Nonnative and Exotic Fishes in Montana *

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The history of sport fish management in Montana, as in much of the United States, is largely management with nonnative and exotic fishes. In this discussion nonnative refers to fishes from another part of the country -- that is, moved from one drainage to another. Exotic means fishes from another continent. And native or indigenous refers to fishes that inhabited an area when it was first discovered -- in other words, not introduced.

Fishermen are usually surprised to learn that in most of Montana the rainbow trout is not native. It is a Pacific Drainage fish.

C. J. D. Brown in his 1971 book "Fishes of Montana" called it introduced. However, four years ago, using sophisticated biochemical techniques, two geneticists from the University of Montana working with two biology students from Carroll College established that it is native to four streams in the Kootenai River Drainage in the northwestern corner of Montana. Hatchery rainbow were introduced into the upper Madison River drainage in 1889 and through extensive planting are now found in every Montana county. Therefore, for all practical purposes our rainbow fishery is based on introductions.

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The brown trout is an exotic. It came from Europe and it, too, was introduced into the upper Madison River drainage in 1889. The year 1889 was important in the history of Montana fish planting for also in this year the brook trout, native only to eastern North America, was introduced into the Yellowstone River drainage.

Kokanee, the fresh water form of sockeye salmon, was introduced into Flathead Lake from the West Coast in 1914.

Our department has a "fisherman's log" program whereby cooperators maintain a diary of their fishing and loan it to the department for a short period each year. The department records and compiles the data. These are our best indication of the species composition of catches statewide. They show that nearly a third of the fish caught are rainbow trout; 12 percent are brook trout; 10 percent, brown trout; 10 percent, yellow perch; and 6 percent, kokanee. None of these are native. When all species are tallied, the log data indicate that 78 percent of the total catch in Montana is introduced fishes leaving only 22 percent native. The most important natives in the catch are cutthroat trout, which comprise 11 percent of the total catch; whitefish, 8½ percent; and Arctic grayling, a mere 1 percent.

Fish planting at the turn of the century was immediately successful. Thanks largely to the comparative recentness of the glacial period (a remnant of a continential ice sheet was still in Montana 12,000 years ago, a short time in geographical terms), Montana waters were poor in number of fish species and many lakes

and stretches of streams above barriers to fish passage were fishless. Tiny fish planted in virgin waters did exceptionally well.

However, if we had it to do over again, we would be more careful. Most everyone is familiar with the problems that have been caused by carp. This native of Asia was widely distributed in the United States as a food fish starting in the 1870's. The earliest Montana record is for Helena Valley in 1886. A prolific species, it competes with more highly regarded fishes and degrades the aquatic habitat.

Introduction of bullheads (we have two species) has also caused much more harm than good. Continuing down the list, we would be careful not to plant yellow perch into waters where they would only become stunted; and we would keep brook trout out of grayling streams. Brown trout, for the most part, would not be planted in lakes. Although they often do well, few fisherman can catch them from lakes. And we would even be more careful with rainbow trout, our main management fish, for they have made serious inroads into native cutthroat waters.

R. J. Behnke, an expert on western trouts, has conservatively estimated that 99 percent of the original population of cutthroat trout in the interior United States has been lost in the last 100 years.

Why do we care? What difference does it make if all the native cutthroats are replaced by rainbow trout? The answer is nicely

expressed by E. O. Wilson and E. O. Willis in a piece they wrote under the heading "The Diversity Ethic"; it reads in part:

> In a world of shrinking faith and uncertain trumpets, very few precepts are any longer accepted as absolute. We can nevertheless hope that one of them will be the ethic of organic diversity--that for an indefinite period of time man must add as little as possible to the rate of worldwide species extinction and where possible he should lower it. This precept, which is based wholly on rational considerations, can also be the guiding principle of applied biogeography. It emerges from a recognition that man is the self-appointed but still profoundly ignorant steward of the world's natural resources, that the living part of the environment is still mostly unknown to him, and that he has therefore scarcely begun to conceive of the possible benefits that other organisms will bring in economic welfare, health, and esthetic pleasure. To sense the depth of that ignorance, consider that biologists do not even know to the nearest order of magnitude how many species exist....

Our caution in introducing nonnatives and exotics is an effort to protect not only native fishes, but also esteemed introduced populations such as our Madison River rainbow and brown trout. For, at the present state of the art, the introduction of new species to enhance fishes favored by humans is, as pointed out by J. J. Magnuson of the University of Wisconsin, largely a game of chance that often has unexpected consequences.

