AQUACULTURE update

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Continuous light suppresses sexual maturation in coho salmon

Coho salmon (*Oncorhynchus kisutch*) ordinarily become sexually mature no later than one year after smolting, a trait that reduces their utility for salmon farming. In a previous study, we demonstrated that exposure of coho salmon to constant long-day photoperiod during their second summer and autumn in netpens delayed the appearance of sexual coloration by approximately three months (Aquaculture Update #47). The present experiment was conducted to investigate the potential for using photoperiod treatment during the winter to suppress sexual maturation for an entire year and thereby allow a more extended harvest window for adult coho salmon.

Coho fry were held at 14°C under a short-day photoperiod (10L:14D) for 60 days followed by a simulated natural long-day photoperiod to produce underyearling smolts (Clarke et al. 1989). On June 28, the length and weight of each fish was measured and parr were culled. Smolts were given passive integrated transponder (PIT) tags by i.p. injection. On August 30, they were distributed randomly among four 4000 L tanks (n=28-29 per tank). Two of the tanks were held under simulated natural photoperiod (LDN) and two were exposed to constant light (LL). On November 15, half of the fish in each of the LL groups were exchanged with half of the fish in the LDN groups, producing four treatment combinations (LDN, LL August - February, LL August - November and LL November - February). On February 22, the photoperiod for the two LL tanks was

changed back to LDN.

Body weight averaged 23g in the smolts at the time of tagging in June. Growth was suppressed during exposure to LL. After 11 weeks of exposure to LL in mid November 1995 body weight averaged 209 and 206 g compared with 323 and 308 g under LDN (Fig. 1). At the end of the second period of LL exposure on February 22, weights ranged from a low of 389 g in the fish exposed to LL from August to 755 g in the LDN group. By mid October 1996 when many fish were sexually mature weights ranged from 1.6 to 2.8 kg (Figure 1). Weights in October 1996 were ranked in the order: LDN > LL August-

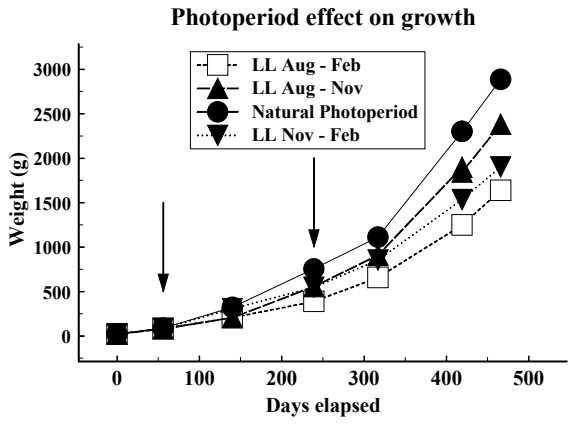

Figure 1. Arrows indicate start and end of continuous photoperiod treatment.

November > LL November-February > LL August-February. Salmon in the LDN and LL August-February groups were all maturing while only some males matured in the LL November-February group and no fish matured in the LL August-February group. No external signs of maturation were evident in the immature fish held from October 1996 to June 1997. It is concluded that exposure to continuous photoperiod can be used to delay sexual maturation by one year and thereby extend the rearing cycle for coho salmon. The period when maturation of coho salmon can be suppressed by light treatment is between November and February, although this should be confirmed by further trials under farm conditions.

Similar studies using photoperiod treatments in netpens and in tanks have demonstrated that photoperiod can be used to stimulate growth and suppress sexual maturation of Atlantic salmon (Bromage et al. 2001; Endal et al. 2000; Oppedal et al. 2003).

Considerations for use of lighting

1. Sexual maturation can be influenced by other factors such as cage size and fish density. Therefore, the light treatment should be tested on a few cages in order to establish its effectiveness.

2. Coho salmon, Atlantic salmon and rainbow trout have different growth responses to light treatment.

3. Placing the light source under water will eliminate surface light pollution which is a nuisance to navigation and neighbouring residents. According to the manufacturers, underwater lights can increase light penetration by as much as 40% compared with surface mounted lights.

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References

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