

**SEARCHES FOR THE RED BAND FISH *Cepola rubescens* L.
AT LUNDY 1984-1988**

By

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INTRODUCTION

In 1974, a population of the red band fish *Cepola rubescens* L. (fig. 1) was found in relatively shallow water (17m below chart datum) off the east coast of Lundy (Atkinson 1976). Previously, this fish had only been known from deep water locations (70 - 200m) off the west coast of Britain, from where specimens had been caught in trawls over mud grounds (Wheeler 1969). The discovery of the population at Lundy meant that observations could be made of these fish in situ for the first time by SCUBA divers and remote operated underwater television cameras.

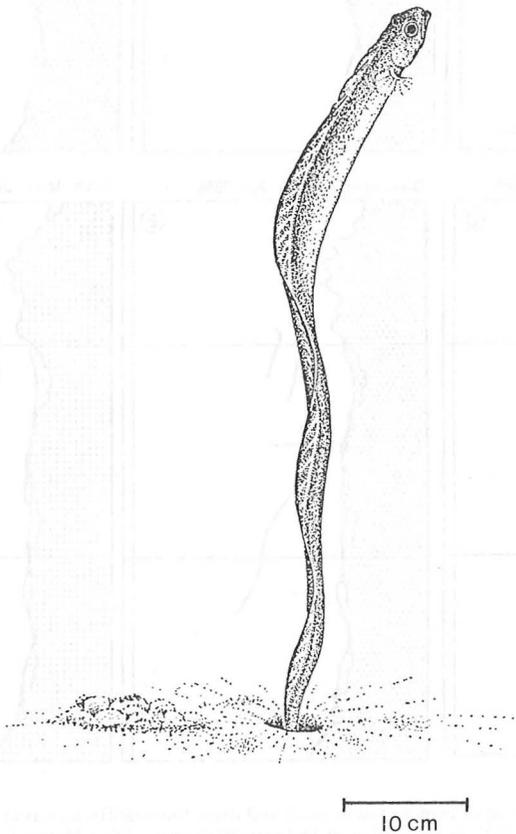


Figure 1: A male red band fish *Cepola rubescens* emerging from its burrow (original drawing from a photograph by the author).

