

## **Temporal and spatial distribution of harmful algal bloom (HAB) species in coastal waters of Kota Kinabalu, Sabah, Malaysia**

### **Abstract**

Development of harmful algal blooms (HABs) in coastal waters of Kota Kinabalu, Malaysia, is a recurring problem. The blooms are caused by *Pyrodinium bahamense* var. *compressum* and *Cochlodinium polykrikoides*. Recently, another potential NAB species, *Gymnodinium catenatum*, was identified. The occurrence of these species is known to be related to a range of factors, including seasonal monsoons, nutrients, physical parameters and geomorphology. To understand the occurrence and distribution of the three species, extensive samplings were carried out over a period of one year, including the South West Monsoon (SWM), North East Monsoon (NEM) and Inter-Monsoon (IM) periods, at 5 stations located in 3 different bays off Kota Kinabalu. Cell density of the three HAB species and in situ physical parameters (salinity, pH and temperature) were recorded. Secondary data such as rain fall and wind speed were obtained from the Meteorology Department, Kota Kinabalu. *C. polykrikoides* and *G. catenatum* occurred year-round with the highest cell densities of  $1.54 \times 10^7$  cells L<sup>(-1)</sup> and  $1.24 \times 10^6$  cells L<sup>(-1)</sup> in December (NEM). *P. bahamense* var. *compressum* was found in low numbers with maximum cell density of  $2 \times 10^4$  cells L<sup>(-1)</sup> in August (SWM). The absence of *P. bahamense* var. *compressum* during the highest peak of *C. polykrikoides* and *G. catenatum* was related to nutrient concentrations and composition. The three species tended to occur at stations near the river and in a sheltered area. The results of the study indicate that the coastal area of Kota Kinabalu may continue to experience HAB problems, unless environmental conditions change significantly.