

STOCKING AND AQUATIC RANCHING IN SOUTH AMERICA: LESSONS FROM STOCKING NONINDIGENOUS SPECIES FOR FISHERIES

Theresa M. Bert*, Hernán Ortega, Héctor López-Rojas, Ana Bonilla-Rivero, Carlos Bernardo M. Alves, Pablo Horacio Vigliano, Marcelo Fabián Alonso, Miguel A. Pascual, and Javier E. Ciancio
Florida Fish and Wildlife Conservation Commission
Florida Wildlife Research Institute
100 Eighth Avenue Southeast
St. Petersburg, Florida 33701, USA
theresa.bert@myfwc.com

In South America, the definitions of stocking and fish ranching most often refer to “enhancing” native fish communities by introducing alien (not indigenous to the country) or translocated (not indigenous to the area of introduction) species into principally freshwater environments, where they are ranched for commercial or sport fisheries. Many introductions of these non-native species occurred in the 1930’s, when planeloads of salmonids were dumped over high-altitude lakes. Since then, other non-native species have been introduced into the wild to initiate (principally) commercial or (rarely) recreational fisheries or have been introduced for aquaculture and escaped. Throughout South America, these species are believed to have disrupted native fish communities, sometimes before baseline data could be gathered documenting the native species present and their ranges or the relative abundances and ecological niches of the native species. The responses to these introductions and the proposed solutions to the environmental situations they have caused vary greatly among those countries. We present examples of the environmental and, in one case, socio-economic changes that non-native fish introductions have generated in four South American countries and the proposed or actual institutional responses to those changes. Together these stories clearly demonstrate that fisheries should not be enhanced by stocking non-native species. But, there might be acceptable exceptions to this rule. The viewpoint depends on the perspective of the viewer and application of the definition of “non-native.”

In Peru, freshwater alien fishes, including carps, guppies, perches, poecilids, tilapias, and rainbow trout have been introduced into three hydrographic systems--the Amazon, Pacific coastal rivers, and Lake Titicaca--for fish farming, the ornamental fish trade, public health applications, and sport fishing; and fishes native to Peru have been translocated among these systems. Native fishes in a high-altitude World Heritage Park have been extirpated from some areas and reduced to marginal habitats in other areas by rainbow trout. The Nile tilapia (*Oreochromis niloticus*) and guppy (*Poecilia reticulata*) have altered rivers in the Amazonian highland forest basin and Pacific coastal system. Alien-species introductions into Lake Titicaca and an Amazonian lagoon have caused chain-reaction introductions of other alien species in attempts to compensate for the damage that the first alien-species introductions caused. Because so little is known about these river systems, institutional responses are at the most basic level--describing the fish species in these systems. Because problems associated with non-native species introductions are just now being recognized, regulation of species introductions is difficult and environmental education programs that inform the public of the general problem have not yet been widely implemented.

In Venezuela, trouts were introduced into Andean streams of the Orinoco River system and Magdalena River basin; nine other species, including carps and tilapias, have been introduced into the wild or have escaped from aquaculture facilities; and a number of fishes native to Venezuela have been translocated among river basins. The biggest problem in attempting to assess the environmental impacts of these introductions and translocations is a lack of knowledge of the native fish communities in many Venezuelan rivers and lakes. Establishing regulatory controls, providing incentives for research on the aquaculture of indigenous species, and creating public awareness about the potential environmental dangers associated with boosting fisheries by introducing non-native species are obvious solutions to the problem of introducing and translocating fishes; but here, too, implementing these initiatives can be difficult.

In some of the most important river basins in Minas Gerais, Brazil, non-native fishes can constitute up to 40% of the fish fauna. Tilapias, the most widely distributed exotics within the state, have had negative impacts on fisheries and on fish species compositions in reservoirs. Although introduced congeneric but non-native species generate revenues from fishing and aquaculture, they can negatively affect the native species through competition, predation, and interbreeding. The widespread introduction of the peacock bass and other piscivorous species for fisheries is the cause of local extinctions in large lakes where economically valuable native-species fisheries once existed, and the introduced fishes may not be palatable to local humans. Solution to these problems involve better enforcement of legislation governing the sale and transport of live organisms, development of native-species aquaculture, and public awareness programs on the adverse impacts of exotic species. None of these are easily implemented.

The fish communities of Argentina's Patagonian basins are characterized by low species diversity. Their fish community structure and underlying intra- and interspecific dynamic relationships have been and are still poorly understood. Around 1904, ten species of salmonids were introduced for sportfishing. Following the original introductions, unplanned stocking was widely practiced by individuals wanting the opportunity to harvest these fish. Three species colonized almost any available water body in Andean Patagonia and two others established self-sustaining populations at a few locations. Species' populations that inhabit different water bodies seem to have diverged and given rise to what are believed to be particular stocks, some of which support economically important, world-class sport fisheries. Although no detailed studies exist, it is thought that these salmonids had a tremendous negative impact on the native biota. In addition, the emerging net-pen aquaculture of some of these species was feared because potential interbreeding between escaped (inferior) cultured salmonids with the now-trophy-level "native" salmonids could reduce the population's overall fitness (i.e., trophy size). Finally, scientists view the salmonid adaptations as a goldmine for ecological and quantitative genetics studies. Thus, after 100 years, the introduced salmonids are perceived as trophy sport fish, ecological nemeses, and economic promoters through sportfishing and aquaculture. In this novel situation, introduced alien species are considered by many people to be more important than original native species regardless of environmental concerns. The challenge for the future is to develop a consensus among Patagonian provinces regarding the leading policy for access to the introduced-salmonid resource and to establish the steps needed to generate information for its sound management.