

Reducing bycatch of marine megafauna



S. Hoyt Peckham
Grupo Tortuguero de las
Californias
La Paz BCS, México

Threats to dugong

Habitat degradation (Modification/loss;
contamination)

Predation

Disease

Direct take (fishing/hunting/poaching)

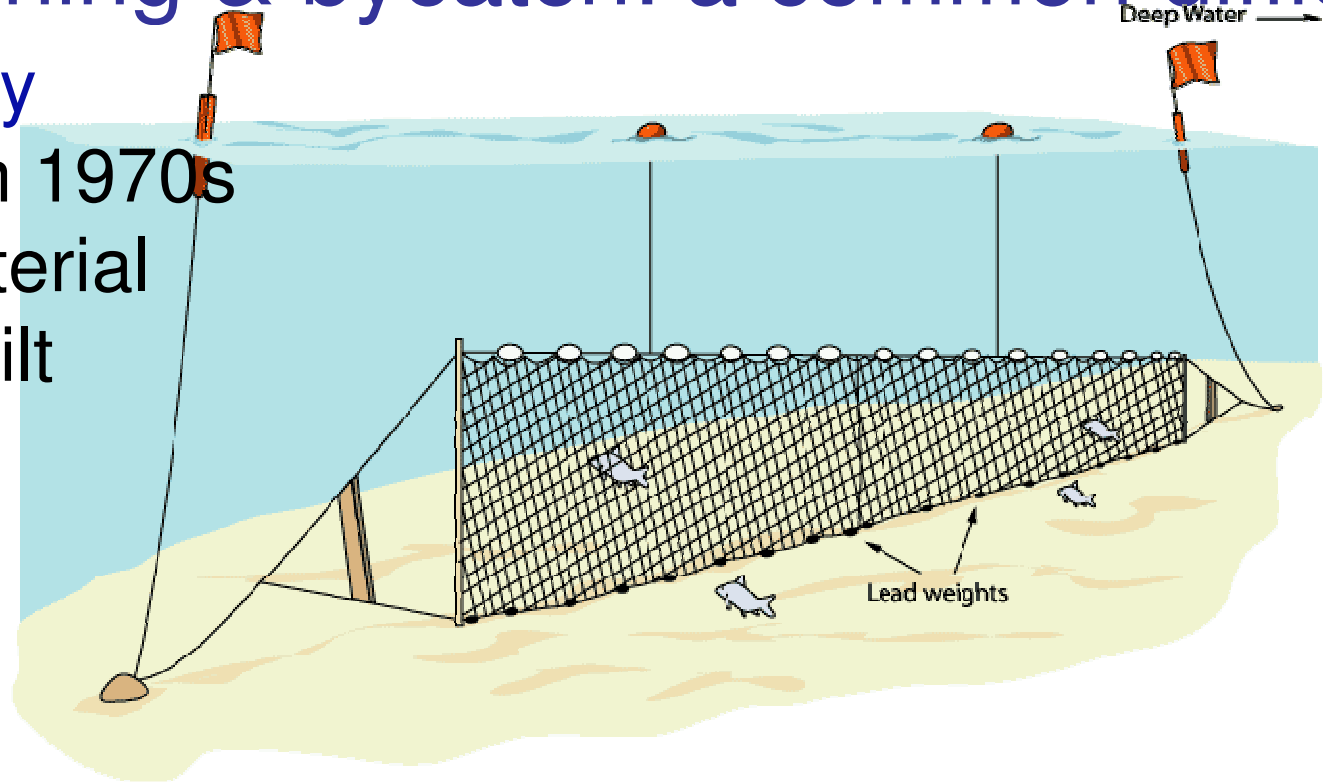
Indirect take (bycatch)

gravest threat: coastal gillnets (Marsh et al)

Gillnet overfishing & bycatch: a common difficult

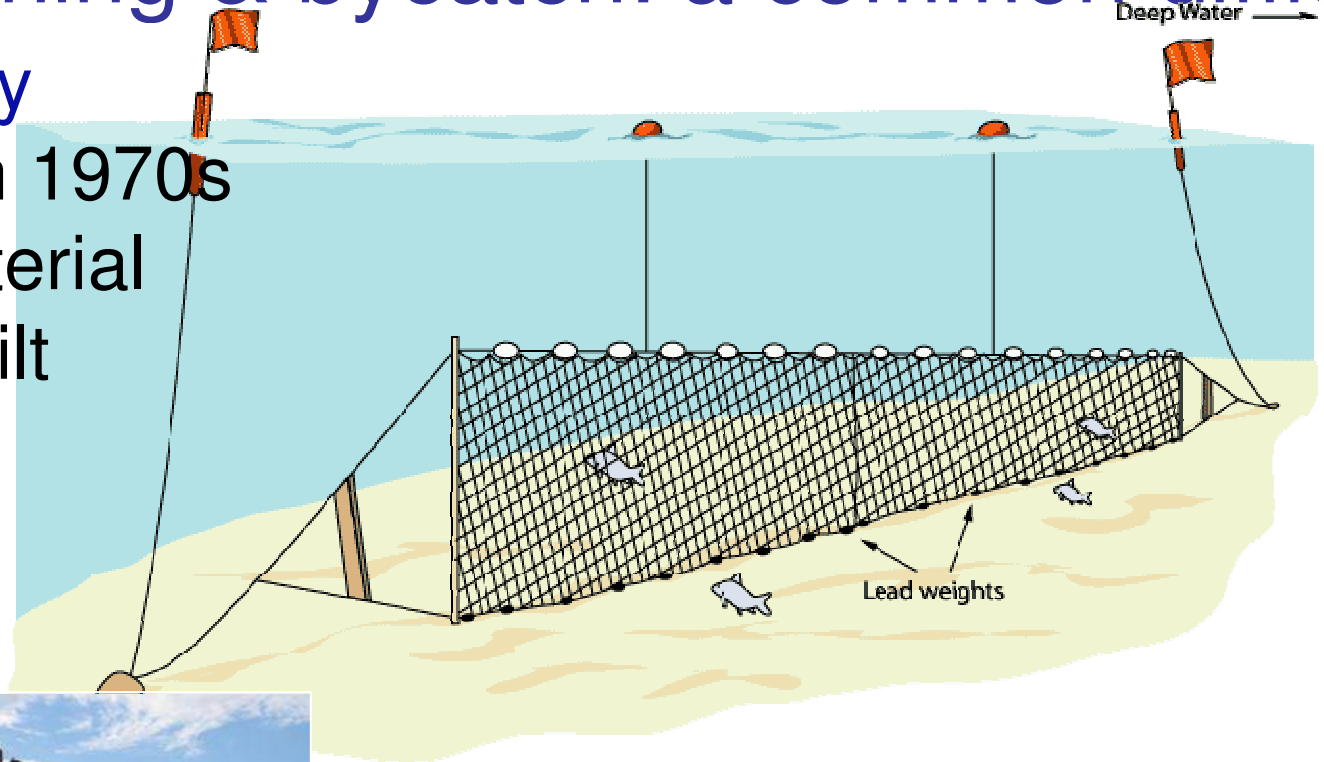
ubiquitous globally

- proliferated from 1970s
- inexpensive material
- easily woven/built



Gillnet overfishing & bycatch: a common difficult ubiquitous globally

- proliferated from 1970s
- inexpensive material
- easily woven/built



low profile, but big impacts

- high catch rates
- low selectivity/high bycatch
mammals, turtles, sharks, b
fish, inverts

