

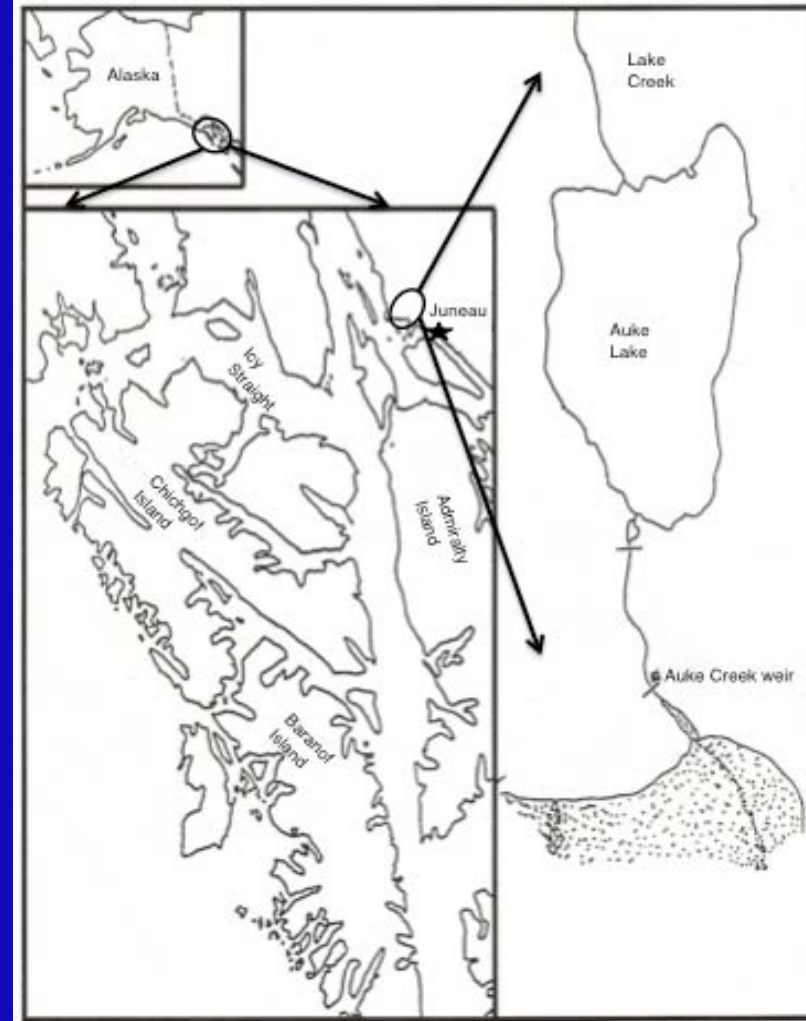
Earlier migration, reduced phenotypic variation, and genetic changes in Auke Cr. salmon.

David Tallmon, Ryan Kovach, John Joyce, Tony Gharrett



Auke Creek Site

- NOAA permanent weir
- ~40 yrs detailed data
- Sockeye, pinks, coho runs
(DVs & cuts, too)



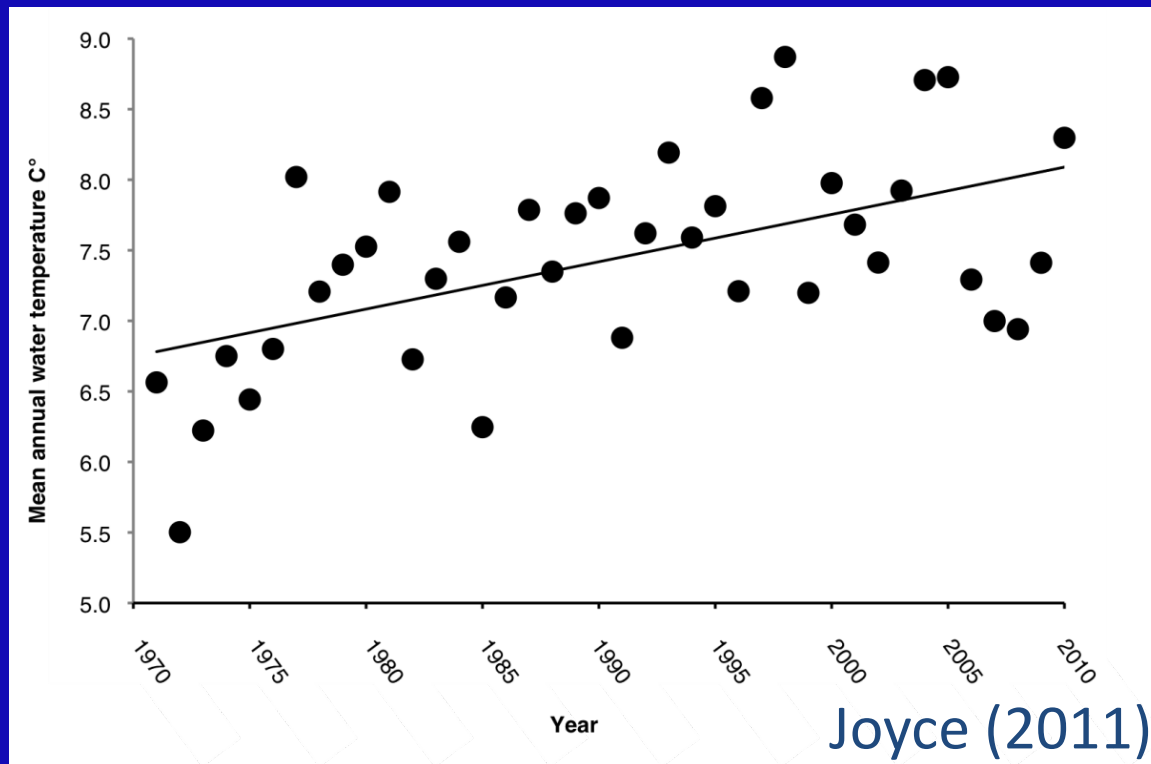
Auke Creek is warming.

