



## Compensatory Mitigation as a Bycatch Management Strategy

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### A Roadmap

- A naive digression on policy, and bycatch issues
- Problem cases and a potential solution
- A worked Example
- Are there other opportunities?
- Why consider alternatives?

## Principles for Designing Marine Biodiversity Management Policy

- Effective
  - i.e. has to achieve desired conservation outcomes
- Adoptable
  - Economically viable
  - Technologically feasible
- Enforceable
  - Compliance may not be an issue
- Sustainable
  - Have to be able to implement and maintain program

## Goals for Marine Biodiversity Management Policy

- Population growth rates that are stable or increasing
- Habitat that can sustain the species over the long-term

## Grappling with Bycatch Issues

- Fisheries bycatch has gained momentum, and agencies are beginning to deal with it
  - Department of Environment and Heritage
    - Threat Abatement Plan for Bycatch
  - Australian Fisheries Management Agency
    - Bycatch Action Plan
- In some cases can readily be dealt with via changes in fishing practices
  - Gear modifications to reduce bycatch
    - Tori poles
    - Weighted lines
  - Changes in practices
    - Night setting
    - Area closures

## However, There Are Costs

- Financial Costs – for fishermen and agencies
  - Opportunity and Operational costs
    - Night setting to avoid seabird bycatch
    - Safety issues with heavily weighted lines
  - Monitoring costs
    - Even for Tori poles monitoring may be required by the regulatory agencies
- Political Costs - contentious management actions have resulted in some cases
  - Lawsuits over swordfish closure in Hawaii due to turtles
  - Reduced effectiveness in management committees

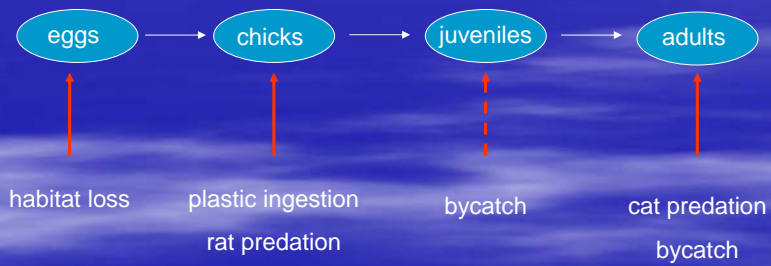
## And Solutions More Difficult For Some Species

- Seabirds in Australia's Eastern Tuna and Billfish Fishery
  - Bycatch appears to be manageable with gear modifications
  - However, for some species, measures don't appear effective
    - Flesh footed shearwaters
    - Multiplicative effect if bring baits to surface
  - Pending regulations - closures if bycatch limits are exceeded
  - Clearly there will be:
    - financial losses for the fishery
    - administrative burdens and costs
    - Expenditure of political capital

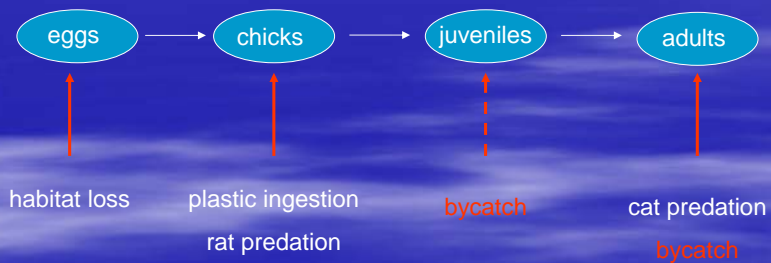
## Compensatory mitigation – an Alternative?

- Compensatory mitigation
  - Common in wetland conservation, and related to carbon trading
  - Simple idea:
    - a. Work out mortality sources through life cycle
    - b. Estimate relative magnitude of mortality sources
    - c. Calculate the cost to alter each mortality source
    - d. Estimate revenue generated by each mortality source
    - e. Use capital from high revenue mortality sources to fund conservation measures to alleviate low revenue mortality sources

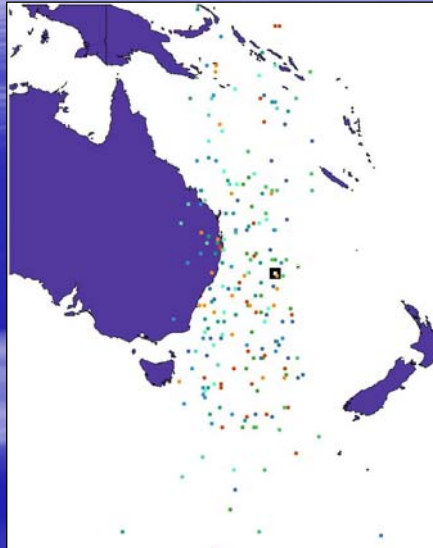
## Human impacts on flesh footed shearwaters



