Acoustic Deterrents and Marine Mammal-Gillnet Bycatch

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Acknowledgments

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Outline

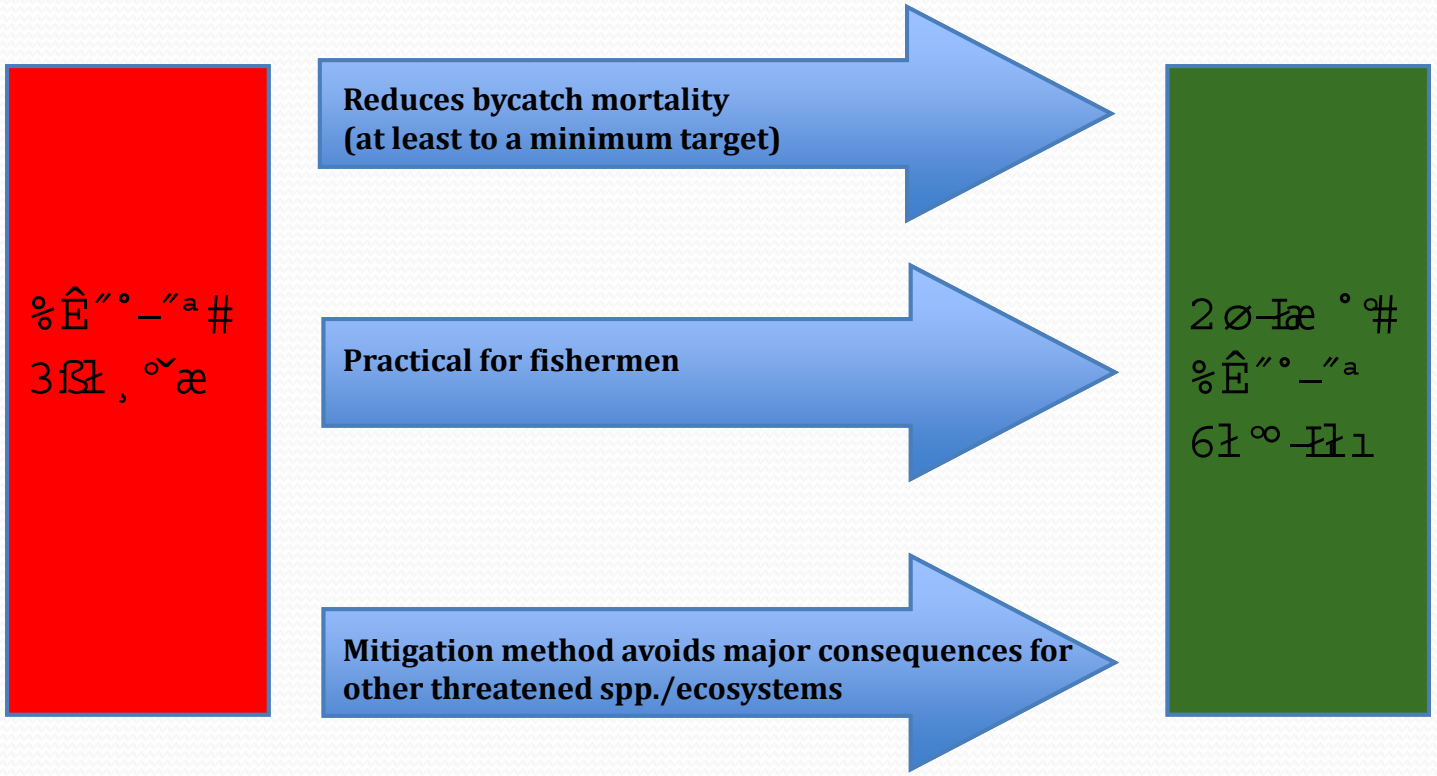
- Synopsis of acoustic deterrents
- Research priorities
- Observations on future directions

2011: Review Progress

International Marine Mammal - Gillnet Bycatch Mitigation Workshop

- ~ 50 participants from around the world
- What has been our experience in mitigating marine mammal bycatch over the past 25 years? Specifically, what have we learned about different techniques?
  - Acoustic
  - Non-acoustic gear modifications
  - Time-area closures
  - Gear switching

Basic Objective



Workshop Questions

- What have we learned from the body of scientific evidence from the past ~ 20 years of trying to solve the problem?
- What looks promising, questionable, or warranting further research focus?
- Focus: achieving consensus on scientific evaluation of techniques (i.e., *Did it reduce bycatch?*), not political, social, economic, operational, etc.