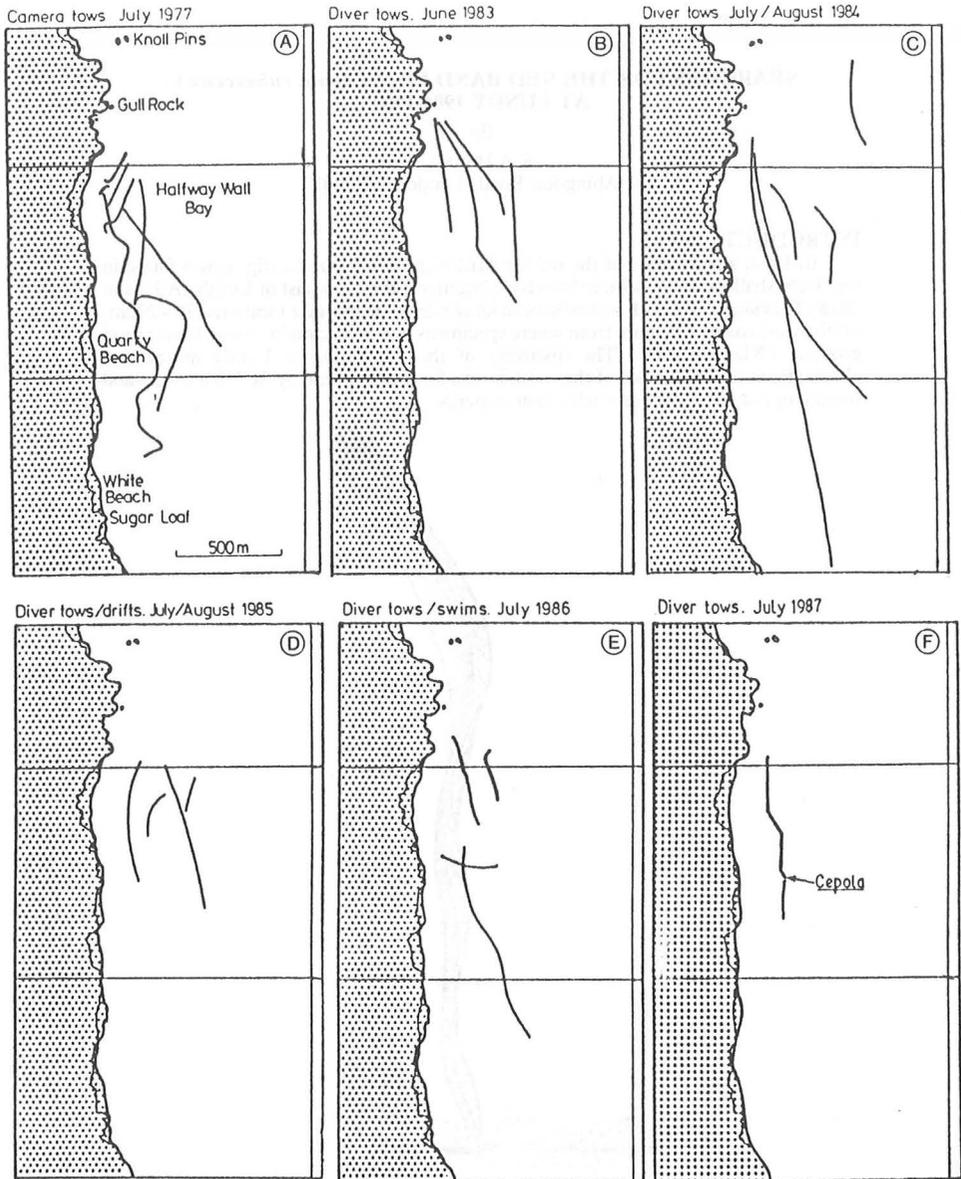


Figure 2: Location of camera tows (1977) and diver tows/drifts/swims in 1983, 1984, 1985, 1986 and 1987 in the region of Halfway Wall Bay. (After Howard 1987).

