Preliminary Evaluation of Genetic Population Structure of Blueline Tilefish

SC DNR Population Genetics

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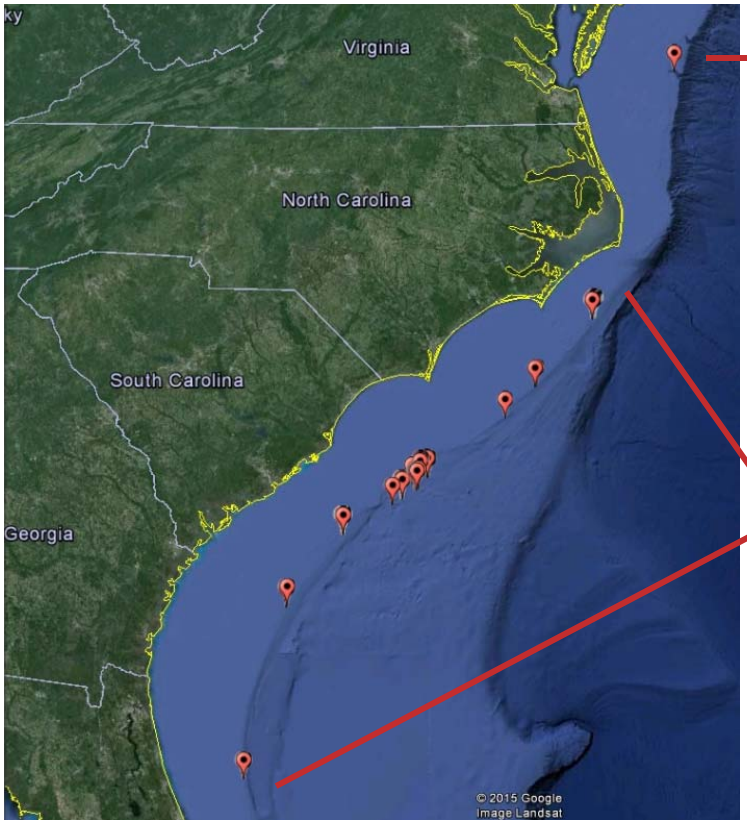
Marker Selection

- 14 samples (southern)
- Screened 56 microsatellite loci
  - Red snapper, cobia, spotted seatrout, red drum
- 4 loci were polymorphic in blueline tilefish

Locus	Original species	Motif
Ra7	Red Snapper	$[CA]_9TACAA[CA]_3CG[CA]_2A[CA]_7ACACG[CA]_2TACAA[CA]_{10}$
Prs275	Red Snapper	$[CA]_{10}$
Prs240	Red Snapper	$[CA]_{21}$
Cneb22	Spotted Seatrout	$[TG]_{10}$

Genetic Samples



North = 136
(fin clips)

South = 123
(fin clips, otoliths, & muscle)

State	Sample Size	Collection Dates	TL Range (mm)
VA	136	7/23/15 - 8/6/15	296-871
NC	31	Aug 2012 - Aug 2014	496-722
SC	82	May 2011 - Oct 2014	429-719
GA	5	Jul 2011 - Jun 2014	567-717
FL	5	Jun 2011 - Aug 2013	520-655
Total	259	---	---

Sample Genotyping

- DNA isolation: standard protocols
- Microsatellite amplification
  - Single 11 µl reactions on iCyclers
- Visualization
  - Beckman CEQ8000
- Chromatogram scoring
  - 2 independent readers

Marker Validation

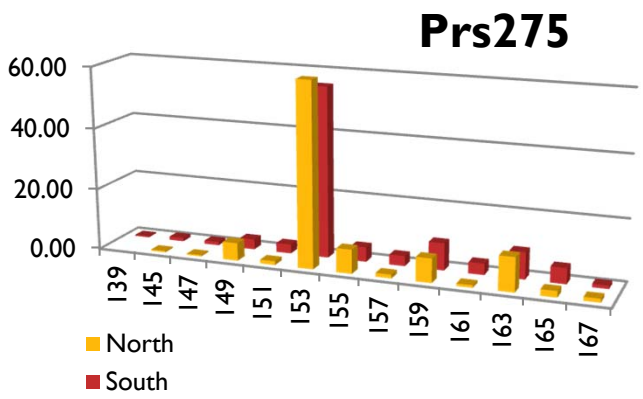
- Linkage disequilibrium
  - None detected ($p>0.192$)
- Moderate polymorphism
- Null allele frequencies low ($p<0.036$)
- HWE

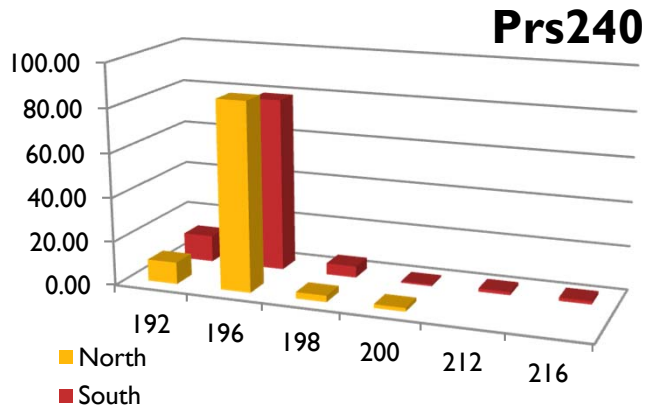
Locus	North	South	Locus	North	South
Ra7			**Prs240**		
N_A	10	10	N_A	6	4
A	9.9	9.9	A	5.9	4.0
P_{HW}	0.088	0.278	P_{HW}	0.000*	0.713
Prs275			**Cneb22**		
N_A	13	12	N_A	6	5
A	12.9	12.0	A	5.6	5.0
P_{HW}	0.495	0.938	P_{HW}	0.105	0.094

