OBLIGATORY WINTER DIAPAUSE IN STATOBLASTS OF *PLUMATELLA CASMIANA* (BRYOZOA: PHYLACTOLAEMATA)

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ABSTRACT

Statoblasts are asexual overwintering structures produced by colonial freshwater invertebrates, the Bryozoa, which live attached to submerged objects. Each statoblast comprises a mass of undifferentiated cells enclosed in a bivalved shell. When conditions favor germination, the valves separate and a white germinal yolk mass protrudes. Various studies have assessed whether statoblasts must go through an obligatory dormant period (diapause), or whether they can germinate as soon as favorable conditions arise (quiescence). To date, diapause has not been demonstrated in statoblasts. The present study set out to explore the dormancy and germination of statoblasts in Brown Co., SD.

Statoblasts of *Plumatella casmiana* were field-collected in mid-winter from shoreline debris at Moccasin Creek and maintained in the laboratory until study. Germination was studied in samples immersed in distilled water. No germination was observed until March. These results demonstrate that statoblasts of *Plumatella casmiana* from this population enter winter diapause. Following the breaking of diapause, statoblasts showed a mean germination success of 22%, most germinations occurring in 7-14 days.

Statoblasts collected in the fall and brought into the laboratory could be germinated by immersion throughout the winter. This shows that neither seasonal changes in photoperiod, nor desiccation, trigger diapause alone. To study possible effects of chilling on the induction of diapause, statoblasts were transferred to filter paper, placed in Plexiglas tubes, and immersed in a Cole Parmer *Polystat* programmable water bath containing a 1:1 mixture of ethylene glycol and water. Cooling was studied for various periods up to 18 days. Chilling temperatures varied between 0 and -10_C; in all experiments, statoblasts were initially exposed to 5_C, then cooled to the experimental temperature over a 5 hour period. Results indicate that diapause is induced by brief (10h) exposure to -10_C and more prolonged exposure to higher temperatures. Long-term viability of these statoblasts is currently being studied, but we can infer that cessation of germination is due to diapause rather than mortality given the much more severe temperatures tolerated in the field. No dormancy was induced following 18 days chilling at 0_C; statoblasts submerged throughout the winter thus probably do

not enter diapause.

Effects of chilling and desiccation on post-diapause statoblasts were also studied to determine whether they account for significant spring and summer mortality. A chilling duration of 10 hours was used with various temperatures down to -25_C. The effect of desiccation was studied by placing statoblasts in a desiccator (anhydrous $CaCl_2$) for 24-48 hours. These modest exposures to extreme chilling and desiccation had no significant effect on viability. The fact that such chilling regimes induce dormancy in the fall and winter suggest that induction of diapause can occur only within a critical developmental window, or that it requires compound cues such as a combination of temperature and photoperiod.

There is a clear adaptive advantage of diapause for statoblasts in this population of *P. casmiana*. In the fall and early spring, sub-freezing temperatures are frequently interspersed with brief warm periods. If these were to trigger germination, the resulting colonies would not survive the winter and the overwintering mechanism for the species would fail.