Harp Seal Populations

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For the fecundity of the seals, let’s sort out some definitions.

‘pregnancy rate’ means the proportion of seals found to be pregnant that year when they are lethally sampled, based usually on ovaries from moulting animals. Symbol (this is a proportion or probability so no units)

‘natality’ means the probability of producing a live pup. Symbol (this is a proportion or probability so no units)

The number of females pregnant in year given there are females in the population could look like this

Where the pregnancy rate is a response to environmental variables which I represent as a vector of different ones e.g. capelin, SST etc. Parameters in this function are in vector

A very common type of formulation is to make into a logistic equation which might go like this

Note that I’ve also included a multiplier on the logistic function to take account that fecundity changes with age.

This approach could be used to estimate i.e. the values, based on observations of , capelin and cod.

Then some of those females go on to actually pup. The proportion that do is and we could allow this to vary by year as well, but let’s not for now!

This can all be embedded in the seal population model which updates the female population at every time step