

研究论文

粤东大规模海水增养殖区柘林湾浮游细菌的时空分布

马继波, 董巧香, 黄长江*

温州医学院环境与公共卫生学院, 浙江 温州325053

收稿日期 2005-12-16 修回日期 2006-5-27 网络版发布日期: 2007-2-25

摘要 2001年9月至2004年12月对粤东大规模海水增养殖区柘林湾表、底层水体中浮游细菌的时空分布进行调查。结果表明, 柘林湾浮游细菌总均值为 $59.4 \times 10^4 \text{ cell/dm}^3$, 与国内外富营养化程度较高的内湾海域大致相当。在平面分布上, 浮游细菌总体上表现出湾内高于湾外、养殖区高于非养殖区的分布格局, 说明大规模增养殖业对浮游细菌的时空分布具有重要的影响, 其中网箱养殖的影响尤其显著。湾顶黄冈河口浮游细菌呈现显著的逐年增加趋势, 其原因一方面与调查期间降雨减少有关; 另一方面可能是受周边陆源污染输入加剧的影响。在周年变化上, 浮游细菌表现为典型的单峰型周年变化模式, 主要是受水温的调控。年度峰值出现在夏季高温季节(6~8月), 低谷出现在冬季低温季节(12~2月)。浮游细菌与溶氧呈现显著意义的负相关关系, 但低溶氧可能是湾内养殖区初级生产力低下所致, 而非浮游细菌耗氧所为。相反, 溶氧降低可能会促进专性或兼性厌氧细菌的增加, 使养殖环境进一步恶化。

关键词 柘林湾; 浮游细菌; 时空分布; 温度; 溶氧

分类号 [Q178](#), [X171.5](#), [X55](#)

The temporal and spatial distribution of bacterioplankton in a large scale mariculture located in Zhelin Bay, Eastern Guangdong Province, China

MA Ji -Bo, DONG Qi ao-Xi ang, HUANG Chang-Ji ang*

School of Environmental Science and Public Health, Wenzhou Medical College, Wenzhou 325035, China

Abstract Zhelin Bay is one of the most important bays for large-scale marine culture in Guangdong Province, China. Due to the increasing human population and the expanding mariculture in the last two decades, the ecological environment has changed dramatically, e.g., a large-scale of harmful algal blooms (*Phaeocystis*) frequently occurred. Although degenerative and eutrophic environment has brought huge economic loss and caged-fish culture has become more and more difficult, few studies were followed. From May 2000, our group initiated an ecological investigation around Zhelin Bay, in which we monthly investigated the phytoplankton, zooplankton, bacterioplankton, nutrients, water temperature, salinity and other biochemical parameters. The present study reports the spatial and temporal distribution of bacterioplankton and their relations with water temperature and dissolved oxygen. Samples were collected monthly between September 2001 and December 2003 at nine sampling stations, and quarterly in 2004 at all stations. Each sampling was scheduled to cover high tide (1.5 h). Five liters of water samples were collected with HQM-1 sampling bottles 0.5 m under the surface and 0.5 m above the bottom at each station, and 100ml water from each sample were aliquoted into sterile polyethylene bottles, and immediately fixed with 5% formaldehyde (final concentration). Bacterioplankton was stained with Acridine Orange (1 g/L), filtered through 0.22 μm polycarbonate filters stained by Irgaian, and counted with a Zeiss Axioplan 2 plus fluorescence microscope (magnification 1000 \times). Temperature, salinity, and dissolved oxygen were determined in situ with a portable instrument for water quality analysis (YSI6600-02, USA). Relations between bacterioplankton abundances and environmental variables were analyzed by means of the linear fit using software Origin 7.0. The total abundance of bacterioplankton varied from $0.7 \times 10^4 \text{ cell/dm}^3$ to $540.0 \times 10^4 \text{ cell/dm}^3$, with an overall average of 59.4×10^4

扩展功能	
本文信息	
▶ Supporting info	
▶ [PDF全文](689KB)	
▶ [HTML全文](0KB)	
▶ 参考文献	
服务与反馈	
▶ 把本文推荐给朋友	
▶ 加入书架	
▶ Email Alert	
▶ 文章反馈	
▶ 浏览反馈信息	
相关信息	
▶ 本刊中 包含“柘林湾; 浮游细菌; 时空分布; 温度; 溶氧”的 相关文章	
▶ 本文作者相关文章	
· 马继波	
· 董巧香	
· 黄长江	

4 cell/dm^3 , which is similar to values reported for other eutrophic estuaries environments across the world. There were no significant differences for their overall averages of bacterioplankton between samples collected on the surface ($58.8 \times 10^4 \text{ cell/dm}^3$) and at the bottom ($60.4 \times 10^4 \text{ cell/dm}^3$). Spatially, total abundance of bacterioplankton was greater in samples collected from the inner than outer boundaries of Zhelin Bay, and also was greater in samples collected from caged-fish culture areas than areas without mariculture. In addition, bacterioplankton abundance showed an increase trend over the years within the investigation period. The findings suggest that mariculture may effect the bacterioplankton dynamics in the long run. Temporally, total abundance of bacterioplankton ranged from $1.6 \times 10^4 \text{ cell/dm}^3$ to $265.0 \times 10^4 \text{ cell/dm}^3$. Total abundance had a unimodal annual pattern and was greatest in summer (from June to August) and least in winter (from the first year December to February of the second year). The abundance of bacterioplankton was positively correlated with water temperature and negatively correlated with dissolved oxygen. It was possible that the low concentration of dissolved oxygen mainly resulted from low density of phytoplankton but not respiration of bacterioplankton in caged-fish culture areas. On the contrary, low dissolved oxygen could lead to the rapid growth of some specific or compatible anaerobic bacteria in cage culture areas.

Key words Zhelin Bay _ bacterioplankton _ temporal and spatial distribution _ water temperature _ dissolved oxygen

DOI

通讯作者 黄长江 cjhuang5711@163.com