OBSERVATIONS ON THE EARLY POST-EMBRYONIC DEVELOPMENT OF LOLIGO VULGARIS (MOLLUSCA, CEPHALOPODA)

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RESUME. Cette note présente quelques observations sur le comportement et la croissance chez de très jeunes Calmars (Loligo vulgaris L.) élevés en aquarium jusqu'à l'âge de 2 1/2 mois. Ces taux de croissance correspondent à ceux observés par d'autres chercheurs chez L. opalescens.

In contrast to benthic young cephalopods, planktonic hatchlings have so far only been reared a few times in the laboratory. CHOE and OSHIMA (1963) have raised young Sepioteuthis lessoniana to the age of 45 days. LAROE (1971) was able to rear Sepioteuthis sepioidea from hatching to the adult stage, which is attained after 5 months. These two species have comparatively large eggs, so that the hatchlings are of sizes (ML 5 - 6 mm) that are attained only a few weeks after hatching in other loliginid squids. Loligo vulgaris and L. opalescens have a dorsal mantle-length of only about 3 mm at hatching, but these young animals prove sufficiently robust to survive under the artificial conditions of laboratory rearing. They feed on living prey, mainly crustacean larvae, small mysids and fish larvae. Prey as large as the predator is readily attacked and eaten.

Loligo vulgaris was raised earlier to the age of 45 days (BOLETZKY, 1974). Young L. opalescens attained a maximum age of 100days in the experiments of HURLEY (1976). Using large copepods as the main food, HANLON et al. (in press) obtained a higher growth rate than HURLEY who used Artemia as food.

The food offered in the experiments here described were small mysids, in which the telson was cut away in order to slow down the animal's escape movement (cf. BOLETZKY, 1974), and occasionally half-grown Artemia.

When attacking prey, the animals generally go through the sequence of phases that have been observed in cuttlefish by MESSENGER (1968): attention (with orientating movements and/or approach), positioning (with binocular fixation of the prey), seizure by the tentacles (with forward pouncing, in contrast to the ejection of the tentacles of cuttlefish).

The prey seized by the tentacles is quickly taken over by the shorter arms and manoeuvered into a position suitable for eating. It has been observed that young squid ingest only the flesh of mysids and drop the empty exoskeleton (BOLETZKY, 1974).

Animals actively "hovering" sometimes stretch out their tentacles laterally. This very characteristic posture was also observed in animals while eating a prey.

Generally Loligo remains constantly active in mid-water. Animals settled on the bottom often show signs of weakening, but they can recover after feeding and then resume active swimming. Weakened animals regularly present a different light reflection around the eye ball. Instead of the bright green color normally produced by the iridocytes, the eyes turn red.

Except when attacking, the animals do not expand their chromatophores all over the body surface. In young Loligo a few weeks old, the mantle surface presents a transverse band of continually expanded chromatophores, which lies on a level with the ink sac.

In one experiment with L. vulgaris (Fig. 1), I have observed fast growth in the only two animals (of originally 70) surviving beyond the first week of rearing. These animals were kept in a round 5 liter glass vessel in normal day-light. The water was renewed by a daily exchange of $^1/_2$ of the volume. The water temperature corresponded to room temperature and generally varied between 18.5 and 22°C, but on several occasions rose to 25 or 26°C.

In a second sample reared in continuous light (fluorescent tubes suspended 50 cm above the tank), two animals survived for over two months (Fig. 1).

These animals hatched between 28 October and 5 November 1977 from an egg mass suspended in a round 50 liter PVC tank with running, filtered sea water. Several hundred hatchlings were in this tank when the egg mass was removed. They were fed small mysids 2 to 3 mm long. Later on, the few remaining animals were also given larger mysids without telson (cf. above).

For the first 50 days, the growth rate of these animals corresponded to that observed by HANLON et al. (loc. cit.) in Loligo opalescens. However, after 50 days culture, the two remaining animals did not grow much. When they died, they had only reached the size that other animals had attained about 50 days after hatching. This may be due to the low water temperature at that stage (see Fig. 1).

