

# Linking Foraging Behaviour and Energetics to Identify and Safeguard Marine Habitat Around Colonies of an Arctic Seabird



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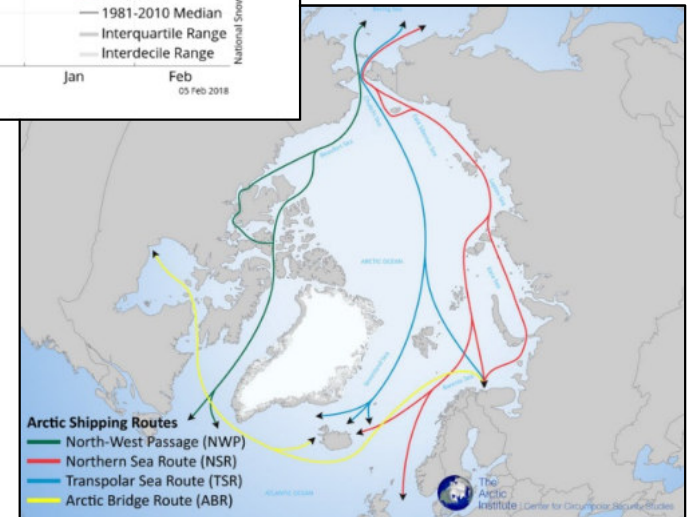
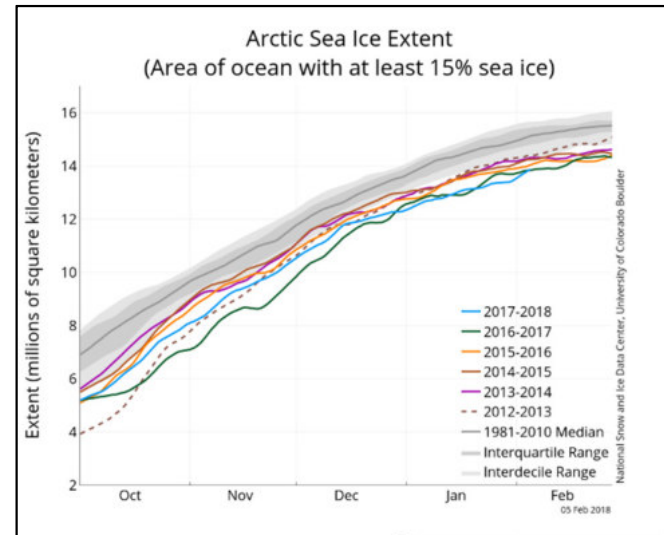
Arctic Biodiversity Congress – 2018



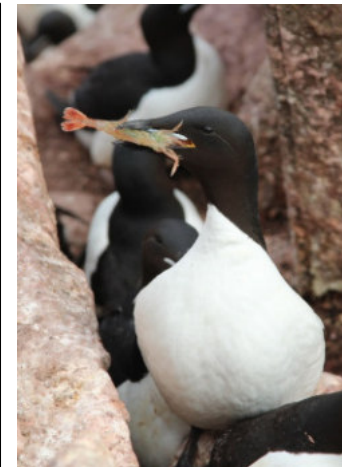
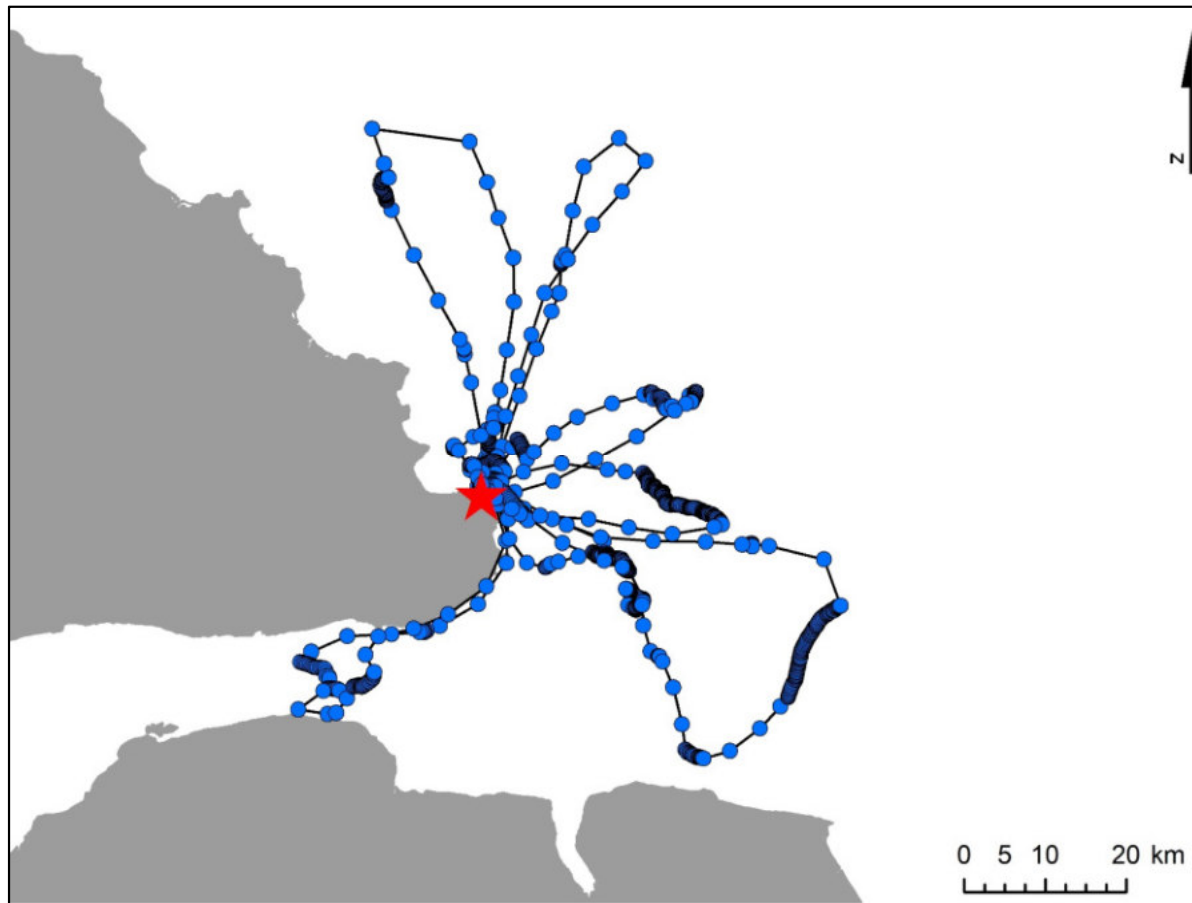
# Murre colonies and climate change