Global Change Biology (2008) 14, 229–235, doi: 10.1111/j.1365-2486.2007.01494.x

Climate warming causes phenological shift in Pink Salmon, *Oncorhynchus gorbuscha*, behavior at Auke Creek, Alaska

SIDNEY G. TAYLOR

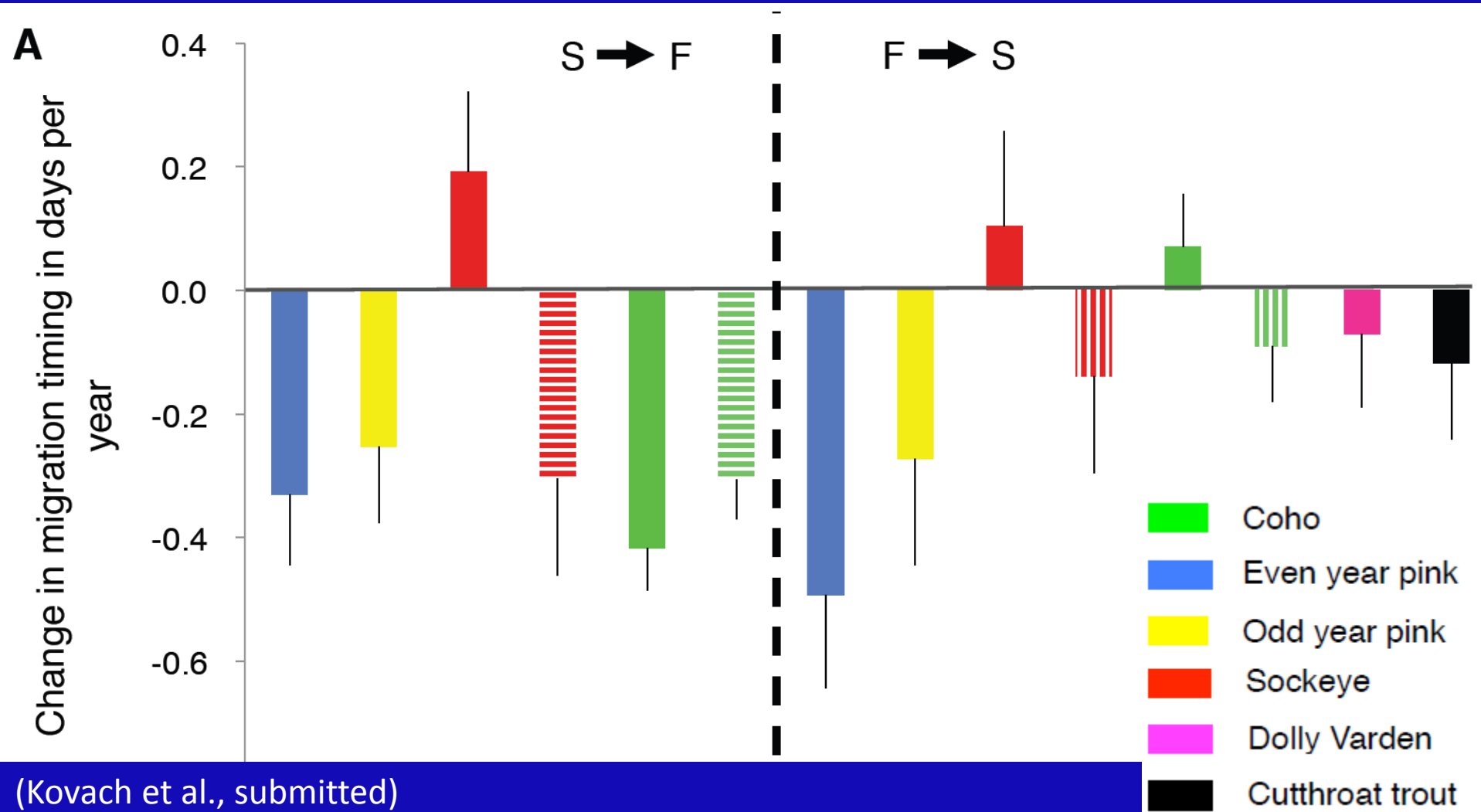
There was a significant trend of earlier migration of pink salmon fry at a rate of $-0.5 \text{ days yr}^{-1}$ (SE = 0.13, $P < 0.001$).



