Some Observations On The White Amur In Arkansas

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ABSTRACT

In a search for better methods of controlling troublesome aquatic vegetation, fishery biologists have discovered the white amur (*Ctenopharygodon idella,* Val.). When this fish was imported into the United States, Arkansas became interested in its ability to assist in solving a growing aquatic weed problem. Experiments in Arkansas have proven the white amur to be one of the best biological control agents for aquatic vegetation. The white amur differs greatly from the common carp (*Cyprinus carpio,* Linnaeus) in palatability, appearance, and internal structure. Spawning attempts were successful in 1970 in Arkansas. This provided fish for stocking in isolated lakes for further research. Digestive tract studies indicate the fish is entirely herbivorous while preliminary observations indicate no significant competition with other fishes.

INTRODUCTION

During the past few years the problem of noxious aquatic vegetation in Arkansas has been brought more and more to the attention of fishery workers. These nuisance plants hindered fishermen, detracted from the lake appearance, and presented problems to fishery management. In the early 1960's chemical control was recommended, but due to the high cost of using these extensively and because some few people could see ahead to the future, a different method of control was sought. The possibility of biological control was then discussed and initiated. A result of this was the importation of the white amur, The white amur has proven successful in other countries in controlling aquatic vegetation in streams, channels and lakes. Preliminary studies have indicated that the white amur will be successful in the United States, also without detrimental effects to the ecology.

MORPHOLOGICAL CHARACTERISTICS

The white amur is a native of those rivers of Siberia, Manchuria, and China which flow into the Pacific Ocean from latitudes 50° N to 23° N. It has been successfully introduced into a number of countries of southeast Asia, namely Malaysia, Taiwan, Japan, and in eastern Europe, including Holland and Germany for the purpose of weed control and human food (2). The white amur is a cyprinid fish with superficial resemblance to our chub exhibiting an elongated moderately compressed body with large scales numbering forty-two along the lateral line. The head is broad and rounded with a wide, tough, toothless mouth, and located in the throat are two rows of comb like pharyngeal teeth preceding the stomachless gut. The movement of one set of teeth against the other grinds the food. Located midway along the back is the short dorsal fin. The caudal fin is broad and powerful, pectoral fins are near the ventral surface and the pelvic fins originate just posterior to the dorsal fin. The mature male of the species exhibits pearl organs on the dorsal side of its pectoral fins during the spawning season. The male is also more susceptible to Quinaldine, an anesthetic, during the spawning season than the female. A mature female during spawning season hosts an extended abdomen resulting from egg production. Mature males usually are smaller than females of the same year class. There are no barbels present on the amur and the short dorsal fin has no serrated osseous spines as are present in the common carp. This fish may be rated as one of the fastest swimming and strongest freshwater fish in the United States today. An informal taste panel consisting of various fishery workers was conducted at the Warm Springs, Georgia, research station. This panel rated the white amur second only to Red Snapper and better than catfish, bass, and trout. With weights exceeding 100 pounds, this fish has tremendous possibilities with the American fisherman. It has been caught on popping bugs, pellets, grass, worms and other similar baits, and when hooked, it exhibits terrific fighting capabilities. It is able to withstand a wide range of water temperature from 0° to 35° C, can tolerate salinities as high as 10,000 PPM and can withstand oxygen concentration as low as 0.5 PPM (2).

FIELD STUDIES

Spawning

In 1963, 70 fingerling white amur were transported from Malaysia to the Fish Farming Experimental Station, Stuttgart, Arkansas. A small number of these original fish were artifically spawned in 1966 at Stuttgart, producing 1,700 fry. These fry were distributed to the Arkansas Game and Fish Commission and Auburn University in Alabama. Very little work was conducted in Arkansas from 1966 to 1969.

Spawning attempts in Arkansas began in the Spring of 1968 and again in 1969, but due to working with immature fish the project was unsuccessful. However, spawning attempts were successful in the Spring of 1970 in Arkansas, producing approximately 250,000 fry (1). Again in 1971, spawning attempts were successful producing approximately 1,000,000 fry. All successful spawns were obtained by a combination of Human Chorionic Gonadtrophin and whole dried carp pituitary. The eggs were striped from the female and fertilized by stripping milt from the male. Male sperm production may be enhanced by an injection of dried carp pituitary. These eggs were incubated in McDonald hatching jars and paddlewheel catfish hatcheries. The eggs are non-adhesive and demersal. They will suffocate very easily if not upheld by a current of some type.

