

# Life in the Fast Lane: Ecology and Behavior of the Smallest Cetaceans



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Professor David Gaskin



'The Hut' on Deer Island

Harbour porpoise research in the Bay of Fundy began in 1969, conducted by Dr. David Gaskin from the University of Guelph in Canada



Dr. David Johnston



Dr. Andrew Westgate



Dr. Heather Koopman

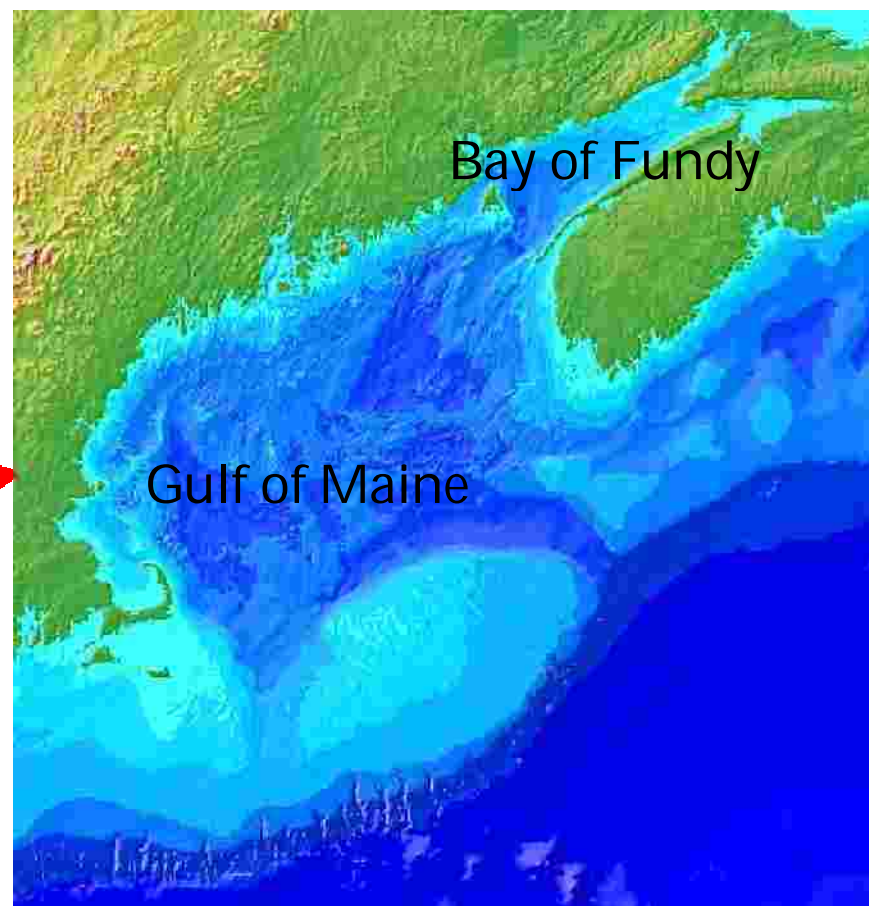
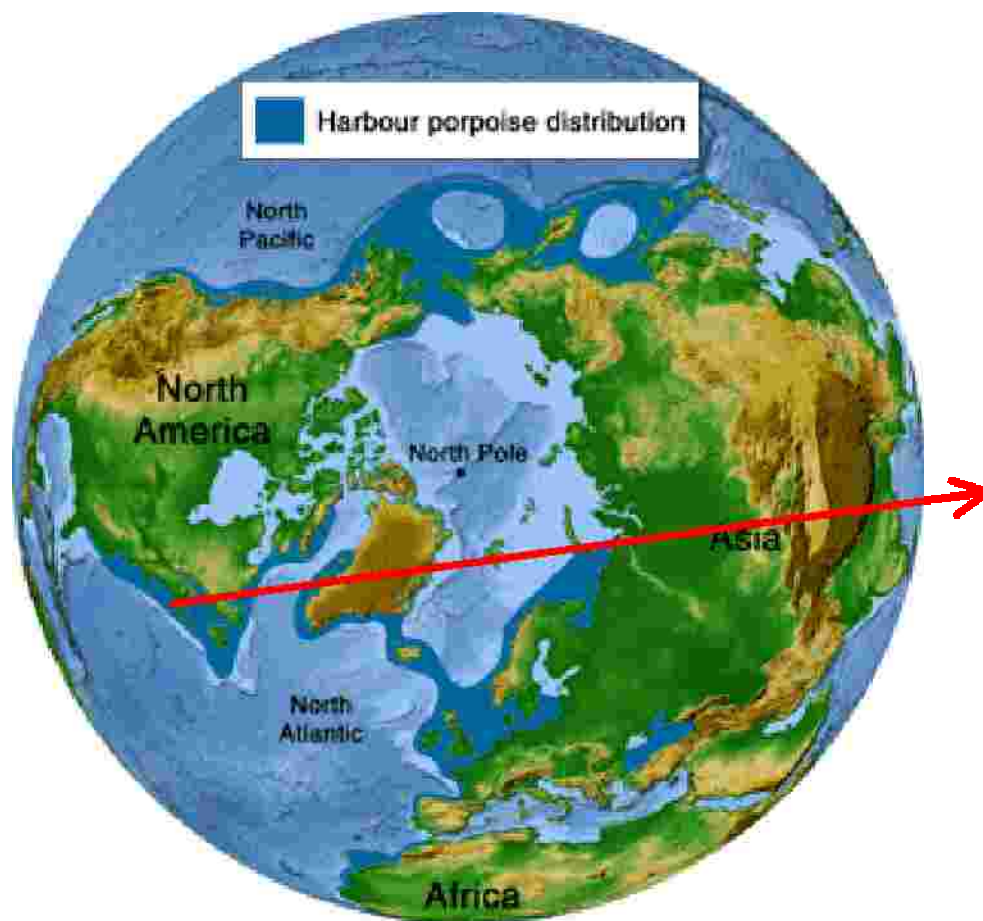