An example is given in a 1975 paper by California biologists C. von Gerdern, Jr. and D. F. Mitchell. In the early 1950's, the lack of a suitable forage fish was considered a factor limiting the development of largemouth bass populations in California. After a careful study including consultation with other states, threadfin shad were selected and introduced from Tennessee. Early California experiences with shad were generally favorable. They were heavily utilized by sport fish as food and bass growth rates were improved.

Subsequent research, however, indicated that shad compete with young bass for food and that such competition has an adverse impact on bass survival. All largemouth bass then in California were the progeny of introductions from areas far to the north of the original range of threadfin shad. In other words they were not coadapted.

Weak bass year classes were associated with high population densities of adult shad. Young-of-the-year shad did not provide forage for bass hatched late in the spawning season, and competition for food between young-of-the-year bass and shad resulted in heavy losses of young bass. Creel census data indicated that bass angling declined following establishment of shad in impoundments in California's Central Valley.

One approach California was going to try in an effort to solve the problem was to introduce bass from areas where bass and shad evolved together in the hope that these bass would be better equipped to cope with the problems shad create.

R. J. White of Montana State University, furnished another example. It involves tributaries to the Great Lakes where runs of Pacific salmon have developed from stocking in the last 15 years or so. Michigan studies White was involved in have shown that coho juveniles outcompete juvenile brook and brown trout. Populations of the latter seem to be declining as a result. In nature, coho fry emerge earlier and are larger than the brown or brook trout fry, and the coho's size advantage is maintained for the 15 months or so they reside in streams.

Therefore, they apparently have a greater competitive edge than their behavior alone affords them.

On the other hand, as shown by other researchers, coho seem to have no effect on steelhead rainbow trout populations. This is explained by the fact that coho and steelhead have long evolved together in the same streams and have reached a behavioral accommodation. In contrast, no well-developed behavioral mechanism for sharing of stream resources exists between coho and brook or brown trout, as they have not evolved together.

The northern pike is native in Montana only in the Saint Mary River drainage on the northeastern edge of Glacier National Park. However, they have been propagated at state and federal hatcheries and planted in numerous lakes and streams east of the Continental Divide.

In 1953 an illegal plant into Dry Fork Reservoir was the first introduction west of the Divide. By the time we discovered the northerns they were well established in marshy areas, making eradication impossible. They moved from the reservoir area into the Little Bitterroot River, in turn into the Lower Flathead River, and then into the Clark Fork of the Columbia and Noxon Rapids and Cabinet Gorge Reservoirs.

Unfortunately, northerns have also been illegally transplanted into Flathead River above Flathead Lake where they have become established. A few have been taken from the lake. In addition, a series of illegal plants have been made into other lakes in

northwestern Montana. Recently their movement through Cabinet Gorge Reservoir has taken them across the border into Idaho. The vanguard has reached Lake Pend Oreille where they may do grievous damage.

H. W. Li and P. B. Moyle in a recent paper in the "The Transactions of the American Fisheries Society" suggest guidelines for the introduction of new species into aquatic environments. Among these are:

1. No introduction should be made into the few aquatic systems left that show little evidence of human disturbance.

2. Introductions should be considered mainly for systems that have been so altered by human activity that it is necessary to create a new community to take advantage of the production.

They further suggest a candidate for introduction should be:

1. Coadapted with some members of the new system. The wisdom of this was demonstrated in the examples I cited in which introduced threadfin shad and coho caused problems when placed with species they had not evolved with.

2. Adapted to a narrow niche--that is, it should occupy only a limited environment and have a restricted diet.

3. A species with limited capacity to disperse and colonize, so should it escape from the site of introduction, there would be a good chance of controlling its spread. Obviously this was not the case with pike in northwestern Montana.

4. Free of disease and parasites not already present in the receiving water.

The Montana Department of Fish, Wildlife, and Parks has a responsibility for seeing that unwise introductions are not made. Under state law no fish or fish eggs can be planted in the waters of the state without authorization from the department. Waters covered do not include those in national parks or Indian reservations. Further protection is provided by the Montana Environmental Protection Act. This provides that before fishes can be moved into the state, or even from one drainage to another within the state, an environmental impact statement must be prepared, or at the very minimum (when there is essentially no potential for damage), an environmental assessment must be prepared.

We are currently preparing an environmental impact statement on the proposed introduction of an additional forage fish into Fort Peck Reservoir. Candidates under consideration are the rainbow smelt, which has recently provide spectacular walleye and chinook salmon growth in North Dakota; the alewife; and the cisco. When completed, the statement will be distributed widely for public comment.

Decisions on the introduction of exotics are some of the most awesome responsibilities of the fisheries manager. Every effort must be made to predict the outcome. Our Department is conservative; we do not want to gamble with our priceless fishery resource. It is our philosphy that introductions should be made only when the possiblility of benefit is large and the possibility of harm is small.

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