Return of the Marine Predators to California Waters

Ryan Freedman and Chris Lowe CINMS + CSULB





How do you feel about the state of the environment today?

The environment is good and improving
The environment is poor and improving
The environment is good and declining
The environment is poor and declining

Growing problems...



A community of seafood lovers



Taking too much...

- Over 100 years worth of declining marine stocks through early 1990s
- Hunted many marine mammals to near extinction
- Loss of marine predators from bycatch







Effects on Ocean Communities?

- All these impacts have taken their toll
- Predators are usually first impacted
- Cascading effects
- Food web out of whack



© 2007-2009 The University of Waikato | www.sciencelearn.org.nz

Shark Populations Have Taken a Hit Over 40 years of

pressure

- Overfishing
- Habitat loss
- Pollution
- Bycatch mortality
- displacement





Showing the Diversity of Sharks in the Classroom

SHARKS

http://www.nationalgeographic.com/ magazine/2016/06/shark-speciesfamily-tree-ocean-ecosystempredator/

Shark are easier to overfish

Many sharks are like us

- Long time to mature
- Slow growing
- Long lived
- Produce few, but large young

• Historically feared due to attacks on humans

- Bad reputation made them easier to harvest
- Fueled by Jaws



Differences in Reproduction







- 12-15 Months
- K selection

- Spawn Annually
- r selection

White sharks

\$16,500

Vulnerable to overfishing

- Life history traits
- High value of jaws, meat and fins

Caught as bycatch in fisheries

- Relatively low abundance
- High market value
- Protection
 - 1994 CA
 - 1997 U.S. Atlantic and Gulf of Mexico
 - 2004 CITES Appendix II
 - 2005 HMS Fishery Mgmt. Plan -All U.S. waters





4 Very Crucial Steps

- Some landmark legislation
 - Marine Mammal Protection Act (1973)
 - State ban on nearshore gillnets (1994)
 - Magnuson-Steven Act (1996)
 - CA Marine Life Protection Act (1999)



The Gillnet Story...

- Grew very rapidly in the late 70s
- Very effective, but quickly over capitalized
- Rapid reduction in target spp
- High bycatch (marine mammals, birds, other fishes)





Number of net sets



Recovery of bycatch species Especially predators!!!



- Other spp. caught in nearshore gillnets have shown similar increases (Pondella & Allen 2009)
 - Giant black seabass
 - Leopard shark
 - Soupfin shark (tope)

CA sea lion (Calif. & Baja)

Imbers

NOAA concludes population carrying capacity



Known adult seasonal aggregation sites

Farallon Islands Año Nuevo Island



Los Angeles

Guadalupe Island 🌘

Adult habitat and migrations







White shark nursery



White shark catch data sources 1936-2009; n=369

NOAA -DFG Gillnet logbooks

Sci. coll PacFIN MBA

- NOAA-DFG Gillnet logbooks
- DFG shark tagging program
- DFG game warden reports
- NOAA Observer program
- PacFIN
 - MBA Juv. white shark tagging Prog.
 - Scientific collections
 - Newspaper and scientific articles



Fishery reports 1936-2009; n=369



Captures by fishery type and age









Entangling Net Captures & Effort 1981-2012

-O- Offshore drift gillnets - swordfish, shark



Working with local commercial fishers





White Shark Captures (2006-2009)



YOY SPOT Detections (2006-2009)



Fisheries interactions

- Avg. 44±24% baby white sharks found dead in nets annually (2006-2012)
- 94% survival for live caught and released sharks!
- Shorter net soak times can further reduce mortalities





Why hang out along certain SoCal beaches?



Shark Tagging

Help from Claude Panis HB, Joe Bailey SB, and Terry Yamamoto LACo lifeguards

Seasonal migrations

Bring Data into The Classroom

http://www.gtopp.org

Autonomous shark tracking robots

 1st fully autonomous tracks of a tagged shark

Dr. Chris Clark – Harvey Mudd College Engineering/Computer Sci.

Sharing the waves

Return of the predators

- It's taken decades
- Better water quality, fisheries management has allowed for ecosystem recovery
- Predators return!
- "unintentional ecosystem management"

California's greatest conservation success story

Photo by Chuck Winkle

Do you feel that you hear about environmental success stories?

- Yes
- No

The Major Missing Habitat Piece

nedge b

1

Farallon Islands Año Nuevo Island

Los Angel

Guadalupe Island

Sharks' All You Can Eat Buffet

Why is it important to Know about Sharks at the Islands

- Indicate Healthy Ecosystem
- Maintain Balance in Ecosystem
- Increase Biodiversity
- Decrease disease prevalence

- The Northern Cl are critical habitat
 - Lots of food
 - High habitat diversity
 - Far from human
 Impact

Sharks in the Sanctuary

Aggregation of leopard sharks - Santa Cruz Island

Bring Data into The Classroom

SCATTN TRACKER DISCOVER ABOUT US Search... BLOG CONTACT http://www.scattn.org

The Channel Islands Array

Leopard Sharks Around CINMS

Barbara

• Mixed habitat use

Lompoc

- Possibly restricted by temperature
- Came up from San Diego

Soupfin Sharks Around CINMS

Barbara

• Mixed habitat use

Lompoc

- Maybe forage in different habitats
- Came up from San Diego

Guitarfish Around CINMS

Oxnard

Santa Barbara

40 Miles

• Remain along coast

Lompoc

- Facultatively use Estuaries
- Came up from San Diego

Seven Gill Sharks Around CINMS

Oxnard

Santa Barbara

- South side of the islands
- Closer to deep waters

Lompoc

• Came from SF Bay

White Sharks Around CINMS

Oxnard

Santa Barbara

• Ontogentic shift in habitat

Lompoc

- Juveniles along the coast
- Adults along the islands

Ν

Why Connectivity Is Important

- Connectivity boosts ecological function
- Connectivity is dependent on movements

While predator recovery is a good thing, there will be consequences...

We have to learn to share the waves!

