

Candidate loci under environmental selection in a panmictic marine population

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Summer flounder, (*Paralichthys dentatus*), is a popular and economically important species for recreational and commercial fishermen along the U.S. east coast. Management of summer flounder is complicated by their recent geographic shift northward, and uncertainties in how they may adapt to climate change. To understand how summer flounder may respond to environmental changes, we investigate existing genetic variation across space by asking:

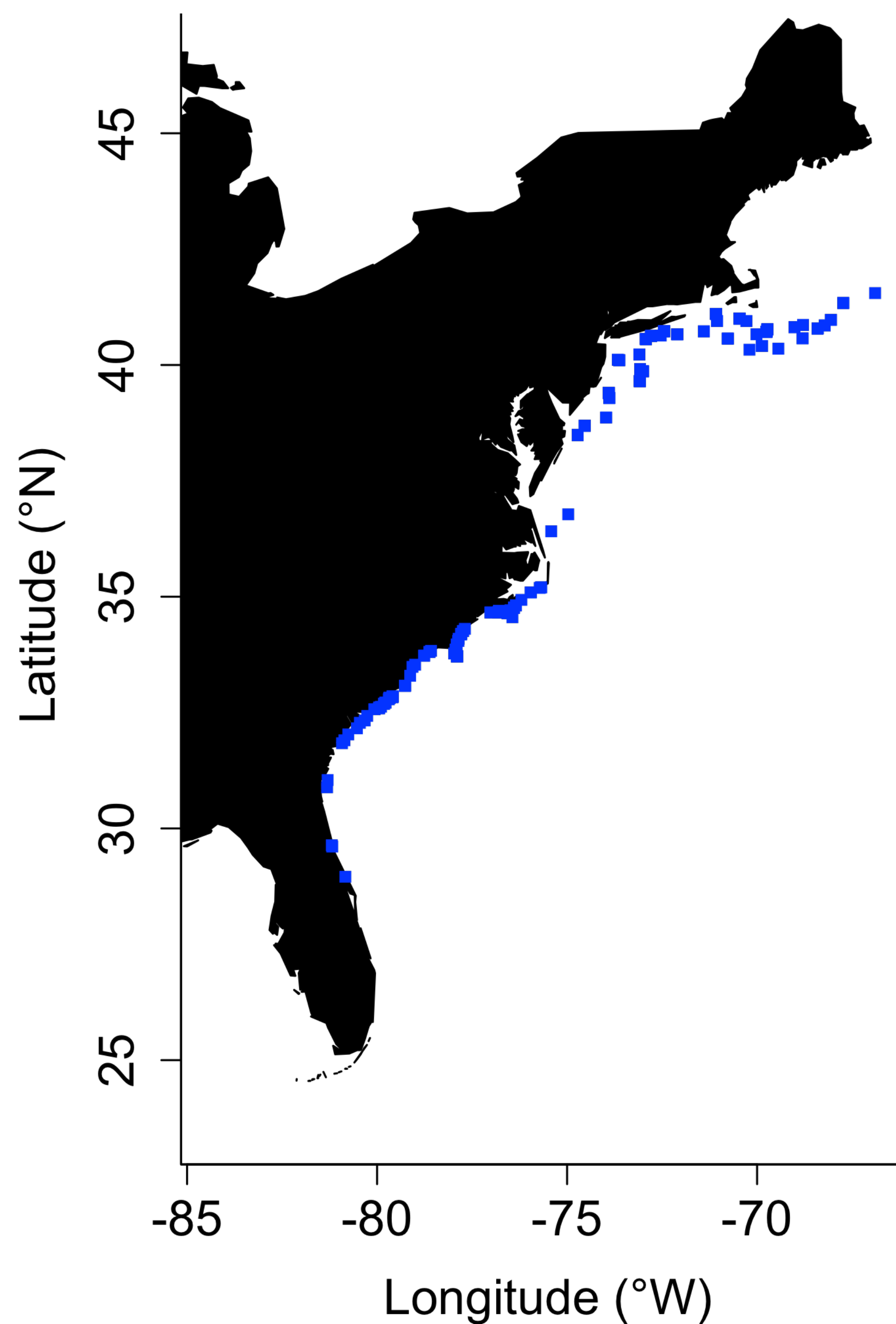


Figure 1. 306 summer flounder were caught throughout the species range in 2013-2014.