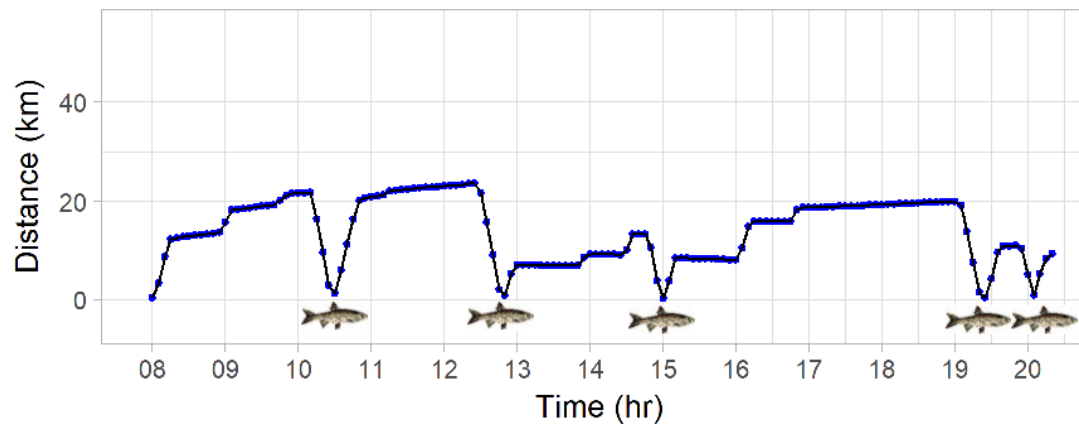
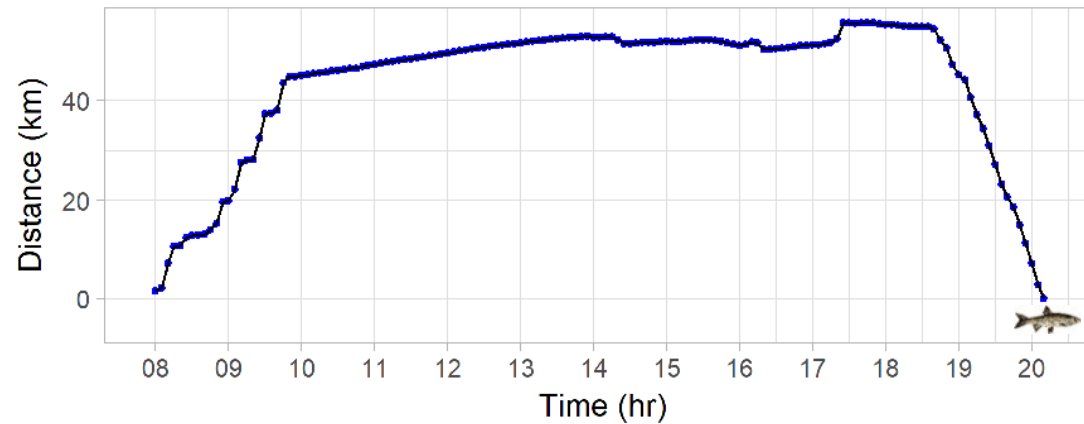
Irons et al 2008, Global Change Biology



