

Genetic Dynamics of Natural Stocks of *Crassostrea virginica* in Florida Waters:

Implications for the Genetic Management of Cultured Oysters

Mike Tringali Florida Fish and Wildlife Research Institute



FWC Mission :

Managing fish and wildlife resources for their longterm well-being and the benefit of people.

FWC Policy for the Release of *Cultured Organisms :

...all activities involving the <u>release</u> of organisms shall be undertaken with full consideration of their impact on natural biological diversity and in ways that do not threaten the state's natural biological heritage...

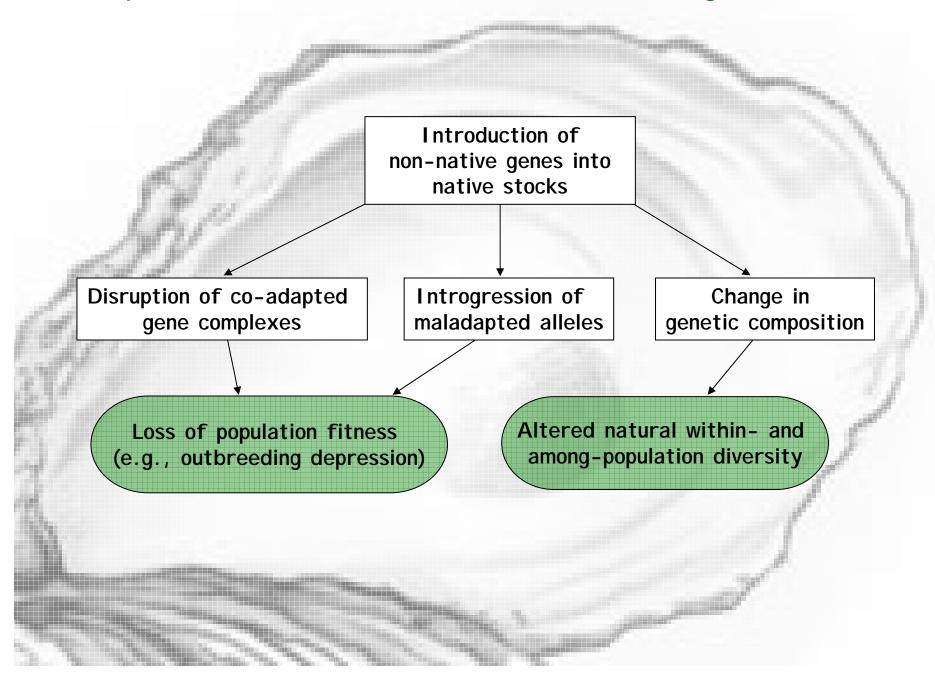
*Cultured = any organism that has spent some phase of its life cycle in captivity.