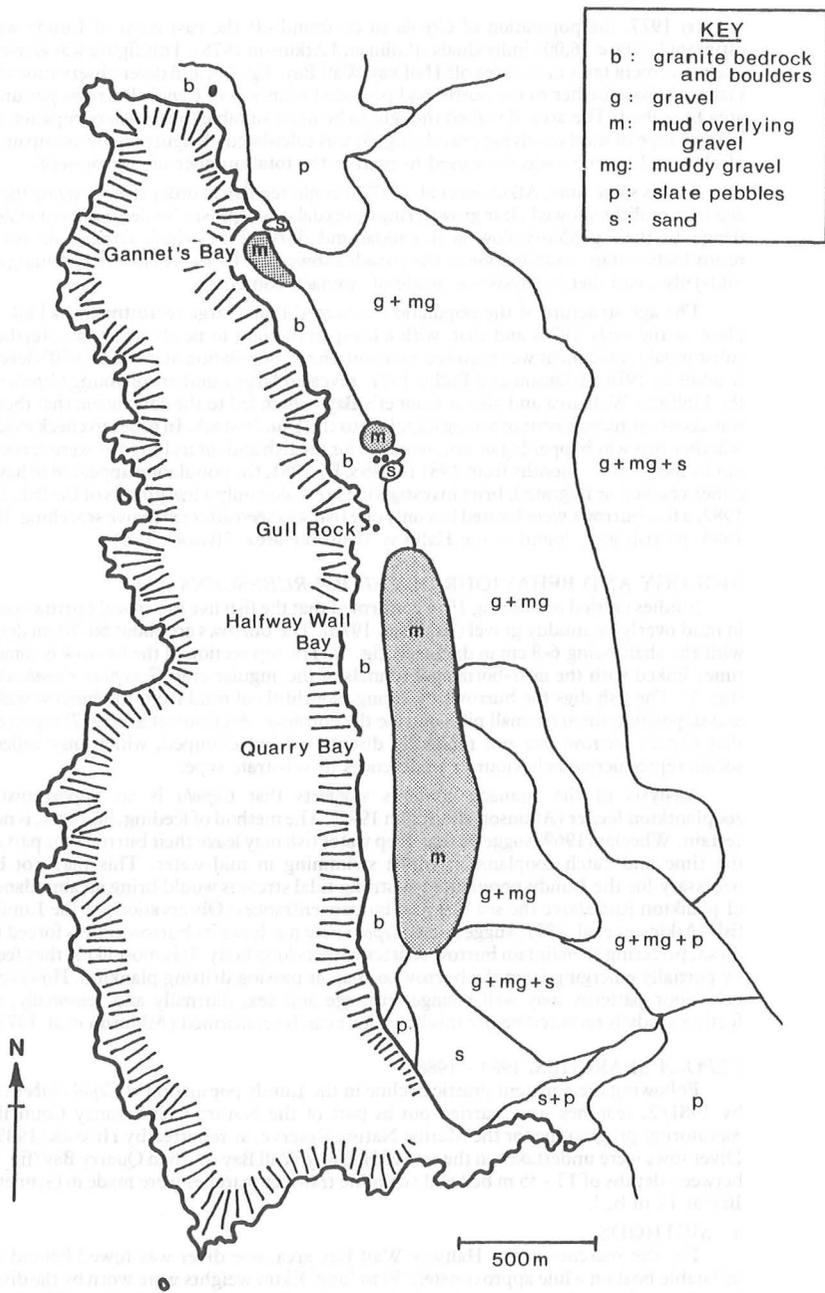


Figure 3: Bottom sediment types off the east coast of Lundy (after Hiscock 1983). The area of mud overlying gravel (shaded) is where most fish were found in 1977.

In 1977, the population of *Cepola* to be found off the east coast of Lundy was estimated to be c.16,000 individuals (Pullin and Atkinson 1978). This figure was arrived at after camera tows in the area off Halfway Wall Bay (fig. 2a), and diver observations in Gannet's Bay further to the north, had provided numbers of *Cepola* burrows per unit area of seabed. The area of seabed thought to be most suitable for *Cepola* occupation (a bottom type of mud overlying gravel) (fig. 3) was calculated. A figure of 60% occupancy of observed burrows was then used to predict the total number of fish present.

At this same time, Atkinson et al. (1977) caught ten fish in order to investigate their age (the otoliths showed clear growth rings); sexual dimorphism (males possess a violet fringe to their golden-yellow anal, caudal and dorsal fins, which females do not); reproductive state (examination of the gonads showed the fish were close to spawning in mid-July); and diet (analysis was made of stomach contents).

The age structure of the population indicated that a large recruitment had taken place in the early 1970s and that, with a lifespan thought to be about 8 years, further substantial recruitment was required to maintain the population at its mid-1970's level. Studies in 1976 (Atkinson and Pullin 1977) revealed large numbers of young *Cepola* in the Halfway Wall area and also at Gannet's Bay, which led to the conclusion that there was constant recruitment of young *Cepola* into the Lundy stock. In order to check to see whether this was happening or not, searches for the fish and/or its burrows were carried out in the summer months from 1981 to 1983. By 1981, the population appeared to have either crashed or migrated: brief investigations revealed only a few groups of the fish. In 1982, a few burrows were located but only one fish was seen after extensive searching. By 1983, no fish were found in the Halfway Wall Bay area (Hiscock 1984).

BIOLOGY AND BEHAVIOUR OF *CEPOLA RUBESCENS*

Studies carried out during 1974 confirmed that the fish live in vertical burrows dug in mud overlying muddy gravel (Atkinson 1976). The burrows are about 60-70 cm deep with the shaft being 6-8 cm in diameter (fig. 4). The top section of the burrow is sometimes linked with the near-horizontal tunnels of the angular crab *Goneplax rhomboides* (fig. 5). The fish digs the burrows by taking mouthfuls of mud from the burrow walls and depositing them in small piles outside the entrance. Atkinson et al. (1977) reported that *Cepola* burrows are not randomly distributed but clumped, which may reflect social/reproductive behaviour or preferences in substrate type.

