The Impact of Oil Spills on the Northeast Arctic Cod Population

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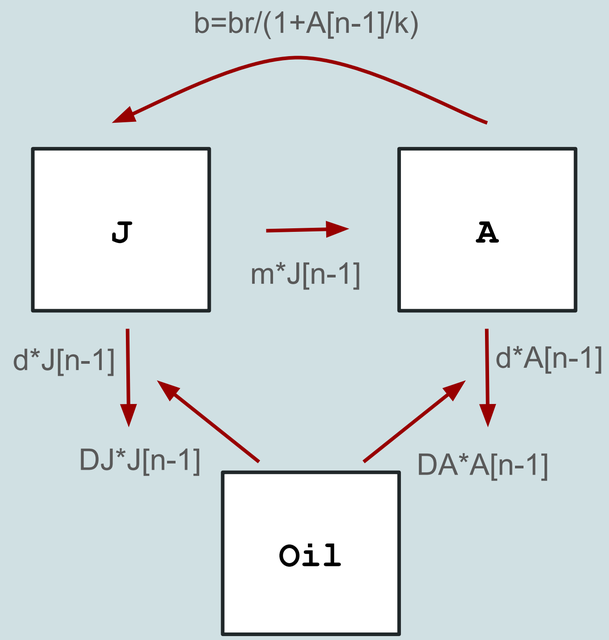
Introduction

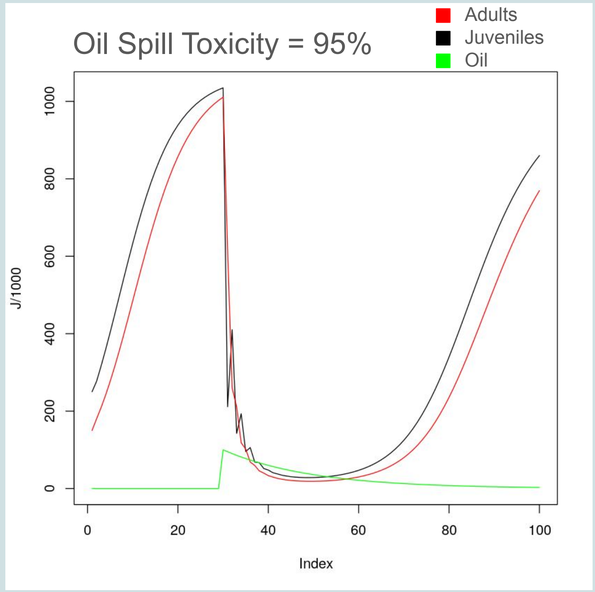
The Barents Sea is one of the most important fishing grounds for the Northeast Arctic (NEA) cod.[2] Because of its location, this area is prone to oil spill pollution, which affects the cod population. In my model, I look at the impact oil spill toxicity levels have on the NEA cod juveniles and adults.

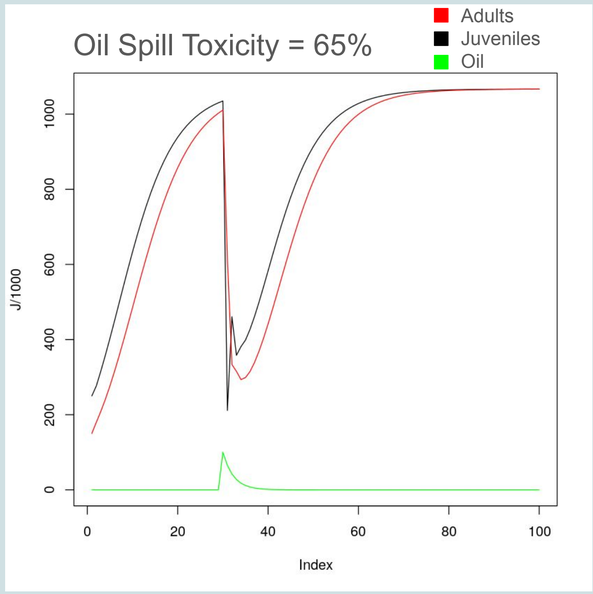
Model



Assumptions:

- The cod do not migrate out of the area
- Constant reproduction throughout the time frame
- Started with a sample population of juveniles, adults, and carrying capacity
- Calculated percentages for death rates, maturity rate, and birth rate
- The oil spill impacts all juveniles the same and all adults the same





Results

The model shows that both the adult and juvenile populations drop when the oil spill occurs and then after some time they start to increase again

The juvenile population is affected more by the oil spill → the population drops faster and at some points goes below the adult population

The 65% oil toxicity graph shows that there are less deaths, the cod recover faster, and the population reaches an equilibrium compared to the 95% graph

Discussion

The model suggests that a little while after the death of juveniles, there will be fewer mature individuals capable of reproduction compared to a scenario without oil impact or one with less oil toxicity. This leads to a change in the age structure of the population, with a relatively larger proportion of younger individuals persisting for some time after.[1] Furthermore, it shows that oil exposure increases mortality in juveniles.[3] Despite the oil spill dropping the cod population significantly, the surviving cod were able to recuperate quickly, bringing the population back up.

References

1. Ainsworth, Cameron H et al. “Impacts of the Deepwater Horizon oil spill evaluated using an end-to-end ecosystem model.” *PloS one* vol. 13,1 e0190840. 25 Jan. 2018, doi:10.1371/journal.pone.0190840
2. Carroll, JoLynn, et al. “Assessing Impacts of Simulated Oil Spills on the Northeast Arctic Cod Fishery.” Marine Pollution Bulletin, vol. 63–73, 1 Jan. 2018, https://doi.org/10.1016/j.marpolbul.2017.10.069.
3. Vikebø, Frode, et al. “Spatio-temporal Overlap of Oil Spills and Early Life Stages of Fish.” Ices Journal of Marine Science, vol. 970–981, no. 4, 14 Oct. 2013, https://doi.org/10.1093/icesjms/fst131.