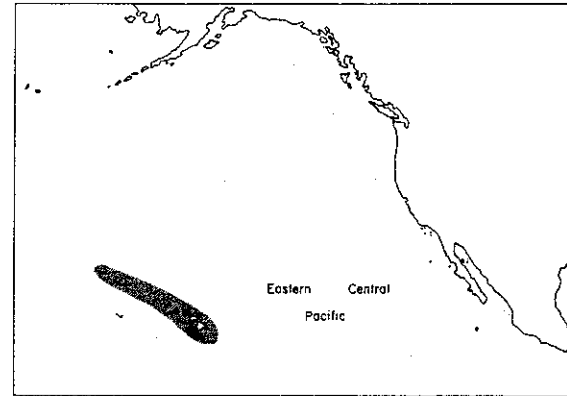


5 *Euprymna scolopes*¹

C. T. Singley



1 Introduction

Euprymna scolopes Berry, is a relatively unknown species of the family Sepiolidae, which by all accounts is endemic to the Hawaiian archipelago. Its small size, cryptic behaviour and limited distribution obviate any economic importance and have hindered field studies. This species, however, remains of considerable biological interest. The ease with which it may be maintained under laboratory conditions make it a good candidate for more extensive research aimed at understanding cephalopod anatomy, physiology and behaviour (Fig. 5.1).

There is little published information on *Euprymna scolopes*. The early descriptions of Berry (1912b, 1913) provide a minimum of life cycle information gleaned from collection data of the *Albatross* expeditions. The remaining work on this species deals with description of its embryology (Arnold *et al.*, 1972) or with specific biological or anatomical details (Singley, 1982). Hence, the following description depends heavily on unpublished observations made by the author over the period from early 1971 through 1977. Because of *Euprymna's* nocturnal and cryptic behaviour, most observations were of animals reared and/or maintained in the laboratory. Some additional information is provided by field observations and capture data collected throughout the study period.

¹ This work was carried out at The Pacific Biomedical Research Center, University of Hawaii, USA.

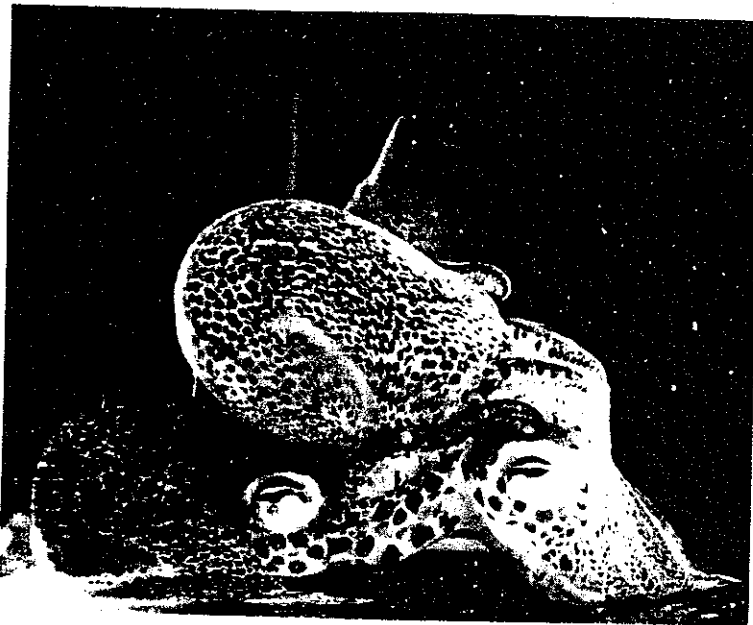


Fig. 5.1 *Euprymna scolopes* in copula. The larger female is grasped from below by the male's dorsal-lateral and ventral-lateral arms. The male's ventral arms are attached to the ventral side of the female's head and ventral arms.

