

# Seabird bycatch patterns in Alaska

## Good years, bad years and pink salmon



???



???

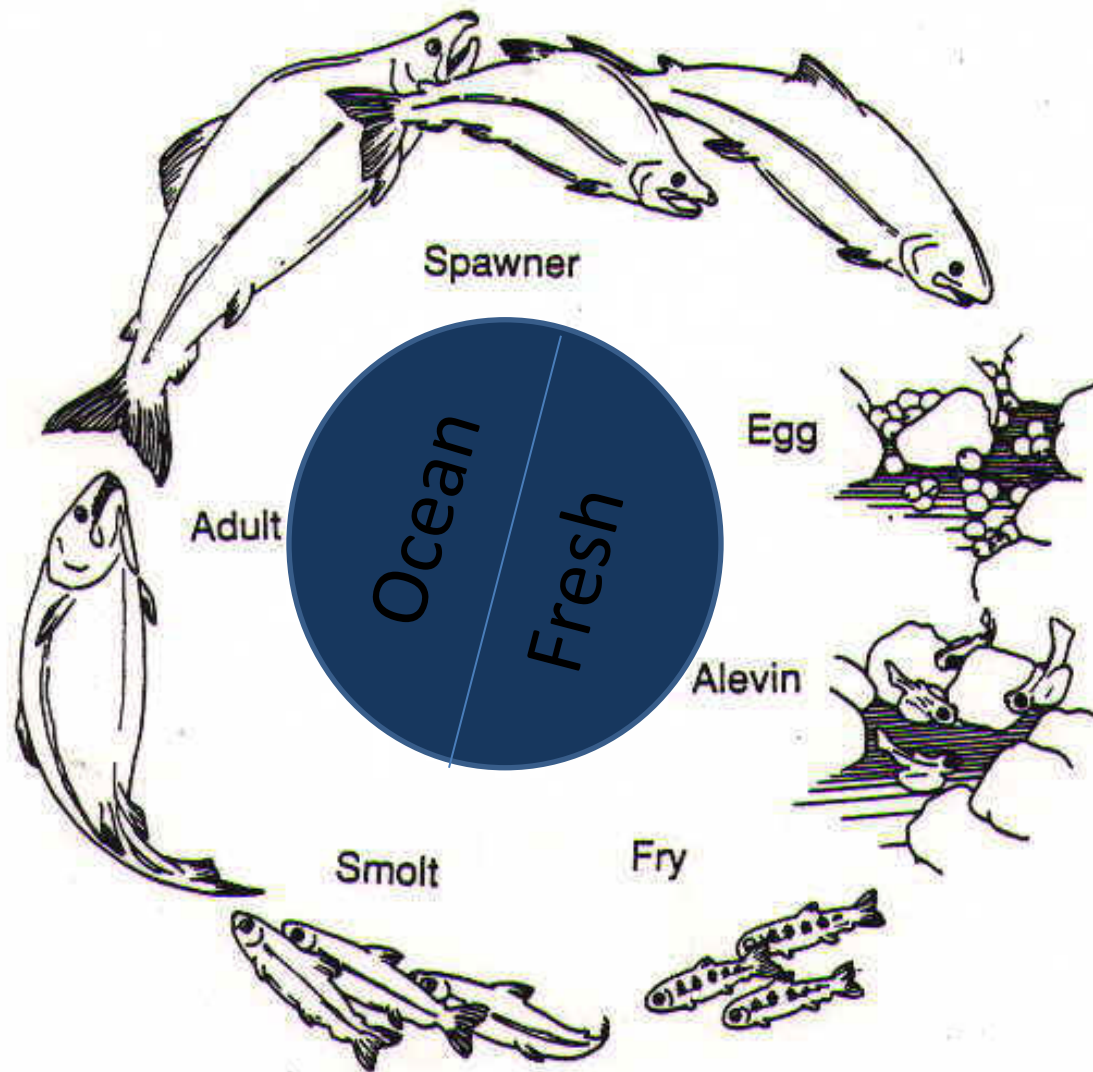


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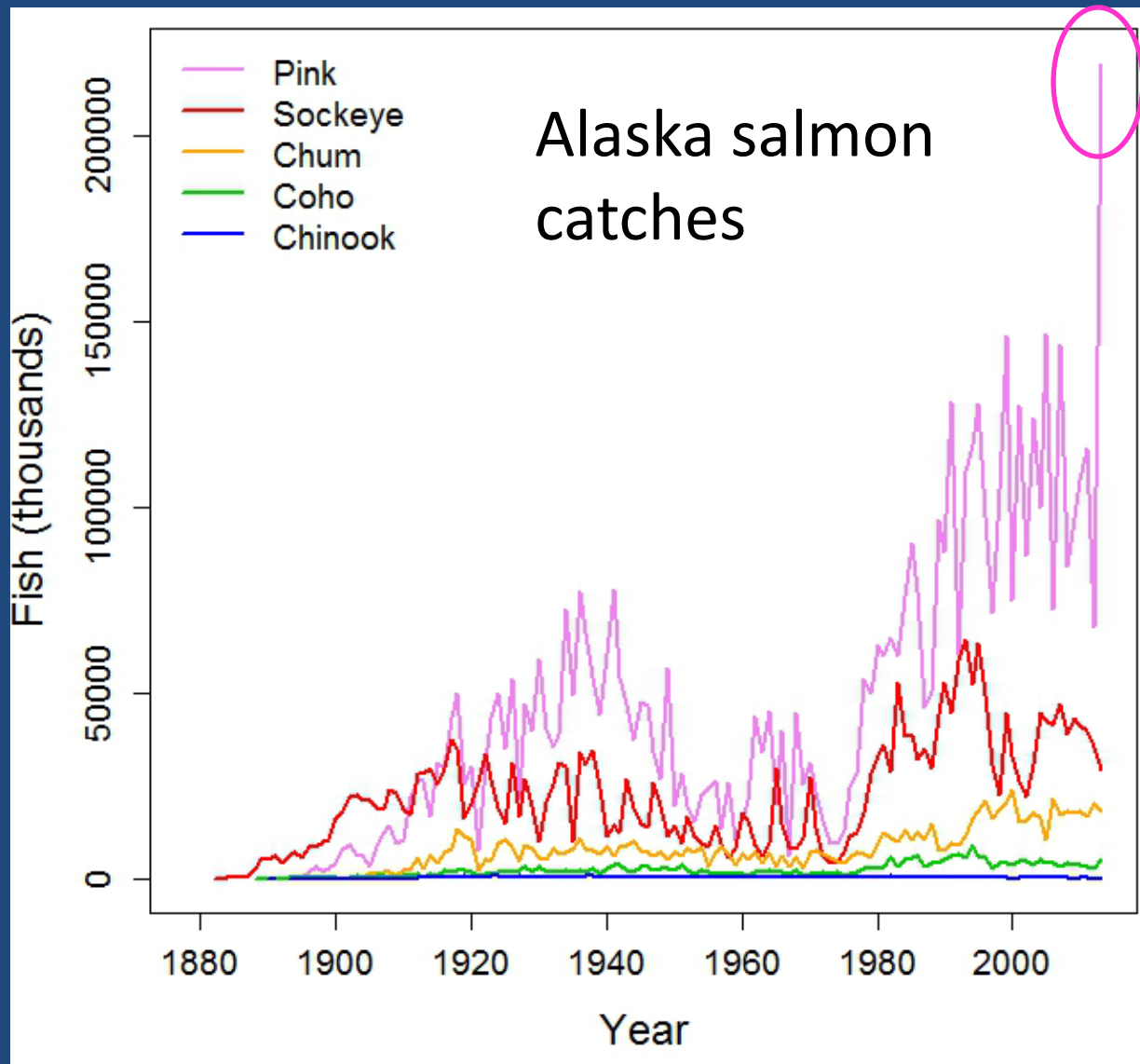
