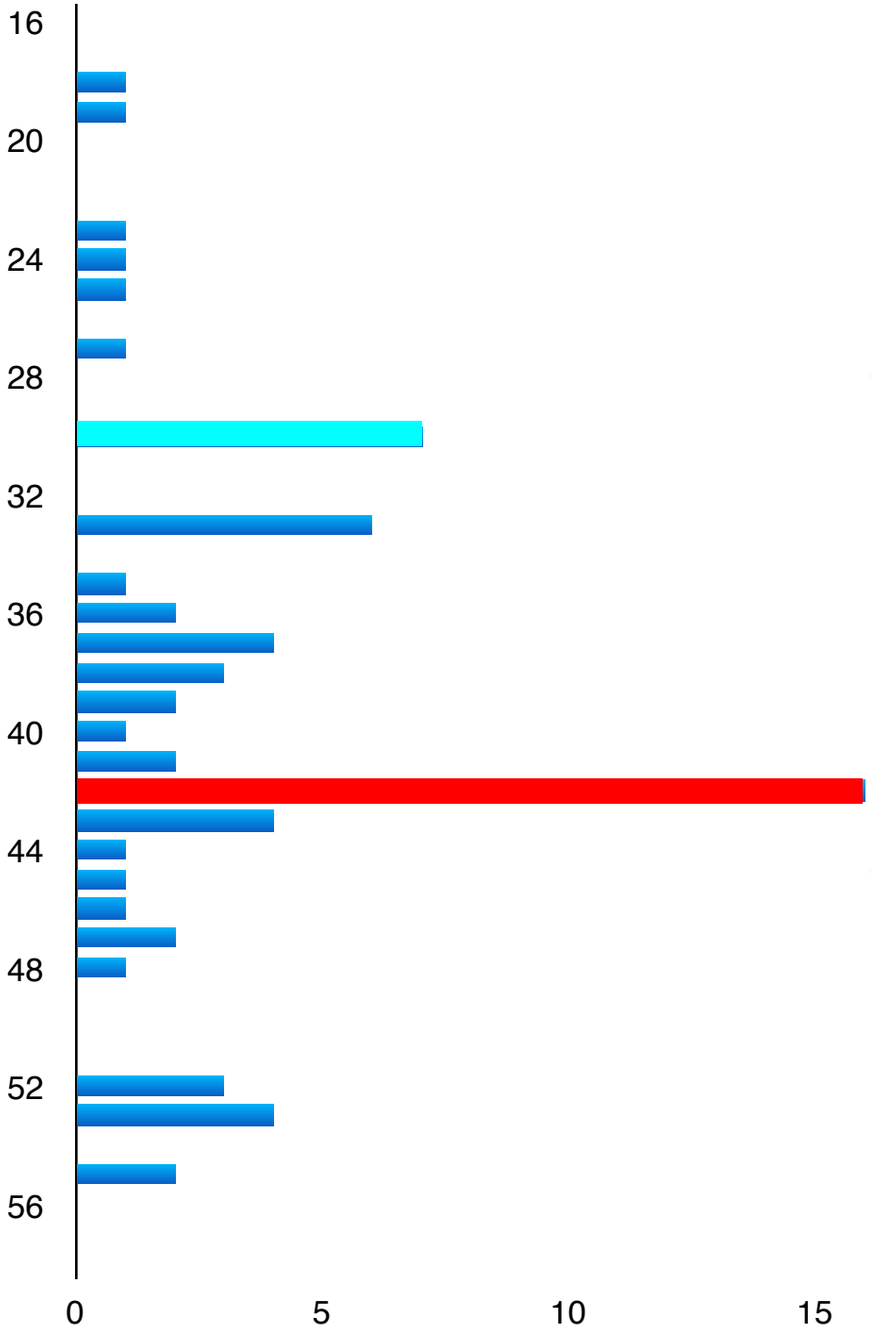
Latitudinal gene transfer and the biogeography of Chile

Wares, J.P.
Ewers, C.
University of Georgia

studies by latitude indicating biogeographic break (from Camus 2001)