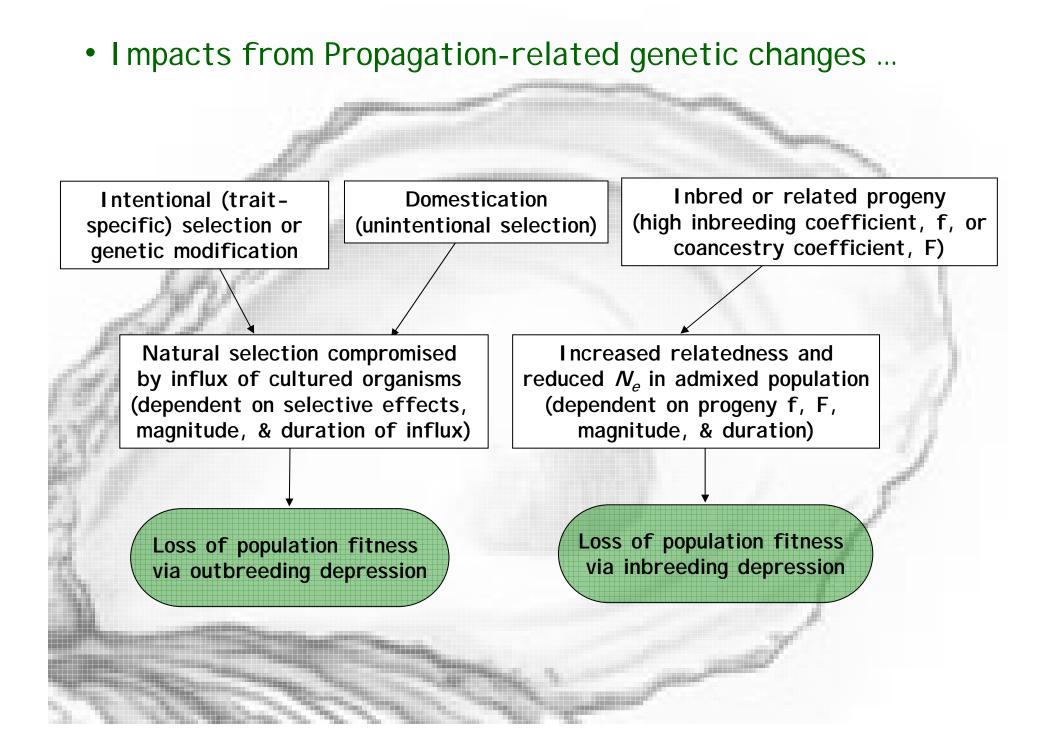
Genetic Concerns

- exogenous (inter-stock) gene transfer • founder effects • Impacts from Translocations of Non-Indigenous Genes altered selection/drift dynamic outbreeding depression
- maladapted alleles or traits
 Impacts from Propagation-related deficiency of the transmission of transmission
- genetically medified organisms (GMISPAs
- inbreeding depression
- •mutanonal free fearm Excessive Genetic I nput reduced effective size (Ne)
- diversity loss
 Natural Stocks
- introgressive hybridization
- family size variance
- domestication

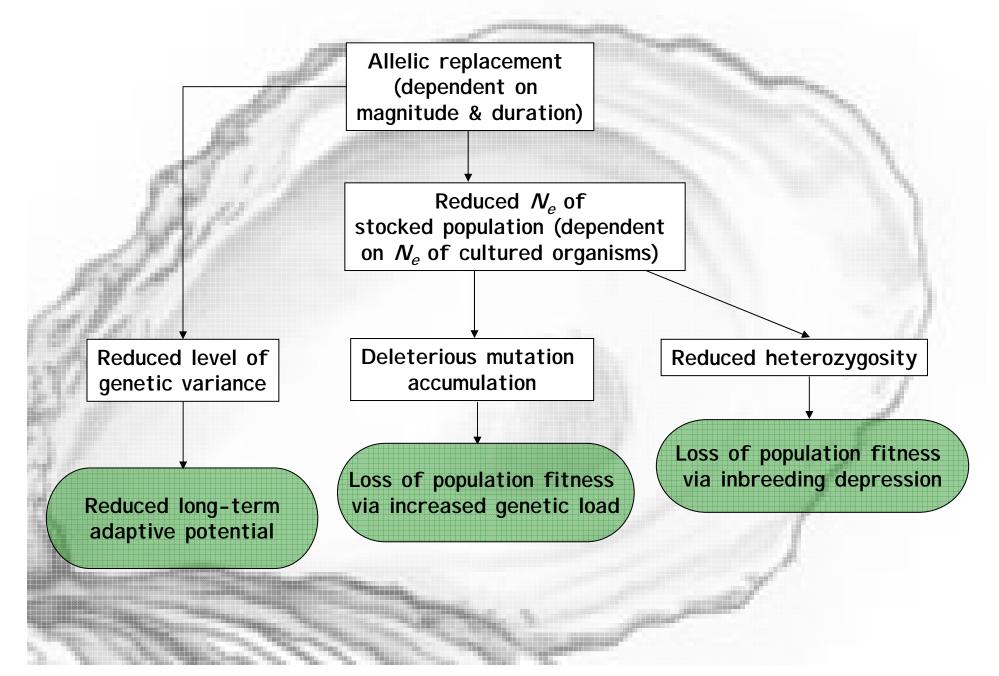
- genetic swamping
- allelic replacement
- hybrid swarms
- disrupted genomic coadaptation

• Impacts from Translocations of Non-Indigenous Genes ...





