DESCRIPTION OF THE ENDOCRINE REPRODUCTIVE CYCLE OF THE WRECKFISH *Polyprion americanus* IN CAPTIVITY

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Introduction

The wreckfish (*Polyprion americanus*) is one of the species chosen by the DIVERSIFY project (www.diversifyfish.eu) to differentiate the European aquaculture. It is a good candidate species, since it grows very fast and exhibits excellent flesh quality. It is a late maturing species (Peres & Klippel, 2003) that adapts easily to captivity and grows well at low temperatures (Papandroulakis et al., 2004). However, its integration into aquaculture presents important restraints, one of them being the acquisition of broodstock and their reproduction in captivity. Wreckfish spend their first 1-2 years of life in surface waters following floating objects and then migrate to deep waters (>600m), where they live for the rest of their life. For its successful use by the aquaculture industry, a full description of its reproductive cycle in captivity is required, as well as the development of reproduction control methods.

Materials and Methods

Four different broodstocks at different research institutes in Greece and Spain were used at the Hellenic Center for Marine Research (HCMR, n=3), the Instituto Español de Oceanografía (IEO, n= 10), the Aquarium Finisterrae (MC2, n=24) and the Conselleria do Medio Rural e Mariño (CMRM, n=10). Fish were monitored from March 2015 to October 2016. Ovarian biopsies and sperm samples were collected monthly, and oocyte diameter and maturity stage and sperm quality, in terms of density ($x10^9$ spermatozoa ml^{-1}), motility percentage (%), motility duration (min) and sperm survival at 4°C (days), were estimated. Spermiation index was calculated on a subjective scale from S0 to S3, depending on the ease of sperm release after abdominal pressure. Blood samples were also collected monthly and testosterone (T) and 11-ketotestosterone (11-KT) were measured in males and T and estradiol (E2) were measured in females.

Results and Discussion

Twenty-four natural spawns were obtained by the broodstocks of IEO and MC2 in 2015, and 22 in 2016, defining the reproductive period to be between March and June. During this 4-month reproductive period, males produced good quality sperm with sperm density ranging between 3.85 and $15.03x10^9$ spermatozoa ml^{-1}, motility percentage of 70-90%, duration of forward motility of 2-5min and sperm survival between 4 and 10days at 4°C; some males produced sperm throughout the year. Testosterone and 11-KT reached their highest values when males were in full spermiation (Figure 1A, C). Vitellogenesis begun in winter (December to February) with post-vitellogenic oocytes reaching 1200-1400μm in diameter, prior to oocyte maturation and spawning. Testosterone was correlated to oocyte diameter, with its highest values observed during mid vitellogenesis (oocyte diameter >1000μm, Figure 1B). Due to the high variation between samples, E2 did not show statistically significant changes in relation to oocyte diameter; however, a trend of higher values during early to mid vitellogenesis and lower values during maturation and spawning was observed (Figure 1D). A similar pattern of female reproductive hormones has been described for the European seabass

Dicentrarchus labrax (Asturiano et al., 2000) and indicates that E2 is involved in vitellogenesis and T in oocyte maturation.

Conclusions

Wreckfish are able to mature and spawn in captivity, with their sex steroid levels well correlated with gametogenesis and maturation. More research is needed, in order to establish specific protocols for a more stable production of good quality eggs by this deep-water species.

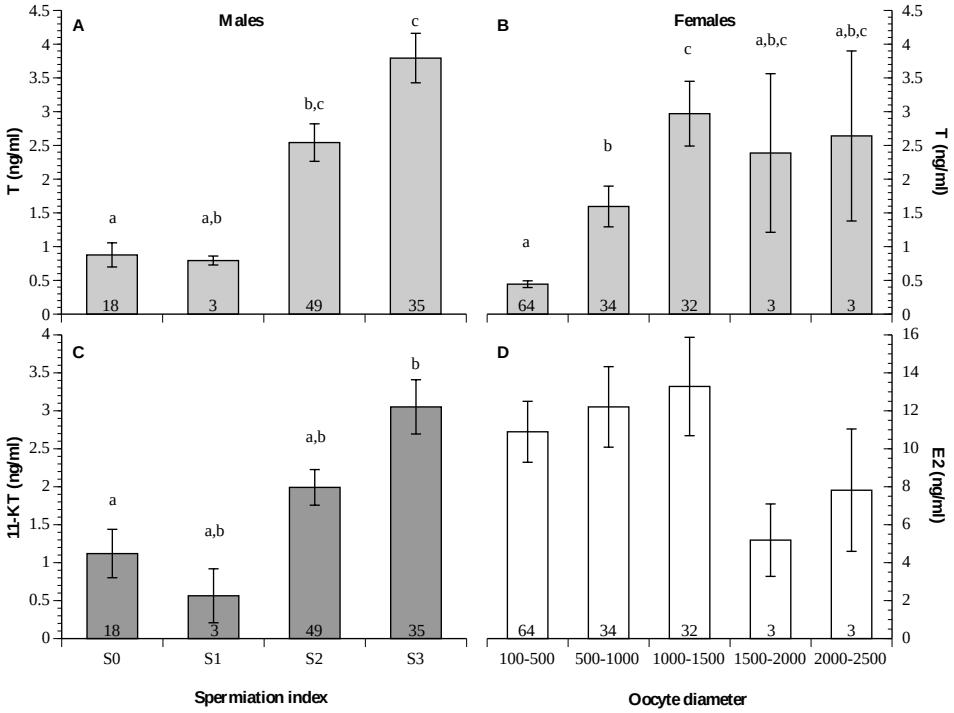

Figure 1. Sex steroid hormone levels (mean ± SEM) of males in relation to spermiation index (A,C) and females in relation to oocyte diameter (B,D) of captive wreckfish of different broodstocks (ANOVA, Tukey HSD, $P<0.05$). Numbers inside bars indicate the number of samples used for the hormonal measurements.

References

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