Analysis of the stomach contents suggests that *Cepola* is an opportunistic zooplankton feeder (Atkinson and Pullin 1977). The method of feeding, however, is not certain. Wheeler (1969) suggests that deep water fish may leave their burrows for part of the time and catch zooplankton whilst swimming in mid-water. This may not be necessary for the Lundy population, as strong tidal streams would bring an abundance of plankton just above the sea bed past burrow entrances. Observations of the Lundy fish (Atkinson et al. 1977) suggest that *Cepola* may not leave its burrow unless forced to do so, preferring to maintain burrow contact with its long body. It is most likely they feed by partially emerging from the burrow to snap at passing drifting plankton. However, behaviour patterns may well change with age and sex, diurnally and seasonally, so further study is required before this behaviour can be confirmed (Atkinson et al. 1977).

CEPOLA SEARCHES, 1984 - 1988

Following the apparent drastic decline in the Lundy population of *Cepola rubescens* by 1981/2, searches were carried out as part of the Nature Conservancy Council's monitoring programme for the Marine Nature Reserve, as reported by Hiscock (1985). Diver tows were undertaken in the area of Halfway Wall Bay south to Quarry Bay (fig. 2) between depths of 13 - 35 m bcd and swimline transect searches were made in Gannet's Bay at 12 m bcd.

a METHODS

For the searches in the Halfway Wall Bay area, one diver was towed behind an inflatable boat on a line approximately 50 m long. Extra weights were worn by the diver in order to keep him close to the sea bed when the boat was under way. The boat proceeded at approximately 1 knot. In 1984, 1985 and 1986, the diver was in two-way

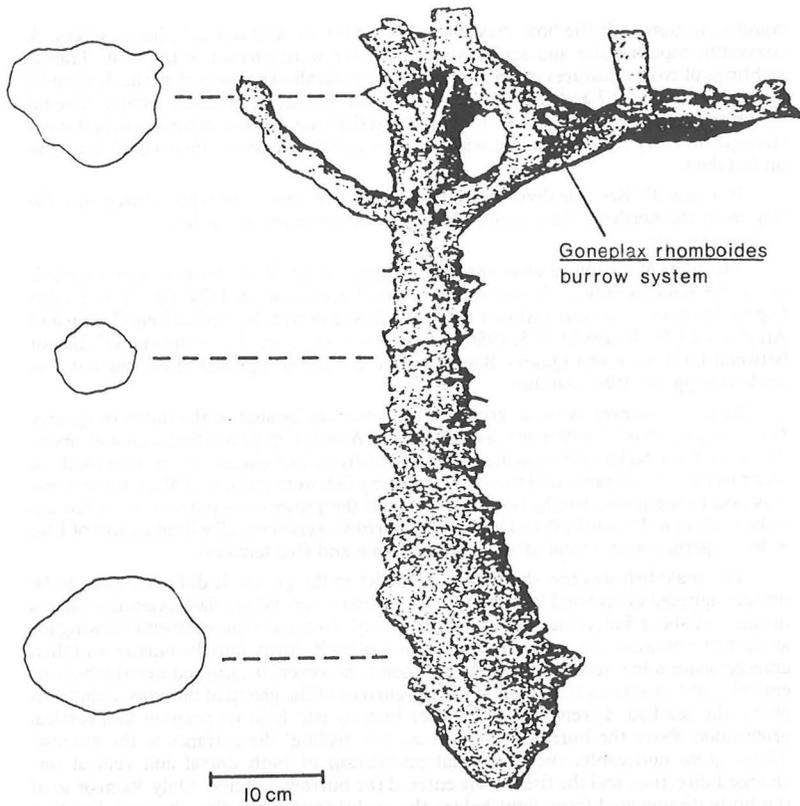


Figure 4: A resin cast of a *Cepola rubescens* burrow, with cross sections on the left (after Atkinson et al. 1977). Note the adjoining *Goneplax rhomboides* tunnels near the top of the burrow, and the enlarged chamber at the bottom.