Outline

- conceptual framework
- reducing catchability in gillnets
- conservation mosaic
- case 1: solutions from Mexico
- case 2: solutions from Japan



Conceptual framework for reducing fisheries impact

Behavioral Incentives

- Regulatory: input and output controls (effort, capacity, and catch)
- Economic: market-based mechanisms (J. Donlan)
- Social: outreach/education

Fishing interventions

- Availability of nets: spatial and temporal restrictions
(MSP and MPAs: A. Grech)
- Selectivity of nets: modification of gear & methods (catch to reduce dugong catch)

Increasing gillnet selectivity: how to catch fish, not dug

Extensive experimental research on turtles and cetaceans

Selective signaling: fish and megafauna see and hear differently (e.g. Gilman et al 2009, Read 2008)

- colored and/or illuminated nets deter turtles (Wang et al 2010)
- acoustic pingers deter porpoises (Kraus et al 1997)
- magnetic fields deter sharks (Wang et al 2010)

Behavioral cues: fish and megafauna respond differently

- shark scarecrows deter turtles, not fish (Wang et al 2010)

Increasing gillnet selectivity

Habitat use: megafauna use different microhabitats

- low profile nets: catch groundfish, not turtles (Salisbury et al 2005)
- surface lowpro nets: catch turtles where they can breathe

(Eckert et al 2008)

Scaling: megafauna are stronger and bigger

- smaller mesh: megafauna doesn't entangle
- weaker mesh: megafauna breaks free

Increasing gillnet selectivity

Dugongs

- Limited experimental research to date
See Appendix 7 (A. Grech)
- Opportunity for future research

Outline

- conceptual framework
- reducing catchability in gillnets
- conservation mosaic
- case 1: solutions from Mexico
- case 2: solutions from Japan



Context: under-regulated small-scale fisheries

- isolated villages and camps
- fisheries are major employer
- poverty
- drug abuse
- fishery organization weak
- wide range of fisheries
- stocks declining
- management & enforcement limited

In the absence of management resources,
conservation depends on local fishers



Loggerhead turtle

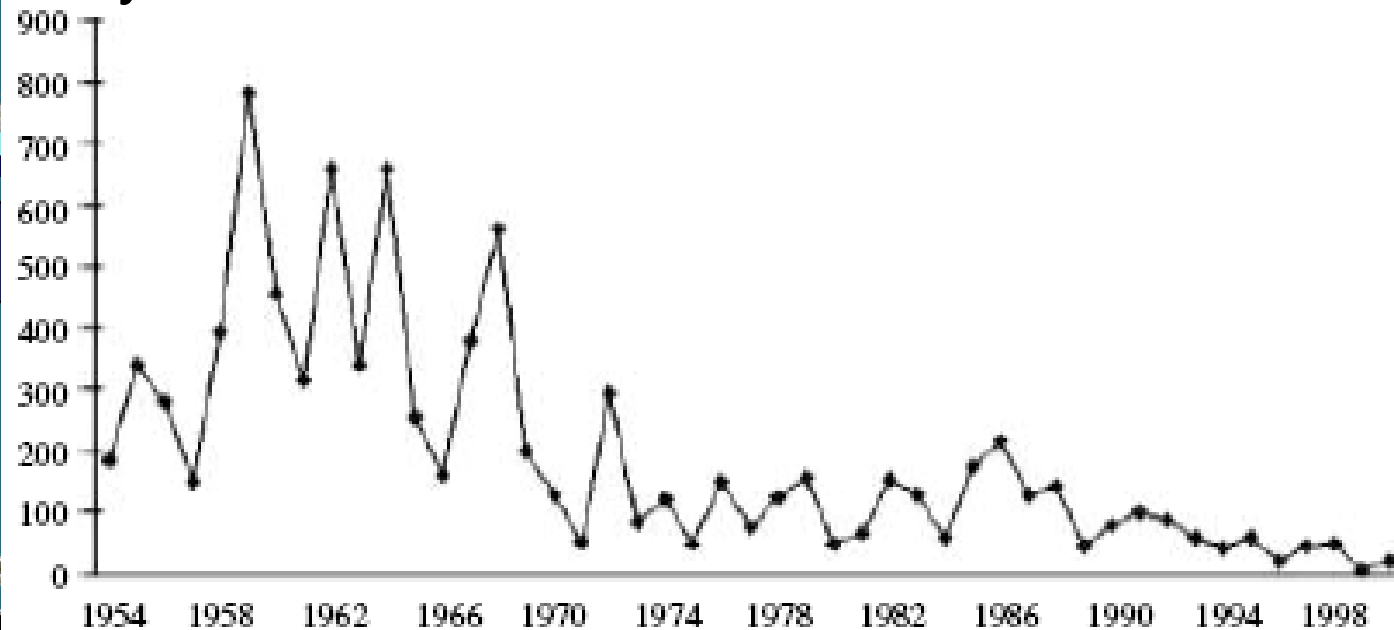
Live large: multiple habitats

Live slow: Critically endangered

~1500 nesters/year



Playa Kamouda



Kamezaki et al. 2003

Equator

Japan

Bycatch - local perception



*¿How can loggerheads be endangered?
I caught **forty** in my net just this morning...*

halibut gillnetter
Puerto Lopez Mateos, Agosto 2003

Proyecto Caguama (Operation Loggerhead)

Objective

- partner with fishers to reduce bycatch
- maintain fishing & community wellbeing

Goals

- raise awareness (enable to answer question themselves)
- assess bycatch with fishers
- partner to develop & implement solutions
- empower fishers to augment sustainability

Conservation Mosaic

Integrate bycatch awareness, research, adoption, and incentivization

Networks

Social Networking

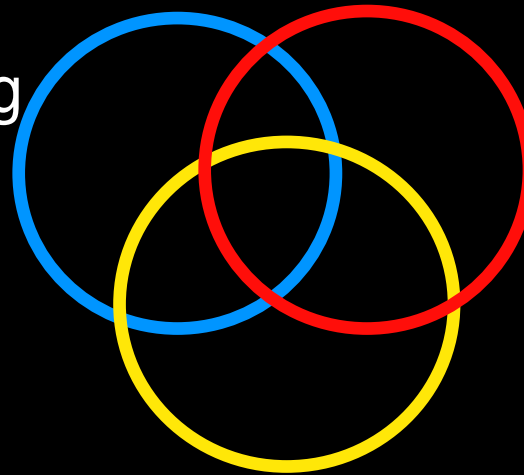
Barabasi 2002



Knowledge

Participatory research

Fortmann et al. 2008



Communication

Social Marketing

Mackenzie-Mohr 1999

Jacobson 1999

Nichols 2003; Peckham & Maldonado, In Press

ProCaguama 2010

aarón esliman (grupo tortuguero)

victor de la toba (grupo tortuguero)

vladimir de la toba (grupo tortuguero)

ruth ochoa d. (CICIMAR)

bertha montañó m. (CIBNOR)

eglé flores gonzález (U. Americas Puebla)

natalia rossi lafferriere (columbia u)

esteban delgado (U. Arizona)

david maldonado d. (ProCaguama)

cesareo castro (grupo tortuguero)

edgar caballero aspe (UABCS)

alejandro gaos (proCAREY)

mizuno kojiro (STA JAPON)

david ramirez delgado (IPN)

david soriano (IPN)

félix moncada (CIP)

maria wojakowski (duke)

