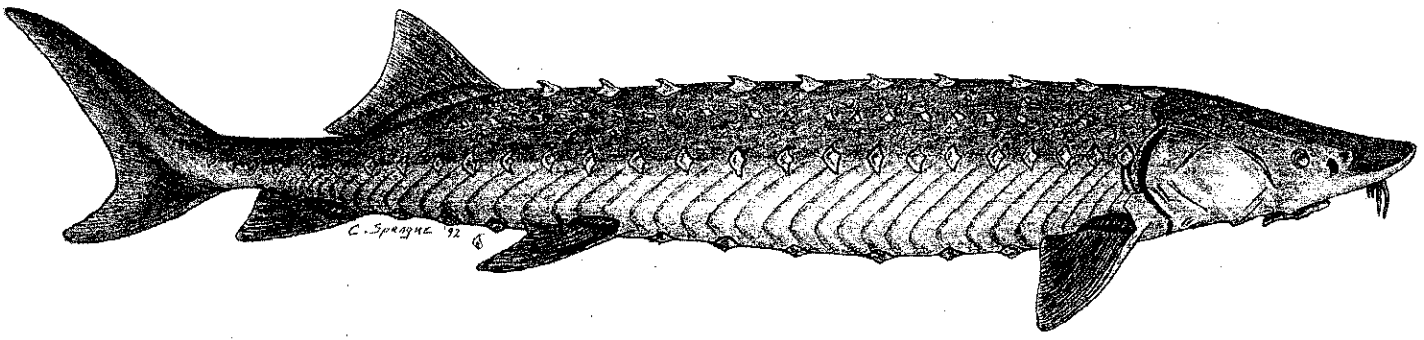
Kohlhorst

WHITE STURGEON

MANAGEMENT FRAMEWORK PLAN



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captive males for breeding. Some commercial growers in California collected eggs from domestic females for the first time in 1990. California anticipates that hatchery-reared brood fish will replace wild brood fish in the near future (D. Kohlhorst, CDFG, pers. commun.).

Although culture facilities can incubate and rear sturgeon, the industry is striving to refine techniques and increase its success. Nutrition, particularly for the larval stage, needs improvement. Initiation of feeding at the proper time and diet are critical for larval survival (Doroshov and Binkowski 1985). White sturgeon larvae use live foods more efficiently than dry or semi-moist feeds (Buddington and Doroshov 1984; Buddington and Christofferson 1985; Doroshov and Binkowski 1985; Dabrowski et al. 1987). Larvae fed a mix of live and semi-moist diets survived at a rate of 40-60% (Doroshov and Binkowski 1985). Larvae suffer higher mortalities on a dry diet than on live or semi-moist diets (Buddington and Doroshov 1984). Larvae fed only a semi-moist diet grow 40% slower than those on live diets (Buddington and Doroshov 1984). Dry diets were the least desirable.

Food designed specifically to optimize survival, health, and growth of white sturgeon is not available. Some diet composition data are available (Appendix D). Evaluations of sturgeon diets vary from studies of flesh composition, survival, and growth (Hung et al. 1987b; Stuart and Hung 1989). Flesh composition studies provide an index of growth and nutritive value. Flesh with high lipid, protein, and moisture indicates a rapidly growing fish. Comparison of flesh from both wild and hatchery sturgeon may provide insight into the quantity and quality of food in the wild. Hung et al. (1987a) performed proximate composition analyses of wild and hatchery-reared white sturgeon. The composition values for both groups did not vary significantly from each other, although body weight, carcass weight, and liver weight differed significantly between the groups. The differences in weight were attributed to optimal culture conditions available to hatchery fish.

A. HISTORY OF STOCKING EFFORTS

White sturgeon stocking programs are experimental and none of the Pacific states presently have on-line programs to maintain or enhance populations through hatchery propagation.

From 1980-1988, the CDFG required private sturgeon culture facilities to release hatchery-reared fry or fingerling (young-of-the-year) sturgeon into the wild as mitigation for the gametes they collected from wild fish. There were 6-13 permits issued each year for gamete collection. Each permittee could collect eggs from six females. The number and age of the young sturgeon released were at the discretion of the grower, within the confines of the permit (B. Hulbrock, CDFG, pers. commun.). These release programs were not evaluated. None of the planting programs required marked fish, so survival of hatchery-reared juvenile sturgeon in the wild, optimum planting size, and the influence of planting time and location are unknown.

A horizontally transmitted virus infecting the digestive tract caused mortality in 1984-1986 in California hatcheries (Hedrick et al. 1991). There are no recent reports of this virus and its presence did not affect the mitigation planting program.

Upon the outbreak of the white sturgeon iridovirus (WSIV) in 1988, the CDFG suspended the mitigation planting program. An increased understanding of this virus may help control its spread.

Despite California's suspension of the mitigation program, juvenile sturgeon carrying the WSIV may have been transported outside the state. California regulates the importation of live fish with a permit system, but not the exportation. Aquaculturists regularly ship juvenile sturgeon to several states in the United States as well as foreign countries. The receiving state is responsible for disease screening and transportation of potentially diseased fish within its boundaries.