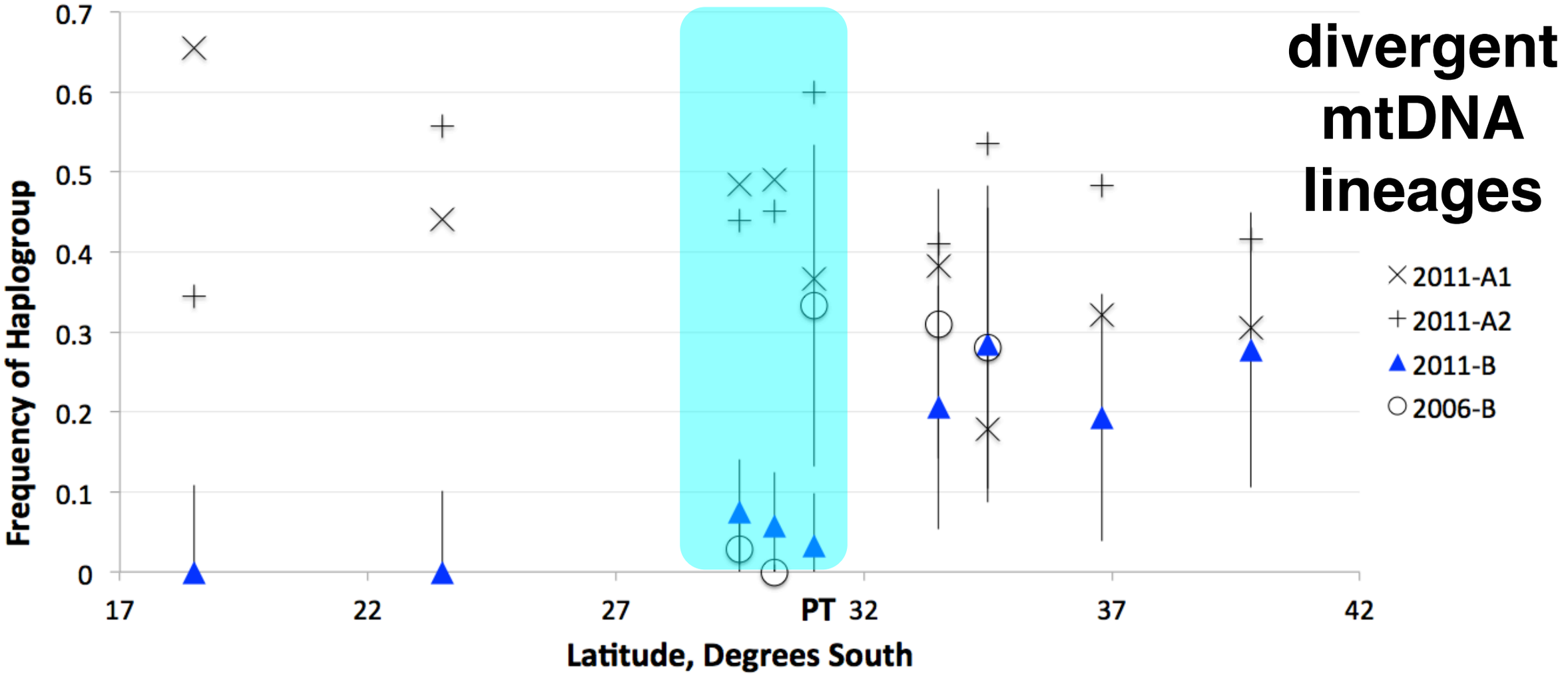
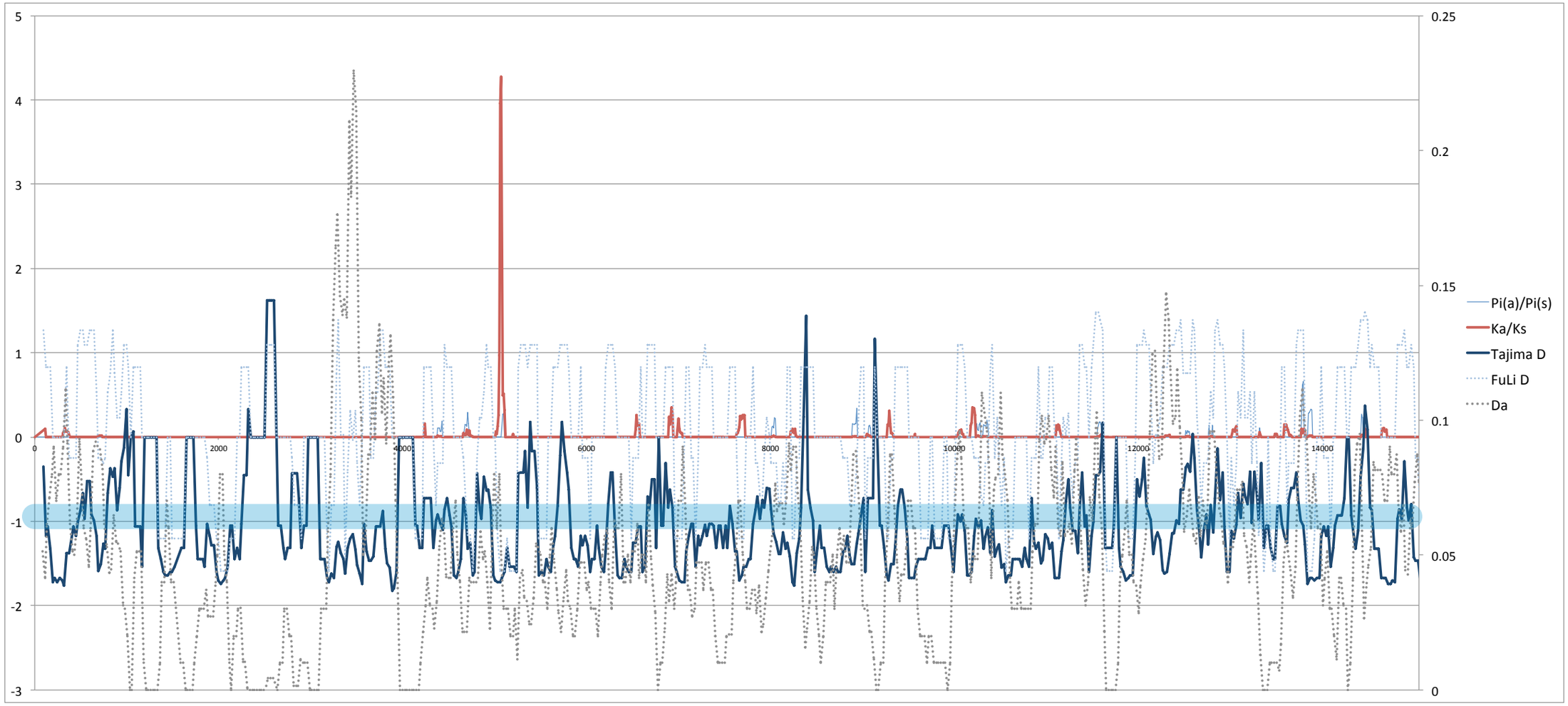
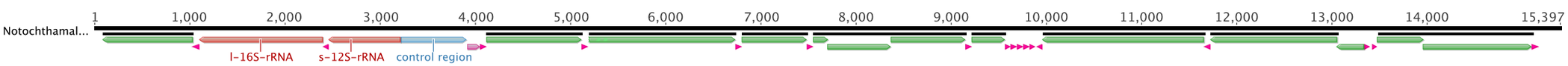
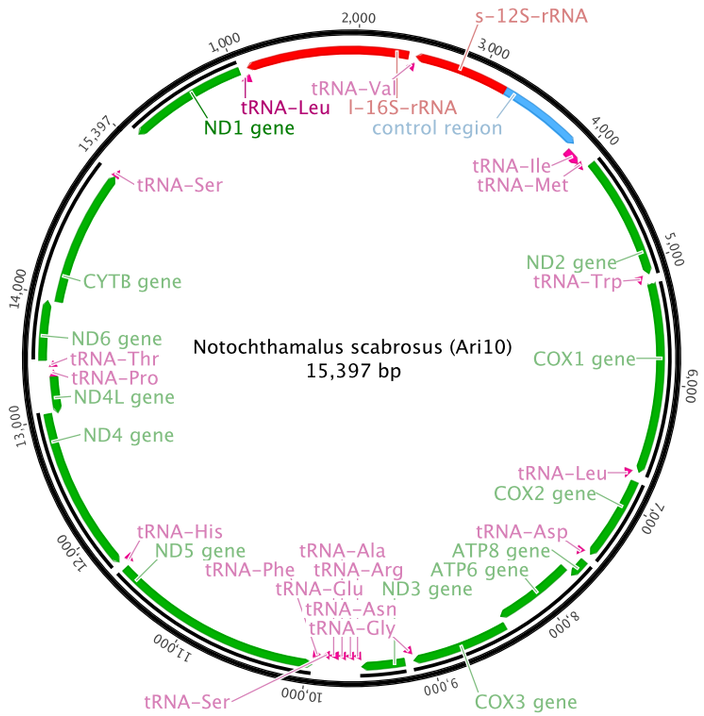


Figure 2. Observed frequencies of haplogroups, as identified through Bayesian clade probabilities, across the geographic range of *N. scabrosus* as sampled. Haplogroup B data are shown from 2006 (Zakas et al. 2009) for the locations shared with current (2010–2011) sample. Error bars are based on binomial sampling frequencies and are shown only for the B clade samples for clarity. Only Punta Talca (labeled "PT" on horizontal axis) exhibits a significant ($P < 0.05$) shift in frequency of B clade individuals. All other changes in haplogroup frequencies are not statistically significant.