Grand Manan Whale & Seabird Research Station

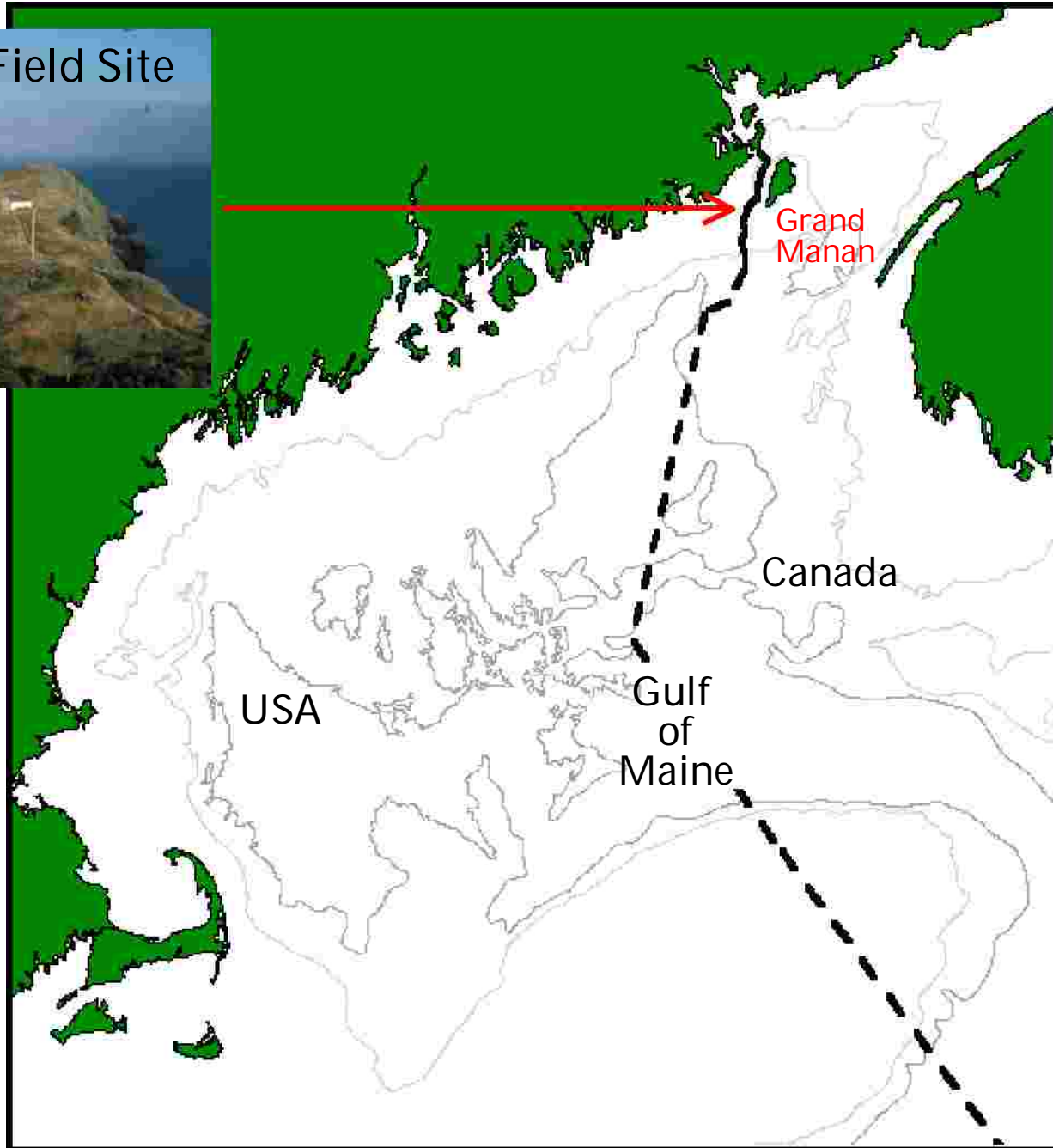


Dr. Tara Cox

The harbour porpoise research program continues today, conducted by Drs. Westgate & Koopman from the University of North Carolina at Wilmington, USA



