### Supplemental Tables and Figures

#### Supplemental Tables

**Table S1.** Dungeness crab domoic acid contamination monitoring and management program design1 in California, Oregon, and Washington before the 2020-21 and 2015-16 seasons (2015-16 season values are provided in parentheses if different from the 2020-21 season).

|  |  |  |  |
| --- | --- | --- | --- |
| **Dimension** | **California** | **Oregon** | **Washington** |
| Action threshold (ppm) | >30 ppm in viscera >20 ppm in meat | ≥ 30 ppm in viscera ≥ 20 ppm in meat | ≥ 30 ppm in viscera ≥ 20 ppm in meat |
| Detection limit (ppm) | 2.5 ppm | 1.0 ppm | 1.0 ppm |
| # of crabs per site | 6 crabs | 6 crabs | 6 crabs |
| # of sampling sites | 17 sites | 12 sites (5 sites in 2015) | 4 sites (2 sites in 2015) |
| # of management zones | 8 coastal zones (none in 2015) | 12 coastal zones (none in 2015) | 4 coastal/3 inland zones |
| Management actions | Area closure, evisceration order (area closure only in 2015) | Area closure, evisceration order (area closure only in 2015) | Area closure, evisceration order (area closure only in 2015) |

1 See **Table S2** for more information on the management of commercial and recreational Dungeness crab fisheries in California, Oregon, and Washington.

**Table S2.** “3S” management (sex-size-season) of commercial and recreational Dungeness crab fishing in California, Oregon, and Washington.

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| **State** | **Open** | **Close** | **Min. size (in)** | **Daily bag limit** | **Season notes** |
| *Commercial* |  |  |  |  |  |
| Washington | Dec 1 | Sep 15 | 6.25" | Males only | Summer season (Jul 1-Sep 1): 2500-lb trip limit, potential closures, more testing |
| Oregon (bay) | Sep 1 | Dec 31 | 6.25" | Males only | No weekends or holidays, not in December if adjacent ocean area is closed |
| Oregon (ocean) | Dec 1 | Aug 14 | 6.25" | Males only |  |
| California (northern) | Dec 1 | Jul 15 | 6.25" | Males only |  |
| California (central) | Nov 15 | Jun 30 | 6.25" | Males only |  |
|  |  |  |  |  |  |
| *Recreational* |  |  |  |  |  |
| Washington | Year round | ---- | 6.25" | 5 males |  |
| Oregon (bay) | Year round | ---- | 5.75" | 12 males |  |
| Oregon (ocean) | Dec 1 | Oct 15 | 5.75" | 12 males |  |
| California (northern) | Early Nov | Jul 30 | 5.75" | 10 males/females | First Saturday in November |
| California (central) | Early Nov | Jun 30 | 5.75" | 10 males/females | First Saturday in November |

**Table S3.** Sources of news releases describing closures, advisories, and other management actions related to biotoxin contamination on the U.S. West Coast.

|  |  |  |  |
| --- | --- | --- | --- |
| **State** | **Type** | **Years** | **Link** |
| PSMFC | Dungeness crab | 2004-present | <http://www.psmfc.org/crab/> |
| WA | Dungeness Crab | 2009-present | <https://wdfw.wa.gov/fishing/commercial/crab/coastal/letters-notices> |
| OR | ODFW news releases | 2010-present | <https://www.dfw.state.or.us/news/2021/index.asp> |
| OR | ODA news releases | 2016-present | <https://odanews.wpengine.com/tag/shellfish/> |
| CA | CDFW news releases | 2015-present | <https://cdfwmarine.wordpress.com/2020/> |
| CA | CDPH shellfish advisories | 2014-present | <https://www.cdph.ca.gov/Programs/OPA/Pages/Shellfish-Advisories.aspx> |

**Table S4.** A guide to interpreting the results of the power analysis.

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|  |  |  |  |
| --- | --- | --- | --- |
| **Category** | **Notation** | **Interpretation** | **Implication** |
| False negative (Type II error) | β | Tests clean but is actually contaminated | Opened riskily - a public health threat |
| True positive (Power) | 1 - β | Tests contaminated and is actually contaminated | Closed correctly |
| False positive (Type I error) | α | Tests contaminated but is actually clean | Closed unnecessarily - a burden on fishers |
| True negative | 1 - α | Tests clean and is actually clean | Opened correctly |

