the mud-water interface. Thus the decline could logically be attributed to ice scour in the shallow areas. It would be difficult to ascertain whether lower temperatures were involved, because organisms of each of the taxa have different physiological responses and age structures. Whatever the cause, most taxa that exhibited a seeming decline recovered to 1983 densities within 6 months.

The distribution and occurrence of aquatic macrophyte taxa changed little between years. Maximum percent coverage of macrophyte beds varied little between years and rivers. Development of beds in June was delayed in 1984 in the St. Clair River and at Belle Isle, but by September the beds were little different in 1984 than in 1983, at least through the upper two-thirds of SCDRS. There were significant differences in biomass between years, but there were no consistent differences between locations or months. Impacts on submersed macrophytes, other than possibly delayed development due to lower temperature, could not be ascribed to the ice jam.

Fish catches were usually lower in 1984, but this trend occurred in both rivers and in most comparisons was not statistically significant. Lower catches in 1984 may have been due to the effect of lower temperatures on development of plant beds, general activity level, and seasonal migrations.

CONCLUSIONS AND RECOMMENDATIONS

This study was conducted to describe the present distribution and abundance of macrozoobenthos, aquatic macrophytes, and juvenile fishes in SCDRS. We believe that we have addressed this objective for the open water season on SCDRS within the constraints imposed by our data, and that our study provides a baseline data set that can be used to evaluate any future extension of the navigation season. We do not believe that the results of our study can be used alone to answer the question of whether increased winter vessel traffic will have a measurable effect on SCDRS. The ice jam of April 1984 may have had an undefined effect, but we cannot show that the ice jam was caused or exacerbated by navigation, or that the jam simulated conditions that might occur from vessel operation in January or February.

The benthic, aquatic plant, and fish communities described here appear to exist at the observed level of traffic without obvious ill effects from winter ship traffic. However, winter vessel traffic has occurred in SCDRS for many years and thus there is no truly unaffected baseline from which the effects of winter navigation that may have already occurred can be empirically judged. It has been postulated that increased shipping might amplify ice scour, turbulence, flooding, and dewatering, which in turn could affect the density, location, and behavior of biota in the system. It has also been postulated that the environmental impacts of increasing winter shipping may be cumulative and take several years to become readily observable. We believe that an adequate evaluation of the potential impacts of winter navigation on SCDRS will require the development of an energy flow model plus an age-structured fishery model.

The Corps-funded research on SCDRS has provided a substantial data base from which a model of this kind might be developed. Additional data are needed on phytoplankton, periphyton, and zooplankton standing crop and production, plus terrestrial inputs to complete the energy budget. This information would permit quantification of the simultaneous effects of all components according to their interrelationships in the ecosystem, and would avoid the problem associated with a piecemeal evaluation of individual components. Such a model would be useful in partitioning impacts so that rational remedial strategies and mitigation could be attempted.