Impacts from Excessive Genetic Input into Natural Stocks ...



Genetic Risk Assessment

- Case by case
- Natural stock boundaries
- Develop a plan for genetic management

Policy Standards

- Prevent translocation of <u>non-indigenous</u> genomes
- Minimize impacts from propagation-related genetic changes
- Manage cultured proportion in cultured + wild admixtures
- Monitor potentially impacted wild populations

High Genetic Load in *Crassostrea gigas* (Launey and Hedgecock 2001, *Genetics* 159:255-265)

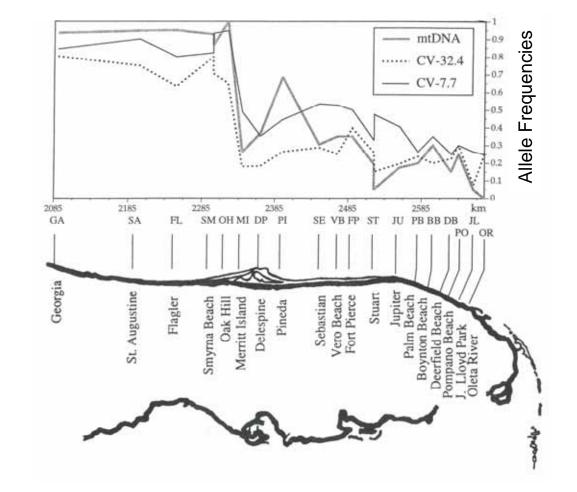
 Heterosis (F1 hybrid vigor) is a common phenomenon in bivalve mollusks

• Strong and widespread selection against inbred individuals (F2, F3 ...)

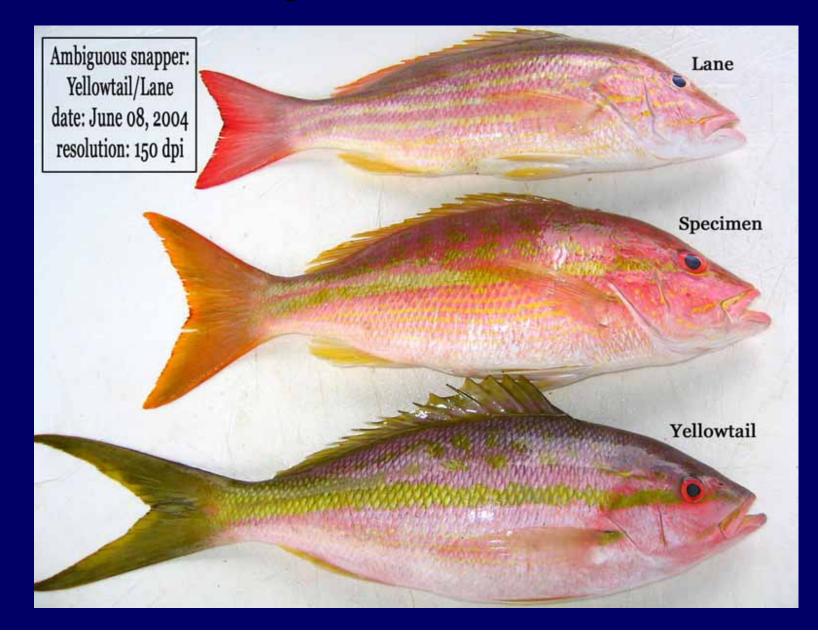
 Conclusion - wild parentals carried large number of highly deleterious <u>recessive</u> mutations