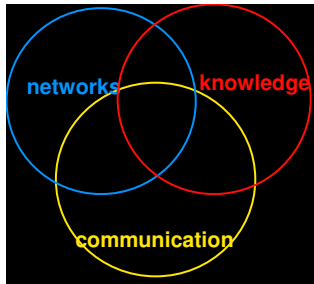
alonso aguirre (wildlife trust)

kama dean (propeninsula)

chris pesenti (propeninsula)

jesus lucero (GT&procaguama)



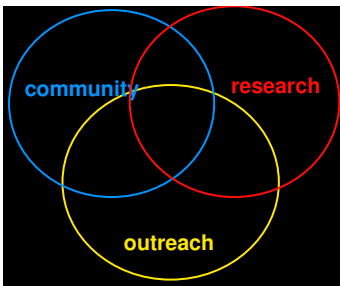


Networking

Bycatch workshops (expert consultations)

- engage highliners
- assess bycatch
- brainstorm solutions
- organize experiments



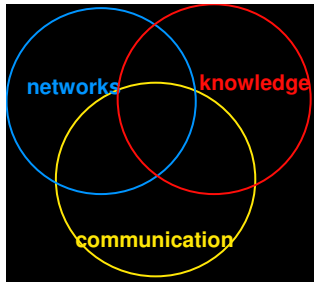


Networking

capacity building
& broadening perspectives

Local, regional, & intl meetings & exchanges
Leadership training
Internships & externships