# Pink salmon have a 2 year life cycle



Thus, odd and even year classes don't mix



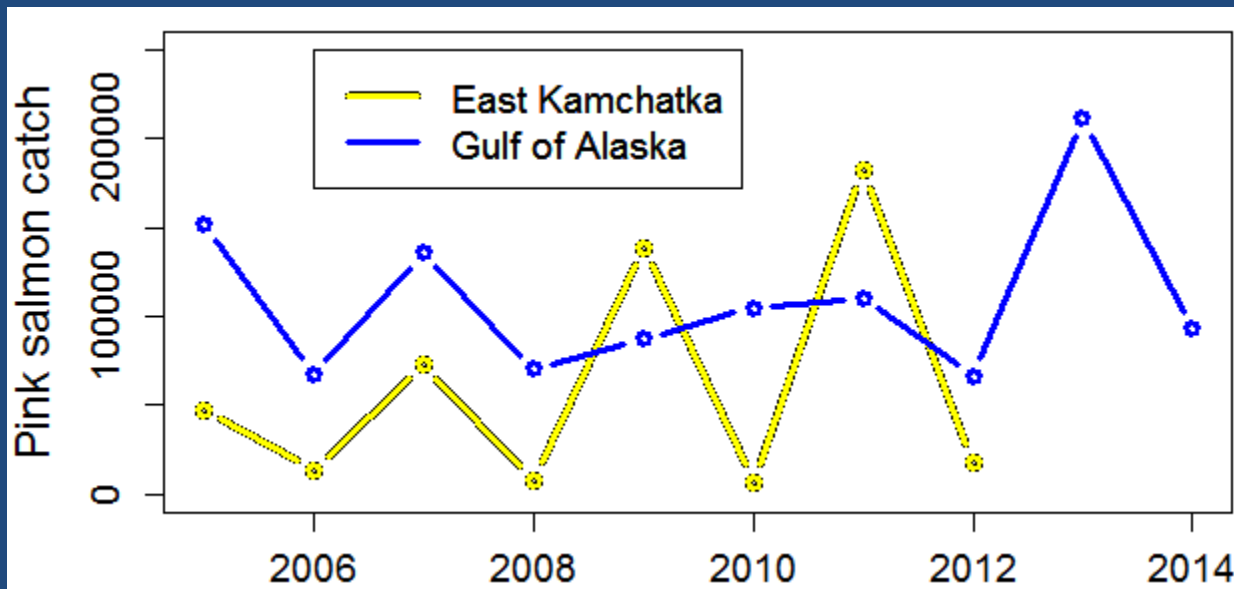
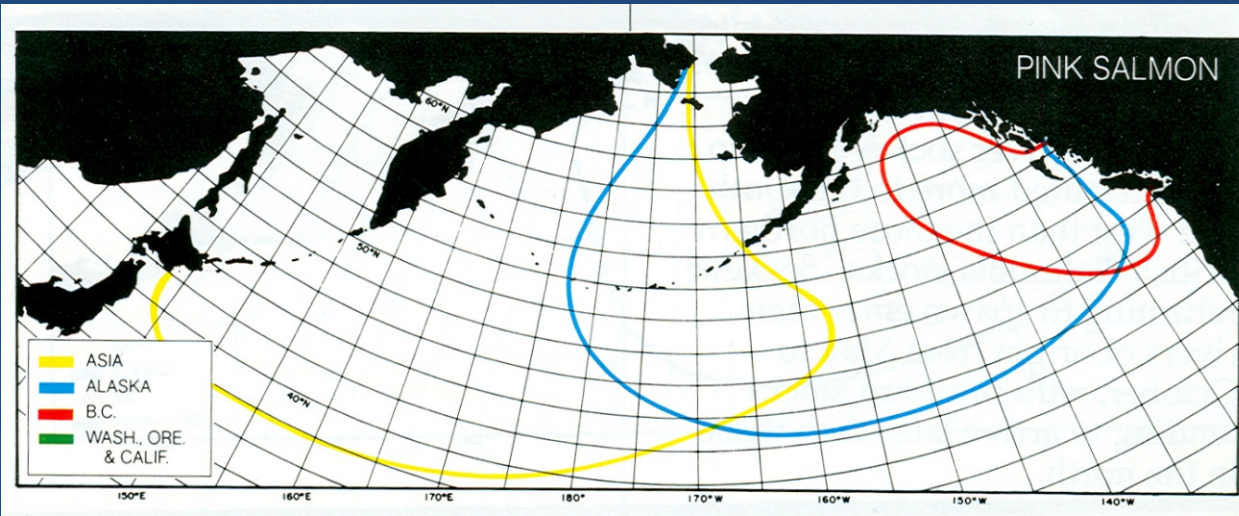
# Pinks are the most numerous salmon



