

Further studies on the seasonal distribution and abundance of fish in Delta Marsh

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Introduction

Delta Marsh is a 21,870 hectare marsh located on the southern shore of Lake Manitoba. It is a relatively protected area ideal for spawning and the rearing of young for many species of fish. The marsh is uninhabitable during the winter due to the depth of ice cover and winterkill, thus use of the marsh by fish is seasonal (Schneider 1983). The marsh is connected to the lake by four major creeks and is subject to large natural fluctuations in water level, depending on whether the prevailing wind is from the south (lowering water levels in the marsh) or, more often, from the north (raising water levels in the marsh). During the spring of 1996, high runoff from above average winter snowfalls in outlying areas overwhelmed the Assiniboine River Diversion control structure near its entrance into Lake Manitoba. This resulted in the flooding of much of the area in which the following study was conducted. Water levels remained abnormally high for the entire summer.

Two past studies of fish abundance in the Delta Marsh were carried out in 1983 and 1995, by Schneider (1983) and Kiers and Hann (1996), respectively. Both of these studies exposed apparent trends in fish abundance levels in the marsh throughout the summer. Typically, a spring period of high fish abundance consisted of fatheads, sticklebacks, and perch, followed by a mid-summer lull, and then a small autumnal peak consisting of mainly benthic species such as bullhead, carp, and sucker (Schneider 1983, Kiers and Hann 1996). It was the goal of this work to examine the temporal and spatial distribution of fish within the marsh in order to determine whether this apparent trend is a predictable and consistent phenomenon.

Methods

The sampling protocol used for this fish abundance study follows that of Kiers and Hann (1996) with slight modification. Four sites were monitored during this

study (Fig. 1) and the numbering scheme follows that of Schneider (1983). Three sites were located on the Blind Channel: Site 1 offshore from the Portage Country Club (PCC) canoe dock, Site 2 at the Fisherman's Shack, and Site 4 located roughly between Site 1 and the channel connecting with Forster's Bay. Site 7 was located at Crescent Pond which is normally not connected to the rest of the marsh.

A transect of three stations was established at each site. Station A was located near the *Typha*-water interface while Station B and Station C were located 10 m and 20 m from shore, respectively. Two standard minnow traps (Gee) were suspended at each station, one at 10 cm from the surface and another at 60 cm (in most cases near the sediment interface), from a float anchored to rebar secured into the substrate. Due to the high water levels which persisted throughout the study period it was possible to maintain the bottom traps at 60 cm for the duration of the summer at all sites. In 1995, receding water levels forced the removal of the bottom trap in some locations.

Traps were set for one twenty-four hour period weekly from June 3 to August 24. Traps were placed in the water at about 08:30 and checked at about 20:00 to approximate a 12-hour sampling day. The traps were returned to the water and checked again at about 08:30 the following morning to approximate a 12-hour sampling night. The traps were then removed from the float and stored until the following week. Fish were identified to species using Scott and Crossman (1973), and counted on-site before being released. The black bullhead (*Ameiurus melas*; formerly *Ictalurus melas*) and the brown bullhead (*Ameiurus nebulosus*; formerly *Ictalurus nebulosus*) were not differentiated to species and are combined as *Ameiurus* spp.

Results

Total fish abundance per trap, pooled over all species, peaked between June 10 and June 18 at most sites (Fig. 2). The majority of the catch at this time consisted of adult fathead minnows concentrated in the upper Blind Channel. Two smaller peaks were observed about every second week for the following month. After

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July 22-23, abundance levels dropped to near zero for all sites for the remainder of the study period. The only exception to this was a brief peak on August 6-7. This catch consisted entirely of young-of-the-year bullheads at one site, the Fisherman's Shack.

