THE ISOTOPIC RECORD OF OXYGEN IN PHOSPHATES OF FOSSIL FISH - DEVONIAN TO RECENT.

KOLODNY*, Yehoshua, Dept. of Geology, Stanford University Stanford CA 94305 , on leave from Dept. of Geology, The Hebrew University, Jerusalem Israel, and LUZ, Boaz, Dept. of Geology, The Hebrew University, Jerusalem Israel

The isotopic composition of oxygen in the phosphate ($\delta^{18}O_p$)was determined in 159 fish bones and teeth from museum collections throughout the world. The fossils were both marine and fresh-water ranging in age from the Devonian to the Recent. In 45 of those we also determined the isotopic composition of oxygen and carbon of the lattice carbonate in apatite ($\delta^{18}O_c$ and $\delta^{13}C$). In most cases the isotopic results are compatible with previously available geological information: the difference between marine and fresh water, the indication of previously known warm and cold time periods, and the ranking of fishes from warm to cold according to their inferred life habitat.

Three fish specimen from the Devonian of the Orcadian Basin in Scotland yield results which are compatible with the thermal structure of a stratified lake.The isotopic analysis of *Inocentrus vulgaris*, a fish found inside Cretaceous inoceramids, yields normal marine $\delta^{18}O_p$. Hence we favor the suggestion of Tourtelot and Rye (1969) that ^{18}O depleted inoceramids did not deposit their shells in isotopic equilibrium with sea water.

The relationship between $\delta^{18}O_p$ and $\delta^{18}O_c$ suggests early diagenetic replacement of an originally phosphatic phase by carbonate fluor apatite (CFA). This conclusion is in accord with REE studies of fish fossils. The correlated latitudinal variation in $\delta^{18}O$ of meteoric water and temperature should result in a small variation of $\delta^{18}O_p$ in fresh water fish. The large range in $\delta^{18}O_p$ of Recent fish is the outcome the "altitude effect" (Dansgaard, 1964) i.e. of the existence of Recent high altitudes, and sharp morphological gradients.