# Bay of Fundy Field Site



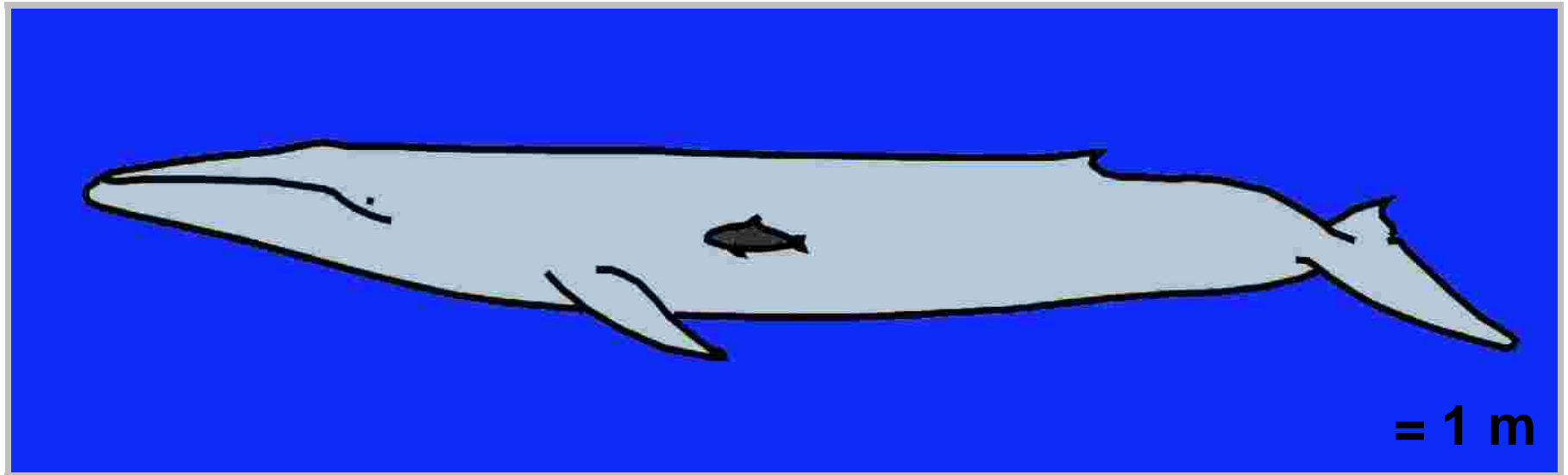


## Porpoises are:

Small and fat ~ 1.5 meters long & ~ 65 kg

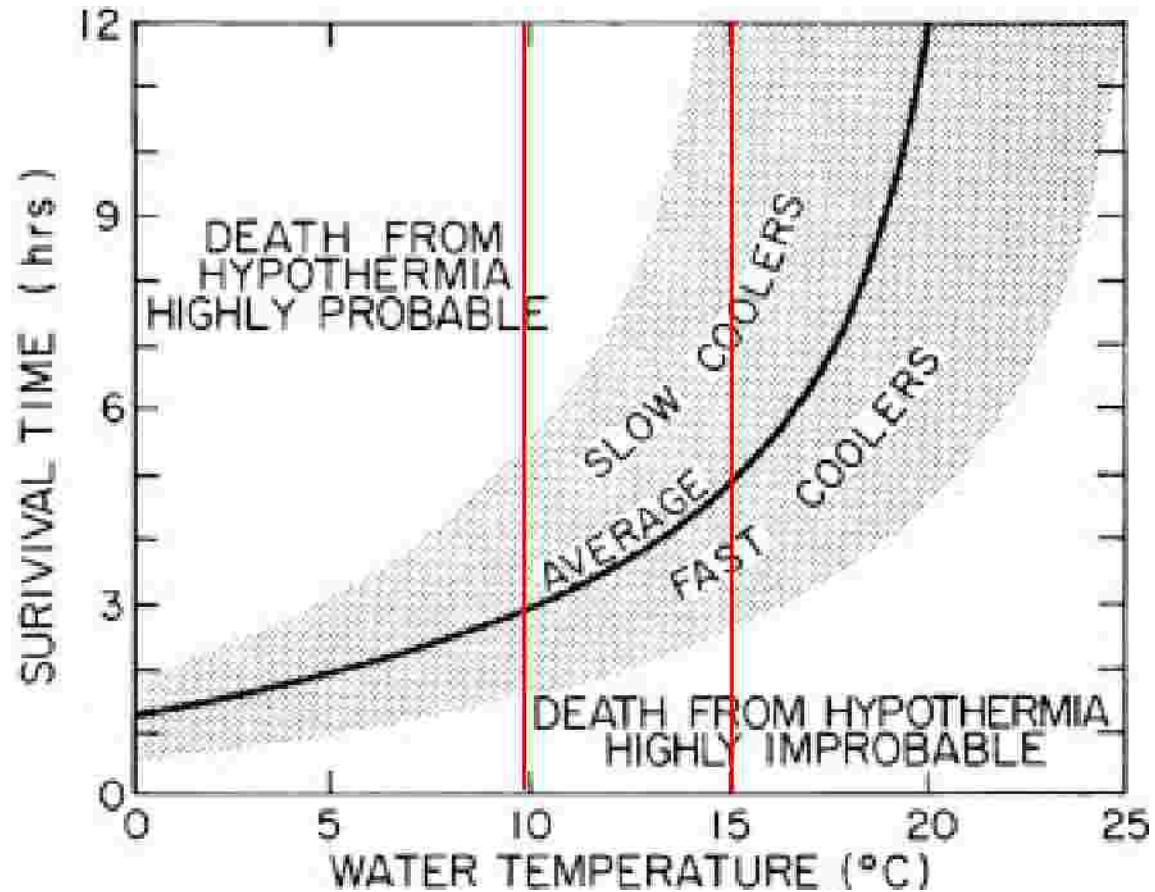
Short-lived ~ seldom live for more than 15 years

