

Ten Years of Domoic Acid Surveillance in Stranded Marine Mammals of Monterey Bay 2009-2019



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Introduction and Background



- The Long Marine Lab Marine Mammal Stranding Network has responded to stranded marine mammals for over 30 years in Central California.
 - *200-250 marine mammals strand per year in Monterey and Santa Cruz counties.*
- ***Pseudo-nitzschia australis*** is one species of diatom that produces domoic acid (DA) and is associated with harmful algal blooms (HAB) on the central coast.
 - **Domoic acid is a neurotoxin** and has caused unusual stranding and mortality events *in* marine mammals since at least 1991 in Central California (Scholin et al., 2000).
 - These strandings tend to occur during El Nino Southern Oscillation conditions and are generally around March – May, and July– September
 - *Most work on DA focused on live stranded and rehabilitated marine mammals, clinical effects, and often single species.*

Objectives

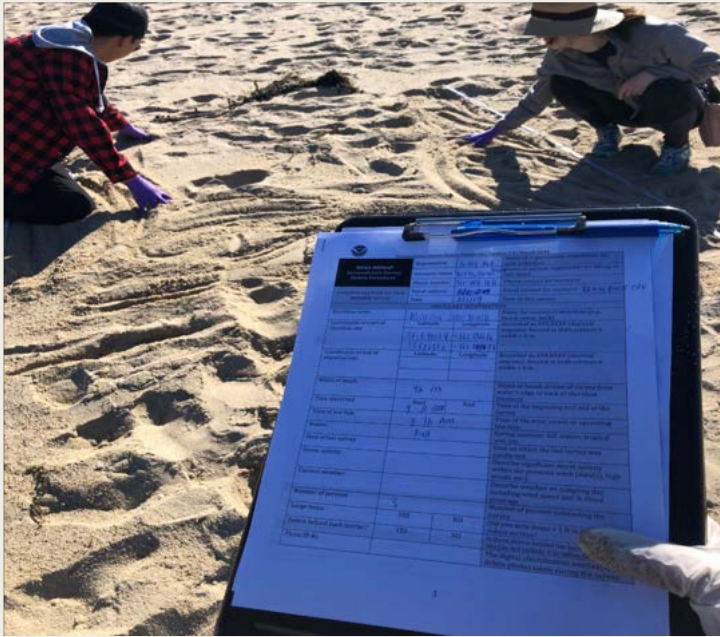
1. To quantify background levels of domoic acid in stranded marine mammals regardless of the cause of death.
2. To develop a rigorous rubric for assigning cause of death (COD) in dead stranded marine mammals.

Approach

- Collected stomach contents, feces, and urine from all fresh dead stranded marine mammals over a ten year period.
- Tested for domoic acid and quantified temporal patterns as well as patterns across species
- Developed cause of death criteria based on literature, did preliminary analysis of DA levels across COD categories



Methodology and Strategy



Objective 1

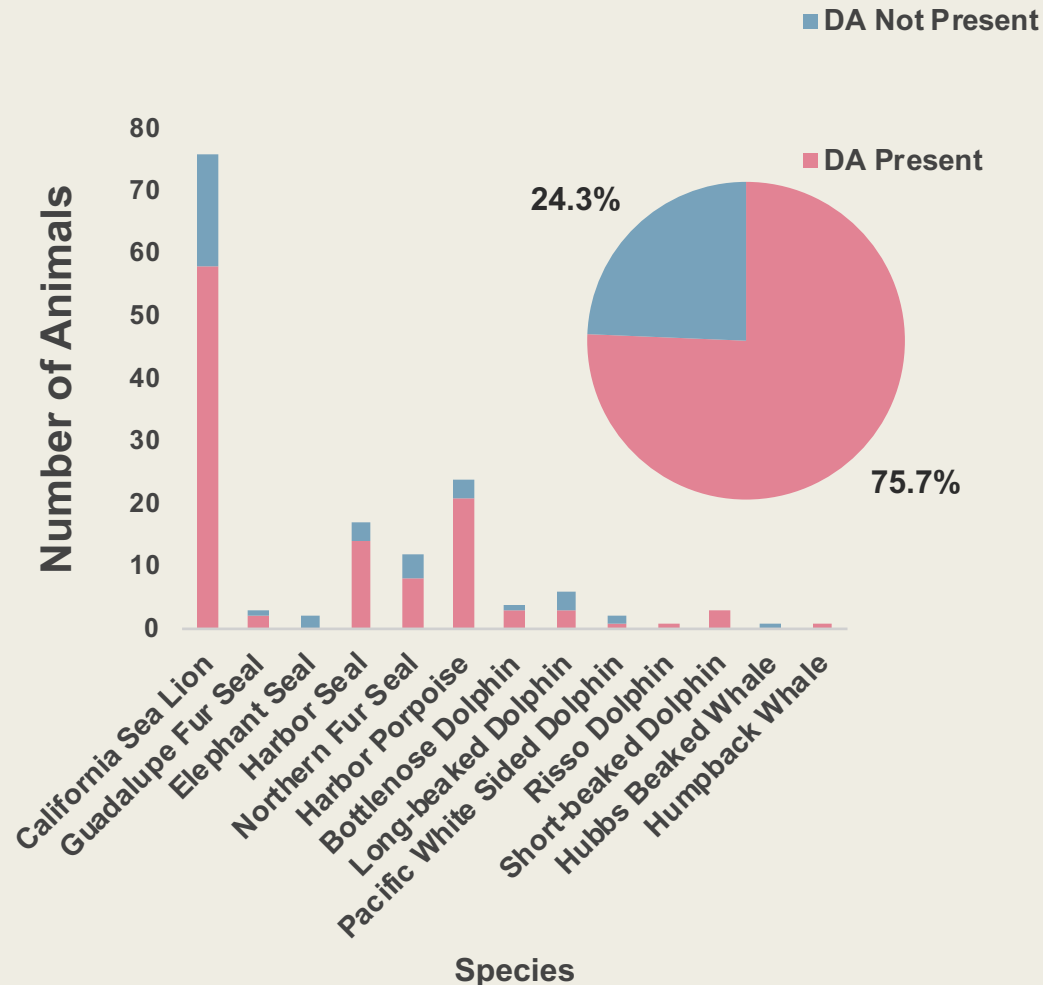
- 152 animals fresh dead (code 2) or moderately decomposed (code 3) were collected by volunteers and staff
 - Level-A forms were filled out at the stranding site
 - Carcasses collected or necropsied fresh
- Feces, urine, stomach contents were collected and analyzed for DA

