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 29.6C) at all stations. Salinity measurements 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 14.6g/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/m3) 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.