Risk assessment of antifouling emissions in sensitive marine environments - semi closed port, marina or an anchoring area

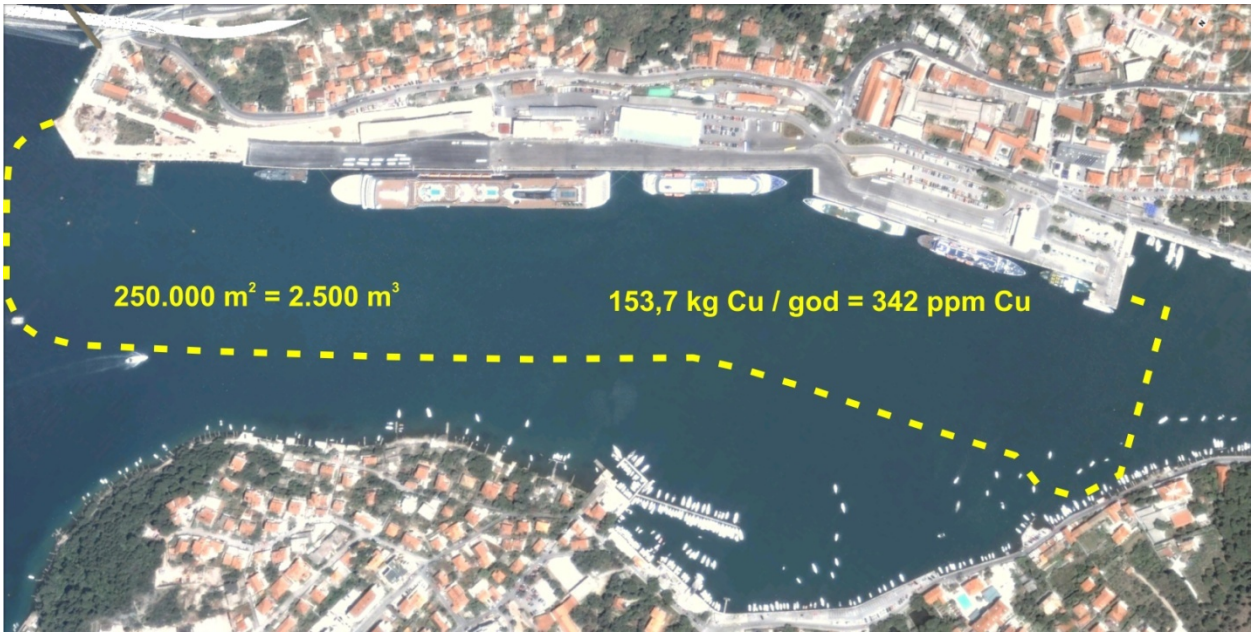
Hrvoje Carić, Institute for Tourism, Croatia, hrvoje.caric@iztzg.hr
Anamaria Štambuk, University of Zagreb, Croatia, astambuk@zg.biol.pmf.hr

Introduction

Growth of tourism in marine environments is constantly increasing environmental contamination risks, frequently neglected by various management practices. Paradoxically, environmental degradation ultimately decreases the quality of resources tourism is dependent upon. Antifouling-related contamination from Vessels is one of the most serious threats posed upon marine ecosystems.

Methodological approach

We propose here an interdisciplinary triangulation to evaluate antifouling-pollution environmental risks within the frame of the Dubrovnik Port case study. Heavy metal environmental burden was calculated based on the ships data (submerged ship area and heavy metal emission rate). Pollution risk was detected and was confirmed by three independent ecotoxicological studies conducted independently in the same area: (1) heavy metals sediment analyses, (2) antifouling related imposex occurrence in banded murex Hexaplex trunculus and (3) biomonitoring study on Mediterranean mussel Mytilus galloprovincialis.



Map: The hypothetical intervention area at the Dubrovnik Port marine area, with the basic parameters for the calculation of copper contamination of sediment (Map source: Google Earth)

Description: The surface area marked on the map is ~250,000 m^2, annual amount of biocide Cu deposit is 153,7 kg, and the volume of the sediment is calculated by multiplying this area with the 1 cm/year sedimentation rate, leading to total volume of ~ 2,500 m^3 of contaminated sediment.

Findings

Presented calculations pointed out that economic benefit of pollution prevention for the port in question can rise up to substantial saving of 1,8 mil € / year. Results of ecotoxicological studies undertaken in this area corroborate the contamination level appraised in these calculations. Chemical analyses of contaminants in the sediment and biological data derived from the past studies on Mediterranean mussel and banded murex provide alarming evidence that Dubrovnik Port can be considered as one of the Adriatic pollution hot spots.

Based on the above it can be concluded that presented calculation of Cu emissions can be calculated based on data on boat traffic that is usually available with port or environmental management authorities. This calculation can serve as an indication of potential antifouling risk for ports, marinas, or anchoring areas of any sensitive or marine protected area with vessel activity. If this indication shows an outstanding value, such as described in the Dubrovnik port case, any of ecotoxicological monitoring methods can be applied to directly monitor and evaluate the pollution impact.

Expected result - implementation

Work presented here offers new and simple methodological approach to assess antifouling environmental risk by combining the calculations of antifouling emission and pollution cost using data available to any port authorities with the simple ecotoxicological endpoints that serve as readily-available indication of environmental threat.

Implementation of methodological approach presented here in the future risk assessment studies will further promote development of Good Environmental Status Descriptors in accordance with the Marine Strategy Framework Directive.

Environmental improvements can and should be achieved through the wider implementation of alternative antifouling technologies that are currently in use or being researched.

Summary

1. Tourism practices generally ignore environmental impacts and can ultimately decrease the quality of environmental resources that tourism is dependent upon.

2. Marine sensitive areas are especially neglected when it comes to the issue of antifouling emissions in tourism / recreational vessels.

3. A calculation of ecotoxicological burden based on boat traffic can serve as an indication of contamination risks.

4. Antifouling Risk Assessment can be confirmed through the biomonitoring methods.

5. Environmental improvements can be introduced through substitution of antifouling coating.

6. Environmental management of sensitive and protected areas should incorporate this type of monitoring and risk assessments.