EFFECTS OF CULTURE DENSITY ON GROWTH AND BROODSTOCK MANAGEMENT OF THE CUTTLEFISH *Sepia officinalis* (Linnaeus, 1758)

Miguel J. Correia, Pedro M. Domingues, António V. Sykes & José P. Andrade

CCMAR - Universidade do Algarve
Campus de Gambelas - 8000–810 Faro – PORTUGAL
email: mtcorreia@ualg.pt

Center of Marine Sciences of the Algarve

INTRODUCTION

One of the key aspects of successful large scale culture is determining the optimum culture densities. Only a few density studies for *S. officinalis* have been conducted (Nabhitabhata, 1995; Forsythe *et al*., 1994; 2002; Domingues *et al*., 2003; Sykes *et al*., 2003). Furthermore, in these studies, scarce information on growth and effects of juvenile and adult culture density on reproduction and other aspects of the life cycle has been supplied (Boal *et al*., 1999). The objective of this research was to determine the effects of a low and a high culture density on juvenile and adult growth and other aspects of the life cycle of the cuttlefish. Also, to try to establish broodstock management and to obtain a good culture density, feeding rates associated, as well to access the effects of crowding on the reproductive behaviour of this species, especially on fecundity and egg quality.

MATERIAL & METHODS

► A total of 219 juvenile cuttlefish (one month old), weighing on average 1.40 ± 0.11g were used. Two densities of 16 and 75 cuttlefish m^{-2} were tested with 3 replicates each. In the first experiment, dead cuttlefish were replaced by similar weight ones, and in the second part of the experiment, no dead cuttlefish were replaced, to determine the effect of density on mortality. All cuttlefish in every replicates were weighed every two weeks, until start of egg laying. Cuttlefish were fed live grass shrimp (*Palaemonetes varians*), almost *ad libitum*. Data collected was used to determine mean instantaneous growth rate (IGR), feeding rate (FR), food conversion (FC), mean cumulative mortality and biomass index (BI) according to Domingues *et al*. (2001).

► Eggs were collected on a daily basis and one third of them were weighed every day. Fecundity (eggs $female^{-1}$), and relation between female and egg sizes were determined. 9 replicates of 100 eggs each were used in separate baskets, for each density, to determine fertility (hatching percentage).

CONCLUSIONS

► Cuttlefish cultured at the lower density grew larger (137.3±21.6g) than those cultured at the higher density (91.8±12.3g). It is likely that bottom areas, besides temperature, have an important effect on growth obtained. In fact, Sykes *et al.* (2003) indicates that bottom areas play a major role in density studies for this species, which is bottom oriented. This could explain the considerably larger growth rates obtained here, at similar temperatures, compared to Forsythe *et al.* (2002).

► Results obtained for female fecundity and fertility indicate that egg quality by females cultured at the lower density was almost half of the ones cultured at high density (hatching rate for the high culture density was higher than almost all generations cultured in our laboratory until the present (Domingues *et al*., 2001, 2002) or the ones reported by Forsythe *et al.* (1994).

► Results from this experiment indicate that growth is directly related to density. Culture densities up to 4 $Kg.m^{-2}$ seem to be adequate to grow this species, and possibly higher biomasses can be used. Nevertheless, lower culture densities should be used to optimize reproductive potential. The correct balance of males and females in the tanks should be further studied in order to optimize fertility, and improve reproductive potential as well.