Alaska salmon catches

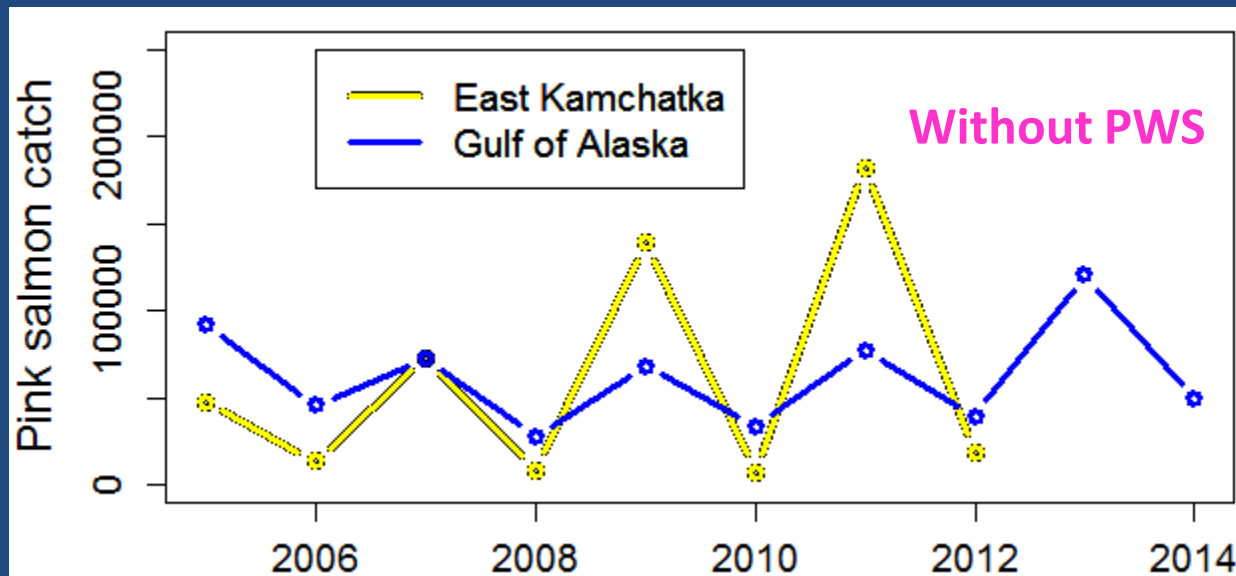
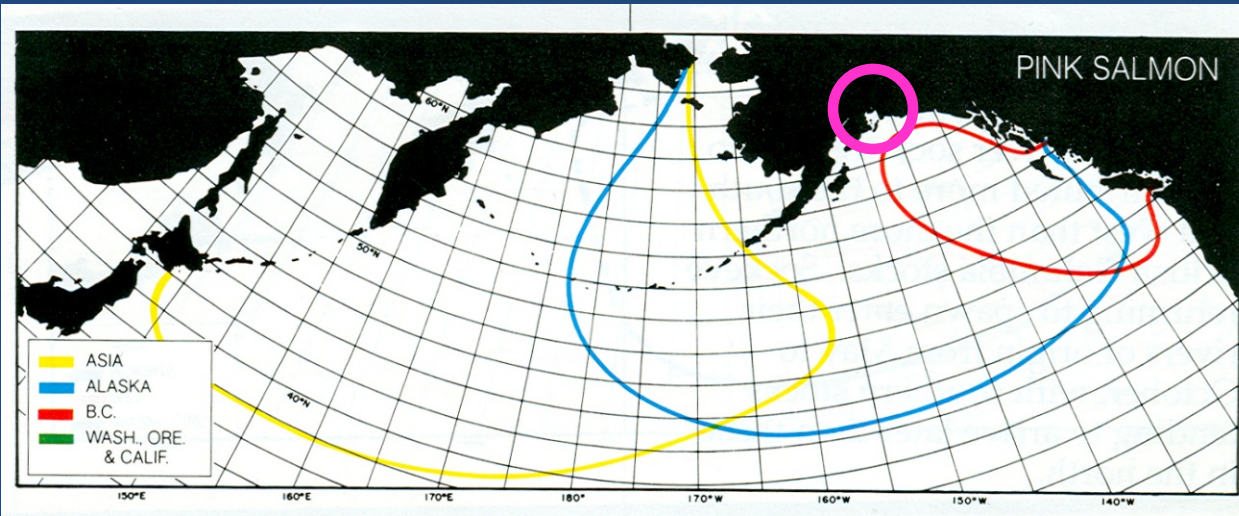
Record catch in 2013!

