



Assessment of the use of copper alloy aquaculture nets: Potential impacts on the marine environment and on the farmed fish



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ABSTRACT

The environmental effects of the copper aquaculture nets were estimated by a multidisciplinary approach. A copper alloy net (brass net) cage and a conventional net cage with Cu₂O antifouling paint were established at a fish farm in Bathy Limani Bay, Paleros, Aetolia Acarnania region, Greece, for a 1-year period. Copper concentrations in abiotic (water, sediment, particulate matter) and biotic (organisms) samples were measured. The biological effects of copper on organisms (mussels, farmed fish) were further assessed with a battery of biochemical biomarkers (acetylcholinesterase, catalase, glutathione-S-transferase, metallothioneins). During the first 6 months of cage installations, the copper alloy (brass) net seemed to release more Cu to the surrounding environment and affect the biota more compared to the conventional net, although non-significant correlations were found between biotic and abiotic variables. However, at the end of the experimental period, equilibrium was reached in the copper alloy (brass) net cage with similar values of dissolved Cu and Cu in organisms as the conventional net cage. An exception to these results was the sampling of August 2013, where an increased effect on water chemistry and mussels in the conventional cage was observed, which may be attributed to the use of antifoulants on the examined conventional net or on the surrounding conventional nets. No accumulation of Cu in sediment was detected. No consistent temporal or spatial trend was observed for biochemical biomarkers. In addition, for both experimental cages and in all sampling periods, dissolved Cu never reached the maximum permissible limits in the Greek legislation, and Cu concentrations in the farmed fish and mussels do not exceed established limits for edible parts set by Food and Agriculture Organization of the United Nations (FAO).

Statement of relevance: In this manuscript, a set of methodological tools and indicators were studied in order to assess the potential impacts of the use of copper alloy aquaculture nets on farmed fish and, eventually, the marine environment of the Mediterranean Sea. The authors believe that the aim of this work is within the journal's scope and the presented results, analysis and interpretation will be of interest to scientists involved in various aspects of aquaculture (management, environmental pollution, ecotoxicology, food safety etc.).

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