地学前缘 2008, 15(6) 18-24 DOI: ISSN: 1005-2321 CN: 11-3370/P

论文

鱼耳石中锶和钡富集的影响因素及其环境响应

中国地质大学 地质过程与矿产资源国家重点实验室, 北京 100083

摘要：

鱼耳石中元素锶和钡主要来源于鱼类生存的水体,这两种元素通过腮或肠进入内耳淋巴液,继而以类质同象的方式沉淀在耳石晶格内部空位和晶格间隙中。耳石结晶沉淀的整个过程不仅受生物的调控作用,而且还受到外界环境,如水体元素浓度、盐度、温度等因素的影响,因此耳石中某种元素的浓度与其在水体中的浓度之比(元素富集系数)与鱼类所生存的环境之间具有一定的响应关系。在以上各种因素中,水体元素浓度对耳石元素富集系数的影响最为显著。一般来说,耳石中某种元素的含量与水体中相应的元素浓度呈正相关关系，而水体中元素之间就耳石中的富集过程也存在一定的相互促进或抑制作用,如Sr对Ba为协同作用,Ca对Sr、Zn为拮抗作用。另外,水体盐度或温度与元素富集系数之间不存在简单的线性相关关系,而是因鱼种、水体综合环境及元素种类不同而有所差异。研究结果表明:鱼种一定的情况下,耳石中元素富集系数与水体盐度和温度存在良好相关关系。基于以上相关性分析,可以认为耳石中元素富集系数与环境因子(水体元素浓度、盐度、温度)之间存在响应关系。因此,可以选用那些受环境影响大但对自身调控影响小的元素(如:Sr、Zn、Pb、Mn、Ba、Fe、Li、Ni、Cd)来建立耳石与水体环境之间元素富集系数的定量化模型,并利用这种响应关系及定量化模型进行生态环境监测和渔业管理。

关键词： 鱼耳石;元素富集系数;环境响应;水体生态;生物监测

The influential factors of strontium and barium enrichment in otolith and their response to the environment.

State Key Laboratory of Geological Processes and Mineral Resources, China University of Geosciences, Beijing 100083, China

Abstract:

Strontium and barium in otoliths are mainly from ambient water where fish survives. These two elements precipitate into otoliths crystal lattice or interstitial to substitute for calcium (Ca2+) in vaterite or aragonite. The precipitation of otoliths is controlled not only by biological regulatory, but also influenced by environmental factors, such as: element concentration, salinity, temperature of ambient water, food intake, etc. So there is a response relationship between element partition coefficient and ambient environment. The element concentration of ambient waters is the most significant one among all above mentioned environmental factors. In general, the element concentration in the otoliths is positively correlated to those in the ambient waters. When multi elements coexist in the ambient waters, there exist synergism and antagonism between some ions, for example, synergism between strontium and barium, and antagonism between calcium and strontium or zinc. There is no simple correlation between element partition coefficient and salinity or temperature; for some certain species and specific range of values, there exist some good correlations. Based on the specific species situation and selecting those elements that are affected greatly by environmental factors than by biological regulatory, such as Sr, Zn, Pb, Mn, Ba, Fe, Li, Ni, Cd, etc., we could use the response relationship to monitor the ecological environment and to manage fishery.

Keywords:

Key words: otoliths; element partition coefficient; environmental response; aquatic ecology; biological monitoring

收稿日期 null 修回日期 null 网络版发布日期 null

DOI:

基金项目:

国家重点基础研究发展计划 “973”项目(2007CB815604);国家自然科学基金项目(40473044);中国地质大学矿物

岩石材料国家专业实验室开放基金项目(6004)

通讯作者: 李胜荣。Email: lisr@cugb.edu.cn

作者简介: 罗军燕(1975—),女,博士研究生,矿物学、岩石学、矿床学专业,研究方向:环境与生命矿物学及成因矿物学
