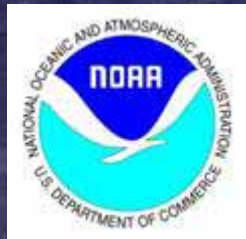
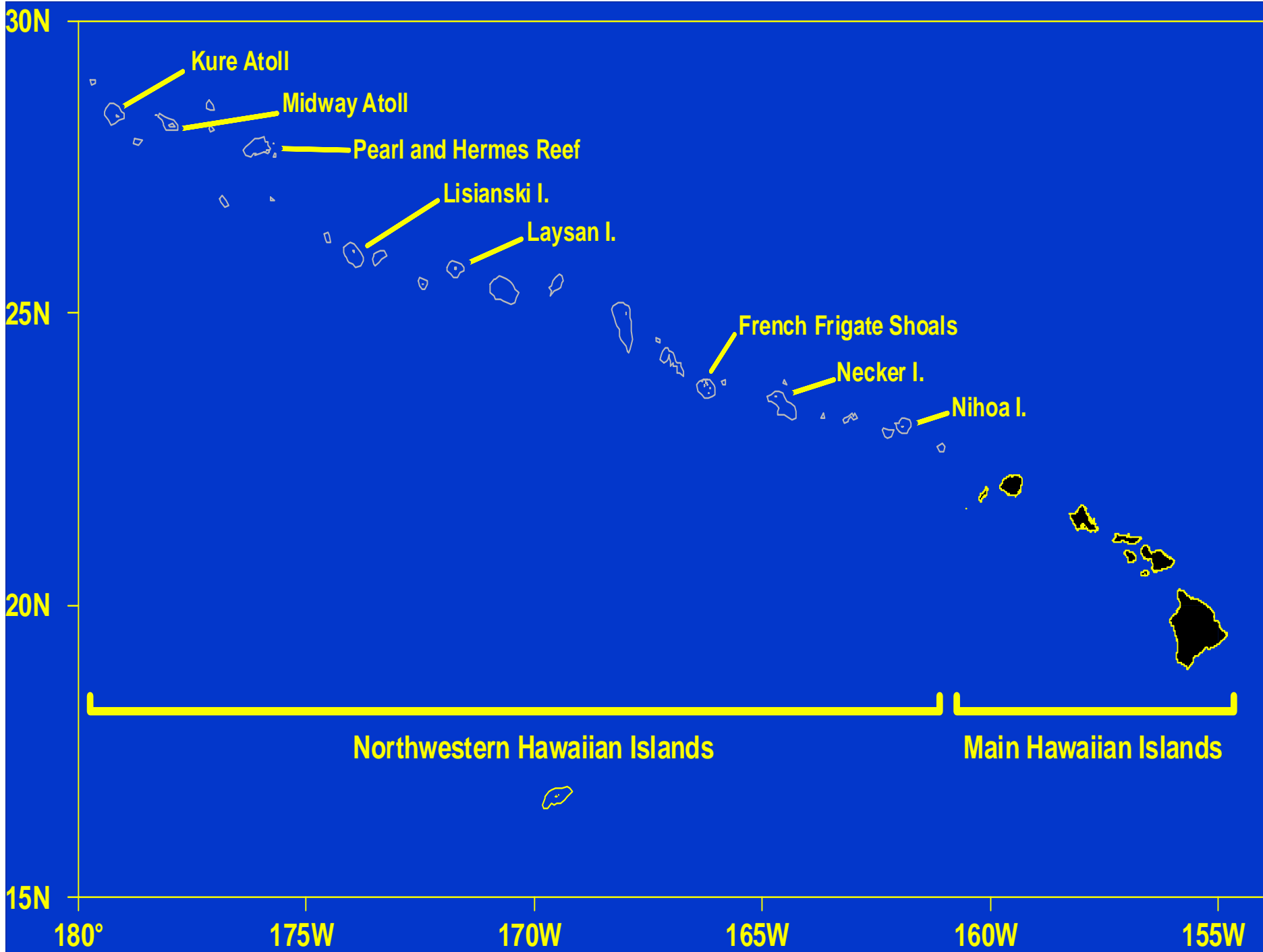


