Evaluations of Primary productivity and Carrying Capacity in the Coastal Waters

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Summary

As a part of a research program on sustainable exploitation of biological productivity in coastal waters, primary productivity of phytoplankton populations was investigated in Otsuchi Bay, a ria in the Pacific coast of the northern Honshu, Japan during a spring bloom period from mid January to late April 1998. A fluorometer for natural fluorescence was moored at a 7.5-m depth in the central part of the bay. The ria was characterized by an intense exchange of sea waters between inside and outside the bay: outflow of near-surface water over inflow of oceanic water at depth. This circulation controlled the formation of diatom blooms, and consequently primary production as monitored by natural fluorescence. Natural fluorescence was bio-optically converted to primary production. The conversion using fixed number for the phytoplankton light absorption coefficient yielded poor estimates of primary production. However, the conversion using a function in which the coefficient was expressed as a function of chlorophyll *a* provided good estimates which showed significant correlation with direct estimates. The function indicated phytoplankton absorption varied depending on chlorophyll a concentration. This was considered as manifestation of the "package effect" of diatoms which predominated during the bloom. Primary production derived from natural fluorescence showed a significant correlation with the integrated primary production as estimated by the chlorophyll method, allowing a evaluation of the integrated production from natural fluorescence measured at the 7.5-m depth. Primary production of the bay during the observation period was estimated to be 1703 tC.