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RESULTS

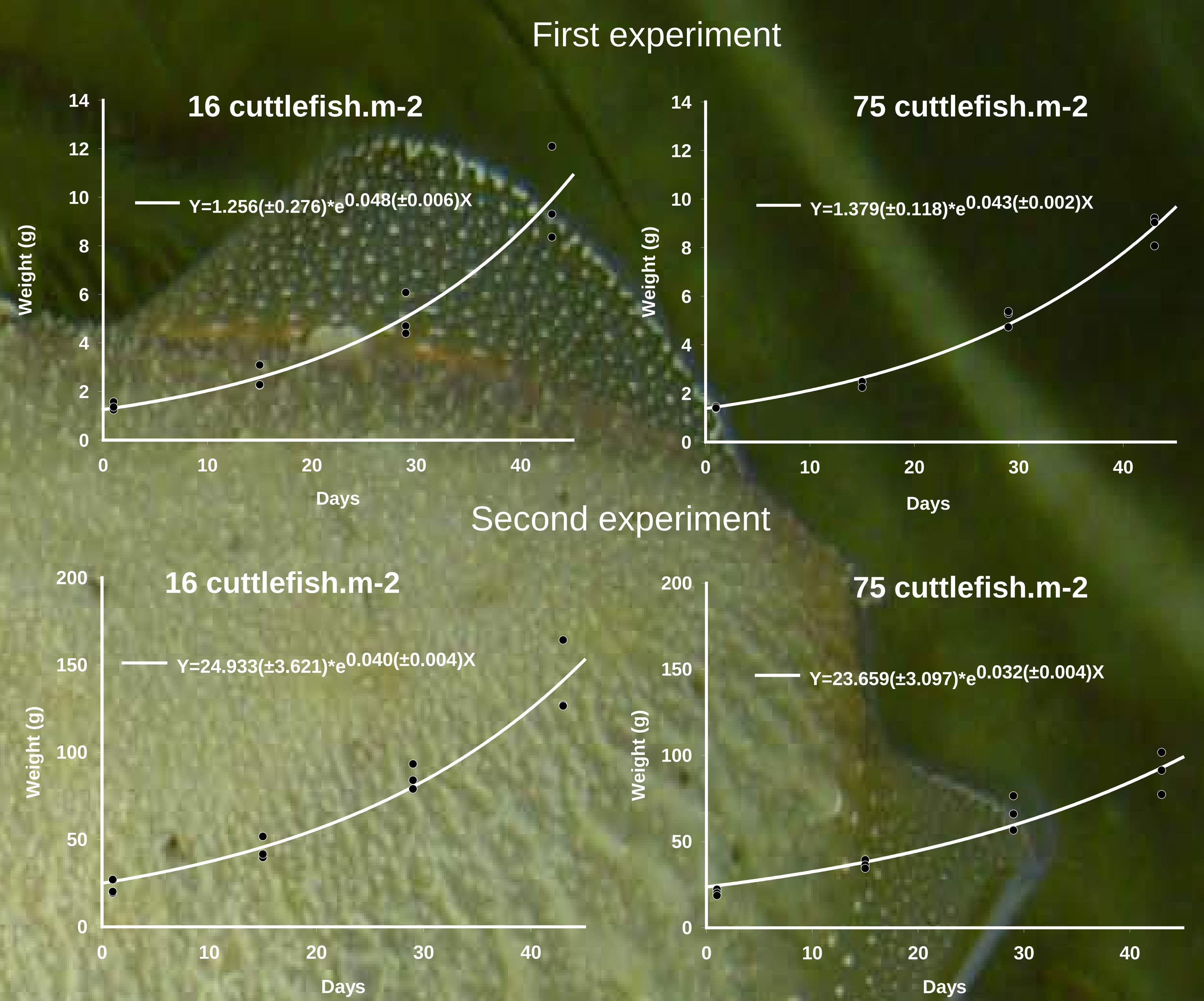

Fig. 1- Growth curves for each density and experiment

Table 1 – IGR, FC, FR, Fertility and Fecundity for each experiment.

	16 cuttlefish.m^{-2}	75 cuttlefish.m^{-2}
IGR (% bw d^{-1})	4,70±0,53	4,24 ± 0,26
FC (% bw d^{-1})	37,06 ±4,22	33,15 ± 2,75
FR (% bw d^{-1})	12,58 ±1,03	12,73 ± 0,86
Fertility (%)	35.8 ± 9.4	62.0 ± 16.9
Fecundity (eggs $female^{-1}$)	834	290

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