Save the Bay, Eat a Ray

A Purported Trophic Cascade Mediated by Declines In Large Shark Populations and the Consequences of Applying Simplistic Models to Complex Ecosystems

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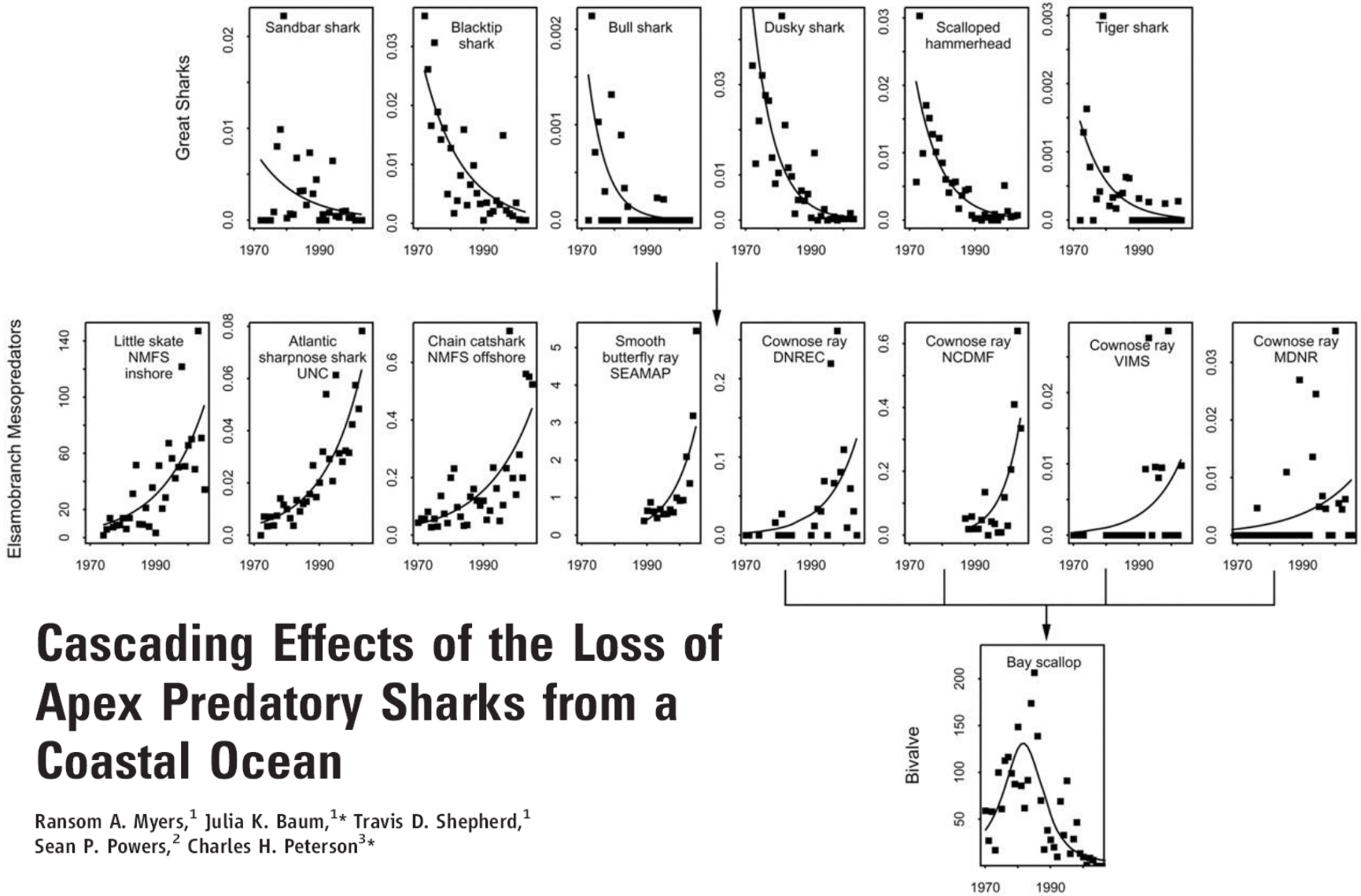

Cascading Effects of the Loss of Apex Predatory Sharks from a Coastal Ocean

Ransom A. Myers,[1] Julia K. Baum,[1]* Travis D. Shepherd,[1]
Sean P. Powers,[2] Charles H. Peterson[3]*

Myers et al. (2007) Science 315, 1846-1850

Predicting ecological consequences of marine top predator declines

Michael R. Heithaus[1], Alejandro Frid[2], Aaron J. Wirsing[1] and Boris Worm[2]

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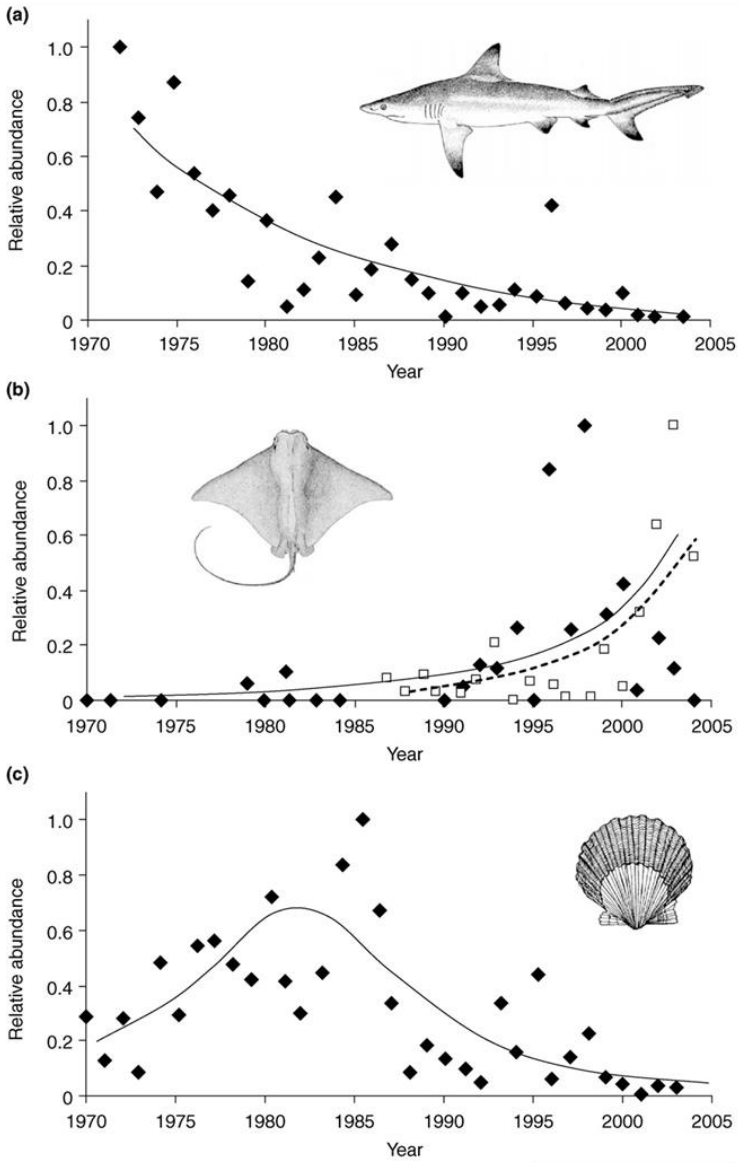

TRENDS in Ecology & Evolution

Journal of Animal Ecology

British Ecological Society

Journal of Animal Ecology 2009 doi: 10.1111/j.1365-2656.2009.01531.x

REVIEW

Cascading top-down effects of changing oceanic predator abundances

Julia K. Baum[1,2*] and Boris Worm[1]

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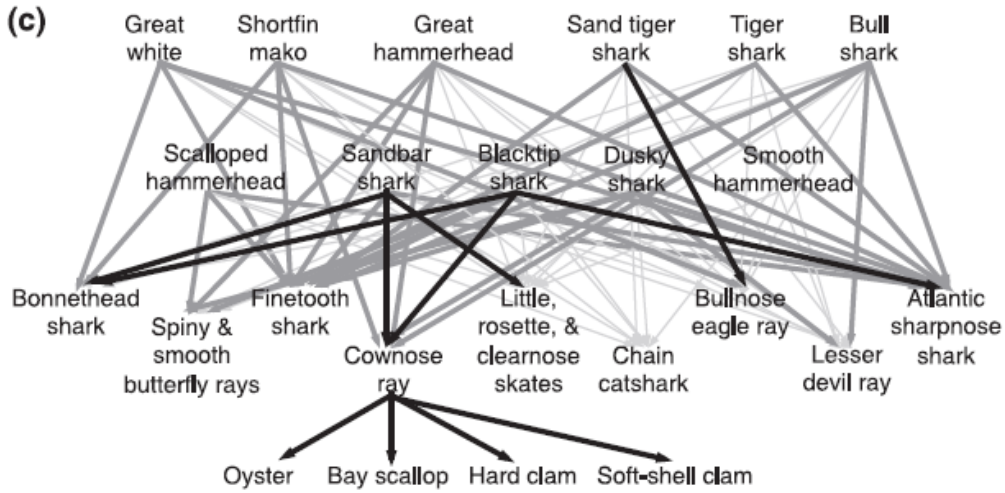
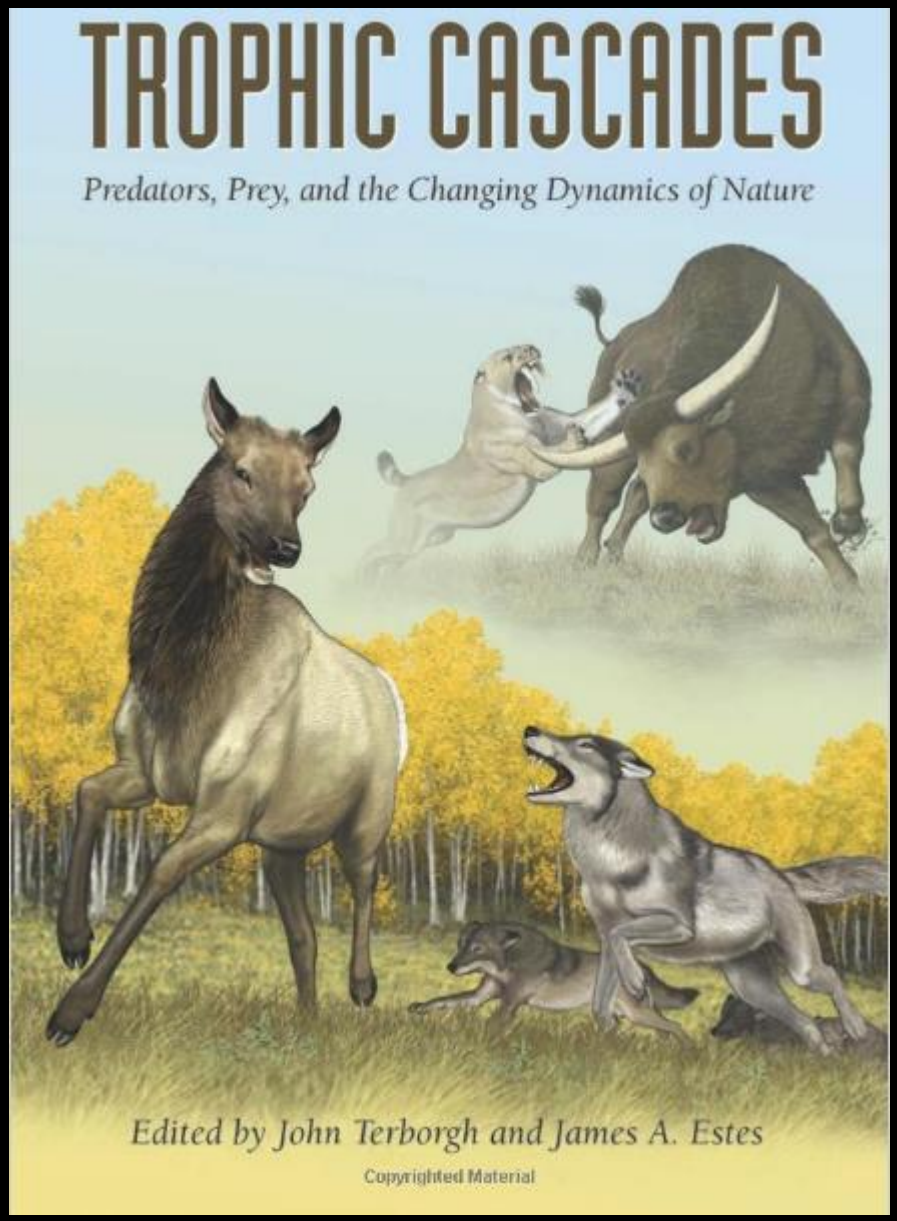


Baum and Worm (2009)

Heithaus et al. (2008)



CHAPTER 3

Some Effects of Apex Predators in Higher-Latitude Coastal Oceans

James A. Estes, Charles H. Peterson, and Robert S. Steneck

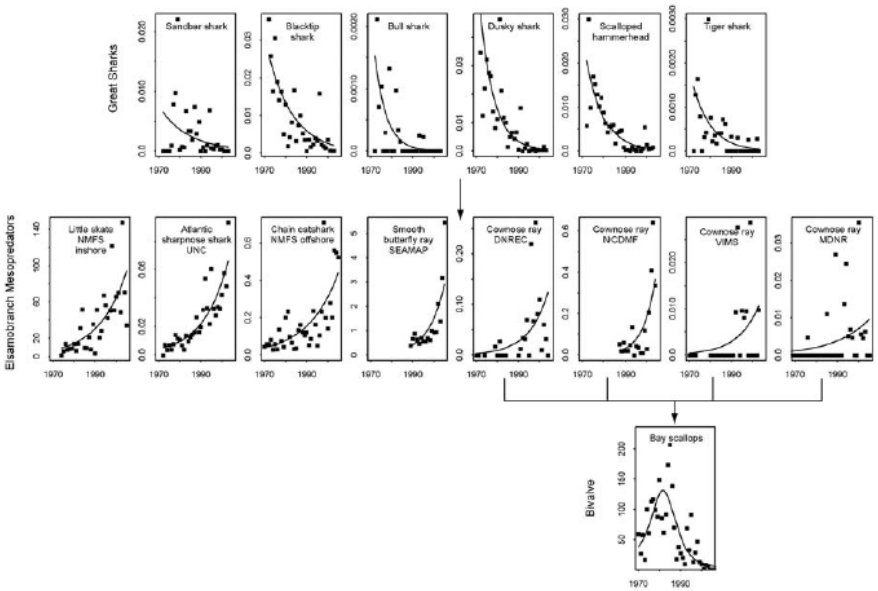


Figure 3.2. Patterns of temporal covariation among the declines of great sharks, the rise of small elasmobranchs, and the declines of bay scallops in East Coast estuaries and coastal oceans (from Myers et al. 2007). DNREC = Delaware Department of Natural Resources and Environmental Control, Division of Fish & Wildlife; MDNR = Maryland Department of Natural Resources, Fisheries Service; NCDMF = North Carolina Department of Environment and Natural Resources, Division of Marine Fisheries; NMFS = National Marine Fisheries Service; SEAMAP = Southeast Area Monitoring and Assessment Program, South Atlantic; UNC = University of North Carolina Institute of Marine Sciences longline shark monitoring survey; VIMS = Virginia Institute of Marine Science.

Outline

A. **Examination of the reported trophic cascade mediated by declines in large sharks**

   i. **Are declines in large sharks as severe as reported?**

   ii. **Are increases in smaller elasmobranchs credible?**

   iii. **Are the trophic links sufficient to elicit this cascade?**

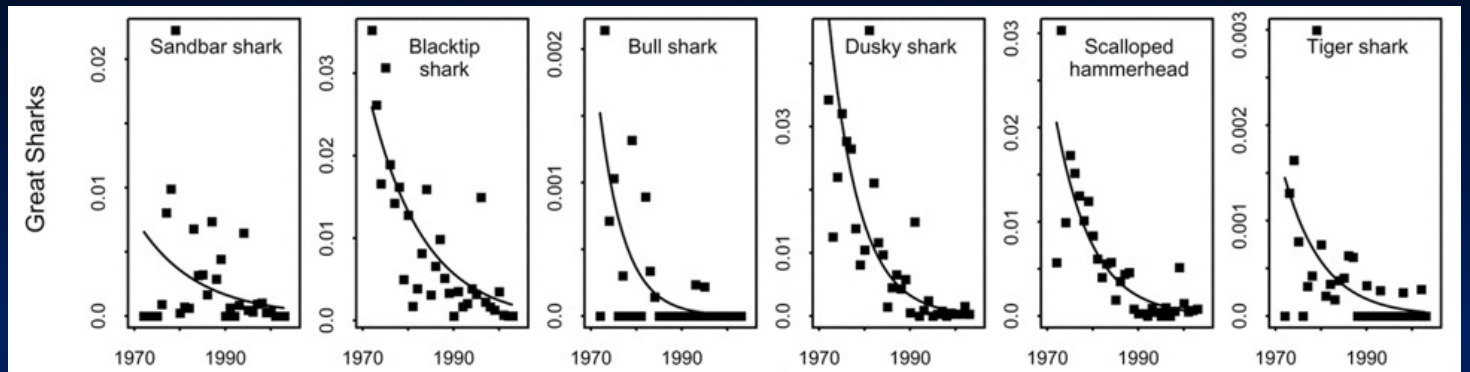
   iv. **Is increased cownose ray abundance responsible for declines in commercial bivalve populations?**

B. **Cascading effect of the purported trophic cascade – fishery development for cownose rays**

A. Examination of the reported trophic cascades mediated by declines in large sharks

i. Are declines in large sharks as severe as reported?

UNC Survey Data



Myers et al. 2007

sandbar shark
(*Carcharhinus plumbeus*)

bull shark
(*Carcharhinus leucas*)

scalloped hammerhead
(*Sphyrna lewini*)

smooth hammerhead
(Sphyrna zygaena)

BlacktipShark
(*Carcharhinus limbatus*)

Dusky Shark
(*Carcharhinus obscurus*)

Tiger Shark
(Galeocerdo *cuvier*)

ISSUES: Very low sample sizes for 3 of 7 species:

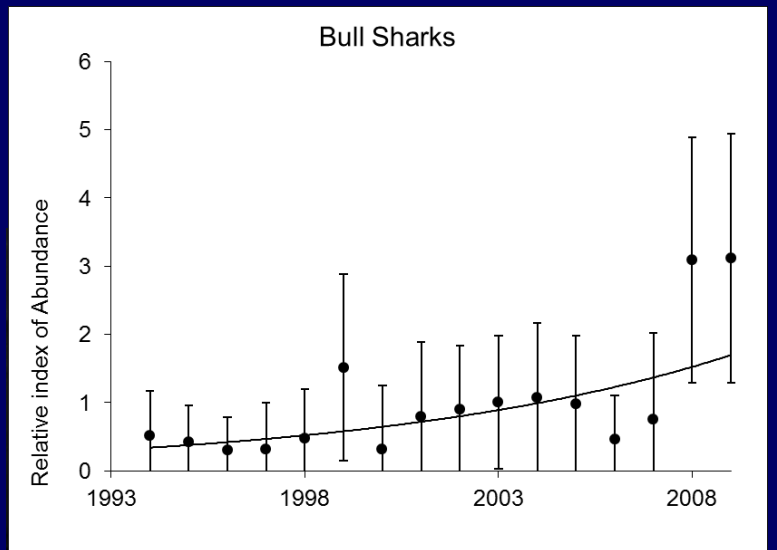
32 year time series

smooth hammerhead (N=5)
99% decline

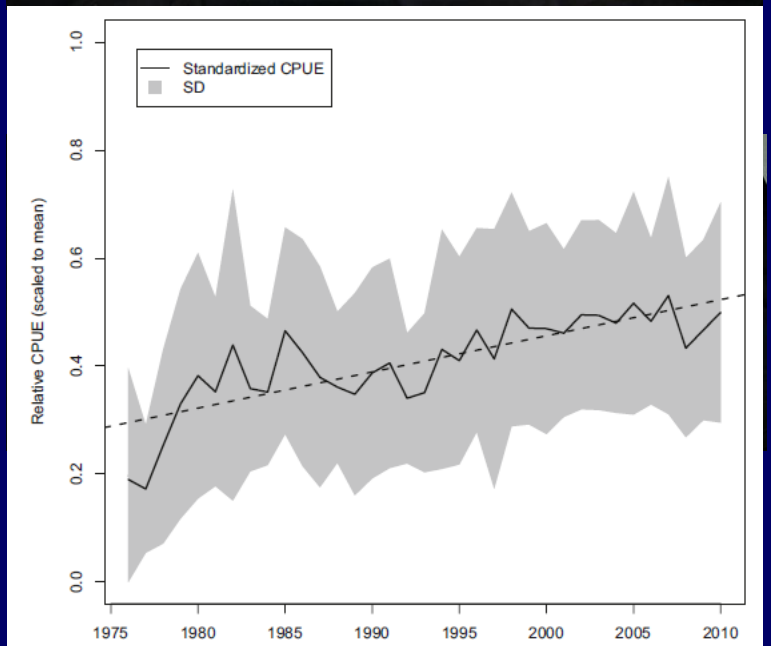
bull sharks (N=23)
99% decline

tiger sharks (N=39)
97% decline

Other data sets suggest stock of bull sharks and tiger sharks have been increasing since 1993 (year of implementation of the FMP)



Carlson et al. (in press)

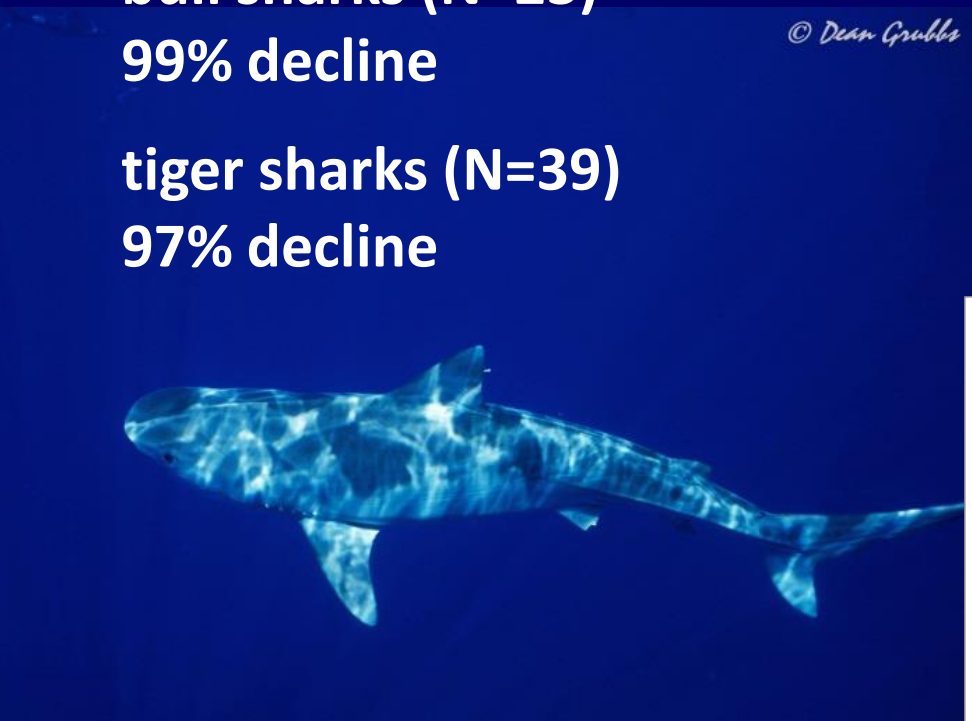


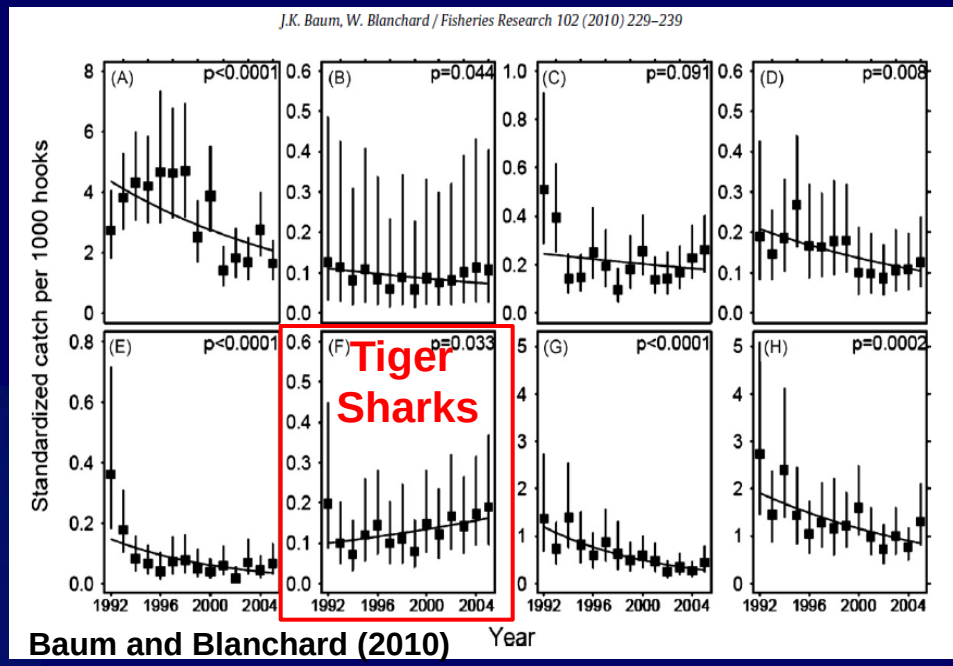
Froesche et al. (2012)

ISSUES: Very low sample sizes for 3 of 7 species:

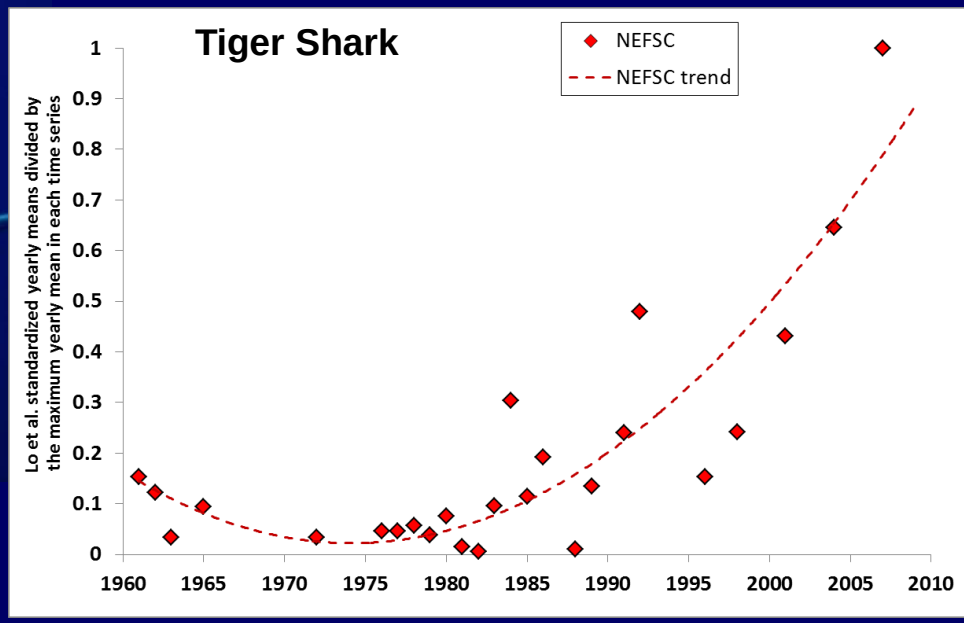
32 year time series

- smooth hammerhead (N=5)
  99% decline
- bull sharks (N=23)
  99% decline
- tiger sharks (N=39)
  97% decline