1 Negative test = clean test; Positive test = contaminated test

2 Clean = <1 in 6 crabs above the action level; Contaminated = ≥1 in 6 crabs above the action level

**Table S5.** Range of plausible values for the key characteristics used to construct the simulated early- and mid-season contamination events.\*

|  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
|  | **Early season contamination event** | | |  | **Mid-season contamination event** | | |  |  |
| **Scenario** | **Lat. Span** | **Initial intensity** | **N. Duration** | **S. Duration** | **Day of peak** | **Lat. of peak** | **Peak intensity** | **Peak size** | **Duration** |
| Small | 1-1.5° | 0.6-0.8 | 25-50 days | 0.3-0.6 of north | Day 75-250 | 42.5-45.5°N | 0.4-0.6 | 1-1.5° | 10-40 days |
| Medium | 2-2.5° | 0.7-0.9 | 50-75 day | 0.3-0.6 of north | Day 100-250 | 42.5-45.5°N | 0.5-0.7 | 1-2.5° | 10-50 days |
| Large | 4° | 0.8-1.0 | 75-125 days | 0.3-0.6 of north | Day 150-250 | 42.5-45.5°N | 0.6-0.8 | 1-3.5° | 10-60 days |

\* Lat = latitudinal/latitude; N = northern; S= southern; intensity = proportion of crabs contaminated above the 30-ppm action level; southern duration = a proportion of the northern duration

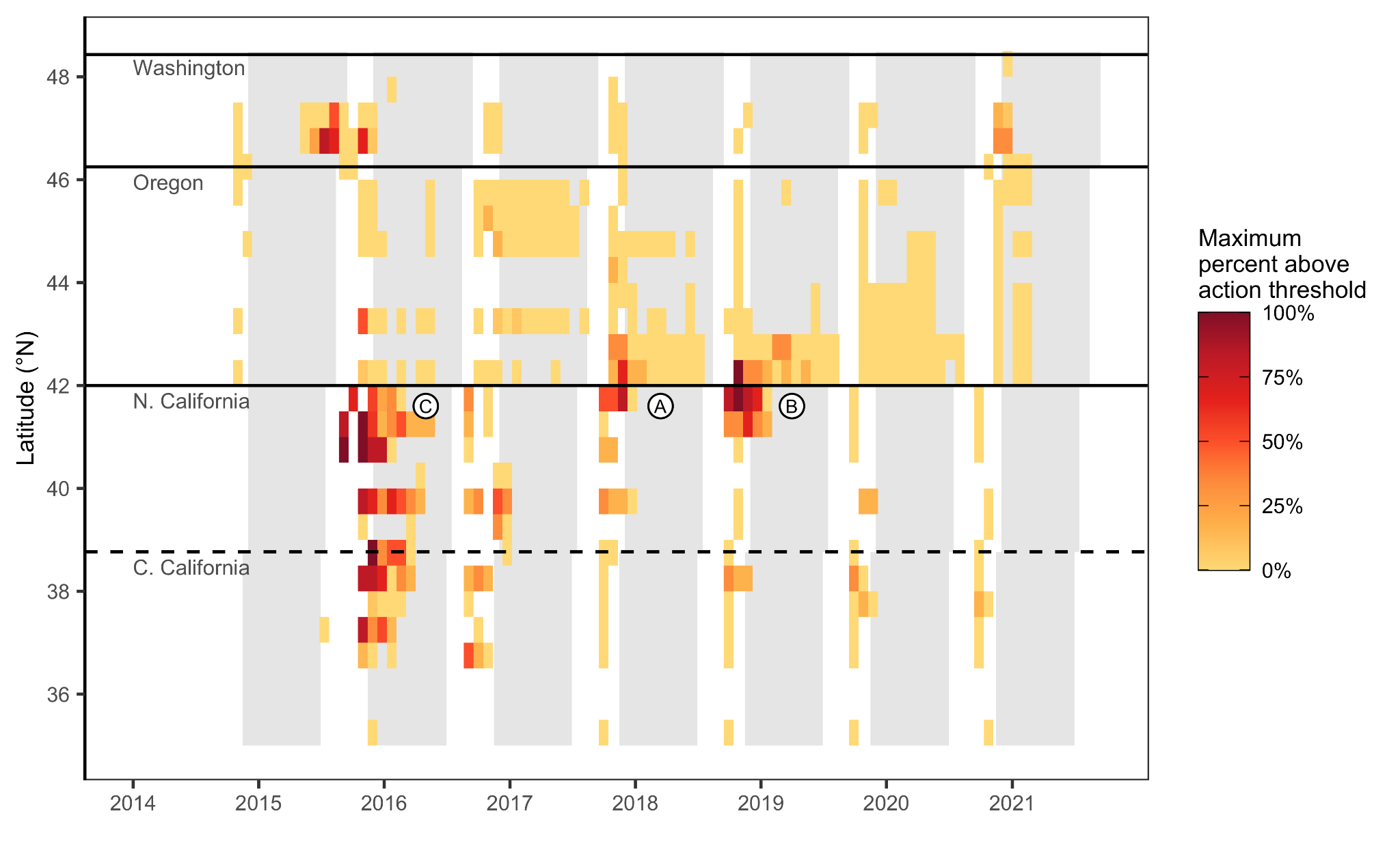
**Table S6.** Latitudinal density of domoic acid monitoring sites for Dungeness crab by state.