Questions

- Is there evidence of earlier migration across Auke Creek salmon life histories/species?
- Is there evidence of reduced phenotypic variation across life histories/species?
- Is there evidence for a genetic response by pink salmon to selection for earlier migration?

Most Auke Cr. life history/species show earlier migration.



Questions

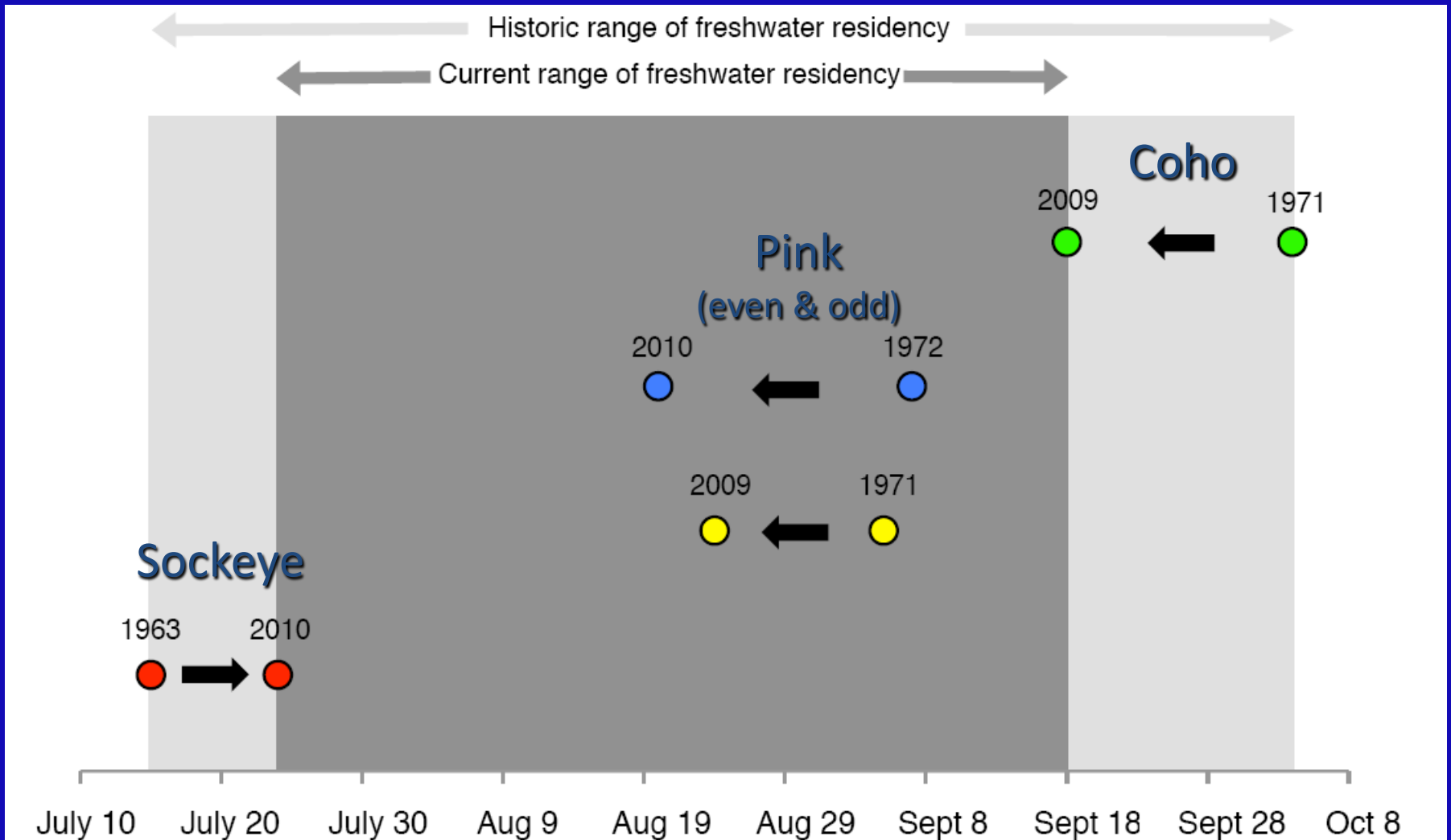
- Is there evidence of earlier migration across Auke Creek salmon life histories/species?

