长江口低氧区异养细菌及氮磷细菌分布

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Spatial distribution patterns of heterotrophic, nitrogen, and phosphate bacteria in hypoxic zone of Yangtze River Estuary.

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摘要

2009年8月15—28日，对长江口低氧高发海域的异养细菌、无机磷细菌、有机磷细菌、反硝化细菌和氨化细菌的空间分布特征进行初步研究.结果表明： 氨化细菌数量最高，表层水、底层水和表层沉积物的数量均值分别为307.52×10^4 个·L^{-1}、184.50×10^4 个·L^{-1}和199.97×10^2 个·g^{-1}；其次为异养细菌，数量均值分别为87.35×10^4 cfu·L-1、86.85×10^4 cfu·L^{-1}和64.26×10^2 cfu·g^{-1}；再次为有机磷细菌，数量均值分别为19.26×10^4 cfu·L^{-1}、18.82×10^4cfu·L^{-1}和19.56×10^2 cfu·g^{-1}；无机磷细菌只分布在长江口内和河口南槽至舟山海域，数量均值分别为18.50×10^4 cfu·L^{-1}、31.00×10^4 cfu·L^{-1}和7.17×10^2 cfu·g^{-1}；反硝化细菌分布广，但数量较低，均值分别为3.94×10^4 个·L^{-1}、23.08×10^4 个·L^{-1}和6.22×10^2 个·g^{-1}.相关性分析结果说明：盐度、硝酸盐、磷酸盐、硅酸盐和pH是影响水体和表层沉积物异养细菌、磷细菌和反硝化细菌分布的主要因子；底层水和表层沉积物异养细菌、磷细菌与水温呈显著正相关；底层水异养细菌和有机磷细菌与溶解氧(DO)呈显著正相关；表层沉积物无机磷细菌与DO呈显著正相关，氨化细菌与DO呈显著负相关.聚类分析结果说明：低氧对表层沉积物的细菌群落结构产生影响.

关键词： 长江口 低氧区 异养细菌 氮细菌 磷细菌

Abstract:

In August 15-28, 2009, a preliminary study was conducted on the spatial distribution characteristics of heterotrophic bacteria (HB), inorganic phosphate bacteria (IPB), organic phosphate bacteria (OPB), denitrifying bacteria (DB), and ammonifying bacteria (AB) in the hypoxic zone of Yangtze River Estuary. In the water surface, water bottom, and sediment surface of the zone, the average quantity of AB was the largest, being 307.52×10^4 cells·L^{-1}, 184.50×10^4 cells·L^{-1}, 199.97×10^2 cells·g^{-1}, followed by that of HB (87.35×10^4 cfu·L^{-1}, 86.85×10^4 cfu·L^{-1}, and 19.56×10^2 cfu·g^{-1}), and of OPB (19.26×10^4 cfu·L^{-1}, 18.82×10^4 cfu·L^{-1}, and 19.56×10^2 cfu·g^{-1}, respectively). IPB was only observed within the Yangtze Estuary, south passage of the Estuary, and Zhoushan inshore, and its average quantity in the water surface, water bottom, and sediment surface was 18.50×10^4 cfu·L^{-1}, 31.00×10^4 cfu·L^{-1}, and 7.17×10^2 cfu·g^{-1} respectively. DB had a wide distribution, but its average quantity was low, being 3.94×10^4 cells·L^{-1}, 23.08×10^4 cells·L^{-1}, and 6.22×10^2 cells·g^{-1} in the water surface, water bottom, and sediment surface, respectively. Salinity, NO_3^--N, PO_4^{3-}-P, SiO_3^{2-}-Si, and pH were the main factors affecting the distribution of HB, IPB, OPB, and DB in water body and sediment surface. The HB, IPB, and OPB in water bottom and sediment surface had significant positive correlation with water temperature; the HB and OPB in water bottom and the IPB in sediment surface were significantly positively correlated with dissolved oxygen (DO); while the AB in sediment surface was significantly negatively correlated with DO. Cluster analysis showed that hypoxia affected the bacterial community structure in sediment surface.

Key words: Yangtze River Estuary hypoxia zone heterotrophic bacteria nitrogen bacteria phosphate bacteria

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