# Modelling optimal responses and fitness consequences in a changing Arctic

Reimer, JR, Mangel, M, Lewis, MA, & Derocher, AE
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A female polar bear lives in a world of tradeoffs:

Should she hunt in the **riskier active ice**...

Active ice

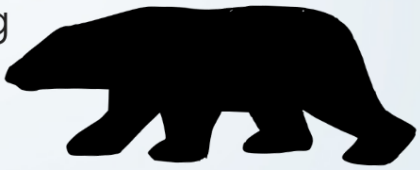
Prey are abundant, but cubs are at risk of infantide, or having to swim long distances.

...or in the **safer fast ice**?

Fast ice

Prey are less abundant, but cubs face less risk.

Should she continue investing in a **reproductive attempt** or **save her energy** for next year?



How might the answers to these questions change if the **sea ice breaks up earlier**, shortening the important spring feeding period?

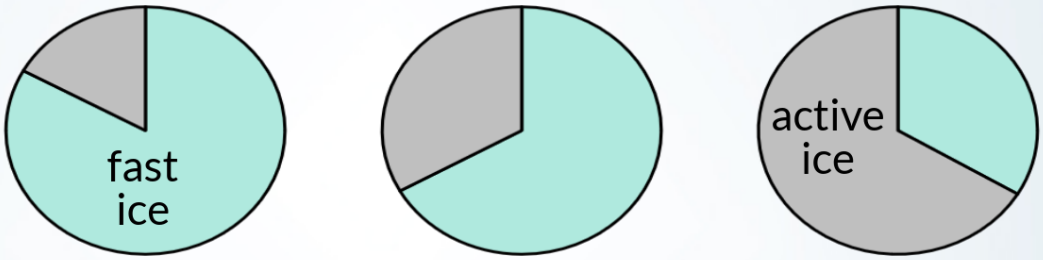
We explored these tradeoffs using **stochastic dynamic programming,** a type of mathematical model**.**

We found that:

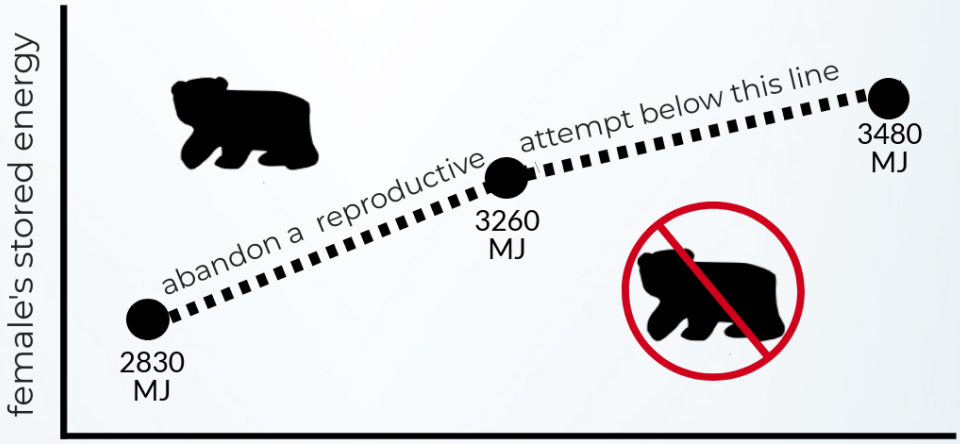
earlier ice breakup

historical date → 1 week earlier → 3 weeks earlier

leads to increased use of riskier habitat




and shifts in reproductive thresholds,




resulting in fewer cubs produced over the lifetime of a female polar bear.