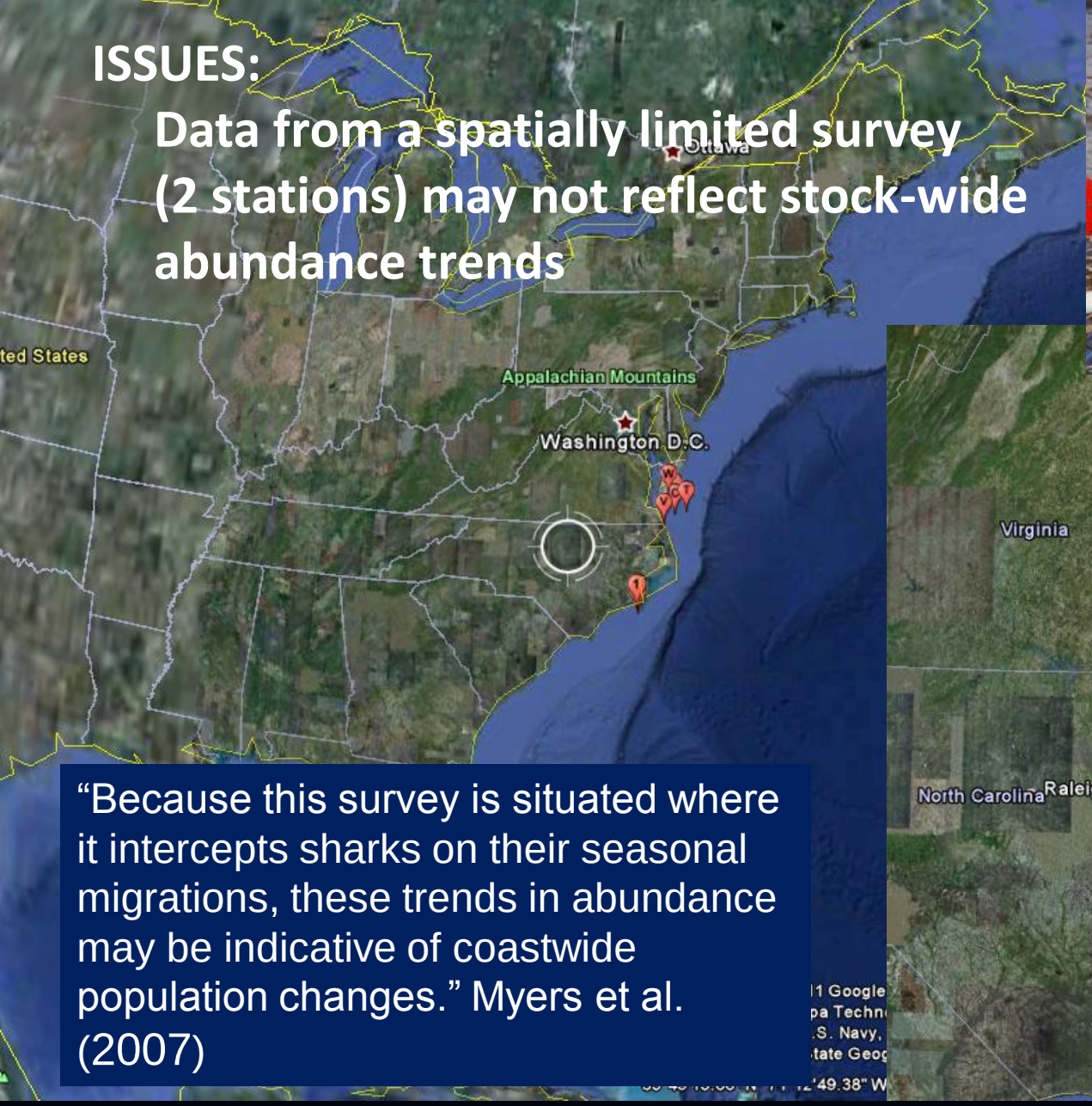
Baum and Blanchard (2010)

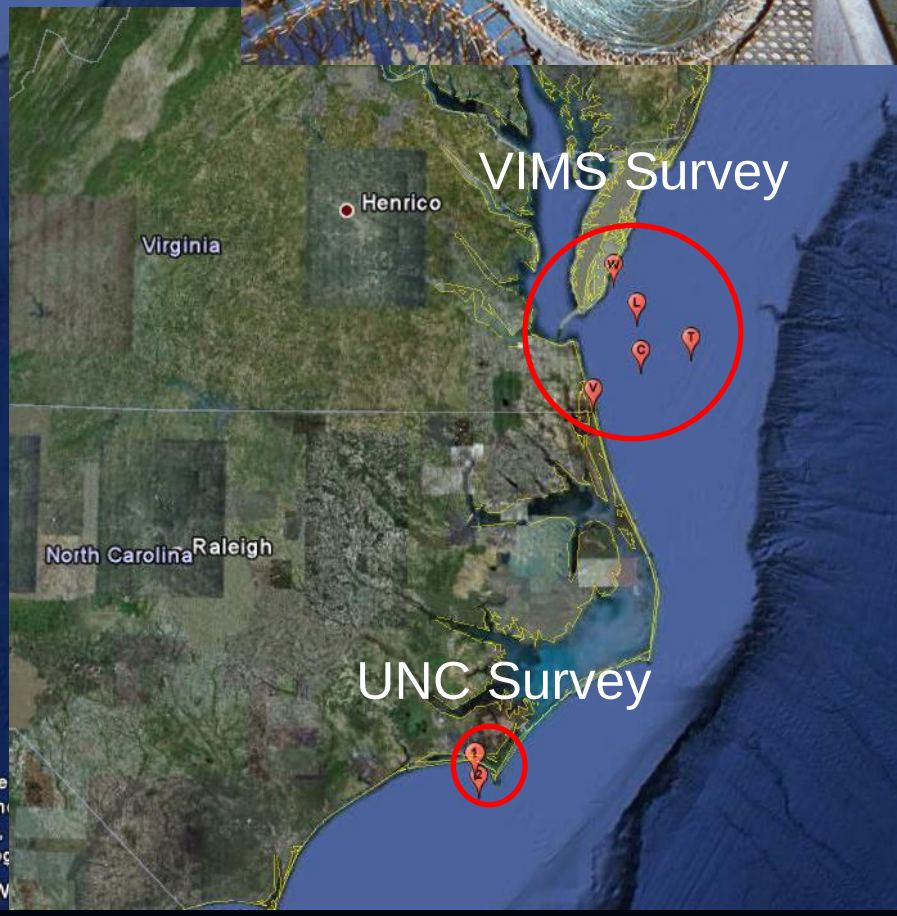


Other data sets suggest stock of bull sharks and tiger sharks have been increasing since 1993 (year of implementation of the FMP)

ISSUES:

Data from a spatially limited survey (2 stations) may not reflect stock-wide abundance trends

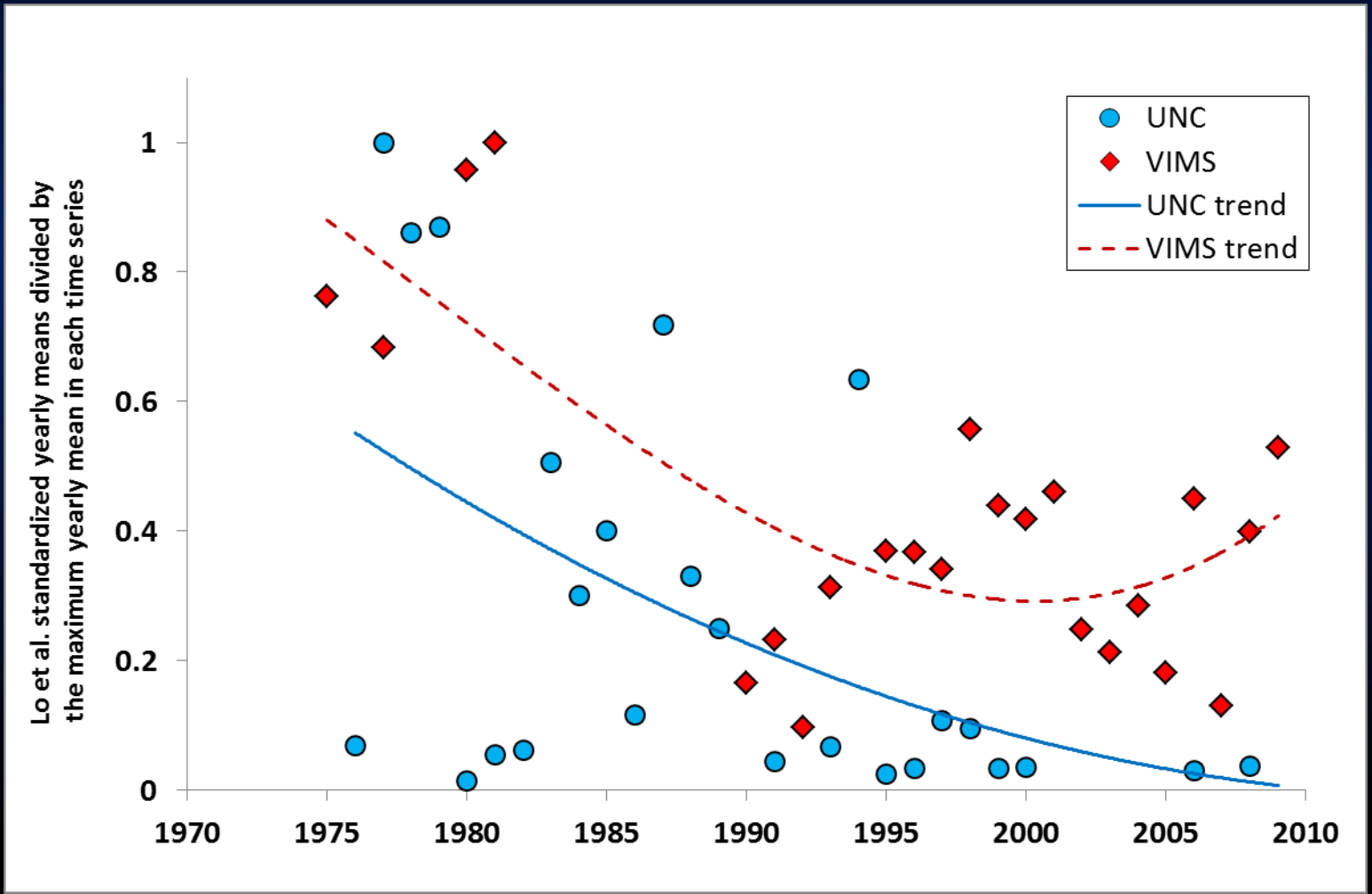




"Because this survey is situated where it intercepts sharks on their seasonal migrations, these trends in abundance may be indicative of coastwide population changes." Myers et al. (2007)

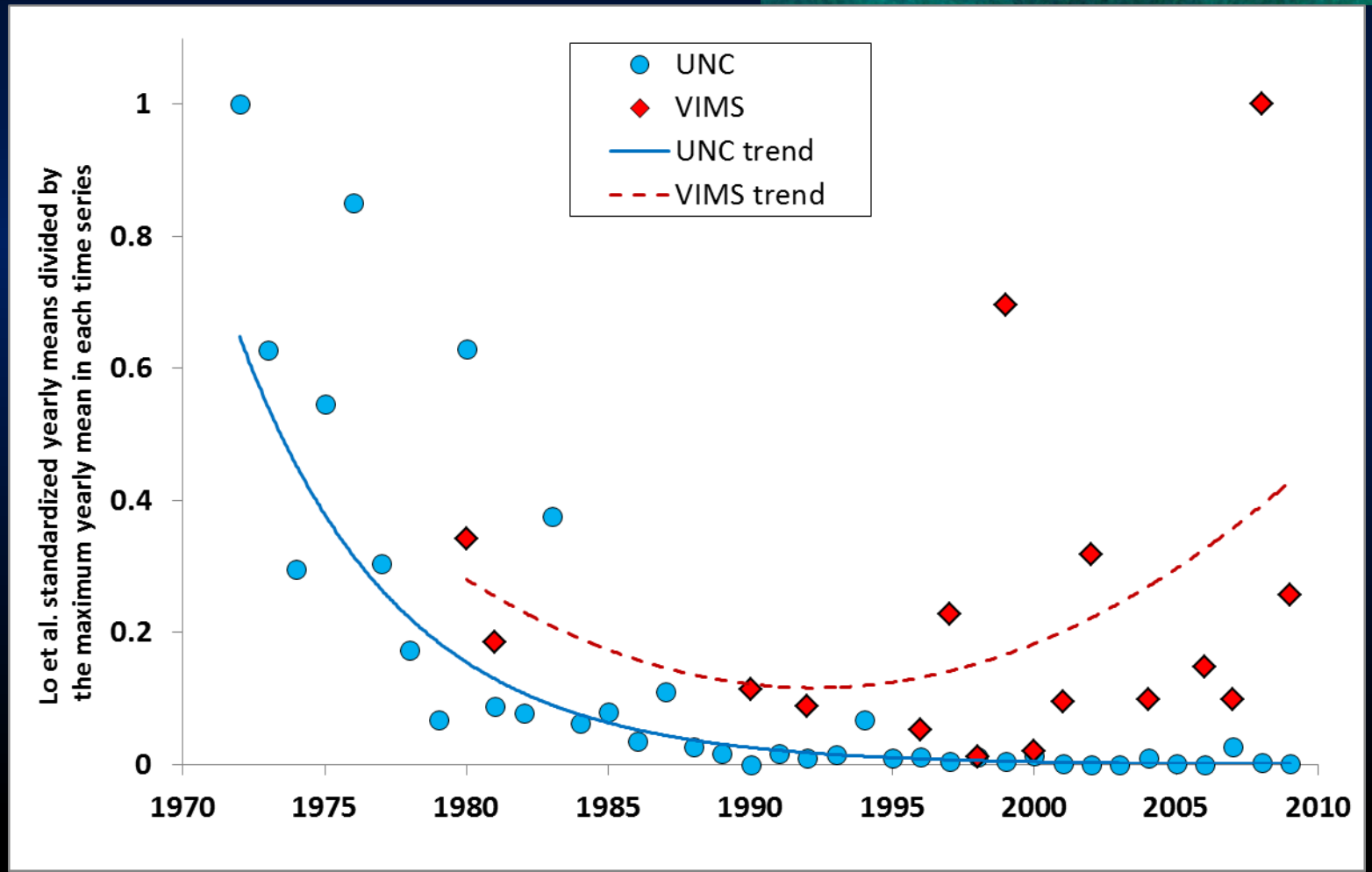
Fishery Independent Longline Surveys: UNC (1972-pres.; 2 fixed stations)
VIMS (1974-pres.; 5 fixed coastal stations)

Carcharhinus plumbeus (Sandbar Shark)



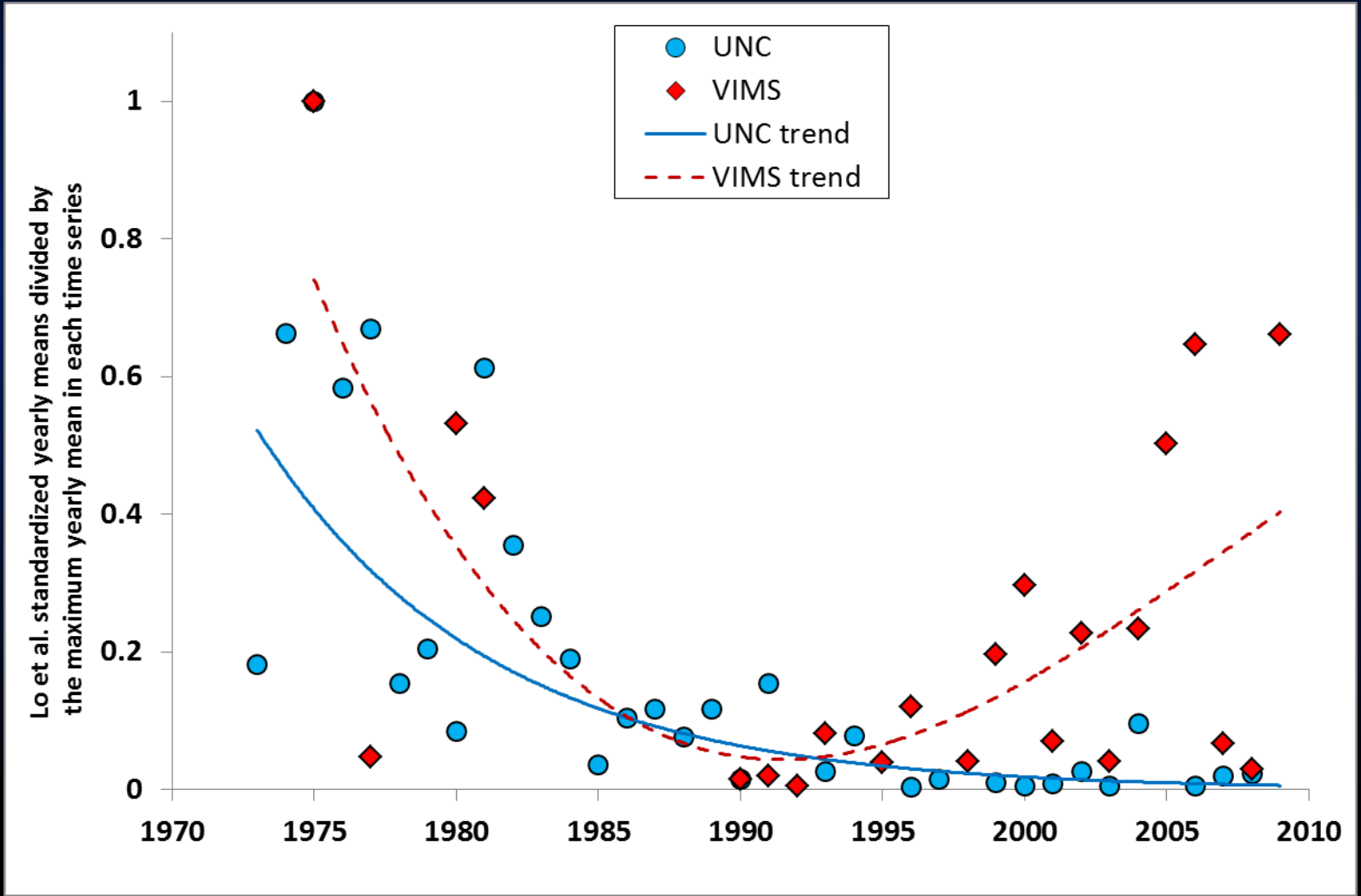
Carcharhinus limbatus (Blacktip Shark)

Northern population shift?

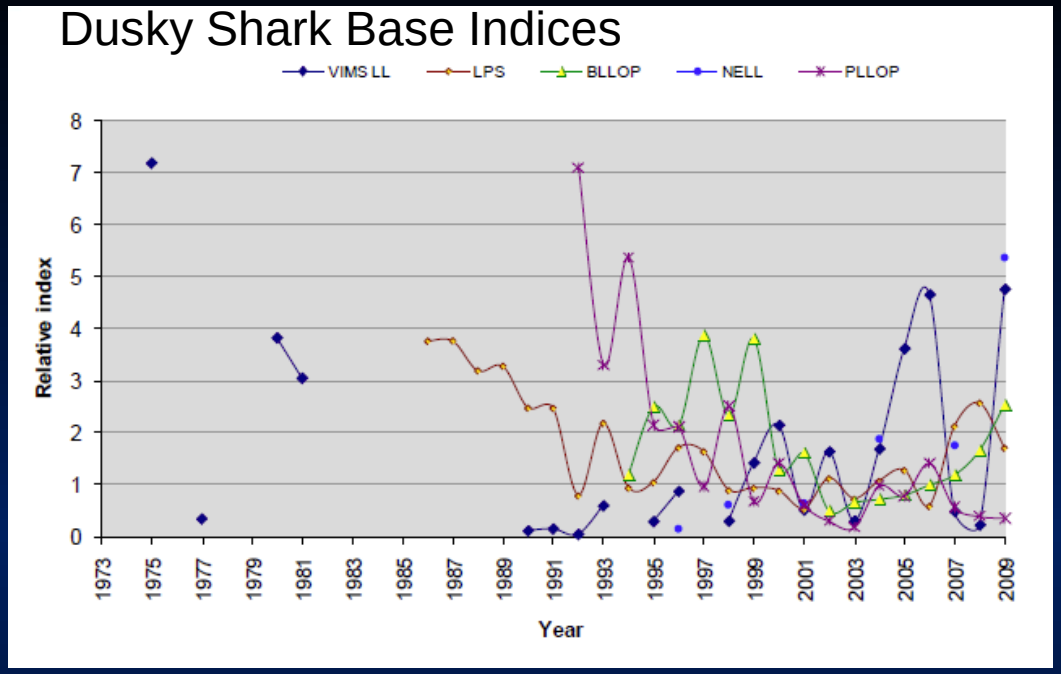


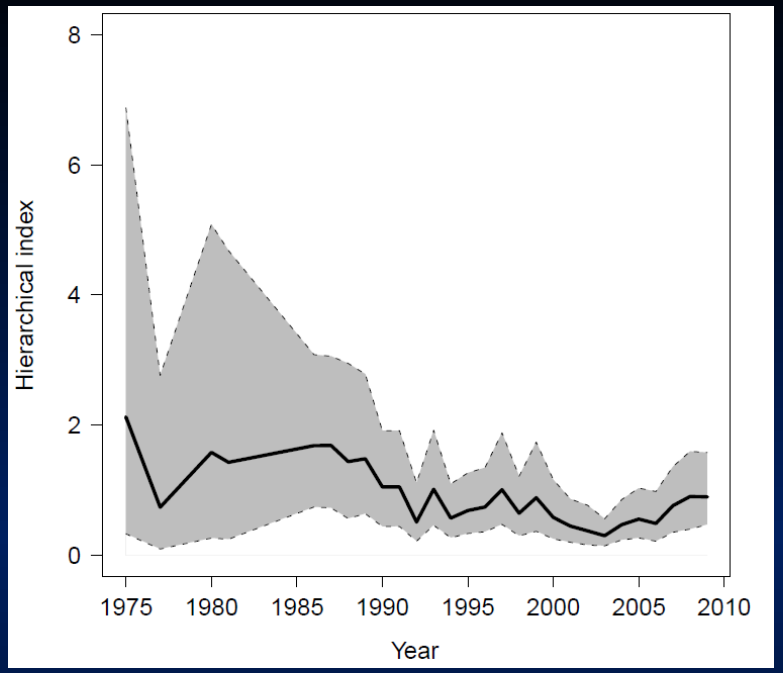
Carcharhinus obscurus (Dusky Shark)

Northern population shift?



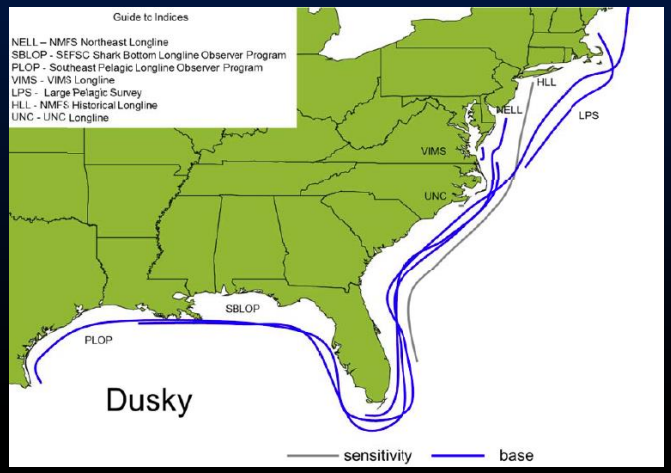
Stock assessments suggest dusky sharks abundance declined by 80%. Abundance increasing; 2009 SSB depletion 85%





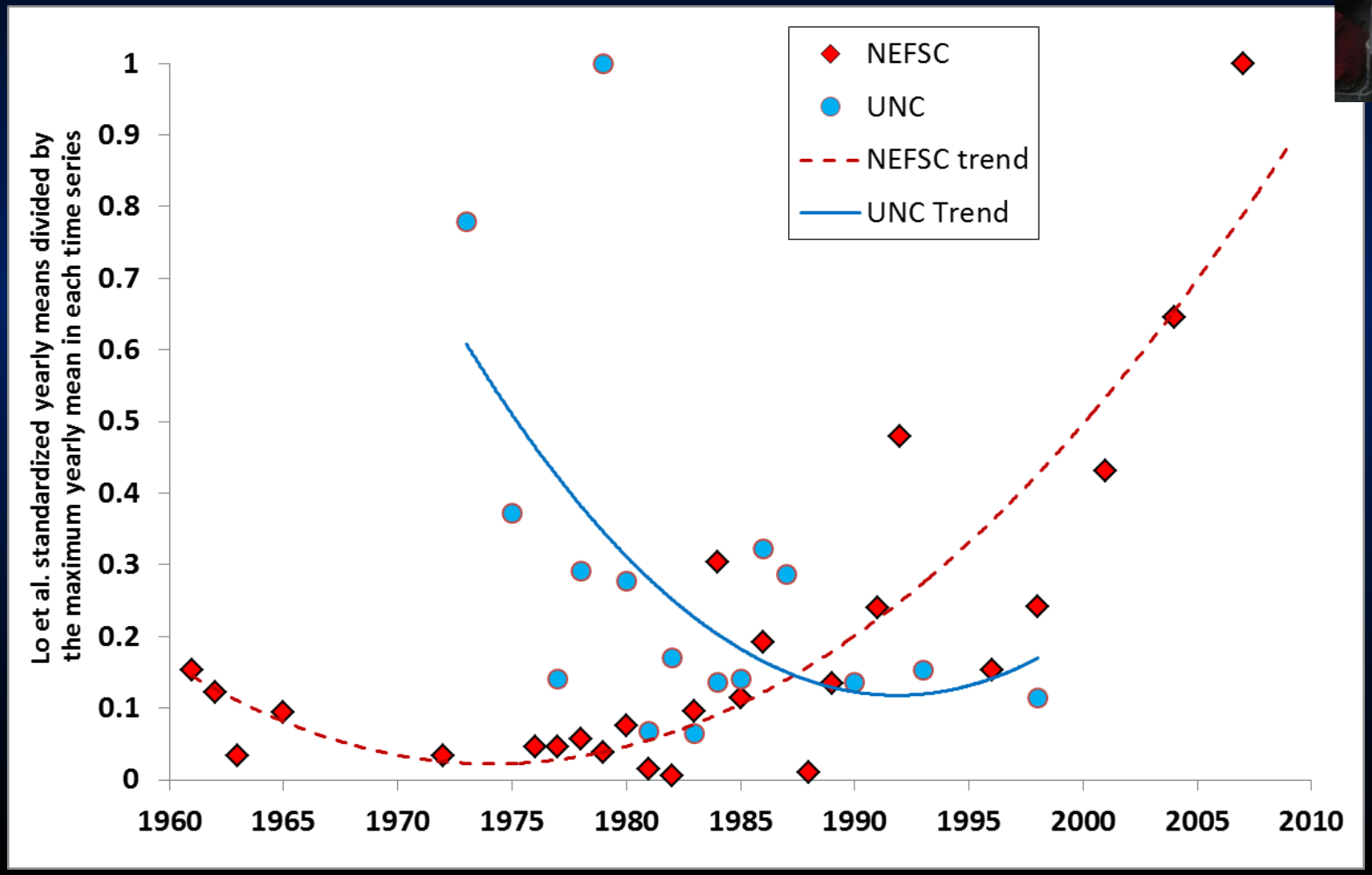
http://www.sefsc.noaa.gov/sedar/Sedar_Workshops.jsp?WorkshopNum=21

Conn, P. B. 2010. Hierarchical analysis of multiple noisy abundance indices. Canadian Journal of Fisheres and Aquatic Sciences 67:108{120.

