EFFECT OF INCREASING SEAWATER INTRUSION ON THE PHOTOTROPHS IN A BRACKISH LAKE, LAKE HAMANA, JAPAN, REVEALED BY SEDIMENTARY PHOTOSYNTHETIC PIGMENTS

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Lake Hamana, locating in central Japan and faced on the Pacific Ocean, is a brackish, holomictic and eutrophic lake constituted from 6 basins. Development of anoxia in deeper layer of water during summer in this lake has been a serious problem for fisheries and inhabitants. It is known that seawater intrusion and lake salinity increased by the construction of training walls in 1954–1956 to direct tidal currents into the lake, via Imagire-guchi channel, the sole inlet for seawater.

We analyzed photosynthetic pigments of both algae and phototrophic sulfur bacteria in five sediment cores to reconstruct the temporal and spatial changes in phototrophs both in oxic and anoxic zones over Lake Hamana. Sediment cores used in this study were a ^{210}Pb-dated sediment core (78 cm; the deepest layer of the core corresponds to ~250 years ago) collected from the central basin and non-dated sediment cores (< 40 cm) collected from 4 outer basins. Detected carotenoids in the cores with their origin in parenthesis were fucoxanthin (diatoms), alloxanthin (Cryptophyta), diatoxanthin (diatoms and dinoflagellate), lutein (green algae and higher plants), zeaxanthin (cyanobacteria), α-carotene (Cryptophyta and Rhodophyta) and β-carotene (most algae and higher plants) for algae living in oxic zone, and okenone (*Chromatium*) and isorenieratene (brown *Chlorobium*) for phototrophic sulfur bacteria living in anoxic zone. The occurrence of bacterial pigments, okenone and isorenieratene, in all sediment cores suggests that the anoxia has existed over Lake Hamana, and anoxia has existed over at least ~250 years from the dated sediment core.

The temporal change in total bacterial carotenoids (TBC; the summed concentration of okenone and isorenieratene) showed much in common with that in total algal carotenoids (TAC; the summed concentration of algal carotenoids) in each core (r^2 > 0.7). This similar trend of TBC to TAC in each core suggests that the productions both in oxic zone (algae) and anoxic zone (phototrophic sulfur bacteria) changed parallel over Lake Hamana.

In the surface layers of the cores, the decreases of zeaxanthin relative to diatoxanthin and lutein, and of okenone relative to isorenieratene were observed. These suggest that the composition of phototrophs both in oxic and anoxic zones changed over Lake Hamana. From the ^{210}Pb-dated sediment core, the depth at which these decreases occurred corresponded to ~1960. At the same time, the lake salinity has increased to the present level in the central basin. Thus, the decreases of both zeaxanthin (cyanobacteria) and okenone (*Chromatium*) over Lake Hamana were introduced by the seawater intrusion caused by the construction of training walls on the channel. The resultant reduction of anoxic layers has caused the disappearance of *Chromatium* while brown *Chlorobium* still remains.