Participatory research

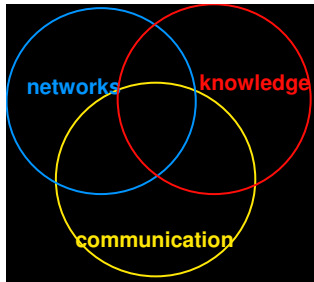
Assess bycatch

- observe rates
- extrapolate fleet-wide mortality

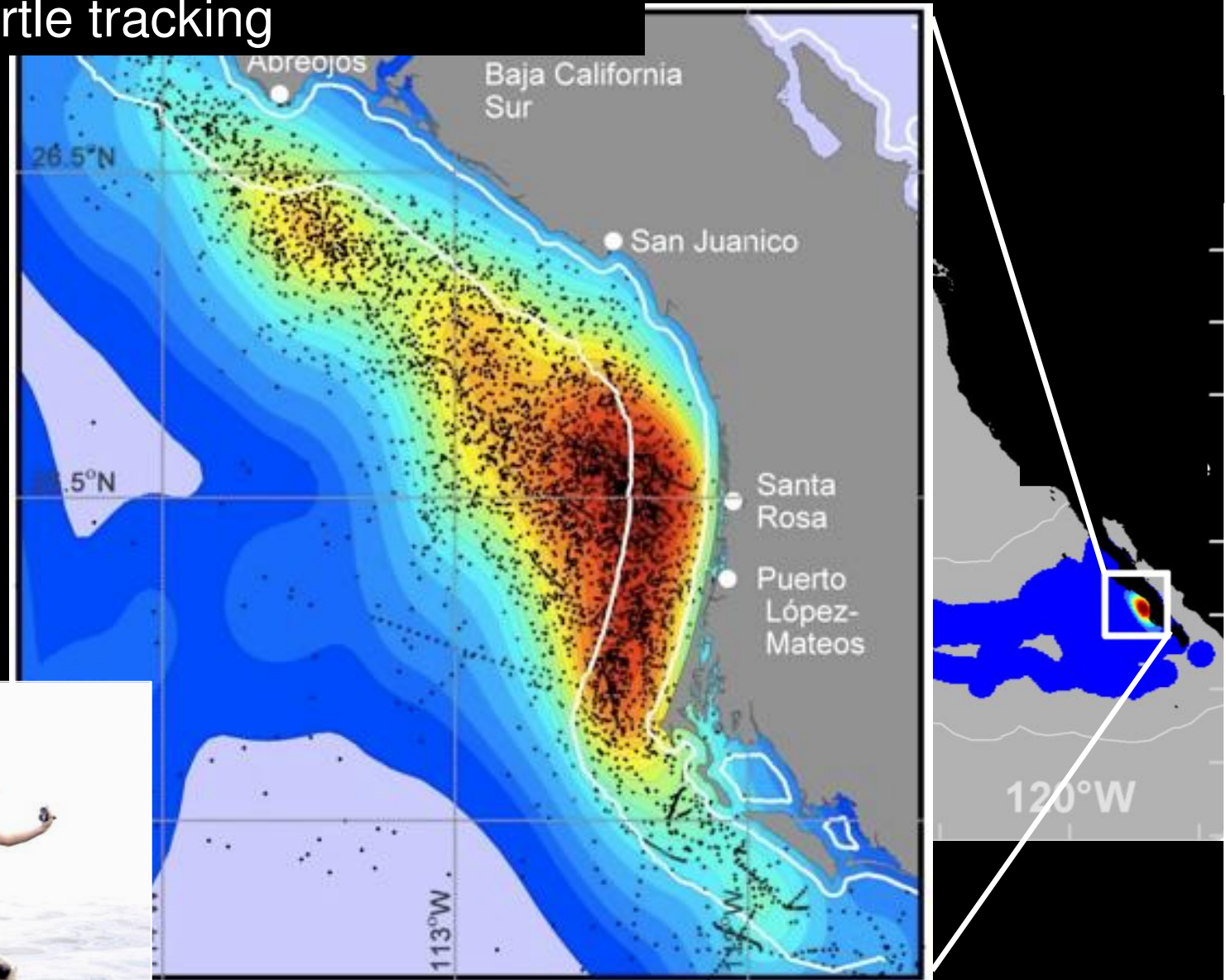
Regional ecology

- identify turtle hotspots
- track fish landings

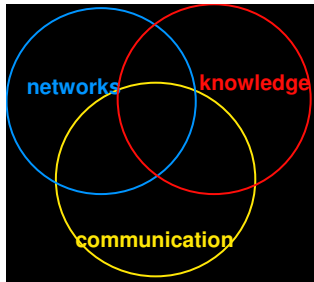




Participatory research turtle tracking



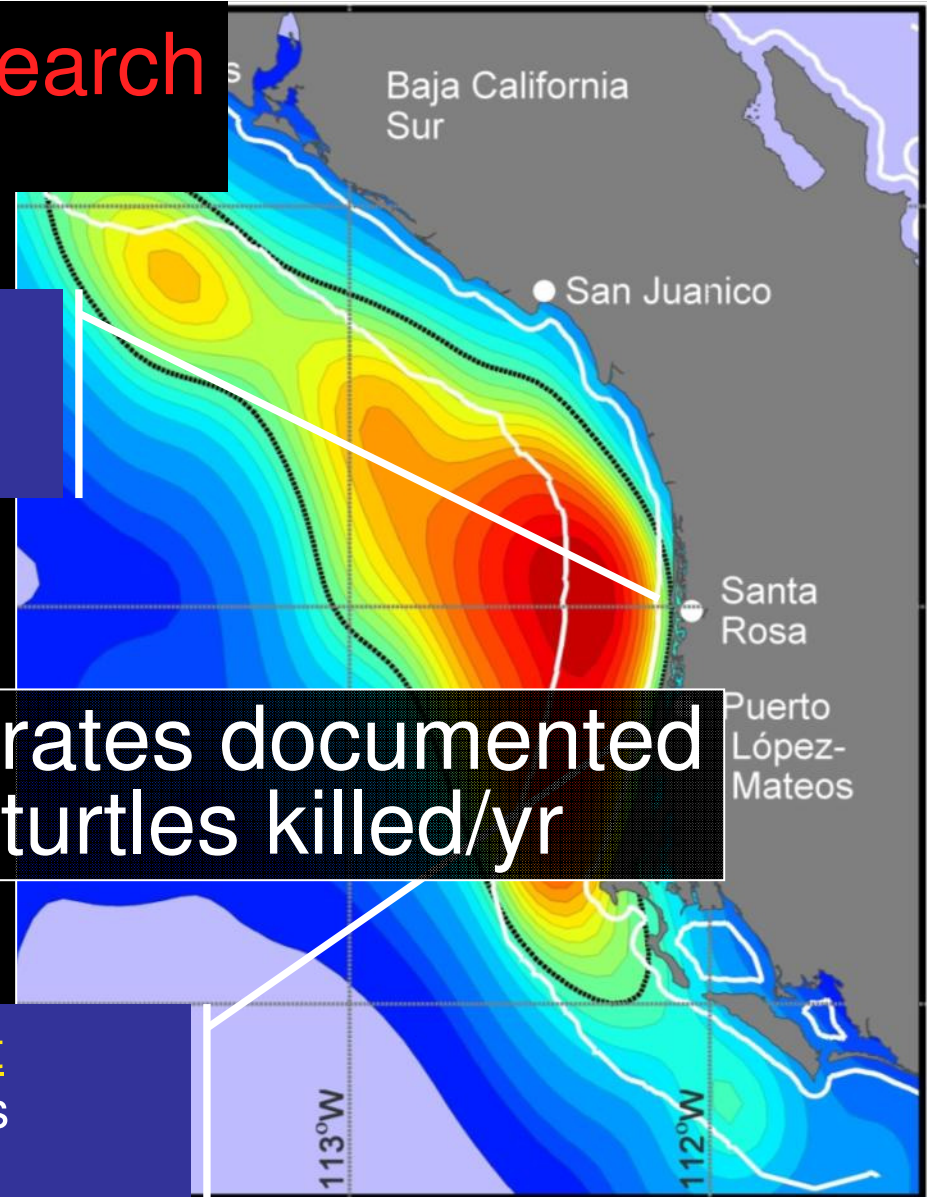
44 satellite tracks; 1996-2006 Peckham et al 2007a



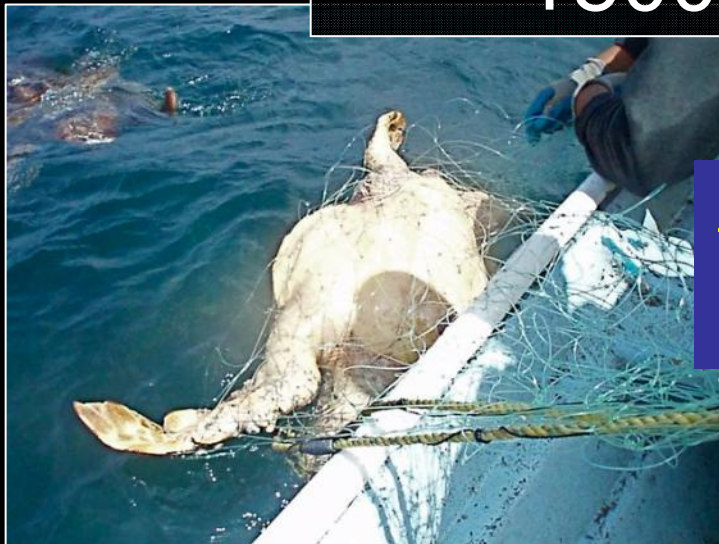
Participatory research bycatch assessment



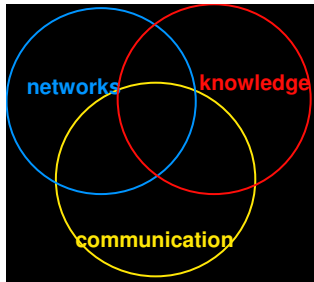
Longline fleet
5-8 boats
6.0
turtle/boat/day



highest bycatch rates documented
~1500-2950 turtles killed/yr



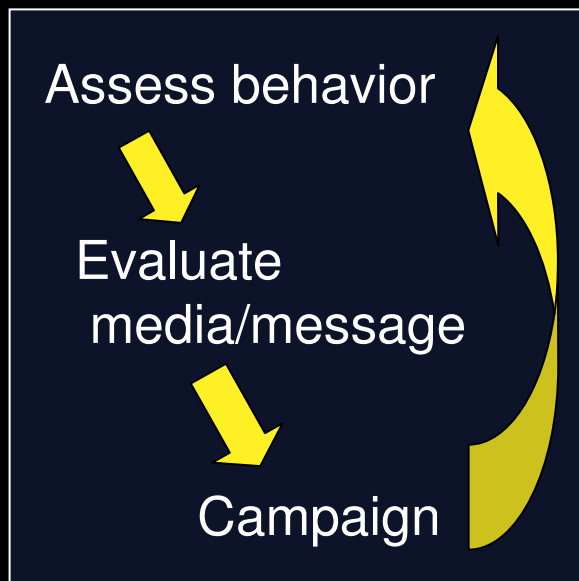
Gillnet fleet
12-50 skiffs
0.8
turtles/boat/day



Strategic Communication

locally resonant media

Social marketing



comic books



murals

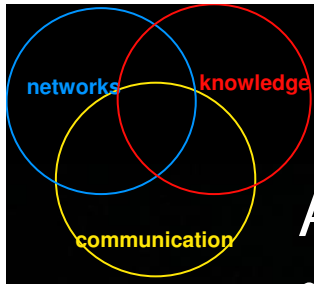
local & VHF radio



neighborhood film

positive messaging

*“the future of loggerheads lies
in your hands (BCS fishermen)”*



Strategic Communication

Annual Caguama Festival

- community organized
- regional phenomenon



Bycatch reduction trials

Participatory research Gillnet selectivity

Fisher workshops

¿How can we reduce gillnet bycatch and maintain fishing?