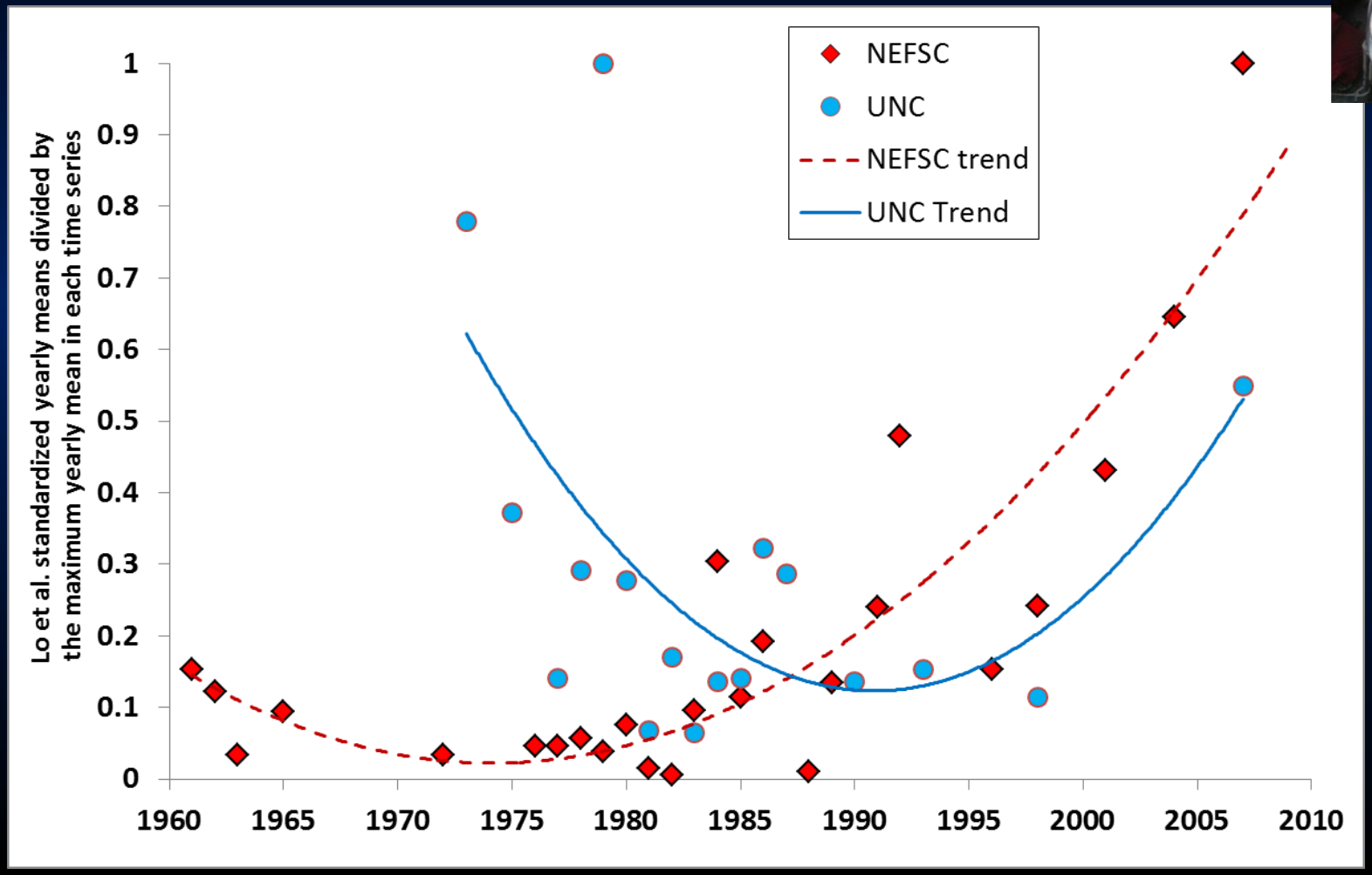


IUCN: Vulnerable A2bd
Musick, J.A., Grubbs, R.D., Baum, J. & Cortés, E. 2009. Carcharhinus obscurus. In: IUCN 2011. IUCN Red List of Threatened Species. Version 2011.2.

Galeocerdo cuvieri
(Tiger Shark)



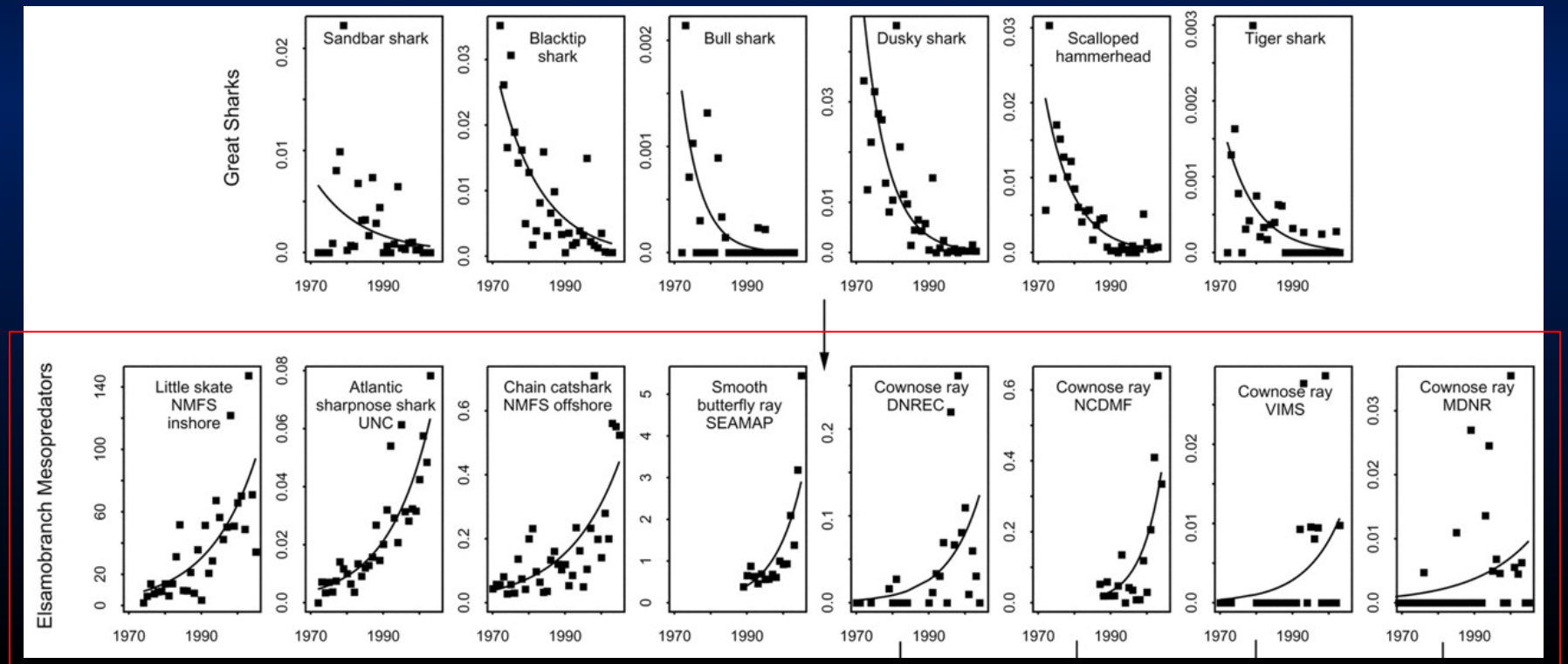
Galeocerdo cuvieri
(Tiger Shark)



A. Examination of the reported trophic cascades mediated by declines in large sharks

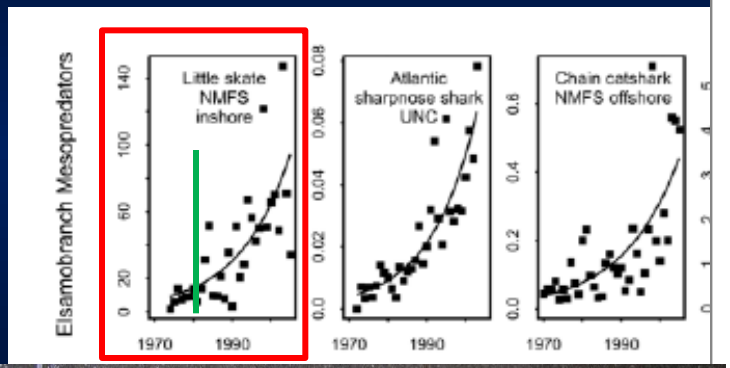
ii. Are increases in smaller elasmobranchs credible?

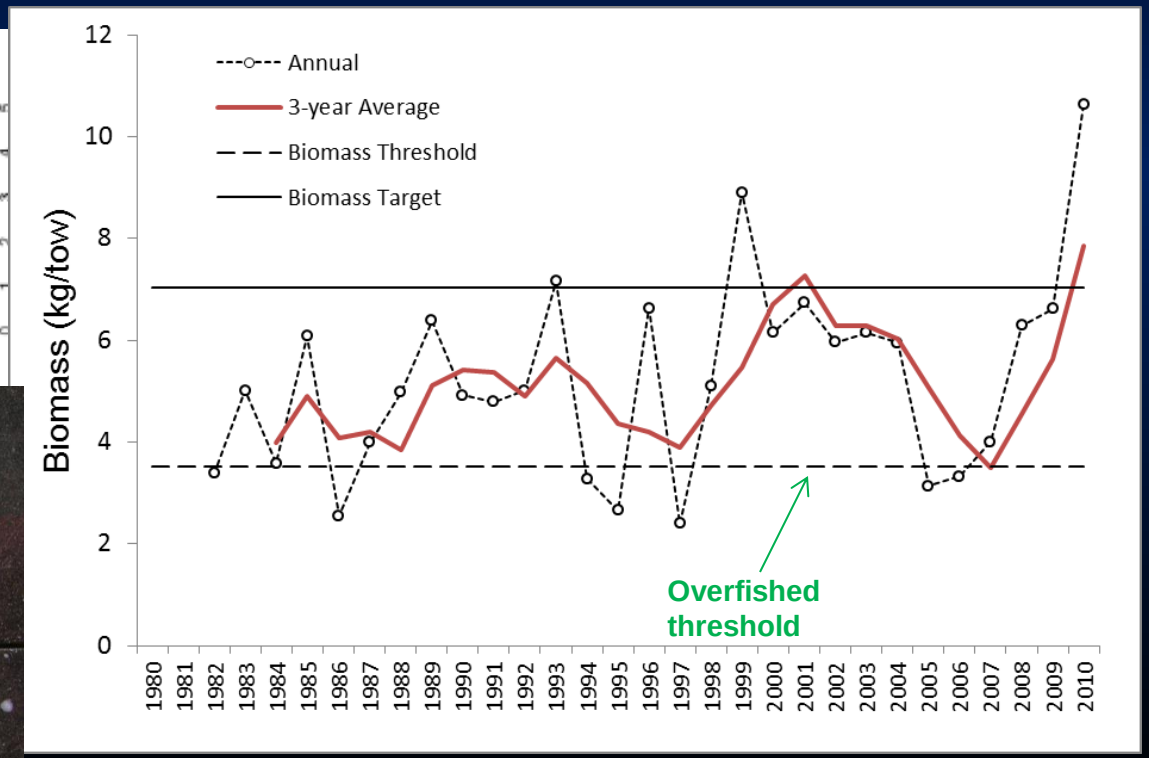
Are they real and are they consistent with life history?



ii. Are increases in smaller elasmobranchs credible?

Little Skate (*Leucoraja erinacea*)

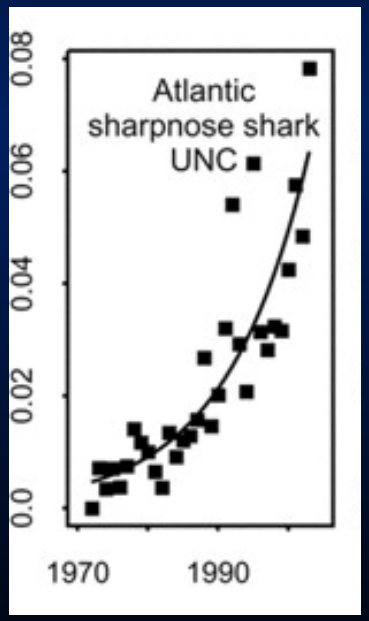


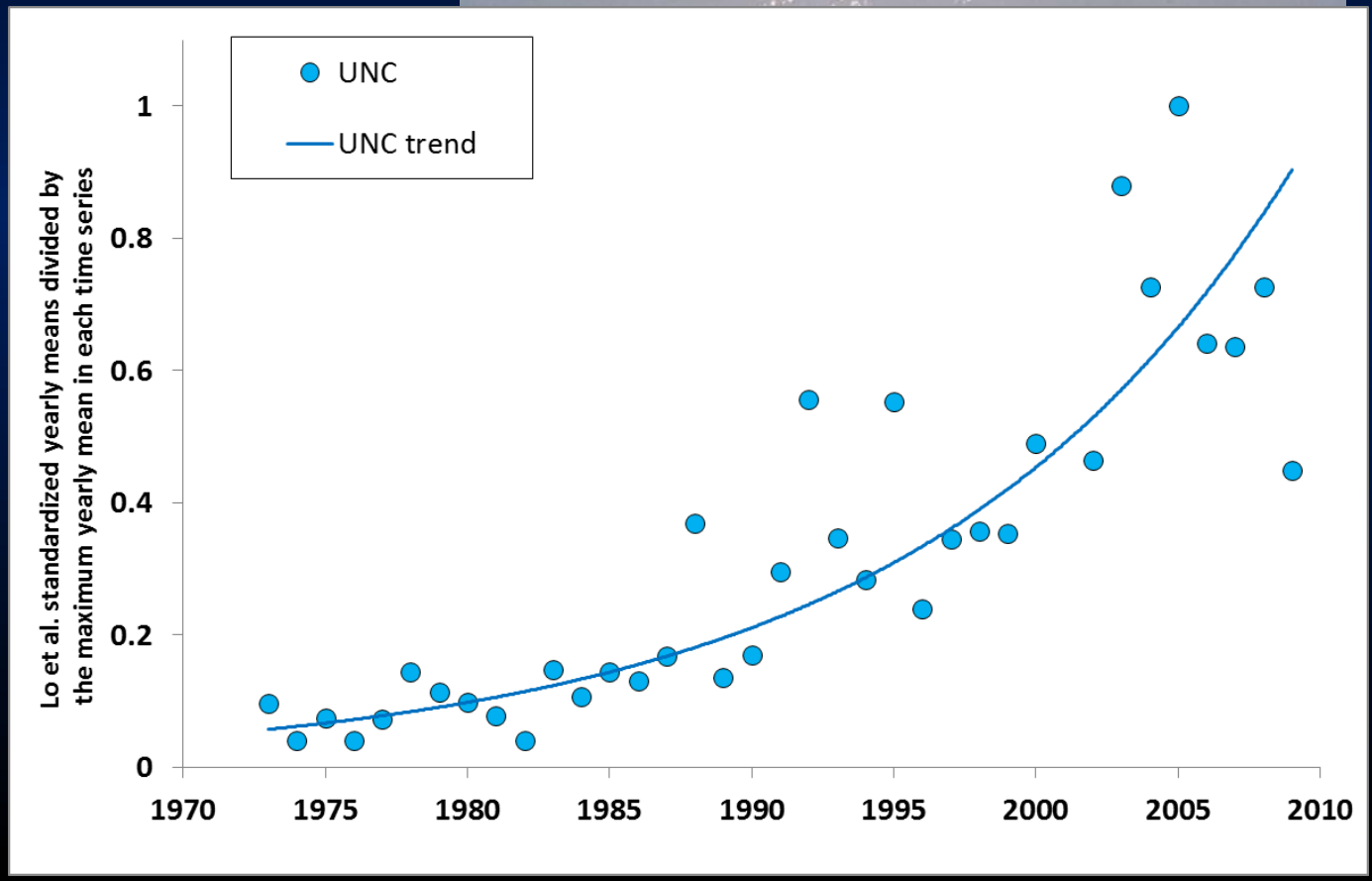


MADMF index: no trend
CTDEP Index: declining trend

ii. Are increases in smaller elasmobranchs credible?

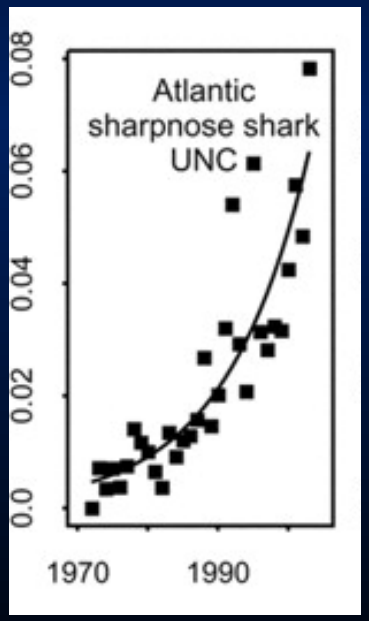
Rhizoprionodon terraenovae
(Atlantic Sharpnose Shark)

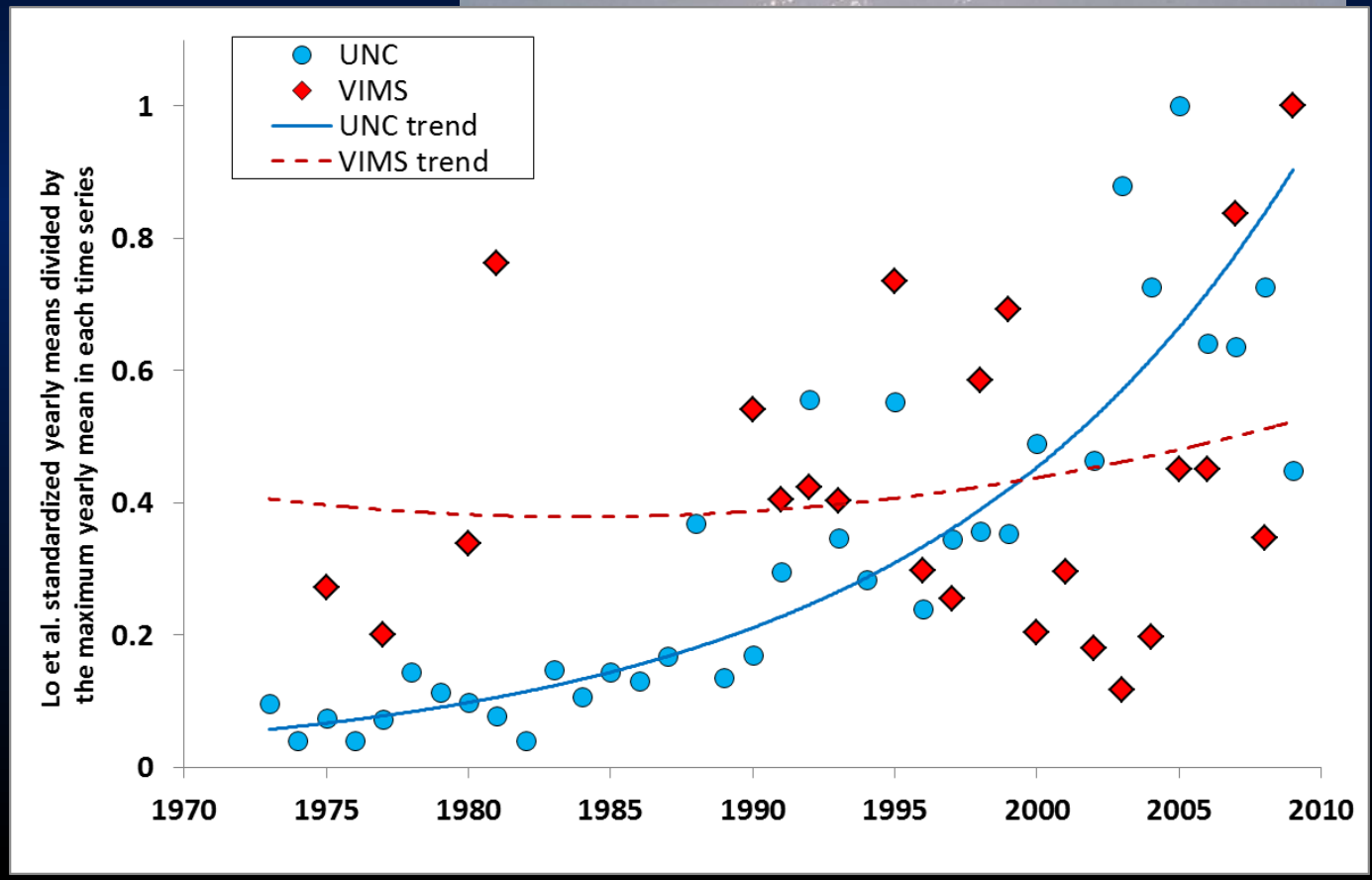




ii. Are increases in smaller elasmobranchs credible?

Rhizoprionodon terraenovae
(Atlantic Sharpnose Shark)





SEDAR 13 Stock Assessment Report for Small Coastal Sharks

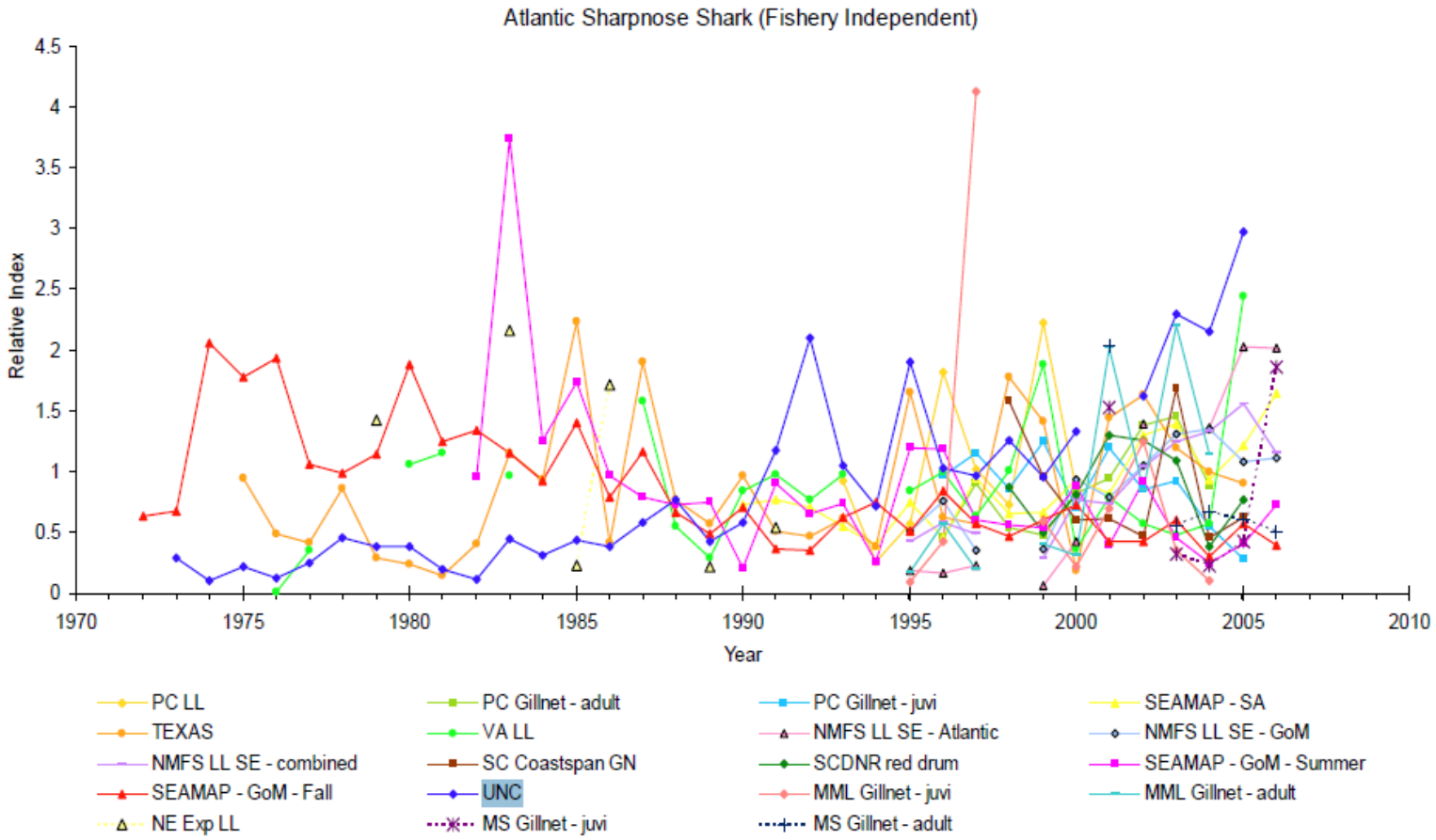


Figure 3.3. Fishery-independent catch rate series for **Atlantic sharpnose sharks**. Solid lines indicate base case indices while dashed lines are for series to be used in sensitivity analysis. Series are scaled (each series is divided by the mean of the years within that series which overlap between all series) to appear on a common scale.