# Breeding seabirds are central place foragers

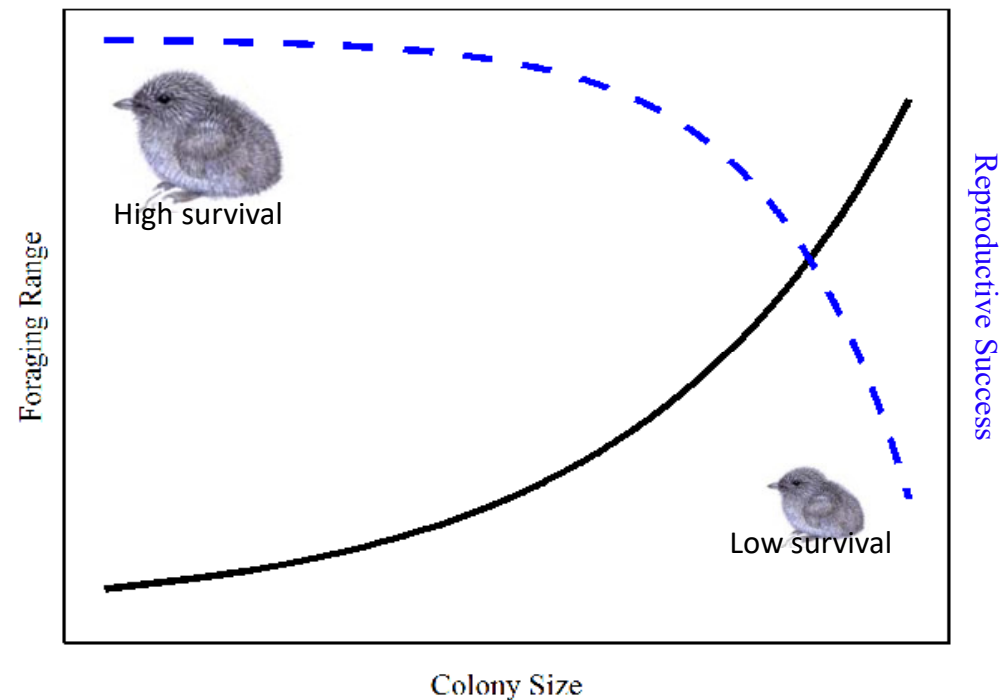


# Foraging far can limit chick provisioning



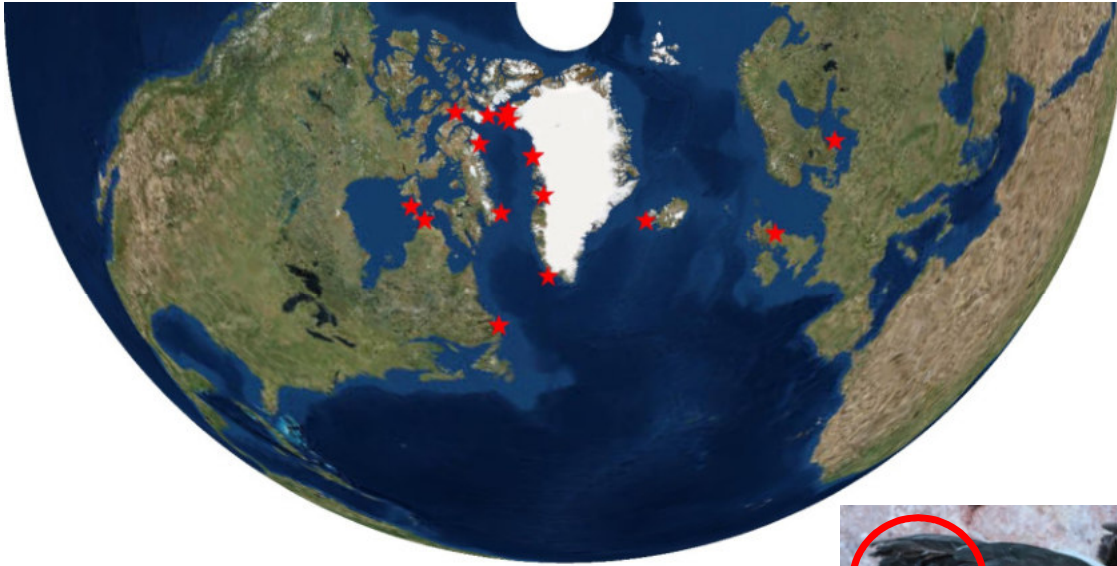
# Density dependence at large colonies?

Can we predict foraging range and reproductive success from colony size?