2 Egg stage

Mature females maintained in the laboratory frequently deposited eggs on the sides of their tanks, on small rocks, or pieces of coral which were provided for that purpose. Dead coral appears to be the preferred substrate for egg deposition. In captivity, eggs are generally deposited towards the base of the coral head at the coral/sand interface, but may also be deposited within the 'fingers' of the coral. This placement of the eggs corresponds to the positions of egg masses observed in the field. Of two such field sightings, made on a shallow (<1.0 m in depth) shoreward reef, both masses were attached to the undersides of coral ledges adjacent to sandy areas of the reef. To the author's knowledge there have been no reports of eggs having been dredged from deeper waters.

The individual eggs of this species are surrounded by several layers of semi-transparent jelly and encapsulated by a thin, white, relatively opaque material (fig. 1 in Arnold *et al.*, 1972). The encapsulating material gives positive reactions for polysaccharide with the Periodic acid-Schiff (PAS) procedure and for protein (with Bromphenyl Blue; unpublished observations). This material appears to be a complex mucopolysaccharide. The eggs

are cemented to one another and to the substratum by the capsular material. Grains of sand and pieces of bottom rubble are incorporated into the capsules of individual eggs.

Individual egg capsules measure approximately 4 mm in diameter. The eggs within are ovate and measure 2.1 ± 0.11 mm by 1.8 ± 0.06 mm (\pm s.d., $n = 24$ from 2 different females; unpublished data). A total of eight females deposited eggs in the laboratory. Individual depositions numbered from 12 to approximately 300 capsules. One individual deposited a total of 310 eggs in several batches over a period of 32 days. None of the females possessed fully depleted ovaries at the time of their death.

Embryonic development in this species has been described (Arnold *et al.*, 1972) and is typical of decapod development.

3 Juvenile stage

Juvenile *Euprymna scolopes* hatched in the laboratory have an average mantle length of 1.5 ± 0.21 mm and a cranial-caudal length of 2.2 ± 0.19 mm (measurements were taken on live animals with the use of a dissecting microscope). These figures correspond well with the size of the smallest animals captured in the field.

Data from collections made throughout the year on the island of Oahu suggest that *Euprymna* goes through, at most, a very short (less than one week) planktonic phase. Juveniles larger than week-old laboratory-reared animals are seldom found in plankton samples taken during the day, whereas younger animals are common in small numbers. Yolk laden hatchlings and juveniles judged to be one week of age or younger are commonly seen over shallow sandy reefs in daylight especially during the spring and fall seasons.

In the laboratory, under conditions of normal day length, post-hatching juveniles are very active for the first 24 to 48 h. They seldom burrow, but swim almost constantly. As they age, juveniles spend an increasing amount of time in contact with the bottoms of their tanks. This behaviour further suggests that *Euprymna* undergoes a short planktonic phase. Following this initial active phase animals hatched in the laboratory begin to burrow in the sand for progressively longer periods and by 5 to 6 days spend most daylight hours buried in the substratum.

In the laboratory, juvenile *Euprymna scolopes* were fed primarily mysid shrimps (*Anisomysis* sp.; Arnold *et al.*, 1972). *Anisomysis* is common in the near shore waters of Hawaii and often forms large swarms upon which juvenile *Euprymna* have been observed feeding. In the laboratory, juveniles also consumed adult *Artemia*. However, *Artemia* as a sole food source did not support continued growth and resulted in very high mortality rates.

4 Growth

No adequate growth data are available for this species. However, one group of siblings was followed closely for a period of 120 days (Fig. 5.2). These data are crude at best, being merely a measure of increase in mantle length. However, Fig. 5.2 is consistent with growth curves for *Sepiola* and *Sepietta* reported by Boletzky *et al.* (1971) and is presented here for sake of comparison. The initial high mortality rate observed in Fig. 5.2 was due, in this case, to a high rate of cannibalism and, in part, to injuries sustained by the animals as a result of being reared in small rectangular enclosures.

