Revised Federal Standard Proposed for Copper in Marine Waters

Presented by

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Overview

- EPA issued for public comment draft aquatic life criteria for copper in estuarine/marine waters (July 2016)
  - Updated water quality criteria uses the Biotic Ligand Model (BLM), which allows the criteria to vary with changes in water quality parameters (i.e., temperature, salinity, dissolved organic carbon [DOC], and pH)
  - The 2016 draft copper criteria will be more conservative than the current 2003 for Southern California marinas where DOC is low
  - EPA "normalized" the toxicity data using the BLM to a "standard" water quality criteria
    - Standard = pH of 8.0, temperature of 22°C, DOC of 1.0 mg/L, and salinity of 32 ppt
  - Please note, the draft criteria may not be adopted by the State of California

Key Changes in 2016 Revised Criteria

Current Federal Criteria (2003)	Proposed Revised Criteria (2016)
Chronic criterion = 1.9 µg/L	Chronic criterion = 1.3 µg/L
Acute criterion = 3.1 µg/L For a given 24-hour average concentration	Acute criterion = 2.0 µg/L For a given 1-hour average concentration
44 genera used	78 genera used
Mytilus mussel most sensitive species	*Haliotis rufescens* abalone most sensitive species
Actual EC_{50} data used	BLM used to normalize all EC_{50} data to standard BLM assumptions for temperature, pH, salinity, and DOC, where DOC is 1 mg/L

Please note, the draft criteria may not be adopted by the State of California. The State currently uses the California Toxics Rule (CTR) for enclosed bays and estuaries. However, there is concern that the State may be vulnerable to third-party lawsuits requesting federal standards be applied to specific programs.

Copper BLM Output Example for Varying DOC

Sample Label	Temp (°C)	pH	Cu (µg/L)	DOC (mg/L)	Salinity (ppt)	Model Mode	CMC (µg/L)	CCC (µg/L)
EPA Baseline	22	8	1	1	32	EPA WQC	**1.97**	**1.30**
Example Marina	17-22	7-8	1-10	**0.5**	32-34	EPA WQC	**0.99**	**0.66**
				1		EPA WQC	**1.97**	**1.30**
				1.5		EPA WQC	**2.97**	**1.97**
				2		EPA WQC	**3.96**	**2.62**
				2.5		EPA WQC	**4.95**	**3.27**
				3		EPA WQC	**5.94**	**3.93**

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Newport Marina	(20)	(8)	(3)	**1**	(33)	EPA WQC	**1.97**	**1.30**
				1.5		EPA WQC	**2.97**	**1.97**
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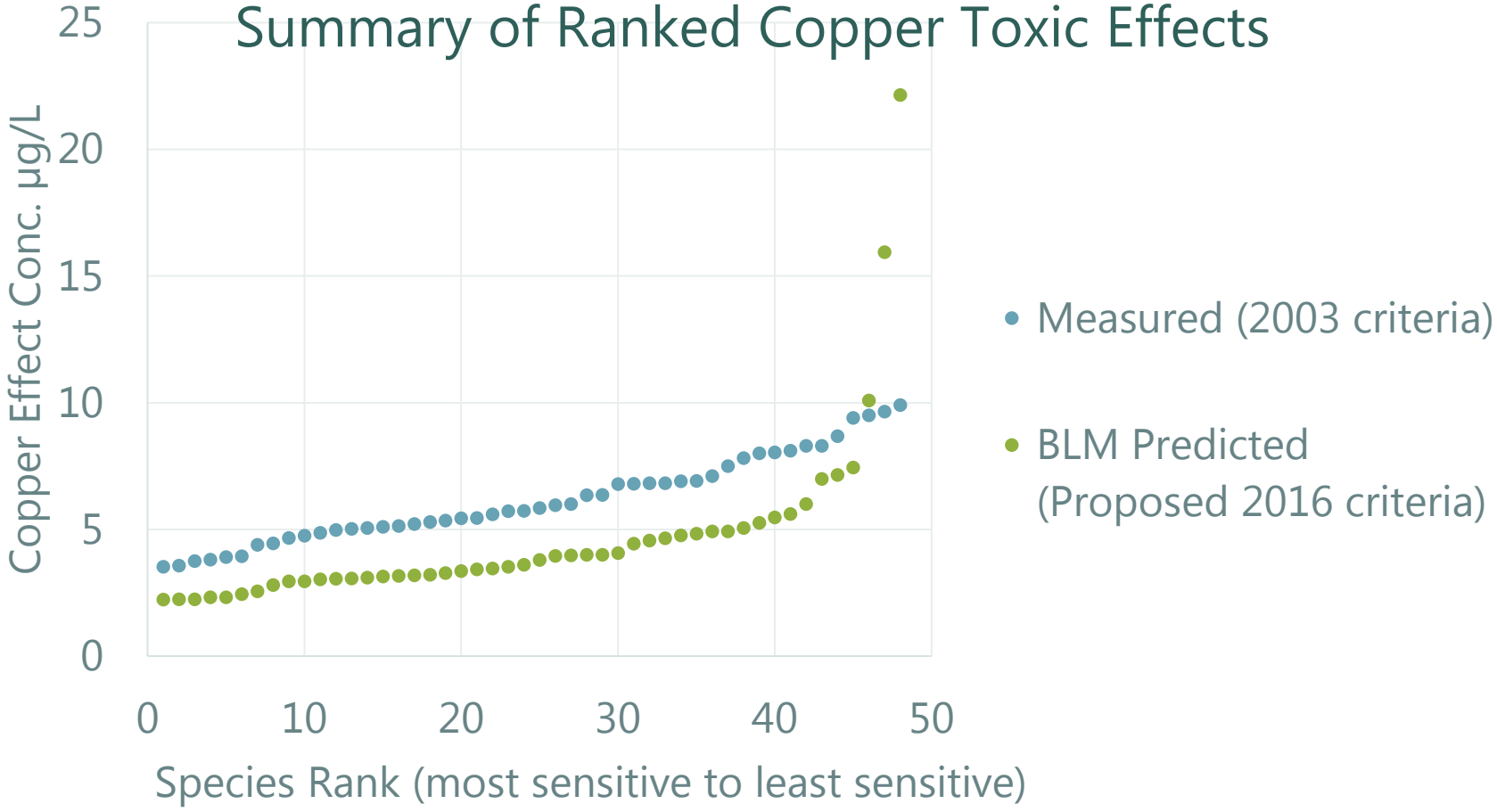


