A Leach Rate Cap on Copper Antifouling Paints in California: A Regulatory Case Study

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Outline

• Background
• Monitoring Studies and Results
• CDPR Re-evaluation
• MAM-PEC Modeling
• Leach Rate Regulation
Antifouling Paints

- Prevention of biofouling of marine vessels results in:
  - Increased fuel efficiency
  - Decrease in vessel damage
  - Invasive species prevention

- Copper is the primary biocide in antifouling paints (AFPs)
  - Broad spectrum
  - Leaches out of paints

- Copper in antifouling paints is a biocide
  - Regulatory authority of the California Department of Pesticide Regulation

Nall, et al., 2017
Copper and Water Quality

• Copper (Cu\(^{2+}\)) is toxic to both target and non-target organisms
  • Only as labile or bioavailable copper

• Species of concern are mussels (blue and Mediterranean)

• California Toxics Rule (CTR) is the enforceable water quality standard

• Dissolved Copper:
  • Acute water quality criterion: 4.8 µg/L
  • Chronic water quality criterion: 3.1 µg/L
Marinas and Water Quality

• Recreational marinas susceptible to Cu pollution
  • High concentration of boats
  • Long periods of time in marinas
  • Poorly flushed

• 303(d) listing of impaired waters

• DPR Monitoring Study
  • Salinity
  • Region
  • Boat density
Monitoring Results

• DCu and associated toxicity exceeding water quality standards in many California marinas.

• Toxicant Identification Evaluation Tests showed DCu was the likely cause of toxicity.

• Saltwater Marinas

• Region – Southern California

• Boat density

Singhasemanon, et al., 2009

- Acute Water Quality Criterion, 4.8 µg/L
- Chronic Water Quality Criterion, 3.1 µg/L

LRS = Local Reference Site; OUT of the marina
DPR Re-evaluation and Legislative Action

- Occurs when DPR determines there are (or likely are) adverse effects of a pesticide on human health and/or the environment.

- Leach rate calculations for every Cu-AFP in California

- In 2014, Assembly Bill 425 from the California Legislature passed:
  - Evaluate registration of Cu-AFPs
  - Determine a leach rate cap
  - Make mitigation recommendations

Do pesticides meet the standard for continuous registration?

What is the allowable leach rate of copper in AFPs that will be protective of water quality?
MAM-PEC Modeling

- Marine Antifoulant Model to Predict Environmental Concentrations (MAM-PEC)
  - Input parameters: underwater surface areas, Cu speciation, salinity, DOC, suspended solids, marina size, etc.

- CTR chronic criterion of 3.1 µg/L dissolved copper is the goal.

- What leach rate will be sufficient to achieve that concentration or lower in California marinas?

Boatus.com

Total Maximum Daily Loads in place already regulate to this concentration.
Modeling, continued

• Investigated leach rate and loading of copper in 5 marina scenarios:
  • #1: 733 boats
  • #2: 1,270 boats
  • #3: 1,833 boats
  • #4: 2,263 boats
  • #5: 4,754 boats

• Obtained maximum allowable leach rates for AFPs for the five scenarios ranging from 1.12 to 24.60 µg/cm²/day
3 CCR § 6190: No copper-based antifouling paint/coating shall be registered over a leach rate of 9.5 µg/cm²/day

- Any currently registered paint above that leach rate will be cancelled.
- For recreational boats only
- Effective July 2018

- The leach rate cap reduces Cu in all marinas but may not be continuously protective of the largest marinas

- Risk management decision: AFPs still need to be efficacious

- Regulation used field work, data assessment, modeling, and outreach to develop a mitigation scenario.
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Questions

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