

## Assessment of the ecological and human health risks from metals in shrimp aquaculture environments in Central Java, Indonesia

<b>Publons ID</b>	33222954
<b>Wos ID</b>	WOS:000551021300002
<b>Doi</b>	10.1007/s11356-020-09967-8
<b>Title</b>	Assessment of the ecological and human health risks from metals in shrimp aquaculture environments in Central Java, Indonesia
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<b>Publish Date</b>	NOV 2020
<b>Journal Name</b>	ENVIRONMENTAL SCIENCE AND POLLUTION RESEARCH
<b>Citation</b>	15
<b>Abstract</b>	<p>The occurrence and contamination level of seven important toxic metals (Cd, Cu, Co, Cr, Hg, Pb, and Zn) and three additional metals (Al, Fe, and Mn) in the water, sediment, and shrimp muscle in aquaculture areas located in Central Java, Indonesia, were investigated. The results suggest that the majority of metals have higher concentrations in the inlet followed by the outlet and ponds. Cd dissolved in the waters exhibited the highest level in Pekalongan (3.15 +/- 0.33 <math>\mu\text{g L}^{-1}</math>). Although Pb was not detected in the water, it was detected in the sediment, and the concentration ranged from 7.6 to 15.40 <math>\text{mg kg}^{-1}\text{dw}</math>. In general, the heavy metal concentrations in the sediments were found to decrease in the sequence <math>\text{Al} &gt; \text{Fe} &gt; \text{Mn} &gt; \text{Zn} &gt; \text{Cr} &gt; \text{Cu} &gt; \text{Co} &gt; \text{Pb}</math>. Concentrations below the effects range low level based on the Canadian sediment quality guidelines were found for Cr, Cu, Pb, and Zn, whereas moderate sediment pollution (25-75 <math>\text{mg kg}^{-1}\text{dw}</math>) was observed for Cr (all regions), Cu (except in the Pekalongan region), and Zn (Brebes and Tegal regions) according to the US EPA standard. The status of the waters was evaluated by calculating a pollution index derived mostly from Mn and Zn. The ecological risk (geoaccumulation index (I-geo), contamination factor (CF), pollution load index (PLI), and potential ecological risk index (ERI)) determined in the sediments indicated that all studied areas had low to moderate contamination. The concentrations of all metals in shrimp were generally below the maximum limits for seafood, except for Zn (in all stations), Pb, and Cr (Tegal and Pekalongan). The hazard index values for metals indicated that consuming shrimp would not have adverse effects on human health.</p>
<b>Publish Type</b>	Journal
<b>Publish Year</b>	2020
<b>Page Begin</b>	41668
<b>Page End</b>	41687
<b>Issn</b>	0944-1344
<b>Eissn</b>	1614-7499
<b>Url</b>	<a href="https://www.webofscience.com/wos/woscc/full-record/WOS:000551021300002">https://www.webofscience.com/wos/woscc/full-record/WOS:000551021300002</a>
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