Multilocus Cline in Crassostrea virginica

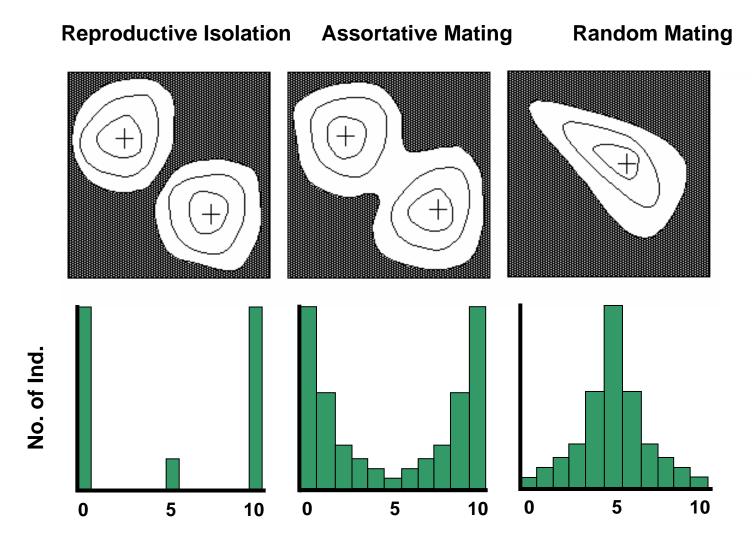
(Hare and Avise 1996)



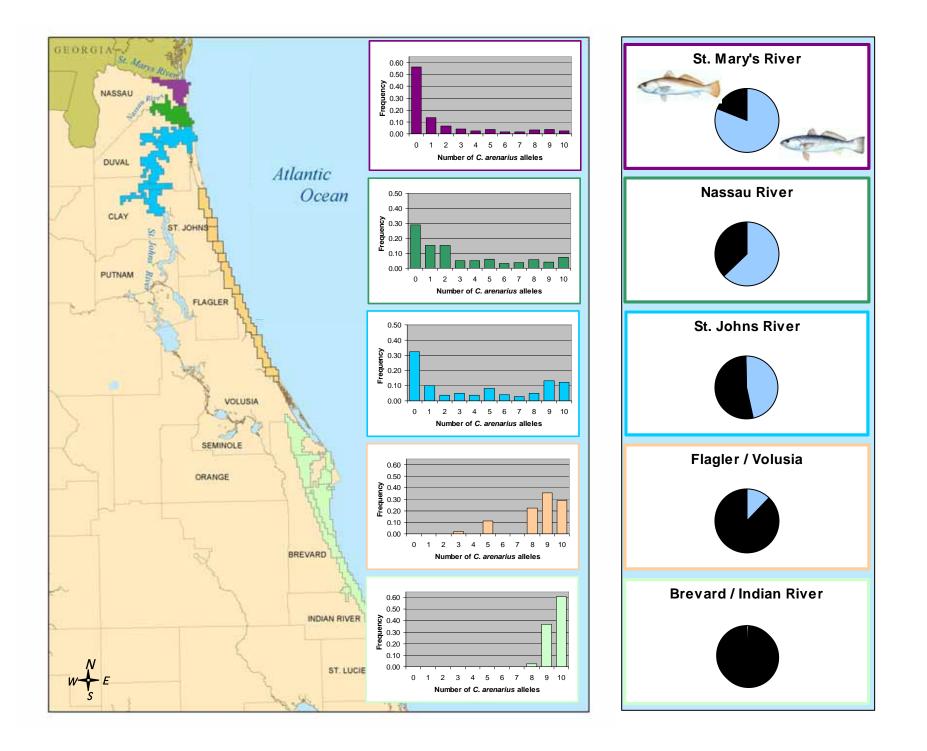
Sterile Hybrids – Who Cares!



Nuclear DNA Hybrid Index Plots ...



No. of alleles from Species 'A' (5 loci)



