

THE UNIVERSITY OF MANITOBA

COMPARATIVE ECOLOGY OF TWO SYMPATRIC SPECIES OF DACE,
RHINICHTHYS CATARACTAE AND RHINICHTHYS ATRATULUS,
IN THE MINK RIVER, MANITOBA

by

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ABSTRACT

The Great Lakes longnose dace (Rhinichthys cataractae cataractae) and the western blacknose dace (Rhinichthys atratulus meleagris) occur sympatrically in the middle portion of the Mink River, Manitoba. Their abundance is associated with high gradient (7 m./km.), which results in rapid water velocities and gravel or rock substrates, and with plant detritus, which supports the insect fauna used as food.

Fry of both species were found in July, but longnose hatch earlier and grow faster than blacknose dace. For a short period both species are found together in shallow, silted margins of the stream, of little or no current. Longnose move out into fast water in July and August when they are between 25 and 30 mm in length, while the majority of blacknose remain in the margins for up to one year, until they reach a fork length of about 45 mm. Thereafter, blacknose are found mainly in channels (15-45 cm/sec) and longnose in riffles (> 45 cm/sec). Blacknose males are territorial over pea-sized gravel, longnose males over small rocks in riffles. There is a marked habitat difference between the sexes of both species during spawning, females entering territories only when completely ripe. In the late fall, blacknose adults and juveniles were found only in beaver

ponds, while longnose were found under large flat stones in riffles.

The diet of the two species is strikingly similar. Longnose and blacknose in their first twelve months fed almost exclusively on the families Baetidae, Tendipedidae and Hydropsychidae, but their proportions differed. Hydropsychidae was always the major food item by weight for older longnose. Older blacknose were similar, but they switched to Tipulidae and Ephemeridae in May and October. Surber samples of benthic fauna were taken in a riffle and a channel. Baetidae and Tendipedidae were highly foraged by both species.

Despite their similar diet, the degree of spatial and temporal isolation between the two species is thought sufficient to allow for their coexistence.

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INTRODUCTION

The Great Lakes longnose dace, Rhinichthys cataractae cataractae (Valenciennes) and the western blacknose dace Rhinichthys atratulus meleagris Agassiz are two small cyprinid fishes whose overlapping distributions result in their sympatric occurrence in many water systems.

The geographic distribution of the Great Lakes longnose dace is still uncertain since full distinction from other subspecies has yet to be clarified. Hubbs and Lagler (1958) report it as occurring in the drainage basin and around all the shores of the Great Lakes, in the St. Lawrence R. as far as Montreal, and in river systems in parts of Wisconsin, Michigan and Indiana.

The western blacknose dace is also found throughout the entire Great Lakes drainage basin, except around the east end of Lake Ontario. Elsewhere it is distributed from northeastern Nebraska, Iowa, North Dakota, the drainage of Lake Winnipegosis and the Lake of the Woods region to the northern part of the Ohio river system (Hubbs and Lagler 1958). Unlike the longnose dace, the western blacknose is uncommon in lakes, being reported most abundant in small, cool tributaries. Both R. c. cataractae and R. a. meleagris occur in the Mink R., Manitoba (Bartnik, 1970).

The purpose of the present study was to investigate

sympatric populations of Rhinichthys in the Mink R. with respect to the principle of Gause. Often termed 'the principle of competitive exclusion, it states, in essence, that no two species can coexist in the same locality if they have identical ecological requirements. Lagler et al (1962) stated that the most common competitions among fishes are for spawning sites, food, space and shelter.

The sympatric occurrence of closely related species, often of the same genus, is a problem that has been widely investigated in a variety of taxonomic groups (eg., Miller on gophers, 1964; Beauchamp and Ullyott on triclads, 1932; Kohn on prosobranchs, 1959). In nearly all cases differences in resources utilized, such as food, or environment occupied, were found. In some cases two species were found together using the same resources, which were temporarily superabundant.

It has also been shown that ecological differences between two species are often magnified by interaction due to competition, sometimes coupled with predation (eg., Larkin and Smith, 1953; Johannes and Larkin, 1961; on the interaction between redbside shiners and Kamloops trout). This phenomenon was termed interactive segregation by Brian (1956) and has been reviewed in fishes by Nilsson (1966) and by Miller (1967) for other taxonomic groups. It is believed typical of newly evolved faunas, whose 'preferences' exhibit considerable plasticity and can change in the

presence or absence of interacting species.

There are a number of publications which include aspects of the ecology of one or both species of Rhinichthys. In some cases the subspecies was not mentioned, but the majority here concentrate on the Great Lakes longnose and the western blacknose. Kuehn (1949), Reed (1959) and Becker (1962) found aquatic Diptera and Ephemeroptera the major food items of longnose dace. Gerald (1966) found baetid mayfly nymphs the main diet of longnose, while Schlick (M.S., 1966) indicated that sympatric populations of the two species ate very similar foods, with Trichoptera and Ephemeroptera the most numerous items. Moore et al. (1934) noted that blacknose dace fed mainly on Diptera larvae and pupae (Tendipedidae and Tipulidae), Ephemeroptera and Trichoptera.

Only limited information on the environments occupied is given in the above papers. Becker (1962) generally found R. c. cataractae to frequent fast, shallow water with gravel or rubble bottoms, while R. a. meleagris was usually found between fast and slow water, or in eddies behind rocks. Bartnik (1970), who worked on isolating mechanisms between the two species measured densities of mature fishes during the spring reproductive period in currents above and below 45 cm/sec. He found that the majority of adult blacknose were in water below 45 cm/sec while the majority of adult longnose were in

water above this velocity. However, considerable overlap existed.

The present study provides information on: the distribution and abundance of the two species in the Mink R.; their densities in different environments throughout the life cycle; and on food present and food consumed.