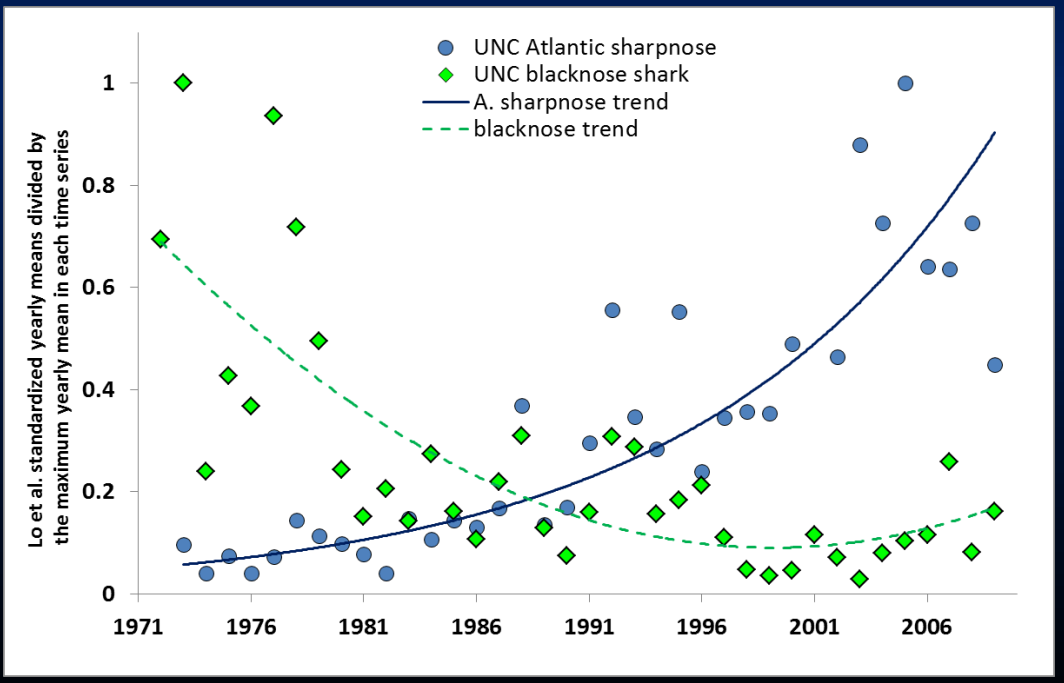
http://www.sefsc.noaa.gov/sedar/Sedar_Workshops.jsp?WorkshopNum=13

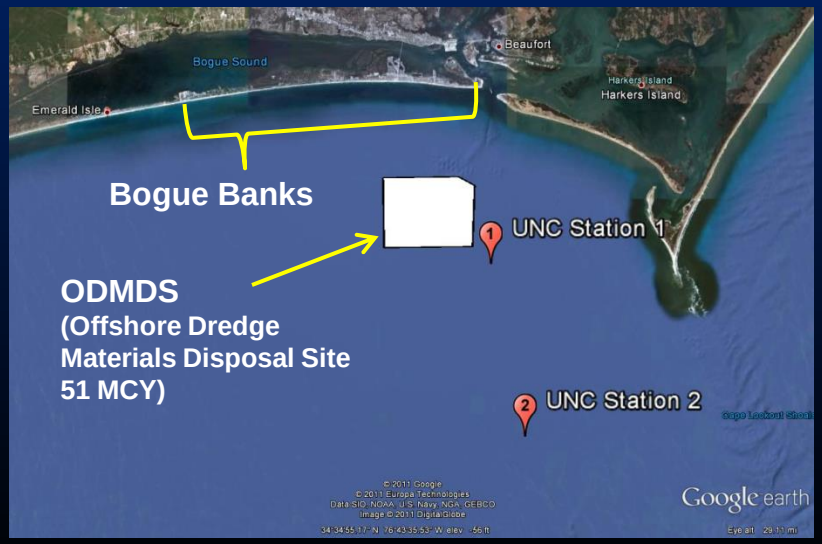
UNC Survey: Two most abundant sharks species - Atlantic sharpnose and blacknose sharks.

Drastic increase in sharpnose sharks attributed to predation release.

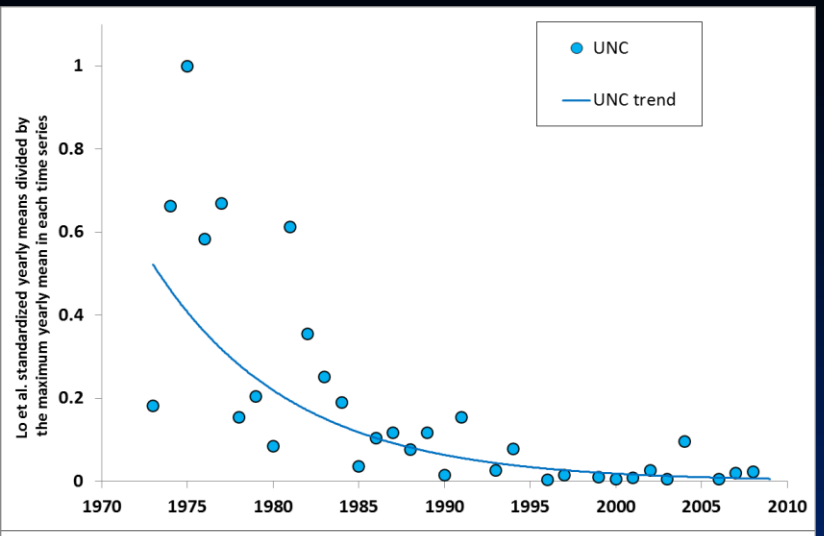
Equally drastic **DECREASE** in blacknose

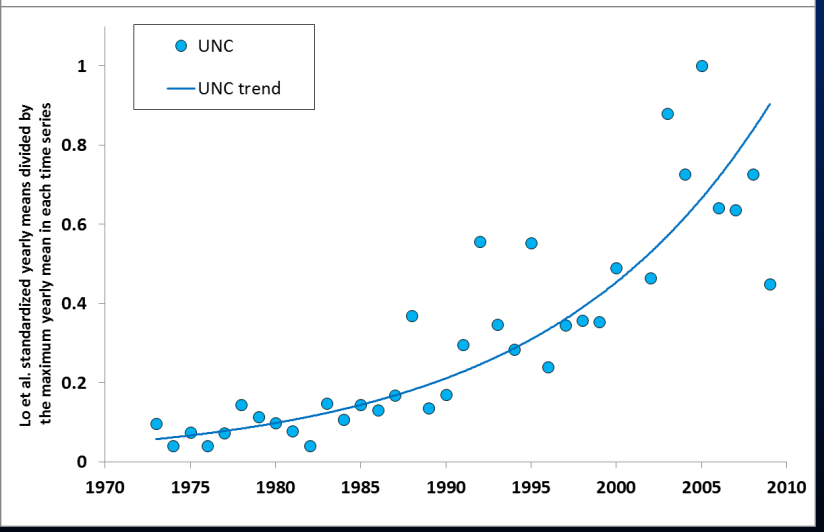
Shift in population distribution, competition or habitat change likely explain this



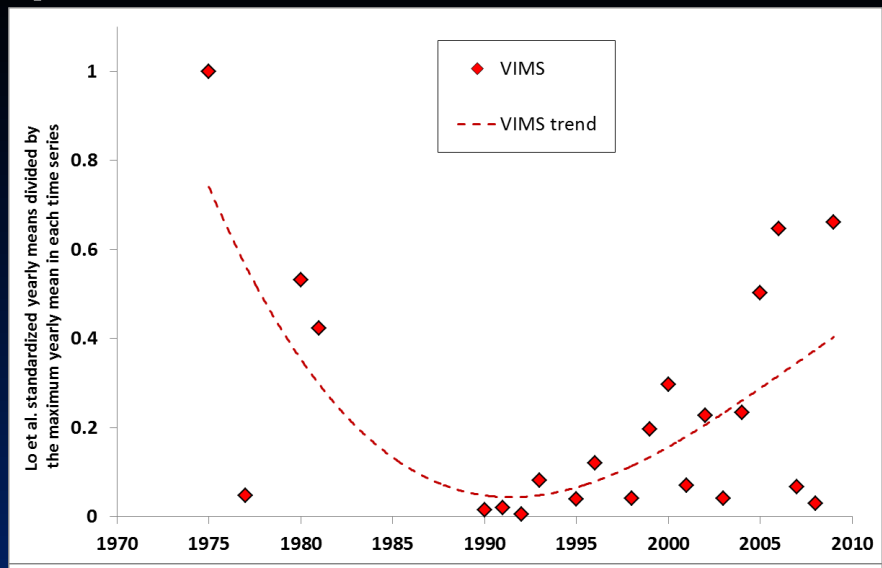


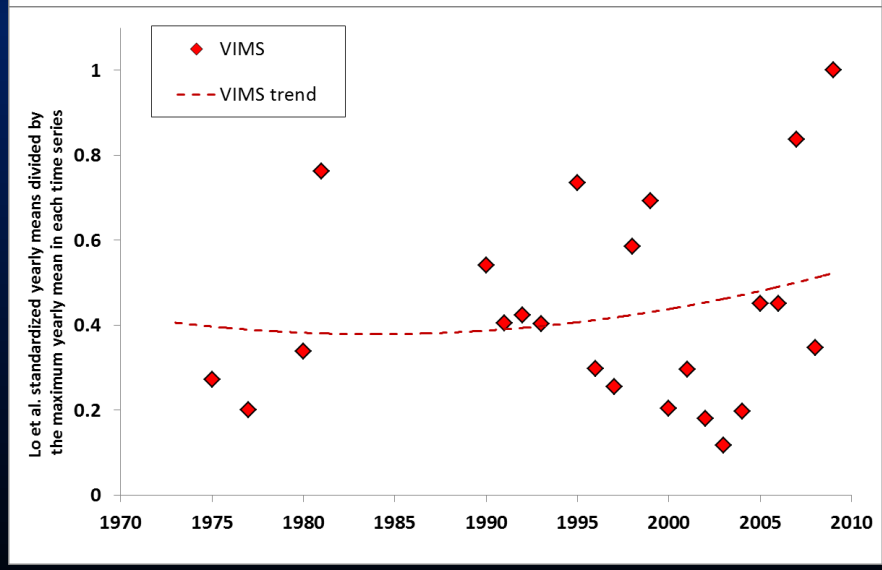
Carcharhinus obscurus
(Dusky Shark)





Predation Release?





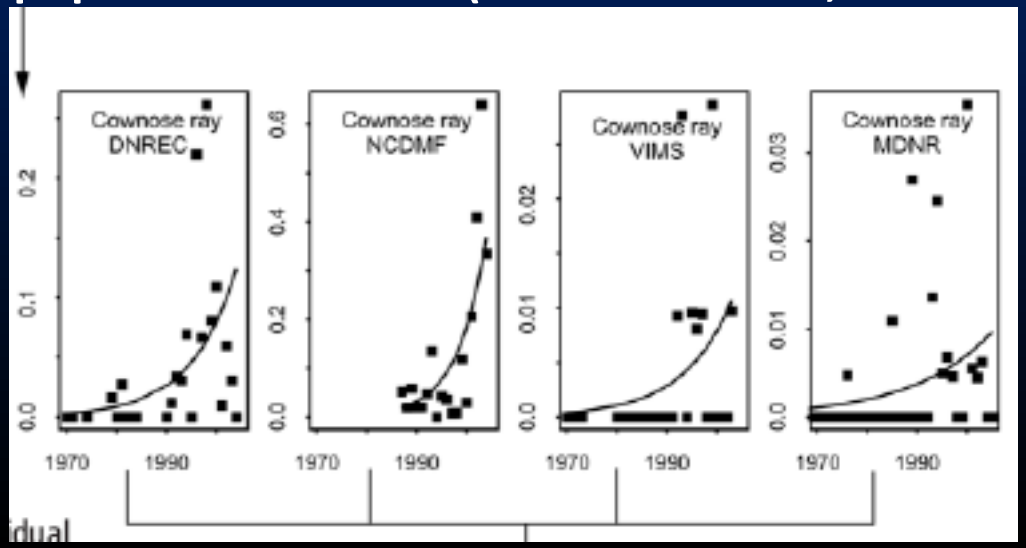
Rhizoprionodon terraenovae
(Atlantic Sharpnose Shark)

The cownose ray population explosion?

Survey	Gear	Years	No. Caught	Inst. Rate
DNREC	Trawl	24	76	0.117****
NCDMF	Trawl	17	230	0.175****
VIMS	Seine	35	11	0.104*
MDNR	Seine	45	26	0.063**
NMFS-Off	Trawl	5	23	-0.265
NMFS-In	Trawl	31	544	0.044*
SEAMAP	Trawl	17	4817	0.059**

Most drastic increases illustrated; very small sample sizes.

Increase may represent a shift in the population distribution rather than a population increase (Frisk et al. 2008, Frisk 2010).



Data from Myers et al. (2007)

HISTORICAL PERSPECTIVE:

John Smith's 1608 exploration of the Chesapeake Bay.
Smith's crew "...Our Captain sporting himself by nailing them [rays] to the ground with his sword, set us all afishing in that manner: thus we took more in an hour than we could eat in a day."

Mitchell (1815)
Cownose rays "are detested by people who live near the shores by reason of the damage they do to the clams (*Mya arenaria*)"

Joseph (1961) Copeia.
Cited unusual catches of cownose rays in pound nets in 1960. Fishermen polled could not "recall such concentrations in the past".

Schwartz (1965) –
"Huge flotillas of *R. bonasus* annually invade the upper bay."
Witnessed the catch of 200,000 cownose rays in the Potomac River in 1964

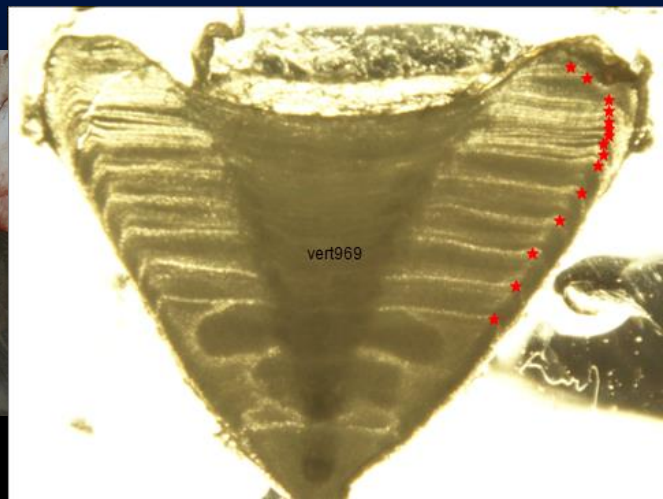
Cownose ray population explosion?

Cownose rays: 7-8 years to mature, Max. age: 21 years
11-month gestation
produce a single pup

Lifetime fecundity: Cownose rays ~10; Large sharks >100

Population doubling time is several decades, r=0.01.

Reference	N (♂)	50% Mat.	K	N (♀)	50% Mat.	K	Region
Fisher, Call & Grubbs (in revision)	217	6-7 years	0.274	319	7-8 years	0.193	Chesapeake Bay
Smith & Merriner (1986)	61	5-6 years	0.126	54	7-8 years	0.119	Chesapeake Bay



A. Examination of the reported trophic cascade mediated by declines in large sharks

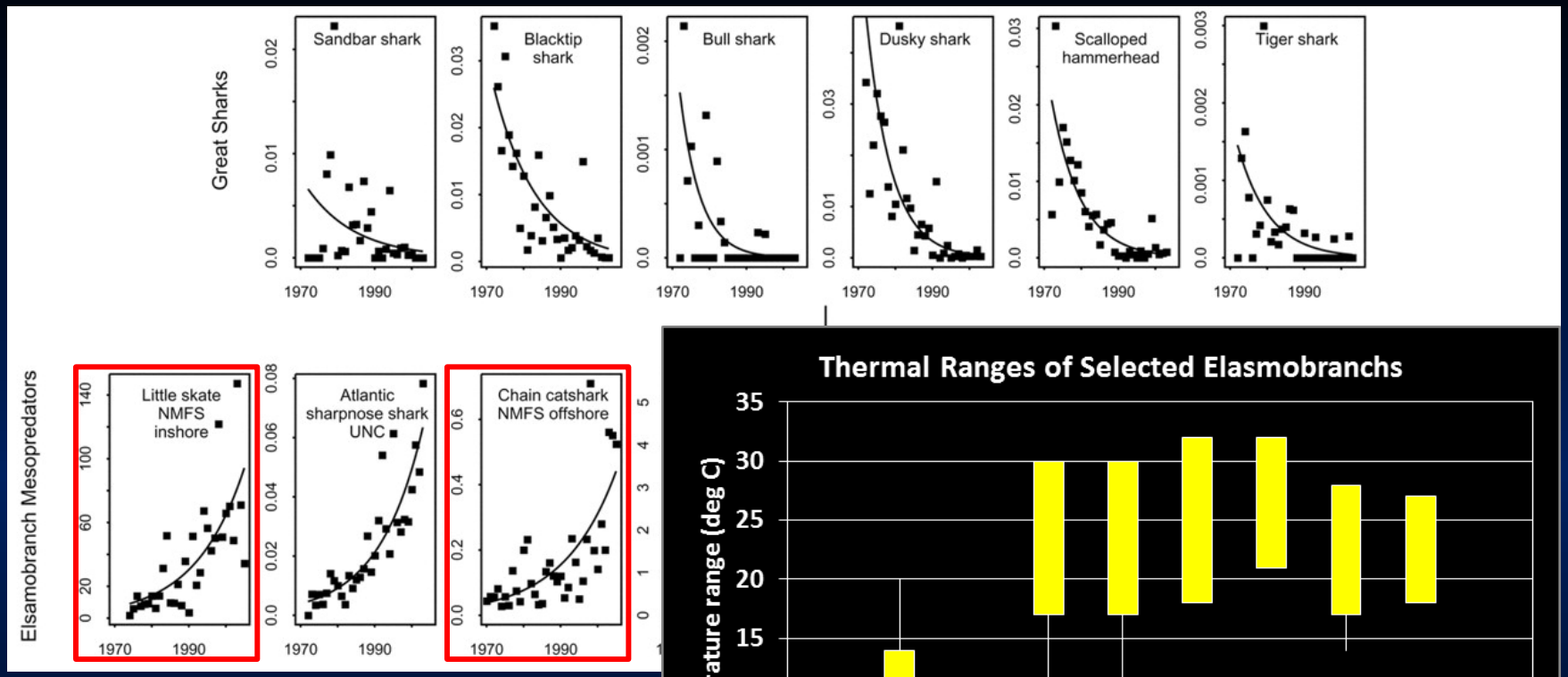
iii. Are the trophic links sufficient to elicit this cascade?

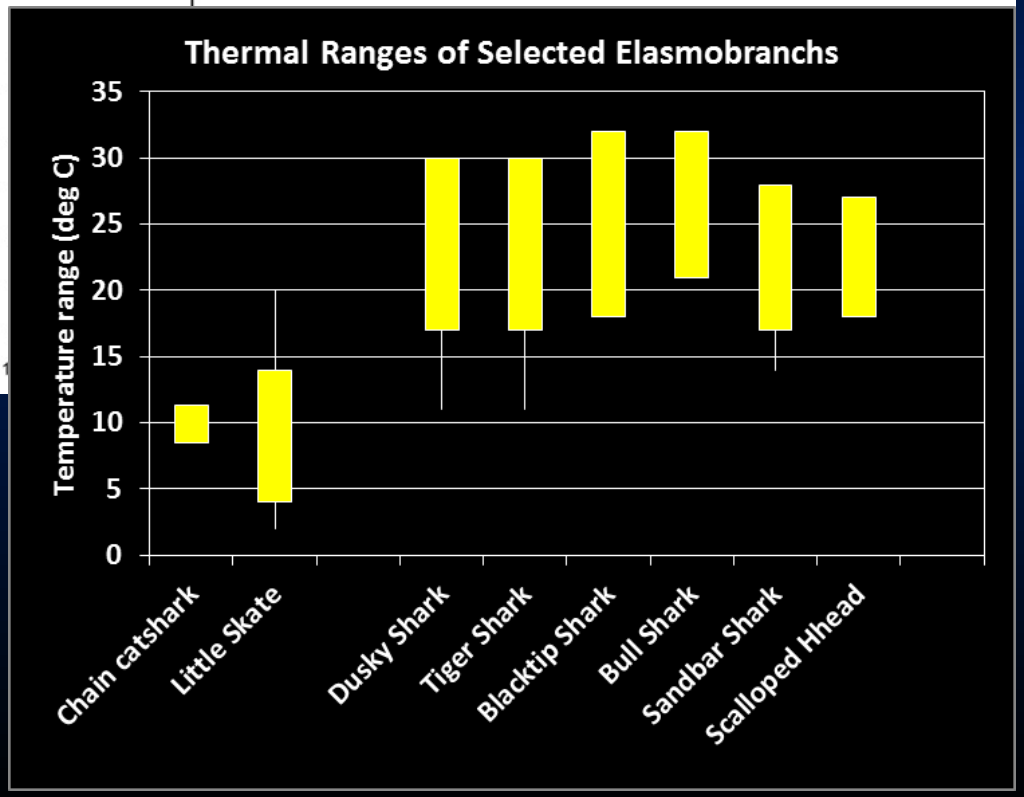
Requirements:

- Spatio-temporal overlap b/w large and small elasmobranchs
- Small elasmobranchs = significant part of large shark diet
- Large sharks = the primary predators of small elasmobranchs

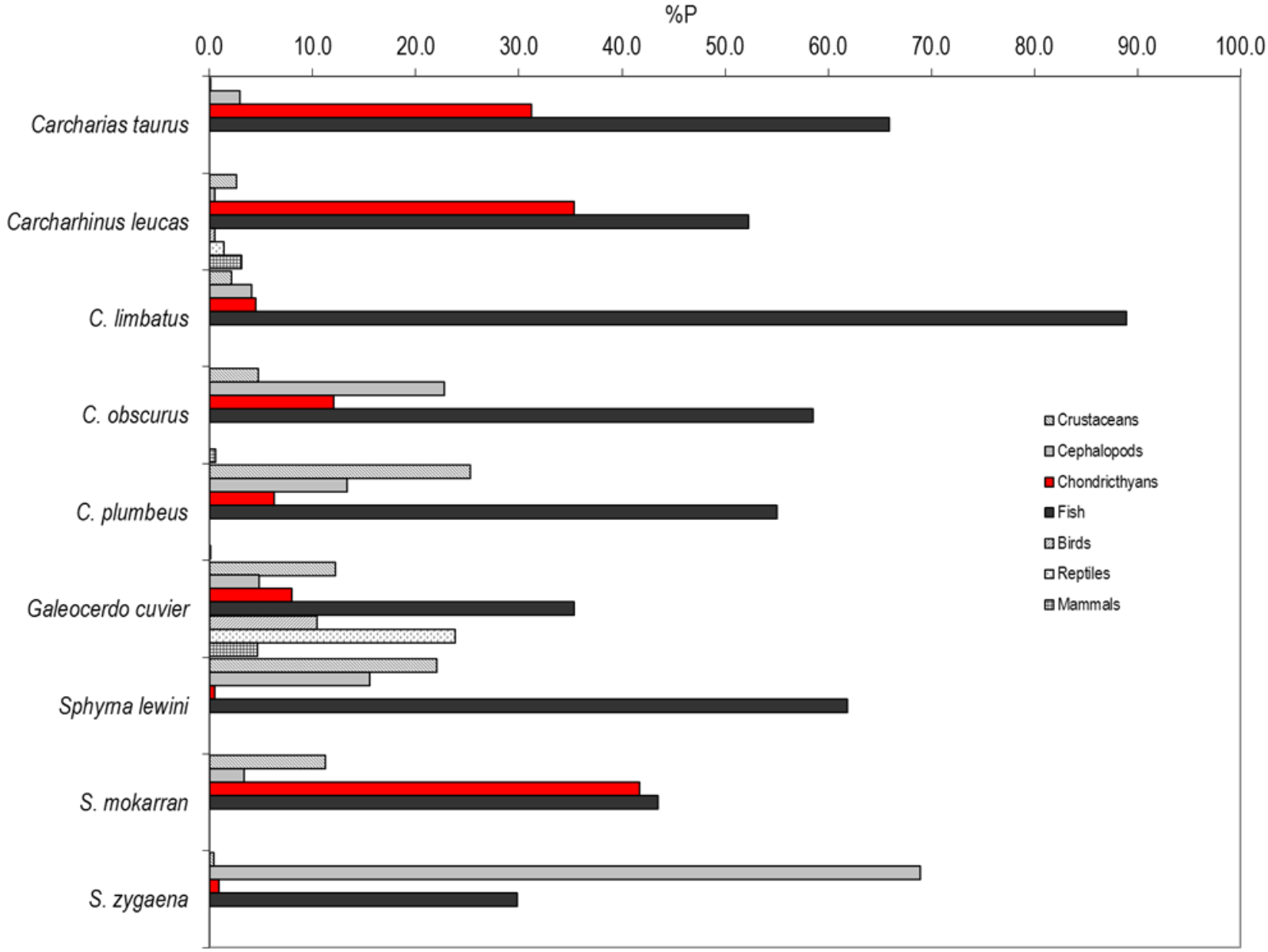
ISSUES:

Some species implicated in the trophic cascade rarely co-occur.





Fitz and Daiber 1963, Compagno 2001, Able & Flescher 1991, Packer et al. 2003, Musick & McEachran 1974, McEachran and Musick 1975, VIMS longline data


%P
0.0
10.0
20.0
30.0
40.0
50.0
60.0
70.0
80.0
90.0
100.0
Carcharias taurus
Carcharhinus leucas
C. limbatus
C. obscurus
C. plumbeus
Galeocerdo cuvier
Sphyma lewini
S. mokarran
S. zygaena
Crustaceans
Cephalopods
Chondricthyans
Fish
Birds
Reptiles
Mammals

Species	% Elasmobranch Diet	
Scalloped Hammerhead	0.5%	
Blacktip	4.5%	(3% cownose ray)
Tiger	8.0%	
Sandbar	6.3%	(0.01% cownose ray)
Dusky	12.0%	(0.01% cownose ray)
Bull	35.4%	

Cortes (1999)

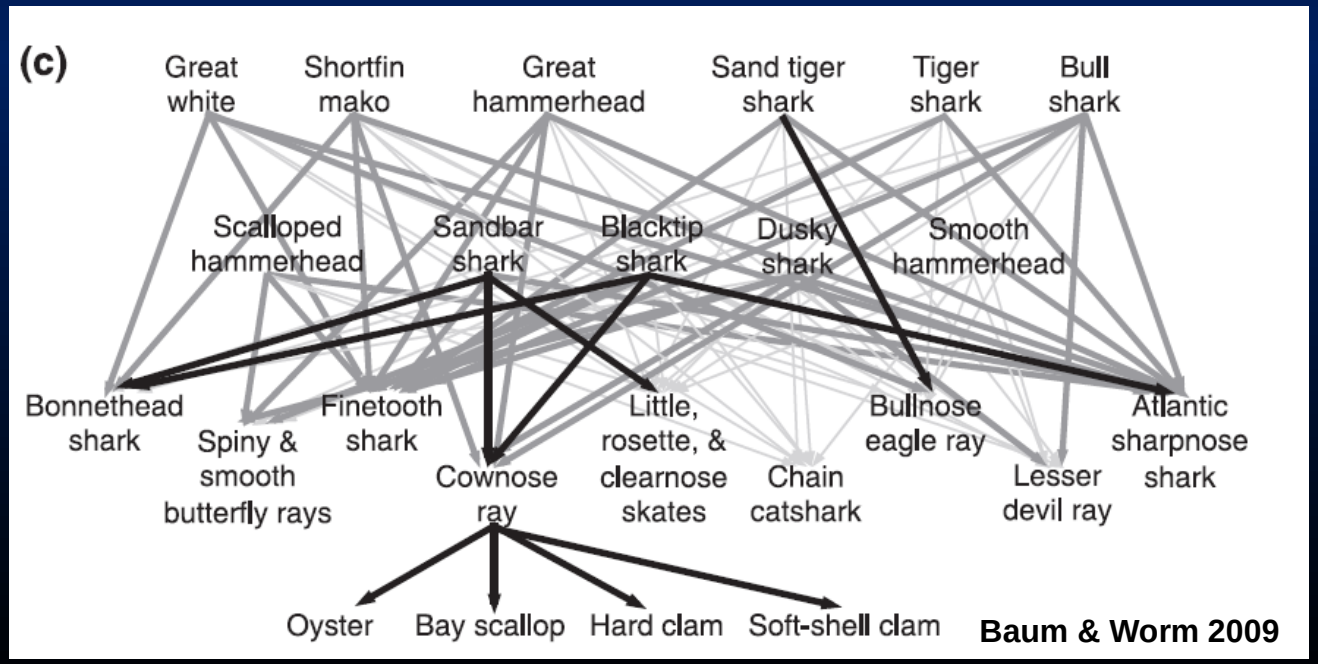
Most common elasmobranch prey for large sharks along East Coast:

Clearnose Skate (*Raja eglanteria*)

Myers et al. (2007 supp. material):
Increase in two surveys
Decline in one survey
No trend in two surveys

A. Examination of the reported trophic cascades mediated by declines in large sharks

iv. Is increased cownose ray abundance responsible for declines in commercial bivalve populations?



