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Biocide release from antifouling paints may be higher than reported, finds Swedish study

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Ytreberg, E., Lagerström, M., Nöu, S. and Wiklund, A.K.E. (2021) Environmental risk assessment of using antifouling paints on pleasure crafts in European Union waters. *Journal of Environmental Management*, 281: 111846.

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Researchers have evaluated the EU's environmental risk assessment tool for antifouling paint used on leisure boats. Currently, product approval applications can report biocide release rates that have been 'corrected' to account for potential overestimation. However, field observations in Swedish waters suggest that these reductions are not accurate and — in order to protect marine ecosystems — should not be used.

Antifouling paints are biocidal products applied to hulls to prevent the growth and settlement of marine organisms, which increase fuel consumption and maintenance costs. Most of these paints are based on copper compounds. Copper only becomes toxic to organisms at certain levels, so is more sustainable than phased-out coatings based on lead and arsenic, for example. However, copper emissions from antifouling paints have been found to impact water quality[1].

Under the Biocidal Products Regulation (BPR), the EU has developed an environmental risk assessment tool that products must pass before going to market. The tool models environmental concentrations based on estimated release rates of biocides (and Substances of Concern) from the paint surface to the aquatic environment for pleasure craft marinas in four regions. Each region has different acceptable threshold levels due to differing water exchange in its marinas. As Baltic marinas are most susceptible to accumulating biocides, these are subject to the lowest acceptable levels, followed by the Baltic Transition, Mediterranean and Atlantic.

In the EU, two methods are currently approved for predicting biocide release rates from paints: a calculation method and a laboratory method[2]. However, as these are thought to potentially overestimate biocide release in real-world scenarios, fixed correction factors may be applied in product assessment[3]. The researchers note that these factors are based on field data for one coating only, though, and that neither method considers changes in conditions that affect leaching (such as salinity, pH and temperature[4]).

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Biocide release from antifouling paints may be higher than reported, finds Swedish study (continued)

The researchers consider eight coatings authorised for use in Sweden, referring to release rates of copper and zinc reported to the Swedish Chemicals Agency. Rates for six paints were based on the calculation method and two on the laboratory method, with rates then compared to those obtained by a new field-based method based on X-Ray Fluorospectrometry (XRF) (a technique that determines elemental concentrations in different materials by measuring the intensity of elements' characteristic X-ray emissions) at three sites (Nynäshamn, Malmö and Kattegat). This method measures average release rates of copper and zinc 14-56 days after application[5]. No field release rates were obtained for the Atlantic or Mediterranean regions, with Kattegat — considered the closest in salinity conditions — used as a proxy.

The researchers note that zinc was not mentioned in the applications for five of the paints; however, the XRF method showed that zinc was released from four of these coatings, which would impact the outcome of the risk assessment (as cumulative effects are taken into account). Using XRF rates, none of the coatings passed the environmental risk assessment for the Baltic, Baltic Transition or Mediterranean regions. However, most of the coatings passed if the correction factors were applied on the rates obtained via the calculation or laboratory methods. Notably, all paints but two would have failed the risk assessment based on zinc leaching alone (as ascertained via XRF), highlighting the importance of its inclusion in risk assessment.

The results demonstrate the importance of release rate method choice on the outcome of antifouling product approval in the EU, say the researchers. If XRF observations are accepted, all paints studied pose an unacceptable risk in all regions except the Atlantic.

The researchers note that release rates from the eight coatings studied sometimes greatly exceed the level required for efficacy against fouling. One study suggests copper emissions could be reduced by 80% in some cases without loss of efficacy[5]. The researchers suggest that as copper pollution is a global problem, the suggestion to use field-specific release rates in environmental risk assessments would also apply to countries outside the EU. The researchers also posit that not permitting the use of correction factors would incentivise the development of lower-leaching or biocide-free coatings (coatings based on silicone, for example).

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