Galapagos Sharks and Hawaiian Monk Seals: A Conservation Conundrum

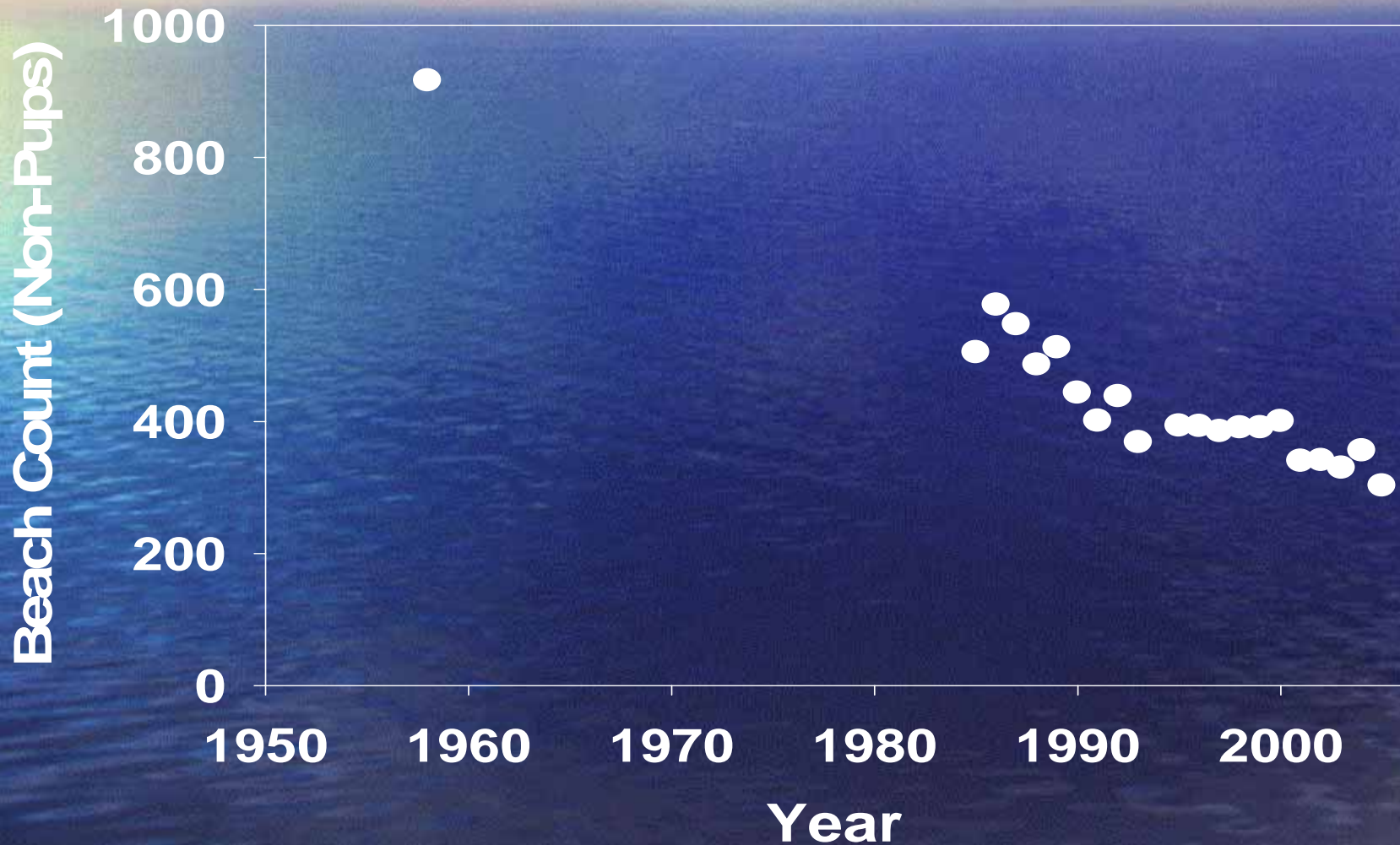
**Bud Antonelis, Bert Harting, Brenda Becker,
Susanne Canja, Shawn Farry, Robert Dollar, Dan
Luers, and Aaron Dietrich**