Baum & Worm 2009

Trophic Relationships

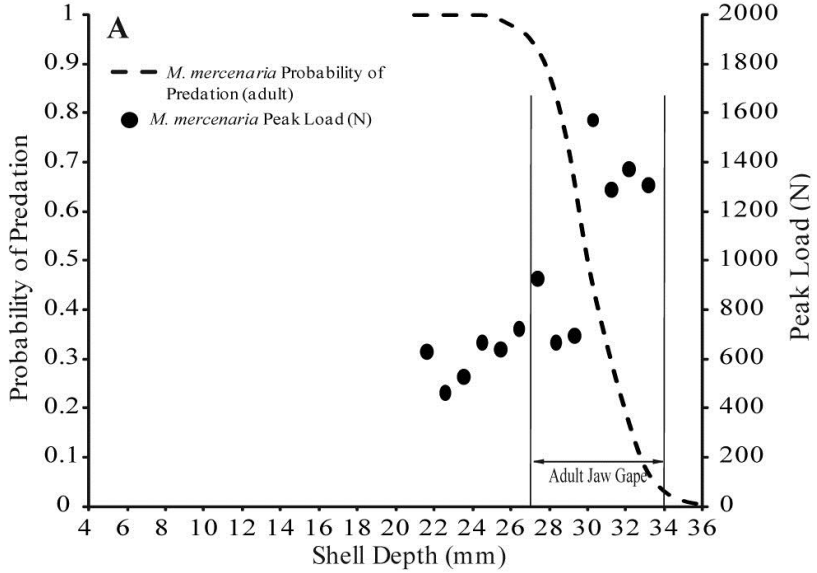
•***Are cownose rays significant natural predators of commercial bivalves?***

Location	Primary Diet
→ Chesapeake Bay (1970's)	Softshell clams, small bivalves
Chesapeake Bay (current)	Small non-commercial bivalves, crustaceans, fishes
→ North Carolina	Bay scallops (70%)
Tampa Bay	Cumaceans and polychaetes
Gulf of Mexico	Amphipods, polychaetes, echinoderms, non-commercial bivalves

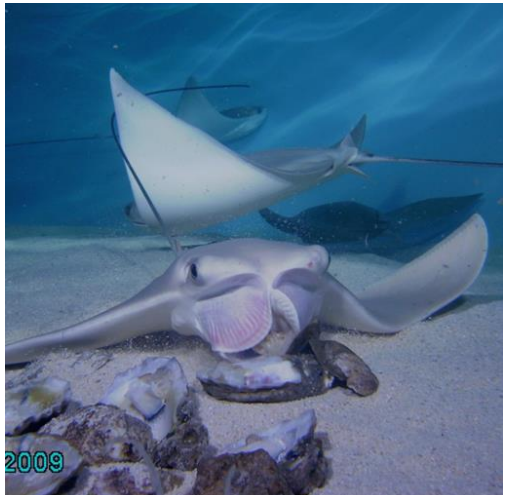
Smith and Merriner (1985), Powers and Gaskill (2003), Collins et al. (2007), Craig et al. (2010), Ajemian and Powers (2011), Fisher et al. (in prep)

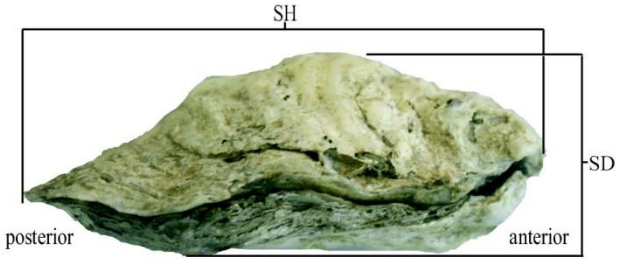
No evidence of significant predation on oysters and hard clams except on "seeded" beds (i.e. on-bottom aquaculture)

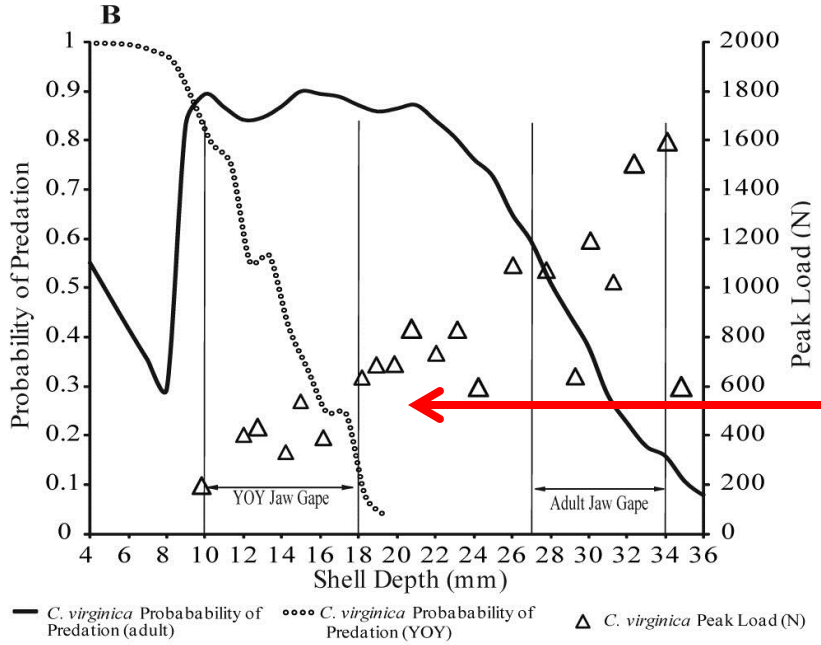
Cownose collected from commercial oyster grounds in Chesapeake Bay: oysters=5% of diet, small weak-shelled bivalves and crustaceans dominated (Fisher 2010 – Report to NOAA NA07NMF4570324)



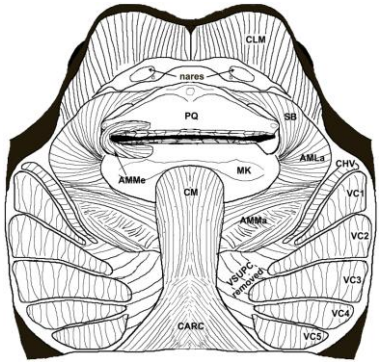
(A)Probability of predation and peak load of *M. mercenaria* as a function of shell depth

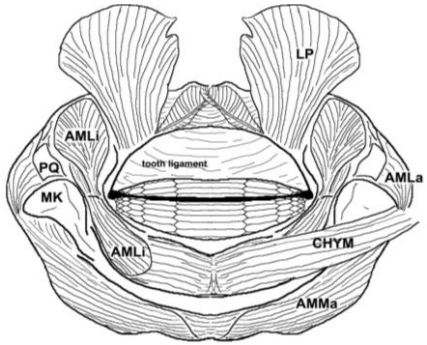






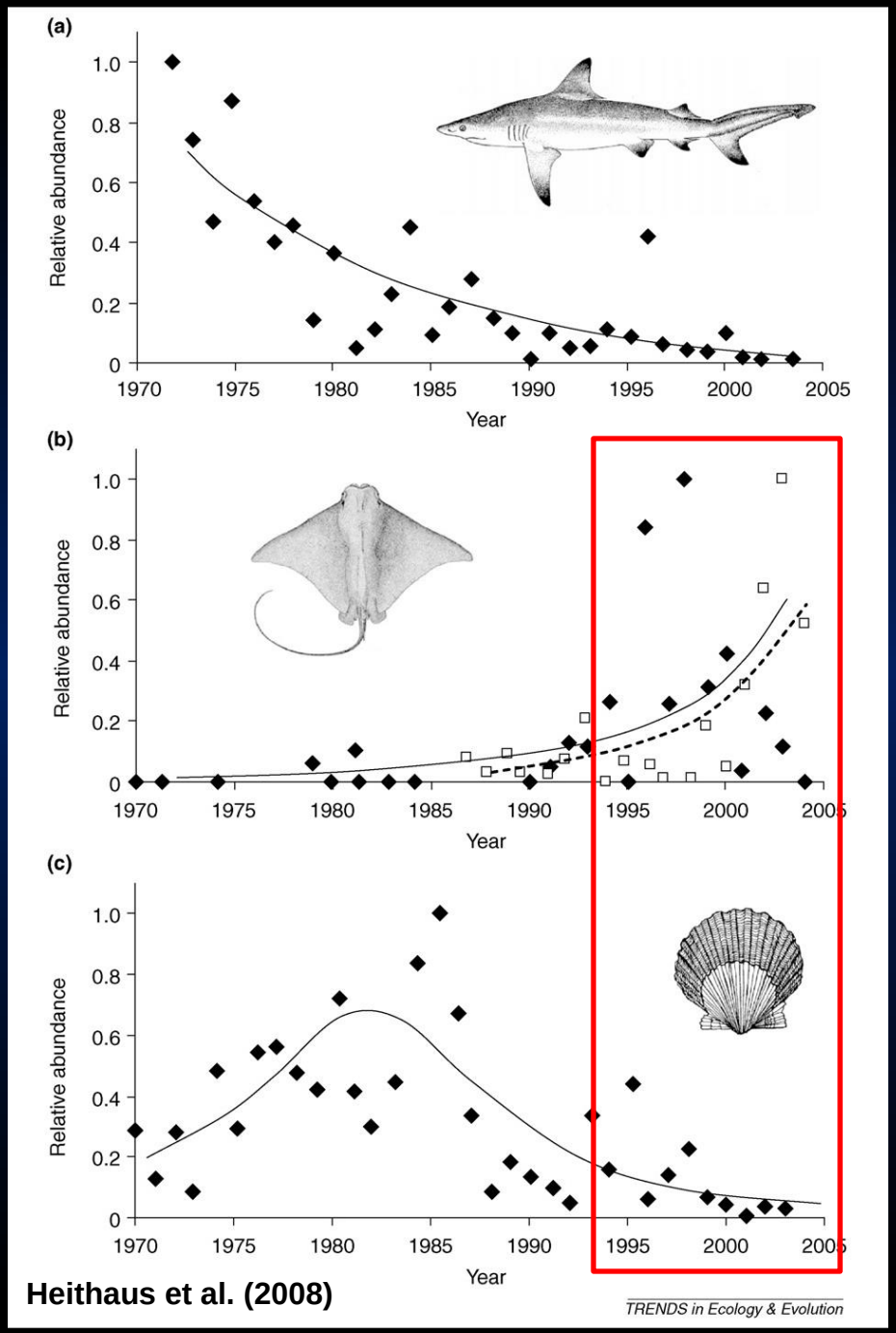
(B) Probability of predations and peak load of *C. virginica* and as a function of shell depth.





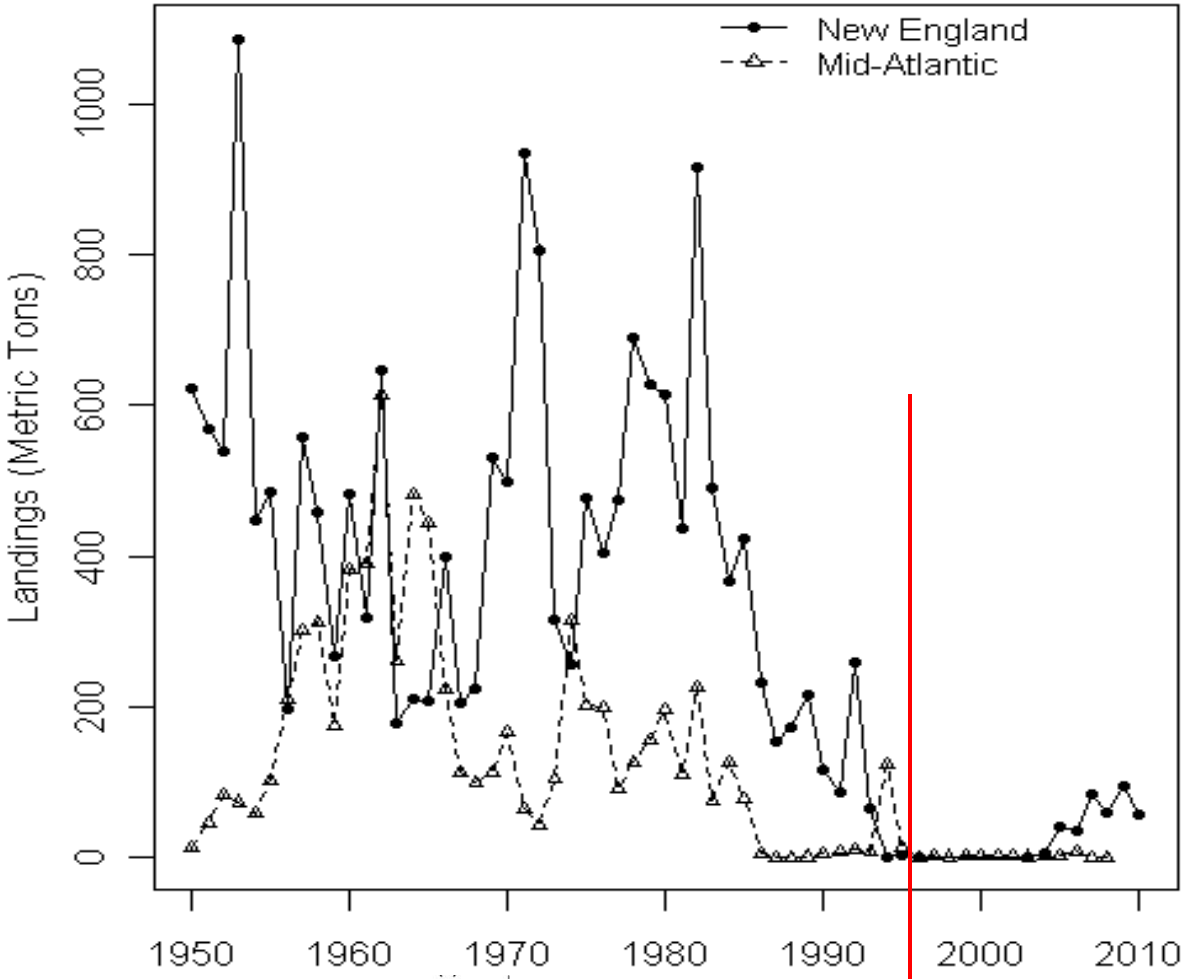
Fisher, R.A., G.C. Call, R.D. Grubbs. 2011. J. Shellfish Research 30(1): 187-196.

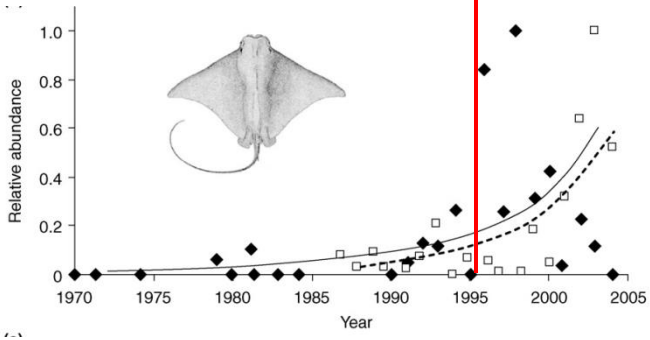
Kolmann et al. 2012. Scaling of bite force in cownose rays



Heithaus et al. (2008)

Atlantic Coast Bay Scallop Landings (1950-2003)





- Scallop populations are declining all along the East Coast, even where cownose rays do not occur
- Cownose rays may be inhibiting recovery, but they are not the cause of scallop stock collapses

NCDMF (2007):

1937: wasting disease killed seagrass leading to scallop collapse

1987: red tide caused scallop recruitment failure

1999: Hurricanes Denis, Floyd, Irene

<u>Recreational fishery unmonitored</u>
NMFS 1991: ~1,000,000 trips/yr
(1/2 bushel allowed; if 5% successful, would match commercial harvest)

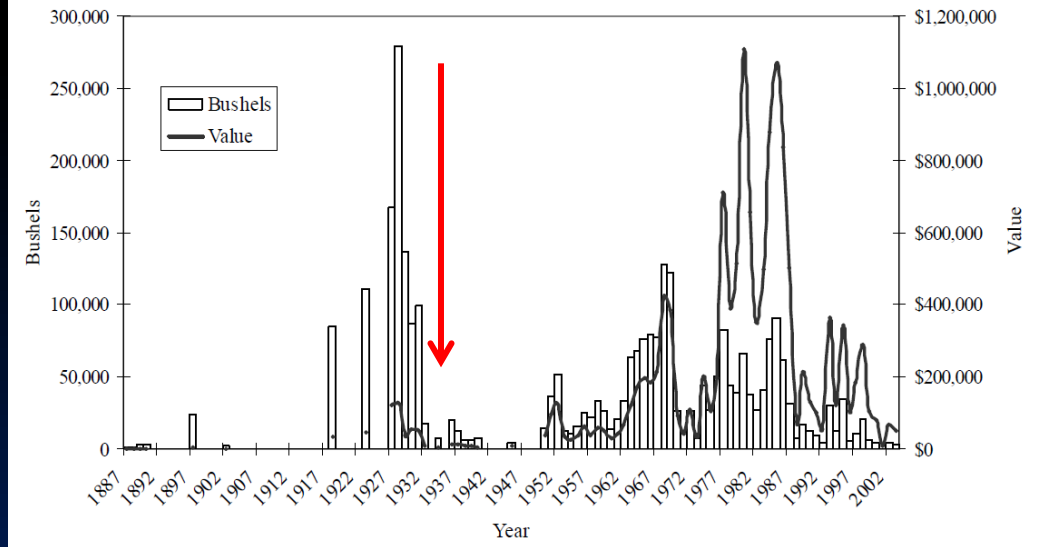


Figure 6.1. Bay scallop historical landings (bushels) and value, 1897-2003. DMF Trip Ticket Program.

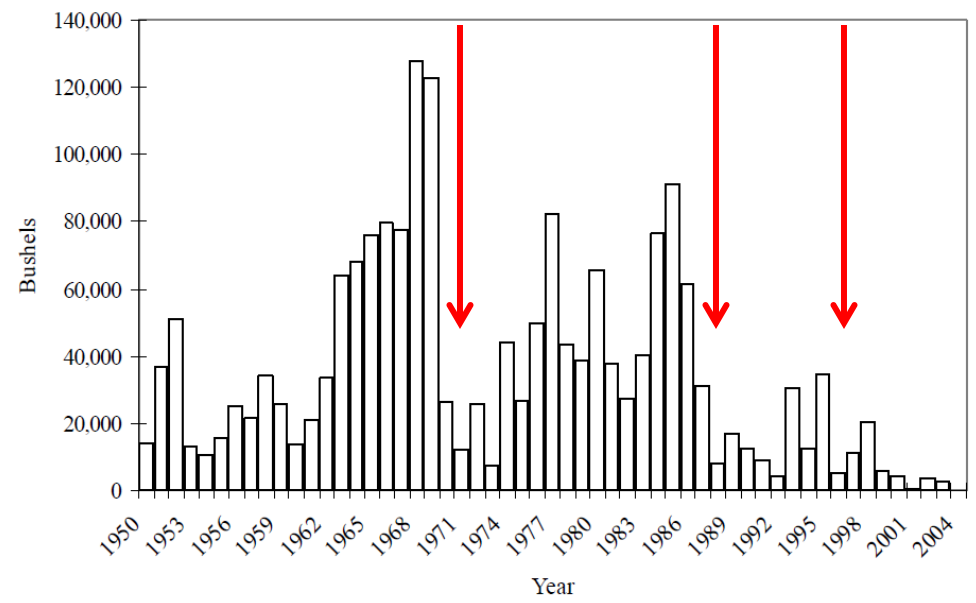


Figure 6.3. North Carolina commercial bay scallop landings (bushels), 1950-2004. DMF Trip Ticket Program.

Oysters

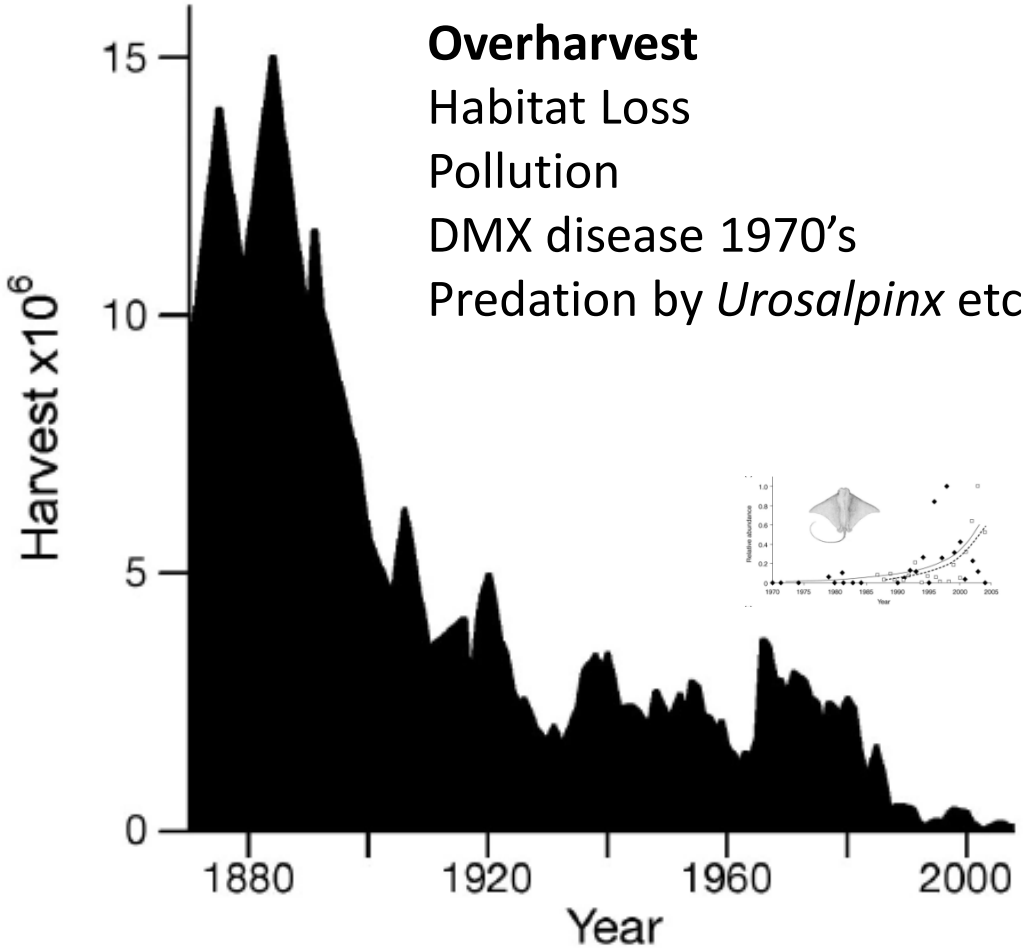
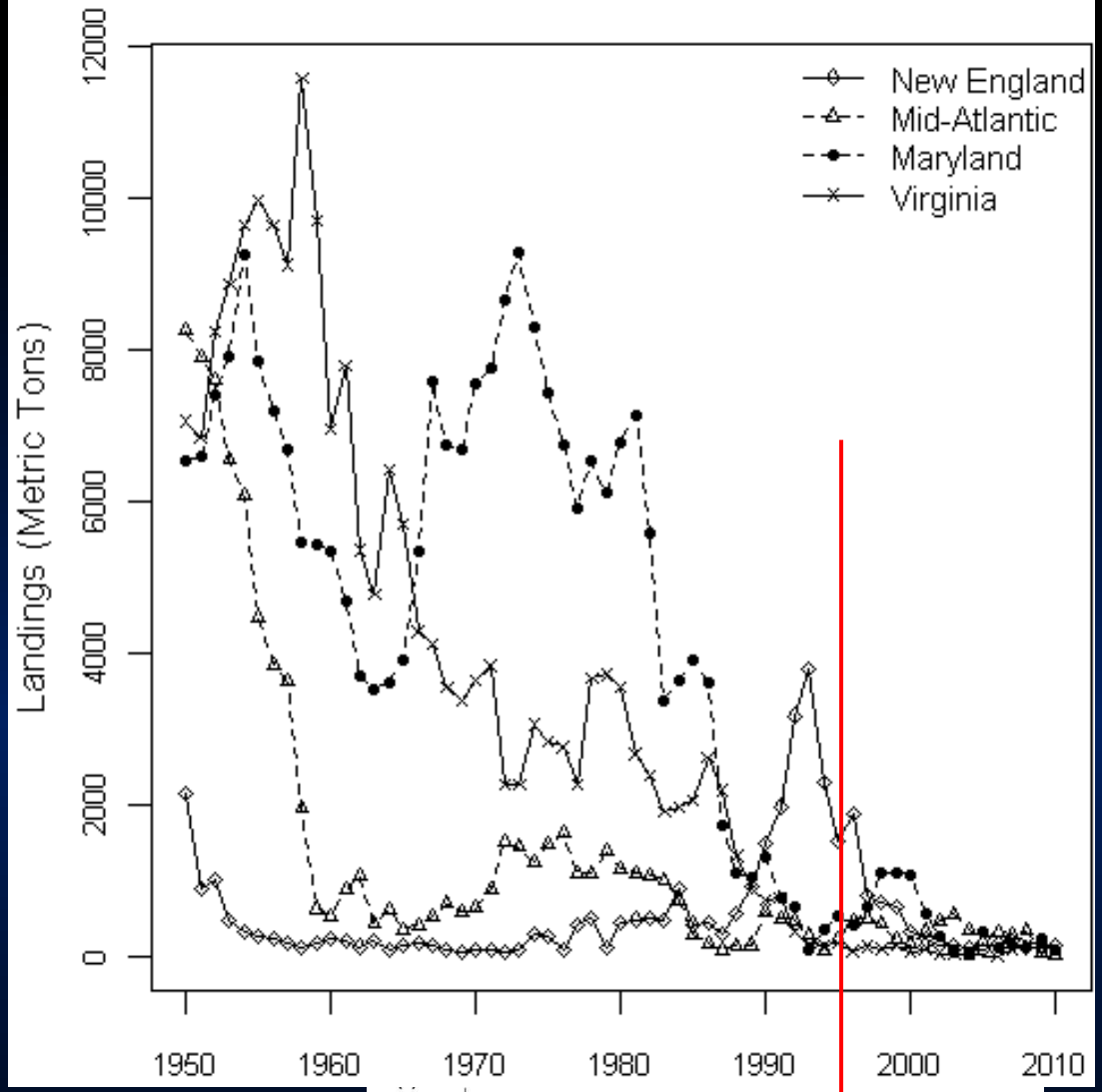
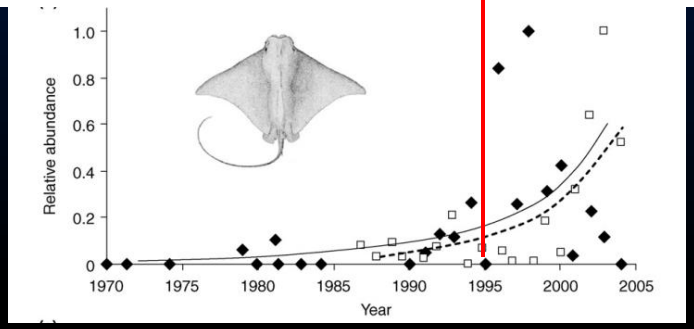


Fig. 1. *Crassostrea virginica*. Reported harvest of Chesapeake Bay oysters (in Maryland bushels) in Maryland and the Potomac River, USA, during 1870 to 2008

Wilburg et al. 2011: Fishing is largest cause of declines in Chesapeake Bay oysters; disease is 2nd. Increases in natural mortality from predation are overshadowed.

