

学 位 論 文 の 要 約

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<p>学位論文の題名</p> <p>The effect of simultaneous salinity and temperature drop with different exposure times on the early developmental stages of coastal marine species (初期発育段階の沿岸性海洋動物に与える塩分と水温の同時変化の影響)</p> <p>学位論文の要約</p> <p>Torrential rainfall is one of the main external factors affecting coastal marine species during spawning seasons. Heavy rain over a certain period may influence embryonic development of coastal marine organisms. The earliest life stages of coastal marine species are the most sensitive to changes in their environment but as they develop, their tolerance rate increases. Therefore, the objective of this research was to determine the combined effects of simultaneous salinity and temperature drop with different exposure times on the egg stages of coastal marine species (disk abalone <i>Haliotis discus discus</i>, giant abalone <i>Haliotis gigantea</i>, bamboo sole <i>Heteromycteris japonicus</i> and japanese flounder <i>Paralichthys olivaceus</i>) with regard to onset hatching time, hatching success rate, percentage of abnormality, larval measurements and survival rate.</p> <p>Experiment 1, the embryonic developmental response of two abalone species (disk abalone and giant abalone) to a drop in salinity with different exposure times was investigated to gain a better understanding of the reasons for the decrease in natural stock populations. Two experimental designs, first, combinations of two salinities (34 and 17 psu) and four exposure times (0, 1, 2 and 4 h), and second, combinations of three salinities (34, 24 and 14 psu) and four exposure times (0, 1, 3 and 6 h) were tested on disk and giant abalone eggs to determine the effects on hatching onset time, hatching success, percentage of abnormality and survival rate. Hatching onset time increased significantly for both species as salinity dropped and exposure time increased. Both species followed a decreasing trend in terms of hatching success as exposure time increased at low salinity levels. As for abnormality, both species showed a significant negative effect of low salinity and long exposure times. Giant abalone showed better adaptability to long exposure time at low salinity levels, and hence a higher survival rate, than disk abalone.</p> <p>Experiment 2, the response of early development of bamboo sole to gradual salinity drop (34, 24, 14 psu) with different exposure times (1, 3, 6 h) to mimic natural conditions during spawning season were investigated in a series of small-scale laboratory experiments. An experimental set-up containing six replicates per treatment using plastic microplates were each stocked with 78 gastrula stage eggs and exposed to gradual salinity drop conditions following recovery after certain periods of exposure time. Onset hatching time was significantly prolonged by 6 h exposure, irrespective of salinity level. Hatching success rate, percentage of morphological abnormality and survival rate at 4 days post-hatch (dph) showed no individual main effects and interaction between salinity and exposure time. Although the total length of newly hatched larvae (NHL) and yolk sac volume showed significant interaction, NHL pre-anal length and final total length at 4 dph showed no interaction but individual main effects of salinity and exposure time.</p> <p>Experiment 3, The early stage development response of Japanese flounder to gradual drop in salinity (34, 24, 14 psu) with different exposure times (1, 3, 6 h) were investigated to gain better understanding of the decrease in natural stock and its relationship to global weather pattern changes. A series of small-scale laboratory set-up containing six replicates per treatment using plastic microplates were each stocked with 78 fertilized japanese flounder eggs of gastrula stage and exposed to salinity drop following recovery to</p>			

ambient conditions after certain periods of exposure. Two-way ANOVA analysis data showed that salinity (S) and exposure time (E) individually or as a combination (S x E) had no effects on hatching success rate, percentage of abnormality and survival rate at 4 days post-hatch. Onset hatching time, NHL total length and yolk sac volume showed individual effects but recorded no interaction effects between S and E. Pre-anal length and final total length at 4 days post-hatch showed no individual or combination effects between S and E.