Seasonal changes in abundance of four Acartia species (Copepoda, Calanoida) in the coastal waters of Peninsular Malaysia; relationship with monsoon transition

ABSTRACT

The seasonal variation of *Acartia* copepods from the waters of Peninsular Malaysia was studied via monthly observations at 2 fixed stations on the west coast (Pulau Pinang and Port Dickson) and 2 fixed stations on the east coast (Kijal and Penyabong) from October 2012 to March 2014. In situ temperatures recorded during this period were relatively constant (mean 29.6±0.7°C) at all stations. Salinitymeasurements were also fairly constant (mean 30.3 ± 1.1 PSU) for all stations during this study except at Penyabong where the salinity during the northeast (NE) monsoon season was significantly lower ($p<0.05$) (mean 23.2 ± 7.9 PSU) than during the southwest (SW) monsoon season. Concentration of chlorophyll *a* at Pulau Pinang during the SW monsoon period was significantly higher ($p<0.05$) (mean 14.6±5.4µg/L) than during the NE monsoon period. Four species of *Acartia* were identified at all stations: *A. amboinensis, A. erythraea, A. pacifica* and *A. spinicauda*. At Kijal, *Acartia erythraea*population was significantly higher ($p<0.05$) (mean 695.7 ± 618.4 inds/m^3) compared with the other stations. *Acartia* species composition at Port Dickson was similar to Penyabong, while Kijal was similar to Pulau Pinang. Small-sized species, *Acartia pacifica* and *A. spinicauda* were dominant at Port Dickson and Penyabong, while the larger-sized species, *Acartia amboinensis* and *A. erythraea* were dominant at Kijal. Generalized additive mixed models (GAMMs) were applied to abundance data to describe the environmental preference associated with population recruitment of these species, and the results identified a relative contrast in environmental envelopes occupied by the larger and smaller-sized species. The large-sized species preferred colder and more saline water while the small-sized species preferred warmer and lower salinity water. The succession and co-occurrence of similar sized species is suggested to be a result of the combined effect of species-specific preference to varying temperature–salinity regimes.