Oysters





- Cownose rays may be inhibiting mitigation efforts, but they are not the cause of oyster stock collapses

Cascading effects of pseudoscience

– fishery development for cownose rays

Save the Bay, Eat a Ray

Boston Seafood Show

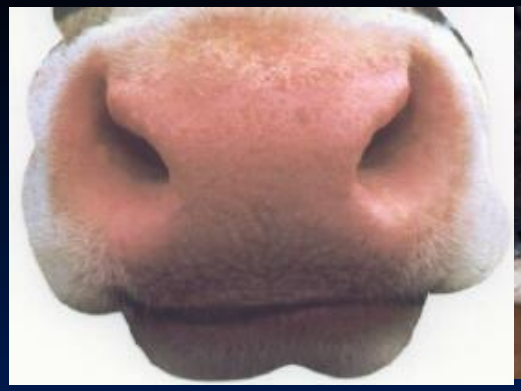
ChesapeakeRay
Virginia Seafood

Brussels Seafood Show

Rhinoptera bonasus

Rhino = Greek for “snout”

ptero = Greek for “wing”



BONASUS

A beast like a bull, that uses its dung as a weapon

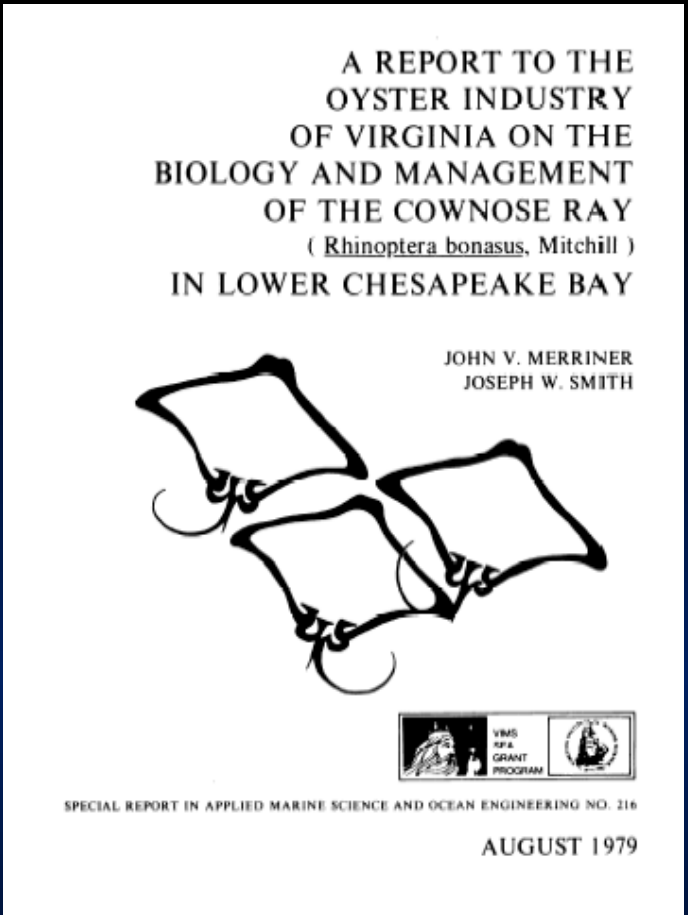
Pliny the Elder [1st century CE]: The bonasus when attacked runs away, while releasing a trail of dung that can cover three furlongs. Contact with the dung burns pursuers as though they had touched fire.

Merriner and Smith (1979)

Reported substantial losses to seed and harvestable oyster beds in Virginia due to cownose ray predation.

Recommendations:

1) **Fences to protect planted oyster bottom**
2) **Develop a fishery for cownose rays**
3) **Directed fishery should begin after July 15 to allow births**
4) **Develop sportfishing derbies for cownose rays**
5) **Add cownose ray to the list of citable fishes maintained by the Virginia Saltwater Fishing Tournament**


A REPORT TO THE OYSTER INDUSTRY OF VIRGINIA ON THE BIOLOGY AND MANAGEMENT OF THE COWNOSE RAY
(Rhinoptera bonasus, Mitchill)
IN LOWER CHESAPEAKE BAY

JOHN V. MERRINER
JOSEPH W. SMITH

SPECIAL REPORT IN APPLIED MARINE SCIENCE AND OCEAN ENGINEERING NO. 216

AUGUST 1979

Otwell and Lanier (1978)

Also reported losses of scallops in North Carolina to cownose rays. Proposed a fishery and tried to develop a market.

Sound familiar?

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Home » News » Environment

Would you eat a cownose ray? Virginia hopes so

Posted to: Food and Cooking | Environment | News | Virginia Login or register to post comments

The Chesapeake ray, also called the cownose ray, sucks clams and oysters from the bed of the Chesapeake Bay, crushes them with rock-hard plates that serve as teeth, swallows the meat and spits out the shells. This cownose ray at the Virginia Aquarium is feeding on an oyster. (2010 Virginia Institute of Marine Science)

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By Lorraine Eaton
The Virginian-Pilot
© July 21, 2010

For four years now, the stat
the number of shellfish-eatin
Chesapeake Bay by adding
waters - humans.

The state opened the water
created a market for the win
colored flesh, which tastes r
steak than seafood. It even
bullfish to the more palatable
ray.

But, so far, few are biting.

"I have folks who buy it who
because it tastes like red m

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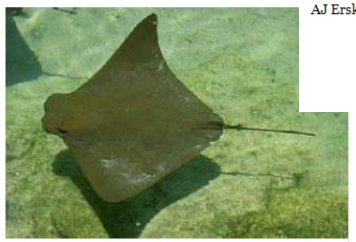
Going green with Chesapeake Ray, the 'next calamari'

Posted by **Linda Busche** on March 18, 2011 10:28 AM



If there's a downside to putting an invasive species of seafood on the menu, National Restaurant Association member Croc's 19th Street Bistro has yet to find it.

The Virginia Beach, Va., restaurant's profits have grown since it added tacos made from the meat of the cownose ray, a type of stingray that preys on Chesapeake Bay's shellfish bounty. It now pays about 35 cents for a slab of ray but initially got the fish for free under a state initiative to interest restaurants in the protein. At the time, the Gulf of Mexico oil spill had driven Croc's seafood costs to $2 per shrimp.

Co-proprietor Laura Wood Habr said it was a no-brainer to give the ray a try. At $10 for an order of Chesapeake Ray Tacos, there wasn't much to lose.

Customers initially were skeptical, but many asked about the new option. "What they really liked was the story," Habr says.

Promotional materials explained the ray, though native, was depleting the Bay's populations of clams, oysters, scallops, lobsters and crabs. Croc's echoed the Virginia Seafood Council's rallying cry, "Eat a ray and save the Bay."

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A cownose by any other name is edible

Marketplace, Wednesday, November 11, 2009

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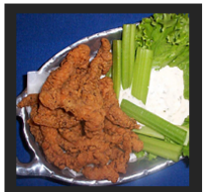
Cownose rays are becoming a growing menace on fishing in the Cheasapeake Bay. So some local oystermen are finding ways to turn the predators into a meal. But to make the rays more appetizing, they need some good marketing. Sabri Ben-Achour reports.

TEXT OF STORY

KAI RYSSDAL: Making your living on, or from the water has never been easy. Fishing can be dangerous. It's sometimes not very profitable. Increasingly there are strict limits on how much fishermen can catch. And then there are the natural predators. Oystermen near the Chesapeake Bay are hoping they can turn their enemies into a tasty treat. Sabri Ben-Achour reports.

SABRI BEN-ACHOUR: A few miles up Virginia's Cone river, near the mouth of the Chesapeake Bay, thousands of oysters are beginning their lives in metal tubs, just below the water's surface. Oysterman AJ Erskine pours them into a sorting machine.

AJ ERSKINE: They're about three months old, and they're ready to go in cages.



Fried ray strips (The Virginia Marine Products Board)

Save the bay, eat a ray http://www.ifood.tv/print/231031

ifood.tv

Published on ifood.tv (http://www.ifood.tv)
Home > Blogs > pepperdiarios's blog > Save the bay, eat a ray

Save the bay, eat a ray
By pepperdiarios
Created 4 Nov 2010 - 12:35pm

Do you love your oysters, scallops and clams? Want to do your bit towards balancing the environment? Here is your chance to contribute! Save the bay, eat a ray! Read on to know more.

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From the Editor | Wide Angle | Photography | Pop Omnivore

With a three-foot wingspan, an adult Rhinoptera bonasus *can weigh 40 pounds.*

Cownose rays swarm the Chesapeake Bay each summer, taxing an already fragile ecosystem by gobbling shellfish and roiling grass beds. Shaped like kites, they taste like tuna—a meaty mouthfeel packed with lean protein. Now area officials see a potential win-win: Whet human appetites with a tasteful name ("Chesapeake ray") and rebalance the bay.

Rays aren't invasive newcomers here; in 1608 one stung explorer John Smith. But as predators like coastal sharks have declined, the observed spike in cownoses, though untallied, could be grounds for a carefully monitored fishery—and new revenue streams for watermen, retailers, and localities. Call it the new calamari?

Eat a Ray, Save the Bay?
Posted Jan 5 2011

Going green with Chesapeake Ray, the 'next calamari'

Posted by **Linda Busche** on March 18, 2011 10:28 AM

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Save the bay, eat a ray

By pepperdiaries

Created 4 Nov 2010 - 12:35pm

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The executive director of the Virginia Marine Products Board, Mike Hutt has been working hard to familiarise people with the Chesapeake ray, spread awareness on the danger the ray poses to the smaller sea species and encouraging people in eating a ray to save the bay and including these rays in their regular diet. The ray tastes a little different than its white-fleshed cousin, the skate."It's not flaky, and it has a texture and tastes closer to veal or beef," says Mike Hutt.

AmericanRenaissance.com
There is not a truth existing which I fear or would wish unknown to the whole world. — *Thomas Jefferson*

10 Invasive Species That Cost the U.S. a Bundle

More news stories on Miscellaneous

Bruce Watson, Daily Finance, August 25, 2010

Anyone who has ever watched an episode of Animal Planet knows that ecosystems are fragile, relying on the delicate balance of species and resources. But what is less-known is the high economic cost when that balance is upset by animals that are alien to an area.

Some animals and insects—including killer bees, Asian carp and Asian mongooses—are introduced by humans to correct an imbalance, but end up posing an unforeseen threat to other species. In some cases, species that were once endangered grow out of control due to the efforts of concerned scientists and environmentalists to protect them. Caught between the danger of doing too much or too little, only one thing is certain: when it comes to the environment, each option carries a high price.

Here are 10 animals that, for one reason or another, have overpopulated their environment, threatening other species, resources and, ultimately, themselves.

Canada Geese

It's hard to believe, but a little over 100 years ago, over-hunting drove Canada geese close to extinction. New York State officials decided that the birds needed help if they were to survive and, from 1958 to 1963, wildlife experts released scores of geese into the state's forests. Before long huge flocks were settling throughout the state.

Today, officials face the opposite problem: There are more than 200,000 geese in New York, and they have begun endangering public health by soiling parks and lakes, stripping farmers' fields and getting in the way of airplanes. According to one report, over the last ten years, they have struck 78 planes in the area, costing $2.2 million in aircraft damage and killing at least 24. In fact, 2009's "Miracle on the Hudson" plane crash was caused by Canada geese.

Cownose Ray

{snip}

{snip} The huge ray population—which has expanded because of the overfishing of coastal sharks—keeps gobbling up the thousands of farmed oysters that wildlife officials have farmed throughout the [Chesapeake] Bay. So here's a quick recap: too few sharks = too many rays = too few oysters = stingray fricasee. Bon appetit!

Asian Carp

In the Great Lakes, fishing is big business: a $7.5 billion industry, it supports an estimated 800,000 jobs. Unfortunately, the lakes—the world's largest freshwater ecosystem—are extremely fragile, and are under attack by a number of invasive species. Already harassed by zebra mussels and sea lampreys, fishermen in the area are frightened by another potential threat: Asian carp. Imported by catfish farmers in the 1970's to skim algae from aquaculture ponds, the fish escaped from their original home and migrated throughout the Mississippi River, massively depleting plankton and pushing out other species.

{snip}

Coyotes

Unlike most invasive species, coyotes are native to North America, with a natural habitat that extends from Alaska to Central America over terrain ranging from mountains to plains to—these days—cities (in one notable case, a coyote even staked out a Chicago Quiznos).

{snip} A 2004 survey by the National Agricultural Statistics Service (summarized in this livestock report) found that coyotes were responsible for killing an estimated 135,600 sheep and lambs worth $10.7 million. The extensive cost to agriculture has led government officials to spend millions every year poisoning, trapping and shooting an estimated 90,000 coyotes.

Pythons

It was bad enough when Floridians just had to worry about Burmese pythons: the Everglades are infested with an estimated 100,000 of the gargantuan snakes, many of which are descended from abandoned pets. Recently, however, African rock pythons—an even larger, more aggressive python species—have been found in the swamp, and experts worry that the new snakes might be interbreeding with the Burmese pythons, yielding what some officials have referred to as a "super snake." Thus far, the pythons have largely stayed in the Florida swamps, but experts warn that the new hybrid could be very adaptable, potentially spreading as far north as Virginia and all the way to California. Along the way, the snakes —which are capable of eating goats and crocodiles—could eventually pose a major threat to children, pets and livestock.

Wild. Available.
Day boat harvested.

Chesapeake Ray (Rhinoptera bonasus) is a delicious, mild tasting fish caught in the United States along Virginia's Eastern Shore, the Chesapeake Bay and its many tributaries. Ray is a tender, red meat fish offering a "meaty bite".

Captain John Smith dined on ray in 1608. Today, chefs are excited about adding a new fish to the menu and their customers rave about the taste.

For more information contact:
Virginia Marine Products Board, 554 Denbigh Boulevard, Suite B, Newport News, Virginia 23608
Telephone: 757-874-3474, Fax: 757-886-0671, Website: www.virginiaseafood.org

Can Your

Menu

Use Something

Special?

Wild

Day Boat Harvested

Available

Chesapeake Ray

A delicious, mild tasting fish caught Along Virginia's Eastern Shore, The Chesapeake Bay, and its many tributaries
A fish for meat eaters.

A tender, red meat fish with a "meaty bite" and the dining excitement of Wild Game

Customers are raving about the taste!

Chefs are raving about the versatility!

This fish is recipe friendly.

Chesapeake Ray

adapts to most culinary applications.

Broil it, Sauté it

Grill or Pan Sear it,

Pan Fry, Braise, Stew,

or

Fry it

Wild. Available.
Day boat harvested.

Chesapeake Ray (Rhinoptera bonasus) is a delicious, mild tasting fish caught in the United States along Virginia's Eastern Shore, the Chesapeake Bay and its many tributaries. Ray is a tender, red meat fish offering a "meaty bite".

Captain John Smith dined on ray in 1608. Today, chefs are excited about adding a new fish to the menu and their customers rave about the taste.

Ray Fillet

- Resembles tuna with a rich red coloration like No. 1 tuna and has a beef or veal flavor.
- An average fillet is 2 lbs.
- Skinless fillets are packed fresh daily.
- Harvest season – late May until late September.

Fresh Fillet

- Packaged in poly bags in 10 pound increments, chilled to 32°F, surrounded by ice for a long shelf life.

IQF frozen Fillet

- Packed in 15 lb. seafood freezer boxes with each fillet separated by freezer paper, for easy access to individual fillets.
- Available year round

Harvesting

- Ray are harvested by day boats using pound or gill nets.

Preparation

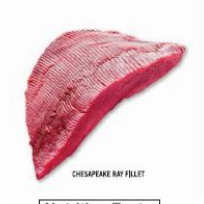
- Chesapeake Ray can be sautéed, grilled, fried, pan seared, steamed or broiled.
- Ray fillet accepts all marinades and sauces.
- Ray should be cooked over high heat for a short duration of time, approximately three minutes on each side to medium well.
- To enhance the tenderness, ray fillets should be cut on a bias or against the grain.

Serving Suggestions

- Serve as you would veal or beef.
- Can be used as an appetizer or entree; or in a sandwich, wrap or soup.
- Delicious when marinated or served with sauces.
- Can also be grounded for stuffing or meat sauces.

For more information contact:
Virginia Marine Products Board, 554 Denbigh Boulevard, Suite B, Newport News, Virginia 23608
Telephone: 757-874-3474, Fax: 757-886-0671, Website: www.virginiaseafood.org

Product Image & Nutrition Facts



CHESAPEAKE RAY FILLET

Nutrition Facts
Serving size 4 oz (112 g)
Servings per container to be specified

Amount Per Serving	
Calories 100	Calories from fat 0
	%Daily Value*
Total Fat 0 g	0 %
Saturated Fat 0 g	0 %
Trans Fat 0 g	
Cholesterol 120 mg	40 %
Sodium 105 mg	4 %
Total Carbohydrate 2 g	1 %
Dietary Fiber 0 g	0 %
Sugars 0 g	
Protein 22 g	
Vitamin A 0 % • Vitamin C 0%	
Calcium 0 % • Iron 10%	

* Percent Daily Values are based on a 2,000 Calorie diet. Your daily values may be higher or lower depending on your Calorie needs.

	Calories:	2,000	2,500
Total Fat	Less than	65g	80g
Sat Fat	Less than	20g	25g
Cholesterol	Less than	300mg	300mg
Sodium	Less than	2,400mg	2,400mg
Total Carbohydrate	Less than	300g	375g
Dietary Fiber	Less than	25g	30g

Package Information

CHESAPEAKE RAY SHIPPING CARTON

CHESAPEAKE RAY FILLET, PACKAGED IN SHATTER PACK STYLE BOX FOR EASY FILLET ACCESS.

Product Image

CHESAPEAKE RAY WING

Package Information

CHESAPEAKE RAY SHIPPING CARTON

Nutrition Facts

Nutrition Facts
Serving size 4 oz (112 g)
Servings per container to be specified

Amount Per Serving	
Calories 100	Calories from fat 0
	%Daily Value*
Total Fat 0 g	0 %
Saturated Fat 0 g	0 %
Trans Fat 0 g	
Cholesterol 120 mg	40 %
Sodium 105 mg	4 %
Total Carbohydrate 2 g	1 %
Dietary Fiber 0 g	0 %
Sugars 0 g	
Protein 22 g	
Vitamin A 0 % • Vitamin C 0%	
Calcium 0 % • Iron 10%	

* Percent Daily Values are based on a 2,000 Calorie diet. Your daily values may be higher or lower depending on your Calorie needs.

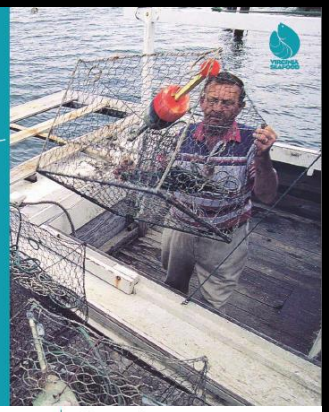
	Calories:	2,000	2,500
Total Fat	Less than	65g	80g
Sat Fat	Less than	20g	25g
Cholesterol	Less than	300mg	300mg
Sodium	Less than	2,400mg	2,400mg
Total Carbohydrate	Less than	300g	375g
Dietary Fiber	Less than	25g	30g

Chesapeake Ray
Bait & Chum

Fresh, frozen Chesapeake Ray (Rhinoptera bonasus) is available year-round from your top quality bait supplier.

Chesapeake Ray is harvested by day boats using pound and gill nets.

Ray is cut fresh then blast frozen, producing quality bait that holds up for a long period of time.



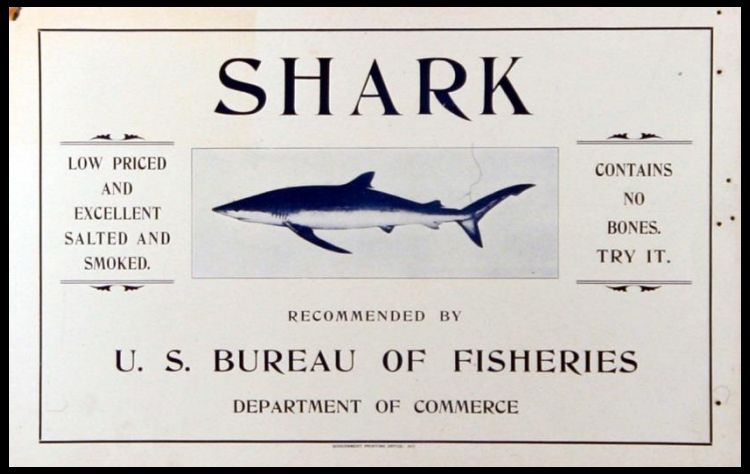
Product Information

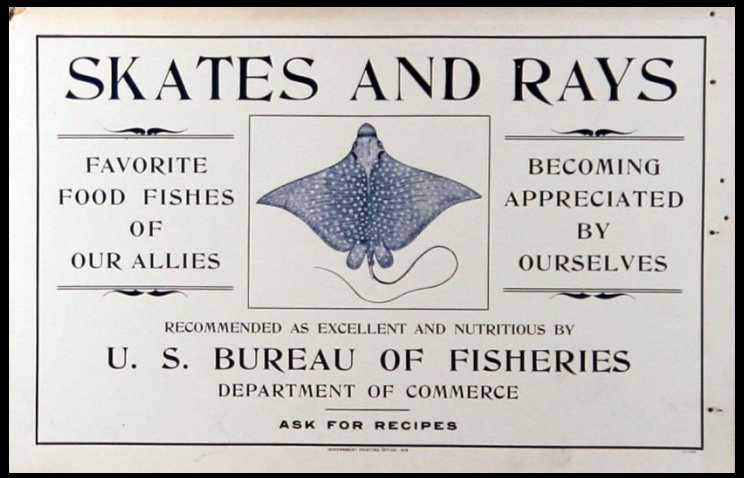
CHESAPEAKE RAY BAIT IN CUSTOM CUT TO THE SIZE NEEDED.

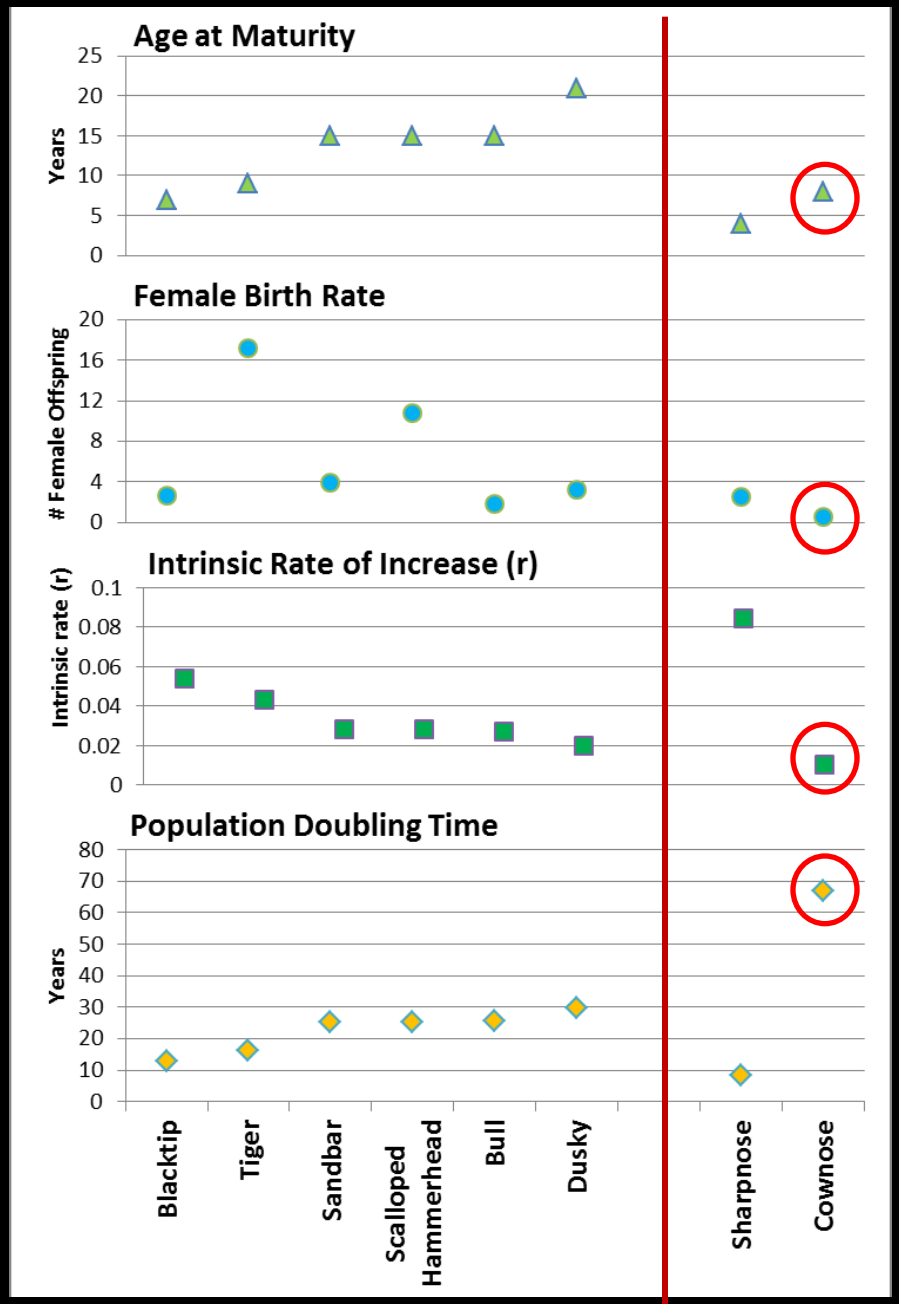
Package Information

CHESAPEAKE RAY BAIT SHIPPING CARTON

www.virginiaseafood.org/chesray/



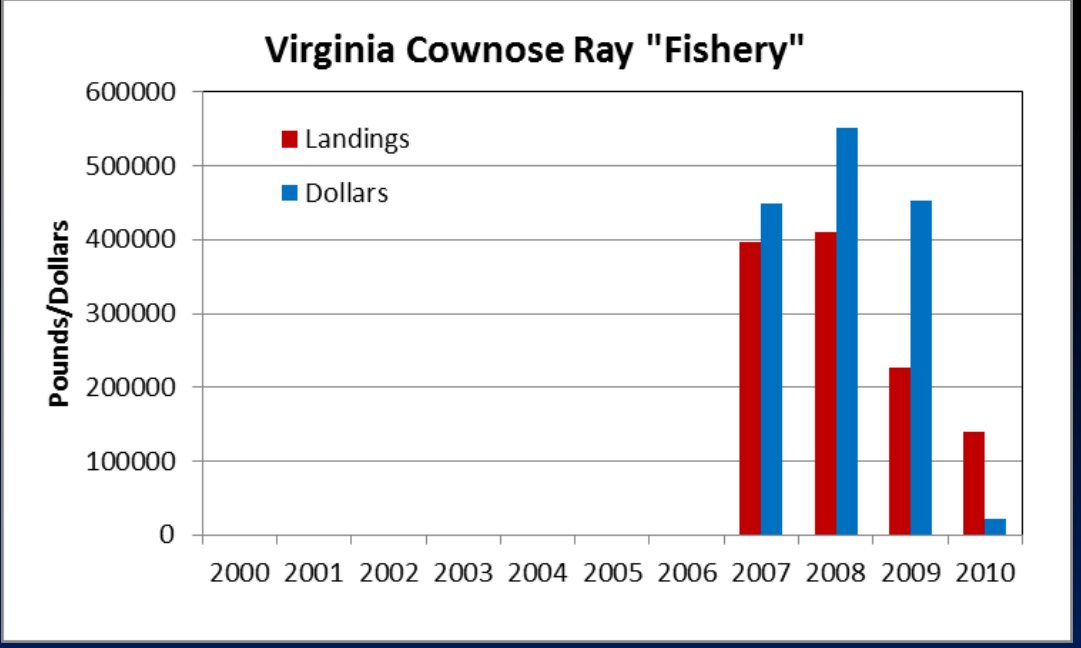




Smith et al. 1998: Sharks
Grubbs et al. in prep: Cownose

Predators

Prey



Does not include commercial discards or recreational mortality (e.g. ray derbies)