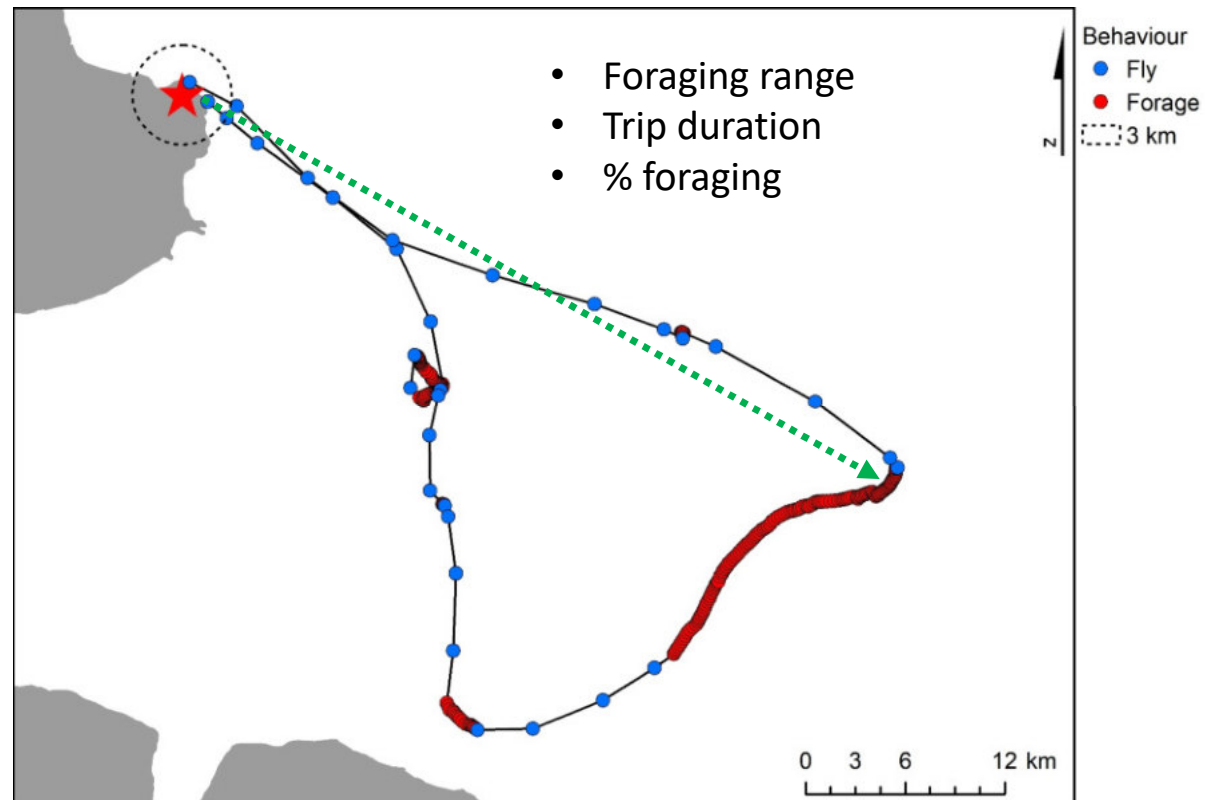


Adapted from Gaston et al 2007

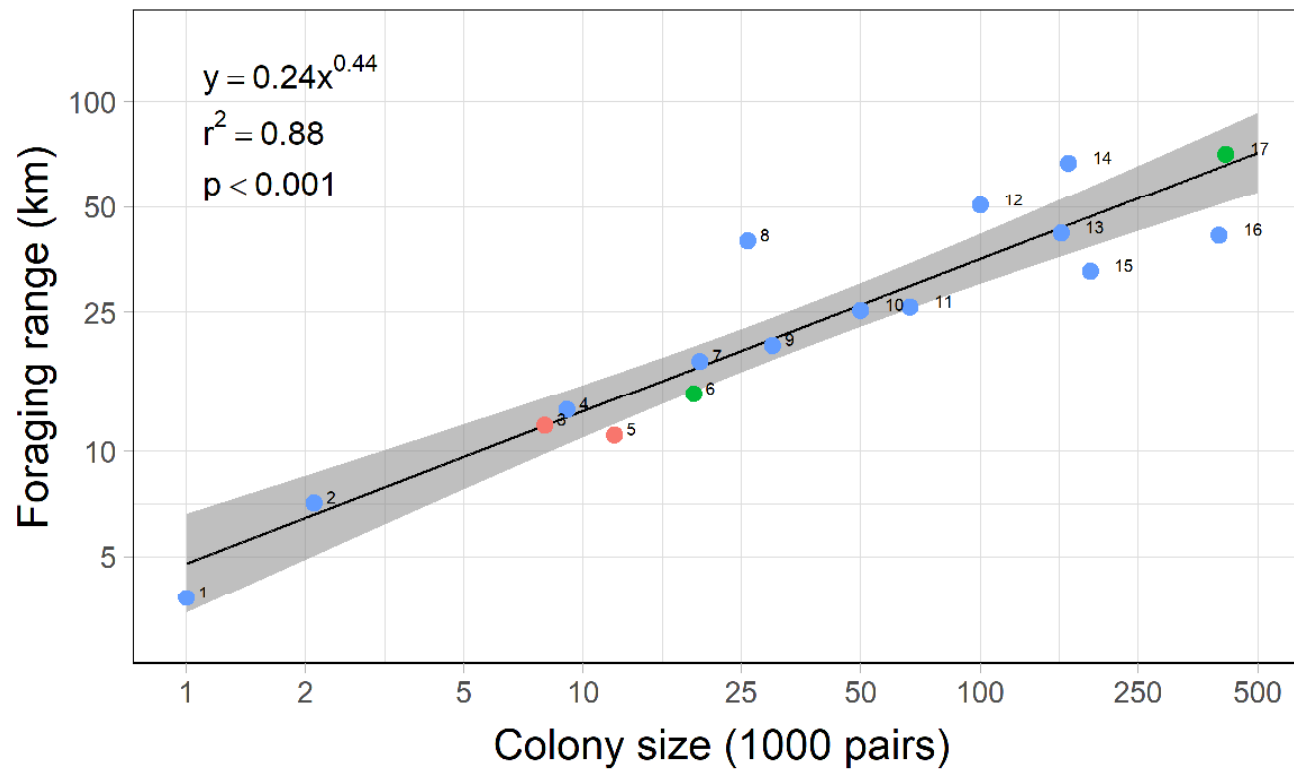
# Multi-colony GPS tracking



# Quantify foraging behaviour



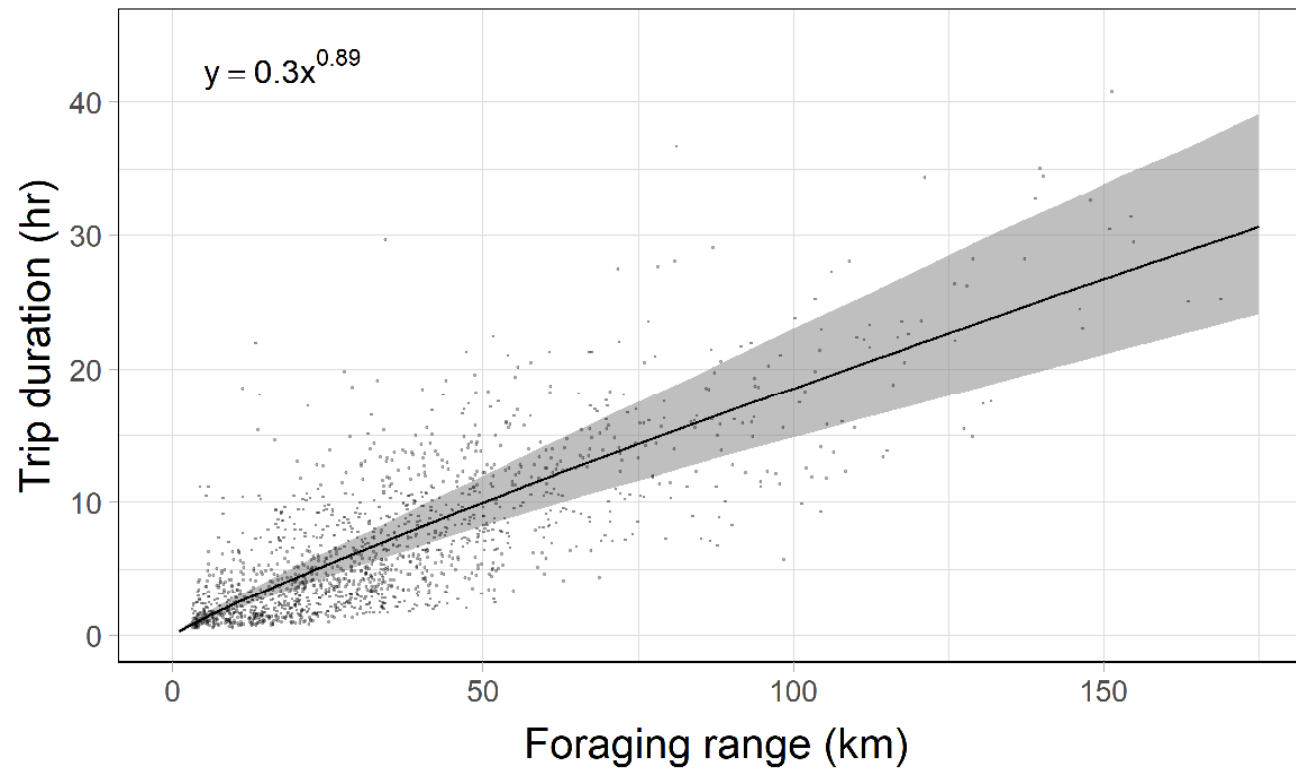
# Foraging range increases with colony size



