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Abstract: The mussel industry in Sweden has since the beginning of the 1980's suffered from seasonal occurrence of diarrhetic shellfish toxins in mussels. The toxins may cause diarrhea, vomiting and nausea in humans. The organisms responsible for these problems are microalgal cells belonging to the genus *Dinophysis* in which several potentially toxic species occur in Swedish waters. There is a Swedish regulation on critical abundance of these species which initiate an intensified sampling of both mussels and algae and eventually also closure of farms. A clear relationship between the abundance of *Dinophysis* and toxin content in mussels is however not always obvious. On reason for this is that the toxin content in cells varies both within species, between species and between areas. The main objective with this thesis was to explore the observed discrepancy between cell abundance and mussel toxicity. The procedure was by improving the knowledge about variations in toxin content and composition of the toxins in the *Dinophysis* cells.

Two areas were sampled, one representing the outer coastal zone and one in a more sheltered area of the inner west coast archipelago. It was found that sampling technique could have a crucial effect on both cell numbers and the observed toxin content in cells. In the worst case, the sampling method could lead to a substantial cell loss as well as an underestimation of the toxic content of the remaining cells, thus underestimating any forecast of mussel toxicity. It was further found that the toxin content in the *Dinophysis* cells had an inverse relationship to population density, so that cells of low abundance contained substantially more toxins compared to cells from a larger abundance. It was found that cells of *D. acuminata* of high toxin content may be up to 15 times more toxic compared to cells occurring in high abundance. This seemed to be a novel result. One possible explanation to the decrease of cell toxin content as abundance increases was attributed to that recently divided cells of *Dinophysis* contained about half the toxin content compared to undivided cells. A spatial difference in toxin content was also evident as lower abundances of *Dinophysis,* found in the outer coastal zone, contained higher toxic levels compared to cells occurring in high abundances in the inner archipelago. A substantial amount of toxins was also found to be outside the cells when *Dinophysis* cells occurred in high cell abundances, indicating that the toxins could actively be excreted possibly as an allelopathic substance. Another important finding was that *D. acuta* contained the overall highest amounts of toxins of the *Dinophysis* species found along the Swedish west coast, indicating that this species is the main contributor of toxin in Swedish mussels. This was further supported by that *D. acuta* occur at the same time as toxins normally start to appear in mussels.

In conclusion several factors were found that could be responsible for the observed discrepancy between cell abundance of *Dinophysis* and mussel toxicity. The results do indicate that it is not the actual cell number of *Dinophysis* that is crucial in predicting occurrence of toxins in mussels. Somehow the toxin content of the *Dinophysis* population has to be included in forecasting shellfish toxicity. The future challenge will be to find a practical, fast and cost-effective way to monitor toxins on a regular basis.

Keywords: *Dinophysis,* Dinoflagellates, HAB, Toxins, OA, DSP, DST, DTX, PTX *Dinophysis acuta, Dinophysis acuminata, Dinophysis rotundata, Dinophysis dens*, Skagerrak, Koljö Fjord,