

Stochastic simulation model: proportions of pregnant salmon lice

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The effect of lice distribution on proportions of pregnant salmon lice (*Lepeophtheirus salmonis*), was modelled in a stochastic simulation model. An overall fit of the data to the Poisson distribution was found in two separate datasets, and thus was used as the base of the stochastic model. In dataset one all lice stages followed a true Poisson distribution. Examining the variance-mean ratio (VMR) of adult female lice in dataset two showed a pattern where most cages (n=125) had a VMR above 1, indicating degrees of over-dispersion, while a few (n=7) showed under-dispersion. Of the 146 samples in the final dataset, 139 showed a dispersion within ± 0.5 of the mean adult females, conforming reasonably to the Poisson distribution. We constructed a model in @Risk which generated the number of fish carrying both adult female and adult male lice, being a necessity for lice reproduction, from a range of expected mean numbers of adult lice (λ). A variation of the same model with added extra variance was also generated in the @Risk software for the same λ values. The model was run first with an additional variance giving a VMR of 1.3, which was the VMR of adult females observed in data set two, and secondly with a VMR of two, being the outermost limit of acceptable variance of a Poisson distribution. The model showed that at an estimated adult female lice count of 0.5 adult lice per fish only 40% of the female lice are effectively reproducing. Sea lice reproduction is not linear with female abundance and the proportion of pregnant females will be lower at low lice levels and go towards 100% as the abundance increases. Our findings should have implications for routines for lice counts and decisions on when and how to establish intervention regimes against lice.