Rejected by fishermen

- decrease mesh size
- reduce soak time
- reduce net size

Tested

- net height (low profile)
- buoyless nets
- hook & line

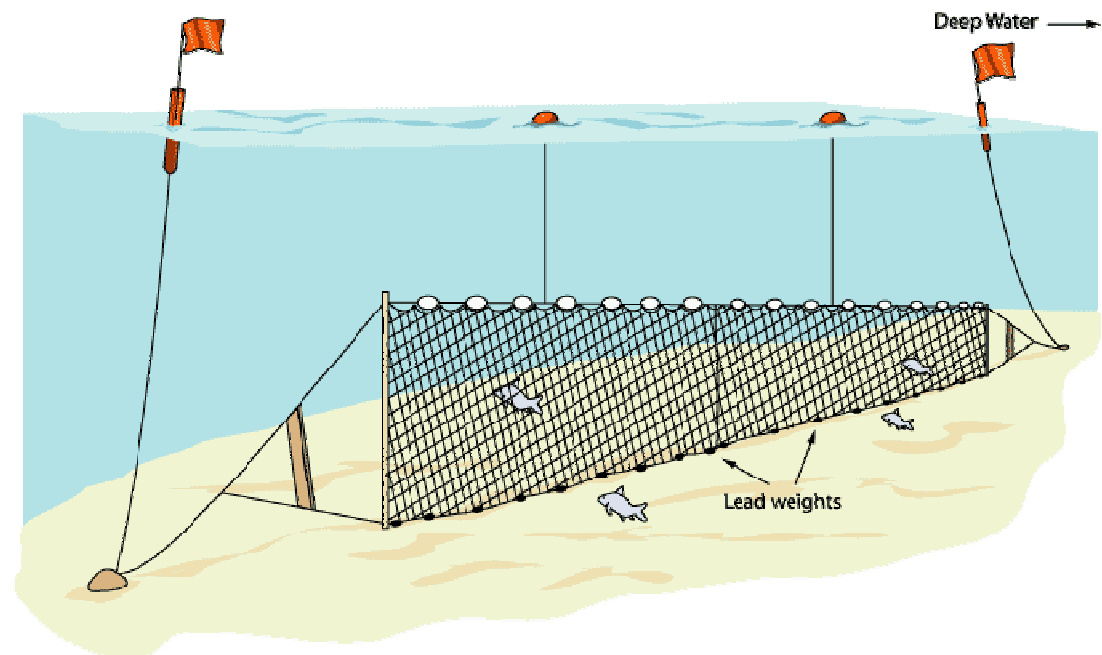
Buoyless nets 2007-9

Participatory research Gillnet selectivity

Design

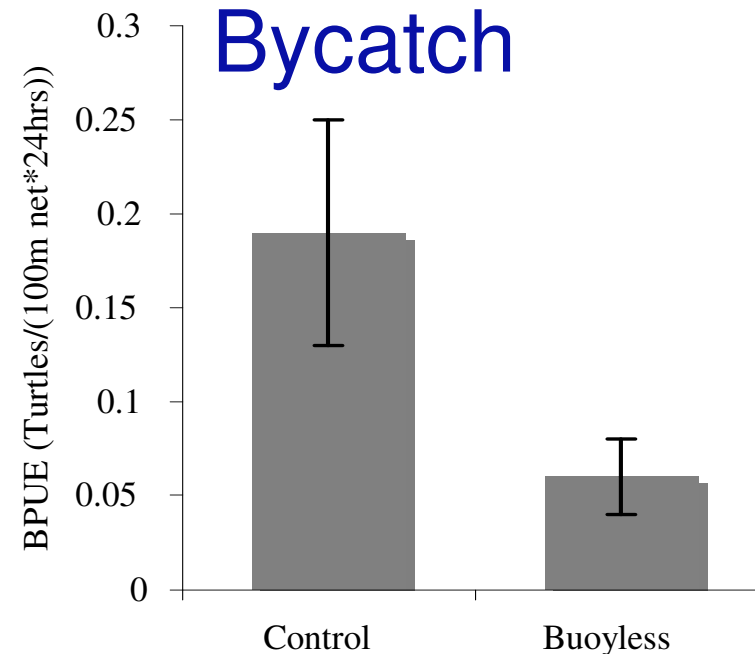
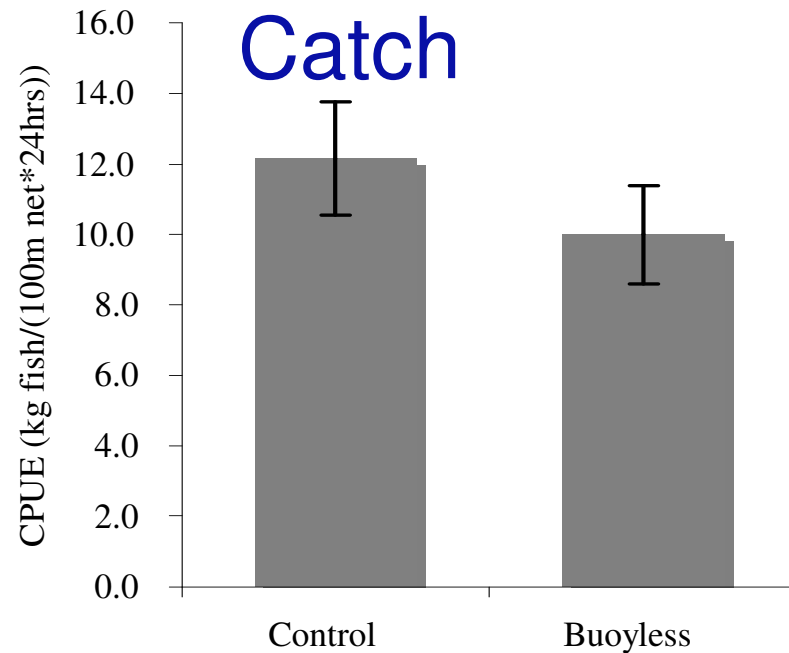
- (buoyless = no buoys on float line)
- 135 paired sets in turtle hotspot
- conventional vs buoyless nets

supported by:
WPRFMC
NFWF



Buoyless nets

Participatory research Gillnet selectivity



- similar catch ($p = 0.092$)
- 68% fewer turtles caught in buoyless ($p = 0.002$)

Conclusions

Partial solution for turtle bycatch reduction

BUT, decrease in Cc bycatch may not be enough

Hook trials

Participatory research Hook fishing

- crews equipped with rods, sounders, etc.
- onboard training by international experts
- comparison of bycatch, catch and earnings



Results: hook trials

Participatory research Hook fishing

- hooks: yield more of valuable finfish
- hooks: zero bycatch of turtles and other spp.
- hooks: preferential market for added value

Hooked fish = 100-400% more \$/kg

Conclusions

- Hooks economically viable (¿preferable?)
- Hooks may increase sustainability
(catch fewer fish, no turtles, earn more \$\$)
- market-based solution
(fueled by demand, not NGO or govt)

Conceptual framework for reducing fisheries impact

(In México - loggerheads)

Behavioral Incentives

- Regulatory: input and output controls (no: low resources, political will)
- Economic: market-based mechanisms (yes - cultivate preferential mkt)
- Social: outreach/education (yes - conservation mosaic)