Shift in toxicity curve because of BLM adjustment

50 most sensitive data points used to develop criteria (natural seawater)

Comparison of recorded effects concentration to BLM adjusted effects concentration

Biotic Ligand Model

- BLM had already been accepted for freshwater
- State Water Resources Control Board asked EPA to consider approval of the BLM for marine waters
  - BLM allows for adjustment of site-specific water chemistry that can bind copper, leaving it less bioavailable
  - For waters with high dissolved organic carbon, the copper limits are much higher

Key Issues that Affect the Relevance of the Criteria to California Harbors

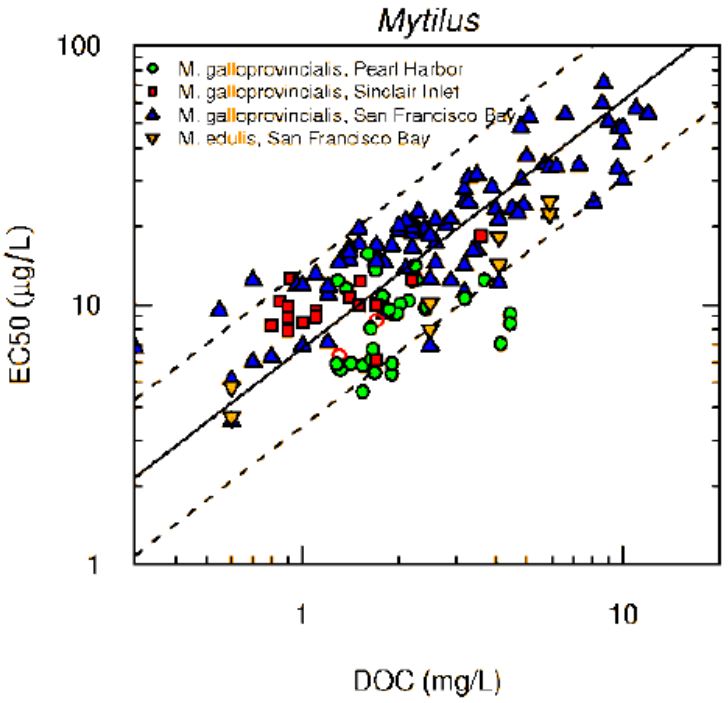
- New criteria are lower than the California Ocean Plan's background copper concentration of 2 µg/L
- The BLM does not provide the flexibility it was intended to provide
- The BLM should include flexibility for considering different habitat types and regions (e.g., the Gulf, enclosed bays, harbors, saltmarshes, etc.).
- Greater pressure to conduct EPA-approved site-specific criteria evaluations (Water Effect Ratio testing)