# When pink salmon are abundant, they are super abundant



- Catches similar in magnitude
- PWS 09/10 switch

# When pink salmon are abundant, they are super abundant

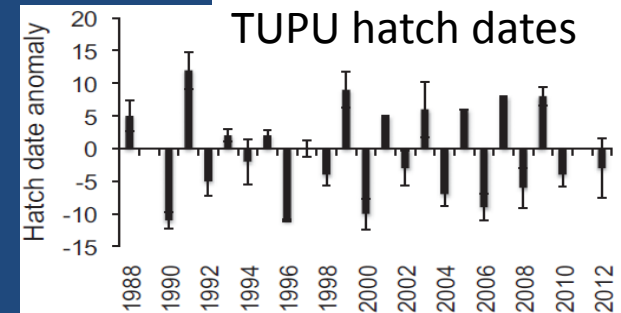
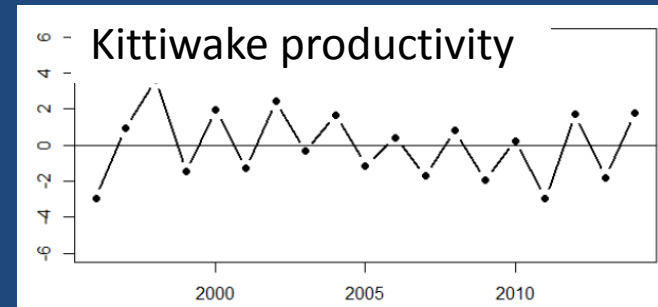
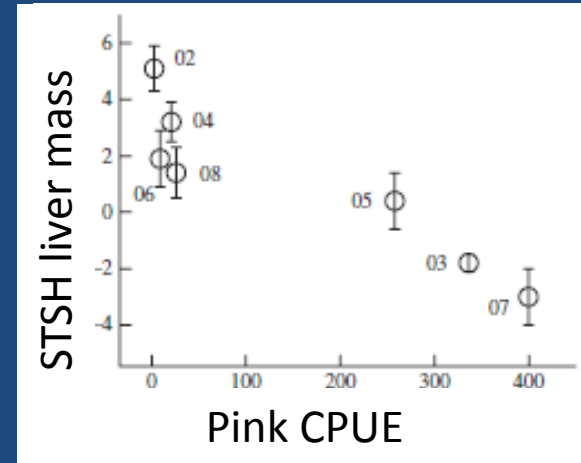


- Catches similar in magnitude
- Prince William Sound 09/10 switch

# Pink salmon – seabird links



- **Similar diet:** krill, small fish, and squid → *competition?*
- Toge et al., 2011: Shearwater body condition lower when pink salmon catch rates higher (but not bycatch)
- Zador et al., 2013: dominant trend in kittiwake productivity negatively correlated with pink salmon catches
- Springer and Van Vliet 2014: Significant differences between odd and even years in seabird parameters