Fishing interventions

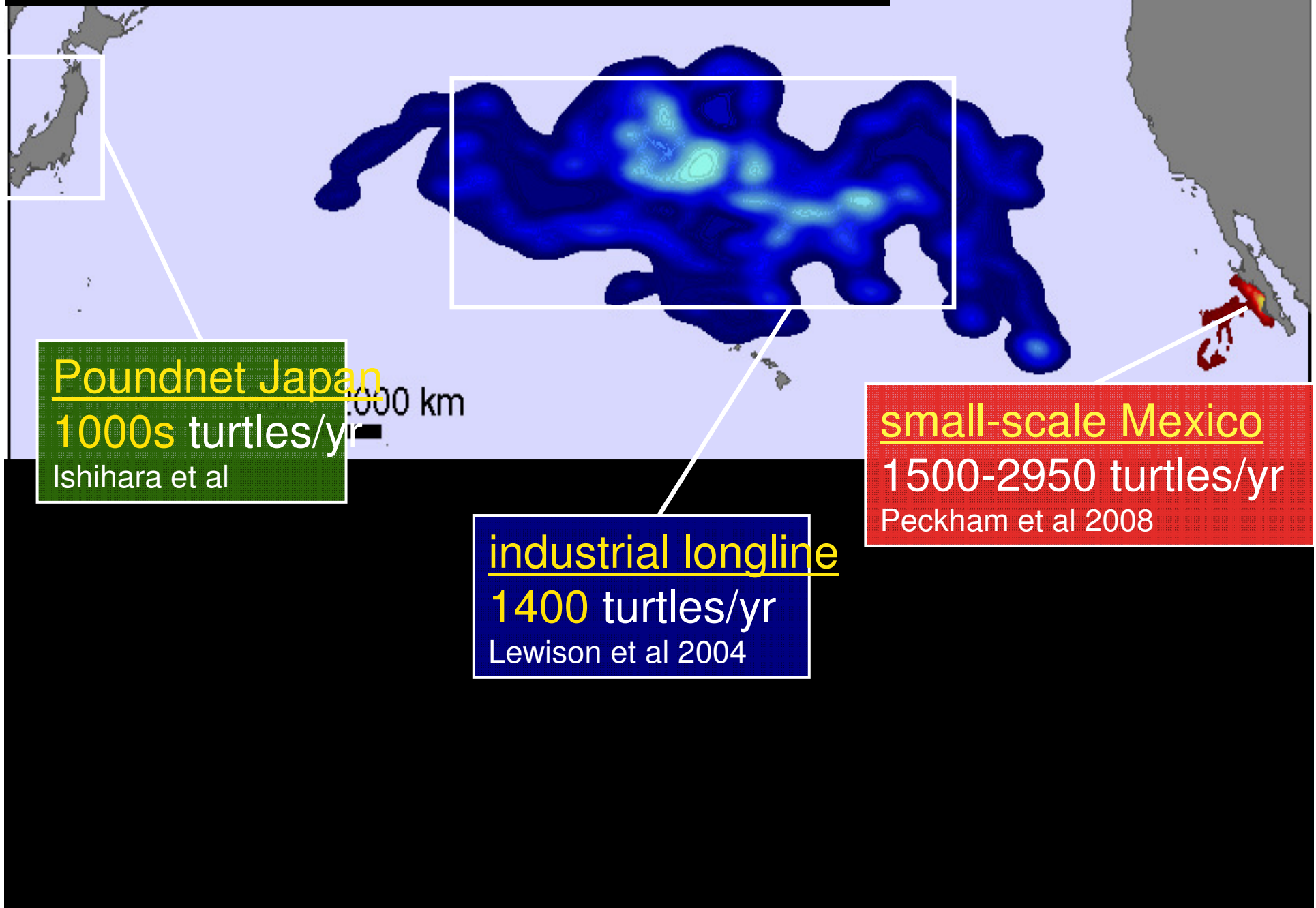
- Availability of nets: spatial and temporal restrictions MSP (no: low resources, political will)
- Selectivity of nets: modification of gear & methods (catch and release)
buoyless nets + hook & line

Outline

- conceptual framework
- reducing catchability in gillnets
- conservation mosaic
- case 1: solutions from Mexico
- case 2: solutions from Japan



Loggerhead conservation opportunity



Reducing poundnet bycatch

Japanese coastal waters

100s-1000s of loggerheads killed

Gov't and fishermen deny issue



Sea Turtle Assoc. Jap

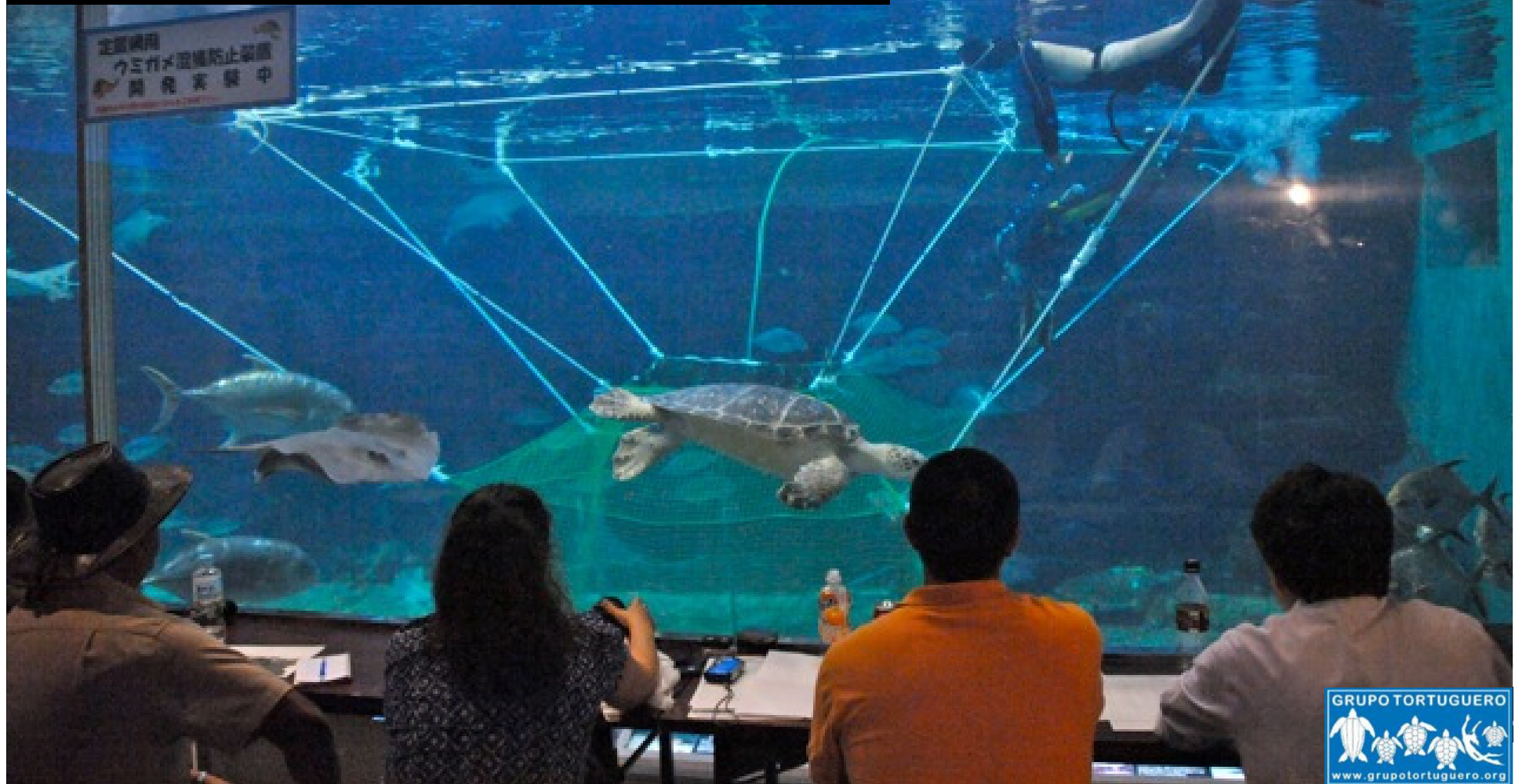
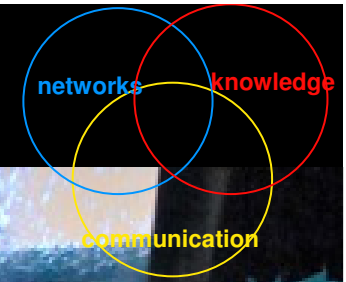
Ishihara et al 200