Yes, 11/14 show earlier migration

Adult coho 17 days earlier than 40 yrs ago

$\bar{x} = 1.7$ day earlier/decade

Adult salmon availability has decreased.

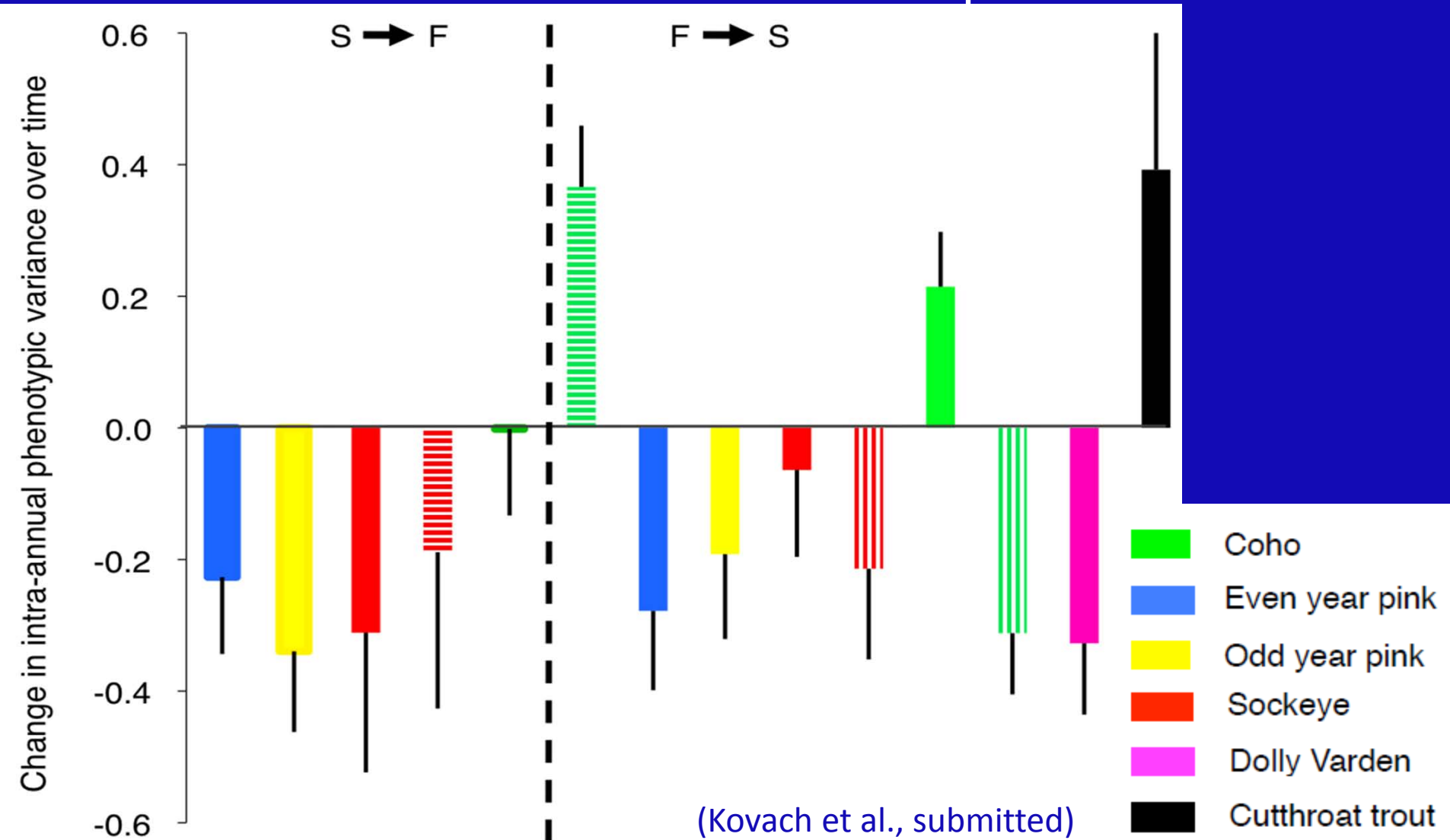


(Kovach et al., submitted)

Questions

- Is there evidence of earlier migration across Auke Creek salmon life histories/species? **Yes.**
- Is there evidence of reduced phenotypic variation across life histories/species?

Most Auke Cr. life history/species show reduced variation (V_p) in timing.



Questions

- Is there evidence of earlier migration across Auke Creek salmon life histories/species?
- Is there evidence of reduced phenotypic variation across life histories/species? **Yes.**

11/14 cases show reduced variation

$\bar{x} = 10.2\%$ ($SE = 6.1\%$) \downarrow in V_p

→ Plastic or genetic?

