Effects of seismic energy releases on the survival and development of zoeal larvae of Dungeness crab (Cancer magister)

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In blind, controlled field experiments, early Stage II zoeae of Dungeness crab (Cancer magister DANA) were exposed to sounds from single discharges of a 13.8-litre array of seven air guns. Their survival and development were followed during subsequent laboratory culture. Immediate mortality was low (0 to 2%) and showed no significant difference between control and exposed larvae (alpha > 0.05). Across all treatments and blocks of the experiment, survival to the molt to Stage III averaged 88.8%. The conditional Stage IV survival rate averaged 69.8%. The times to the molts to Stage III and Stage IV averaged 14.4 and 34.9 days, respectively. For immediate and long-term survival and time to molt, the field experiment revealed no statistically significant (alpha > 0.05) effects on zoeae for exposures as close as 1 m from the array, nor for mean sound pressure as high as 231 dB re 1 mu Pa and cumulative energy density up to 251 J/m sub(2).

Post hoc power calculations showed that any reduction in zoeal survival as a result of sound exposure was less than 7% for survival to Stage III and less than 12% for Stage IV conditional survival (1- beta = 0.90, alpha = 0.05 one-tailed). The sound exposures in our study were at the maximum levels likely to be experienced by a zoea during an actual survey.

Descriptors: larvae; survival; development; sound; Cancer magister