Bycatch mitigation workshop

Kobe Japan: 22Sep-5Oct 2010

Fishers, Govt, Net Companies, NGOs

Grupo Tortuguero, Sea Turtle Assoc Japan,
Ocean Foundation, Suma Aqualife Park



Bycatch mitigation workshop

Kobe Japan: 22Sep-5Oct 2010

Fishers, Govt, Net Companies, NGOs

Grupo Tortuguero, Sea Turtle Assoc Japan

Ocean Foundation, Suma Aqualife Park



9 Poundnet Escape Devices designed & tested
Broad media coverage
Fishers and Gov't acknowledge solutions potential
(Future: 3 PEDs to be refined, fish tested, field trial)

Conceptual framework for reducing fisheries impact (In Japan - loggerheads)

Behavioral Incentives

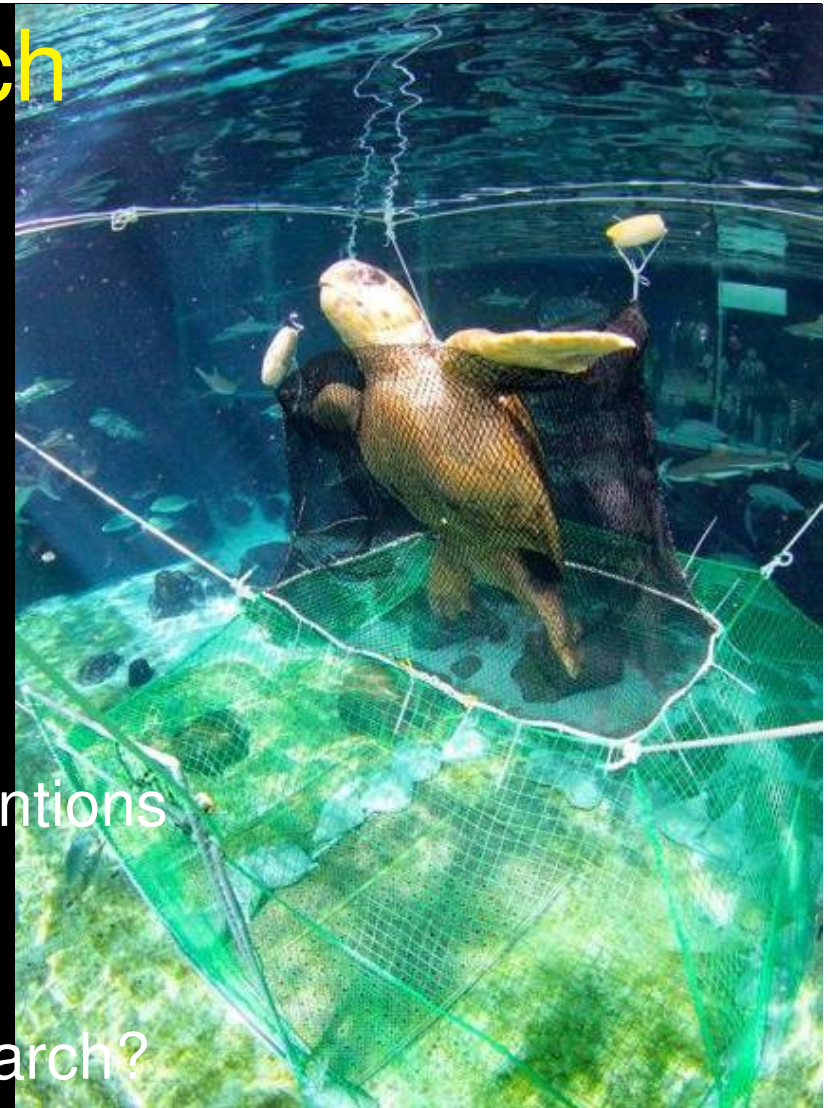
- Regulatory: input and output controls (no: low political will)
- Economic: market-based mechanisms (yes? - PED implementation)
- Social: outreach/education (yes - conservation mosaic)

Fishing interventions

- Availability of nets: spatial and temporal restrictions MSP & (no: low political will)
- Selectivity of nets: modification of gear & methods (catchability) (yes - PED development)

Mitigating dugong bycatch

- identify bycatch hotspots
(rapid and onboard)
- select priority conservation sites
(criteria TBD)
- identify potential incentives & interventions
with govt, fishing, & NGO sectors
- ¿conduct bycatch experimental research?
- coordinate range of tailored incentives & interventions



Acknowledgements

Fishermen and families of Baja California Sur and Japan

Collaborators

GRUPO TORTUGUERO, AC, The Ocean Foundation

Sea Turtle Association of Japan,

A. Esliman, V. de la Toba, WJ. Nichols, R. Ochoa, V. Koch,

Y. Matsuzawa, T. Ishihara, Kamezaki, J. Wang,

J. Seminoff, A. Gaos, T. Tinker, L. Crowder, A. Walli, Y. Tremblay

Project funding

David & Lucille Packard Foundation

Walton Family Foundation

Japan Foundation

Helmsley Trust

CONABIO

Western Pacific Fisheries Mgmt Council

National Fish and Wildlife Fdn

National Marine Fisheries Service

MTCA- US Fish and Wildlife Service

FONMAR



Bycatch successes

Hawaii longline

Gilman et al 2006, 2007

Pacific tuna purse seine

Hall et al 2000

Similarities

- Fishers engaged from outset
- Fishers (co)develop solutions

Hall et al 2007

Jenkins 2007

- High revenue industrial fleets
- Strong regulation



But: unregulated fleets?

- Ubiquitous small-scale
- High BPUE
- Population level impacts

Godley et al 1998

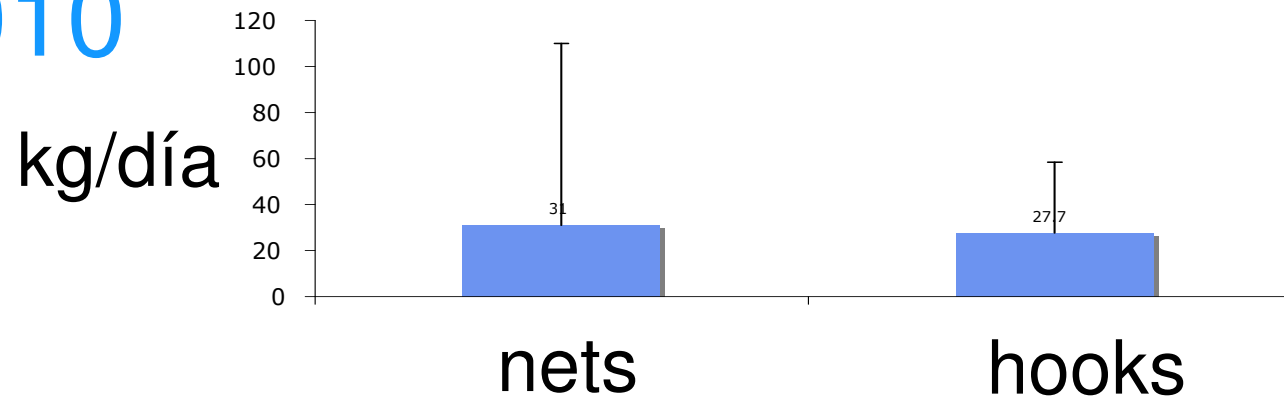
Peckham et al 2007

Programa de Pesca Responsable

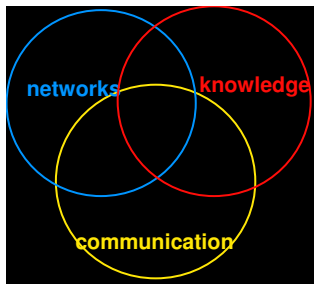
Métodos 2011-12

- Fleet consolidation
series of public meetings; self-ID; MOUs GTC, CCC, Niparajá
- Equipping and On-board training
equipos; entrenamiento captura y manejo abordo GTC, SFP
- Market cultivation GTC, EDF, CAPSC, COBI, SFP
- Facilitate management and enforcement
Covenios with PROFEPA y CONAPESCA