Laughlin, Ewers, Wares 2012. Ecol. Evol. 3:283



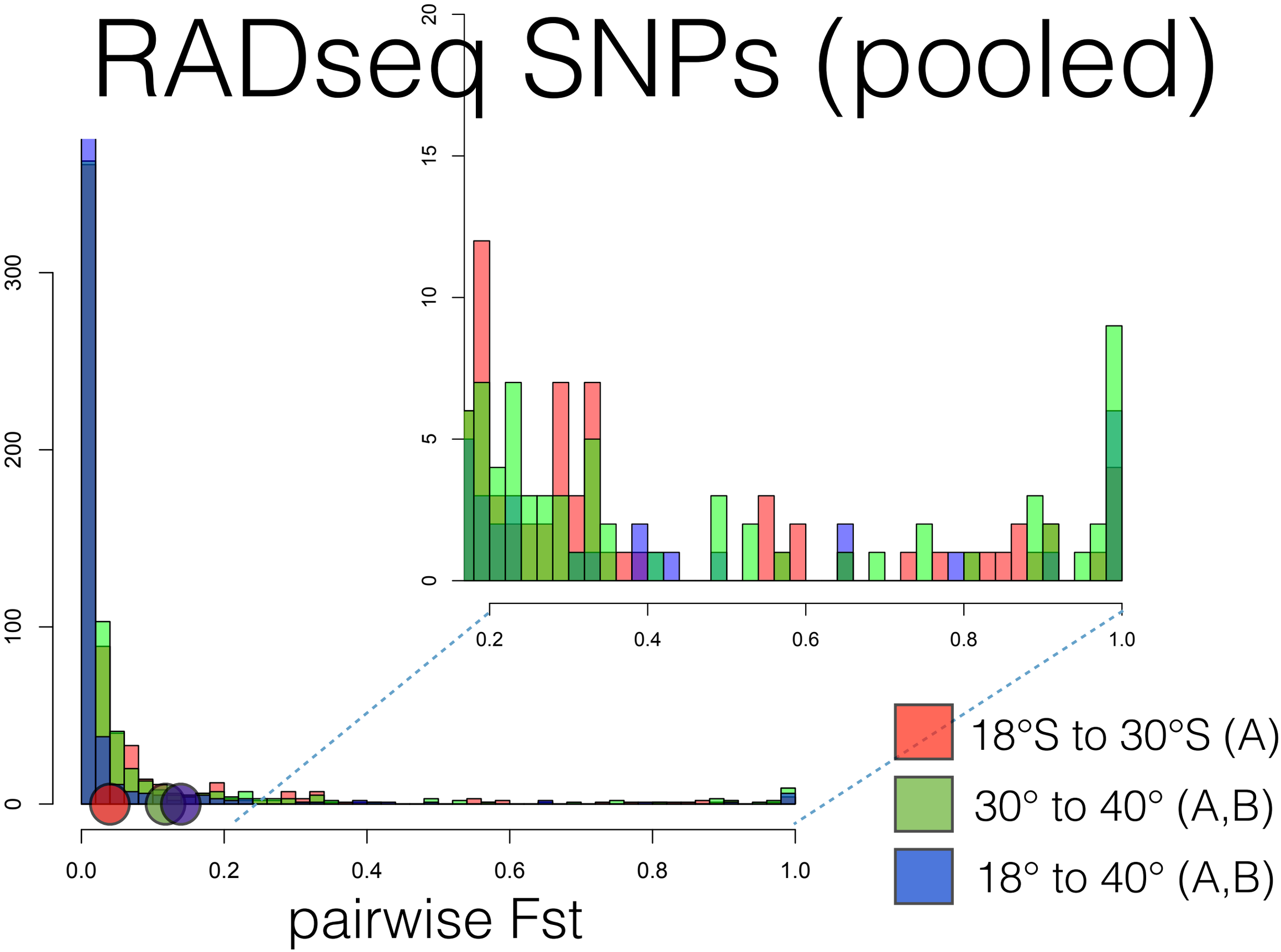




high Ka/Ks near end of ND2 gene, but...

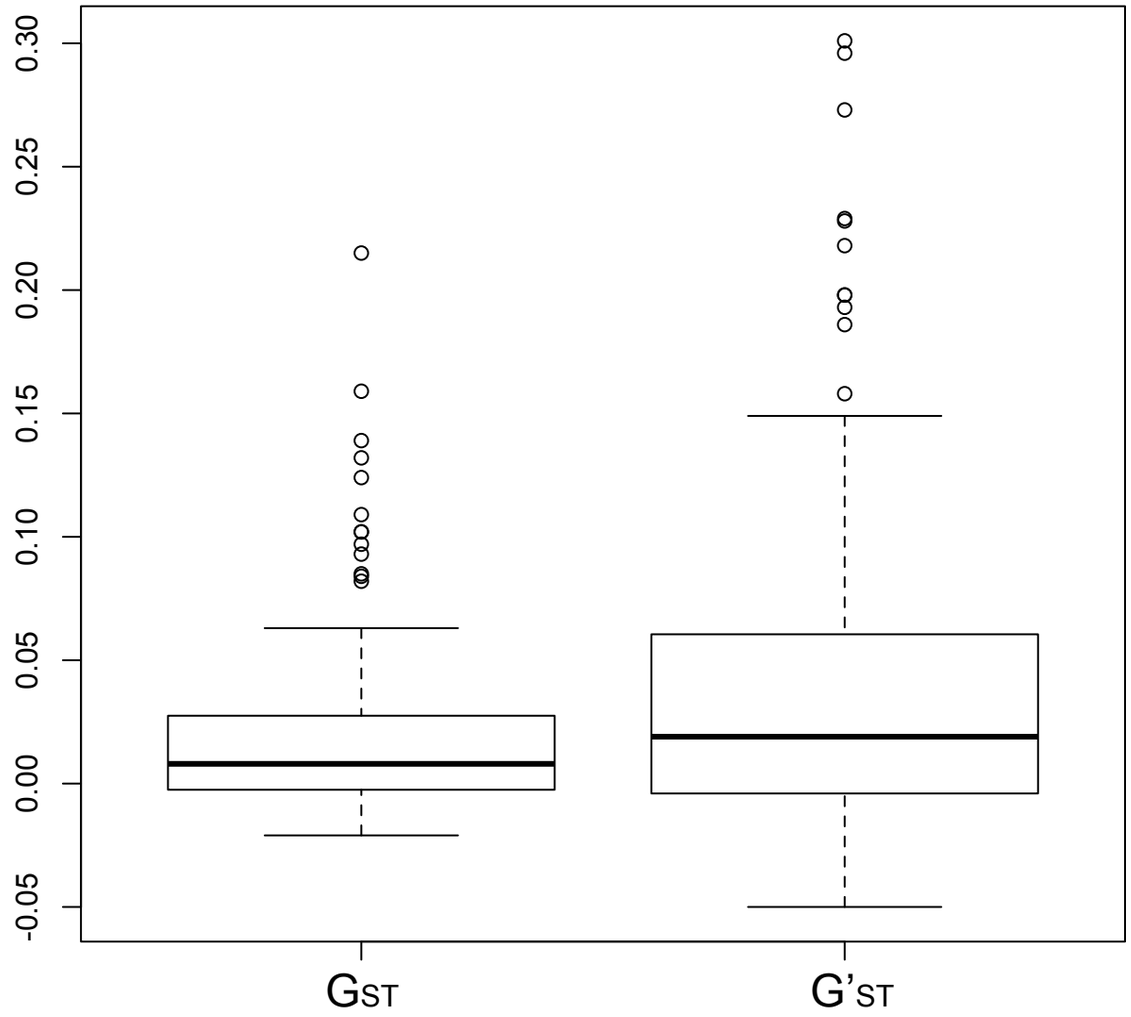
overall negative Tajima's D
near-zero Fu and Li's D
McDonald-Kreitman consistent with purifying selection

