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RCSI Bulletin 157a

The Rochester Prize.

Awarded for a Proposal on the Introduction of the White Amur into Lake Ontario

By: George G. Berg

April 1973

RCSI Bulletin 157b

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Awarded for a Proposal on Coordinated Approaches to Restore Lake Ontario

By: Herman S. Forest

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THE ROCHESTER COMMITTEE FOR SCIENTIFIC INFORMATION
P. O. Box 5236, River Campus Station
Rochester, New York 14627

Bulletin #157a
Water Pollution

April 1973

The Rochester Prize:
Awarded for a Proposal on
THE INTRODUCTION OF THE WHITE AMUR INTO LAKE ONTARIO
by
George G. Berg

Summary

A proposal to introduce the white amur, a Malayan weed-eating fish, into Lake Ontario tied for first place in the competition for the Rochester Prize. The \$1000 prize was offered by the Rochester Committee for Scientific Information for ways of improving water quality at swimming beaches on the shores of Lake Ontario.

The white amur, a tasty fish which may grow to 11 pounds in weight before it is four years old, was the subject of the prize-winning article by Mr. William M. Bailey of the Arkansas Game and Fish Commission.

A View of the Amur

The species was brought to Arkansas in 1963 and has been under study there in hatcheries, ponds and lakes. A true vegetarian, it eats all the varieties of aquatic weeds that clutter the embayment of Lake Ontario. Young amurs show a special preference for the filamentous alga Cladophora, which piles up in huge quantities on beaches. The amur does not root for food and so does not muddy the waters. Though misnamed the grass carp, it is not a carp. Its flesh is white and flaky, and it is an important source of food for many asiatic countries. The risks of the fish spreading out of control are low, because amurs do not breed in lakes that are as cold as is Lake Ontario in the springtime, when they breed. Large numbers of amur fry would have to be bred at local fish hatcheries for the initial field tests. If the fish proves as beneficial as Mr. Bailey forecasts, the R.C.S.I. looks forward to further studies in New York State, aimed at using the hot water released from power plants along the lake to establish breeding grounds for the amur.

Ecological Perspective

The prize was awarded by a jury of scientists who knew that the NYS Department of Environmental Conservation had asked New Yorkers not to buy and release white amurs privately. Agreeing that a new species must not be introduced into lakes in an uncontrolled fashion, the jury nevertheless found merit in Mr. Bailey's suggestion that the amur deserved large scale field tests in the Lake Ontario watershed. The ecosystem of the lake has previously been degraded by fish and plant species introduced carelessly over the past 150 years. These include the Hudson River alewife, which became a nuisance after it displaced the indigenous Lake Ontario herring, and the marine lamprey which displaced the indigenous lake lamprey and helped to destroy the trout fishery. In contrast to these intruders the amur would not compete with resident species but would fit into an empty ecological niche. The introduction of a primary consumer of submerged vegetation into the lake would help to restore some balance to the aquatic ecosystem. The amur's diet would include both the native water plants and others that were introduced by white settlers, such as some species of pondweed, watermilfoil and naiad.

The jury also considered long-range plans for the rehabilitation and management of Lake Ontario. The prize was split between Dr. Bailey and Dr. Verduin. Dr. Verduin's plans included a way of converting the growth of water plants from a nuisance to a beneficial resource in restricted parts of the lake. The white amurs, while keeping the growth under control, would provide the final link in a food chain from weeds in the water to a delicacy on the table.

Biographical Note

Mr. William Bailey, Arkansas Game and Fish Commission, Little Rock, Arkansas 72201, is hatchery manager for the Joe Hogan State Fish Hatchery which is the hatchery for the Arkansas Game and Fish Commission. Born in 1948, Mr. Bailey received his higher education from the School of the Ozarks at Point Lookout, Missouri. He is married and has two children.

Reference

William M. Bailey, "Arkansas' Evaluation of the Desirability of Introducing the White Amur (Ctenopharyngodon idella, Val.) for Control of Aquatic Weeds." This report was presented at the 102nd Annual Meeting of the American Fisheries Society, Hot Springs, Arkansas, 1972. Copies may be requested from the Secretary of R.C.S.I.