**National Marine Fisheries Service
Pacific Islands Fisheries Science Center
Honolulu, Hawaii**

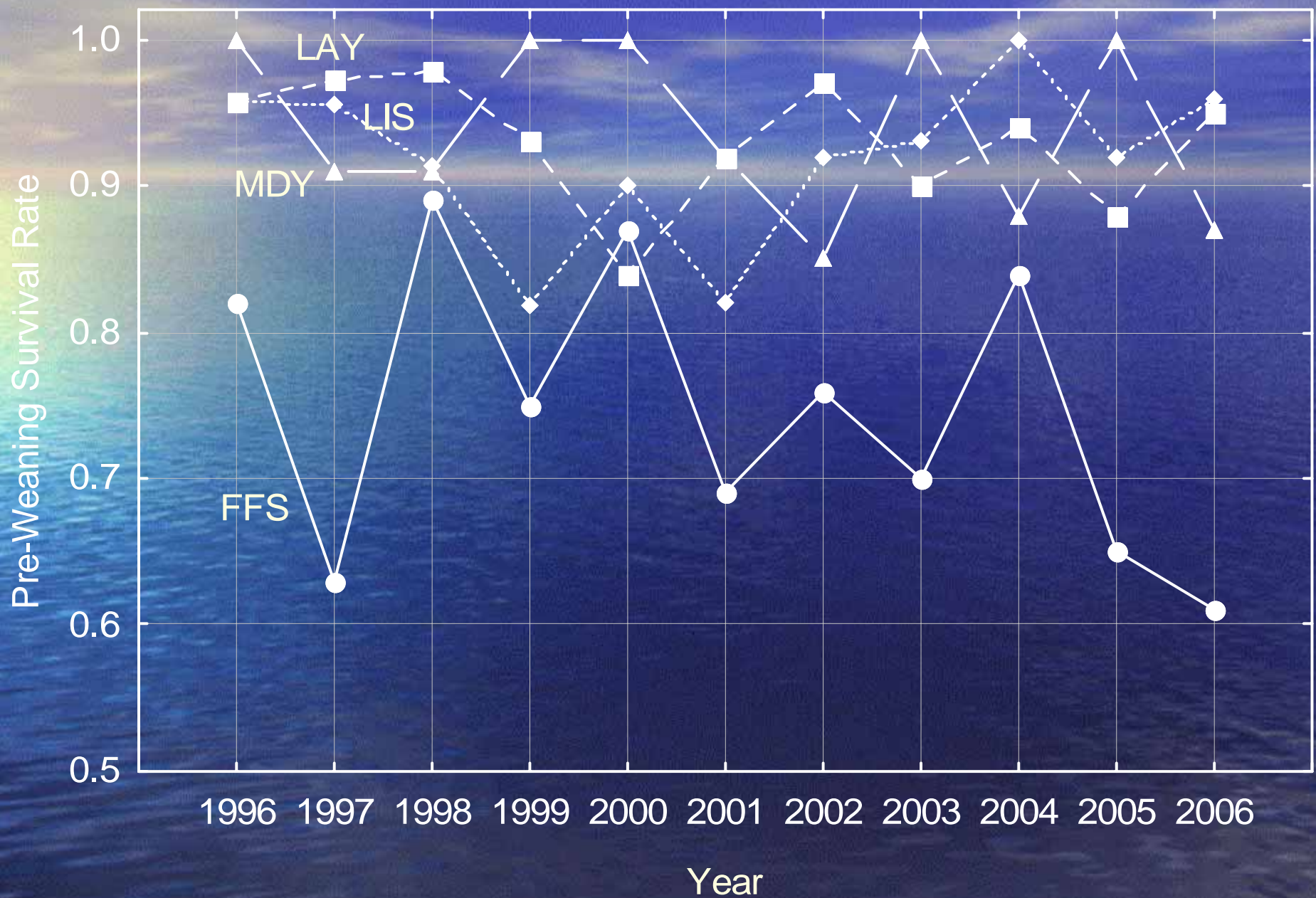




Hawaiian Monk Seal Population Trend



IS THE FFS SITUATION UNIQUE?











Conservation Conundrum

**Competing Interpretations of
Mandates**

Endangered Species Act

Marine Mammal Protection Act

and

Maintain Biodiversity

FWS Compatibility Determination



Doing Nothing

Worst possible consequence?

Best possible consequence?

Doing Something

Worst possible consequence?

Best possible consequence?