Key Uncertainties that Drive the Criteria Lower

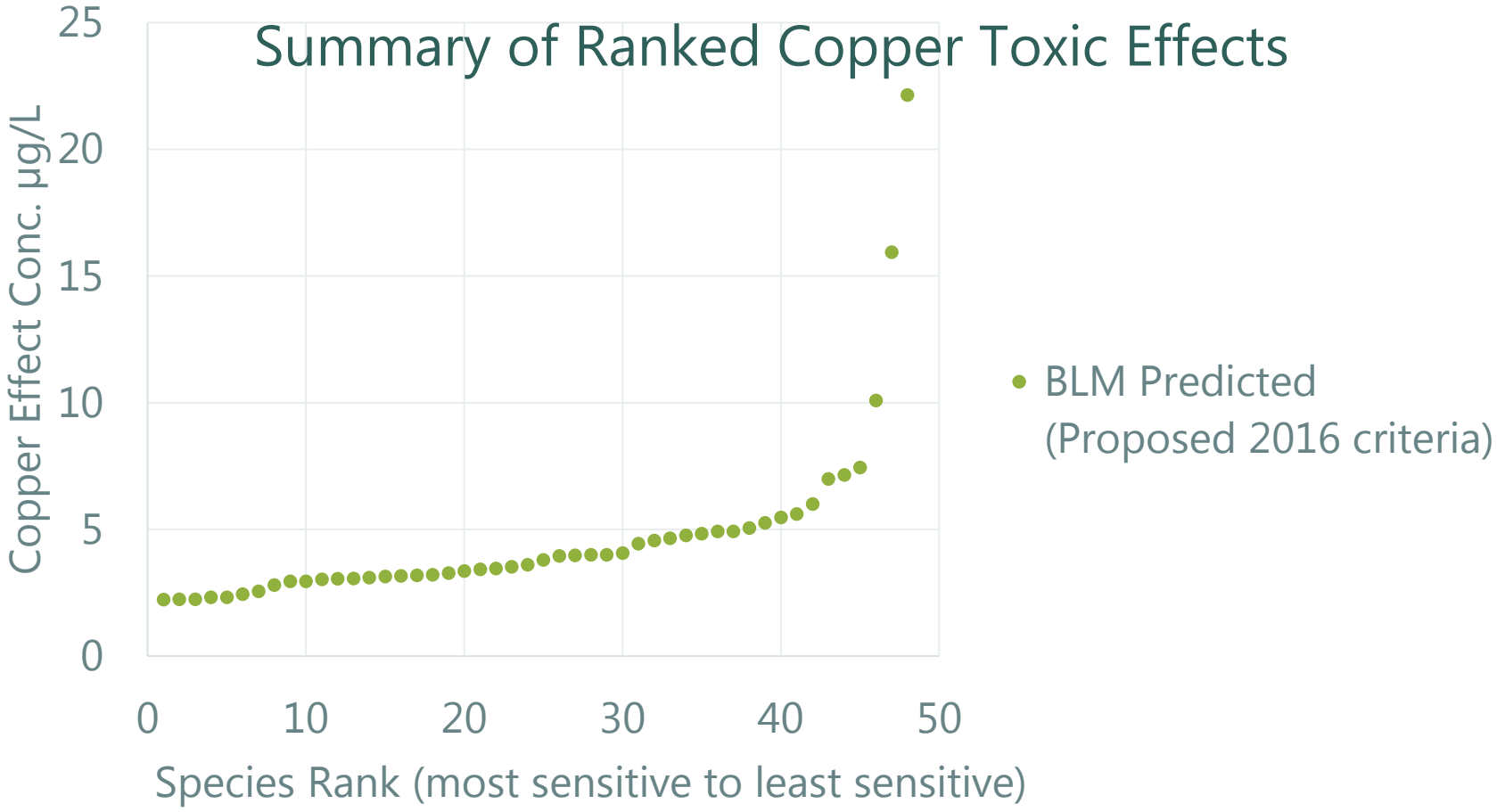
- Uncertainty resulting from a single abalone test used to derive the draft criteria
  - Draft criteria are ultimately driven by results from a single red abalone toxicity test published in 1989
  - Species only present in waters in or near kelp forest habitats; not relevant to enclosed-shallow water bays and harbors or waters in the Gulf and East Coast
  - In contrast, 2003 draft criteria were ultimately derived based on results of hundreds of mussel (*Mytilus spp.*) tests