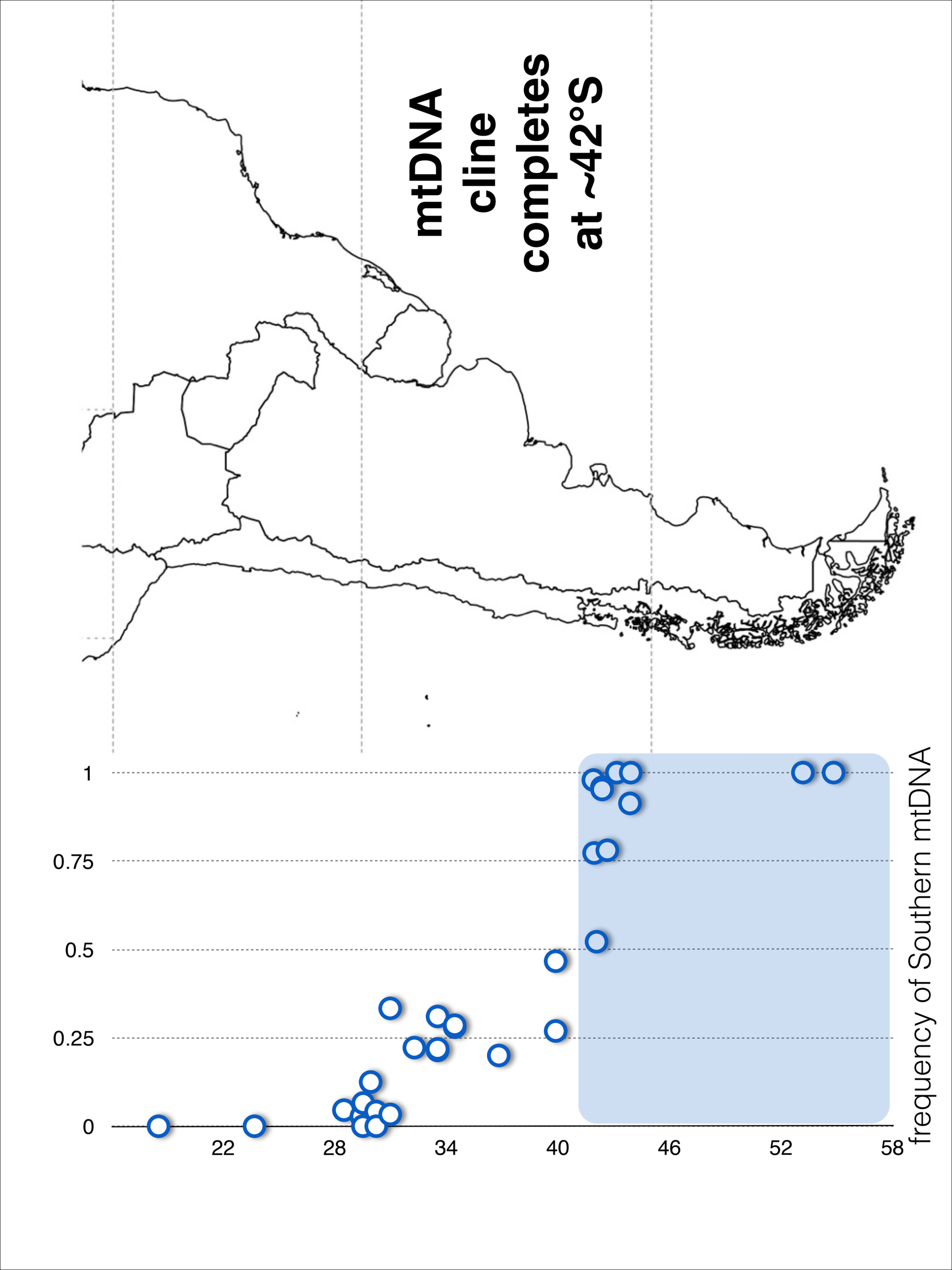
RADseq SNPs (pooled)