2008 = 186 MT

Perspective: 188 MT = Current Federal quota for all large coastal sharks (excluding sandbar sharks) harvested in U.S. Atlantic waters combined

Data from Virginia Marine Resources Commission's commercial landings bulletins
http://www.mrc.state.va.us/landings_bulletins.shtm

RESOLUTION REGARDING ATLANTIC COWNOSE RAYS

American Elasmobranch Society
July 2010
Providence, Rhode Island

WHEREAS the fishing industry along the East Coast, particularly in Virginia and Maryland, is aggressively promoting targeted fishing, new markets, and eradication programs for cownose rays *(Rhinoptera bonasus)* through state governments, seafood shows, the media, and their "eat a ray, save the bay" initiative (which suggests cownose ray consumption is good for the environment);

WHEREAS cownose rays are among the least fecund marine vertebrates, with females maturing around age eight and usually producing just one pup per year after an 11 month gestation period;

WHEREAS large scale removal of a similar South American species, *Rhinoptera brasiliensis,* led rapidly to population depletion followed by an IUCN categorization as *Endangered*;

WHEREAS there have been no assessments of East coast cownose ray population status or sustainable catch levels;

WHEREAS there are no limits on cownose ray fishing and no concrete plans for managing the fishery;

THEREFORE BE IT RESOLVED *that the American Elasmobranch Society urges Atlantic states where cownose rays are being landed, particularly Virginia and Maryland, to immediately impose precautionary cownose ray catch limits and initiate development of a population assessment and science-based interstate management plan, as a matter of priority.*

Acknowledgments

Frank Schwartz
(permission to use and discussions regarding UNC survey data)

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(cownose ray life tables)

Critical Review
Chip Cotton
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Joe Bizarro
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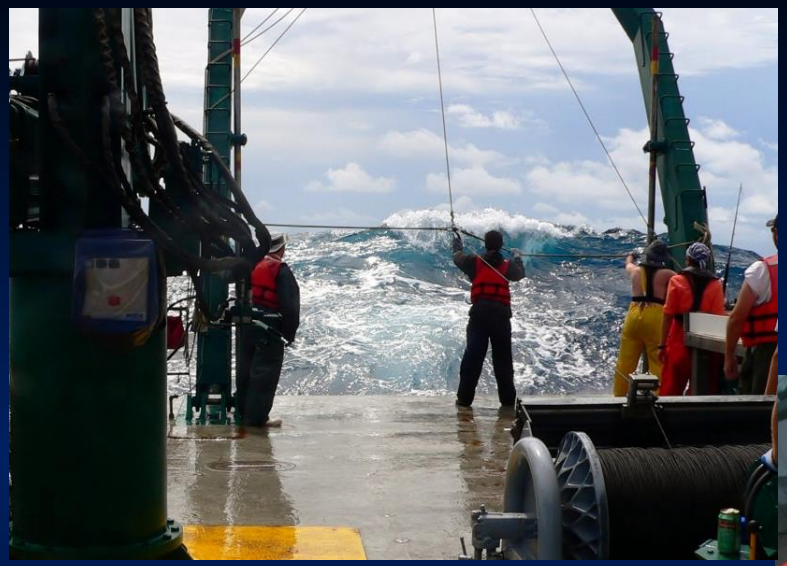
Todd Gedamke
Julie Neer



Team Cownose:
Matt Kolmann
Bob Fisher
Garrett Call

Conservation Guru
Sonja Fordham

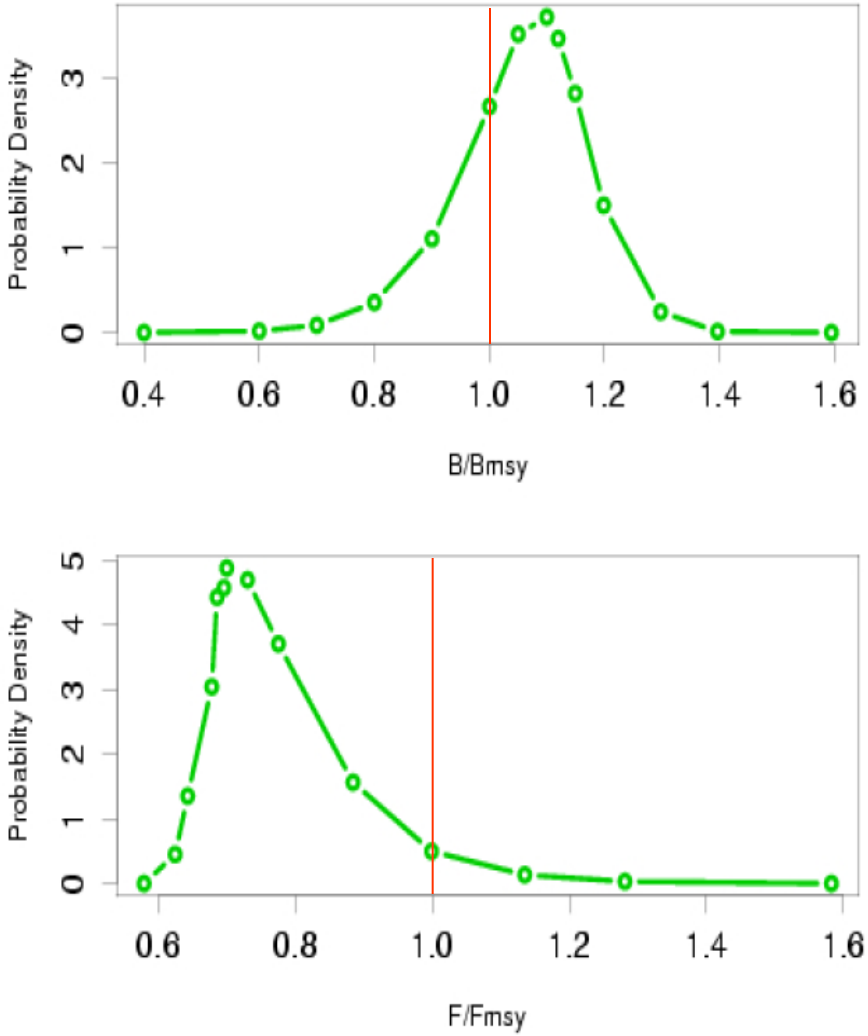


Figure 31.--Likelihood profile of B/B_{MSY} (upper panel) and minimal profile for F/F_{MSY} (lower panel) based on average conditions over years 1998 through 2001.

The trends in abundance in the production model and all alternate runs of the integrated model show the same pattern of decline in the 1980s followed by recovery to above the level at the start of the time series.

Would you eat a cownose ray? Virginia hopes so

The Chesapeake ray, also called the cownose ray, sucks clams and oysters from the bed of the Chesapeake Bay, crushes them with rock-hard plates that serve as teeth, swallows the meat and spits out the shells. This cownose ray at the Virginia Aquarium is feeding on an oyster. (2010 Virginia Institute of Marine Science)

View full-size photo | Buy Pilot photos

RELATED

- Help the Bay, eat a Chesapeake ray - Jul. 21

By Lorraine Eaton
The Virginian-Pilot
© July 21, 2010

For four years now, the state has worked to reduce the number of shellfish-eating rays in the Chesapeake Bay by adding a new predator to the waters - humans.

The state opened the waters to ray fishing and created a market for the winged creature's blood-colored flesh, which tastes more like veal or flank steak than seafood. It even changed the name from bullfish to the more palatable-sounding Chesapeake ray.

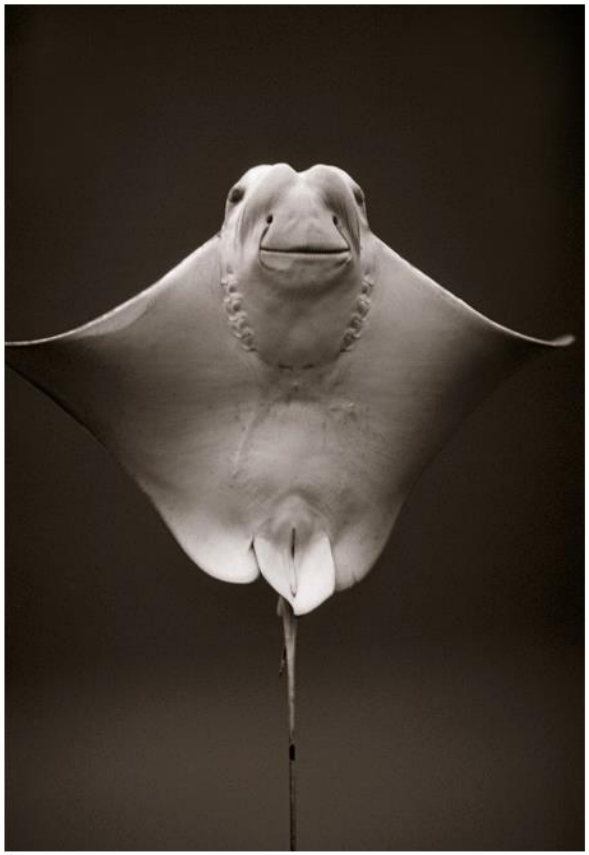
But, so far, few are biting.

"I have folks who buy it who are vegetarians because it tastes like red meat," said Chuck Macin, owner of Uncle Chuck's Seafood in Virginia Beach, but he says that if he had to depend on revenue from the sale of ray meat, he'd "starve to death."

For many fishermen, the Chesapeake ray is an odd-looking nuisance that packs a punch; a stinger

Eat a Ray, Save the Bay?

Posted Jan 5,2011



With a three-foot wingspan, an adult Rhinoptera bonasus *can weigh 40 pounds.*

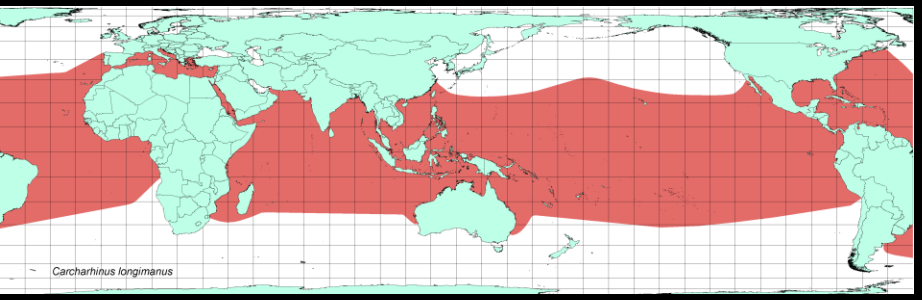
Cownose rays swarm the Chesapeake Bay each summer, taxing an already fragile ecosystem by gobbling shellfish and roiling grass beds. Shaped like kites, they taste like tuna—a meaty mouthfeel packed with lean protein. Now area officials see a potential win-win: Whet human appetites with a tasteful name ("Chesapeake ray") and rebalance the bay.

Rays aren't invasive newcomers here; in 1608 one stung explorer John Smith. But as predators like coastal sharks have declined, the observed spike in cownoses, though untallied, could be grounds for a carefully monitored fishery—and new revenue streams for watermen, retailers, and localities. Call it the new calamari?

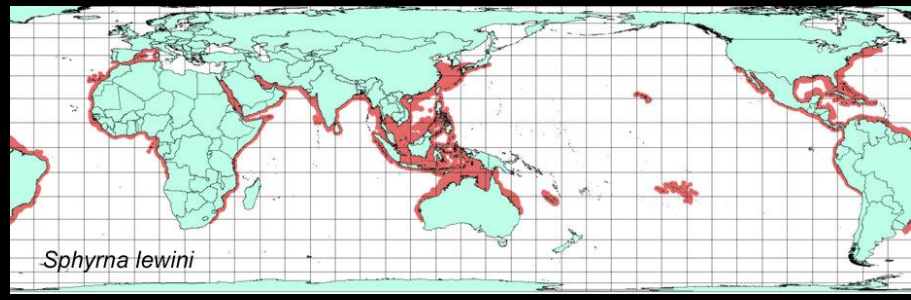
—Jeremy Berlin Photo: Henry Horenstein, Getty Images. NGM Maps

Distribution: Wide-ranging elasmobranchs have four primary patterns (Burgess and Musick 2005)

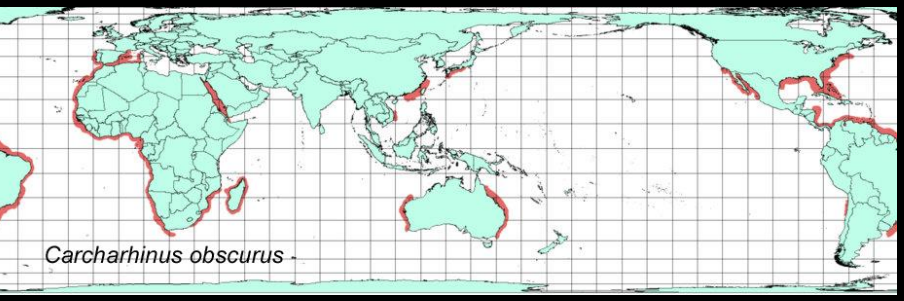
a) cosmopolitan pelagic species found in most oceans



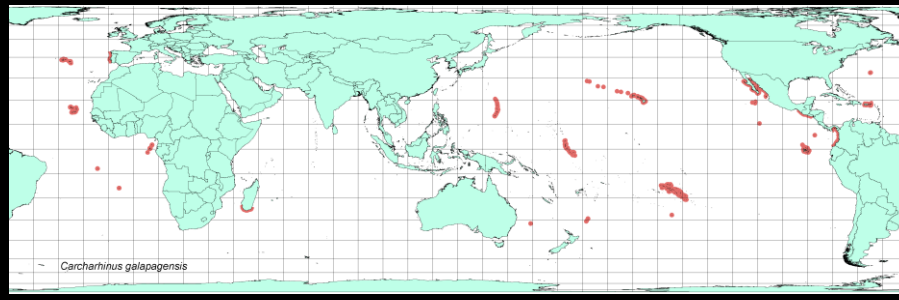
b) widespread cont shelf species with more or less continuous distribution



c) widespread cont shelf with discrete disjunctions b/w isolated or semi-isolated pops



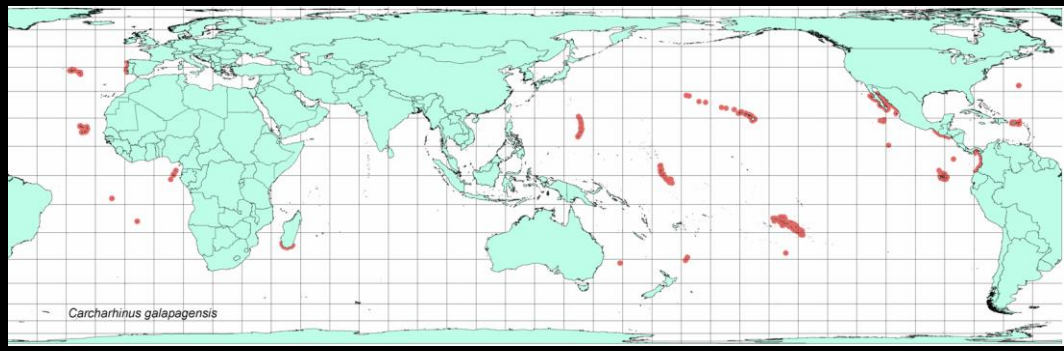
d) widespread tropical insular species discrete disjunctions b/w isolated or semi-isolated pops

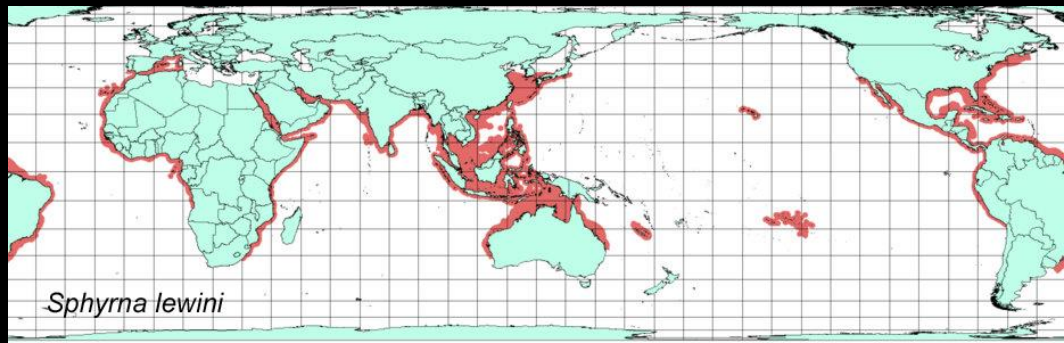


Maps from IUCN Shark Specialist Group (2008)

Wide-ranging elasmobranchs (Burgess and Musick 2005):

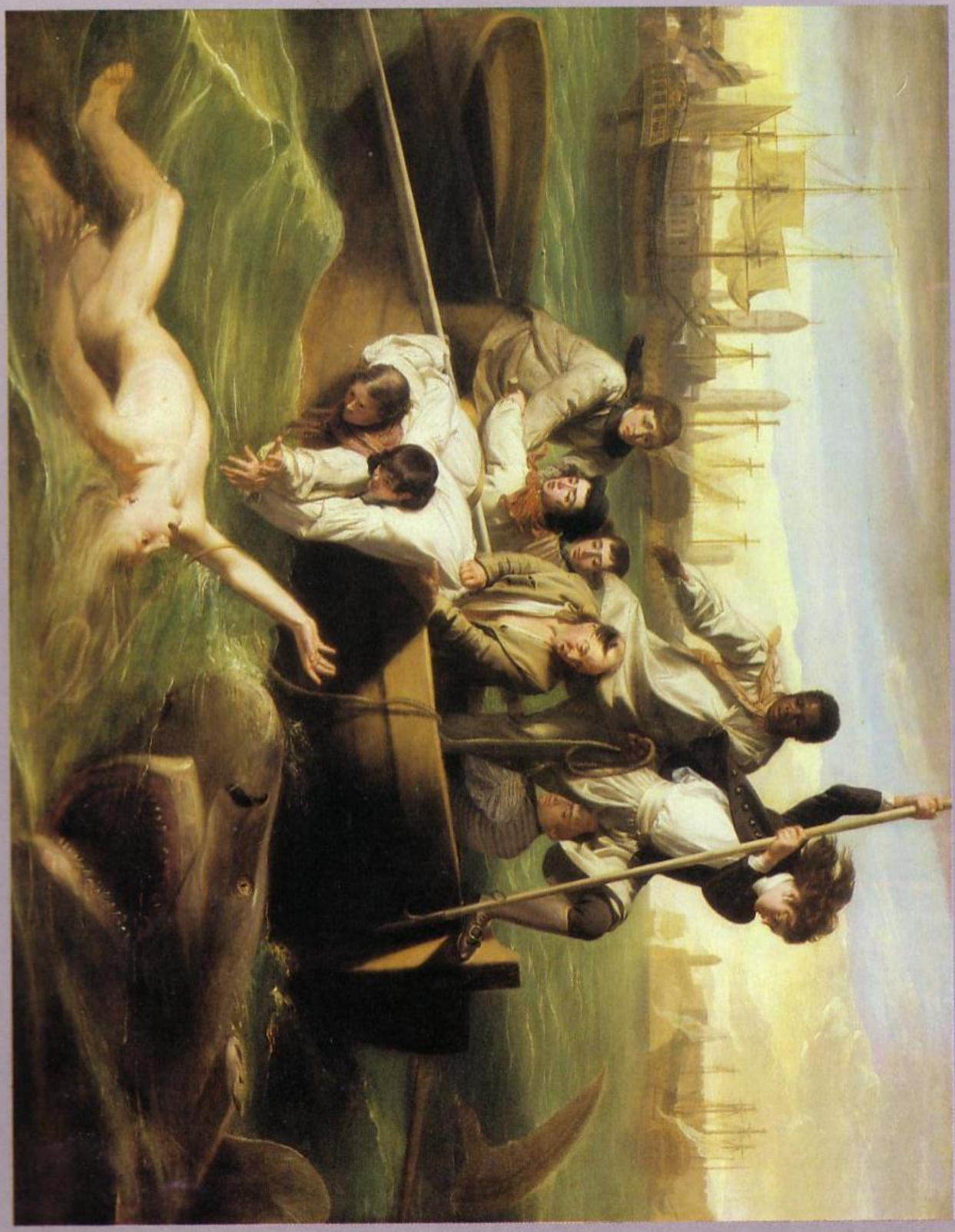
- That wide ranging species have allopatric or semi-isolated populations is of special concern when developing species-specific management and conservation strategies
- Biologically distinct populations deserve independent evaluations of conservation status
- Loss of populations could lead to loss of genetic diversity
- Progressive local extirpations could lead to global extinction





Mangel 2007. “Our separation of “basic” and “applied” science (and, too often, our denigration of the latter), lack of interest in science education (which means the public cannot make informed choices), polarization of the dialogue between science and religion (causing us to lose valuable allies), and crossing of the line between environmental science and environmentalism (in our passion for conservationist outcomes; Hilborn 2006) has come fully around to haunt us, so that in policy discussions science is now just another opinion of stakeholders.”

Watson and the Shark; John Singleton Copley; National Gallery of Art, Washington; Ferdinand Lammot Belin Fund



Other predators:

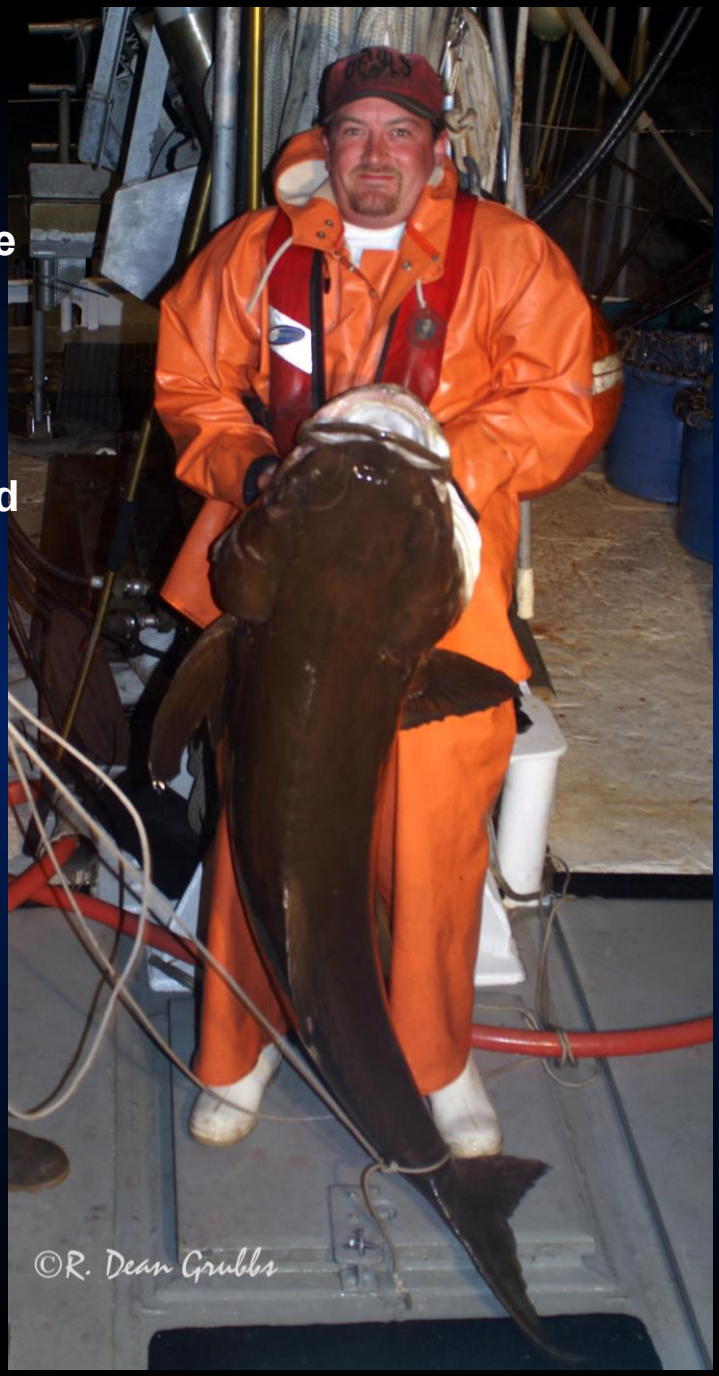
Skates:

Packer et al. 2003: Little skate "juveniles and adults are preyed upon by sharks, other skates (including winter skates), teleost fishes (including cod, goosefish, sea raven, longhorn sculpin, bluefish, summer flounder), gray seals, and rock crabs (*Cancer irroratus*) (McEachran *et al*. 1976; Reilly and Saila 1978; Scott and Scott 1988; Rountree 2001)."