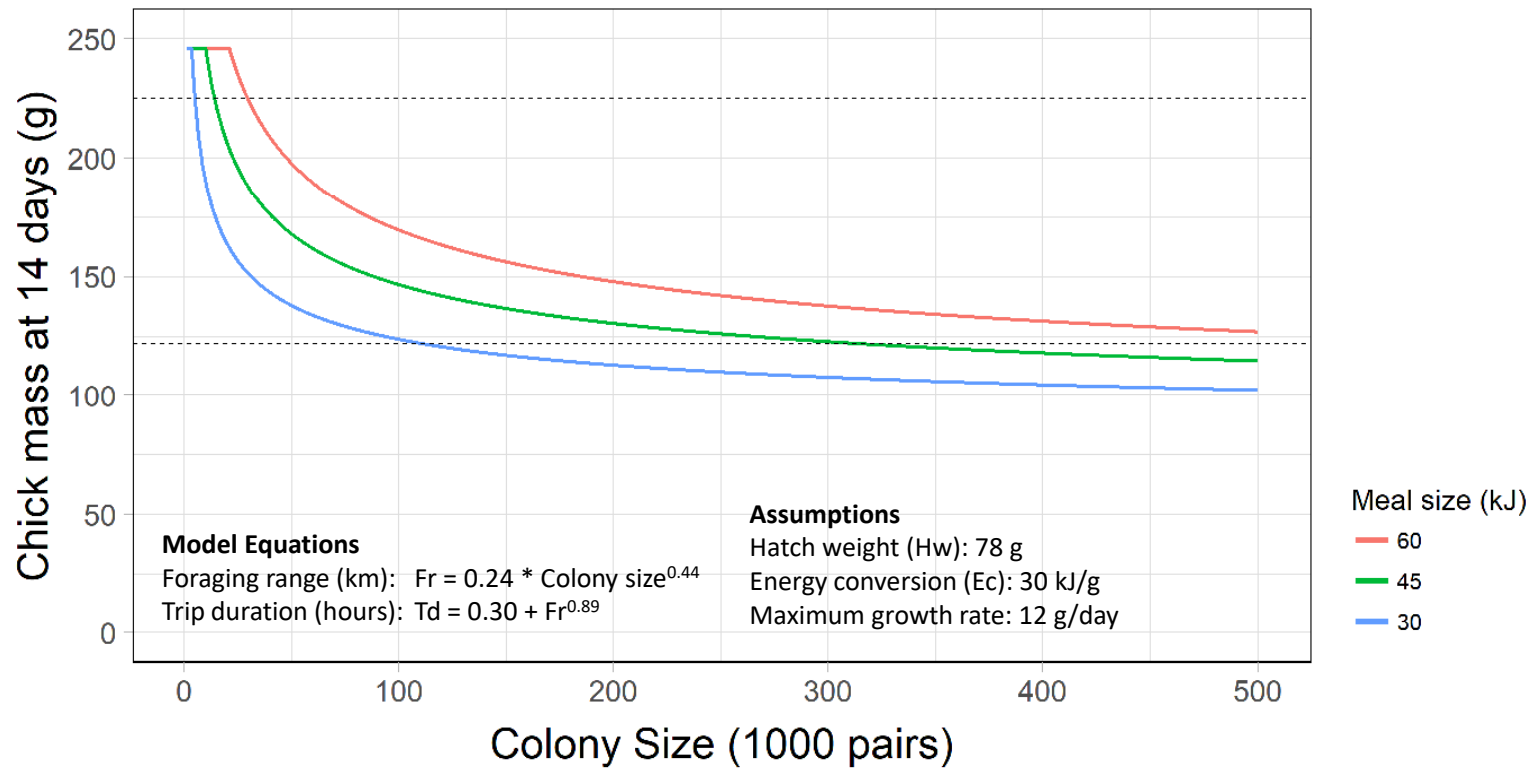
- |                                               |                                         |                                                |
|-----------------------------------------------|-----------------------------------------|------------------------------------------------|
| 1. Ritenbenk, Greenland                       | 7. Kippaku, Greenland                   | 13. Coburg Island, Canada (Falk et al 2002)    |
| 2. Kitsissut Avalliit, Greenland              | 8. Hakluyt, Greenland (Falk et al 2002) | 14. The Minarets, Canada                       |
| 3. Stora Karlso, Sweden (Evans et al 2013)    | 9. Coats, Canada                        | 15. Saunders, Greenland                        |
| 4. Carey, Greenland                           | 10. Cape Graham Moore, Canada           | 16. Digges Sound, Canada                       |
| 5. Isle of May, Scotland (Thaxter et al 2009) | 11. Apparsuit, Greenland                | 17. Latrabjarg, Iceland (Benvenuti et al 1998) |
| 6. The Gannets, Canada                        | 12. Prince Leopold Island, Canada       |                                                |

