# EFFECT OF HCG DOSAGES ON HATCHING SUCCESS IN WHITE BASS

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## Background

Research related to the development of commercial aquaculture of *Morone* species has focused increasingly on the culture of striped bass *M. saxatilis x* white bass *M. chrysops* hybrids. Numerous studies has demonstrated that both hybrids, the female striped bass x male white bass (palmetto bass) and the female white bass x male striped bass (sunshine bass), are faster growing (at least during the first 2 years of life), more robust, and more resistant to disease and environmental extremes than purebred striped bass (Kerby, 1986).

Recent declines in the striped bass fisheries along the Atlantic coast of the United States, as well as legal and regulatory constraints, have increasingly limited the availability of wild broodstock (especially females) as a source of gametes (Harrell, 1984). In part, the problem of limited availability of striped bass eggs could be greatly mediated by using female white bass crossed with male striped bass to produce reciprocal-cross sunshine bass hybrids. White bass are common in much of North America (Scott and Crossman, 1973; Becker, 1983); their range has been greatly expanded as a result of stocking. However, legal and regulatory constraints may also limit access to wild white bass stocks. To resolve the dilemma of gamete availability, strategies for domesticating broodstocks and associated methods of controlling reproduction need to be developed (Donaldson and Hunter, 1983; Idler et al., 1987).

Two additional benefits of using female white bass as broodstock are that they normally mature at an earlier age (age 2) and are much smaller (i.e., 250-580 g body weight) than female striped bass,

which in the wild typically mature at age 4 or older and weigh 2-7 kg of more (Scott and Crossman, 1973; Bonn et al., 1976). Earlier age at maturity and smaller size are characteristics that should greatly reduce the cost and effort of broodstock rearing and maintenance.

Strategies for domesticating white bass broodstocks and associated methods of controlling reproduction have been developed (Kohler et al., 1994). In the course of this research it became apparent that the traditional hCG dosage (i.e., 1100 IU/kg wet weight female white base), which is 2-3 times higher than that used for striped bass, had not been adequately tested for efficacy. Accordingly, we evaluated hCG dosages ranging from 0-1100 IU/kg in white bass females that had been habituated to captivity and brought into spawning condition through temperature and photoperiod control.

**Methods**

Adult white bass (300-600 g) were collected from the Illinois River near LaSalle, Illinois, via hook-and-line fishing. Fish were placed in aerated live wells upon capture, moved to an oxygenated, truck-mounted hauling tank, and transported (5-6 h) to several indoor 10,000-L water-recycle systems at Carbondale, Illinois.

Fish were trained to formulated feed initially with moist pellets, which were prepared by mixing a commercial dry trout feed (Purina Trout Chow "broodstock" diet: 40% crude protein, 11% crude fat), raw gizzard shad *Dorosoma cepedianum,* and vitamins (coldwater fish premix). The proportion of dry feed was slowly increased in the diet until fish accepted 100% dry feed, a process that usually took about 2 weeks.

Spawning of white bass occurs between 15-20 °C (Kohler et al., 1994). Water temperatures of all systems were controlled by 746-W (1.0 horsepower) chillers (Frigid Unit) or 1,200-W heating elements placed in each tank, as needed. Temperatures were measured by continuous thermal recorders (Ryan TempMentor model RTM) placed in each system. Rock salt (NaCl) was added to the systems to maintain salinity at about 2%. Dissolved oxygen, temperature, salinity, pH, nitrites, total ammonia, and chlorine were routinely measured, and values obtained were consistently suitable for maintaining good fish health (Stickney and Kohler, 1990).

We attempted to induce spawning with hCG injections at dosages of 0 to 1,100 IU/kg for female fish and 100 IU/kg for male fish. Before injection, the fish were anesthetized with tricaine methanesulfonate (MS-222); 50-100 mg/L) and weighed to the nearest gram. The injections were administered intramuscularly just ventral to the first dorsal fin above the lateral line. Fish were given unique marks (dorsal spine or caudal fin clips) for subsequent identification.

Female white bass were checked for ovulation every 2 h from 16 h post-hCG injection by lightly exerting abdominal pressure to extrude a small amount of eggs. Eggs were staged by procedures similar to those described for striped bass (Kerby, 1986; Rees and Harrell, 1990). In general, ovulation was indicated by the occurrence of clear, free-flowing, uniform-shaped eggs with fully intact inner chorion surfaces. Females that had ovulated were anesthetized with MS-222 (50-100 mg/L), weighed, and dried with a paper towel. We manually stripped eggs (approximately 80% of egg mass) into weighed Teflon cups (15 mL volume). The egg-containing cups were weighed to the nearest 0.1 g, and the number of eggs was estimated by subsampling (Rees and Harrell, 1990). Semen was collected from males by inserting a pasteur pipette in the urogenital opening and applying suction. Semen from two males was placed in the Teflon cups with the eggs of each female, water was added at twice the egg volume, and the contents of the cups were mixed.

After fertilization (2 min), the eggs were placed in a modified Heath tray in labeled, 6 x 6 cm

individual compartments constructed from poly-vinyl chloride plastic and 125 -$\mu$m-mesh Nitex screen. Approximately 5,000 eggs were placed in each compartment. A continuous flow of 16-18°C oxygenated water (5 L/min) was circulated through the trays. Trays were covered with black plastic sheeting to prevent damage to eggs and larvae from excessive light. The eggs generally began to hatch 36-48 h postfertilization, and hatching was completed within 24 h. An additional 96-120 h was required for the larvae to absorb their yolk sacs. All live larvae, dead larvae, and unhatched eggs from each spawn were fixed in 10% formalin for several days and then placed in separate, labeled jars containing 95% ethanol. Eggs were counted with a Plexiglas counting chamber and a dissecting microscope at 10 X magnification.

**Results and Discussion**

hCG dosages considerably less than those traditionally used to induce ovulation in white bass appear to be more efficacious (Table 1). Based on these results we suggest that dosages similar or lower to those used for striped bass ( 330 IU/kg; Kerby, 1986), be used for white bass.

Table 1. Ovulation time and percent hatch for white bass induced to spawn using various dosages of hCG.

| hCG Dosage/Female | Ovulation Time (h) | | % hatch | |
|---|---|---|---|---|
| (IU/kg wet weight) | Mean | Range | Mean | Range |
| 1100 | 24 | 16-32 | 22 | 0-58 |
| 830 | 31 | 26-45 | 36 | 6-90 |
| 280 | 28 | 24-34 | 58 | 0-90 |
| 250 | 39 | 37-40 | 63 | 36-81 |
| 170 | 25 | 21-29 | 61 | 15-89 |
| 150 | 38 | 29-47 | 44 | 19-64 |
| 50 | 37 | 34-39 | 73 | 66-89 |
| 0* | -- | -- | -- | -- |

* Did not spawn.

In addition to providing guidance for improved spawning performance, these data have positive implications toward eventual regulatory approval of hCG for spawning *Morone* spp.

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