## Option 1: Reduce Bycatch Rates in Fishery By Spatial Closures



## Fishery closure for the Eastern Tuna and Billfish Fishery

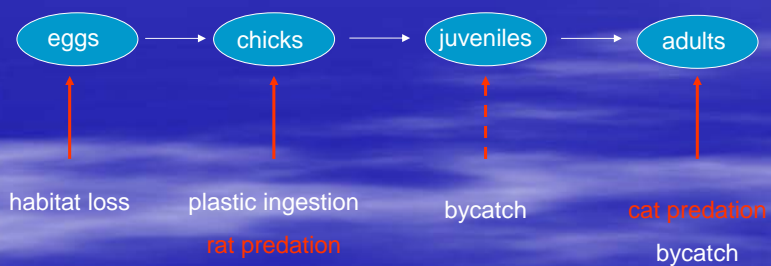


- Approximately \$70 million/year
- Most effort out of southern Queensland (Mooloolaba)

Lord Howe Island

- Birds most abundant around Lord Howe Island (breeding site)
- But, overlap entire fishery

## Option 2: Eradication of Introduced Mammals



# An example: Clipperton Atoll & Ken Stagger



## An Illustration for Cat and Rat Impacts

### Cats

- Guadalupe Island, Mexico – cats and albatross – learned behavior
- Kerguelen Island – estimated 1.2 million seabirds/year

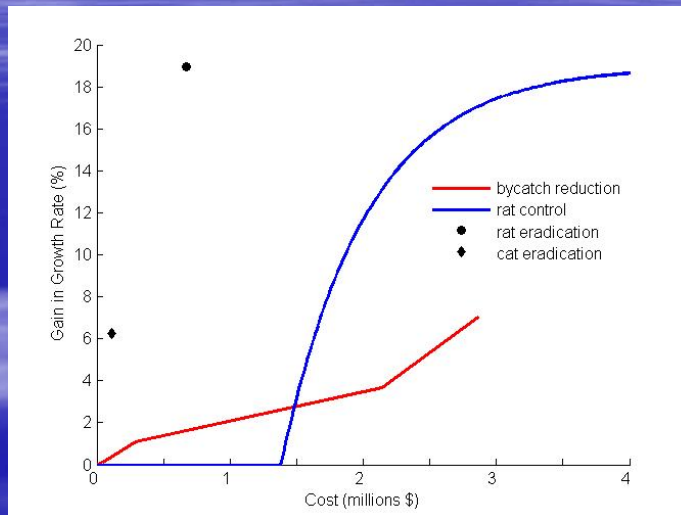


- Rats and even mice prey on seabirds and chicks
- Cuthbert reports a decline in breeding success from 75% to 25% due to mouse predation on albatross chicks
  - Rats known to take ADULT albatross

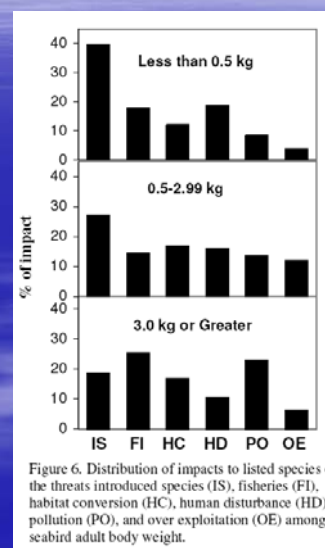
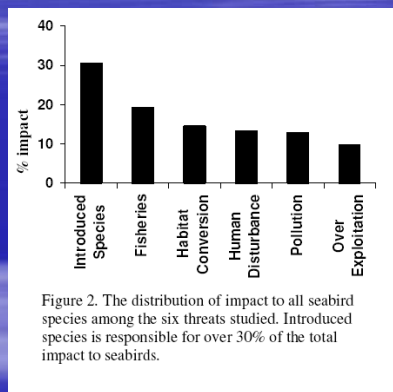
## Human impacts on flesh footed shearwaters

Impact	Possible Action	Effectiveness	Cost
habitat loss	Purchase habitat	unknown	?
cat predation *	Control	some	\$
	Eradication	high	\$\$
bycatch *	Gear changes	low	\$\$
	Area closures	high(?)	\$\$\$\$\$
plastic ingestion	unknown	-----	-----
rat predation *	Control	some	\$
	Eradication	high	\$\$

