

Impacts of gamete concentration, age and contact time on the fertilization success in the tropical species of white sea urchin, *Salmaciella dussumieri*

ABSTRACT

The globoid sea urchin (*Salmaciella dussumieri*) occurs abundantly in the Indo-West Pacific from the Island of the West Indian Ocean, East Africa, Madagascar, Red Sea, South-East Arabia, Ceylon, Bay of Bengal, North Australia, Philippine, China and South Japan and Australia, and also has significant biological, ecological, aquaculture, conservational and medicinal importance. An experiment was carried out to assess the influence of sperm dilution, egg concentration, sperm-egg exposure time, and gamete aging on fertilization success of *S. dussumieri* in a captive laboratory condition. It has been found that dilution, age and contact time of sperm to egg were successively the most dominant factors effecting the success of fertilization, but concentration of eggs did not significantly so over the range investigated. The sperms retained their competency for more than two hours only in relatively dense sperm concentrations ($\geq 10^{-4}$ dilution of 'dry' sperm), although they exhibited lower capability and potency with increasing dilutions and age. In the trials of the egg-sperm exposure time, >80% eggs were fertilized within 10 sec of contact time at lower dilutions (10^{-3} - 10^{-2}) of concentrated sperm, while some longer times were required to get the higher rates of fertilization. On the contrary, eggs remained in good quality for up to a period of 3 h and no abnormality or any adverse effects in fertilization were observed. The findings obtained from the present experiment reveal that limited longevity of diluted sperm have an important effect on fertilization rate of sea urchin eggs during natural spawning seasons in the field. Hence, the globoid sea urchin (*S. dussumieri*) is under extensive selective pressures to breed synchronously with the purpose of producing high sperm concentrations and higher sperm-egg interactions to maximize the success of fertilization in the water column.

Keyword: Sea urchin; *Salmaciella dussumieri*; Sperm concentration; Gamete age; Contact time; Fertilization rate