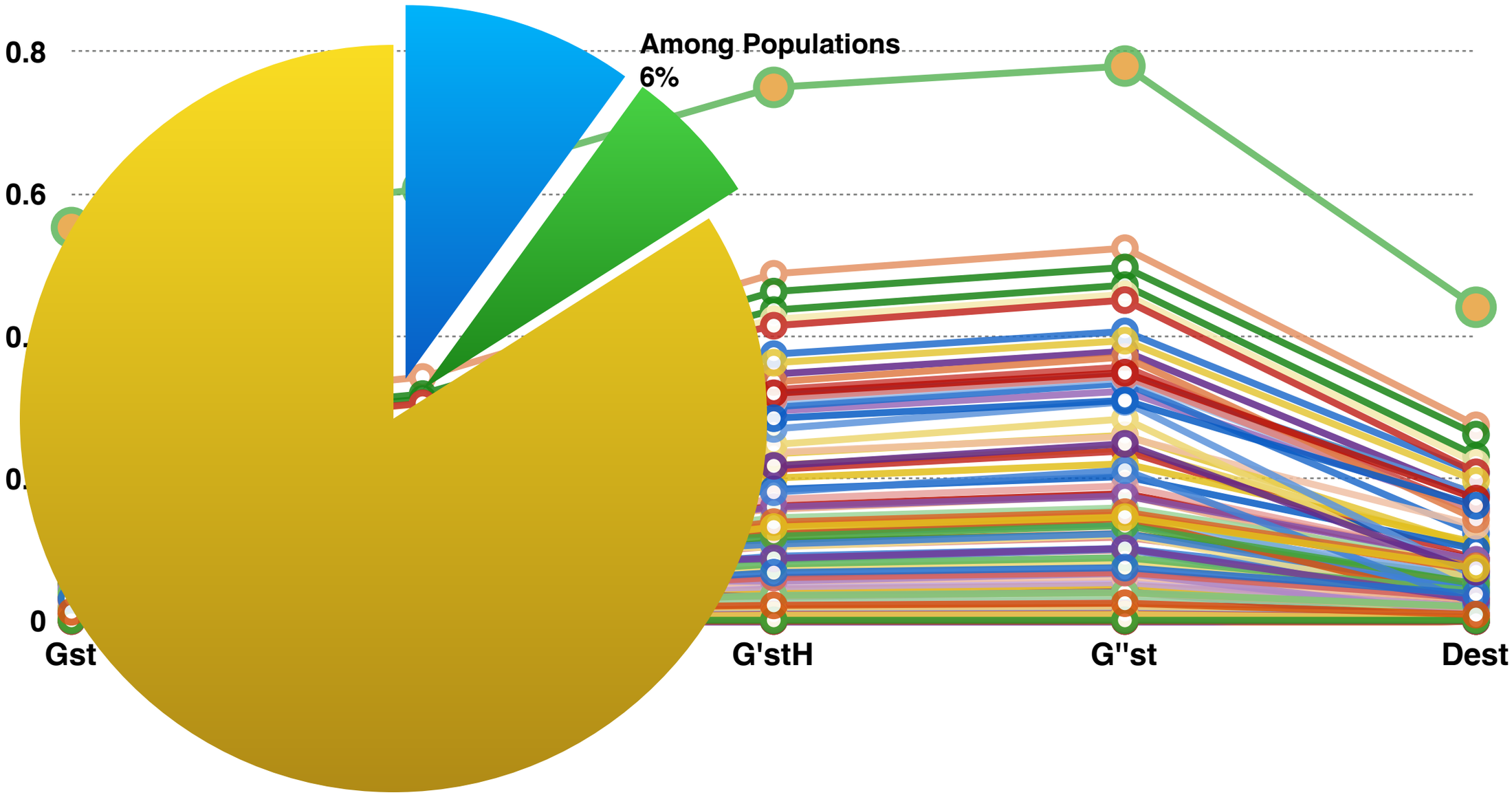
BeadXPress SNPs - individual

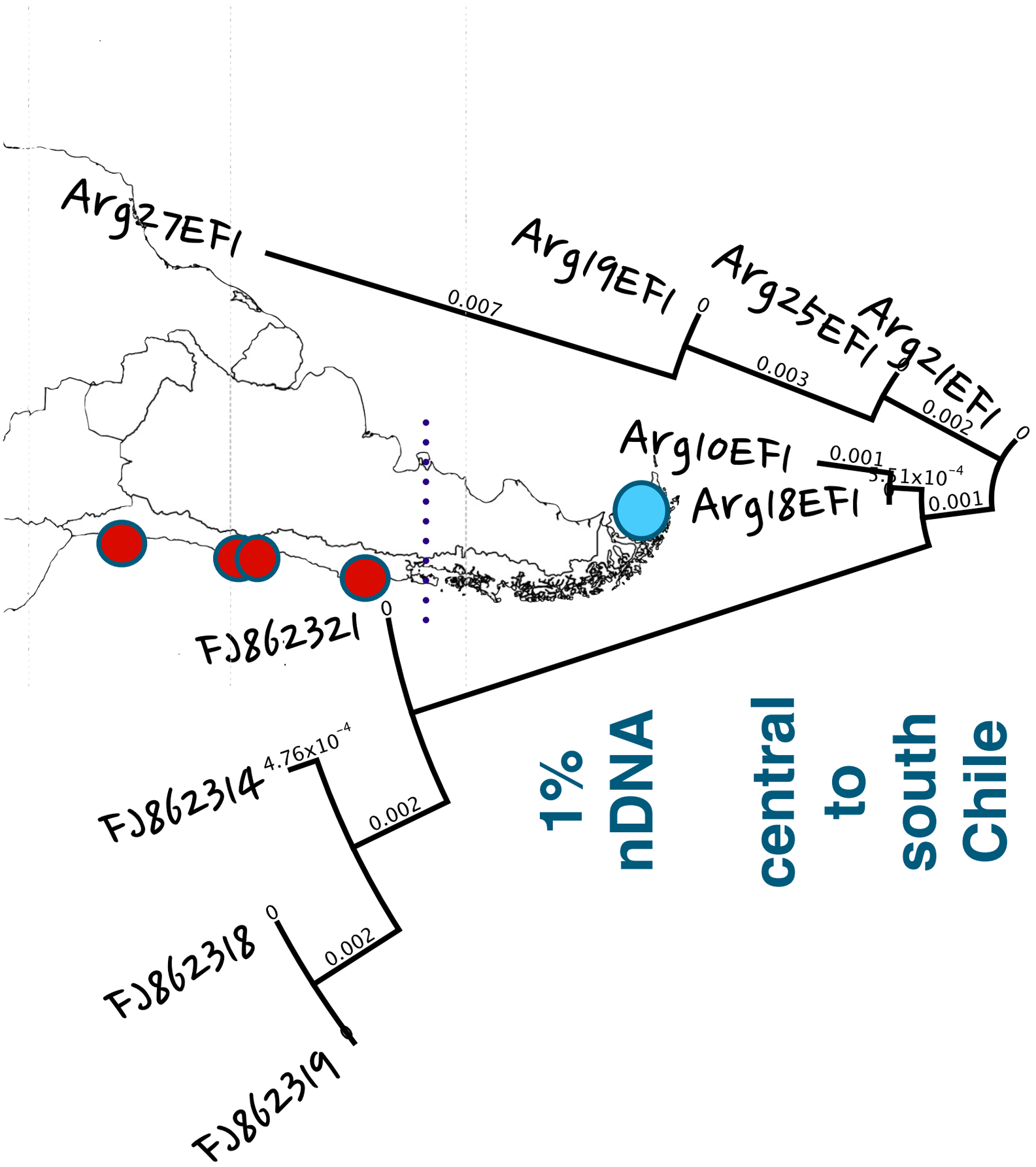
- 102 SNPs, information from 5 regions, 280 individuals
- STRUCTURE, AMOVA consistent: nDNA homogeneity in North, Central
- ~5% loci in cytonuclear disequilibrium ($p<0.05$)




mtDNA
cline
completes
at ~42°S
1
0.75
0.5
0.25
0
22
28
34
40
46
52
58
frequency of Southern mtDNA

outlier locus (of 102 SNPs)




Arg27EF1
Arg19EF1
Arg25EF1
Arg21EF1
Arg10EF1
Arg18EF1
FJ862321
FJ862314
FJ862318
FJ862319
0.007
0.003
0.002
0.001
3.51x10^-4
0.001
4.76x10^-4
0.002
0.002
0
0
0
0
0
1% nDNA central to south Chile

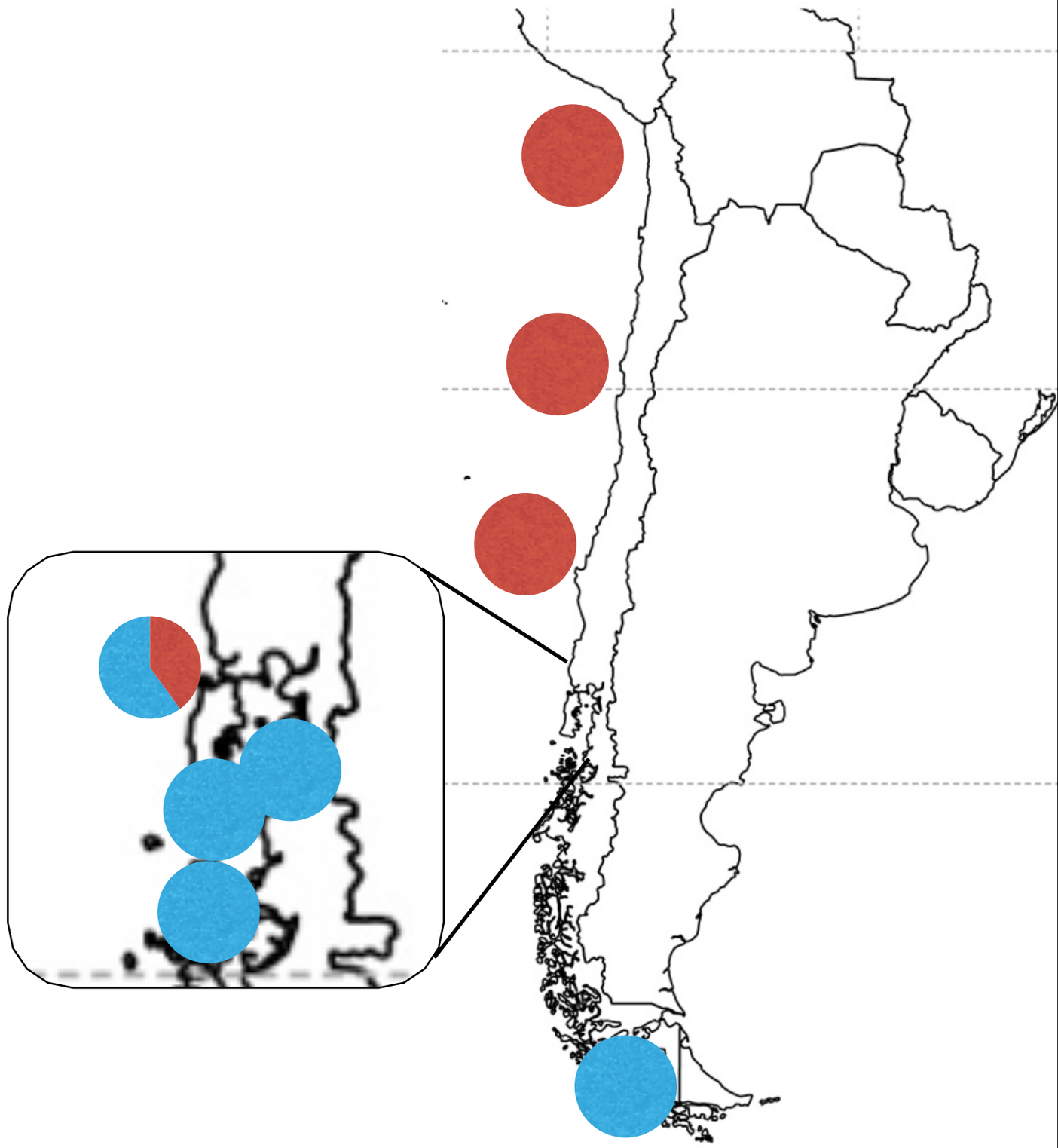
- 102 SNPs (beadXpress) across coast of Chile