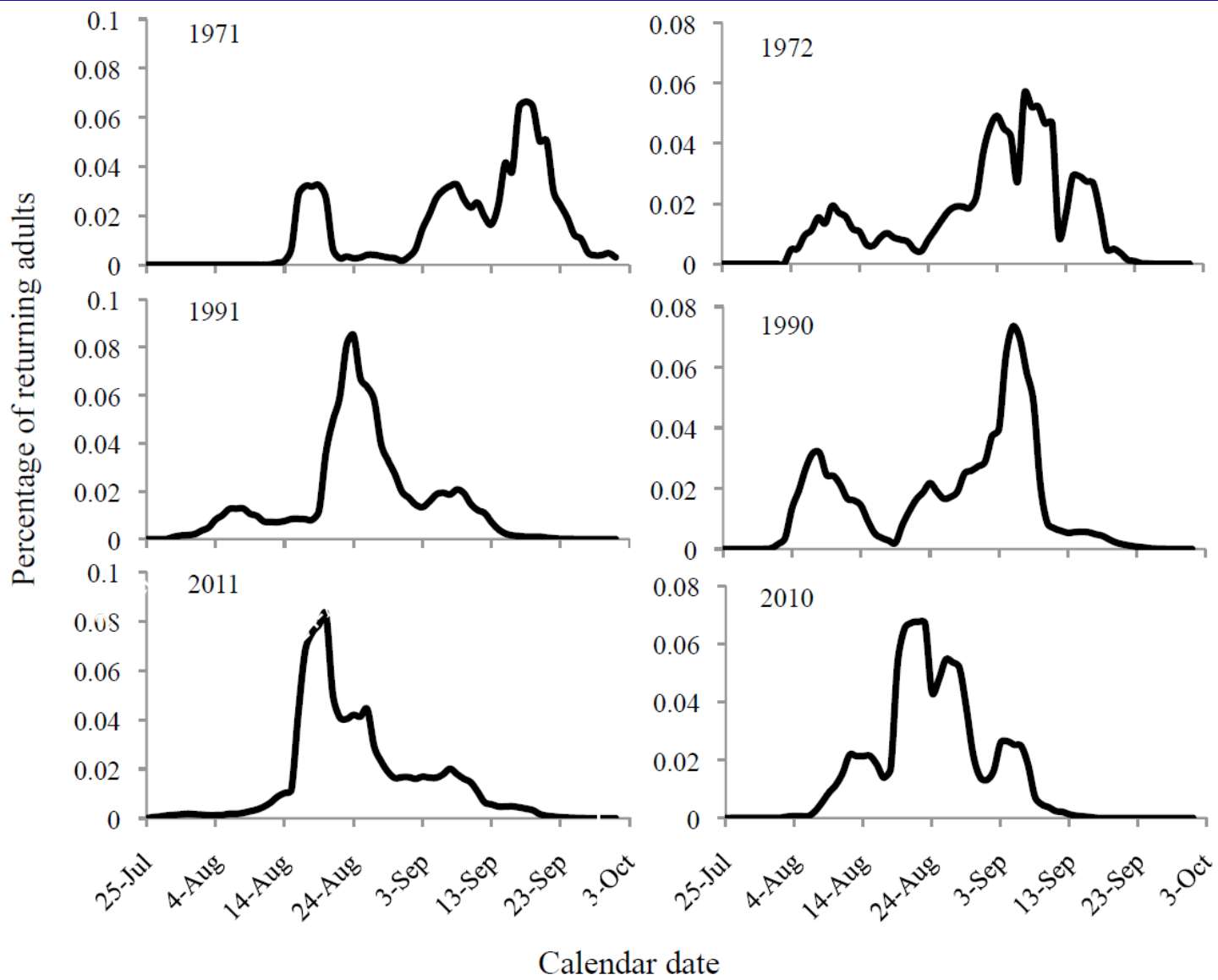
Questions

- Is there evidence of earlier migration across Auke Creek salmon life histories/species? Yes.
- Is there evidence of reduced phenotypic variation across life histories/species? Yes.
- Is there evidence for a genetic response by pink salmon to selection for earlier migration?

