

**THESIS ABSTRACT**

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Title                    **The Uptake, Distribution and Modification of PSP Toxins in Intertidal Organisms**

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Paralytic Shellfish Poisoning (PSP), a food-borne illness produced by several dinoflagellate derived neurotoxins, has long been associated with the consumption of bivalve shellfish. Called "Mussel Poisoning", although it frequently occurs from eating other bivalves, the disorder has occurred in North and South America, Asia and Europe. In recent years it has become evident that the PSP toxins can occur in marine organisms other than bivalves. Researchers, primarily in Southeast Asia, have demonstrated the presence of PSP toxins in gastropod and cephalopod molluscs, echinoderms, crustaceans and some fish species. Some studies in the Pacific Northwest have indicated that toxin is sometimes present in a wide variety of species locally.

The presence of PSP toxins in non-bivalves has many serious implications. Most toxin monitoring programs, run by public health agencies, only check bivalves for toxicity. Usually beaches closed to the general public for bivalve collection are open to the collection of other animals. If high levels of PSP toxins are occurring in these other animals, a real health hazard may exist. Recent experience has shown that as more Asian immigrants move into the Pacific Northwest, and the dietary habits of other Americans become more cosmopolitan, eating patterns change to include marine animals not previously consumed. Thus the risk of exposure to PSP toxins from non-bivalves is increased.

While some research has been done on the occurrence of PSP toxins in non-bivalve marine animals, little has been done to identify the source of the toxins in these animals. In addition, there are few explanations for the ability of these animals to take up potent neurotoxins with no apparent harm to themselves. This ability points to the possibility of physiological or behavioural defense mechanisms in some marine organisms.

PSP research in the past has been hampered by the lack of a rapid, efficient analytical technique for the identification and quantification of all of the 12 naturally occurring PSP toxins. The recent development of a new analytical method, based on High Pressure Liquid Chromatography, which fills all of these criteria, has opened new doors for PSP research. With the HPLC method, questions previously unanswerable, such as the nature of individual toxin changes as materials move through the food web, can now be addressed.

The objective of this research was to answer some of these questions utilizing this new tool. To investigate the dissemination of PSP toxins through the food web, a survey of toxicity in intertidal organisms was conducted. The organisms studied fell into two trophic groups--primary consumers of dinoflagellates (bivalves, barnacles, tubeworms) and secondary consumers (crabs, starfish). The animals were sampled from one location over a period of several months, during which two small *Protogonyaulax catenella* blooms occurred. The samples were analyzed by HPLC to check overall toxin content and changes in toxin profile during the course of the toxic dinoflagellate blooms. To support results from the field studies and further investigate changes in toxicity, laboratory feeding studies of barnacles and crabs were conducted. The results indicated that passage of PSP toxins through the food chain does occur after a *Protogonyaulax catenella* bloom and that the nature of the toxin profile changes according to consumer species and the length of time elapsed since the original bloom.

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