COMMERCIAL FEASIBILITY OF WHITE STURGEON CULTURE IN CALIFORNIA

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ABSTRACT

White sturgeon culture commenced in 1980 with the artificial spawning of wild broodstock. Since then, private sturgeon culture has been legalized in California, generating considerable enthusiasm among aquaculturists attracted by the species' rapid growth and perceived marketability. The biological basis and husbandry practices for commercial sturgeon culture are still untried, although laboratory scale experiments have demonstrated the technical feasibility of sturgeon culture.

White sturgeon were artificially spawned at the University of California, Davis, for the first time in the spring of 1980. Since then, U. C. Davis and several private fish hatcheries have successfully spawned sturgeon. Fish from the initial hatch now exceed 6.8 kg (2+ age class). These dramatic results have encouraged speculation that white sturgeon could be an attractive aquaculture candidate.

Numerous factors determine the viability of any species as a candidate for commercial aquaculture. Bardach et al (1972), listed the following four areas of importance when evaluating candidate species for culture:

1) Reproductive Habits
2) Requirements of the Eggs and Larvae
3) Feeding Habits
4) Adaptability to crowding

Of equal importance for commercial aquaculture is the marketability of the animal.

REPRODUCTIVE HABITS OF WHITE STURGEON

All white sturgeon which have been spawned to date have been broodstock collected from the wild. The procedure involves the collection of broodstock (restricted to hook and line in California) and the induced spawning of selected individuals. Under current California regulations, access to wild broodstock is restricted to five permit holders. Using current techniques, approximately 50% of attempted spawns are successful. The utilization of wild broodstock has several drawbacks, including the difficulty of securing and spawning such fish, and the uneven performance of progeny from wild broodstock. Sturgeon, however, offer a distinct advantage over many species by having a fecundity of between several hundred thousand and one million eggs. Thus, relatively few fish need to be spawned to provide large quantities of larvae. The development of a captive broodstock, however, is a priority item in securing a reliable supply of seed-stock.

REQUIREMENTS OF WHITE STURGEON EGGS AND LARVAE

Despite their high fecundity, white sturgeon possess large (4 mm) eggs which yield hardy, viable larvae. Egg incubation is rapid (5 days @16°C) and relatively easy in standard incubation units (McDonald Jars, "Trout Jars"), provided fertility rates are high. The larvae commence feeding approximately ten days post-hatch, and will readily consume a variety of natural foods (e.g. artemia, tubifex, oligochaetes), but must be trained to accept commercially available artificial diets (e.g. Biodiet, OMP). This weaning process must be carefully monitored and conscientiously applied to avoid significant mortality.

FEEDING HABITS OF WHITE STURGEON

Sturgeon are the largest fish found in fresh water, achieving this size by scavenging the bottom for food (e.g. fish, mollusks). Under culture conditions on artificial diets, white sturgeon exceed 0.5 kg in 12 months, 2.3 kg in 24 months, and 6.8 kg in 36 months. These growth rates were achieved during the initial feed trials with the first year-class progeny. Undoubtedly, faster growth rates can be achieved as experience is gained. Optimal temperatures for growth appear to be between 18-24°C. One difficulty in feeding sturgeon is their sluggish response to food, which allows leaching to occur prior to consumption. Presumably, a food designed for sturgeon (e.g. with attractants and/or decreased "leachability") would alleviate this problem.

ADAPTABILITY OF WHITE STURGEON TO CROWDING

Included in this catch-all category are disease resistance, cannibalism, tolerance to adverse environmental conditions (e.g. dissolved oxygen, ammonia), and any other factor which would impact high-density culture. To date, white sturgeon have demonstrated adaptability to culture conditions and no "skeleton has emerged from the closet" to seriously inhibit sturgeon aquaculture. White sturgeon are unusual in several respects, however, which must be considered in the culture environment. Although tolerant of wide ranging environmental conditions, white sturgeon are very sensitive to rapid shifts in environment (e.g. temperature, salinity, pH, dissolved oxygen). They also seem to be very susceptable to bacteria, therefore tank hygiene must be scrupulously adhered to.

MARKETS AND MARKETABILITY OF WHITE STURGEON

Currently, small amounts of white sturgeon are marketed in California, all of it originating from the Columbia River. These fish are only sporadically available, moderately priced, and generally of relatively low quality. Fishery restrictions in Oregon and Washington limit this commercial catch to fish 122 to 183 cm in total length. Cultured sturgeon would probably be marketed at a much smaller size and would be differentiated from wild fish (sold either live or fresh), in order to command a premium price. The demand for such a product is still speculative, since it has never been available. Other speciality outlets for sturgeon may include aquarium shops (due to the unique, prehistoric appearance of fingerlings), fee-fishing lakes, and potentially caviar.

The technical feasibility of white sturgeon culture has been demonstrated. Whether this laboratory-scale technology can be transferred to commercial aquaculture is still unknown. Aside from the biological questions which remain, successful commercialization requires a proper mix of marketing, willing entrepreneurs, and an appropriate regulatory climate. The progress achieved in the first three years of white sturgeon culture has been tremendous, providing ample evidence for the potential of this species.

REFERENCES

Bardach, J. E., J. H. Ryther, and W. O. McLarney. 1972. Aquaculture. Wiley: Interscience, N.Y., N.Y. 868 p.