Fecund ~ females give birth to a new calf each year



Harbor porpoises are one of the *smallest* cetaceans and thus a good model species for studies of morphology and energetics

# How do Porpoises Survive in Cold Water?



J.S. Hayward (1986) The Physiology of Immersion Hypothermia

# Blubber – Wrapping Yourself in Fat

Insulation

Energy storage

Streamlining

Buoyancy

Biological spring





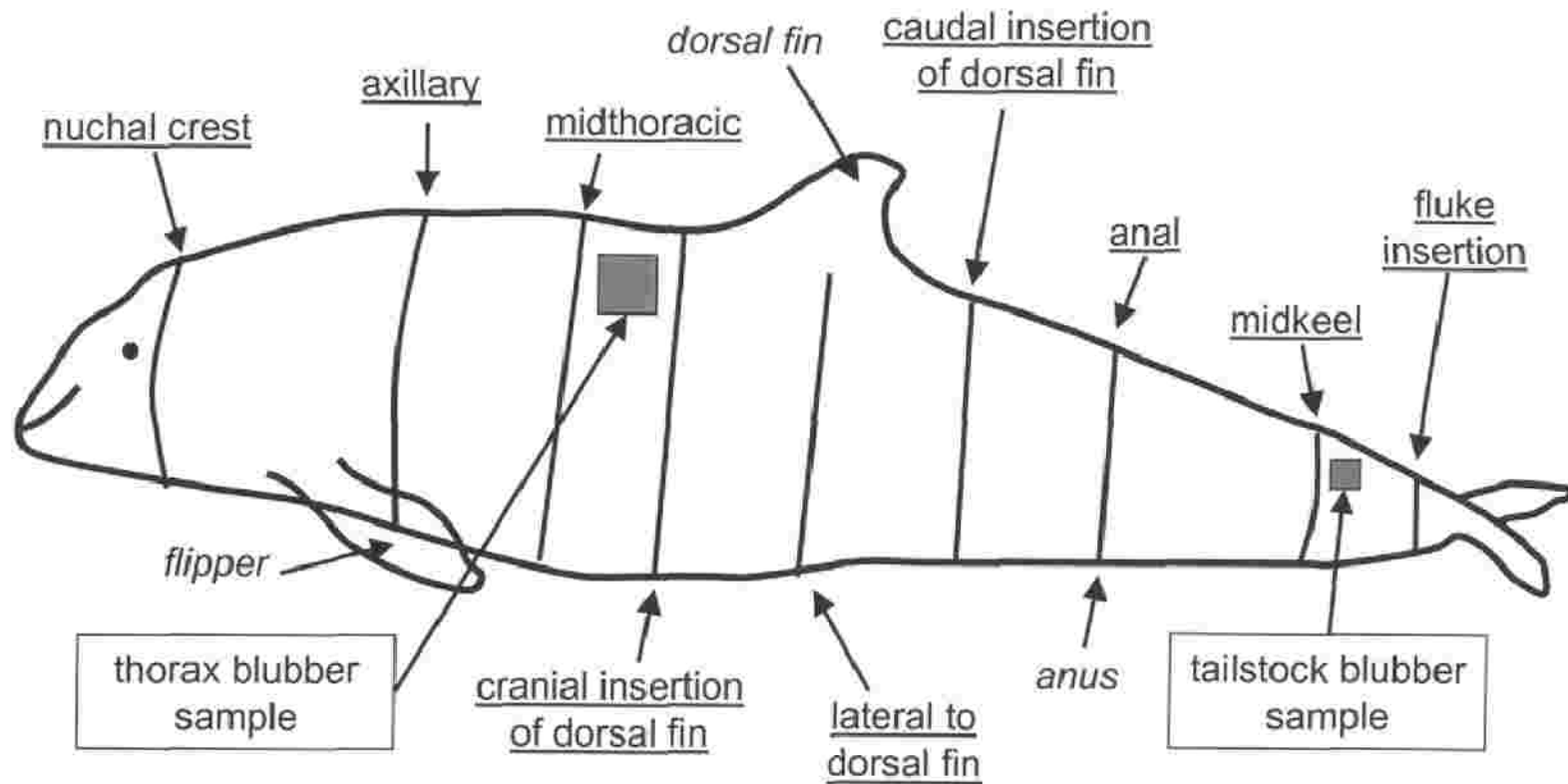
Fat (By-Catch)



