Dinophysis acuminata distribution and specific toxin content in relation to mussel contamination

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Abstract

The first field trip coincided with a large bloom of Dinophysis acuminata. As the D. acuminata bloom in 1995 occurred in August, the contamination experiment being in July provided negative results since mussels were not contaminated. However, concentrates of Dinophysis spp. from different depths were performed during the bloom in August and all the mussel samples from the monitoring network were analysed according to the above described procedure.

Results

Besides toxin contents in mussels, the French phycotoxin network monitors phytoplankton communities. Every year, Dinophysis spp. blooms producing diarrhoeic shellfish toxins (DST) are followed in relation to DST contamination. However, no clear correlation was found between the presence and density of toxic algae and shellfish toxicity. Mussels may contain toxins when there are few or no Dinophysis in the water, and vice versa. This preliminary study reports on the feasibility of a monitoring system involving morays of mussels in a selected site for early detection of DST events. Two cruises conducted in Seine Bay at times when Dinophysis blooms were likely to occur, studied the heterogeneity of the spatial distribution of the algae and the variability in their toxin content. A mussel contamination test was carried out in situ. Results are compared to the Dinophysis spp. distribution in the zone. Concentrates of Dinophysis spp. were determined to estimate the toxicity of the cells.

Exp. setup: Two cruises (Dinosea 1 and II) took place in July 1994 and 1995. Batches of 4 to 5 kg of cultivated mussels, (4 to 5 cm length), coming from a DST-free area as checked by control analyses, were immersed for 7 days at the depth of the water, at four stations on the north and south sides of the mouth of the Seine River. The mussels were removed six days after immersion (see figure 1 for stations location and Table 1 for the batches depths).

Hydrologic description of the zone and phytoplankton samples

For each profile, hydrological vertical structures have been systematically described by use of a specific profiler composed of a diffraction-pattern size analyzer, a standard CTD probe and a sampling array of eight syringes, electrically triggered from the board. All measurement and sampling were synchronised in real time.

CTD probe acquires: depth, temperature, salinity, chlorophyll-like fluorescence, photosynthetic available radiation. Based on diffraction pattern analysis, the particle size analyzer estimates the total volume of particles present in a 8ml free cell flow and measures the size distribution in 30 classes from 0.7 to 400 µm.

Operated in real time, this probe is used for the detection and the sampling of specific water layers (fluorescence maximum, aggregate, zooplankton-rich layers). A hose attached to the profiler structure allowed a precise sampling of the layers.

Dinophysis concentration: Pumping depth from a hose attached to the profiler was also determined on the basis of data relative to particle measurements (proximity of the thermocline, fluorescence, particle size distribution). The concentration technique, as described by Masset et al. (1996), used a peristatic pump which delivered a known volume through two successive screens (100 and 200 µm). A precise amount of the enriched fraction was carefully collected from the 20-µm screen; 10 ml were measured under gentle stirring for precise evaluation of the Dinophysis spp. concentration, and the rest was filtered on a 10-µm filter stored in methanol, for further analysis.

Cell counts of Dinophysis spp.: An aliquot of the sample was counted in a 10-ml sedimentation chamber after dilution, if required. Volumes with cell density per liter was estimated at 12% for a mean density ca 1000 cells.l.

Preparation for analysis: The digestive glands of mussels were dissected and immediately frozen. Extraction was performed according to the protocol of Lee et al. (1987). For phytoplankton concentrates, the 10-µm filters were washed several times with methanol in an ultrasonic bath, and the methanolic fractions were extracted twice with dichloromethane after addition of water. The dry extracts were stored at 70°C until analysis.

Analytic method: The dry extracts of mussel digestive glands and phytoplankton concentrates were treated for HPLC analysis according to the method of Lee et al. (1987). The relative error measured on four replications of extracts of mussel and phytoplankton concentrate was respectively 10% and 13%.

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References