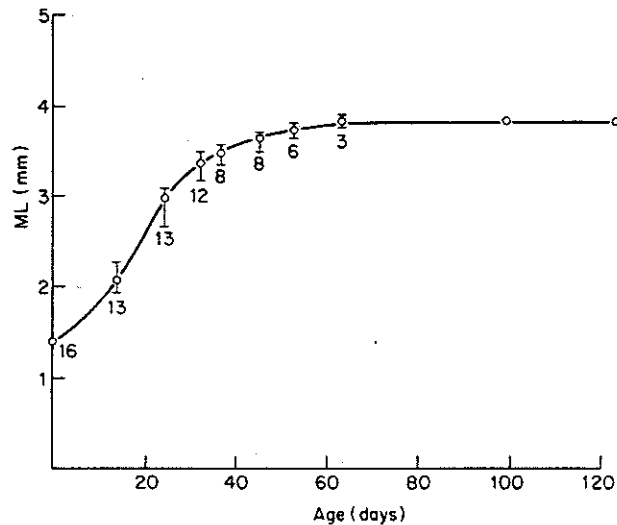


Fig. 5.2 Growth in terms of increase in mantle length (ML). Animals were reared in captivity and fed *ad libitum*. Of the initial 16 sibling animals, only one remained alive to 100 and 120 days of age. Animals were reared individually after 20 days

5 Maturation

No detailed information is available relative to gonadal development as few animals have been reared to maturity in the laboratory. However, observation of these and animals reared from field-captured hatchlings suggest that this species becomes sexually mature at four to six months of age.

6 Reproduction

Secondary sex characteristics are discussed by Berry (1912b). According to

this description, the upper left arm of the male is hectocotylized and the remaining arms carry larger suckers than do those of females of the same size. The sex of mature animals can also be readily discerned by observing the relative size and colouration of the gonad. In females the gonad is translucent and easily visible through the mantle musculature, whereas the male gonad is smaller and opaque-white. In addition, the caudal aspect of the female is broadly rounded while that of the male is more angular.

No pre-copulatory displays or interactions have been noted during observation of matings either in the laboratory or during three matings observed in the field. In all cases the male swam rapidly to and grasped the female from beneath with his arms. The position of the female in most cases was such that she was probably unaware of the male's presence. In the laboratory this was obviously the case. The same sequence of events occurred regardless of whether the female was introduced into the male's home tank or the reverse.

The copulatory position was consistent in all matings observed. The male grasps the female at the margin of her mantle using his dorsal-lateral arms and wraps his ventral-lateral arms up over her head (Fig. 5.1). Spermatophores are manoeuvred with the hectocotylus and placed into the funnel-shaped aperture of the female's oviduct. In the laboratory, the duration of copulation averaged about 45 minutes, the longest period being 80 minutes.

Spermatophores were, in most cases, found with their contents everted into the tissues of the oviduct. The contents of some spermatophores were also found within the mantle and funnel tissues. In each case the mass of sperm was surrounded by the everted 'middle tunic' material of the spermatophore's ejaculatory apparatus. This material has a major polysaccharide component as evidenced by its strong metachromasia and PAS reactivity (unpublished observations). The sperm remain inactive within the capsule, but are activated upon removal to seawater. *Euprymna* possesses no specialized sperm storage organ. Given the placement of the sperm mass, fertilization must take place at some point deep within the oviduct.

Egg laying has not been observed. Captive females often deposited eggs, but only at night and only when left undisturbed. Even attempts at direct observation using only moonlight were unsuccessful. Females typically die within one week of the last spawning.

The data compiled by Berry (1912b) from the collection of the *Albatross*, and those of the author, show that while some post-hatching juveniles are found throughout the year they are abundant only from late February through to mid-April and again throughout October and November. This pattern of abundance suggests the possibility of two reproductive periods per year.

