Effects of gamete concentration, age and contact time on fertilization success in the tropical species of long-spined black sea urchin, Diadema setosum (Leske, 1778)

ABSTRACT

An experiment was conducted to determine the effect of sperm dilution, egg concentration, sperm-egg exposure time, and gamete aging on fertilization success in the tropical species of long-spined black sea urchins, Diadema setosum. The results obtained from the present study revealed that sperm dilution, sperm age, and sperm-egg exposure time were consecutively the most important factors influencing fertilization success, while egg concentration was not significant over the wide range tested. Sperms retained their potency for more than two hours only in relatively dense sperm suspensions (≥10-4 dilution of 'dry' sperm) whereas they showed lower viability and strength with increasing age and dilutions. In egg-sperm exposure time trials, more than 80% fertilization was accomplished at lower sperm dilutions (10-3-10-2) within 10 s of contact, while at higher sperm dilutions, longer times were required to achieve the higher fertilization rates. On the other hand, eggs lingered in good quality for up to 3 h and no adverse effects or abnormality in fertilization were detected in a series of sperm dilution tested. These results suggest that sperm dilution and its limited longevity can play a vital role in limiting the fertilization of sea urchin eggs in the field during natural breeding. It follows, therefore, that the tropical sea urchin (D. setosum) is under considerable selective pressures to spawn synchronously in order to generate high sperm concentrations and higher sperm-egg encounters in the water column to maximize the likelihood of successful fertilization.

Keyword: Sea urchin; Gamete concentration; Gamete dilution; Gamete age; Contact time; Fertilization