

INTRODUCTION

The Michigan Department of Natural Resources (MDNR) is considering introduction of a riverine form of the muskellunge (*Esox masquinongy*) into some inland warmwater rivers in southern Michigan (Scott et al. 1985). These rivers presently support, to various degrees, sportfishing for smallmouth bass (*Micropterus dolomieu*), northern pike (*Esox lucius*), walleye (*Stizostedion vitreum*), channel catfish (*Ictalurus punctatus*), and rock bass (*Ambloplites rupestris*) (Townes 1987). However, fish communities in these rivers are dominated by rough fish (70–90% by biomass and 50–90% by numbers) including suckers (*Catostomus commersoni* and *Hypentelium nigricans*), redhorse (*Moxostoma* sp.), and carp (*Cyprinus carpio*), and fishing interest in most areas is relatively low. The MDNR is hoping that introduction of the muskellunge would add a large, attractive predator to these river fisheries. In addition it could feed on the abundant, presently underutilized, rough fishes present.

The muskellunge is the largest esocid and a voracious predator which is highly regarded as a trophy sport fish throughout its range (Porter 1977; Becker 1983; Crossman 1986). Angling for muskellunge has a rare “charisma” (Porter 1977) due to the fish’s large size (adults are commonly greater than 30 inches), its vicious fighting abilities, and its moody behavior. It is one of the few sport fishes to generate enough interest to prompt the formation of significant angler organizations (the two largest are Muskies, Inc., and Muskies Canada, Inc.), groups which can be important allies of resource agencies in fishery development and environmental protection (Oehmcke et al. 1986).

The muskellunge is found in both lakes and rivers, however, Crossman (1986) stated that it may have originally been a riverine species which secondarily became a lake dweller during the post-glacial dispersal period. It became established in the Great Lakes basin during this period. Early records show that the muskellunge was well known from coastal waters on both sides of southern Michigan and from some Lake Michigan-drainage inland waters, including Gun Lake, Thornapple Lake, and the Thornapple River (Hubbs 1933). Additional anecdotal records indicate that muskellunge were native to a number of southern Lake Michigan tributaries (D. Johnson, personal communication, 1988, MDNR, Plainwell). No records of the muskellunge in inland southeastern Michigan rivers exist (Hubbs 1933; MacGregor et al. 1960; Crossman 1978). It is not clear whether the apparent absence of the muskellunge from this area of the state is a result of actual habitat limitations or dispersal patterns, or whether the muskellunge was originally present in some of the rivers in this area but accurate records are lacking (E. J. Crossman, personal communication, 1988, Royal Ontario Museum, Toronto). Large muskellunge populations once existed in the Maumee River, an Ohio tributary to western Lake Erie (Clark 1964) and large populations presently exist in Lake St. Clair (Crossman 1986). It seems feasible that muskellunge populations may have existed in the

Michigan tributaries of lakes Erie and St. Clair. None of the original southern inland populations exist today; these were presumably destroyed as water quality deteriorated during the industrialization of the early 1900s. Following the clean water legislation of the 1970s, water quality improved dramatically, however, the native muskellunge were gone. One self-sustaining muskellunge population, the product of stocking of the northern form (muskellunge "forms" are discussed below), currently exists in the Thornapple River system in southwestern Michigan (D. Johnson, personal communication, 1988, MDNR, Plainwell). Muskellunge are presently stocked in several lakes in southern Michigan but not in rivers. As the muskellunge was native to certain waters in southern Michigan but not to others, the MDNR's interest in introducing this fish could be considered a reintroduction to some waters and an introduction to others. As the records are not clear on the original distribution of this species, and as the term "introduction" probably elicits more caution than does "reintroduction", in this paper I will take a conservative stance and treat both situations as introductions.

The introduction of muskellunge into southern Michigan rivers would involve both potential benefits and risks. The American Fisheries Society (AFS) has developed a protocol for introductions designed to increase the odds that the benefits will outweigh the risks (Kohler and Courtenay 1986). The first three steps in this protocol are as follows: (1) Rationale—outline the reasons why the proposed introduction would be better than existing native species; (2) Search—consider all possible contenders for introduction; and (3) Preliminary impact assessment—review the literature and examine potential impacts. The objectives of this paper are to review the literature on the biology and management of riverine muskellunge, carry out the above three protocol steps, assess the potential for its successful introduction, and if deemed appropriate, suggest a course of action for introduction and evaluation.

Biology and Management of Riverine Muskellunge

Detailed studies of riverine muskellunge populations are few. The following discussion incorporates information from these and, where appropriate, studies of lake populations.

Taxonomy and distribution

Three forms of the muskellunge are recognized based on coloration patterns and general distribution patterns (Crossman 1978). The northern or western form is generally found in northern Wisconsin, Minnesota, the northwestern border of Michigan's Upper Peninsula, and southern Ontario. The Great Lakes form is found in the Great Lakes, in the large connecting rivers, and in connected inland waters. The muskellunge which were native to Michigan's southwestern rivers were of this form. The Ohio form is found in the upper Ohio River drainage and in Chataugua Lake, New York. It is not clear whether any ecological differences