Stocking

In the Spring of 1970, Lake Greenlee near Brinkely, Arkansas, was stocked with seven adult white amur per acre or 75 pounds of fish per acre. This lake, a topographically isolated 300-acre lake, boasts a continuous history

of heavy infestations of coontail (*Ceratophylum demersum*, L.). A drawdown conducted in the fall of 1970, revealed a lake bottom practically free of all coontail and other submerged vegetation. Netting experiments during the drawdown revealed 19 to 20-pound fish in excellent condition. Degestive tract studies indicated the fish were still obtaining coontail during the winter months. The lake was refilled in the Spring of 1971, and the stocking rate of white amur was raised during the Spring of 1971 to study the effects of the fish when its normal diet was absent. More fish were obtained from Lake Greenlee during August of 1971 for digestive tract studies.

Eighteen digestive systems were opened from white amur ranging from 1.0 to 22.0 pounds. All systems hosted the remains of smart weed (*Polygonum fluitans* Eaton) leaves and stems. The smart weed is native to the shoreline and islands of the lake. In no case did we find a digestive tract which contained any form of animal remains.

A 15-acre population sample conducted on the White River revealed only one white amur out of 10,000 pounds of fish. It was believed that large population existed in this river resulting from the escape of fry from spawning containers. The White River is almost void of aquatic vegetation and the gut analysis of the white amur collected revealed plant material, woody stems, roots, and leaves from various trees. This indicates the white amur seeks and consumes plant materials in an environment almost void of such material. Again no food of animal orgin was recognizable.

If the white amur will spawn naturally in Arkansas, the White River best fits its requirements, Results of the population sample did not indicate that the fish had spawned in this river. The one fish collected was 5 years old at the time of collection.

Susceptibility To Rotenone

Field experiments in Arkansas have shown that the white amur dies from rotenone at low concentrations. This is in contrast to the high resistence which the common carp has for rotenone. Unpublished reports from Georgia show that the amur is susceptible to low concentrations of antimycin also.

Hatchery Use

Interest in Arkansas up until 1971 was basically in the white amur's ability to remove vegetation from troubled ponds on the hatcheries. The fish proved very effective at controlling vegetation in catfish ponds, bass ponds, and bream ponds without hindering growth rates. The disadvantages of having this fish present in ponds with smaller or younger fish is the damage inflicted while harvesting. The amur is a very strong swimmer and thrashes when captured in a seine causing damage to other fish.

Other Information

Most of the information available on the white amur came from other countries and does not reflect the actual behavior of the fish in American waters. Almost all research conducted in the United States on the white amur has been done so in small plastic pools or isolated ponds. This is good for diet preference and consumption ratios. However, we will never know what effects the white amur will have in the wild until we place it there. With this in mind, the Arkansas Game and Fish Commission is beginning to release the fish into public waters in Arkansas. Some of the information available on the white amur in the United States has been exaggerated. Much of this information reflects that these writers researched only the literature and not the fish. Agreed the fish is in the carp family, but it does not exhibit many of the characteristics of the common carp which causes a stigma in the minds of people. The flesh of the amur is tasty, and is considered very good by most people who have eaten it, which is contrary to the conclusion one might draw from the literature.

SUMMARY

Our experiments in Arkansas, though limited, have proven that the white amur is undoubtedly one of the most efficient biological control agents for most types of aquatic vegetation. This fact and the fact that the amur has neither in its natural range or in its artificial ranges became the dominant species, or presented a problem to fishery management, leaves little doubt that more consideration should be made of releasing this fish into public waters (3).

Preliminary studies have revealed that the white amur enhances other fish production in ponds where it is present (2).The half digested food resulting from short gut creates a fertilization effect meaning faster growth of other species of fish. In Arkansas the fish has assisted in many cases, the harvesting of fish from hatchery ponds by removing the vegetation. Commercial hatcheries may utilize this fish in the near future for removal of vegetation from ponds providing methods of removing the amur before harvesting other species can be developed.

Agencies throughout the world are viewing the white amur for aquatic vegetation control with great enthusiasm. Its tremendous appetite for aquatic growth with its incredible ability to covert noxious growths into marketable flesh while lessening the eutrophication processes in canals, rivers, and lakes are qualities most attractive when considering an agent for biological control of aquatic weeds. According to Russian information, the amur readily consumes 35 species of aquatic plants and may consume as much as two times it weight daily (2). With this in mind, it is believed that the stocking rates must be low so as not to deplete the available food before the amur becomes of sufficient size for human consumption. Stocking rates also will vary depending upon average temperature. For example, the stocking rate required to control vegetation in Florida will be somewhat lower than that required in Illinois. Each locale will need to determine its own stocking rates for control.

There is no doubt that the amur will effectively control aquatic weeds in Arkansas. The eyes of scrutiny are upon many of the herbicides now in use or under study, and a biological control may be necessary. The world can better exist with an organism sutiable for the table more than it can tolerate the increasing use of synthetic chemicals which are entering our food chain daily.

LITERATURE CITED

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