1 Do summer flounder exhibit population substructure?

We used ddRADseq and the dDocent pipeline to genotype 241 samples at 1137 SNPs, and then analyzed the SNPs using PCA and STRUCTURE

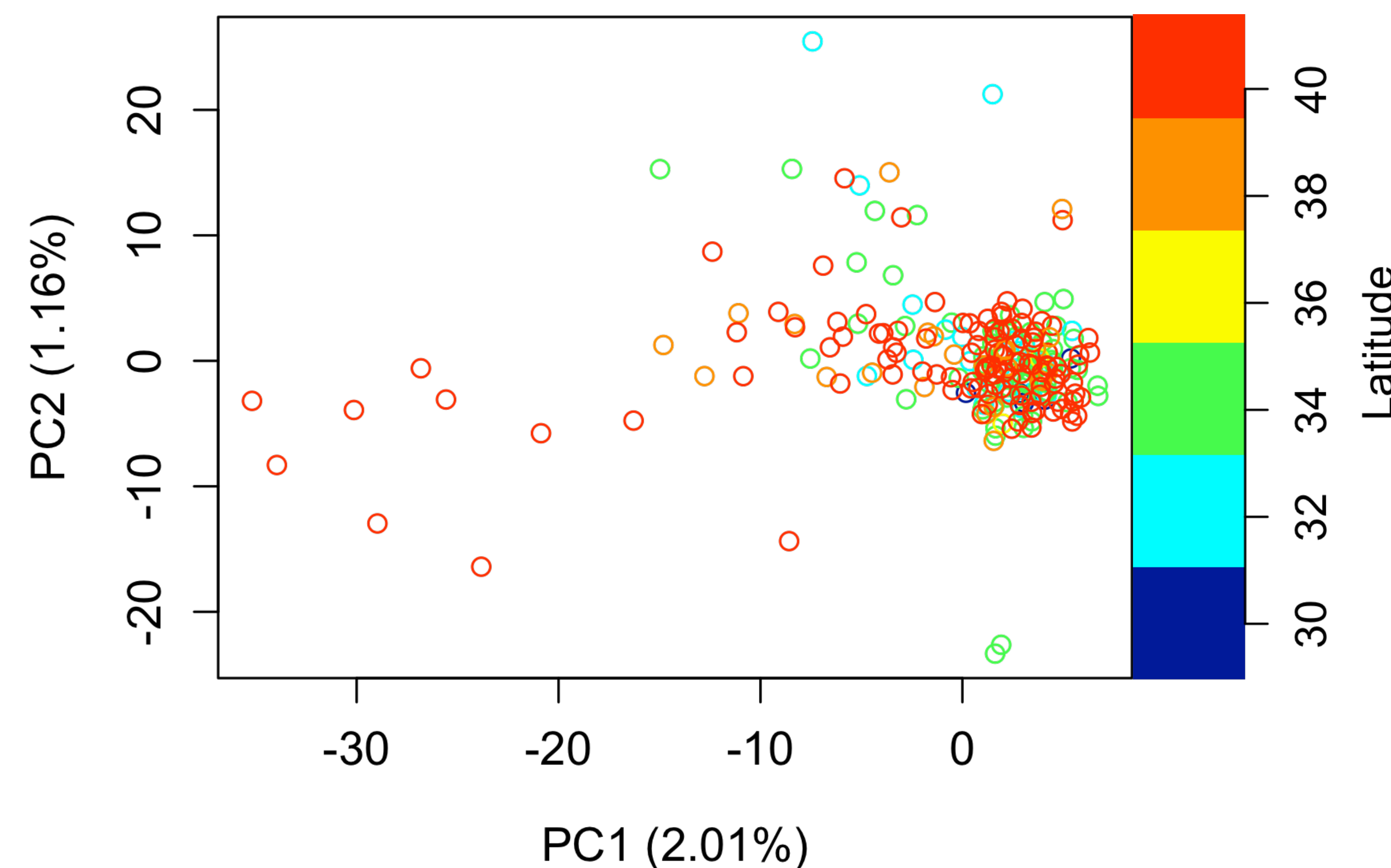


Figure 2. PCA of 241 summer flounder using 1137 loci suggests a single population, but some fish caught on Georges Bank are genetically divergent.

