EARLY JUVENILE DEVELOPEMENT OF THE CUTTLEFISH (*SEPIA OFFICINALIS* L.) AND SQUID (*LOLIGO VULGARIS* L.)

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Abstract

Juvenile cuttlefish hatched in the laboratory were reared for 15 days. Hatching was not simultaneous and was completed after 5 days. The cuttlefish were fed mysids. As with the cuttlefish, juvenile *Loligo* hatched in the laboratory. Newly hatched specimens were fed with *Brachionus plicatilis*.

Keywords: Early development, cuttlefish, squid

Introduction

Cephalopod research, especially cuttlefish *Sepia officinalis* has been carried out for many years (1-3). Due to fast growth rates, high food conversion (4, 5) high market price, and good adaptability to captive conditions, the cuttlefish is a very interesting species for mariculture and for biomedical research (6). In comparison with other cephalopods, cuttlefish eggs are relatively large and hatchlings are similar to adult specimens (1, 3). Another cephalopod that is interesting for mariculture and important for fishery resources is squid, *Loligo vulgaris*. Until recently, some research had been done on reproduction and rearing (7-14).

Materials and methods

Specimens of cuttlefish were captured in the Malostonski Bay, 70 km northwest of Dubrovnik. Cuttlefish for the broodstock (20 ind.) were collected throughout July 2002. The sex ratio was 1:1. Specimens weighed from 95-130 g, and the mantle length was 9-11.1 cm. The adaptation time was very short. During the first 6 hours, specimens separated into couples to different parts of the rearing tanks. Broodstock were cultured in ambiental conditions, with a temperature range of 23.3-27.6 °C, salinity 36.4-38.2 ‰ and dissolved oxygen 6.5-6.7. The broodstock was feed with sardines. Adaptation to this food was fast. After a few days, females started to attach eggs onto a plastic net. Eggs were transferred for incubation in 100 l tanks. Small and damaged eggs were separated. Young cuttlefish were cultured in incubation tanks and measured until the 15th day of life. Hatchlings were feed with live mysid shrimp.

On April 30th, 2002, 22 strands with squid eggs were collected in the Malostonski Bay near Dubrovnik. Strands were placed in 300 l tanks with ambiental conditions. There was a constant flow of 50-70% seawater daily through a 0.5 mm mesh net, temperature ranged from 17.3-20.6 °C, salinity 36.2-37.9‰ and dissolved oxygen 6.7-6.9. The paralarvae were measured until the 8th day of life and were fed with *Brachionus plicatilis* and *Artemia salina.*

The cuttlefish and squid experiments were carried out under artificial photoperiods (12:12 h, 2000 lux). The water was gently aerated from the bottom of the tanks. The tanks were cleaned by siphoning once daily.

Results

The reproductive behavior of cuttlefish was more evident in males. They swam side-by-side near females with intense body colors. When male and female pairs formed, a head-to-head meeting was noted. Four groups of eggs were attached to different parts of the tanks. The average number of attached eggs in a single position was 150-250. Females attached eggs in the same place a few times during 2-3 days. Hatching started after 22 days of incubation and lasted 4 days. After hatching, young cuttlefish were on the bottom of tanks. The average mantle length was 5.44±0.75 mm. After 15 days of rearing, the mean mantle length was 7.11±0.62 mm. In each of the three rearing tanks, there were 300 hatched cuttlefish. The first day after hatching, 2000-3000 mysids were added to each tank and feeding started at once. Cuttlefish selected prey up to 10 cm visual distance. The rest of the uneaten food was rejected.

The incubation period of squid eggs lasted 22 days. After the first day of hatching, 15% of paralarvaes hatched. The largest number of hatched paralarvaes was on the 3rd day (50%). After four days, all the paralarvaes hatched. The mean dorsal mantle length was 2.95±0.33 mm. The mean mantle length was 3.46±0.28 mm eight days after hatching. Paralarvaes chose prey up to 10-15 mm in front of the visible area around the head.

Discussion

Since 40% of the cuttlefish in the broodstock spawned and attached eggs in tanks, it may be concluded that *S. officinalis* adapt easily to captive conditions. In good rearing conditions, it is possible to get two cultures per year, during the summer and winter seasons. Cuttlefish eggs are relatively large. Newly hatched cuttlefish are similar to adult specimens (1). In comparison to squid paralarvae, they are much larger and need larger prey that can be located at greater visual distances. When they don't hunt mysids, juvenile cuttlefish are on the bottom, while squid paralarvae prefer the water column. During the rearing period of 15 and 7 days, neither species showed marked growth, but the first live food was very easily accepted.

S. officinalis and *L. vulgaris* are excellent candidates for aquaculture in Croatia. They are a targeted fishing species of cephalopodes due to good prices. Both species grow fast, reaching adult size and reproducing quickly. They adapt well to different diets and there is little difficulty in switching them from live to dead food.

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