COMU  
Mixed  
TBMU

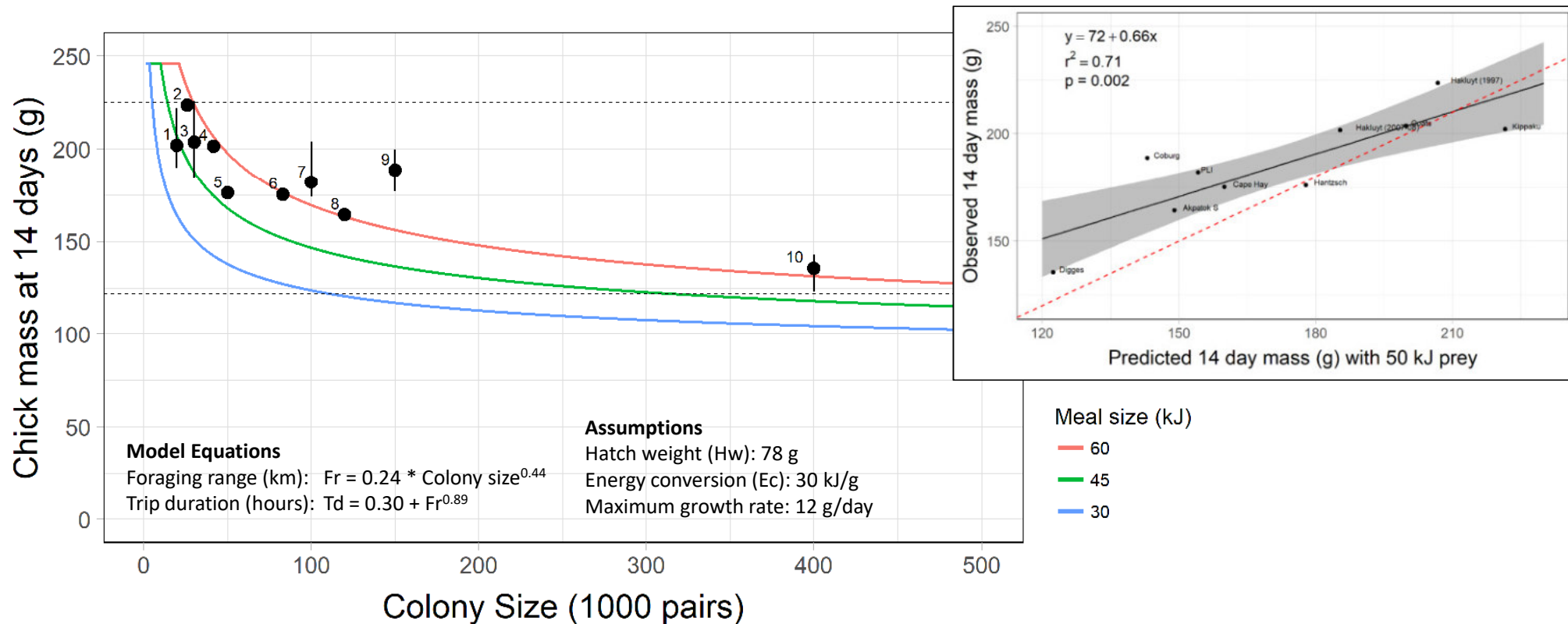
# Trip duration increases with foraging range



# Modelling chick growth rates



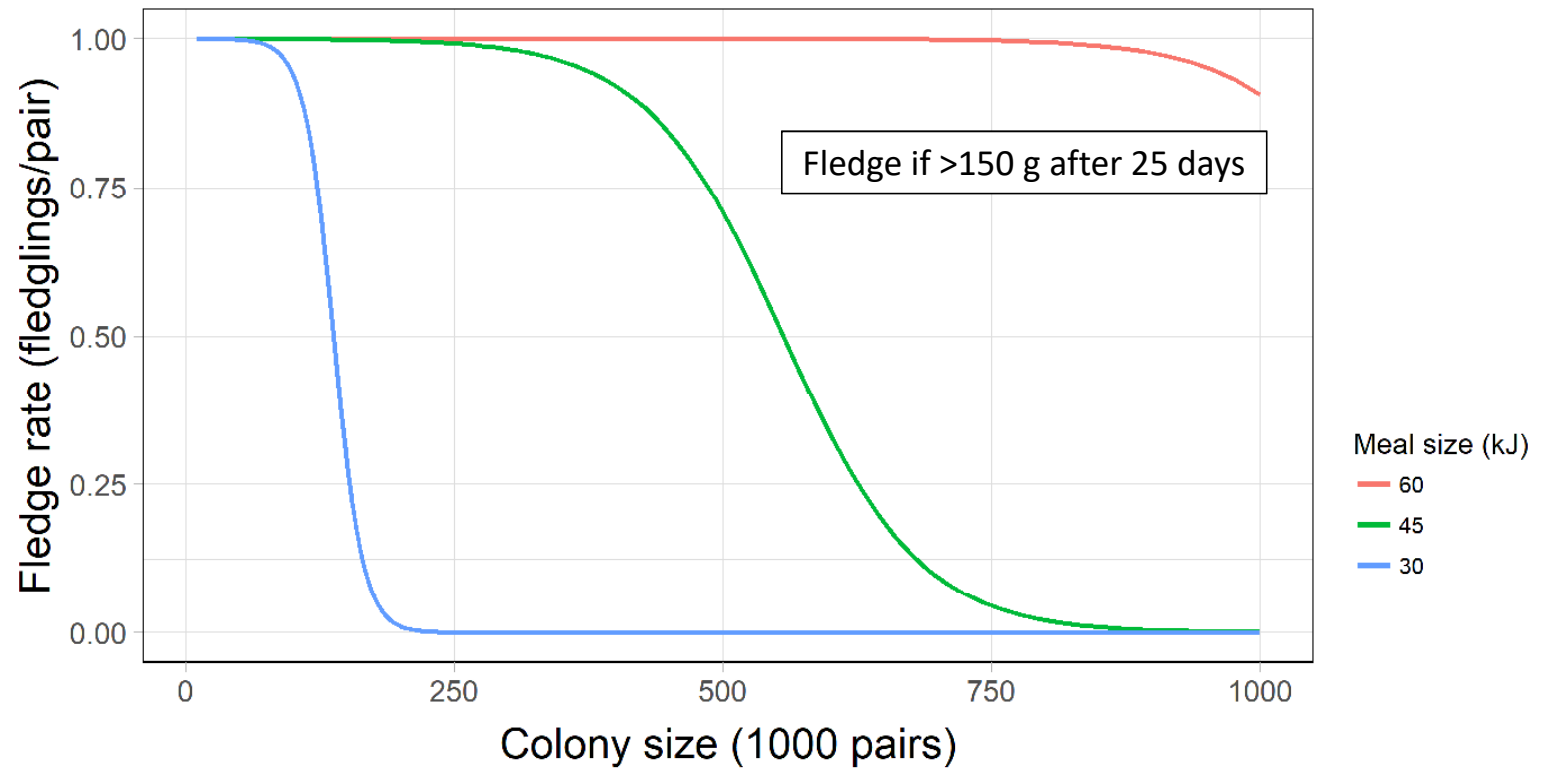
# Modelling chick growth rates



1. Kippaku, Greenland
2. Hakluyt, Greenland, 1997 (Falk et al 2002)
3. Hakluyt, Greenland, 2007-08
4. Coats, Canada
5. Hantzsch, Canada (Gaston et al 1983)