Cownose rays:

In 9% of stomachs from cobia (*Rachycentron canadum)*

(Arendt et al. 2001)



Journal of Animal Ecology

British Ecological Society

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REVIEW

Cascading top-down effects of changing oceanic predator abundances

Julia K. Baum[1,2]* and Boris Worm[1]

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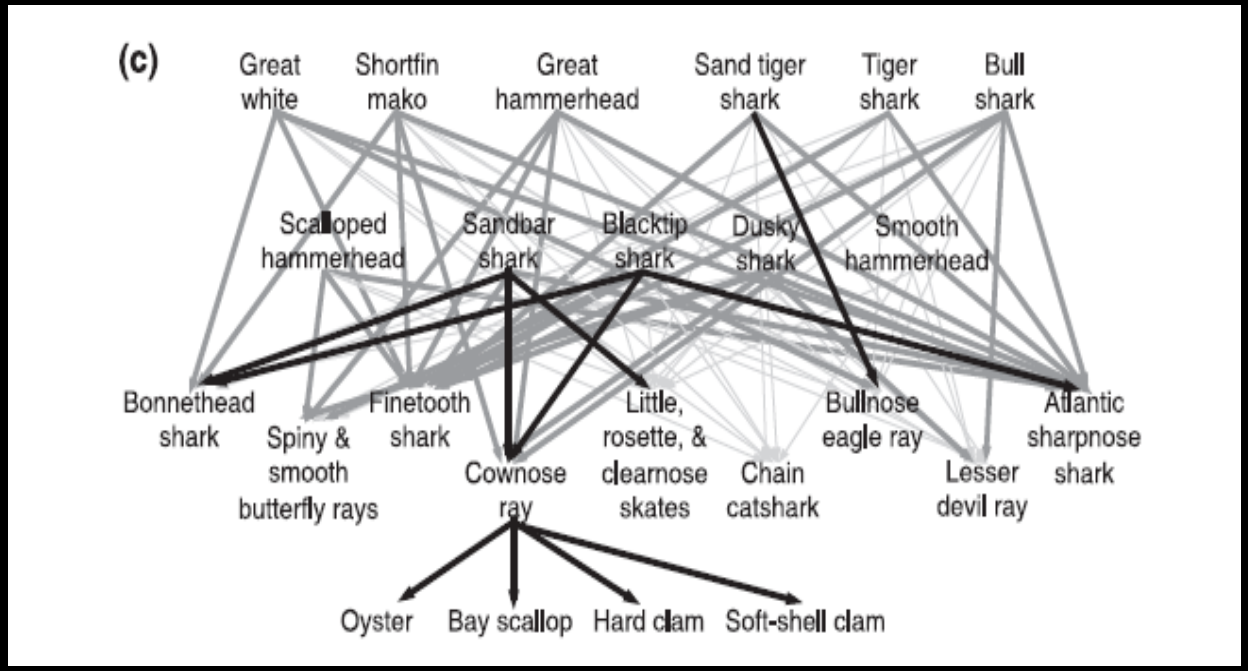


ISSUES:

1) a) Declines in large coastal sharks were exaggerated using inappropriate (pelagic longline logbooks) or spatially limited (North Carolina longline survey) data sets.

b) They ignored more robust analyses conducted in stock assessments that suggest, while there have been real declines, they are not as severe as presented.

c) Low sample sizes for some species: e.g. claimed 99% decline for bull shark based on N=23, tiger shark from N=39, and smooth hammerhead from N=5 over 35 years.

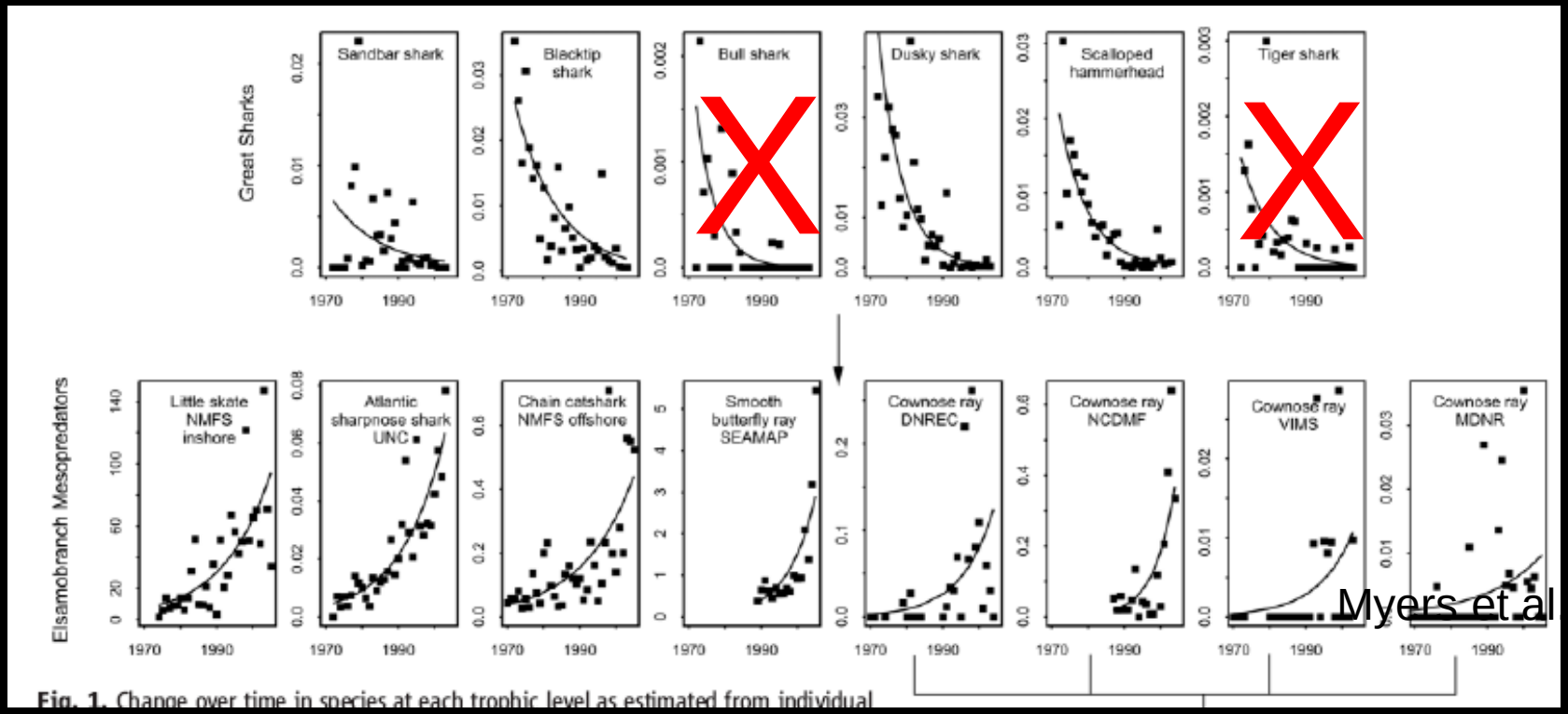


Fig. 1. Change over time in species at each trophic level as estimated from individual

ISSUES:

2) There is little evidence that the so-called meso-predators (small sharks, batoids) are major prey for any of the large sharks.

3) Some species implicated in the trophic cascade do not even co-occur.

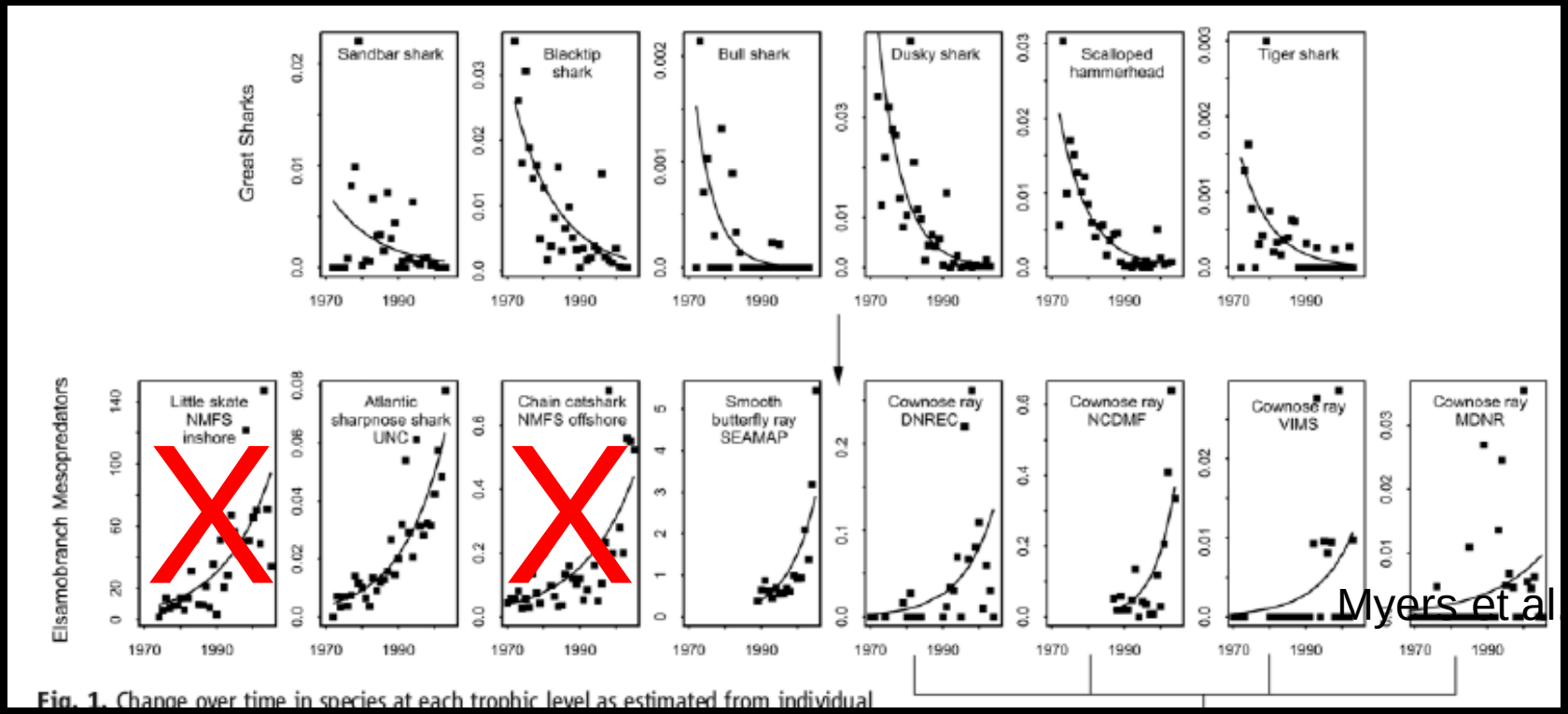


Fig. 1. Change over time in species at each trophic level as estimated from individual

ISSUES:

4) Inconsistent conclusions and contradictions.

The two most abundant sharks in the UNC survey have been Atlantic sharpnose and blacknose sharks. Myers et al. reported a drastic increase in sharpnose sharks and attributed this to predation release due to declines in large sharks.

They failed to report that they also found an equally drastic DECREASE in blacknose sharks. Blacknose and sharpnose have different patterns of habitat use. More parsimonious explanations for opposite abundance trends in two allopatric species are that either the population distribution has shifted or the habitat has changed.

Atlantic Sharpnose	UNC	1973	2003	31	2239	All	0.084****
Blacknose	UNC	1972	2003	32	1304	All	-0.090****

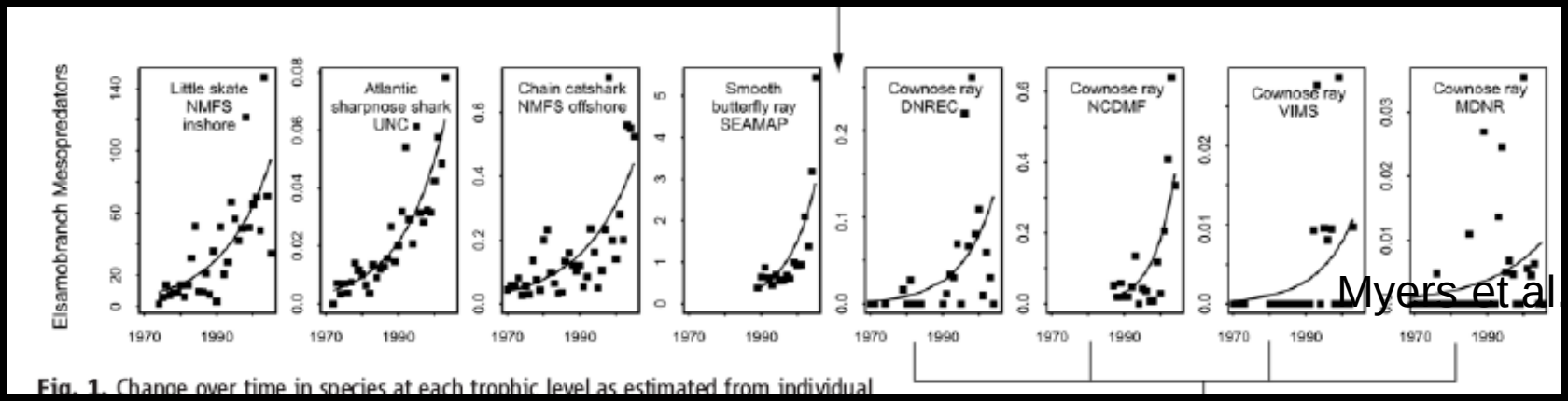


Fig. 1. Change over time in species at each trophic level as estimated from individual

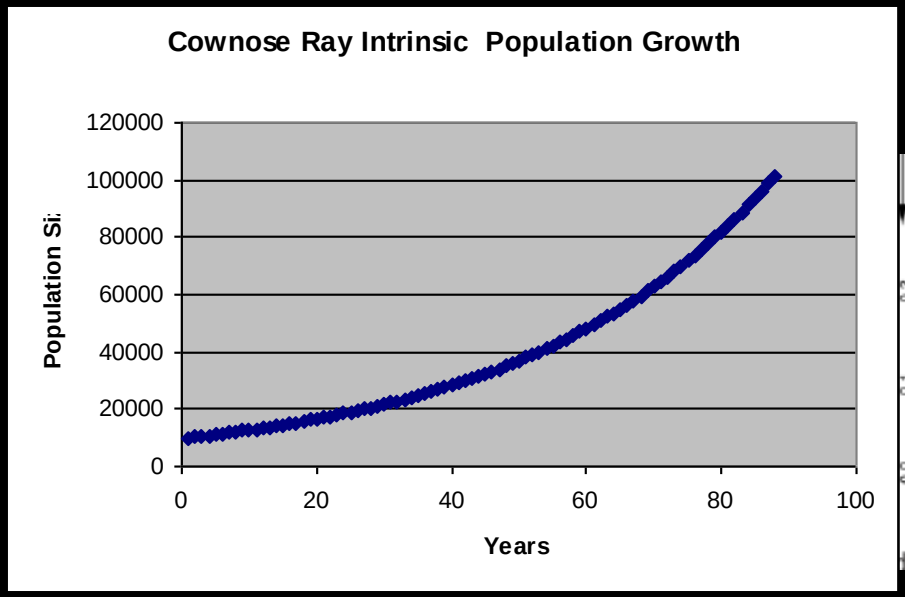
5) The Rhinoptera bonasus explosion.

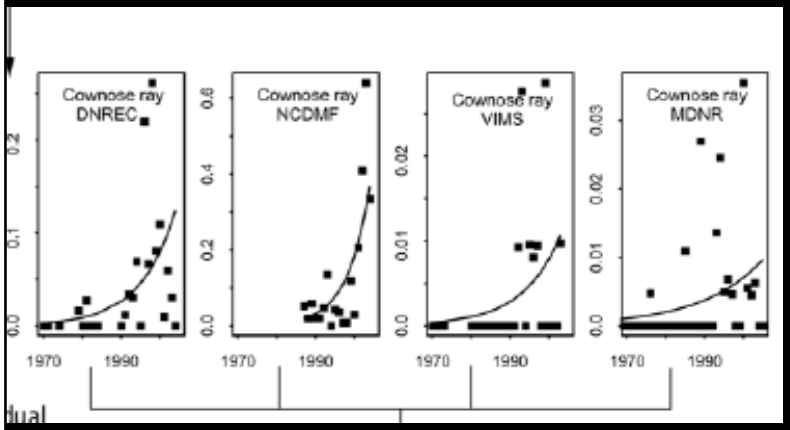
Cownose rays: 8 years to mature, 11-month gestation, produce a single pup

A ten-fold increase would require at least 70 years and they claim it happened in a decade by using inappropriate data sets.

Chose to show graphs of the 4 most drastic increases, all of which could be attributed to a shift in the population distribution rather than a population increase .

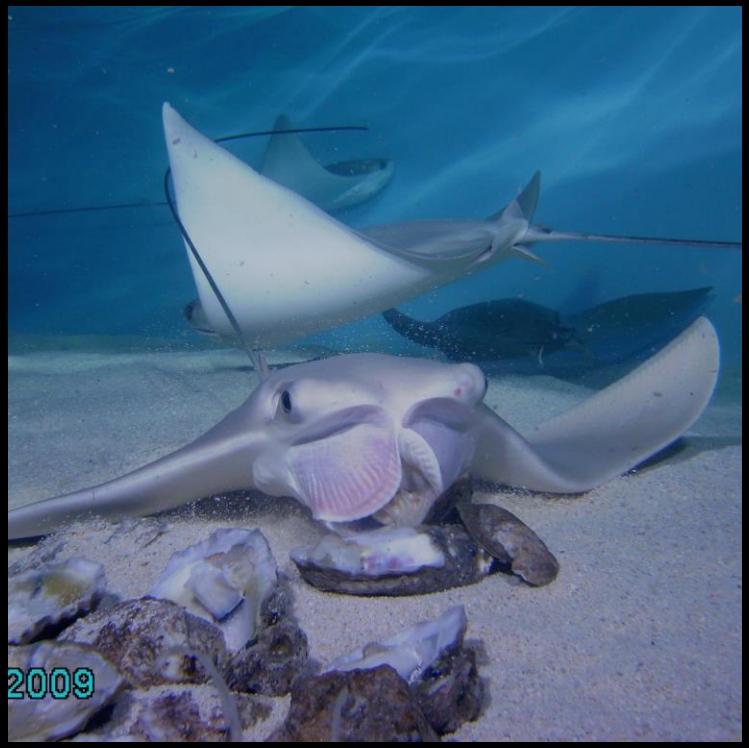
They also failed to point out that the peak relative abundance of cownose rays in 3 of these 4 surveys occurred around 2000 and have declined since.

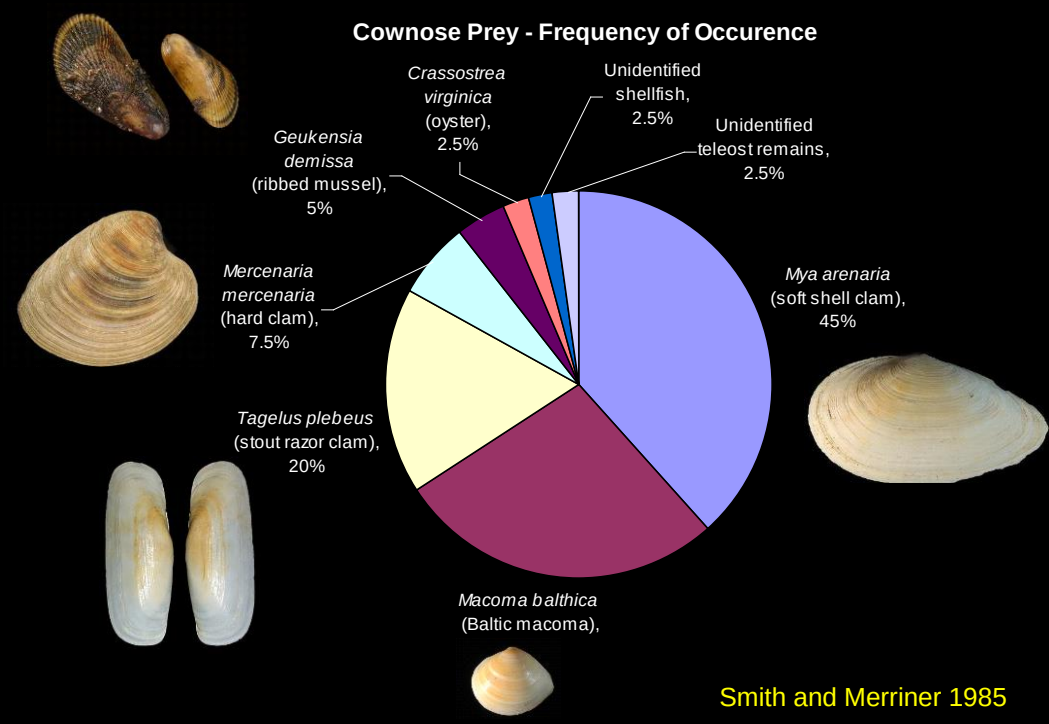




6) Cownose ray diet

Blaylock (1993) and Smith and Merriner (1985) are cited in support of the statement "Their diet consists largely of bay scallops (Argopecten irradians), soft-shell clams (Mya arenaria), hard clams (Mercenaria mercenaria), oysters (Crassostrea virginica), and several smaller, noncommercial bivalves?." This is a perversion of these studies. Blaylock only mentions that they feed on bivalves and Smith and Merriner indicated that oysters and hard clams were a very small portion of the diet. Scallops were completely absent. Soft-shell clams and small non-commercial clams were the major components of the diet. cause the declines.



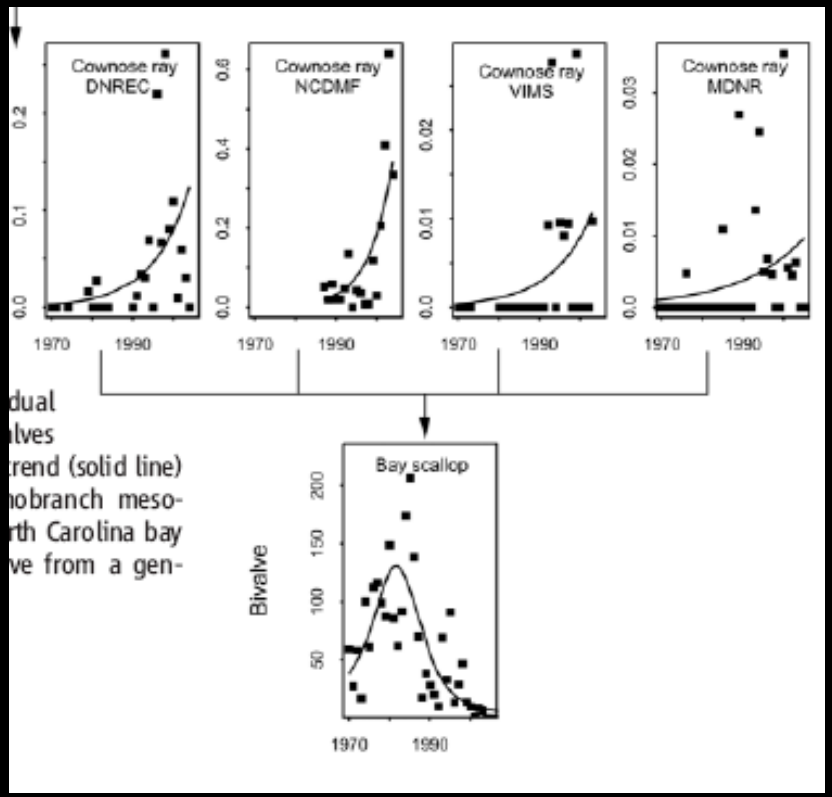


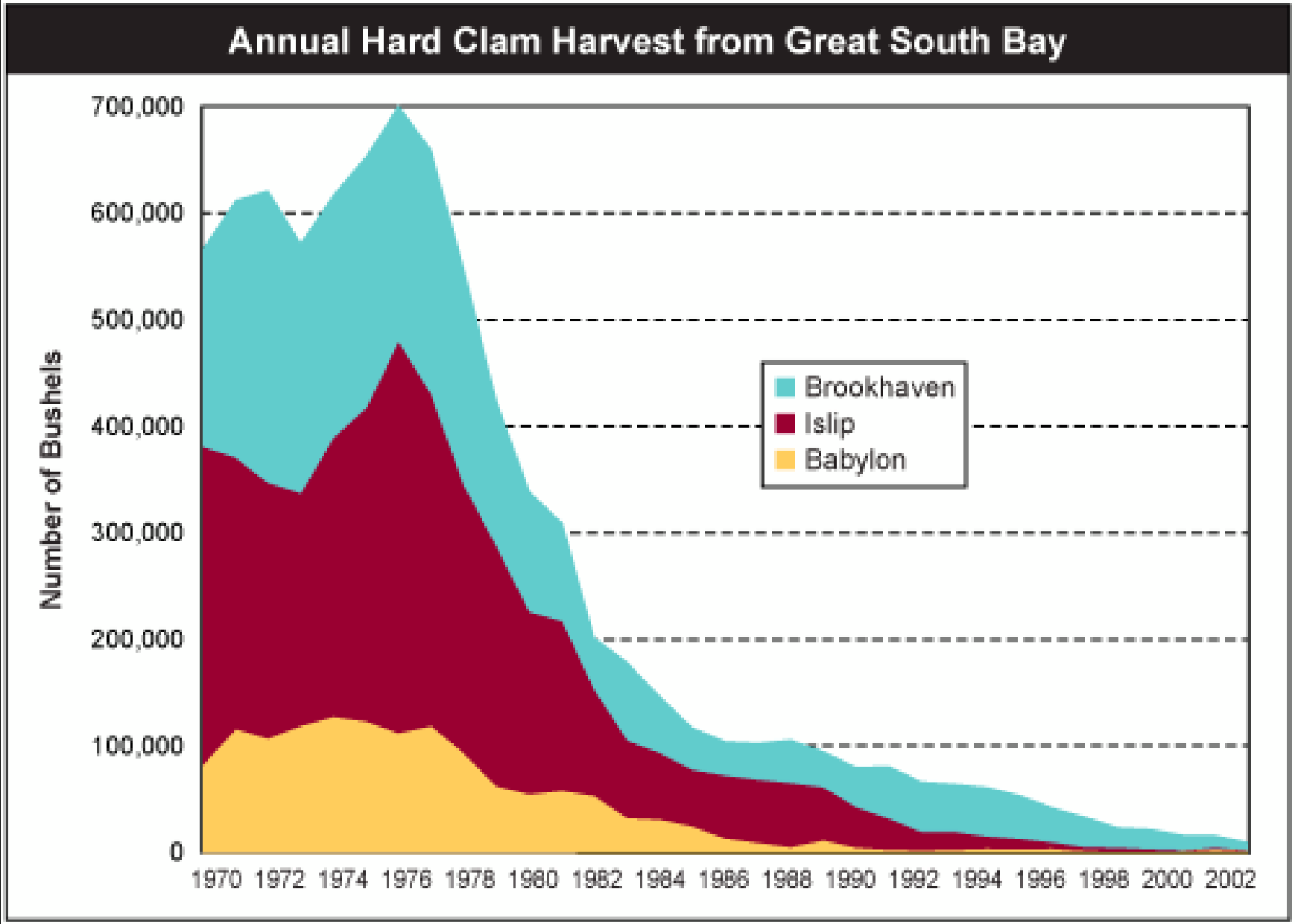
Smith and Merriner 1985

7) They did not consider alternative (more likely) explanations for bivalve declines - desease, overharvest, recruitment failure.

a) Amazingly, the editors and reviewers didn't recognize that the decline they showed in the bay scallop population occurred a decade prior to the purported increase in cownose rays.

b) According to the NC Bay Scallop FMP "In recent years, harvest has decreased to essentially no landings because of recruitment failure resulting from a red tide event in 1987, several hurricanes in the 1990's and cownose ray predation."





Source: NYS DEC