Animal Reproduction Science 113 (2009) 167–176

Contents lists available at ScienceDirect

Animal Reproduction Science

journal homepage: www.elsevier.com/locate/anireprosci

Effect of dietary supplements of mussel and polychaetes on spawning performance of captive sole, *Solea solea* (Linnaeus, 1758)

Gloriana Cardinaletti[a], Gilberto Mosconi[a], Roberto Salvatori[b], Domenico Lanari[c], Daniele Tomassoni[d], Oliana Carnevali[e], Alberta Maria Polzonetti-Magni[a,*]

[a] *Università di Camerino, Dipartimento di Scienze Morfologiche e Biochimiche Comparate, Via Gentile III da Varano, 62032 Camerino (MC), Italy*
[b] *Orbetello Pesca Lagunare S.r.l., Via Leopardi 9, 58015 Orbetello (GR), Italy*
[c] *Università di Udine, Dipartimento di Scienze della Produzione Animale, via San Mauro 2, 33010 Pagnacco, Udine, Italy*
[d] *Università di Camerino, Dipartimento di Medicina Sperimentale e Sanità Pubblica,Via Madonna delle Carceri 9, 62032 Camerino (MC), Italy*
[e] *Università Politecnica delle Marche, Dipartimento di Scienze del Mare, Via Brecce Bianche 60131, Ancona, Italy*

ARTICLE INFO

Article history:
Received 14 September 2007
Received in revised form 29 May 2008
Accepted 5 June 2008
Available online 8 June 2008

Keywords:
Common sole (*Solea solea*)
Broodstock
Spawning performance
Nutrition
Egg quality

ABSTRACT

Three diets were compared for the feeding of captive common sole broodstock (*Solea solea*) kept under ambient photoperiod and temperature conditions. A group of 70 adults were caught in the wild and the 38 males and 32 females distributed at random in six tanks. All the fish were acclimated to the same semi-moist diet (M) in the pre-experimental period from December to February. Three dietary treatments were offered in the experimental period from March to May with two replicates (tanks) per treatment. The treatments were M alone, M supplemented with fresh mussels (*Mytilus edulis*) (M + M), and M supplemented with live polychaetes (*Perinereis cultrifera*) (M + P). Spawning occurred during April and May when water temperature was 17 and 18 °C, respectively, and salinity around 34–35 ppt. Average daily dry matter intake expressed as a proportion of body weight was M 0.65 ± 0.34%, M + M 0.43 ± 0.18%, and M + P 0.56 ± 0.27%, and differed significantly ($P < 0.05$) between treatments. The average daily dry matter intake within a tank ranged from 0.31 ± 0.04% in

* Corresponding author. Tel.: +39 0737 402740; fax: +39 0737 402738.
E-mail address: aberta.polzonetti@unicam.it (A.M. Polzonetti-Magni).

0378-4320/$ – see front matter
doi:10.1016/j.anireprosci.2008.06.003

February to 0.98 ± 0.26% in May ($P < 0.05$), apparently due to changes in the photo-thermal regime. Diet significantly affected the number of days when spawning occurred, the number of days when hatched eggs were produced, and the proportion of fertilized eggs ($P < 0.05$); and affected the number of days on which viable eggs were produced during April (NS). In all cases, the results were lowest for M + M, while those for the other two treatments did not differ significantly. Differences in hatching rate were not significant in April. During May, no spawning occurred in fish given the M + M treatment, and the differences between the other two treatments were not significant. Values for all variates tended to be higher for M + P than M + M in April and lower for M + P and M in May. These results suggest that supplementing the semi-moist diet with mussels depressed feed intake and, consequently, reproductive performance; the semi-moist diet alone and semi-moist diet supplemented with polychaetes allowed satisfactory food intake and reproductive performance in broodstock sole.

1. Introduction

Among the most promising candidates for marine fish farming in Europe are Soleid flatfishes, which include both the common sole (*Solea solea*) and Senegal sole (*Solea senegalensis*).

The common sole is one of the most frequently fished species in Italy (2556 tons; F.I.G.S., 2004). Although it sells well in the market and thus would be a candidate for rearing on a commercial scale, there are currently no significant aquaculture facilities for sole in this country.

Several studies conducted since the 1970s to develop production technology for this species have suggested simple schedules for obtaining spontaneous spawning (Baynes et al., 1993 for reviewer) by manipulation of photoperiod and temperature (Devauchelle et al., 1987), or of temperature alone (Lenzi and Salvatori, 1989).

The natural spawning season in the Mediterranean occurs in late winter and spring (January–April, with two peaks in February), while in the Bay of Biscay it occurs December–May, and in the North Sea, April–June (Quero et al., 1986).

In cultured fish species, particularly in new ones for aquaculture, the variability in reproductive performance is the main limiting factor for the successful mass production of juveniles (Bromage, 1995). The daily and seasonal rates of feeding obtained with different broodstock diets directly affect fecundity. Many of the deficiencies and problems encountered during the early rearing phases of the newly hatched finfish larvae are directly related to the feeding regime of the broodstock, including nutrient level and duration (Izquierdo et al., 2001). The accumulation of vital nutrients such as essential fatty acids depends on the nutrient reserves in the mother animal, and consequently on the dietary input of broodstock in the period proceeding gonadal maturation (Blom and Dabrowski, 1996; Bell et al., 1997).

Unfortunately, there is a dearth of knowledge about food composition and feeding regimes to be used in sole broodstock. In most cases, sole spawners were fed different diets based on a range of cooked or fresh mussels and live polychaetes (Baynes et al., 1993). A diet which includes fresh food appeared to give better egg production than one consisting exclusively of cooked or frozen food, and the supplement of live polychaetes may be particularly important (Baynes et al., 1993). For example, Devauchelle et al. (1987) reported a decrease in egg production when fish were transferred to a diet based only on frozen mussels after a feeding period where various fresh mussels (*Callysta chione*, *Glycimeris glycimeris*, *Laevicardium crassum*) and polychaetes (*Nereis diversicolor*, *Nephtys hombergii*) formed the bulk of the diet. Feeding rate (Devauchelle et al., 1987) was on average close to about 12% of body weight per week at temperatures ranging from 8 to 18 °C. In the study performed by Baynes et al. (1993), in which broodfish were fed with fresh molluscs and polychaetes, feeding rates ranged from about 7% body weight per week at 8 °C to about 25% body weight per week at 21 °C, with an overall average of 13%