6. Cape Hay, Canada (Birkhead and Nettleship 1981)
7. Prince Leopold Island, Canada (Gaston et al 2005)
8. Akpatok South, Canada (Gaston et al 1983)
9. Coburg, Canada (Falk et al 2002, Birkhead and Nettleship 1981)
10. Digges Sound, Canada (Gaston et al 1983, Gaston and Hipfner 2006)

# Fledge rates, colony size, and prey quality



# Predicted foraging ranges in Canada



# Conclusions

- Colony size effects adult foraging behaviour and limits chick provisioning
  - Lower fledgling mass and lower juvenile survival
- Evidence for density dependent population regulation
  - Carrying capacity of large colonies limited by prey quality
  - Small colonies can increase foraging effort to maintain chick growth
- Define critical breeding habitat based on expected foraging range
  - Only require estimate of colony size
  - Chick mass and prey quality key indicators for monitoring

# Thank You!

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## Acknowledgements

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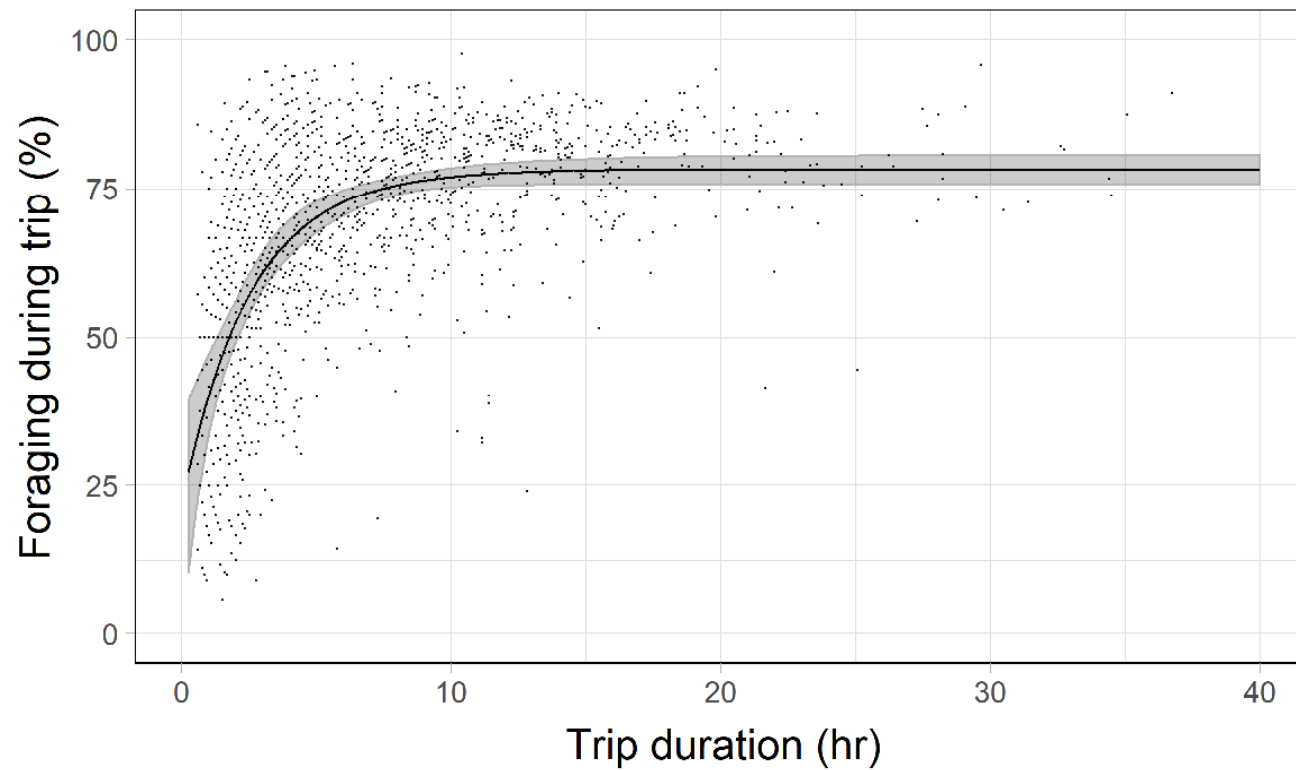
Field work: Josiah Nakoolak, Mike Janssen, Nik Clyde, Émile Brisson-Curadeau, Thomas Lazarus, Esteban Gongora Bernoske, Graham Sorenson, Travis White, Sarah Poole, Scott Flemming, JH Martin, Francois St-Aubin, Tianna Burke, Bruin and Will Black, and many, many others...