Objective 2

- Criteria for determining COD were developed from the literature and surveying the last ten years of necropsy records
- Necropsy reports were reviewed by two independent reviewers and assigned a COD

DA presence in marine mammals

DA Presence in Stranded Animals in Central Coast
2009-2019

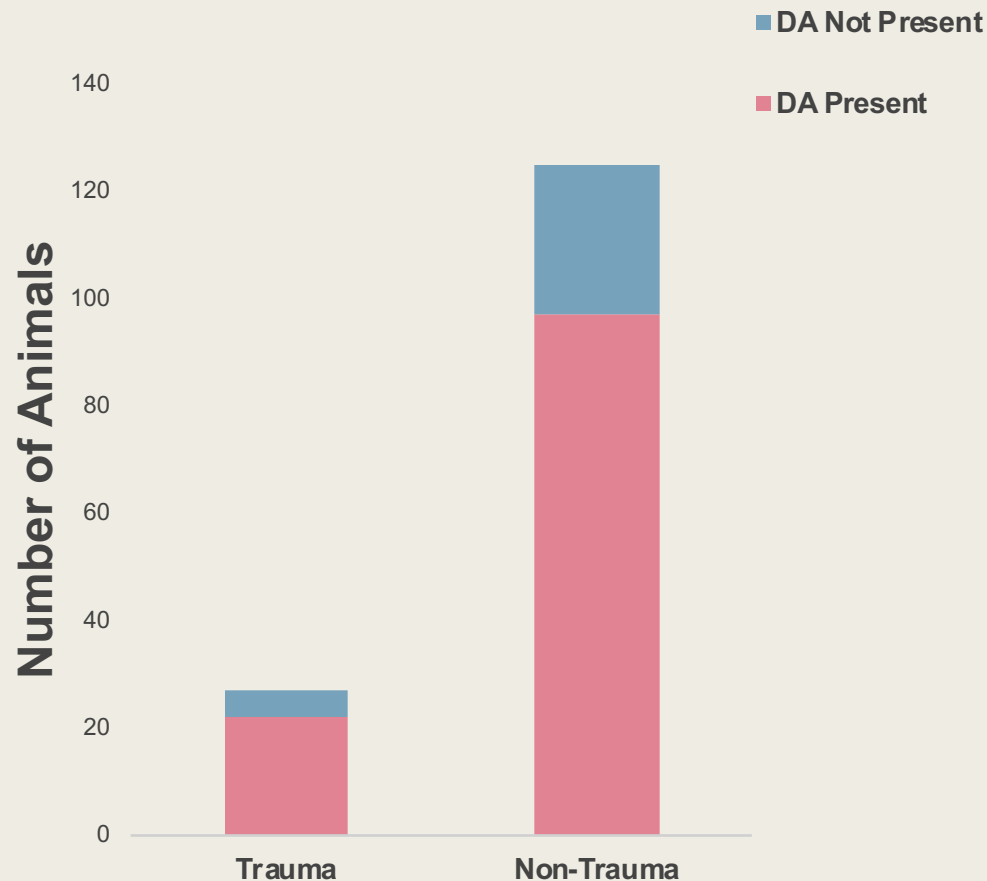


- DA levels ranged: 0 to 238412.48 ng g⁻¹
- 75.7% of animals had DA present in at least one sample
- 11 of the 13 species collected tested positive for DA.
- 50% of our study set were California Sea Lions
- 78.9% of CSLs were positive for DA
 - Only group to have individuals die from Domoic Acid Toxicity

Even outside of a known HAB event, background levels of DA in central coast marine mammals is very high.

DA present regardless of COD

DA Presence in Trauma vs. Non-Trauma Cause of Deaths



- 77.6% of non-trauma cases tested positive for DA
- 77.3% of trauma cases tested positive for DA

These data indicate that background levels of DA are likely present in most animals rather than just sick or injured animals.

- Future work:
 - Further refine of the COD rubric
 - Is there seasonality of acute and chronic DA exposure?
 - Brain analysis to identify chronic vs. acute DA exposure in all fresh dead animals

Acknowledgements and References

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 - John H. Prescott Program (grants NA19NMF4390159, NA18NMF4390057, NA17NMF4390093, NA15NMF4390035)
- Scholin, C. A., Gulland, F., Doucette, G. J., Benson, S., Busman, M., Chavez, F. P., ... Van Dolah, F. M. (2000). Mortality of sea lions along the central California coast linked to a toxic diatom bloom. *Nature*, 403(6765), 80–84. <https://doi.org/10.1038/47481>