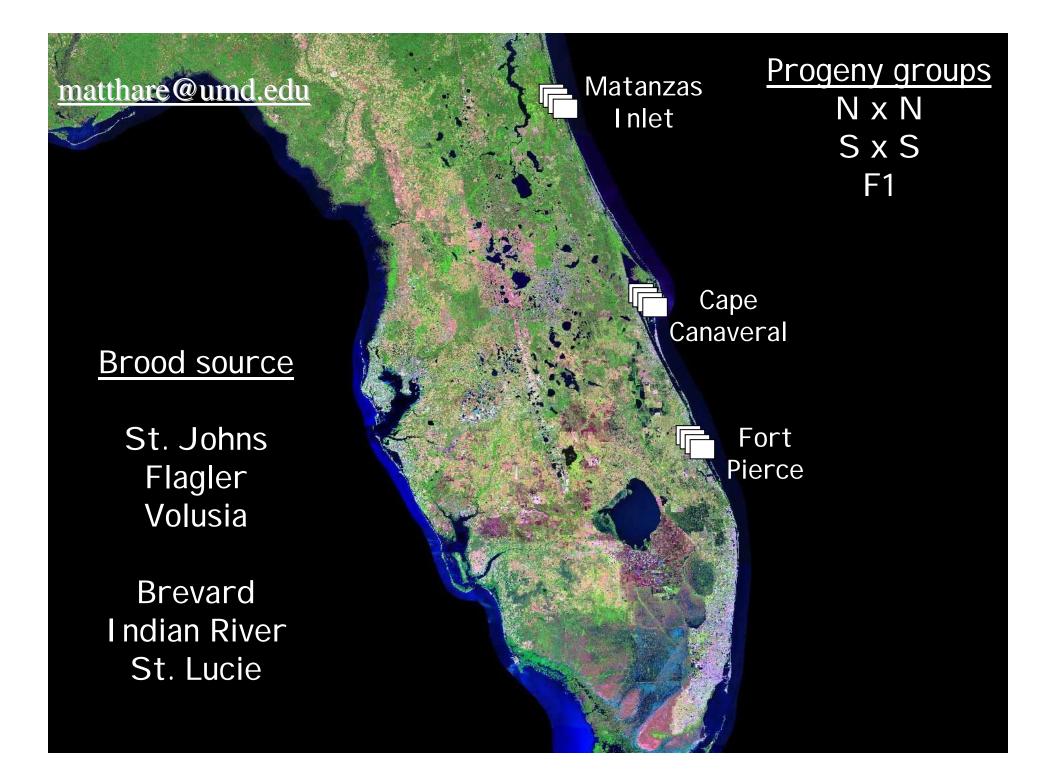
Ongoing studies by Matt Hare's lab ...

Objective – identify factors shaping the genetic cline in oysters along eastern Florida

Abiotic factors - barriers to dispersal

<u>Biotic factors</u> – *genetic incompatibility*, selection along an ecotone, differential fertilization efficiency, hostparasite* interactions

* Susceptibility to Perkinsus marinus



 Restoration/relocation activities have a potential to impact wild populations.

 A fairly distinct genetic break exists in eastern oysters along the Atlantic coast of FL. However, the mechanisms responsible for maintaining the break are still unknown.

 Work is in progress to identify the isolating mechanisms. Additional work should consider the effect of later generation hybridity in wild settings.

																			ĺ,	b		ò	ò						ł	ů	b	ò		b	ò		X				þ					Ů,		١	ł	1
h		ì		I,		Û	ò		h		Ù			ò		ì		ï		b		ò	ò						Ó		Ö			b			X		Ó		h	X			b			h		i
																						Ü	þ						Ŭ		Ü			Ü			h,									Ó				
			ï		Ù			ì		i,			ò		h		ì		I,			ò							Ó	Ó	ò	ò		b	ò		X		Ó	ò		h		i.		Û	õ		I,	
																										ï			ł	Û	b	Ċ,		þ	ü		X		Ó							Û				
h		h		1		Û	0		ï		i)			Ò		ì		ì		i)			þ		ï		ľ		ġ	Ô	Ö			b			X		Û		þ		ì			0		ï		i
																																h	X	Ŭ	ò		k		Ü		k					Û				
			ì		b			ì		I,			ģ		h		h		1			ò		þ		ì		I,		Û	ò		X		ò		X				þ					Û	ò		1	
																																					X		Ó		þ									
h		h		1		Û	0		ï		i)			Ò		ì		ì		i)			þ		ï		1		ĺ,			(e		1	ò		X		Û		þ							ï		i
																																							Û		k									
	ì		ï		l	ĥ		Ì		l		ĺ	ĥ		ì		ì		l	ĥ	i	ĥ		Ì		ï		l		Û	ĥ		ï	ĥ	Û	ĥ		l	ĥ	ĥ		ï		l		į,	ĥ		l	

Summary ...