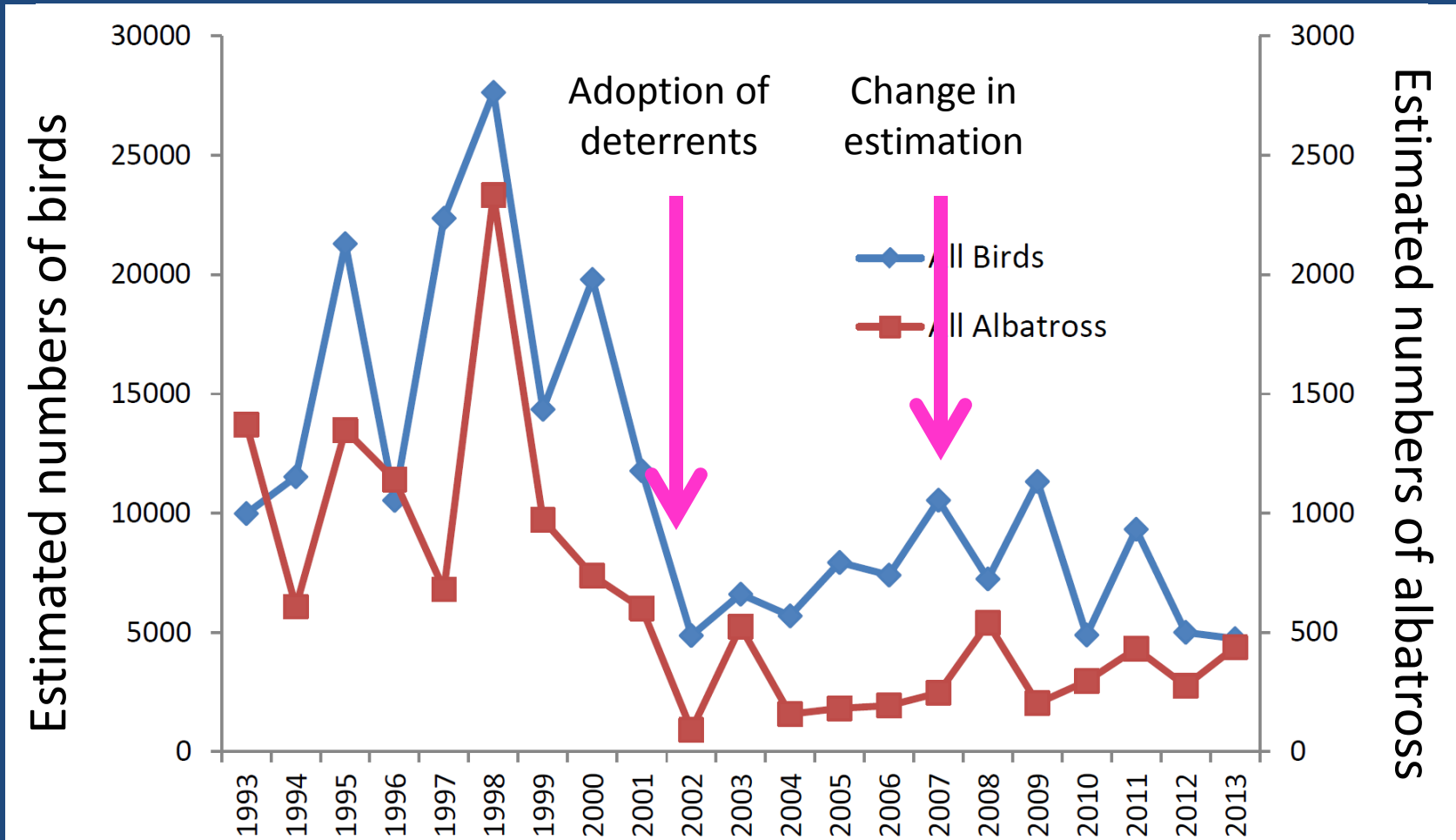
# Theory: alternate or natural prey abundance influences bycatch patterns

- Some seabirds depend on fisheries discards when natural prey abundance is reduced (Furness 1987, Oro et al. 1995)
- Others target natural prey despite availability of discards (Peterson et al., 2008)



*Do seabirds turn to fisheries discards in years when pink salmon are more abundant?*

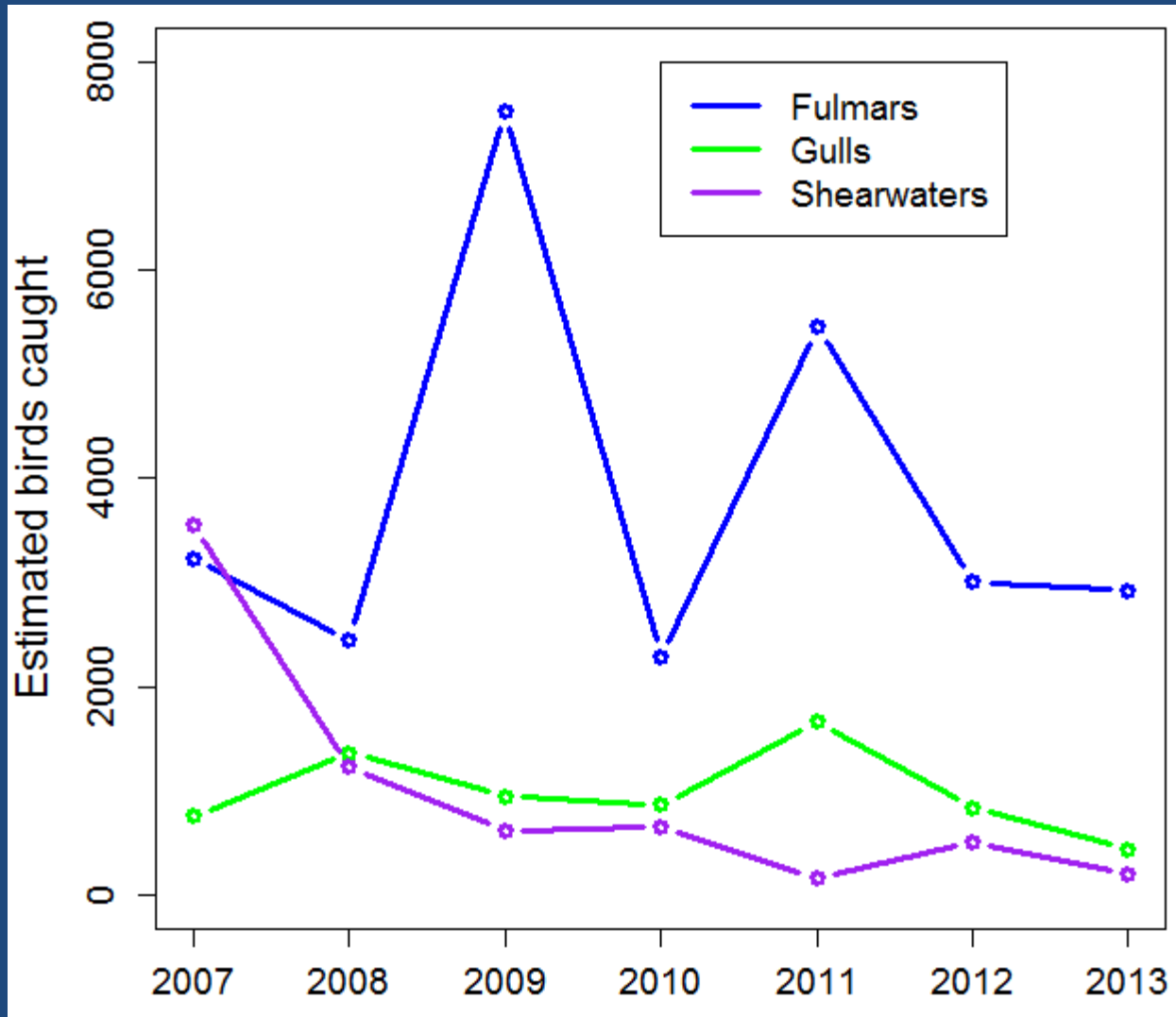
# Seabird bycatch patterns in Alaska have changed