All the murres that participated in this study

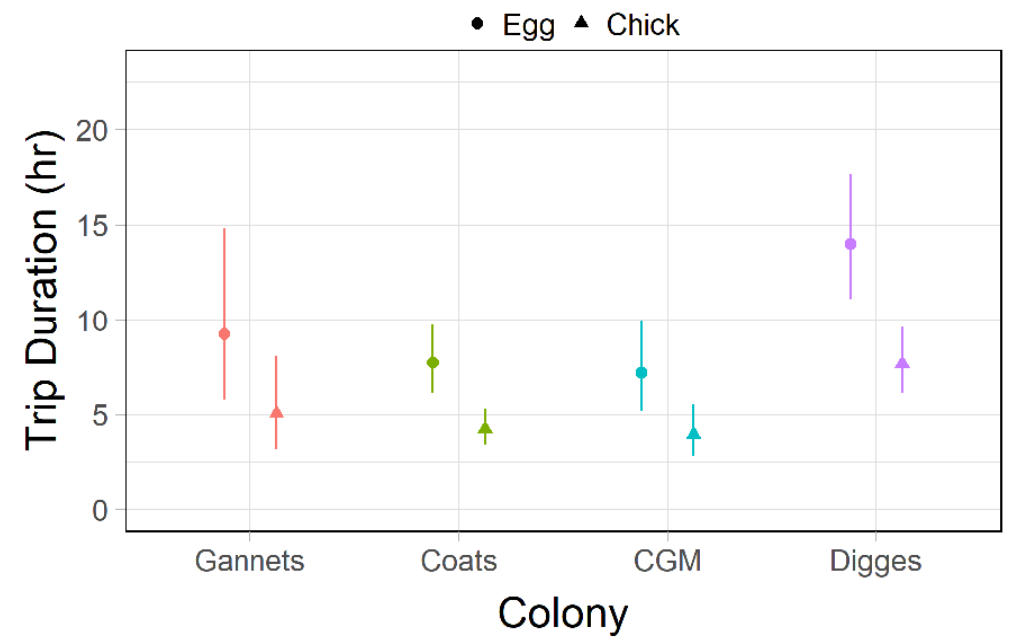
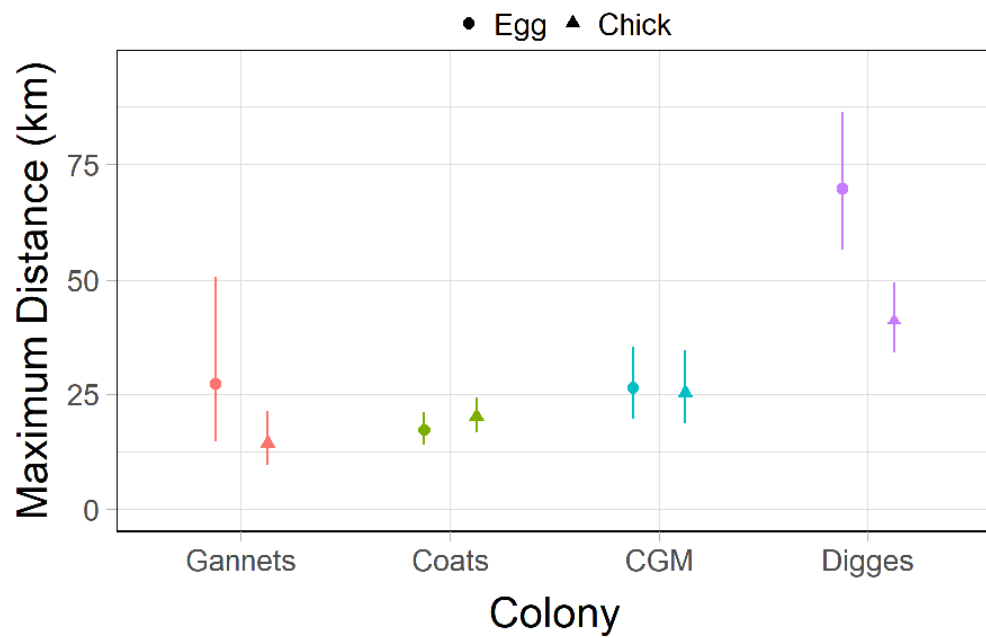




# Foraging (%) by trip duration

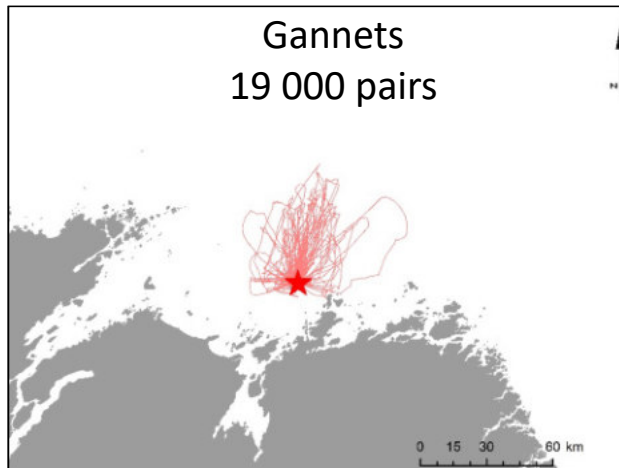


# Foraging behaviour differed among colonies

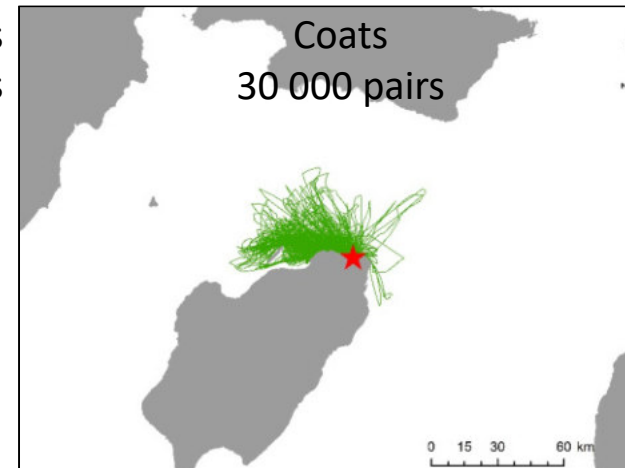


## Foraging tracks from four colonies

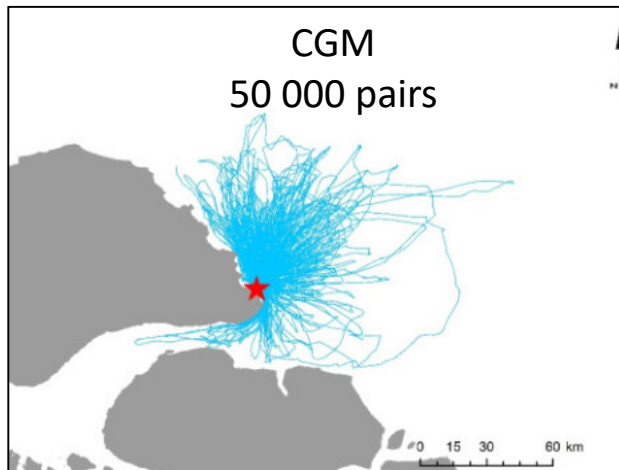
24 birds  
1 year



222 birds  
5 years



77 birds  
2 years



255 birds  
4 years