Adult Pink Salmon

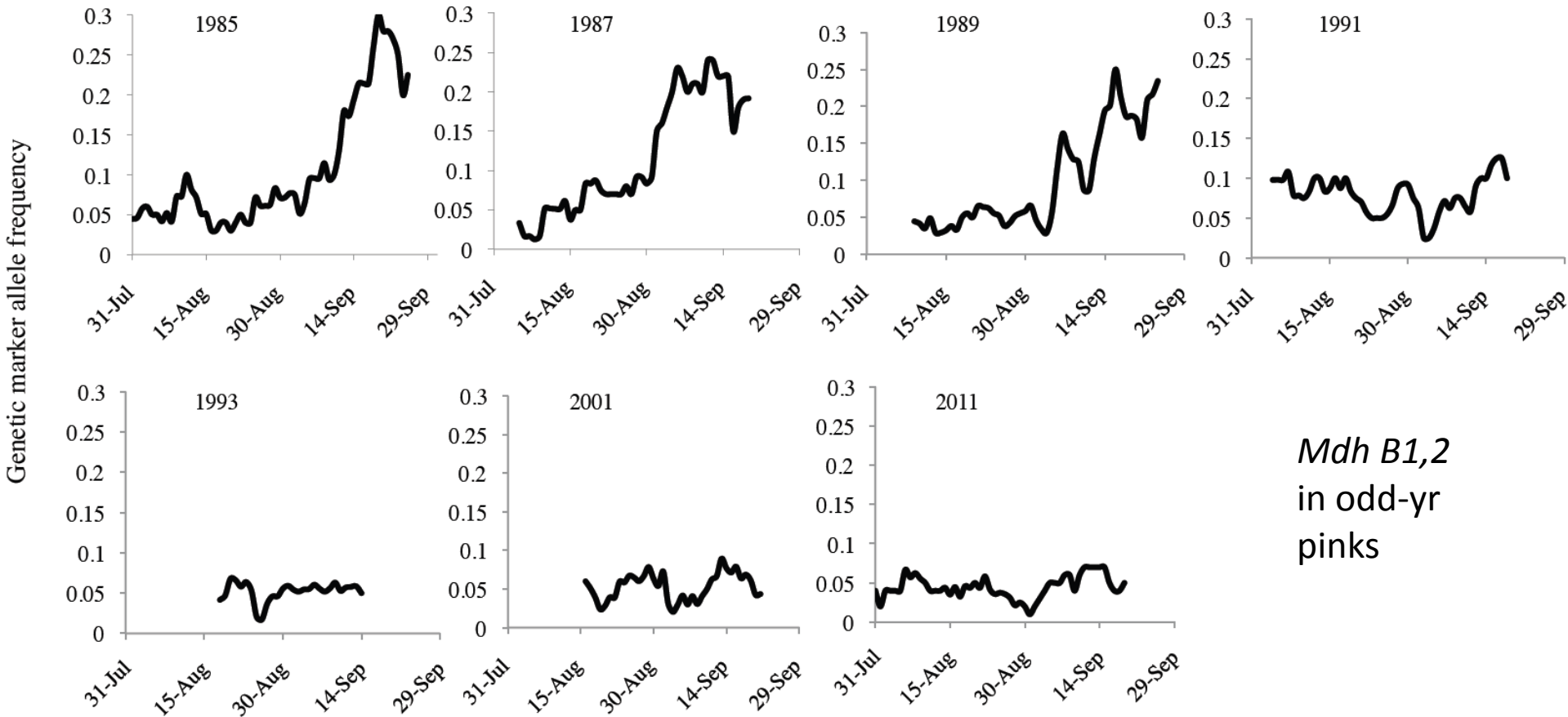
Odd

Even



Earlier Migration
Reduced Variation
Reduced Biocomplexity

Evidence of genetic response to selection for earlier migration.



Have neutral genetic change, but
Is there evidence of an adaptive genetic
response in pink salmon?

Amplified 26 usat loci in odd-year pinks ('93, '01, '09).

Three putative “run-timing” loci (*Clock*, *Cryptochrome*)

Looked for evidence of changes in response to selection over
time ('93-'09).

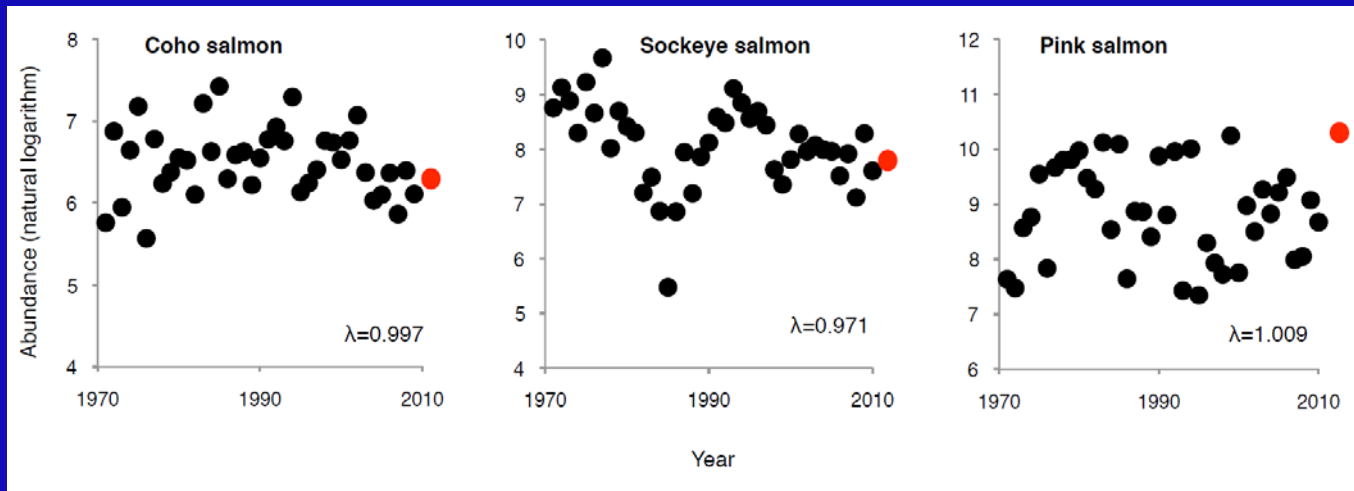
→ No adaptive change in “run-timing” genes