This study



# Fulmar, shearwater, and gull bycatch patterns in Alaska



Northern Fulmar  
Local breeder



Seasonal migrant  
Short-tailed Shearwater

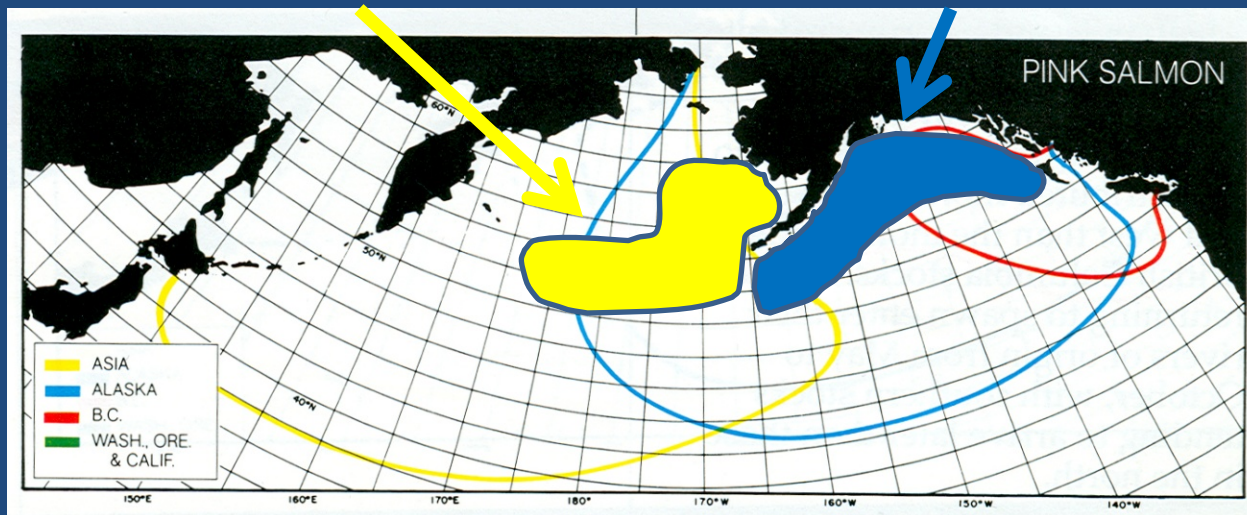


H1: Bycatch estimates are higher in years when pink salmon catch is higher More adult pinks -> depleted seabird "natural" prey (despite Toge et al., 2011 result)

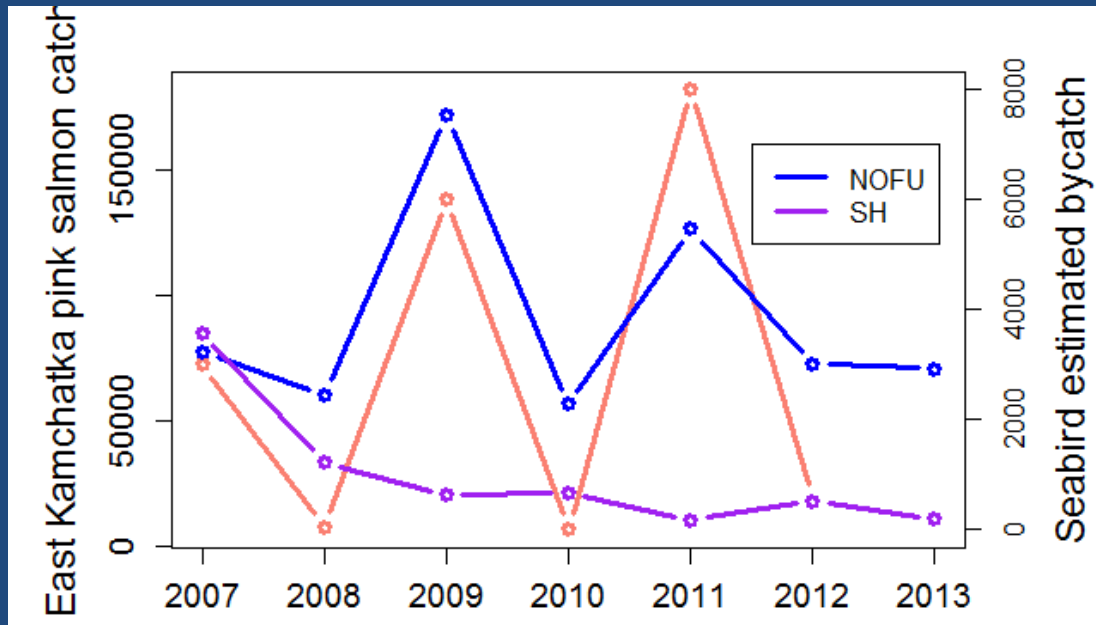
H1a: This relationship is less pronounced for migrants They can move out of the area when "natural" food is scarce

