

**ECOLOGICAL RISK ASSESSMENT AND MANAGEMENT OF BALLAST  
WATER FROM INTERNATIONAL SHIPS IN BAUAN PORT AREA  
BATANGAS, PHILIPPINES**

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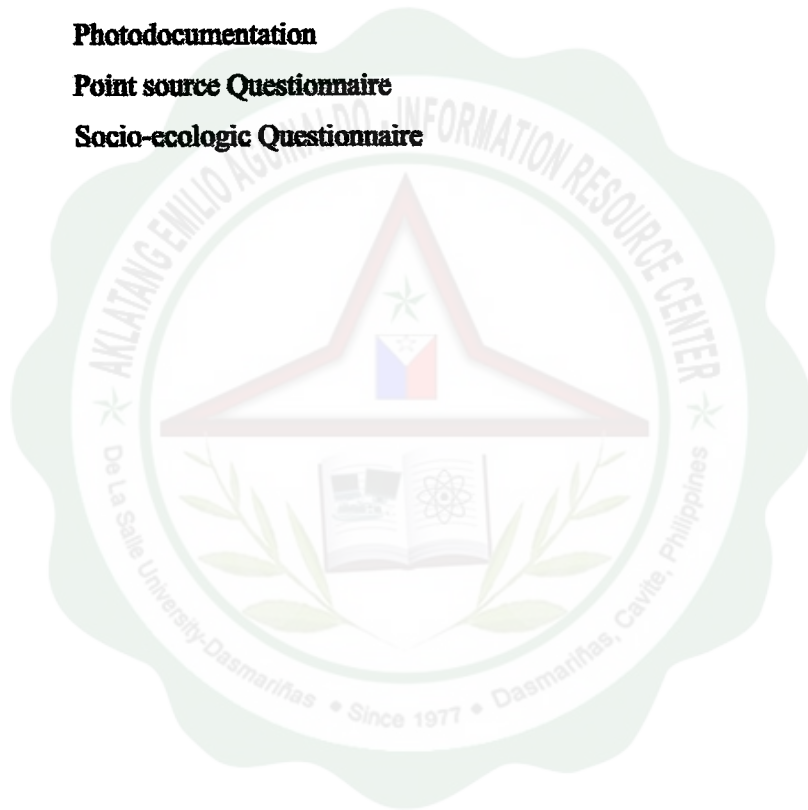


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## ABSTRACT

**RUBIO, JONATHAN S.,** University of the Philippines Los Baños, October 2011.  
**Ecological Risk and Management of Ballast Water from the International Ships in Bauan Batangas, Philippines.**

**Major Professor: Dr NICOMEDES D. BRIONES**

Ballast water collected from international ships in Bauan Batangas, Philippines was used to determine its risk in the coastal water ecosystem. The identification of the risk incurred by the ballast water composed of non-native zooplankton and the biocidal is the main objective of the study.

Ballast water samples were collected from nine international ships as they released ballast water to the coastal port water. The non-native zooplanktons from the ballast water were classified and compared to the indigenous species of zooplankton in the coastal port water. The physico-chemical characteristics of the ballast water were measured and compared to the coastal port water and category class SC water quality of the DENR marine water standards. The toxicity of the ballast water was determined using the *Artemia* bioassay. The ecological risk of the ballast water is identified using the retrospective and prospective risk analysis.

The most abundant zooplankton found in the ballast water is the *Gymnosoma* and followed by *Globigerina* which are tolerant zooplankton. Some of the ballast water zooplankton species when compared to the indigenous zooplankton were present also in

the coastal port water. The relative densities, frequencies and abundance were determined. The zooplankton species were ranked based on their importance values. There are three ships that the number of zooplankton exceeded the standard value of less than 10 organisms per ml of the ballast water.

The retrospective risk analysis shows that the ballast water has possibly affected the indigenous zooplankton, corals, fisheries, and indigenous species. Though, there is no direct observation of the decline of the recipient ecosystem components it can be one of the debilitating factors that change the ecosystem and affect the livelihood and indigenous species.

The risk quotient is used to determine the prospective risk of the ballast water. It shows that there is low risk of some of the physico-chemical factors of the ballast water. The pH, Salinity, phosphate, hardness and temperature have posed a low risk as shown in their risk quotient that exceeded to 1.

The toxicity of the ballast water was determined using the *Artemia* bioassay. The different concentrations of ballast water show a significant difference using the ANOVA test in the survival rate of the *Artemia*. The 100% ballast water inhibited the growth of the *Artemia* while the control has the highest survival rate and the 25%, 50% and 75% have similar survival rate.