Emerita analoga (Stimpson)-Possible New Indicator Species for the Phycotoxin Domoic Acid in California Coastal Waters

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Abstract

We evaluate and confirm the utility of the common sand crab (Emerita analoga) to monitor the algal toxin domoic acid (DA) in the coastal environment. Emerita and sea mussels (Mytilus sp.), a general sentinel indicator for DA, were collected from natural populations over an 11-month period in Monterey Bay, California, and tested for DA using the HPLC-UV method. DA levels in Emerita ranged from 0.07 to 15.4 µg DA g\(^{-1}\) and coincided with observed density trends in Pseudo-nitzschia sp. nearshore. The toxin was not detected for any of the mussels collected for this study.

Introduction

The potential impact to human health, fisheries, and marine life posed by harmful algal blooms (HABs) is mediated by our ability to successfully detect HAB species and the toxins they produce. While sophisticated analytical tools have greatly aided our efforts in the field and in the laboratory, monitoring for the presence of natural marine toxins with general sentinels indicators is still the fundamental approach in safeguarding public health for government agencies tracking marine toxins. The US National Oceanic and Atmospheric Administration (NOAA), the California Department of Health Services (CDHS) and other agencies frequently monitor DA in California coastal waters using the sea mussels, Mytilus trossulus, a bivalve indicator species, to monitor the presence of Pseudo-nitzschia spp. and their domoic acid (DA) production. This method has been particularly useful for the CDHS to monitor the presence of DA in marine life in the San Francisco Bay area (Hatfield et al. 1995, 1996).

HPLC-UV Analysis

SAX Extracts were analyzed for DA isocratically using the method described by Lifschitz et al. (1999).

Table 1. Extraction Efficiency Experiments

<table>
<thead>
<tr>
<th>Tissue Type</th>
<th>Concentration</th>
<th>% Recovery</th>
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<tbody>
<tr>
<td>Sand Crabs 1</td>
<td>25 µg DA/g</td>
<td>99%</td>
</tr>
<tr>
<td>Mussel 1</td>
<td>25 µg DA/g</td>
<td>93%</td>
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Conclusion

The change in DA loads detected for the common sand crab (Emerita analoga) in synchrony with the rise and fall of Pseudo-nitzschia spp. strongly suggests real-time compatibility to nearshore diatom activity. This coupled with the ease with which DA was extracted from sand crab tissue, recommends this intertidal invertebrate as a more successful, cost effective alternative to the widely utilized bivalve indicator.