BACTERIOPLANKTON

Bacterioplankton are bacteria that live in the open waters of the ocean. They are microscopic in size but often very abundant, with studies estimating that the world ocean contains 3.1 x 10^{28} bacterial cells (Karner *et al.* 2001. Nature 409:507-510). They are very important for the cycling of carbon in the ocean and as the source of long food webs. Although difficult to identify (often using chemical techniques), it is important to know which phylogenetic groups of bacteria dominate marine bacterioplankton communities because abundant groups may have different roles in carbon cycling and other biogeochemical processes (Cottrell and Kirchman, 2000, Applied and Environmental Microbiology Dec. 2000:5116-5122).

Yellow Sea / East China Sea

The biomass of bacteria in the warm surface layer varies from 50 to 150 mg/m^2 at the majority of open sea locations in this region. Integrated biomass in southeastern deep-sea locations is calculated to be 2.2-2.9 g/m^2, which is lower than deep-sea locations of the Bering Sea. In shelf areas, the bacteria biomass varies depending on the amount of organic material. During diatom blooms, an integrated bacterial biomass of 7.8-14.3 g/m^2 can occur.

Sea of Okhotsk

The vertical and horizontal distribution of bacteria in the Sea of Okhotsk is the similar to that in the Bering Sea. Upper warm layers are characterized by high bacteria concentrations. Below the thermocline at depths greater than 50 meters, bacterial biomass can be 30-60% of that in the upper layer. At depths from 100 to 400-900 meters bacterial biomass is quite stable (10-40mg/m^2). Rates of bacterial production in the Sea of Okhotsk in summer are high, with a production-to-biomass ratio of 0.2-0.9. In the warmer southeastern waters of the Sea of Okhotsk, this production-to-biomass ratio can range from 0.7-0.9, whereas at a cold coastal station near Sakhalin Island, it was half as much. In 1992, the integrated bacterial biomass in the Okhotsk Sea was approximately the same as in the Bering Sea. However, from 1992-1994 the biomass of bacterioplankton increased to 1.5 times as much. These years experienced unusual blooms of microweeds, which may explain the high productivity of bacterioplankton. The integrated biomass of bacterioplankton from the surface to 200 m was 17.2 g/m^2 in the southern part of the Sea of Okhotsk in 1993, but 9.3 g/m^2 in the 0-50m depth range in 1994. Over the entire Sea of Okhotsk, bacterioplankton production was calculated as $0.96x10^9$ t of living material.

Western Subarctic Pacific

Bacterioplankton numerical abundance in the upper mixed layer of the Western Subarctic Pacific was about 1-2 million cells per ml, with a biomass of 15-46 mg C m^{-3}. This abundance decreased with depth below the thermocline to 10,000-20,000 cells per ml (Sorokin et al. 1996. Journal of Plankton Research 18:1-6). The numerical abundance of planktonic ciliates in the Western Subarctic Pacific, which feed upon bacterioplankton, was estimated to be on the order of 400 – 4,500 cells per litre,

Bering Sea

Total number of bacterioplankton in the upper mixed layer of the Bering Sea during spring-early summer ranged from 1-4 x 10^6 per ml, with a biomass of 10-40 mg C m^{-3} (Sorokin et al. 1996. Journal of Plankton Research 18:1-6). Through out the water column, bacterioplankton biomass ranged between 1.2 and 3.6 g C m^{-2} (biomass 6-18 g m^{-2}). The numerical abundance of planktonic ciliates in the Bering Sea was estimated to be on the order of 1,000 cells per litre, with populations dominated by *Stombidium, Strombilidium, and Tontonia*.

Gulf of Alaska

The biomass of bacterioplankton in the Gulf of Alaska during summer was estimated to be about 1.4 g C m^{-2} from the surface to 100 m, and about 2.6 g C m^{-2} from 100 to 1000 m (Nagata et al. 2001. Journal of Oceanography 57:301-313). It appears that the growth of bacterioplankton in the surface waters of the North Pacific is largely regulated by temperature and the supply of dissolved organic carbon (often from phytoplankton), whereas at deeper depths (the mesopelagic layer, 100-1000 m), the growth of bacterioplankton is largely controlled by the supply of organic carbon (Nagata et al. 2001. Journal of Oceanography 57:301-313).

California Current

In the coastal waters of the California Current region, the *Cytophaus-Flavobacter* cluster numerically dominated the bacterioplankton.

Central Pacific Transition Zone

In the Central Pacific Transition Zone, studies have found that picoplankton belonging to the domain Archaea (specifically those called pelagic crenarchaeota) can be as abundant as bacterioplankton, in particular at depths greater than 150 m (Karner et al. 2001. Nature 409:507-510). Average abundances from the surface to 5000 m are about 10,000 cells per ml for the Archaea and 1000,000 cells per ml for the bacteria. It has been estimated that the world ocean contains about 1.3 x 10^{28} archaeal cells, and 3.1 x 10^{28} bacterial cells (Karner et al. 2001. Nature 409:507-510).