2 Are there particular loci that may be indicative of local adaptation?

BayEnv2 tested for correlations between allele frequencies and five environmental variables while accounting for non-independence between populations

Table 1. Median Bayes Factors for locus – environmental variable associations suggestive of local adaptation (BF > 3; gray cells) after 10 independent BayEnv2 runs. BF values greater than 5 are printed.

Locus	Environmental variables				
	Latitude	Longitude	Depth	Bottom Temp	Bottom Salinity
35					
125	7.16	9.24	6.79	8.78	
214	6.70	8.40	5.32	15.2	
396					
442					
499					
524					
542					
609	5.28			5.03	
615	6.06			5.50	8.09
626					
703					
743					9.87
808					
825					
826					
829					
916					
919				5.06	
923					
990					
1050					

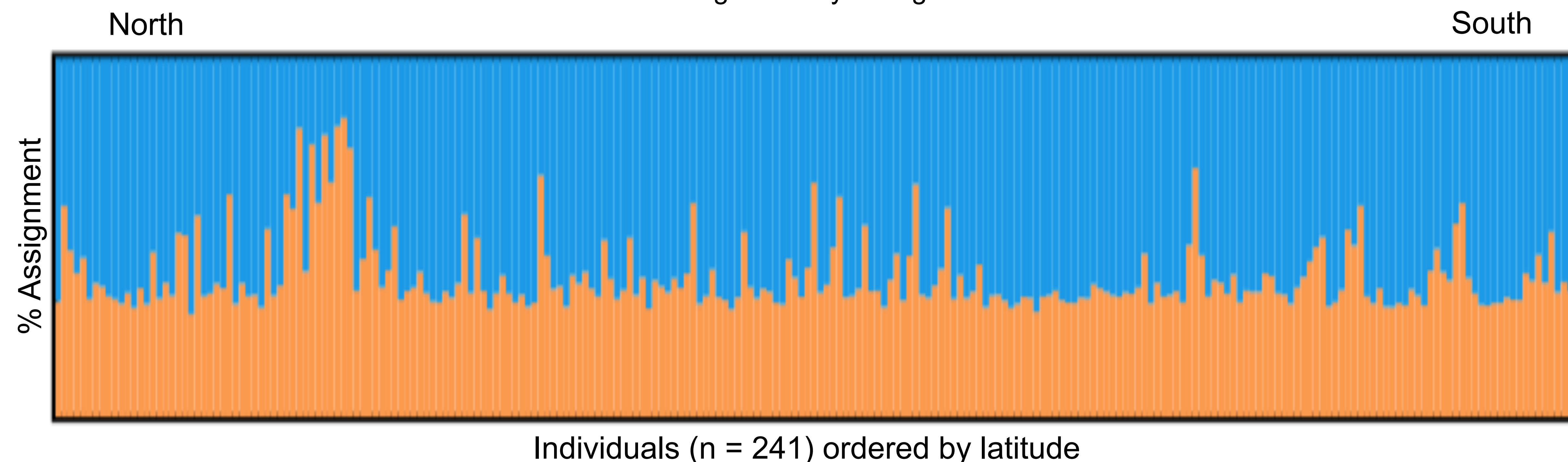


Figure 3. STRUCTURE plot of 241 summer flounder indicate genetic homogeneity along the coast.

RESULT #1

- PCA & STRUCTURE analyses suggest that summer flounder do not exhibit ecologically significant population structure
- A small group of genetically different fish was found on Georges Bank

RESULT #2

- 22 loci (out of 1137) are correlated with environmental variables, suggesting that summer flounder are locally adapted at certain loci
- 16 locally adapted loci are associated with bottom temperature

