

## Effects of salinity on incubation time and hatching of spineless cuttlefish *Sepiella inermis* Linné

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Fertilized eggs were produced from a group of broodstock in a culture tank of 200 liter capacity. The eggs were incubated in aerated 1800-ml capacity bottles with four experimental salinities. Initial density was 20 eggs per liter. The bottles were placed in a water-bath of 400 liter capacity. The study was terminated when all of the live eggs had hatched. Average incubation times were 12, 12, 11 and 10 days when incubated in 29, 32, 35 and 38 ‰ salinity respectively. On average, 52, 82, 93 and 62 % hatched in the 4 experimental salinities. Optimal salinity for incubation of the eggs was between 31 and 37 ‰. There was no significant difference between 32, 34, and 35 ‰.

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### INTRODUCTION

Squid meat was the best supplemental feed for marine finfish broodstock due to the contents of essential fatty acid (Shepherd & Bromage 1988). Cephalopod meat accelerated gonad maturation of the finfish. Watanabe *et al.* (1977 in Watanabe 1988) mentioned that essential fatty acids play an important role in the reproductive physiology as a source of tocopherol.

Spineless cuttlefish *Sepiella inermis* is one of the cephalopods which is locally available in Banten Bay Waters, but the supply of fresh squid is seasonal. A continuous supply of fresh cuttlefish can only be obtained if the cuttlefish is produced in aquaculture. Hence, culture techniques for cuttlefish should be developed in Indonesia. However, information on the biology and culture of the cuttlefish is limited.

Nabhitabhata & Polkhan 1983, Nabhitabhata *et al.* (1984, 1985 after Nabhitabhata 1977) mention that *Sepiella inermis* is highly tolerable to variations of environmental conditions.

They found that the highest survival and growth were obtained in the range of 28 to 32 ‰ salinity. The present study aims at examining the effect of salinity on the incubation period and hatching as part of continued studies on biology and culture of spineless cuttlefish.

### MATERIALS AND METHODS

Cuttlefish eggs were obtained from broodstock cultured in tanks of 200 liter capacity. The broodstock was raised for 87 to 95 days from eggs collected in Banten Bay (normal salinity 32-33 ‰). During growth to adults they were fed with live mysids, and pieces of fresh and dried fish. The mantle length of adults ranged from 66-70 mm (42-54 g body weight). During daytime, the females attached 300-400 eggs per spawn to the aeration plastic pipe and/or egg collectors placed about 5 cm under the water surface.

Plastic bottles, 1800-ml capacity, had the bottoms removed and the bottle-mouths

plugged with rubber plugs. The bottles were filled with filtered sea water adjusted to be 29, 32, 35 and 38 ‰ with freshwater and salt and checked with a refracto-salinometer (ATAGO S-100). Each bottle was aerated. All bottles were placed in a water bath of 400 liter capacity. Cuttlefish eggs were incubated at a density of 20 eggs/liter. Each treatment had 5 replications. The experimental design was according to the Completely Randomized Design (Zar 1974). Water was changed daily. Dissolved oxygen and water temperature were monitored daily using a DO-meter (YSI model 58).

RESULTS AND DISCUSSION

Average incubation periods were 12, 12, 11, and 10 days for eggs in 29, 32, 35 and 38 ‰ respectively. Cuttlefish eggs of the same batch did not hatch on the same day. The time difference between the first and the last hatching was 7-8 days (Figure 1). Nabhitabhata (1997) found periods of 8-19 days, on average  $12.6 \pm 4.1$  days, when incubated at about 28 °C.

Salinity influenced the incubation periods, but salinities lower than 31 and or higher than 37 ‰ were unsuitable for incubation of eggs (Figure 2). This is probably caused by a general relationship between the osmotic pressure inside the eggs and the surrounding fluid (Royce 1972; Spotte 1979; Sverdrup *et al.* 1978; Vernberg 1983).

Cuttlefish eggs incubated in 29, 32, 35 and 38 ‰ hatched 52, 84, 93 and 62 % respectively (Figure 2). The Duncan test showed that the average hatching in 32 and 35 ‰ did not differ significantly. But they were significantly different from those incubated in 29 and 38 ‰. Relationship between salinity and hatching rate could be described by the equation  $Y = -1922.97 + 118.86x - 1.75x^2$  ( $r = 0.697$ ) (Fig. 2).

From the point of view of an aquaculturist a hatching of 80 % is considered to be good. The optimal salinity for incubation of cuttlefish eggs were ranged between 31 and 37 ‰.

The ranges of dissolved oxygen and water

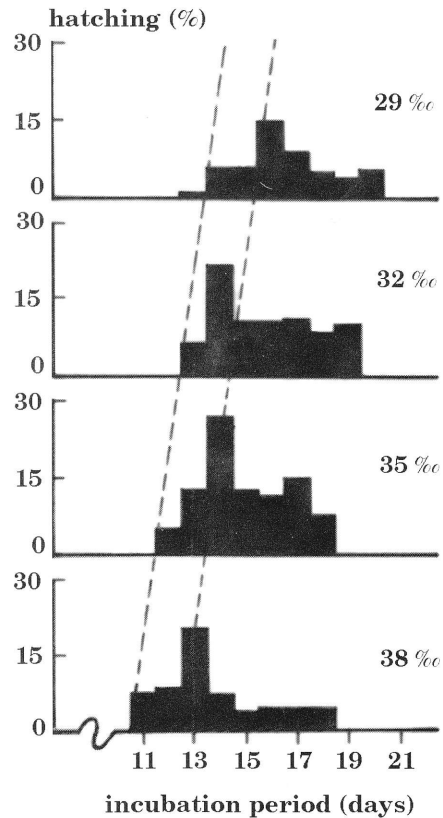


Figure 1. *Sepiella inermis*. Daily hatching in % of total hatching as a function of salinity.

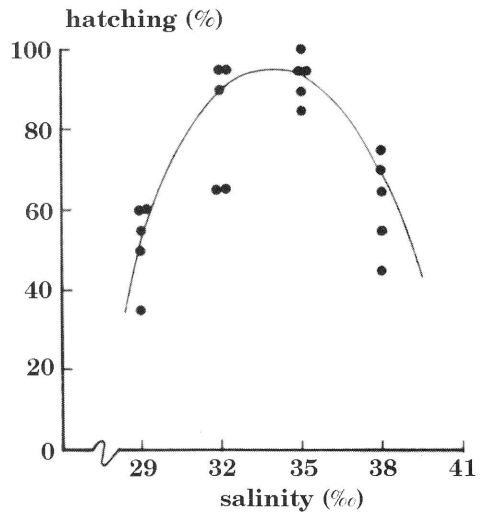


Figure 2. *Sepiella inermis*. Estimated relationship between salinity and the percentage of eggs, which hatched at a given salinity.

temperature 5.6-7.0 mg/l and 26.8-28.2 °C, respectively. Those values were optimal for culture of tropical aquatic animal. Danakusumah (1999) found that dissolved oxygen of 5-7 mg/l and a temperature of 26-28 °C were suitable for culture of neritic squid *Sepioteuthis lessoniana*.

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