Domoic Acid: DA is a naturally occurring marine biotoxin that may be produced during "blooms" of some species of the diatom, *Pseudo-nitzschia*. DA is known to accumulate in seafood species, including birds, mammals, fish, and other invertebrates. Studies in crabs (Schultz et al., 2013) and snails (Cotter and Girard, 2006; Medellin; Forenza, et al., 2010), document preferential accumulation of DA in the internal organs, with less frequent and lower concentrations in muscle tissue.

Domoic Acid Monitoring in California and Oregon Surf clam

State agencies in California and Oregon work to obtain seafood samples from volunteers and the commercial operators, who grow or harvest seafood. Dungeness Crab is primarily harvested in Oregon and Northeastern and Central California, with Dungeness Crab harvested predominately in Southern California. Tissue concentrations of DA are compared in a tissue level, with 30 ppm for Dungeness Crab viscera and 20 ppm for other seafood, including Dungeness Crab meat. State health agencies determine the appropriate actions needed to protect human health. When DA concentrations exceed action levels in seafood, health agencies may close a fishery, issue an advisory to not consume the viscera, or close an entire fishery.

**Methods**

California Dungeness and Rock Crab Sample Collection and Analysis: The California Department of Public Health (CDPH) and the California Department of Fish and Wildlife (CDFW) work with the commercial and other seafood, including the Dungeness and Rock crab fishery in California to obtain representative samples prior to the opening of the crab fishing season, and Rock Crab samples, as available, given the year round fishery. Sampled fields are collected for DA at the CDFW laboratory by high performance liquid chromatography with a method detection limit of 1.5 and 2.5 ppm. The visceras is analysed first, and the meat is subsequently analysed if the visceras DA concentrations are elevated (see below for details).

Oregon Dungeness Crab Sample Collection and Analysis: The Oregon Department of Agriculture (ODA) partners with the commercial Dungeness Crab fishery in Oregon to obtain Dungeness Crab samples prior to the opening of the crab fishing season, as well as during the season when DA levels are elevated in indicator species. Sampled fields are analysed for DA at the ODA laboratory by high performance liquid chromatography with a method detection limit of 1.5 and 2.5 ppm. The visceras is analysed first, and the meat is subsequently analysed if the visceras DA concentrations are elevated. The ODA laboratory uses liquid chromatography/mass spectrometry to ensure meat samples can be analysed if visceras DA concentrations are detected at or above 3 ppm.

Evaluation of Paired Viscera and Meat Domoic Acid Data: The California Office of Environmental Health Hazard Assessment (OEHHA) staff obtained DA concentration data for the available paired paints and meat samples from the same individual from CDFW and ODA. Data were evaluated for each species when sufficient samples were available (Dungeness and Rock crab). Only data for which DA was detected above the method detection limit in both viscera and meat for the same individual were included. Comparison between source and tissue types, and regression models of paired meat and viscera were evaluated using the Microsoft Excel Data Analysis ToolPak.

**Results**

For this data set, viscera and meat DA concentrations were higher in California than Oregon for Dungeness Crab, and higher in the viscera of California Dungeness Crab compared to Dungeness Crab (Figures 1 and 2). This is generally consistent with geographic variations in the occurrence of DA in the environment (OEHHA, 2016).

- Increasing mean DA concentrations occurred at or above the estimated visera “break-through” threshold range of 30 ppm for Dungeness Crab (the model adapted from Schultz et al., 2013) (Figure 2). The relationship between DA in meat and viscera was statistically significant for both Dungeness and Rock Crabs (Figure 2). Based on the linear regression models, mean DA concentrations (Dungeness crab fishery log transformed data and Rock Crab both log transformed and non-log transformed) in Rock Crab are predicted to rise above 50 ppm in visceras concentrations of 77 ppm and 171 ppm, respectively. However, the lowest visceras concentrations in which paired meat samples were 20 ppm or higher occurred at or above 5 ppm in the Dungeness and Rock crab catch (Table 2). Additional samples will be incorporated, as available, into these evaluations to further understand the relative tissue distribution of DA in crabs, and inform sample collection decisions.

Conclusion:

Seaboard seafoods that are candidate for DA testing and fishery closures. In California, DA testing of crabs is conducted in marine areas with major commercial fisheries to include Dungeness Crab with a population of 100 million or more (OCEANIC, 2015). In Oregon DA testing of seafood in marine areas is conducted where Dungeness Crab is harvested, which is believed to provide a clearer indication of when both meat and viscera need to be tested for DA.

Tissue Distribution of Domoic Acid in Field-collected Crabs from the California and Oregon Coasts

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Federal action levels for domoic acid (DA) in shellfish have been declared federal and state efforts to protect human health. Action levels are tissue specific, with 30 ppm for Dungeness Crab viscera and 20 ppm for all other seafood, including Dungeness Crab meat. Viscera action levels are 30 ppm for Dungeness Crab and 20 ppm for all other seafood, including Dungeness Crab meat. State agencies in California and Oregon work to obtain seafood samples from volunteers and the commercial operators, who grow or harvest seafood. Dungeness Crab is primarily harvested in Oregon and Northeastern and Central California, with Dungeness Crab harvested predominately in Southern California. California applied the Dungeness Crab viscera action level of 30 ppm to Rock Crab viscera. Existing data, including published studies, show that DA preferentially accumulates in viscera of shellfish and fish. In previous testing in California, DA was occasionally analyzed in crab meat above the 30 ppm threshold; however, this was only occurs when viscera exceeded the 30 ppm threshold. However, the specific range of DA concentrations in viscera at which the crab meat may exceed the action level has not been determined. In this study, DA is paired meat and viscera of Dungeness Crab from Oregon were evaluated to understand the relationship of DA in viscera and meat, and determine whether DA in viscera could be used to predict DA in meat of different species. Our Dungeness Crab data show there is a statistically significant positive association between DA levels in meat and viscera, consistent with the earlier laboratory study for that species (Schultz et al., 2013). Rock Crab data show a similar pattern, but the smaller sample size is limiting. Further evaluations of this relationship could provide a clearer indication of when both meat and viscera need to be tested for DA.