

Toxicity of Copper on Marine Organisms from the Black Sea

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Aim of the study: The main emphasis of this study is on heavy metal pollution, a subject which is of particular interest because of the essential requirement of organisms for trace quantities of many metals and the fine balance between requirement and excess, disturbance of which results in markedly deleterious effects. The present study investigates the effect on *Crangon crangon* (Linnaeus, 1758) and *Syngnathus acus* Linnaeus, 1758 of copper, which is essential in trace quantities, yet which is markedly toxic even at quite low concentrations.

Material and Methods: *C. crangon* were sampled by beam trawls with 3 m length and 10 mm cod-end mesh size at 10 m with mud or sand substrata. They were separately placed in biological-filtered clean seawater with 3 cm depth of the clean sediment into Plexiglas experimental stock tanks at temperature 21°C. Specimens of *C. crangon* and were fed with *Artemia salina*. *S. acus* were collected using 3 m length and a 20-mm cod-end mesh size, at a depth of 10–20 m. The sizes of the brood-stock were 9 to 13 cm. It has been observed that gravid greater pipefish in stock aquarium were born a day later. Then they were fed with *A. salina* nauplii, which were opened at 30‰ salinity, in the morning and evening for 6 days. Clean sediment was added to the test tanks to create a 3-cm deep layer. In order to evaluate the effect of copper on these organisms, stock solutions of MERC grade chemicals, copper (II) sulphate ($\text{CuSO}_4 \cdot 5\text{H}_2\text{O}$) were prepared in sea water and diluted as required. Short and chronic toxicity tests were made for both of species. Mean numbers of the organisms surviving in seawater containing copper concentrations were calculated.

Results: The water quality measurements showed that the average temperature of the water was 20 ± 1 °C, salinity 17.5 ± 1 ‰, pH 8.1 ± 0.2 and dissolved oxygen 7.1 ± 0.2 mg l⁻¹. These values were not statistically different between the controls and the treatments and replicates. There was no mortality in all the controls for all species, indicating that the holding facilities, water, uncontaminated sediment and handling techniques were acceptable for conducting toxicity tests, as required in the standard EPA/COE protocol where mean survival should be $\geq 90\%$. Cu is essential to many organisms but is potentially harmful at some level of exposure. Animals were checked daily for mortality. Survival of all species decreased with increasing copper concentrations in sea water. On the second day, 80% of the shrimp at 20 ppm died. However, at the end of the 13th day, all of the shrimps exposed to 2 ppm Cu or less are alive. All of the pipefish died at the end of the 3rd day at 5 ppm. The results showed that *S. acus* was sensitive to copper than *C. crangon*.

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