Starved (Stranded)

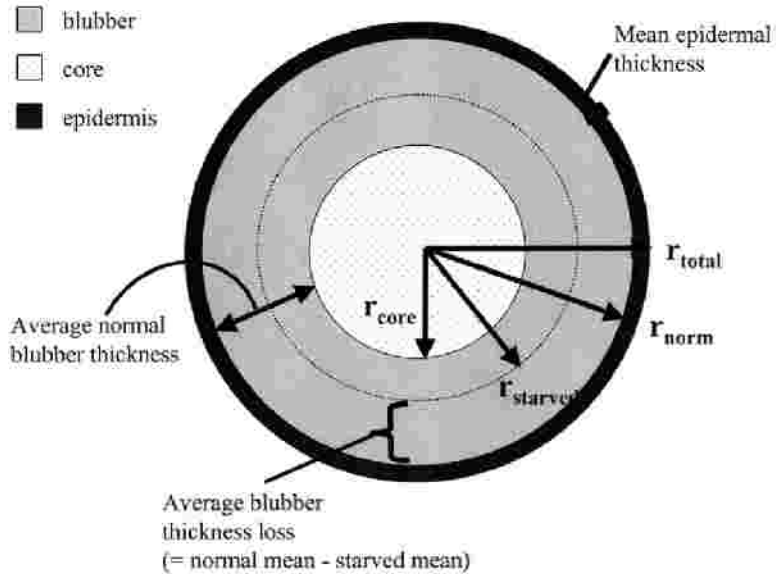
Koopman et al. 2002

# Regional specialization in blubber function



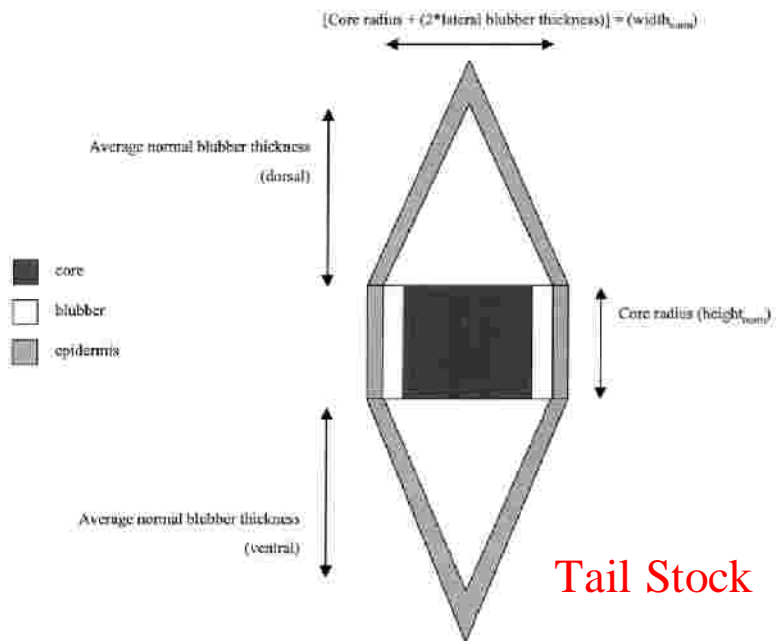
Koopman et al. 2002

## Thorax



## Blubber as an energy