## Costs and benefits of mitigation measures

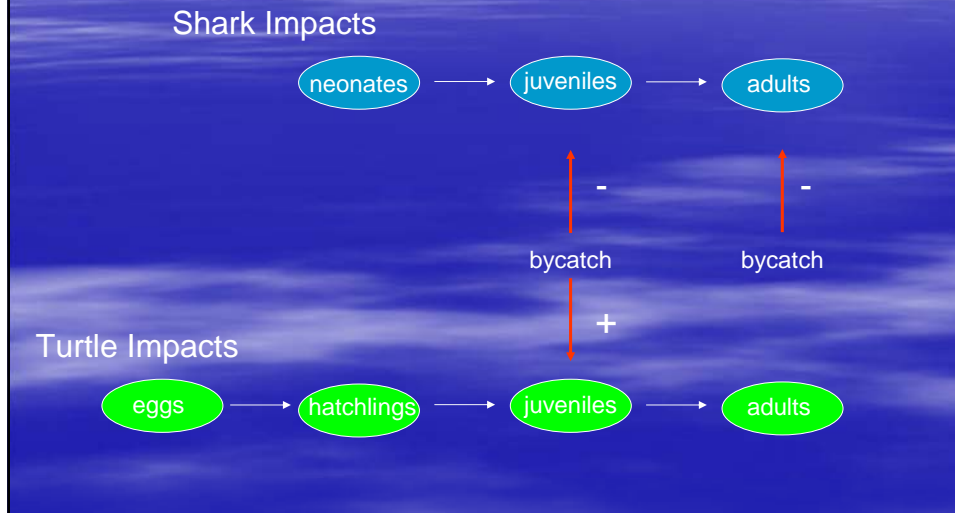


## Opportunities for Seabirds Generally?

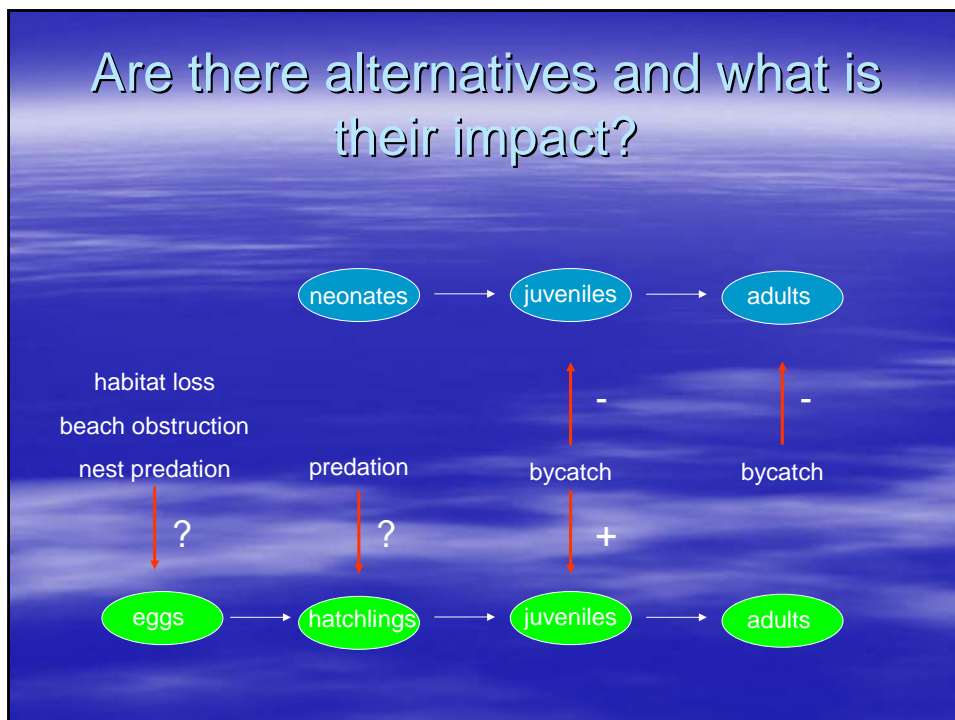


From Wilder 2004, Island Conservation

## Extension to multiple species – the circle hook question



## Are there alternatives and what is their impact?



## Does CM Meet the Principles for Designing Policy?

- Effective
  - i.e. has to achieve desired conservation outcomes
- Adoptable
  - Economically viable – passes on “true costs”
- Enforceable
  - Dock-based, via observers or predicted catches
- Sustainable
  - User Pays

## But, it's a pain – why do it?

- Individual incentives
  - Encourages innovation
  - Individual incentives are best predictor of sustainability
- Focus on species persistence
  - So, target most important threats
- Economic efficiency
  - Potentially easier to sell to policy makers
- Provides a framework for agencies to interact
  - e.g. AFMA/DEH
- A mechanism for thinking about what to do when mitigation is hard
  - Technological approaches don't work
  - Bycatch is too rare to do experiments