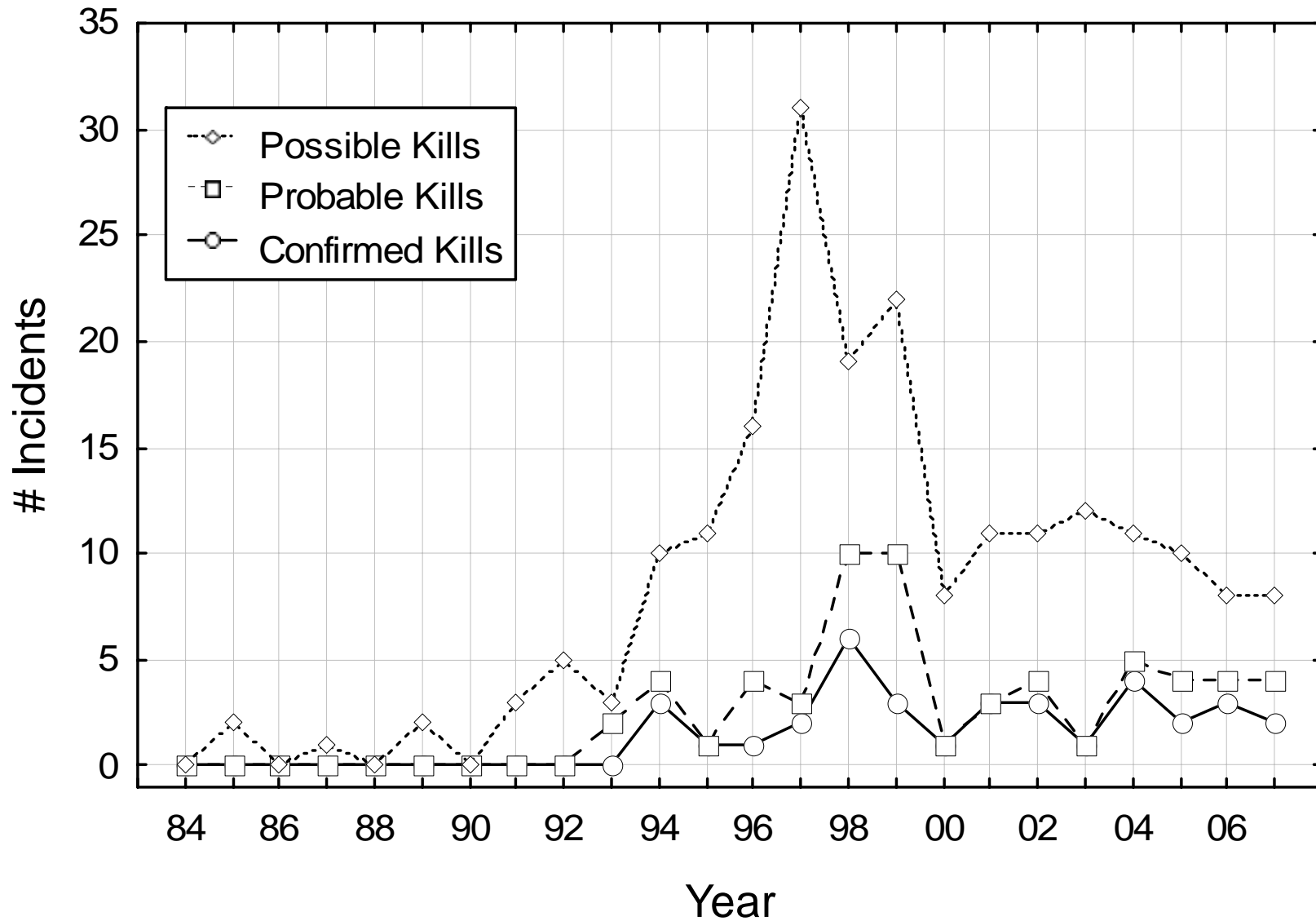
Key Factors Leading to the Shark Removal Experiment

- **Galapagos sharks were primarily responsible for pre-weaned pup losses**
- **Only observed at FFS**
- **G. Sharks are not rare or endangered in NWHI**
- **Probably no more than 20 G. sharks involved**
- **Dramatic rise in pre-weaned pup mortality in late 90's**
- **Expert testimony and ECOSIM modeling used to address concerns of possible ecosystem impacts**
- **Compatibility Determination and Environmental Assessment**

