Predicting Aquatic Threats

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Predicting Aquatic Threats

With luck and considerable pushing by political leaders, efforts to alleviate some of the ecological stresses in the Great Lakes could make progress this year. A slew of recent reports, including one released last December by the Great Lakes Regional Collaboration, have focused attention on the lakes' multiple problems. Despite some successes, one of the most serious threats continues to be the ongoing barrage of aquatic invasive species. Aquatic invasive species in the Great Lakes region, many of them arriving in ballast water in ships, continue to establish themselves, causing major declines in important native species. The annual costs of combating the zebra and quagga mussel invasions are reckoned in the billions of dollars.

Bills now before Congress could improve the situation. Such legislation might, for example, force the use of technology aboard ships to prevent contamination from ballast water residues, which occurs even when the ships are supposedly ballast free. Whether Congress will find the funds to support this and other programs remains to be seen, but the regional sense of urgency is impressive. The threat of aquatic invasive species is also getting more attention in other parts of the country.

Invasive aquatic species remain, however, extraordinarily difficult to fight once they become established, and a science of invasions remains as uncertain as it is for terrestrial species. The article that starts on p. 515, by Peter B. Moyle and Michael P. Marchetti, distills findings from some of the best studies on the factors involved in successful colonizations by freshwater fish. Moyle and Marchetti have spent many years studying fish invasions in California, whose size and geography make it a good laboratory for research on the topic.

The work should be of interest to everyone concerned about invasive species. Moyle and Marchetti cannot reliably "postdict" invasions, and they stress that special local circumstances are often important. Nevertheless, extensive knowledge of the invaders and the invasion process allows a level of prediction that may prove useful in the management and control of alien species. Indeed, some factors that had been hypothesized to be critical turn out not to be, say Moyle and Marchetti. For example, high fecundity is not a prerequisite for success; species with intermediate fecundity are just as successful in invasions. Factors that do seem to be associated with successful invasion capability are wide physiological tolerance and a past history of successful invasion. The analyses also highlight the fact that different characteristics of the invader and the invaded environment are likely to be important at different stages in the invasion process.

Moyle and Marchetti comment that, given the potential for harm from an invader, even 85 to 95 percent confidence in science's predictive ability might be "too high a risk to take." True, it may never be possible to identify future invaders with certainty. But as a practical matter, officials must allocate funds between multiple competing priorities, and further research building on findings such as those described in this issue should help target those funds better. Even an imperfect science of invasions could repay its relatively modest costs many times over.

TIMOTHY M. BEARDSLEY
Editor in Chief

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