

# Biological and physical dynamics of domoic acid production off the Washington coast

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ABSTRACT: The relationship among *Pseudo-nitzschia* distributions, particulate toxin levels in seawater, and the energetic and highly variable water masses of an upwelling-dominated region are explored using data collected during summer cruises off the Washington coast in 1997 and 1998. In the early summer of both years, an area of maximum domoic acid (DA) accumulation was located approximately 50 km off the coast within a counterclockwise, cold feature known as the Juan de Fuca eddy. The stations in the eddy with the highest domoic acid concentrations coincided with high numbers of *Pseudo-nitzschia pseudodelicatissima* (Hasle) Hasle (2.7 μg DA equivalents $L^{-1}$, up to 0.6 × $10^6$ cells $L^{-1}$ in 1997 and 0.2 μg DA equivalents $L^{-1}$, up to 0.2 × $10^6$ cells $L^{-1}$ in 1998), a species known to produce toxin in this region. Other known toxin-producing species were sometimes present, but at <5% of the total *Pseudo-nitzschia* population when >0.1 μg DA equivalents $L^{-1}$ were measured. In 1998, large-scale surveys indicated that high levels of particulate DA in seawater persisted at least until 1 October, covering a maximum area of 100 $km^2$ off the Washington coast in midsummer. The appearance of high levels of DA (up to 2.7 μg DA equivalents $L^{-1}$), coincident with high numbers of *P. pseudodelicatissima* (up to 15.4 × $10^6$ cells $L^{-1}$) at Kalaloch beach on the central coast in late September, was followed by the accumulation of record levels of toxin in razor clams. This toxic episode was preceded by a downwelling-favorable wind event, with associated onshore transport in near-surface layers. We suggest that the Juan de Fuca eddy may be one source of DA to the Washington coast. The duration of upwelling and the exact timing of fall storms likely play an influential role in the intensity of the bloom and the movement of toxic cells from the eddy to the coast.