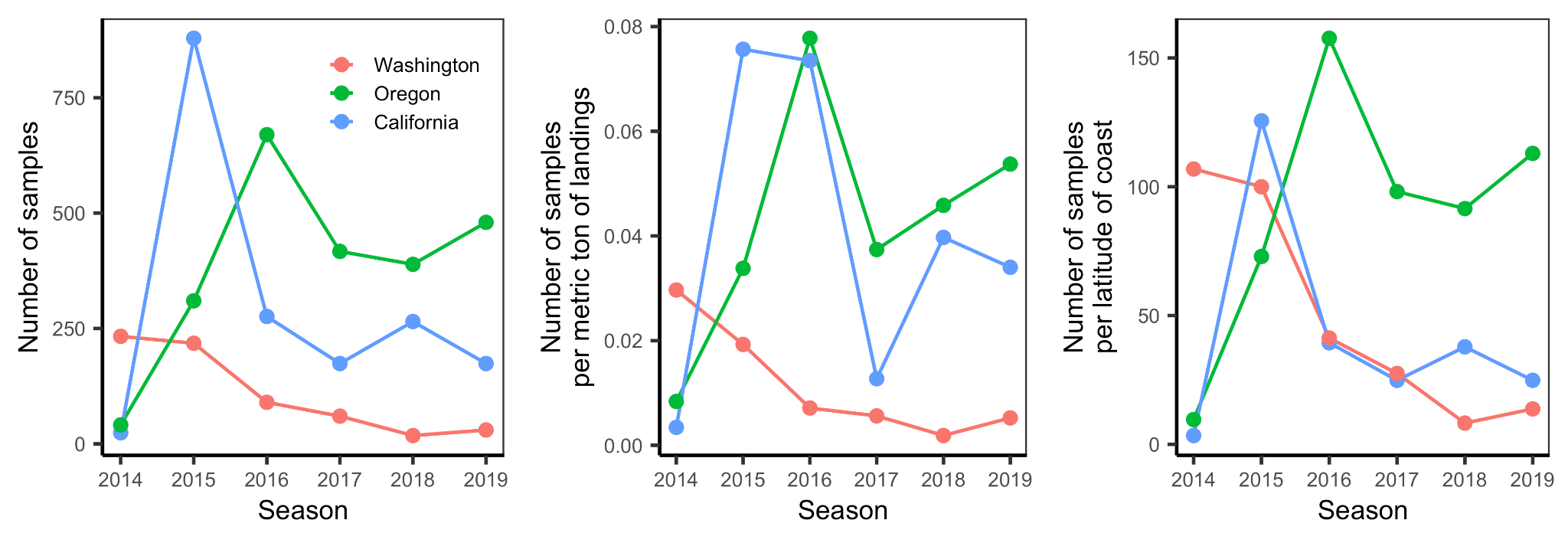
|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **State** | **Lat. range** | **Lat. height** | **2015-16 site density** | **2020-21 site density** |
| Washington | 46.25° - 48.43°N | 2.18° | 2 sites, 1 per 1.09°N | 4 sites, 1 per 0.55°N |
| Oregon | 42.00° - 46.25°N | 4.25° | 5 sites, 1 per 0.85°N | 12 sites, 1 per 0.35°N |
| California | 35.00° - 42.00°N | 7.00° | 17 sites, 1 per 0.41°N | 17 sites, 1 per 0.41°N |

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#### Supplemental Figures

**Figure S1.** The maximum proportion of crabs contaminated above the 30-ppm action level in surveys falling with 0.5° latitude and 4 week intervals along the West Coast from 2014-2021. The (A) small, (B) medium, and (C) large contamination scenarios are modeled after the labeled historical contamination events.

**Figure S2.** Number and density of Dungeness crab domoic acid samples by state and season. The season labels on the x-axis indicate the years during which seasons begin (e.g., 2014 indicates the 2014-15 commercial fishing season).