- more to be genotyped inside and out of Gulf of Ancud: sharp break (STRUCTURE k=2)

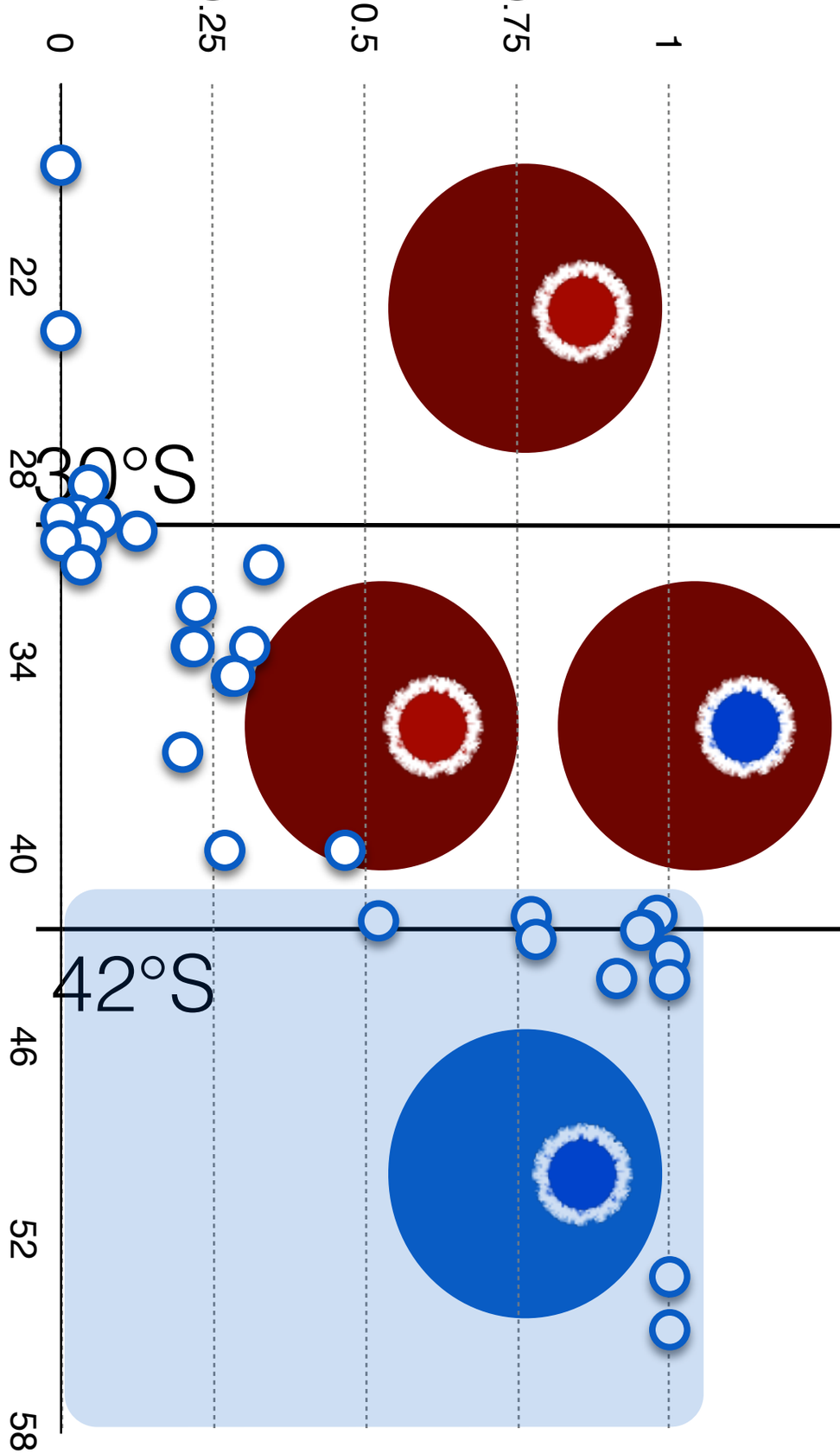
- pattern distinct between nuclear and mtDNA genomes:

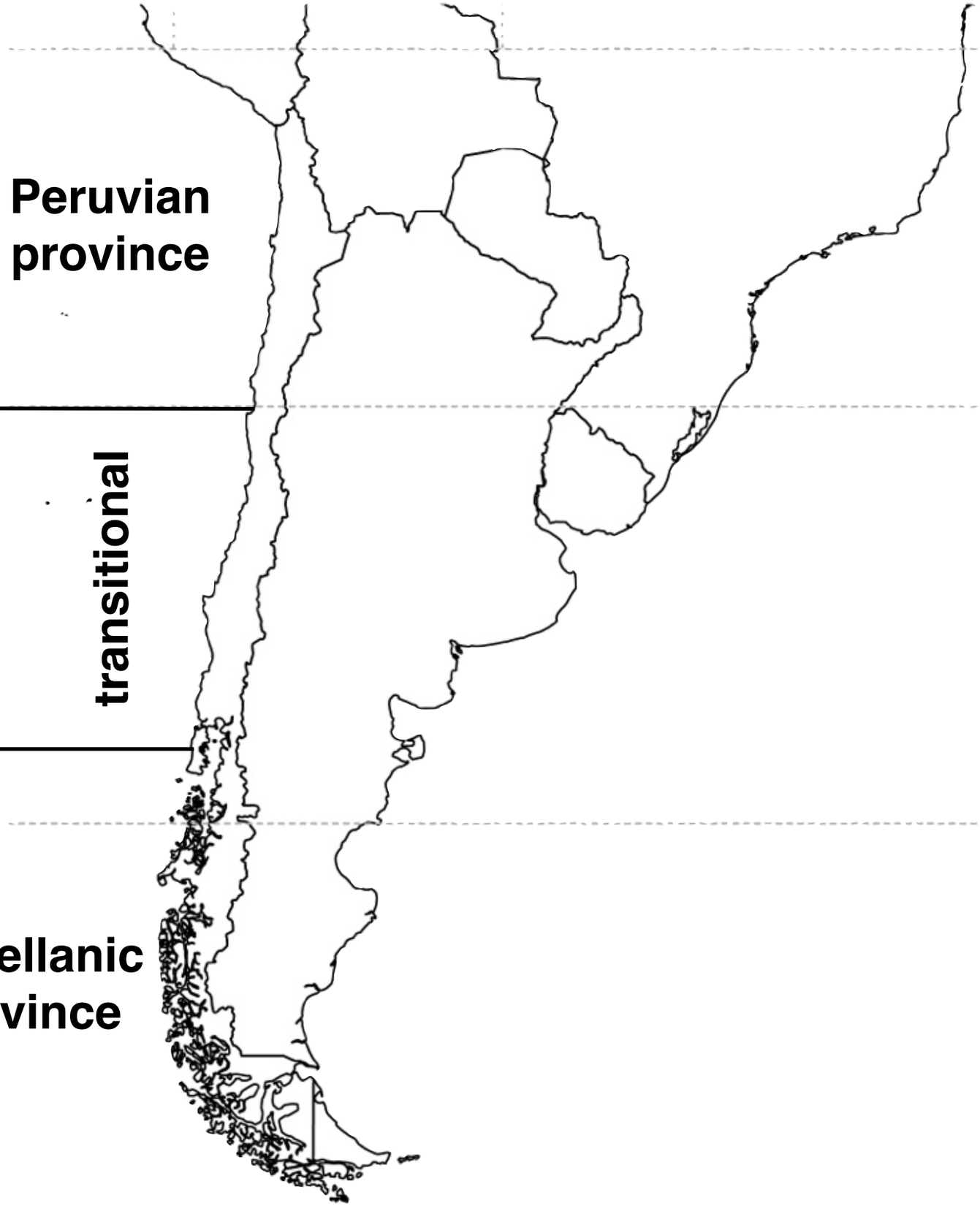
  - 1 selective cline with neutral rafting of mtDNA (dissipation of signal)?