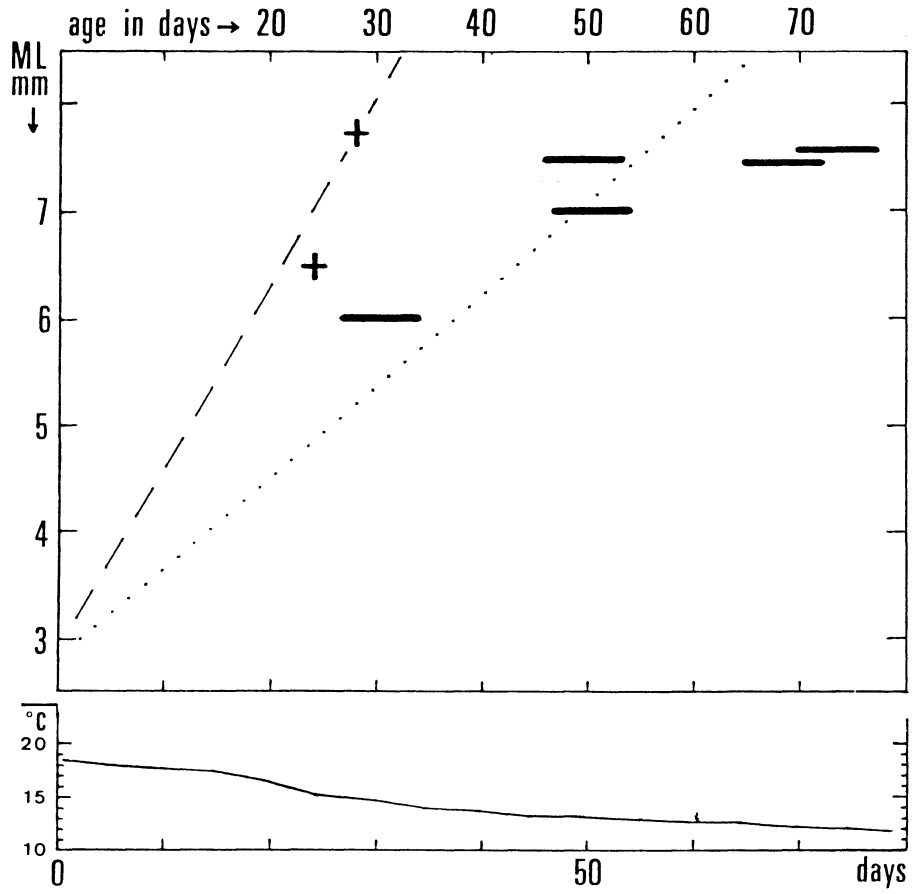

Fig. 1 - Growth in two batches of Loligo vulgaris hatchlings. The crosses represent 2 individuals of a batch of originally 70 hatchlings (see text), raised at temperatures above 18.5°C. Bars represent 5 individuals of a batch of several hundred animals hatched between 28 October and 5 November, raised at temperatures below 18.5°C, as indicated in the lower part of the figure (see text).
ML = dorsal mantle-length.

In terms of working effort, this experiment was the most inexpensive one. No thorough tank cleaning nor other maintenance work was done during the 75 days of culture. Only dead animals were siphoned from the sand bottom twice a week; remaining debris served as food for the small mysids present in numbers ranging from very few at certain times to over hundred at others.

One detail that may have been of some importance was the state of the inner tank wall. It was largely covered by a sheet of red and green algae that had developed over many

months. It certainly formed a visual barrier, so that the animals could easily avoid frequent contact with the wall. Indeed the delicate skin and in particular the rim of the fins are the parts of the animal that suffer most in the confined space of a small aquarium (cf. BOLETZKY, 1974; HANLON et al., in press).

The simple rearing techniques used with Loligo vulgaris will certainly not yield large numbers of grown animals, but they do permit observation of juvenile squids that can not be studied easily in their natural environment.

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