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Bulletin #157b
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April 1973

The Rochester Prize:
Awarded for a Proposal on
COORDINATED APPROACHES TO RESTORE LAKE ONTARIO
by
Herman S. Forest

Summary

Dr. Jacob Verduin addressed the problem of managing Lakes Erie and Ontario from a long range view. He proposed that existing sewage treatments should be supplemented with a system of nutrient control by vegetation, starting with algae and other water plants grown in lagoons, and ultimately growing game animals and crops for human use. This proposal tied for first place in the competition for the Rochester Prize, in which the jury was instructed to "favor methods that would increase species diversity in the lake, increase the consumption of algae, and lower the standing crop of Cladophora". Dr. Verduin emphasized the utilization of biological systems, both in reducing the inflow of nutrients and in utilizing the crops grown from the nutrients.

View of the Problem

"The problems encountered in Lake Ontario are identical with those of Lake Erie, although they are presently less severe because Lake Ontario is deeper and contains a larger volume of water. The largest contributor to the increased phytoplankton and Cladophora growth in the Great Lakes is the spectacular rise in phosphorus fertilization during the past 25 years. Every tributary flowing into these lakes represents a concentrated source of such nutrient injection."

It may be noted that tributary streams, even the Genesee River, seem to contribute only a minor portion of the total input water, compared with the flow from Lake Erie. The abatement of pollution on Lake Erie, which has been the primary concern of Dr. Verduin, is certainly part of the environmental management needed for Lake Ontario. Nevertheless, it is important to note that tributaries cause local pollution; the Rochester metropolitan area chiefly damages the Rochester embayment.

Reducing Nutrient Input

"We must recycle the sewage effluents from the cities on all shores and tributaries either by (spreading the effluent on soil of croplands, on open areas, or parklands) or through a system of lagoons and lakes like those in operation near San Diego, California (the Santee Lakes). It is imperative that we begin immediately to establish such systems around the North American Great Lakes. If we also divert the storm runoff from the cities to a lagoon-lake system then this valuable fresh water resource will be conserved, instead of being regarded as a 'waste disposal problem'. The cost of such recycling of our urban sewage effluents and storm runoff is small in comparison to our highway construction program."

Harvest

"As for promoting consumption of algae, especially Cladophora, the best candidate I know is the black mallard duck. If we include in our lagoon-lake systems, near the Great Lakes, some well-planned black mallard nesting areas we may be able to harvest significant amounts of Cladophora by their grazing.

"The white amur might also be worthy of consideration. It is an herbivorous fish and is also reported to be acceptable to sports fishermen. The species is Ctenopharyngodon idella...Some Fisheries biologists, however, predict that its competition with other game-fish would be detrimental." Note the attached R.C.S.I. bulletin #157a, announcing the co-winner of the Rochester Prize, William M. Bailey, who submitted a proposal on introducing the amur to Lake Ontario.

Ecological Perspective

A natural environment is "clean" because of a mutually supporting interaction among many species of organisms. Man has disrupted the self-regulation, or cleaning of the Great Lakes and reduced species diversity:

- a) by filling in the marshlands that served as a purifier of runoff from land;
- b) by overloading the water at various points with materials that killed off some consumer species and overfertilized some producer species; and
- c) by introducing new, harmful populations that killed off native species.

In designing new management practices, Dr. Verduin used the model of the bound energy pyramid for the natural system. At the base of the pyramid are the green plants which produce food for the system. Their amount would be reduced by limiting the nutrients (particularly the fertilizer phosphorus) available to the plants. Without the high input, much of the nutrient supply will be removed permanently to bottom sediments and through water outlet. Nevertheless, the heavy crop of plants will remain a problem because the diverse organisms which consume them in a natural ecosystem are not present. Conspicuously lacking in Lake Ontario are large direct consumers of plants. The suggested strategy is to guide the runoff into a system of lagoons, or some other area of confined vegetation. These lagoons would hold nutrients back from the lake. The reduced vegetation, in turn, would be eaten by a native game species - a duck - and by an introduced fish - the amur.

Biographical Note

Dr. Jacob Verduin, Botany Department, Southern Illinois University, Carbondale, Illinois, is a professional limnologist noted for his contributions to the measurement of primary productivity (photosynthesis) in lakes, and for his contributions to the explanation of the degradation of Lake Erie. Much of this work was accomplished at Ohio State University and the Franz Theodore Stone Laboratory on Lake Erie. Dr. Verduin was born in 1913 and received his higher education at Iowa State University.

Reference

Jacob Verduin, Man's Influence on Lake Erie, the Ohio Journal of Science, 69(2). 65-70