Key Uncertainties that Drive the Criteria Lower

- Uncertainty associated with normalizing the laboratory-derived toxicity test results to an assumed and non-validated DOC value
  - EPA has assumed DOC is at 2 mg/L for all tests when laboratory DOC and test location are not known
  - This included the single abalone test driving the draft criteria
  - This affected 60% of the 50 most sensitive tests



$$Recorded\ effect\ level \div DOC = adjusted\ effect\ level$$



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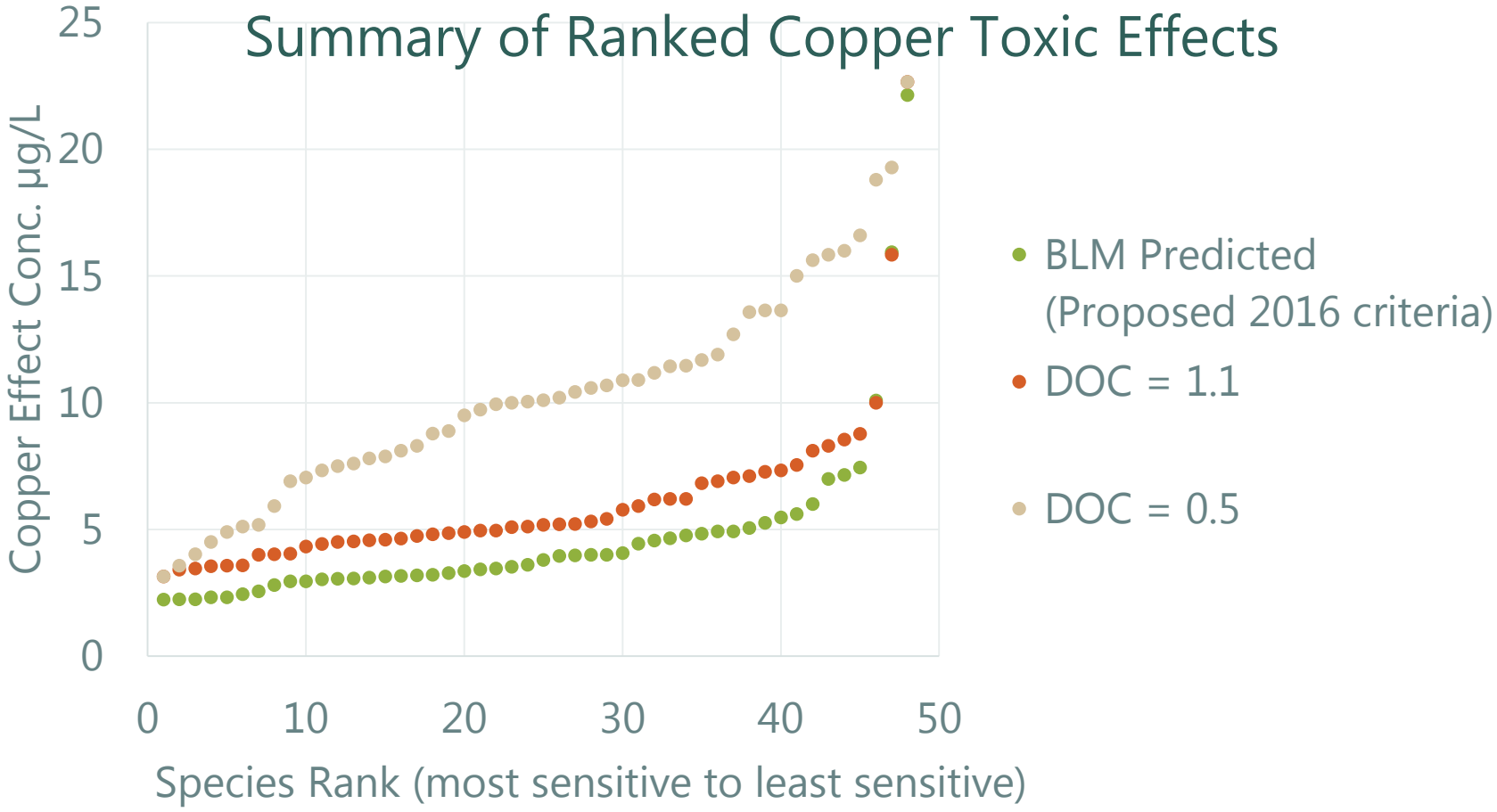

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Key Uncertainties that Drive the Criteria Lower

- Uncertainty in calculation of the acute chronic ratio (ACR) value used to establish the chronic criterion
  - Highly sensitive freshwater species are used to estimate marine species ACR

Technical-based Recommendations

- Criteria should be based on a robust data set; additional abalone data should be collected
- Revise criteria based on actual/new data
  - The toxicity test data set that is modified by the BLM should only include:
    - Species and test conditions known to occur in U.S. waters
    - Paired toxicity tests with actual water quality measurements (specifically DOC)
- Chronic criteria should be derived by marine organism acute:chronic measurements
  - Additional paired chronic/acute tests are needed to justify a new marine-based ACR

Questions/Discussion