Results: Sustainable Fisheries Program 2010



- earnings similar between hooks & nets (28-31kg/day)
- preferential market promises increased profits
- zero turtle bycatch by 18+ boats
- ~140 nets voluntarily retired from loggerhead hotspot
- ~50% fewer strandings



Fishermen's exchanges: local & international

Japan

1. Share bycatch challenges
2. Co-develop solutions
3. Inspire fishermen back "home"



Mexico



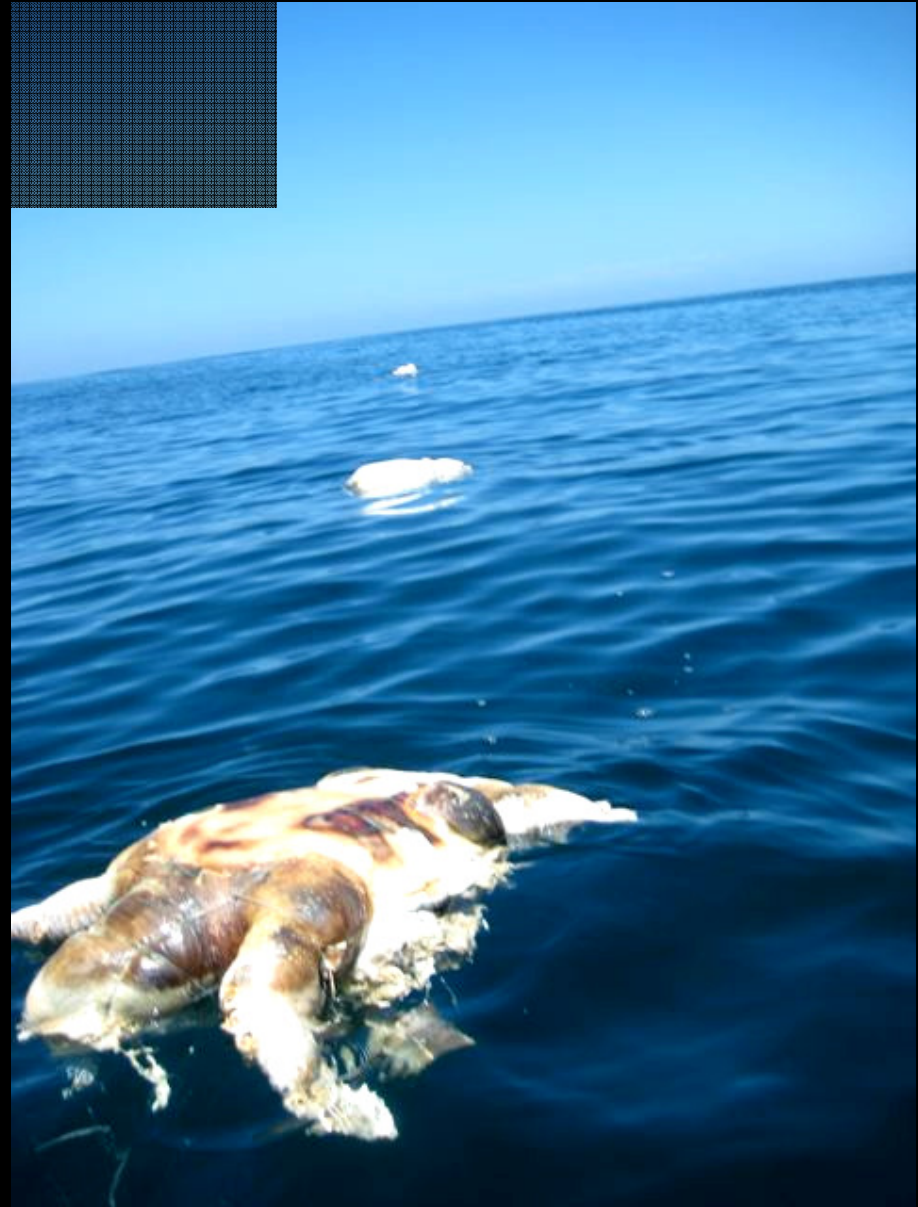
Hawaii

Rodgers 2008
Peckham & Maldonado *In Press*

Support: WWF, NMFS, Japan Fo

Ghost nets - lost gear keeps fishing

- dozens of nets encountered
- 1000s kg fish
- dozens of turtles



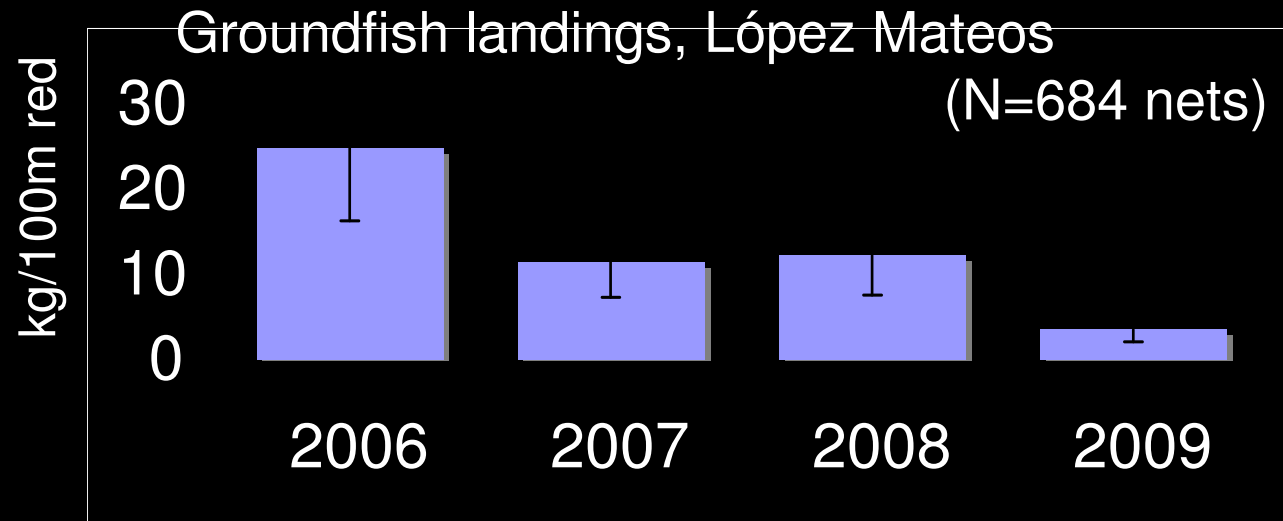
Fisheries regulation in the Bahía de Ulloa

- low/scarce fisheries regulation
- low/scarce law enforcement
- fishing effort and techniques unregulated
- unpermitted fishing and poaching commonplace
- roving bandits

Groundfish fishery



Observations 2004-2009



- producción importante
- 40-80% de ingreso anual
- 10-60 pangas
(20-180 familias)