

**REPRODUCTIVE PHYSIOLOGY OF ADULT SPRING CHINOOK
SALMON DURING THE FIVE MONTHS PRECEDING SPAWNING**

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EXTENDED ABSTRACT ONLY - DO NOT CITE

Captively reared Snake River spring chinook salmon generally spawn two to six weeks later than returning wild fish of the same stock. This de-synchronization in spawning time presents problems to captive broodstock programs that reintegrate captive animals into the wild through releases of captively reared adults and/or the cross fertilization of wild and captively produced gametes. Delayed ovarian development may be due to rearing conditions early in the life cycle, during the final year prior to spawning when secondary oocyte growth is occurring, and/or during the final stages of maturation prior to ovulation. For example, the seasonal delay in ovulation could be caused by inappropriate environmental cues, such as temperature, altering the rate of oocyte

development. The goal of this study was to determine at what stage the captively reared fish are delayed. Gonadal maturation in a hatchery stock of Snake River spring chinook salmon, after their upstream migration, was compared to that of captively-reared fish. In addition, it has been shown that temperature can delay spawning in several salmonid species (e.g. Taranger and Hansen, 1993; Pankhurst et al., 1996), we therefore, conducted a trial to test the effect of water temperature on the timing of spawning.

Adult spring chinook salmon that returned, from the ocean, to the Rapid River hatchery (RR-hatchery return) were sampled (10 males and 10 females) monthly from May through early September. Captively reared female adults of the Lemhi River (LR-captive) stock were sampled (5-9 females) during May, August and at spawning in late September and early October. Reproductive hormones in pituitaries and plasma were measured by immunoassay and gonad stage was determined by histology. Carcasses, viscera and gonads were also collected for proximate composition analysis, and photographs of whole bodies were taken for morphometric analysis of body shape. Females of the LR-captive stock were reared in either freshwater (Eagle Hatchery) or seawater (NMFS Manchester) until the end of May and then were transferred to either chilled (8 °C) or ambient (14 °C) freshwater in early June (Figure 1).

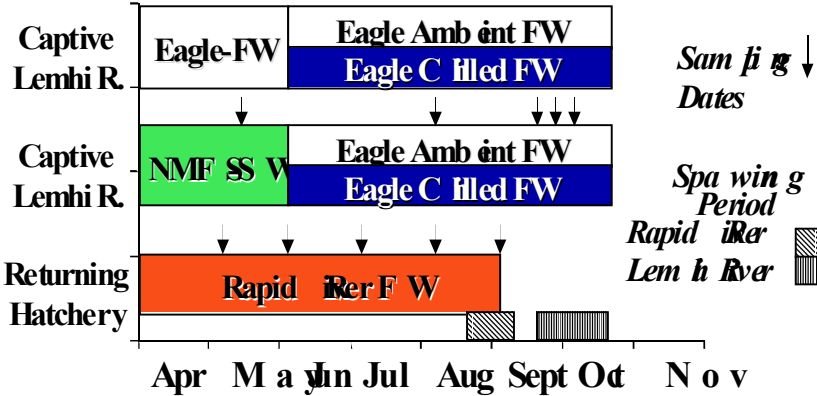


Figure 1. Temperature treatments, sampling and spawning times.

The LR-captive females were 50% smaller in body size, had smaller eggs, and higher relative fecundity but lower total fecundity than the RR-hatchery return females. Pituitary gonadotropins showed a similar pattern of change in the two groups, but levels were 3-4 fold lower in the LR-captive than the RR-hatchery

return stock. Plasma estradiol-17 β levels were similar for the two groups in May, however, by August the LR-captive had significantly higher levels than the RR-hatchery return stock. From May to August, gonadosomatic indices increased 4 and 6-fold in the LR-captive and RR-hatchery return females, respectively. LR-captive females had significantly lower gonadosomatic indices than RR-hatchery return females and considerable atresia and asymmetry in the size of the two ovaries. Overall the LR-captive stock spawned 3-6 weeks later than the RR-hatchery return stock. Spawn date of LR-captive fish was not affected by rearing temperature after May. However, fish reared at the Eagle Hatchery in freshwater prior to May had significantly delayed spawn time compared to fish reared in seawater at NMFS-Manchester.

Together these data suggest that the delay in spawning seen for the LR-captive stock may occur during early ovarian growth and is unaffected by environmental manipulation during final maturation and ovulation. However, atresia in the ovaries of the LR-captive females complicated interpretation of the endocrine data, and the environmental manipulation was performed on a relatively small number of animals. Analysis of gonad histology (in progress) will help to confirm these findings.

References

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