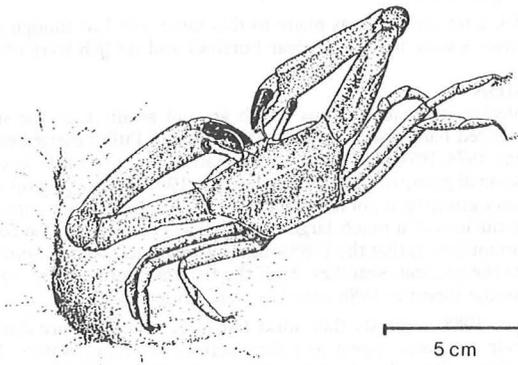


Figure 5: The angular crab *Goneplax rhomboides* (original drawing by the author from a photograph).

communication with the boat crew via a DUCSET underwater telephone system. A coxswain, rope handler and scribe/stand-by diver were present in the boat. Transit sightings of coastal features taken at set time intervals allowed the path of the diver to be plotted later. In 1987 and 1988 the DUCSET was not used, the diver using a slate on which to note down any observations and record the time. If the current was of sufficient strength to carry the diver along without the need for the boat, then a drift dive was undertaken.

In Gannet's Bay, the diver swam following a compass course due south across the Bay from the northern side, noting down any observations on a slate.

b RESULTS

The plots of the towed diver searches are given in fig. 2b-f. It will be seen that these are in the same locality as the camera tows which took place in 1977 (fig. 2a) when 283 *Cepola* burrows were seen within a strip of seabed 1 m wide by 3.9 km long (Pullin and Atkinson 1978). In 1984, 1985, 1986 and 1988, no *Cepola* were seen in Gannet's Bay or between Gull Rock and Quarry Bay, although a possible sighting of one burrow was made during the 1985 searches.

In 1987 however, a small group of burrows was located to the north of Quarry Beach at a depth of 17 m below sea level (fig. 2f). A male *Cepola* was first seen with about 20 cm of his anterior end showing out of the burrow. Subsequent dives were made in order to take photographs and to assess how many fish were present. A 50 m transect line was laid to the north, south, east and west, and the presence of burrows recorded 2m either side of it (Howard 1987). Only fifteen burrows were seen, all within an area of 15m x 4m, together with a total of six fish (one male and five females).

The male fish was less shy than the females in the group. It did not appear to be unduly agitated or stressed by the presence of two divers taking flash photographs at a distance of about 3 m, remaining in its burrow with 20 cm of its anterior end showing for at least five minutes. Occasionally it would lower itself slowly into the burrow and then emerge again a few seconds later. At one point, however, it emerged out the burrow entirely, and swam in a 10 m wide circle up-current of the group of burrows, about 1 m above the sea bed. It returned to another burrow and held its position in a vertical orientation above the burrow, with just its tail 'feeling' the entrance to the burrow. Then, quite noticeably, the sinusoidal undulation of both dorsal and ventral fins changed direction, and the fish slowly entered the burrow, tail first. Only 30cm or so of the body disappeared from sight before the undulation of the fins changed direction again, and the fish emerged after a few seconds. The burrow was clearly already occupied by another fish (a female as it turned out), whose head then appeared at the burrow entrance. The male then returned to the burrow it had originally vacated, entering it again tail first.

In 1988, a return visit was made to this same site, but though some evidence of filled-in burrows were found, no clear burrows and no fish were observed.

DISCUSSION

It is obvious that, for reasons which are not at all clear, the size of the Lundy population of red band fish on which Atkinson and Pullin carried out their extensive studies from 1974-1976, has reduced dramatically. It remains uncertain, however, whether the small group of fish re-discovered in 1987 was a relict population; whether it was a migratory group (it is not known if these fish migrate or not); or whether it was due to form the nucleus of a much larger population given time. One factor which could prove important here is that the 1988 studies were undertaken in September, and not in July as were the previous searches. So if the fish do migrate, they may well have come and gone by the time the 1988 searches were undertaken.

Howard (1988) suggests that adult fish may move inshore during the summer, excavate their burrows, spawn and then return to deeper waters. Vacated burrows would then fill in with sediment due to natural processes. Further searches, from May to August, will be required in future years to determine whether this is so.

The composition of the group (one male and five females) may indicate that the occupancy of burrows in any one group follows a 'harem-type' organization. The 4 cm long V-shaped tail appendages possessed by male fish (as reported by Atkinson et al. 1977) are likely to play an important role in primary burrow recognition.

ACKNOWLEDGEMENTS

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