The predominant fish species recorded during this study was the fathead minnow (Table 1) which was plentiful at all sites except Crescent Pond where it was only rarely observed. Their numbers peaked in mid-June and slowly trailed off through July (Fig. 3). By late July they were only rarely recorded. During the peak many adult males, distinguished by dark facial coloration and the presence of nuptial tubercles (Scott and Crossman 1973), were observed. Yellow perch were another species common, in small numbers, in the Blind Channel and on one occasion, in Crescent Pond. They were caught more often in the spring and mid-summer than in the fall. The nine-spined and five-spined sticklebacks, in small numbers, comprised the dominant catch in Crescent Pond while only occasionally being recorded in the Blind Channel sites. The spring catch of sticklebacks consisted of adult fish while the fall increase in numbers was composed of young-of-the-year which had attained sufficient size to become captured in the minnow traps. For two weeks leading up to this fall peak many small sticklebacks were observed slipping through the meshing as the minnow traps were raised. Young-of-the-year bullhead peaked briefly during mid-August at the Fisherman's Shack site and were found scattered throughout the Blind Channel in very small numbers for the remainder of the year. Spottailed shiners, emerald shiners, juvenile carp and juvenile white sucker were extremely rare, in most cases only being caught once or twice during the entire sampling period. No darters, trout-perch, logperch, pike, or mudminnows, which had been observed in 1983, were recorded in this study.

Examined individually, the three sites located in the Blind Channel show similar activity patterns. The three major peaks (almost entirely of fathead minnows) on June 10 - June 18, July 2-3, and July 15-16 occurred at all three sites (Fig. 4). After July 22-23, the abundance at these sites dropped to near zero for the remainder of the year except at the Fisherman's Shack site where there was a brief occurrence of bullheads. The Fisherman's Shack site was the only one that showed significant numbers of this species. The Crescent Pond site, being essentially landlocked, showed a similar pattern of abundance but a different species composition (Fig. 5). There was an initial spring period of abundance (adult sticklebacks and fatheads), followed by a summer lull, and then a small autumnal increase (young-of-the-year sticklebacks). However, all of these abundances were small in number with the daily catch rarely exceeding 3 fish per trap.

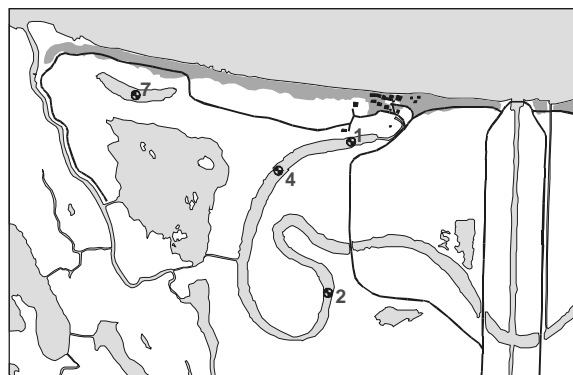


Figure 1. Sites within the Delta Marsh study area sampled in 1996. Site 1 (Portage Country Club canoe dock), Site 2 (Fisherman's Shack), Site 4 (Blind Channel), and Site 7 (Crescent Pond).

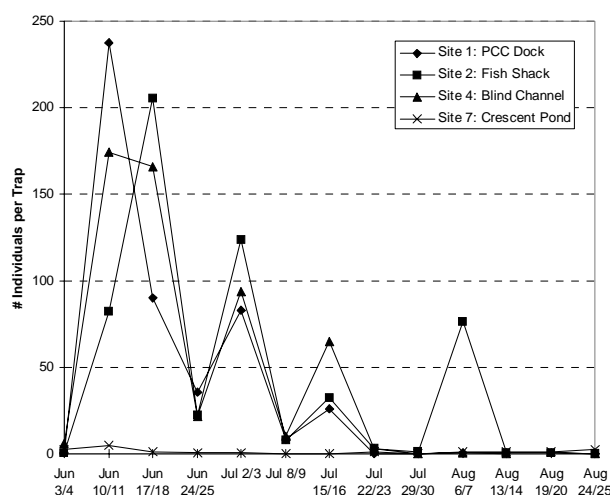


Figure 2. Per trap fish abundance at each site for summer 1996 showing the distinct spring peak, followed by a mid-summer lull, and small autumnal peak.

