ARTIFICIAL REPRODUCTION OF EUROPEAN SILVER EEL (*ANGUILLA ANGUILLA* L.)

A. Palstra, V. van Ginneken, G. van den Thillart

Integrative Zoology, Institute of Biology Leiden, Leiden University, Kaiserstraat 63, 2300 RA Leiden, the Netherlands. E-mail : palstra@rulsfb.leidenuniv.nl

Introduction

A long history of research on artificial reproduction of the commercially important European eel has not lead to production of viable leptocephali. More than 20 years ago Bezdenezhnykh (et al., 1983) obtained larvae but then died within a few days after hatching. Similar results were obtained in two recent studies (Pedersen, 2003; Palstra et al., unpublished results). Success is needed because aquaculture relies exclusively on the yearly influx of glass eels, which has declined by 99% since 1978 (ICES, 2003). In this study, we artificially induced maturation of male and female European silver eel from Lake Grevelingen (the Netherlands) with the objective to artificially reproduce.

Materials and methods

Silver eels (male and female) were caught in the fall of 2001 and 2002 during their seaward migration in the brackish Lake Grevelingen (Bout, Bruinisse, The Netherlands) at the North Sea sluice at 32ppt. Males were weekly IP injected with 125IU Human Chorionic Gonadotropin (HCG; Sigma Aldrich Chemie BV, Zwijndrecht, The Netherlands). Females were weekly IP injected with 20mg carp pituitary extract (CPE; 'Catfish', Den Bosch, The Netherlands). Ovulation was induced by injecting a DHP-solution (2mg DHP dissolved in 175 µl 100% ethanol 1/1 diluted with buffered saline solution) at 8 locations in the ovary. Males and females were hand stripped when ovulation occurred. Fertilised eggs were reared in 120 l incubators at 20°C. Eggs were freshly observed by phase contrast (NIKON Eclipse TS100) and light microscopy (NIKON SM2800), photographed (NIKON Coolpix 4500) and preserved in buffered formalin (4%).

Results

Egg batches of nine females, maturing between 12 and 25 injections, were fertilised with high motility sperm (Palstra et al., submitted). During the first three hours after fertilisation (h.a.f.), most eggs in all batches showed meroblastic cleavage up to the eight cell stage. Egg batches of two females resulted in the development of about 1500 (female 1) and 100 (female 2) embryos respectively (31-32 h.a.f., Figure 1). Embryos were found vigorously moving with the pigmented tail at 58-60 h.a.f. At this time, embryos of female 1 showed head and tail malformations. Embryos of female 2 showed a yolk sac in which the protein part had disappeared and only the fat droplet remained

(Figure 1). At 100 h.a.f. larger further developed embryos, resembling early larvae were found. Hatching had not been observed.

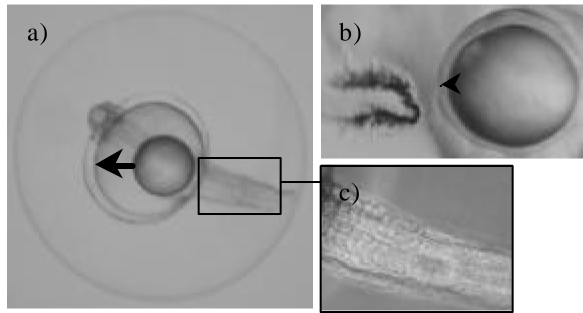

Fig. 1. Eel embryos. a) arrows indicate embryonic yolk protein in an embryo from female 2 at 32 h.a.f. b) yolk protein was absent in an embryo from female 2 at 60 h.a.f. showing also the pigmented tail. c) detailed view of developed somites and Kupfer organ (phase contrast microscopy).

Discussion

In contrast to Japanese eel, European eels show wide individual variability and much slower response to hormonal stimulation (Palstra et al., submitted). However, egg batches of nine females were fertilised of which two showed embryo formation. Late embryos showed vigorous tail movements indicating the onset of hatching (58-60 h.a.f.). At this time, most of the yolk protein was already consumed. Also Bezdenezhnykh (et al., 1983) reported complete reabsorption of yolk of 3.5 day old embryos at the time of death. This is in contrast to larvae of Japanese eel, which resorb the yolk in 8 days (at 21-22ºC; Pedersen et al., 2003) and is probably an artefact.

References

Bezdenezhnykh, V.A., Prokhorcik, G.A., Petrikov, A.M., Petukov, V.B., Plyuta, M.V., 1983. Obtaining the larvae of European eel Anguilla anguilla L. (Pisces, Anguillidae), under experimental conditions. Dokl. Akad. Nauk SSSR 268 (5), 1264-1266 (In Russian).

ICES, 2003. Report of the ICES/EIFAC Working Group on Eels.

Palstra, A., Cohen, E., Niemantsverdriet, P., van Ginneken, V., van den Thillart, G. Artificial maturation and reproduction of European silver eel: Development of oocytes during final maturation. General Comparitive Endocrinology, submitted.

Pedersen, B.H., 2003. Induced sexual maturation of the European eel *Anguilla anguilla* and fertilisation of the eggs. Aquaculture 224: 323-338.

Pedersen, B.H., Ueberschär, B., Kurokawa, T., 2003. Digestive response and rates of growth in pre-leptocephalus larvae of the Japanese eel *Anguilla japonica* reared on artificial diets. Aquaculture 215: 321-338.

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