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Cooperative Research in the Great Lakes: Exploring Characteristics of Success

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Introduction

Our paper describes the unique nature of cooperative fishery research and management in the Great Lakes and formulates operational procedures based on our experiences that may be useful elsewhere.

Cooperative Great Lakes Fishery Research

Cooperative fishery research in the Great Lakes basin occurs at various physiogeographical, organizational, and political scales. For example, at one end of the spectrum, cooperative research programs occur, as described below, between a state fishery management agency and a university on a single lake, Lake Erie. Basin-wide, international coordination, focused on a specific research theme and coordinated by the binational Great Lakes Fishery Commission, represents the other end of the spectrum. Below, we discuss these two examples. Our first example focuses on a long-term relationship between the Ohio Division of Wildlife (ODOW) and the Ohio State University on Lake Erie. A second example describes how resources and projects are coordinated across the Great Lakes basin to understand the role of exotic invertebrates in disrupting Great Lakes food webs.

Ohio Division of Wildlife and Ohio State University

In 1978, and with leadership from the Ohio Cooperative Fish and Wildlife Research Unit, a research partnership between Ohio State University and the ODOW was established. Through time, the partnership has grown, providing substantive funding to university research programs, supporting graduate students and faculty, and leading to science-based management, both on inland reservoirs and Lake Erie. During the past 15 years or so, the partnership truly has flourished as the university (and its associated infrastructure, funded in part by ODOW) grew into its current role as the division's research, experimentally oriented branch, working cooperatively and collaboratively to solve outstanding fish management problems within the state. Operationally, the university benefits via direct funding of research projects, secretarial support, research equipment, building and equipment support and maintenance (including computers), travel to scientific meetings, training, and workshops. In turn, the partnership provides opportunities for (1) internships for graduate students, (2) use of historical data sets (from Lake Erie and our inland reservoirs), (3)

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collection of field data by ODOW personnel in direct support of research projects, and (4) in-kind support of research.

Unique to this partnership is how graduate students decide upon their thesis research. Typically, the ODOW approaches the university with a topic of concern, such as the impact of the invasive round goby *Neogobius melanostomus* on smallmouth bass *Micropterus dolomieu* in Lake Erie. Once this topic is broadly identified, graduate students are recruited, then required to meet with division biologists for the purpose of defining research goals and objectives. Via multiple meetings during their first fall of residence, graduate students present and defend (with typically strong direction from their major adviser) their perspective on the problem. Through these meetings, consensus is reached on the goals and objectives of the research effort, as well as the student's thesis. In our view, this collaborative, agency–university interaction serves both the division and the student.

Research emanating from this collaboration has been immediately applied to management. For example, work on smallmouth bass–round goby interactions in the Bass Islands of the west basin of Lake Erie led to a regulation change resulting in a spring angling closure. As another example, ongoing work with microelemental analysis of walleye *Sander vitreus* otoliths will have important implications for determining the distribution of walleye production across reef- and river-spawning populations, allowing managers to differentially protect stocks based on their contribution to the walleye fishery in Lake Erie. This partnership is a two-way street: students gain insight into agency work while the division profits from the research findings.

Establishing this partnership was driven by visionary individuals within the division who believed their management would be improved by rigorous scientific research. That this perspective would fall on fertile ground within the university was significant and well facilitated by flexible and broad-thinking administrators. Critical to this unique partnership was the willingness of both parties to adapt their respective and sometimes rigid organizations to bring a productive program to fruition.

Food–web disruption research

The most serious challenge facing Great Lakes' fisheries is the potential catastrophic alteration of aquatic food webs by invasions of Eurasian nonnative species. Both vertebrate (e.g., round goby) and invertebrate (e.g., zebra mussels *Dreissena polymorpha*) invaders successfully have colonized the Great Lakes in the last 20 years, forever changing fisheries and their supporting food webs. Coordinated, cooperative research on these effects has been needed to provide fishery management agencies with the information to readjust fish community goals in light of new ecological realities.

In 2001, the Great Lakes Fishery Commission formed a partnership with eight other research-funding organizations, the Great Lakes Fishery Trust and the seven Sea Grant programs in the Great Lakes basin, to focus funding on understanding how four nonnative invertebrates, zebra mussels, quagga mussels *D. bugensis*, spiny water flea *Bythotrephes longimanus*, and fishhook waterflea *Cercopagis pengoi*,S influence food webs of the Great Lakes. This partnership sought to support studies that will enable fishery managers to minimize the impacts of altered food webs on their fisheries. The research theme is described in a white paper entitled "Exotic Invertebrates, Food-Web Disruption, and Lost Fish Production: Understanding Impacts of Dreissenid and Cladoceran Invaders on Lower-Lakes Fish Communities and Forecasting Invasion Impacts on Upper-Lakes Fish Communities" (http://www.foodwebdisruption.org/) by Brian Shuter (Ontario Ministry of Natural Resources) and Doran Mason (NOAA-Great Lakes Environmental Research Laboratory). Within this research theme, the state of knowledge, ecological

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rationale, and key research questions are developed. About 25 research projects have been funded by the partnership during the past 5 years to investigators in federal, provincial, state, and university organizations. Communications among the researchers also has been a high priority. Several workshops for partnership-funded researchers and others have been held, mostly in conjunction with the annual meetings of the International Association of Great Lakes Research.

Several advantages of cooperative research exist within the context of the Great Lakes. First, understanding the role of nonnative invertebrates on Great Lakes food webs requires funding scales in excess of any single organization. Through this partnership, substantial financial resources can be focused on this problem in a coordinated manner. Second, by including several partners, the research problem can be addressed at an appropriate spatial scale. For example, the Great Lakes Fishery Trust focuses on Lake Michigan, whereas Minnesota Sea Grant concentrates on Lake Superior. By working through the Great Lakes Fishery Commission, the combined resources of all partners can be brought to bear across all five Great Lakes in both Canada and the United States. Finally, the food-web disruption theme provides guidance, ensuring that funded projects are consistent with a common rationale and set of priorities. Similar to cooperative management, success of this research partnership depends on key people within the research funding organizations. Because research administrators and their organizations were open to new ideas and new ways of conducting business, this partnership became a reality.

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Applying the Great Lakes Experience

The Great Lakes have an organizational structure where all management agencies have separate but equal voices, where stakeholders are advisory, where decisions are made by consensus, and where an oversight body with credibility (but no management authority) serves to arbitrate difficult issues. Because the system is voluntary, protects and respects individual jurisdictional authority, and requires written goals and objectives, it works. Finally, it works because strong, though cooperative, charismatic leadership characterizes the managers within the basin. Their desire for consistent ecosystem management overrides local, more restricted perspectives, which are, at times, embraced by their administrators.

Cooperative research, in which agencies and universities forge partnerships, and in which funding agencies join forces to attack basin-wide problems, also is driven by effective organizational structures, but most importantly by flexible, creative administrators. Within the Great Lakes, we have been indeed fortunate to have innovative administrators that serve to deal effectively with ever-evolving ecosystem issues. Our view of cooperative management and research and its attendant difficulties lies, first and foremost, with people … success requires fishery managers that have courage and credibility … critical character traits