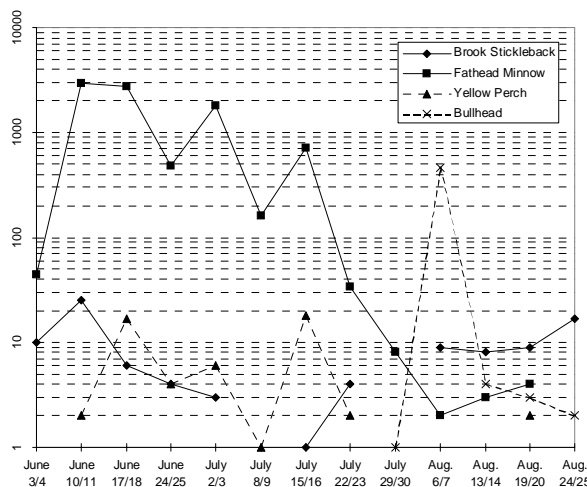


Figure 3. Total fish catch, for selected species, for summer 1996.

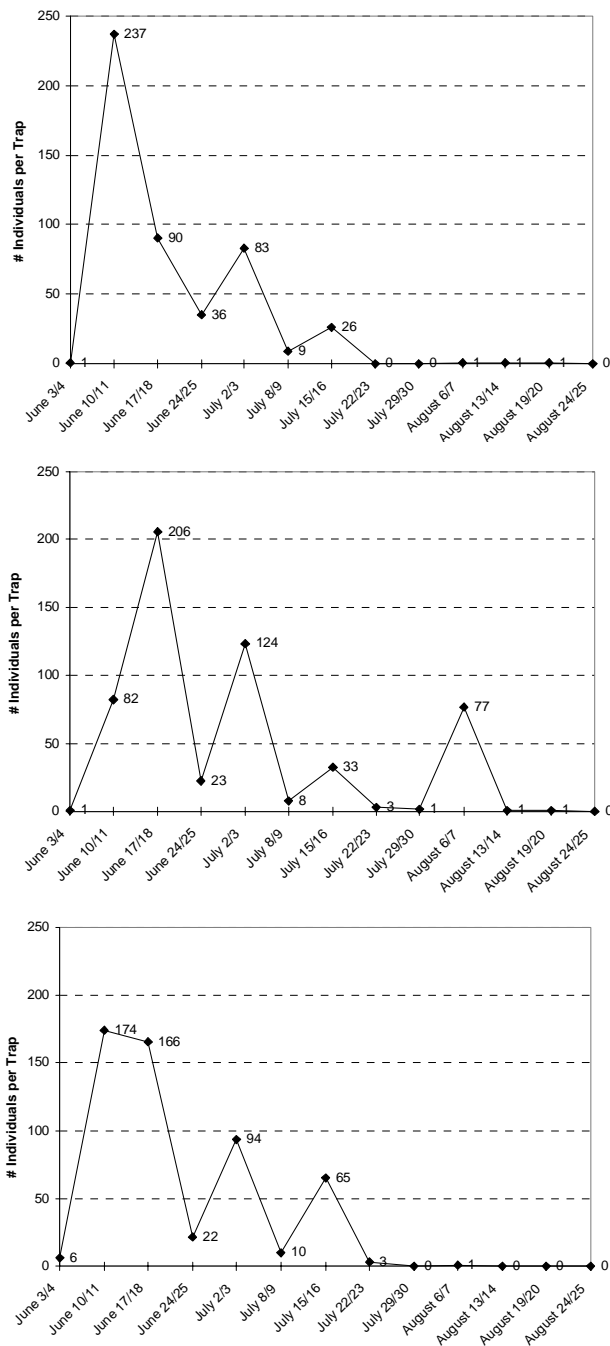


Figure 4. Fluctuations in per trap fish catch for summer 1996 at Site 1 (PCC Dock; top), Site 2 (Fisherman's Shack; middle), and Site 4 (Blind Channel; bottom).