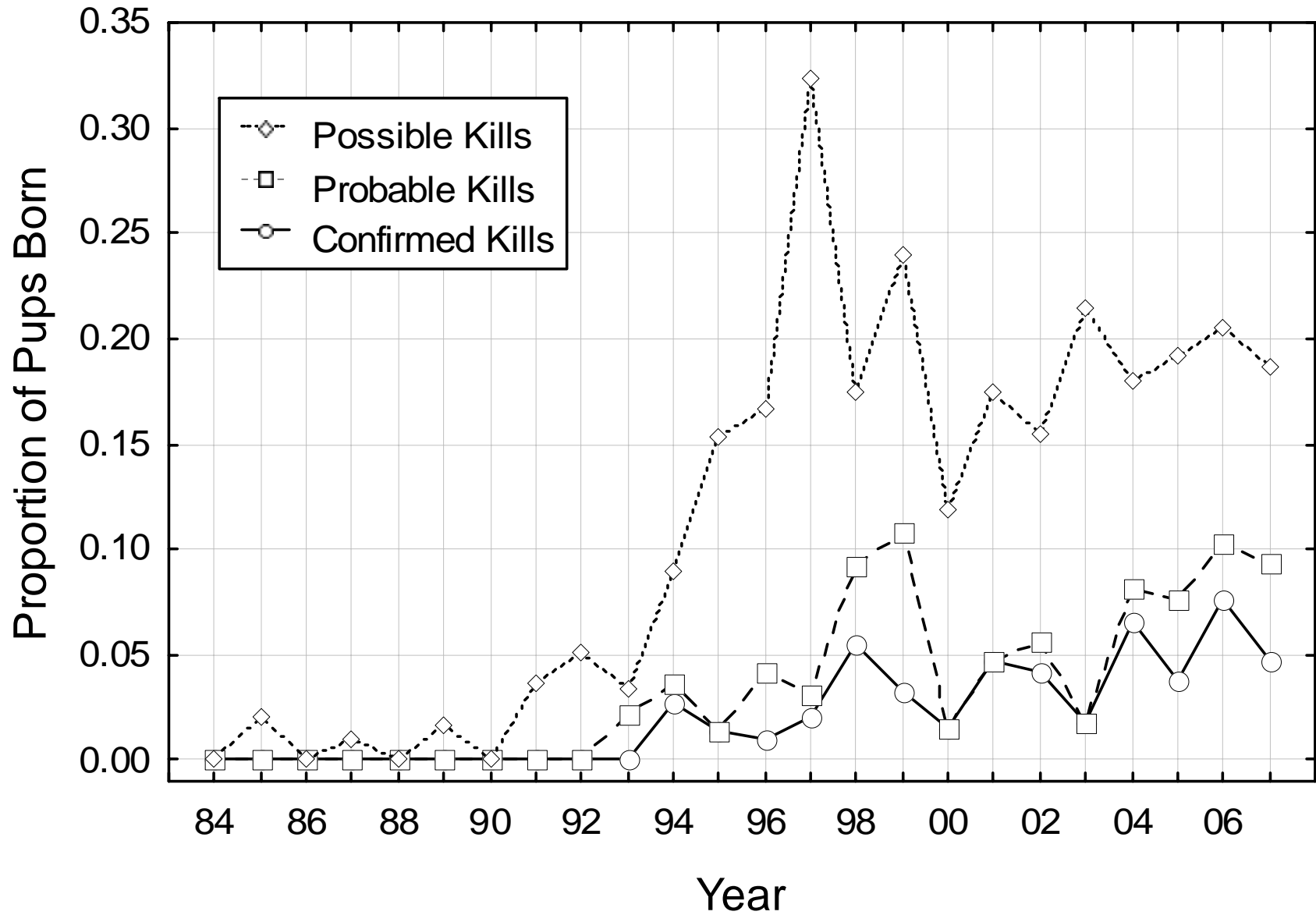
Removal Methods

- **Hook and line: various baits**
- **Harpoon**
- **“Drum” technique: baited hook hung from buoy (1-3 sets at a time)**

Known and Inferred Predation Mortalities at FFS



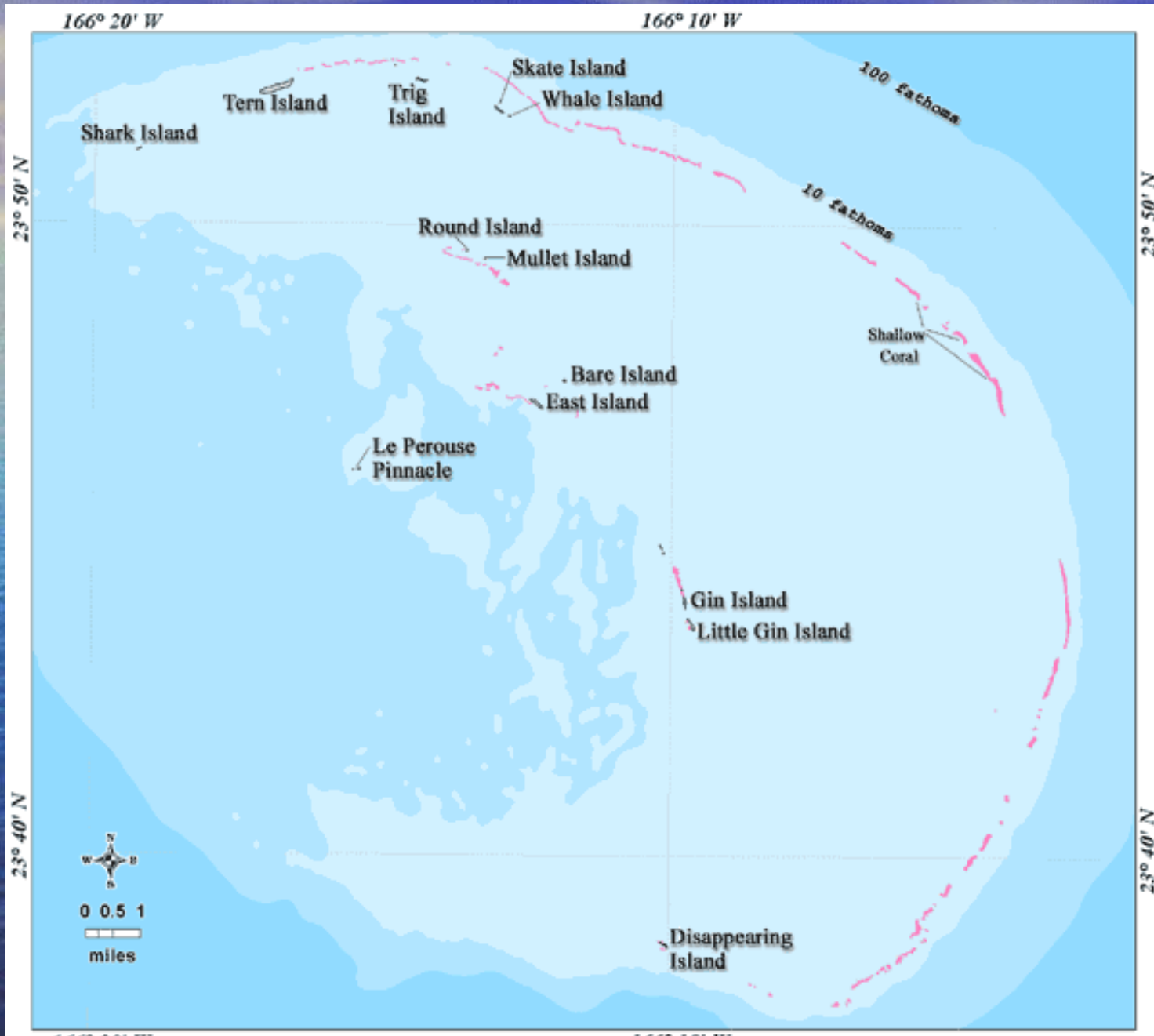
Proportion of Annual Cohort Killed by Sharks (all FFS Sites)