Questions.

- Is there evidence of earlier migration in other life histories/species? Yes .
- Is there evidence of reduced phenotypic variation? Yes.
- Is there evidence for a genetic response by pink salmon to selection for earlier migration?
Yes (neutral marker) and no (candidate loci).

Conclusions

- Lots of phenotypic change – earlier and less variation
- Evidence for selection & genetic change in odd pinks
- Populations appear to be stable



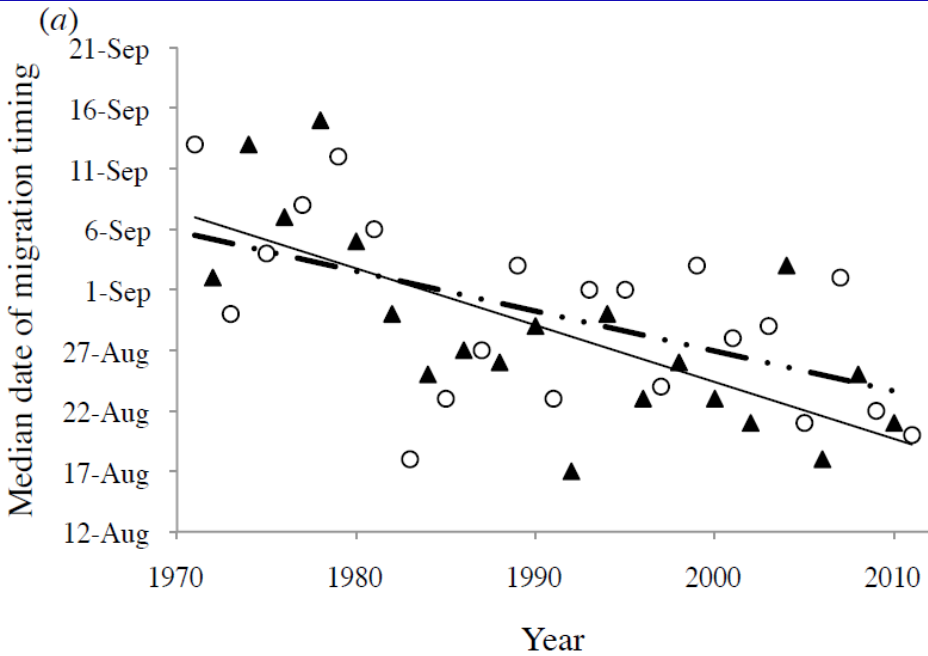
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- North Pacific Research Board (Project # 1110)