An overwhelming 92.6% of the entire fish catch was recorded in the top traps. The only time a significant number was observed in the lower traps was during the spring peak of fathead minnows. During the brief peak of bullheads in mid-August this normally benthic foraging fish was found almost entirely in the upper traps.

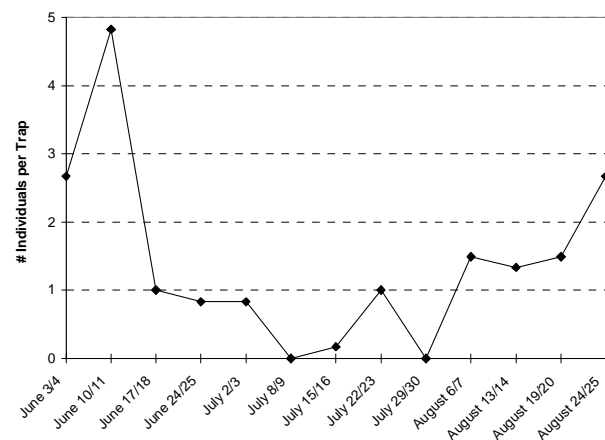


Figure 5. Fluctuations in per trap fish catch for summer 1996 at Site 7 (Crescent Pond).

As in past years there appeared to be no consistent pattern of stratification between stations A, B, or C in most of the Blind Channel. At the Fisherman's Shack fathead minnows concentrated in the outer stations, more mid-channel during the spring peak. At Crescent Pond, however, the catch was usually equal among stations, especially during times of low abundance, but in all cases the numbers are too low to substantiate any trends. As a species bullheads were found almost exclusively in the near-shore, or A stations.

Sixty percent of the total fish catch was represented in the night sampling period as opposed to 40% in the day sampling period. This finding was strongly influenced by the fathead minnows which made up 93% of the season's catch. The bullheads, the next most abundant species, were caught almost entirely during the day sampling period.

Discussion

The results of this sampling project seem to approximate the general summer fish community structure present in Delta Marsh as described by Schneider (1983) and Kiers and Hann (1996). Fish catches peaked in abundance during the spring, followed by a mid-summer lull, and a smaller autumnal peak. However, there are several differences from previous years which should be addressed and placed within the context of the environmental conditions at work during the 1996 sampling period. The spring peak consisting mainly of fatheads was similar in both years but the overall abundance was lower in 1996 than in 1995. Peak numbers of fathead minnows in 1995 were typically in the 450 individuals per trap range whereas, in 1996, values rarely exceeded 200 individuals per trap. Abundances per trap for yellow perch and bullhead were also substantially lower in 1996. Perhaps the most

striking difference from previous years was the complete lack of carp and white suckers. Also, there was only one day in early August where a significant number of bullhead were observed.

There are several possibilities that may explain these observations. Due to severe spring flooding, cool spring temperatures, and persistent high summer water levels the carp and white sucker populations may have had a delayed spawning period. Adult carp were observed spawning in the marsh well into late June. It is possible that by the time sampling was stopped on August 25 the young-of-the-year carp, sucker, and to a lesser extent the bullhead, may not have grown large enough to be caught in the traps. If sampling into late fall were possible we may have seen a more pronounced and distinct fall community. In fact, it appears that there was a significant peak in the abundance of these species in late September (J. Gee, personal communication). Another possibility may be that, because of the higher than normal water levels in the marsh, the bottom traps (suspended at 60cm) were too high off the sediment to catch the generally benthic carp and sucker.

In conclusion, the general temporal pattern of the Delta Marsh fish community seems to be similar year-to-year with variances in timing and overall abundance relating to varying environmental conditions. The extent to which the unusual environmental conditions observed in 1996 disrupted the normal development of the fish community is uncertain but may be significant. Future

fish abundance surveys in the marsh may relate abundance with both water level and temperature fluctuations to determine their impact on observed patterns of abundance.

Acknowledgements

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