1. Eastern Bering Sea/Aleutian Islands bycatch vs. East Kamchatka pink salmon catches

2. Gulf of Alaska bycatch vs Gulf of Alaska pink salmon catch

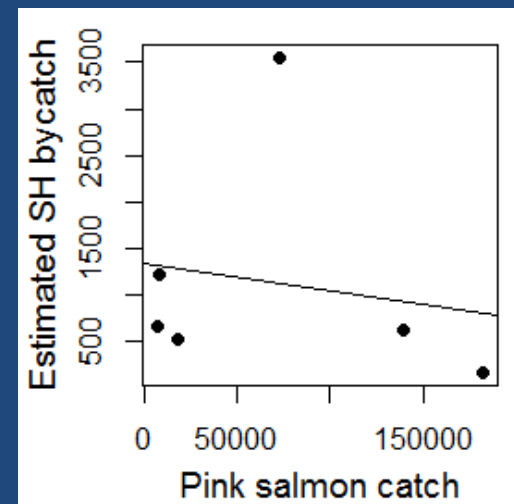
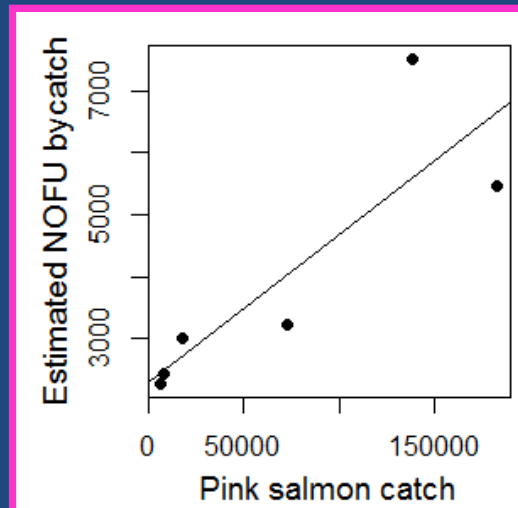


# 1. Bering Sea/Aleutian Islands Northern fulmar bycatch is positively correlated with East Kamchatka pink salmon catches