  - or 2 clines?



What *Notochthamalus* tells us about biogeography

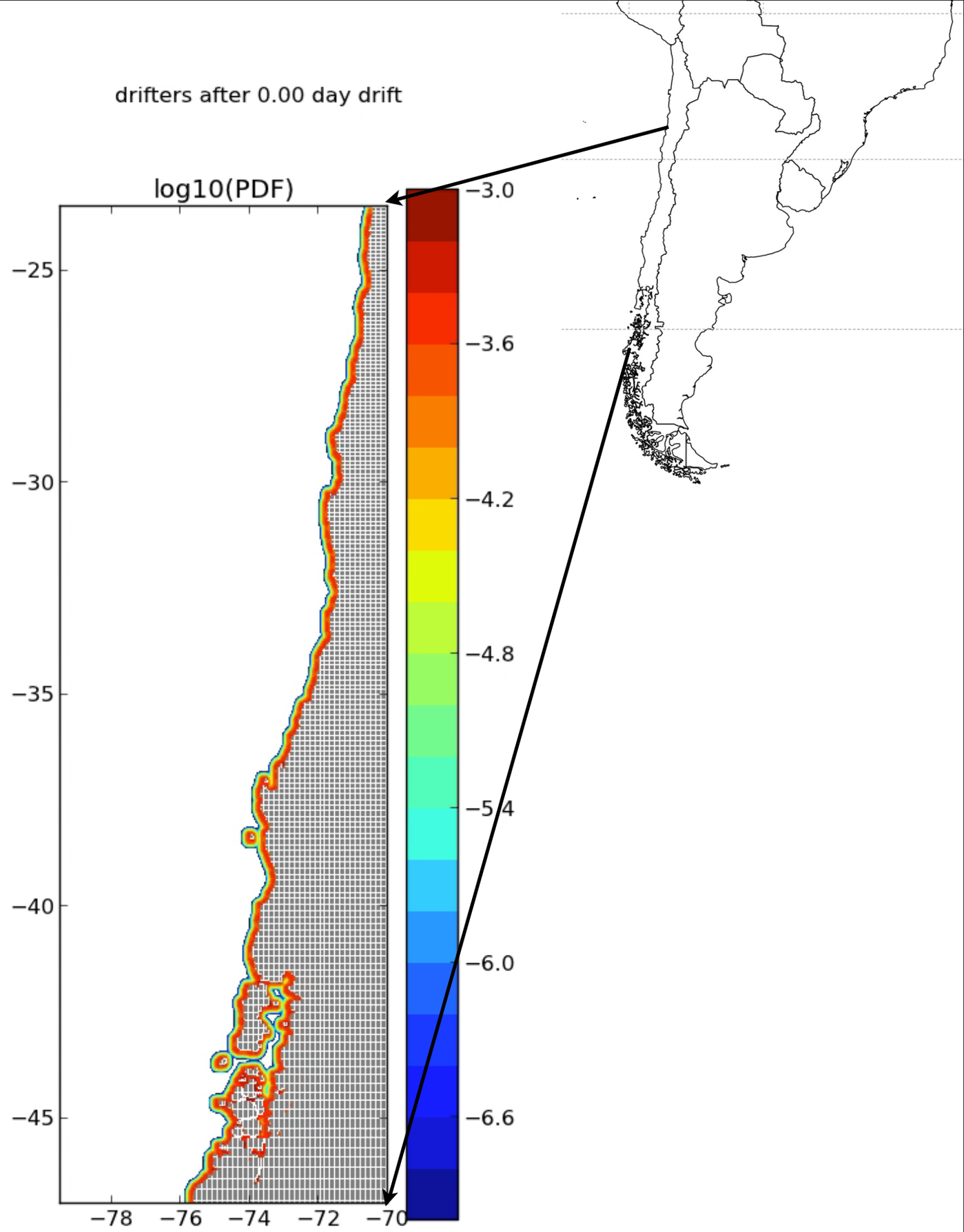




asymmetric introgression

- very common in hybrid zones
- definitely represented in other marine taxa, e.g. *Mytilus*
- mtDNA flows in direction of major currents: neutral spill-over?

retention of
larvae,
traits,
species



retention of
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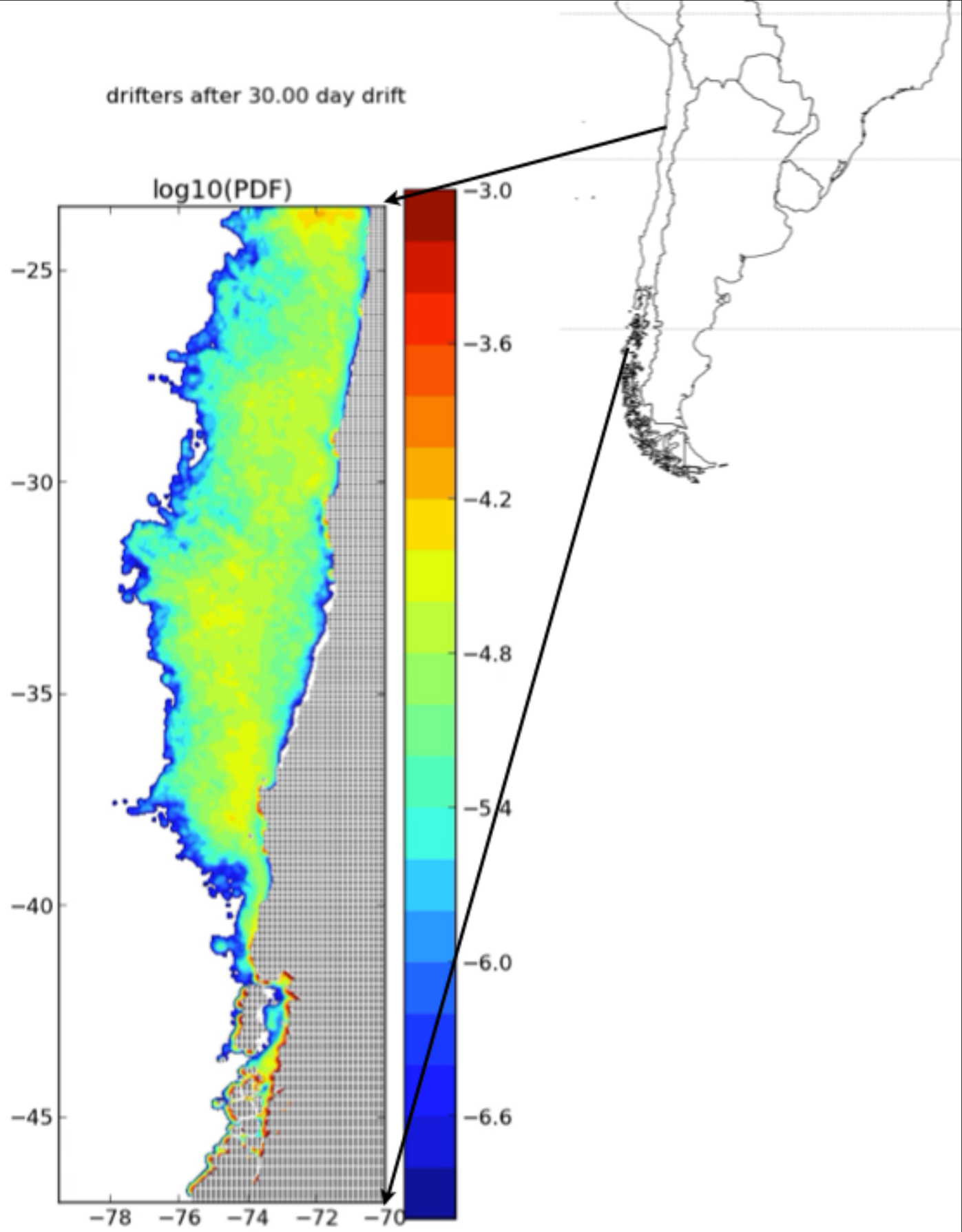

