ABSTRACT

WARWICK, W. F. 1980. Palaeolimnology of the Bay of Quinte, Lake Ontario: 2800 years of cultural influence. Can. Bull. Fish. Aquat. Sci. 206: 117 p.

Three sediment cores from the Bay of Quinte, each about 2 meters long, were taken in March 1972 through the ice in 22.3 meters of water, with a modified Mackereth corer at a site 3 kilometers down channel from Glenora, Ontario. The chronology of the core sediments was established by four chronological techniques — *Ambrosia* pollen, lead-210, carbon-14, and an Erosion Index (a new technique for fingerprinting core sediments) — so that stratigraphic parameters could be correlated with historical events. Historical changes in the quality and quantity of the sediments were defined by grain-size measurements, ignition analyses, and chemical–geological data. Changes in productivity in the water column and the quality of organic materials in the sediments were traced through carbon, nitrogen, phosphorus, and ignition analyses.

Analysis of the fossil chironomid succession demonstrates that man, especially European man, has had, and is having, a profound impact on the Bay of Quinte. Primitive cultures such as the Hopewell who thrived some 2000 years ago, and the Iroquois who occupied the area between 1000 and 1650 A.D., clearly had a measurable effect on the processes influencing the aquatic environment of the bay. However, their impact was minor compared to that imposed by the development of European culture. The chironomid fauna has undergone profound changes since the arrival of European colonists. For 2000 years prior to their arrival, the fauna remained remarkably stable and was characteristic of relatively undisturbed oligotrophic conditions. With the arrival of the French and British, the chironomid community responded to the initial colonization by developing a progressively more eutrophic fauna, paralleling the increased productivity of the bay from increased nutrient inputs. However, the chironomid community reverted to a more oligotrophic fauna when large-scale deforestation in the watershed introduced massive amounts of erosion materials into the bay. The resulting unstable bottom conditions and the dilution and burial of organic food led to the development of an imbalanced oligotrophic fauna, characterized by *Micropsectra* spp., which was maintained in spite of the continued increase in productivity in the water column. The inhibitory effect of the mineral sediments formulated in the expression:

$$\underset{\text{faunal indices}}{\text{TROPHY}} = \underset{\text{productivity indices}}{\text{TROPHY}} - \text{mineral sediment accumulation}$$

continued as long as the rate of sediment accumulation remained rapid, but, once the rate began to decline, the suppressed effects of continued eutrophication proceeded with increasing rapidity. The transition from the imbalanced oligotrophic fauna to the depleted *Chironomus–Procladius* fauna tolerant of present-day eutrophic conditions was so rapid that the intervening *Phaenopsectra* community was unable to develop to proportions normally found in mesotrophic lakes. The increased incidence of deformed larvae in the most recent sediments indicates industrial and/or agricultural contaminants are present in the aquatic environment, and adds a new dimension to the list of insults man has inflicted on the bay.