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**Ecotoxicology of
Antifouling Biocides
With Special Focus on the
Novel Antifoulant Medetomidine
and Microbial Communities**

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Akademisk avhandling för filosofie doktorsexamen i Naturvetenskap med inriktning mot Miljövetenskap som med tillstånd från Naturvetenskapliga fakulteten kommer att offentligt försvaras fredag den 25 oktober 2013 kl. 10.00 i Hörsalen, Institutionen för biologi och miljövetenskap, Carl Skottsbergs gata 22B, Göteborg.

ISBN: 978-91-85529-58-2



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ABSTRACT

Marine biofouling, growth on submerged surfaces, is a problem for the commercial shipping industry but also for recreational boat owners. It leads to increased fuel consumption, loss of maneuverability and is a source of invasive species. The common solution to avoid biofouling is to use antifouling paints containing biocides which hinder the fouling organisms from growing on the ship hull. Medetomidine (4-[1-(2,3-dimethylphenyl)ethyl]-1-H-imidazole, also known as Selektope) is used in antifouling paint due to its ability to inhibit settlement of barnacle cyprid larvae. Exposure to medetomidine hinders settlement and metamorphosis to an adult barnacle at 0.2 µg/l (1 nM), a concentration one hundred thousand times lower than the lethal concentration.

Several studies of possible environmental effects have been performed during the developmental phase of medetomidine as an antifoulant, both on invertebrates and vertebrates. This thesis focuses on the effects on marine microbial communities with studies on short-term toxicity, toxicant-induced succession after intermediate time exposure, long-term microcosm exposure and bioaccumulation. The predicted environmental concentrations (PEC) of medetomidine in different environments have also been established using the MAMPEC model. A worst-case prediction for a Baltic marina generated a water concentration of 0.057 µg/l (0.28 nM). The conclusion for this thesis is that microalgal and bacterial metabolic functions are not affected by medetomidine until very high concentrations (2 mg/l, 10 µM). The same conclusion can be drawn for direct effects on species composition although there is an indication that grazing organisms in the microbial community could be affected, changing their grazing pattern and hence the microalgal species composition. Long-term effects of medetomidine on microbial communities from an antifouling paint were unfortunately surpassed by effects of zinc which was also present in the paint. It can therefore also be concluded that zinc affects both metabolic functions and species composition in microbial communities to a larger extent than does medetomidine.

Keywords: Antifouling biocides, Medetomidine, Microbial communities, Periphyton, Epipsammon, Plankton

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