Genetic Population Structure

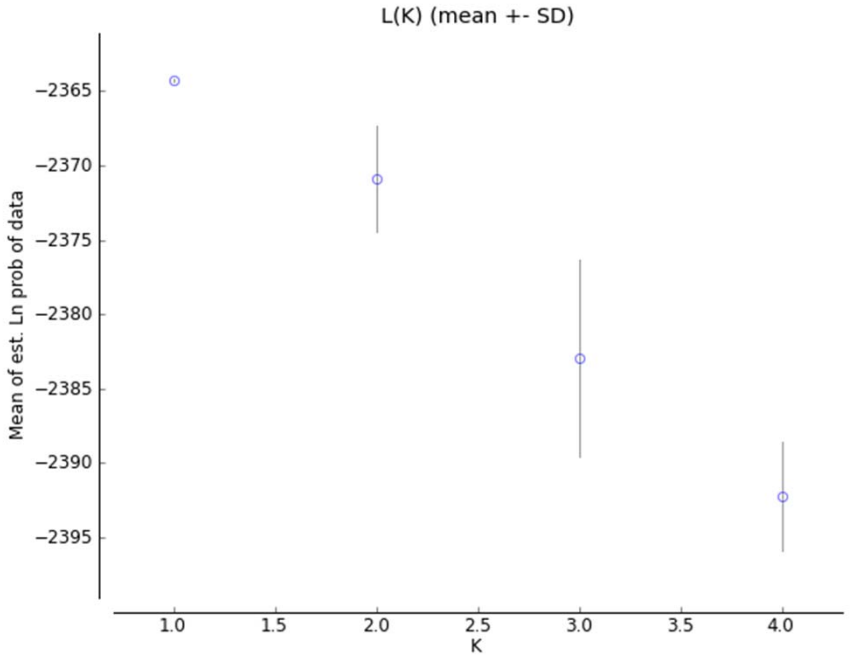
- Cape Hatteras break?
- Allele frequency distributions
  - G-test (GenePop)
- Genetic differentiation
  - F_{ST} (Arlequin)
- Likelihood-based assignment
  - STRUCTURE, HARVESTER
  - Admixture model, correlated allele frequencies
  - K = 1 to 4, with 5 replicates

- Allele frequency distributions (p=0.378)





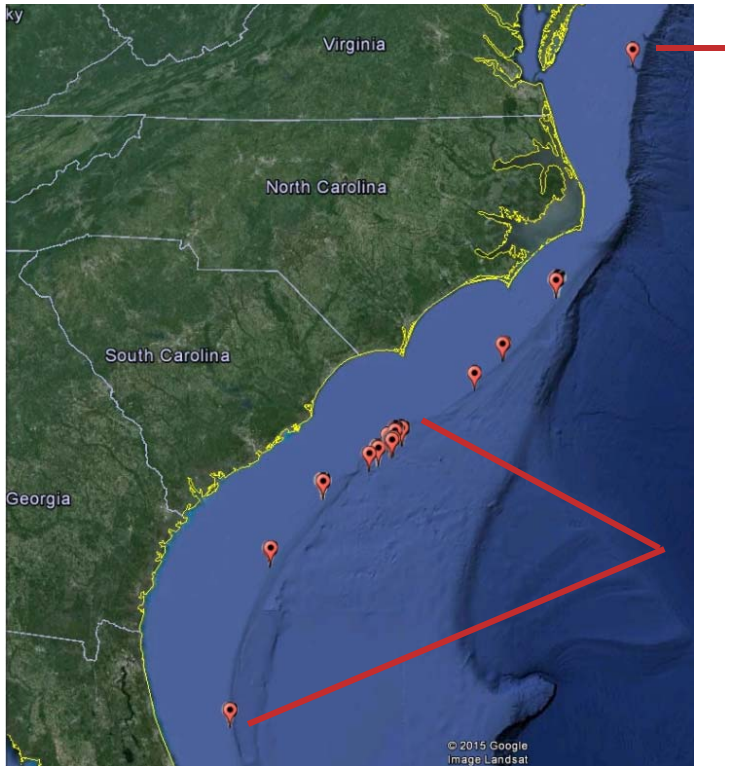
- F_{ST} = 0.001, p = 0.189
- STRUCTURE:
  - K = 1



- Differences at extremes?
  - Exclude NC samples
  - G-test, p = 0.129; F_{ST} = 0.001, p = 0.189; k = 1

- Other break locations?
  - AMOVA (Arlequin)
  - F_{ST} p values > 0.481

State	Sample Size
VA	136
NC	31
SC	82
GA	5
FL	5
Total	259



Genetic Health

- No inbreeding (F_{IS})
- Genetic diversity (H_E)
  - Low-moderate
- G-W index:
  - 0.62

Locus	Atlantic
Ra7	
n	259
N_A	12
H_E	0.737
H_O	0.741
F_{IS}	-0.006
Prs275	
n	258
N_A	13
H_E	0.644
H_O	0.651
F_{IS}	-0.011

Locus	Atlantic
Prs240	
n	258
N_A	6
H_E	0.311
H_O	0.291
F_{IS}	0.066
Cneb22	
n	256
N_A	7
H_E	0.399
H_O	0.422
F_{IS}	-0.058

Summary

- Gene flow along the US Atlantic coast
  - Single population of blueline tilefish
- Limitations
  - Markers –
    - Power to detect strong isolation
    - Not sufficient to detect subtle gene flow patterns
  - Samples –
    - Temporal/spatial distribution of northern samples
- Genetic health – yellow flags