Two Oregon companies collect wild broodstock from the Columbia River, including oversized fish. The operators must allow biologists to monitor broodstock collection efforts, spawning, and subsequent release of the spawning fish back to the river. Each permittee may collect eggs from six adult females. Collections remain below the total annual allowable 18-female collection limit since there have been only two permits (see Section III. A.).

To mitigate for the loss of natural egg production by broodstock collected from wild fish, Oregon has a fingerling replacement requirement. In the past, the ODFW required larval replacement fish, but now stipulates stocking replacement fish as 3-6 in (8-15 cm) fingerlings. The number and size required may vary annually; since 1988, the permits have required 1,000 fingerlings per female spawned. Through 1991 all fingerlings have been stocked in the Willamette River above Willamette Falls.

B. CURRENT CONSERVATION PROPAGATION PROGRAMS

Public Programs

Conservation propagation approaches vary in the region. Idaho's program is an experimental program, not a supplementation program, using state hatchery space and evaluations of marked releases. Oregon plants "replacement" fish, obtained through the gamete collection program, into the Willamette River above Willamette Falls, a natural barrier to sturgeon migration. Although the 1990 replacement fish were OTC marked, there are no ongoing evaluation programs for the small number of fish planted in Oregon. California "replacement" fish were put back into their natal river basin without evaluation programs. Washington has no public sturgeon propagation programs. British Columbia is cooperating with the IDFG and local tribes in planning the Kootenai River sturgeon enhancement program.

Idaho recently began experimental programs in both the Snake and Kootenai River basins. The IDFG instituted a gamete collection program in the Snake River. The juvenile sturgeon (12 in; 30 cm TL) were tagged with passive integrated transponder (PIT) tags and released into the middle Snake River in 1989; this represents the first tagged release of juvenile white sturgeon raised in a hatchery. Sturgeon were planted in two sections of the river: (1) in areas where recruitment already occurs between Bliss and C.J. Strike dams, at the rate of 16.1 fish/mile (10 fish/km); and (2) into an area where recruitment seems limited between Lower Salmon Falls and Bliss dams, at a rate of 161 fish/mile (100 fish/km). The IDFG plans to compare growth and survival of these fish.

The Kootenai River program began in 1990. Obtaining mature males and females simultaneously was difficult and prompted sperm preservation research. Of the 55,000 fertilized Kootenai River sturgeon eggs obtained in 1989, only 100 juveniles survived to 2 months of age. Egg mortality was high and deformities were common in the larvae that hatched. The IDFG, Kootenai Indian Tribe, and the Bonneville Power Administration are cooperatively developing a hatchery dedicated to sturgeon enhancement in the Kootenai River. The hatchery is now operating.

The ODFW has planted both hatchery and wild sturgeon in non-natal rivers as an experimental enhancement program. Oregon has planted both wild fish collected from the Columbia River (in the 1950s) and the mitigation fish from commercial hatcheries into the Willamette River, upstream from Willamette Falls. Wild juvenile sturgeon were collected in the Columbia River and held in hatchery ponds, but they experienced high mortality prior to release in the Umpqua River.

Private Aquaculture

California facilities incubate and rear sturgeon for commercial sale. Nearly 50 facilities register for sturgeon production each year, but only five or six consistently collect eggs and rear juvenile sturgeon for market. There are five commercial sturgeon facilities in California that each produce more than 10,000 lb (4,540 kg) annually. During 1989, total sturgeon production for all facilities was about 1 million lb (454,000 kg). Most of the flesh goes to the fresh fish market as 4.4-30.9 pound (2-14 kg) fish. A commercial facility produces fish of the following sizes for market.

3.3 lb (1.5 kg) fish in 18 months
5.1-7.1 lb (2.3-3.2 kg) fish in two years
11.9-14.1 lb (5.4-6.4 kg) fish in three years
20.1-30.0 lb (9.1-13.6 kg) fish in four years

Private aquaculture in California extended into Oregon in 1981 with the collection of wild broodstock from the Columbia River.

Oregon prohibits the sale of live juvenile sturgeon >6 in (>15 cm) TL without prior state approval. To grow the fish to market size, they are taken to facilities outside Oregon. The permitees must demonstrate that they are attempting to develop domestic broodstock for future use.

Washington permits grow-out facilities, but prohibits wild broodstock collection. In Washington, there are three private facilities that grow sturgeon they purchase from sources out-of-state.

Idaho prohibits the import of all sturgeon from any source. Idaho also prohibits wild brood collection in the state, unless it is done in cooperation with the state. Cooperative programs between the IDFG, the College of Southern Idaho, and the commercial fish industry provide private companies with eggs, larvae, or fingerlings needed for domestic broodstock development (T. Cochnauer, IDFG, pers. commun.). These policies effectively prohibit the use of wild broodstock by the commercial culture industry. The purpose of the policy is to preserve any population of white sturgeon with unique genetic material that might be present in Idaho rivers (Moore 1989).

The Canadian government prohibits the use of wild white sturgeon for commercial culture programs (Swiatkiewicz 1989). There is an interest in developing private aquaculture facilities in British Columbia, but none exist today (V. Swiatkiewicz, BCMEP, pers. commun.). There is one licensed aquaculture research facility at Malespina College, in Nanaimo, British Columbia, that maintains broodstock, incubates eggs, and rears white sturgeon (D. Lane, Malespina College, pers. commun.).