7 Mortality

Estimates of life-span from animals maintained in the laboratory from hatching suggest a life-span of seven to ten months for this species. Mortality of adults was usually closely associated with reproduction. However, no systematic studies have been carried out.

No specific predators of this species have been identified. However, its small size and distribution in the field suggest that it may fall prey to a number of nocturnal fishes. In addition, the Black-Crowned Night Heron (*Nycticorax nycticorax*) has often been observed feeding at night on the reefs where *Euprymna* is abundant. Cannibalism has been observed within and between all age classes. There is no information on parasitism or disease in this species.

8 Ecology

The ecology of this species has not been studied systematically. *Euprymna scolopes* is found throughout the Hawaiian archipelago, usually associated with a sandy bottom Berry, 1912b). Adult and juvenile animals have been captured primarily by 'night-lighting' both along shallow reefs (0 to 3 m; Berry, 1912b, and personal observations) and at a considerable distance offshore (Berry, 1912b; R. E. Young, personal communication). Berry lists a bathymetric range of 0 to 138 fathoms for this species.

9 Conclusion

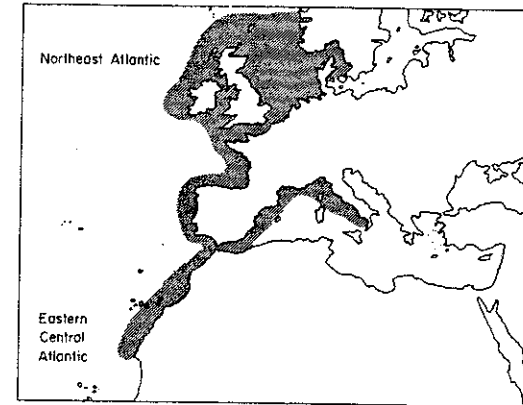
Euprymna scolopes is a small sepiolid species commonly found from shallow, near shore waters to moderate depths throughout the Hawaiian archipelago. Near shore, it is active only at night and spends most of the day buried in the sandy ocean bottom. Its behaviour at mid-depths has not been observed.

Data from animals reared in the laboratory suggest that *Euprymna* has a life-span of 7 to 10 months. In addition, the numbers in various size classes collected throughout the year suggest the presence (in the vicinity of the island of Oahu) of two breeding populations. The breeding behaviour is not distinctive and, as with other decapod cephalopods, death follows soon after reproduction.

In general, information concerning this species is quite fragmentary. Data on growth and ecology especially are lacking. There is much information to be gained by further study of this interesting species.

6 *Sepietta oweniana*

B. Bergstrom and W. C. Summers



1 Introduction

Sepietta oweniana Pfeffer, was described in 1908 as *Sepioloa oweniana*. Naef (1912) placed the species in the genus *Sepietta* based upon the form of the ink sac, the absence of light organs and the morphology of the hectocotylus. *Sepietta oweniana* is a small nekto-benthic species with a maximal mantle length of about 50 mm. It belongs to a group of closely related species which are found on the continental shelf and slope of the northeast Atlantic, and adjoining seas. To our knowledge, *S. oweniana* is not fished commercially and has no direct economic value.

Little information on the biology of this species is available in the literature. It is treated in Naef's (1923) account of the cephalopod fauna in the Gulf of Naples. Information on the morphology of embryological development was also given by Naef (1928). Eggs of *Sepietta oweniana* were used by Jecklin (1939) for egg development studies, however, the egg stage itself was described by Thorson (1946). Both Jaekel (1958) and Muus (1959) gave general systematic and biological information on *S. oweniana*. Some autecological information was reported by Mangold-Wirz (1963) in her account of the cephalopod fauna in the Catalanian Sea (western Mediterranean). A life-span duration was proposed by Mangold & Froesch (1977), and the results of cultivation of closely related species were reported by Boletzky *et al.* (1971). Sepiolid life-spans were further treated by Boletzky (1975a).

The present account is based on the above reports and on our own results