Acoustic Deterrents

- Acoustic Deterrent Devices (Pingers) (< 150dB re 1 µPa @ 1m²)
- Acoustic Harassment Devices (>185 dB)
- Mid-range: ??
- Manufacturers: 7 companies worldwide; ~ 5 others referenced but information elusive
- Range: 2-500kHz
- Unit cost: $32-$1707
- ~30,000 sold to date?

Dawson et al, in press*; Consortium research*

Summary – Pinger effectiveness

- 19 controlled experiments involving 9 species
- Fisheries observer data analysis and area exclusion trials with some 14-19 species
- Pingers work and significantly reduced bycatch for ***at least 7*** (but possibly 12) species (HP, striped dolphin, franciscana, beaked whales: Cuvier's, Hubb's, Stejneger's, and Baird's beaked whale)
- Pingers do not work for four species tested including *Tursiops truncatus*

Dawson et al., in press

“Lab Rat” - 11/14 field trials

The other 3:

- North and Celtic Seas
- One with trawl gear
- Problems with sample size and/or faulty pingers

Dawson et al., in press

Acoustic Deterrent Issues

- Proper deployment (compliance, spacing)
- Habitat exclusion
- Habituation
- "Dinner bell" effect?
  - Higher depredation more a f(x) of higher catch and/or deck lights (at night) (Carretta and Barlow, 2011)
  - Exploit hearing frequency differential: cetaceans and pinnipeds (Bordino & Albareda, 2004)

Acoustic Deterrent Issues

- PBR – need to have measure of management effectiveness
- Endangered Species (e.g., vaquita)
  - Not recommended (IWC, 2000)
    - Bycatch >0
    - Cost in third world
    - Experimental sample size
    - Alternatives better
- Cost
- Battery life

Research Priorities

- The effect of malfunctioning pingers using an experimental set-up where both visual and acoustic data are collected simultaneously (see e.g. Carlström et al. 2009).
- Optimal spacing distances for the specific devices
- Deterrence distance for different marine mammal species to pingers.

Research Priorities

- The properties (frequencies, harmonics and propagation) of pingers in different environments (Shapiro et al. 2009)
- Additional marine mammal species to evaluate effectiveness of pingers to reduce bycatch for respective species
- Further quality control of pingers to ensure less variation in the sound produced by individual pingers (and that a led light is incorporated in the pingers to show that the device is functioning properly).

Research Priorities

- Comparisons between different pingers e.g. randomised pingers vs regular pingers.
- The effectiveness of low-frequency pingers in reducing large whale gillnet bycatch (pinger currently being trialled in Australia but not in an experimental setting).
- Observers collect data on where bycatch occurs along the net in relation to where pingers deployed

Franciscana (*Pontoporia blainvillei*)

- Artisanal gillnet fishery in Argentina
- Pingers work (Bordino et al, 2000)
- Barium sulfate/stiff nets do not (Bordino et al, in press)
- Switching from gillnets to handlines costs 25% more (seasonally) but gear last longer (Bordino et al., in prep)
- Time-area closures?

Future

- Pingers undoubtedly an important tool for reducing bycatch
- Use may need to be subsidized in some places such as in non-industrial fisheries
- More research of acoustic deterrents (e.g., DDDs, other pinger frequencies, other species, other fisheries)
- Pinger refinements (LEDs, other?); promote exchange between manufacturers and fishermen
- Other gear mods?
- Gear switching
- Default: Time-area closures, fishing restrictions (Will fishermen prefer this? Do we really understand the population benefits of this measure –e.g., Slooten et al, *in press.*)