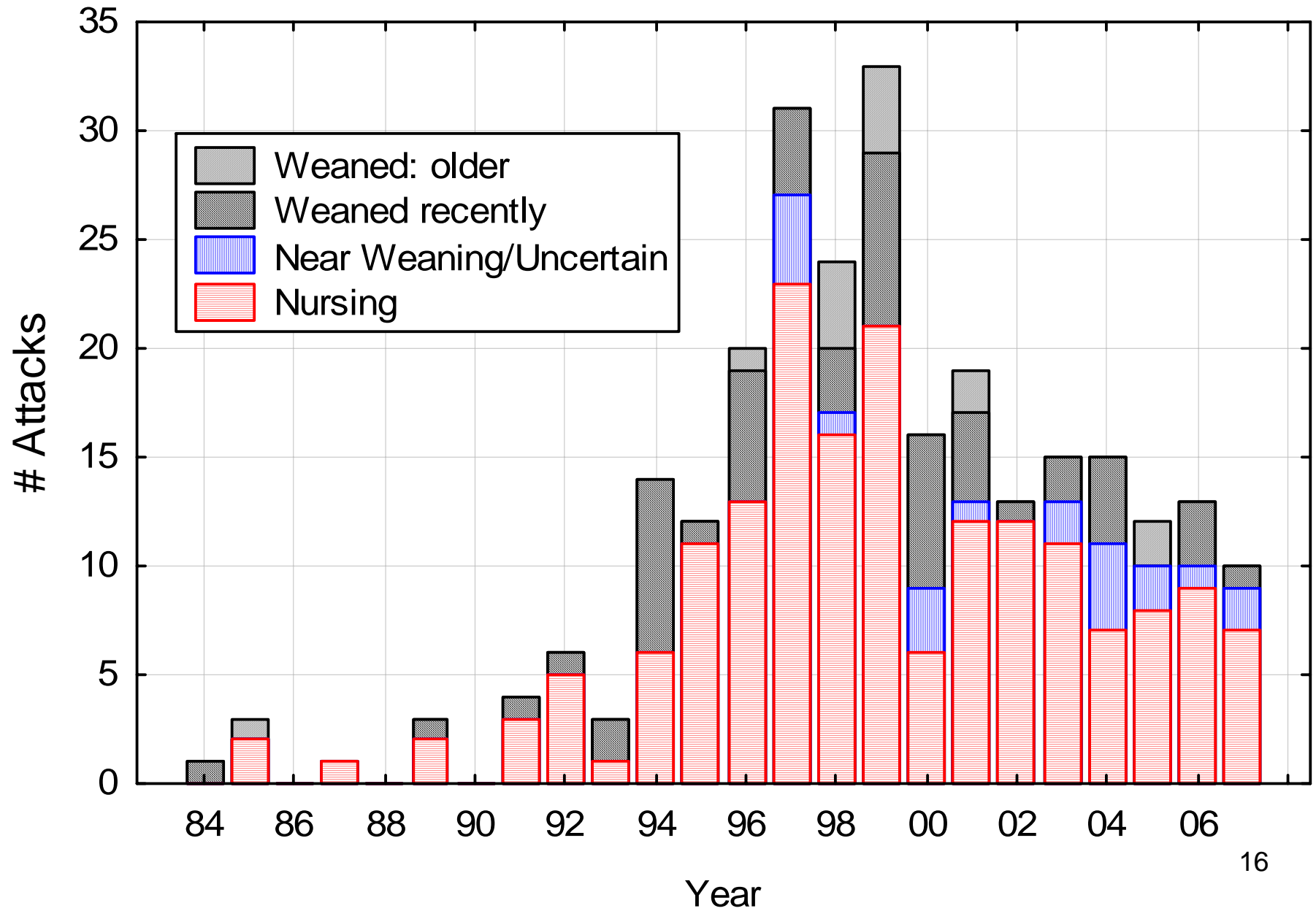
Post Weaning Translocation to “Safe” Locations