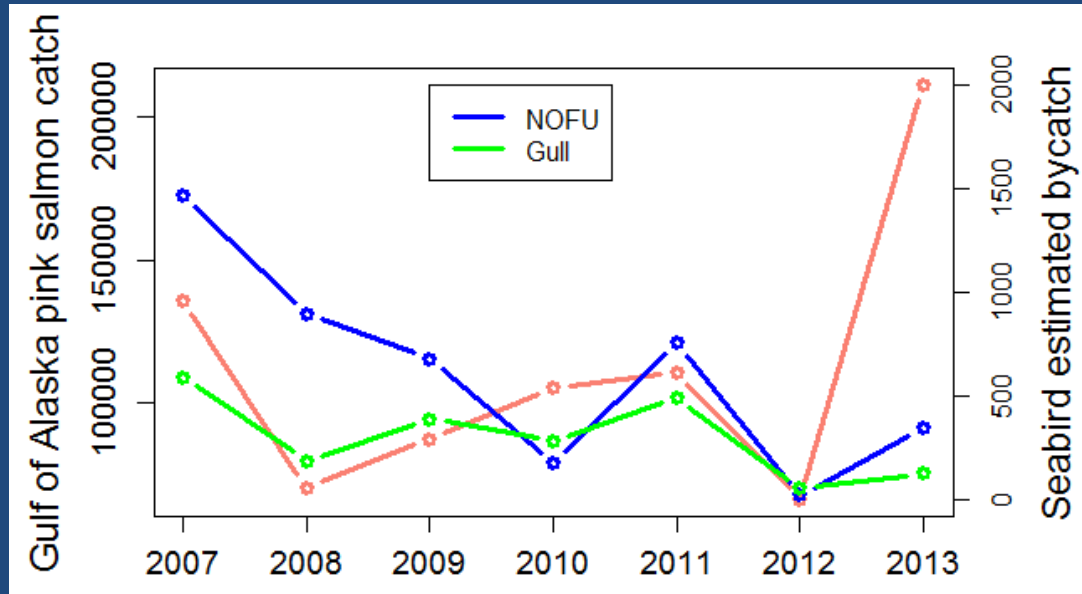


$t = 3.29, p = 0.03$

$t = -0.35, p = 0.74$

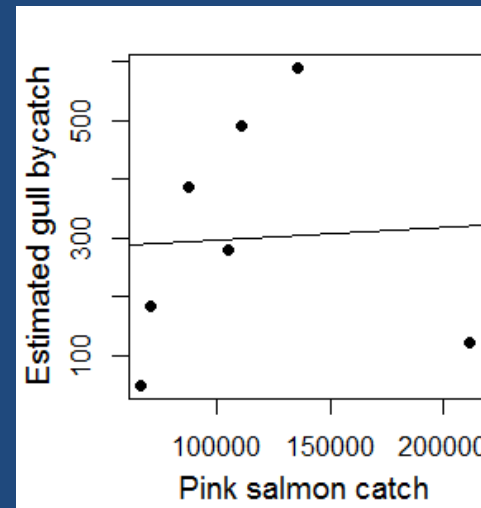
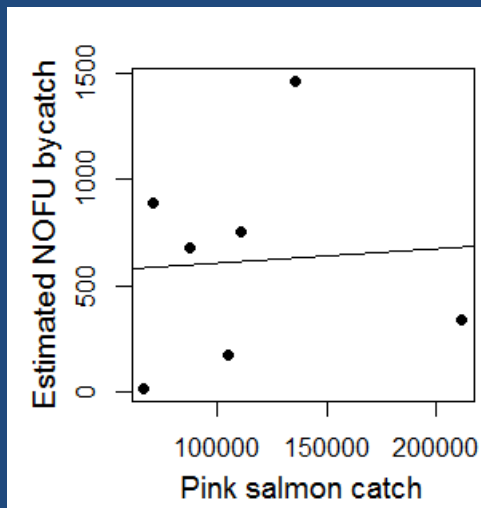


## 2. Neither Gulf of Alaska fulmars or gulls are significantly correlated with Gulf of Alaska pink salmon catch

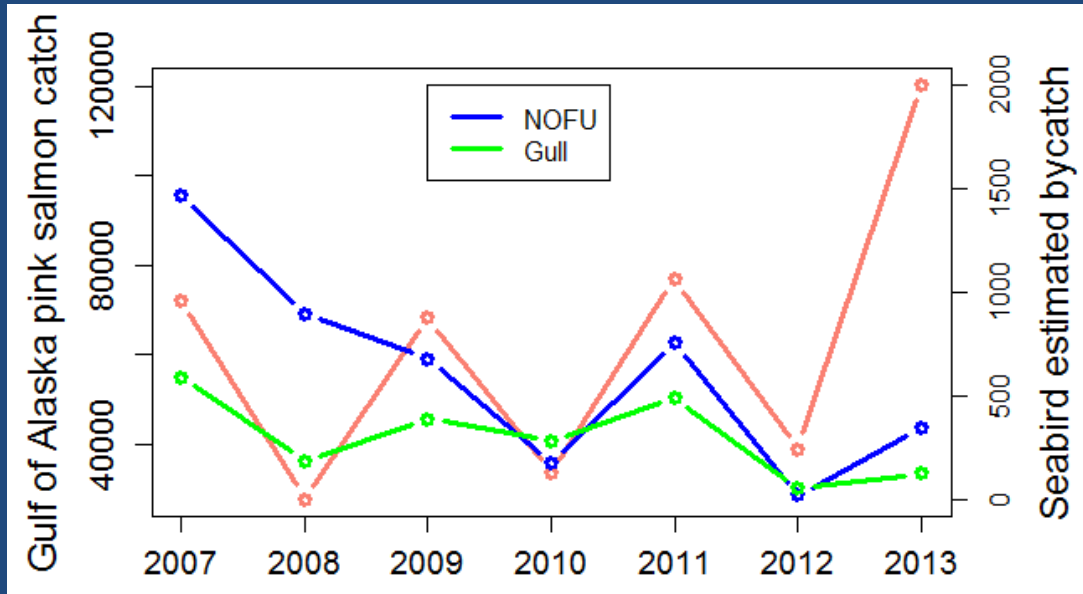


$t = 0.15, p = 0.89$

$t = -0.35, p = 0.74$

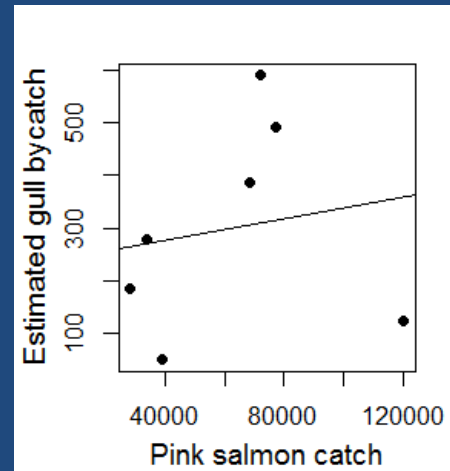
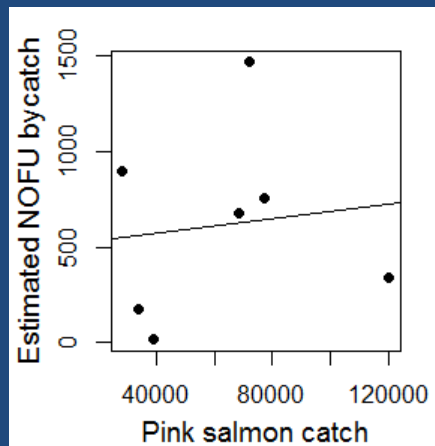


# 2a. This held true even without the weird Prince William Sound pink salmon catches



$t = 0.28, p = 0.79$

$t = 0.37, p = 0.72$



# Summary

1. In the Bering Sea and Aleutian Islands, more fulmars are caught in years with abundant pink salmon (expected)
2. However, shearwater bycatch is not correlated with pink salmon catch (expected; corroborates Toge et al.)
3. In the Gulf of Alaska, neither fulmar or gull bycatch was correlated with pink salmon catch (not expected; 2013 was an “odd” year)



# Conclusions



- Bycatch patterns may inform us about ecosystem conditions
- Bycatch patterns of resident birds may reflect competition from pink salmon
- Bycatch patterns of non-resident birds may not reflect competition because they can leave the system, however there may be unobserved impacts (e.g., body mass and liver condition)
- This is exploratory and correlative work that needs closer investigation