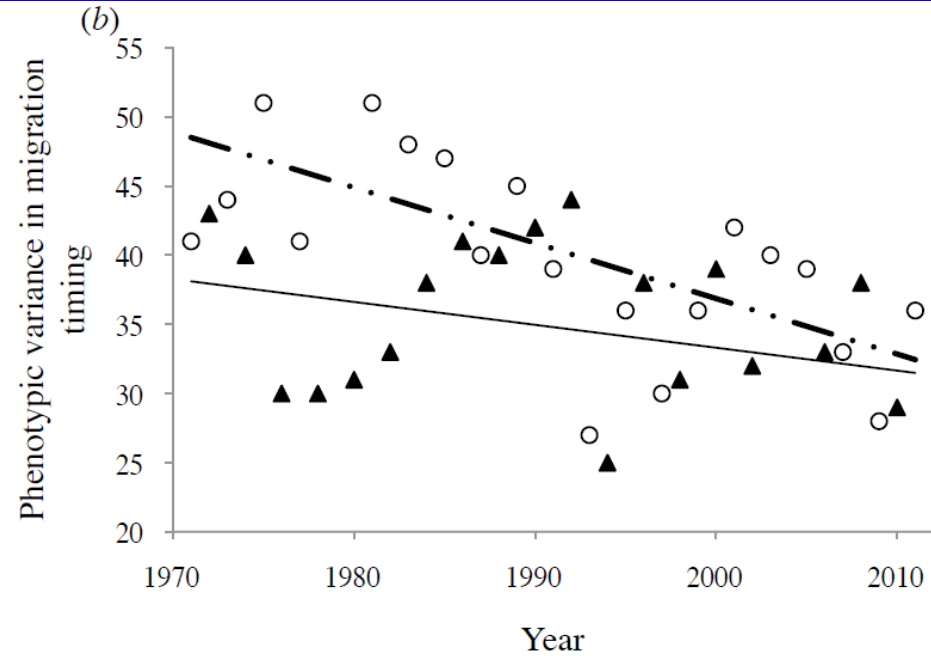


Focus on Adult Pink Salmon

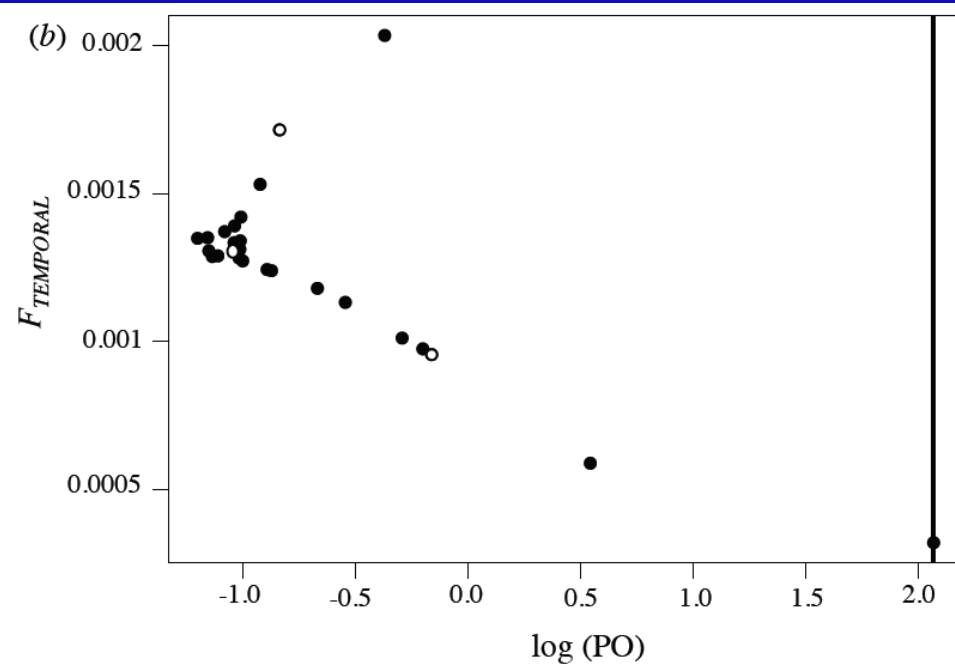
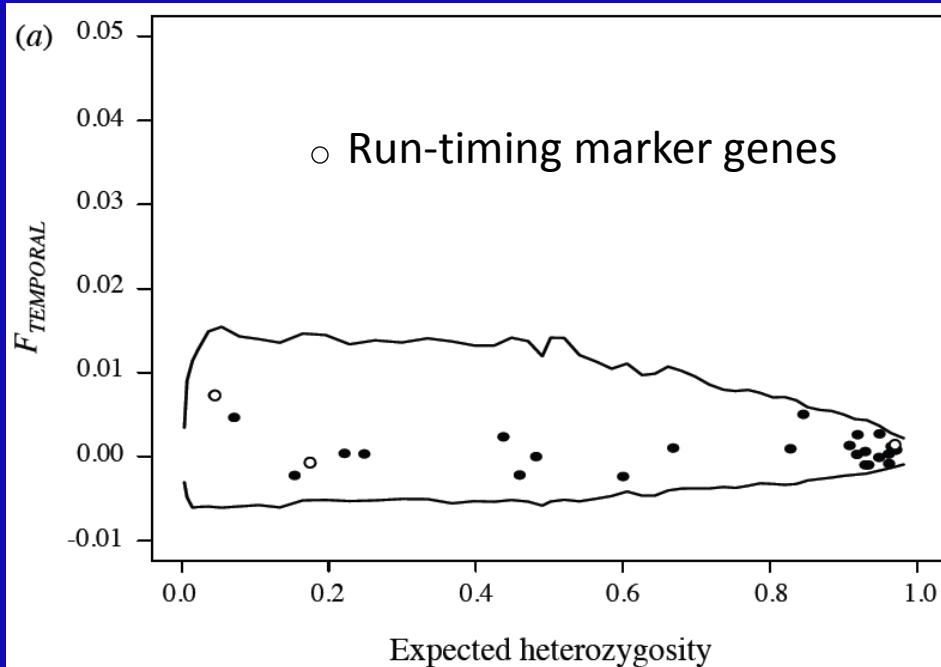
Earlier Migration



Reduced Variation



No evidence of adaptive genetic response to selection at molecular level.



Evidence of genetic response to selection for earlier migration.