FFS Translocation Sites

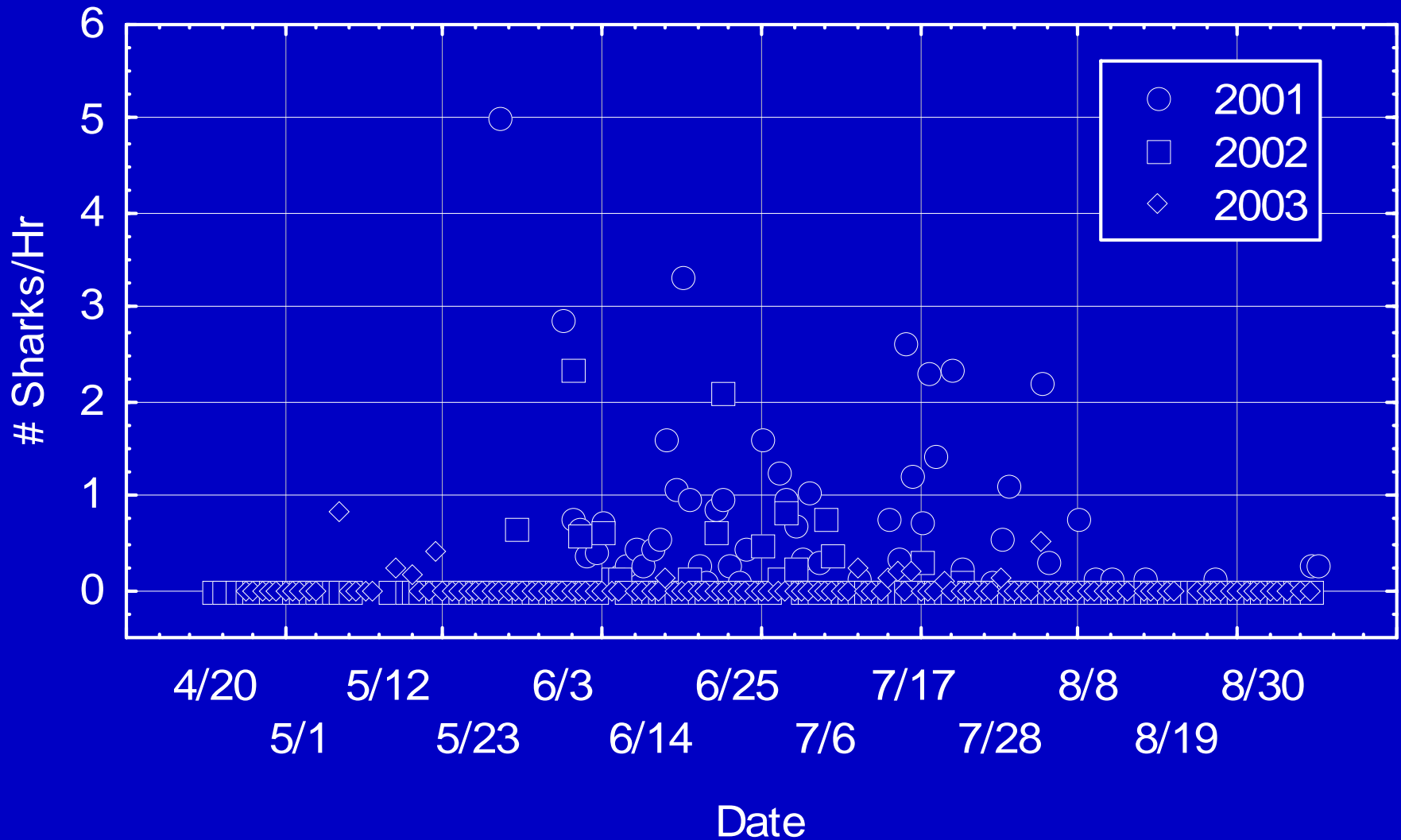


Size Class of Killed + Wounded Pups

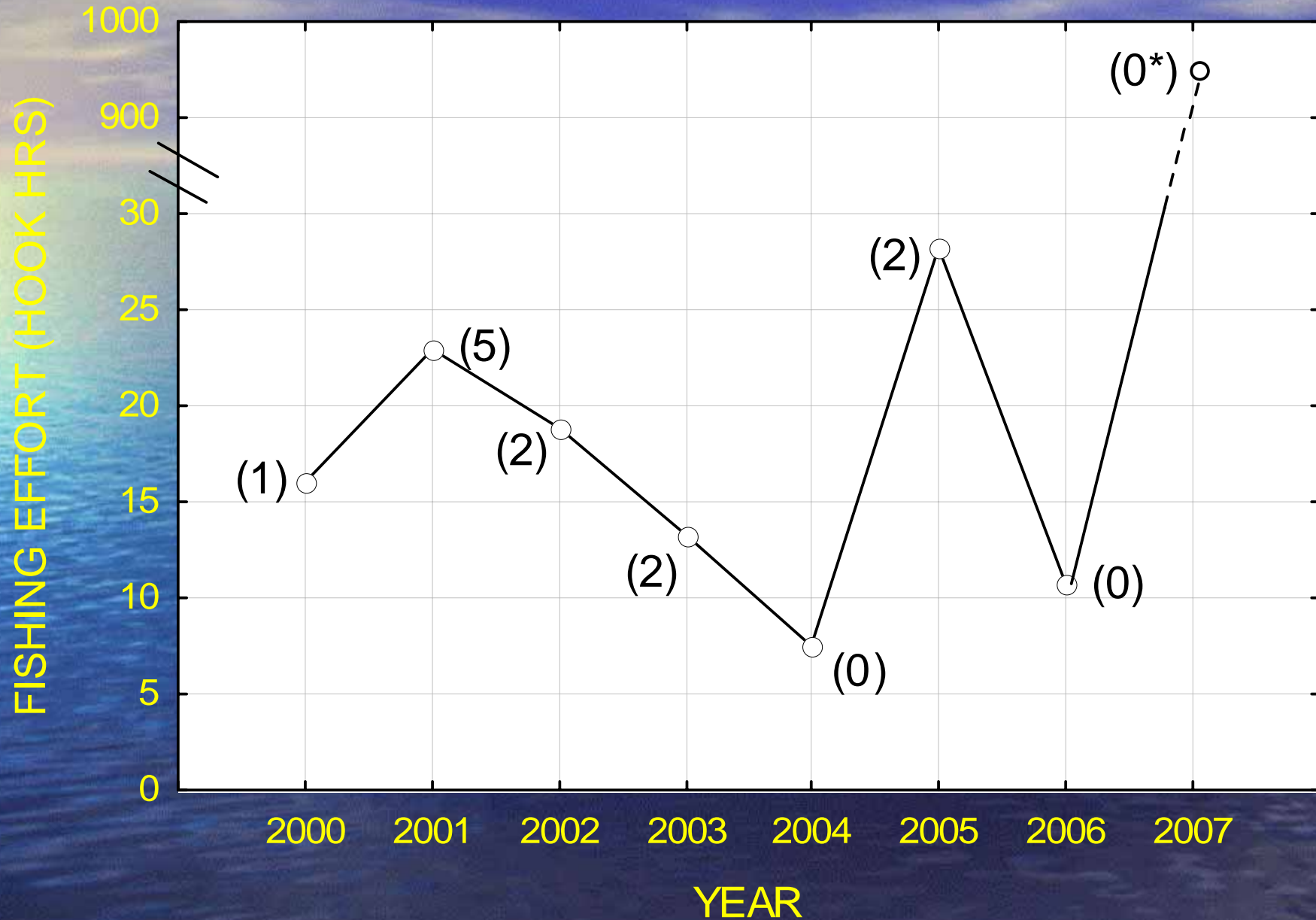




Shark Observation Rate



Fishing Effort at FFS: 2000-2007



Future mitigation needs at French Frigate Shoals

- **Alternative mitigation methods are needed because current techniques are ineffective.**
- **NMFS has ultimate responsibility for Hawaiian monk seal recovery...however, all of the managing entities in the NWHI share responsibility for future survival of the species.**

Shark/Monk Seal Workshop

1/8-9/2008

Actions for 2008

- **Electromagnetic Deterrents**
- **Physical/Visual Deterrents**
- **Sound playback**
- **Seal translocations: weaned pups**

Array of deterrents at Trig Island-2008



Preliminary Results

Use of Sharks Deterrents -2008

Mom & Pup Summary

<u>Islet</u>	<u>Nursing</u>	<u>Births to date</u>	<u>Dead /Missing</u>	<u>Weaned</u>
Tern	1	4	1	2
Trig	5	13	3*	6
East	5	8	1	4
Round	0	1	0	1
Gin	0	4	4	0
Little Gin	1	1	0	0
<u>Total</u>	<u>9</u>	<u>31</u>	<u>9</u>	<u>13</u>

*Only one pup lost a Trig after full deployment of deterrents