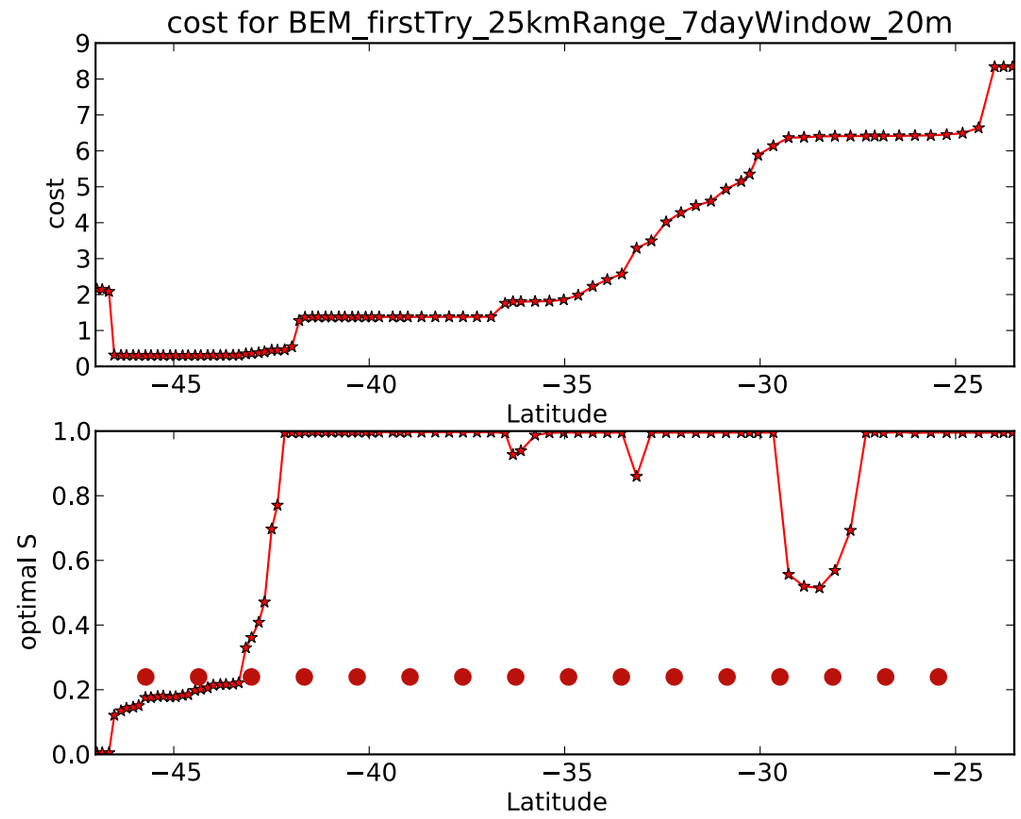

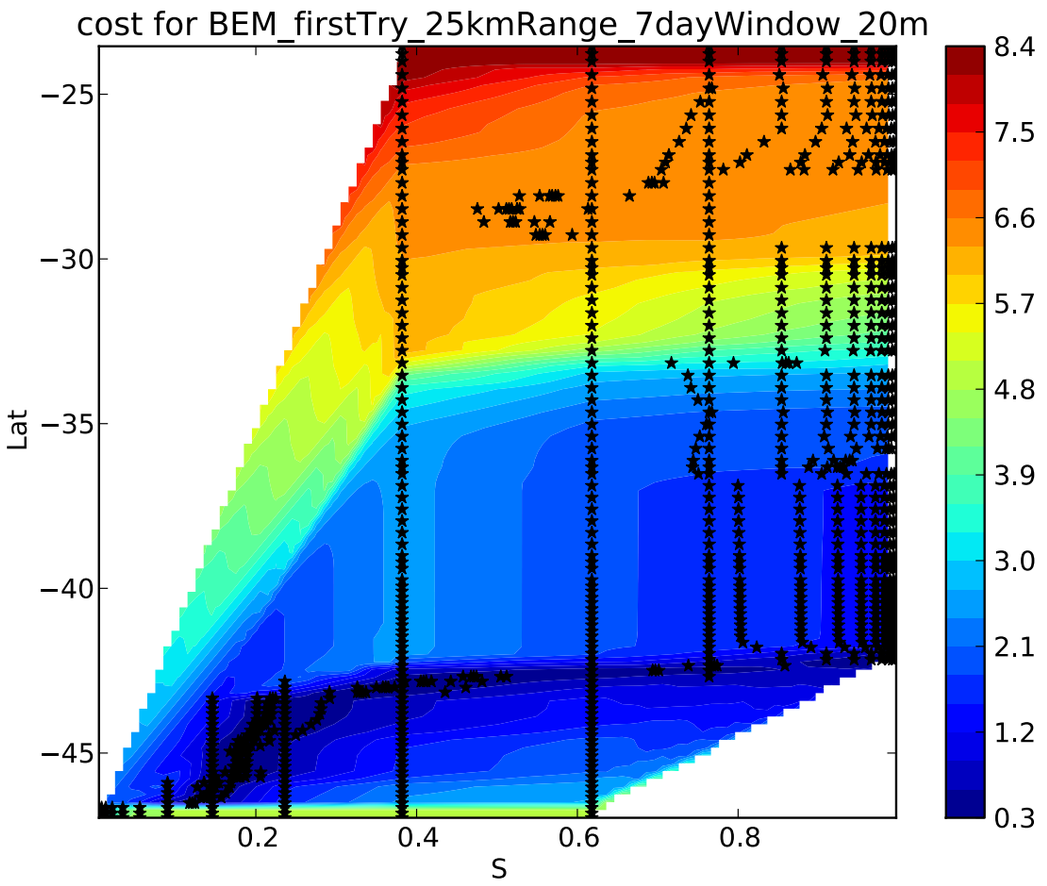

- Likelihood fitting model employing physical oceanography and biological model from Pringle & Wares 2007
- Where is region of differential fitness and how strong is selection/performance differential?

Using population genetics to inform biogeography

- Time scales - identify contemporary processes that maintain disjunctions among regions

- Not often one species responds to two biogeographic transitions...

- Continuing: settlement and nearshore selection, forecast for other systems

supergracias

Kelly Laughlin, Christina Zakas, Ken Jones
Daniel Saucedo
James Pringle

Sergio Navarrete, Pilar Haye
Reserva Añihue, Fundacion Huinay
FONDECYT

NSF-Biological Oceanography