Slow-release GnRHa treatment prevented atresia during vitellogenesis and induced ovulation of captive wreckfish (*Polyprion americanus*)

by

Christian FAUVEL (1), Marc SUQUET (2), Armelle SEVERE (2), Constantinos C. MYLONAS (3) & Nikos PAPANDROULAKIS (3)

ABSTRACT. - The potential of wreckfish (*Polyprion americanus*) to breed in captivity was examined. Ovarian activity varied seasonally, with vitellogenesis beginning in November and ending in May. Slow-release implant with gonadotropin-releasing hormone agonist (GnRHa) prevented atresia, and both GnRHa injections or implants at the end of vitellogenesis triggered ovulation after 7 days. Spontaneous spawning was obtained only in one female, and the few eggs produced were of poor viability. Manual stripping and artificial fertilization produced viable gametes and embryos. Therefore, present captivity conditions inhibited final oocyte maturation (FOM) and spawning, but not vitellogenesis and spermatogenesis. GnRHa treatments stimulate FOM and ovulation of viable eggs.

Key words. - Gametogenesis - GnRHa - Wreckfish - *Polyprion americanus* - Aquaculture.

Introduction

The wreckfish (*Polyprion americanus*) has a worldwide distribution and is a good candidate for aquaculture, due to its rapid growth rate. In the wild, puberty occurs at a total length (TL) of 60-90 cm and spawning takes place at depths of 450-850 meters. An understanding of gametogenesis and sex steroid levels may allow for the development of appropriate hormonal stimulation protocols for reproduction in captivity.

Methods

Wild-caught wreckfish had been held for 4 years in tanks or cages under natural conditions in Brest (France), and for 2 years in tanks under natural photoperiod, but constant temperature (15°C as fixed upper limit), in Iraklion (Greece). They were fed commercial broodstock pellets. Females were sexed by gonadal biopsy and males by the release of sperm. Estradiol (E2) and 11 keto-testosterone (11-KT) were assayed in the plasma, and oocyte stages were assessed after clearing or histology. GnRHa was injected or implanted and eggs obtained by stripping were fertilized artificially.

Results

Five females and one male were sexed successfully in Brest; in Iraklion, one fish was identified as a female and the other two as males. E2 in the females varied over the years and was seasonally higher than in the other fish. 11-KT showed individual seasonal variations with no relation to sex. For 3 years, E2 and oocyte size varied seasonally in the 3 females, which were larger than 85 cm TL. Both parameters peaked during spring (E2: 1.5 ng ml^{-1}; oocyte diameter: 800 µm), but a rapid drop of E2 and oocyte atresia occurred in May. GnRHa implants (100µg kg^{-1}) in the remaining female without atresia (in Brest) supported full vitellogenesis for 1.5 months (diameter: 1400 µm). In addition, injection of 33 µg kg^{-1} GnRHa triggered a peak of E2 up to 4 ng ml^{-1}, a rapid hydration, FOM and ovulation within 7 days, without any spawning. The hand-stripped eggs (diameter: 2300 µm) were translucent and contained several oil droplets; they were fertilized by heterologous sperm (pollack) and hatched 4 days later at 15°C. These hybrids died upon hatching.

In Iraklion, a GnRHa implantation in May induced spontaneous spawning of some eggs after 7 days, but fertilization was very poor, as was embryo survival. On the contrary, a 2nd GnRHa implantation, followed by strip-spawning 2 days later provided 100 ml of eggs of the same size, with 86% fertilization success. Embryonic development lasted for 6.5 days at 15°C, at which time the larvae hatched.

Conclusion

Puberty in captive wreckfish does occur in captivity, but in larger individuals than in wild specimens (Papandroulakis *et al.*, 2004), suggesting that rearing conditions did not fulfil the requirements for complete gametogenesis. As proposed by Zohar and Mylonas (2001), GnRHa not only triggered FOM but also sustained completion of vitellogenesis by prevention of spontaneous atresia, and was effective in producing viable gametes and embryos.

References

PAPANDROULAKIS N., SUQUET M., SPEDICATO M.T., MACHIAS A., FAUVEL C. & P. DIVANACH, 2004. - Feeding rates, growth performance and gametogenesis of wreckfish (*Polyprion americanus*) kept in captivity. *Aquacult. Int.*, 3: 1-13.

ZOHAR Y. & C.C. MYLONAS, 2001. - Endocrine manipulations of spawning in cultured fish: From hormones to genes. *Aquaculture*, 197: 99-136.

(1) Ifremer, Chemin de Maguelone, 34250 Palavas, France. [Christian.Fauvel@ifremer.fr]
(2) Ifremer, BP70, 29280 Plouzané, France.
(3) Institute of Aquaculture, Hellenic Center for Marine Research, P.O. Box 2214, Iraklion Crete 71003, Greece.