store

Starved porpoises lose blubber from their thorax but *not* their tail stock



Thorax blubber – insulation & energy

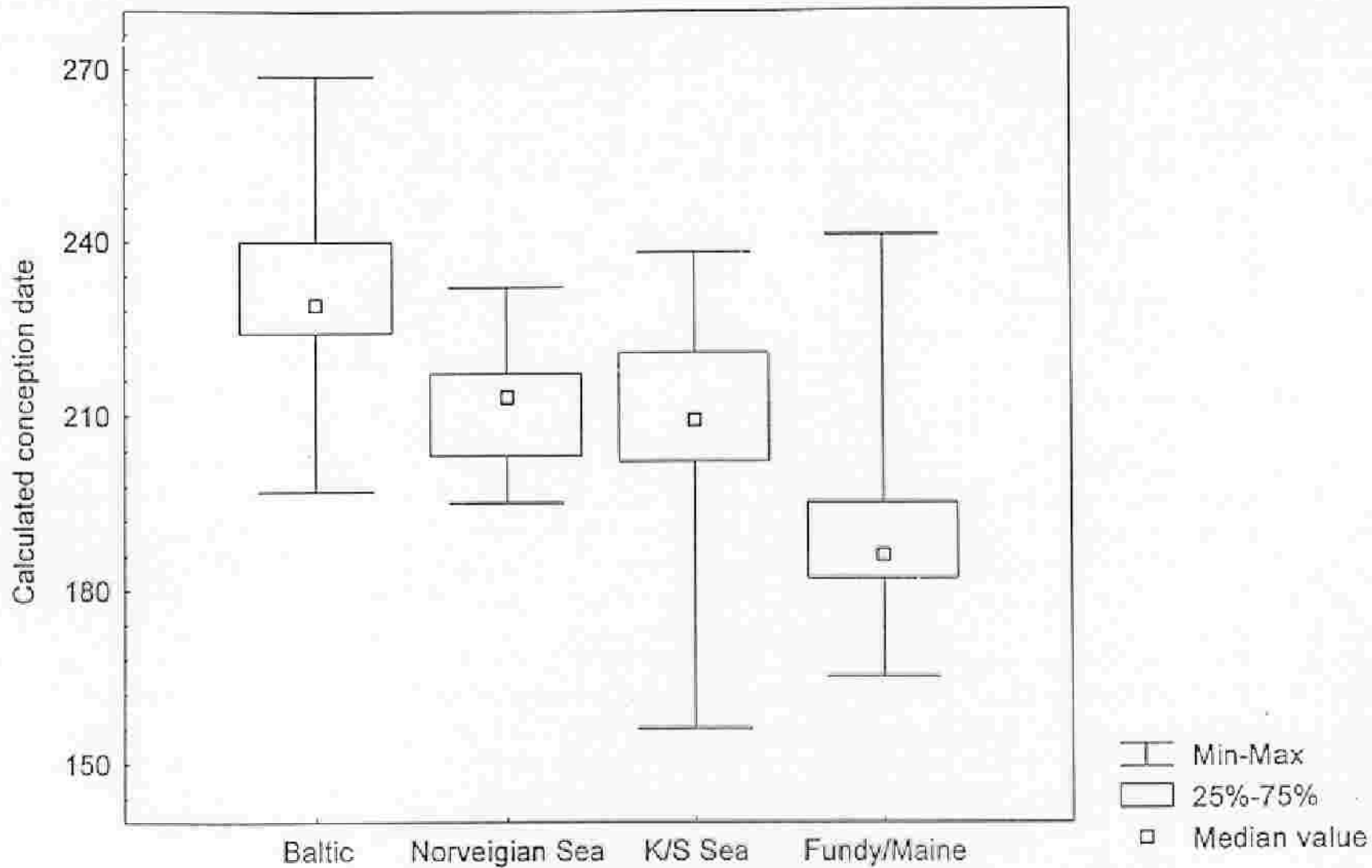
Tail stock blubber – biological spring

Koopman et al. 2002

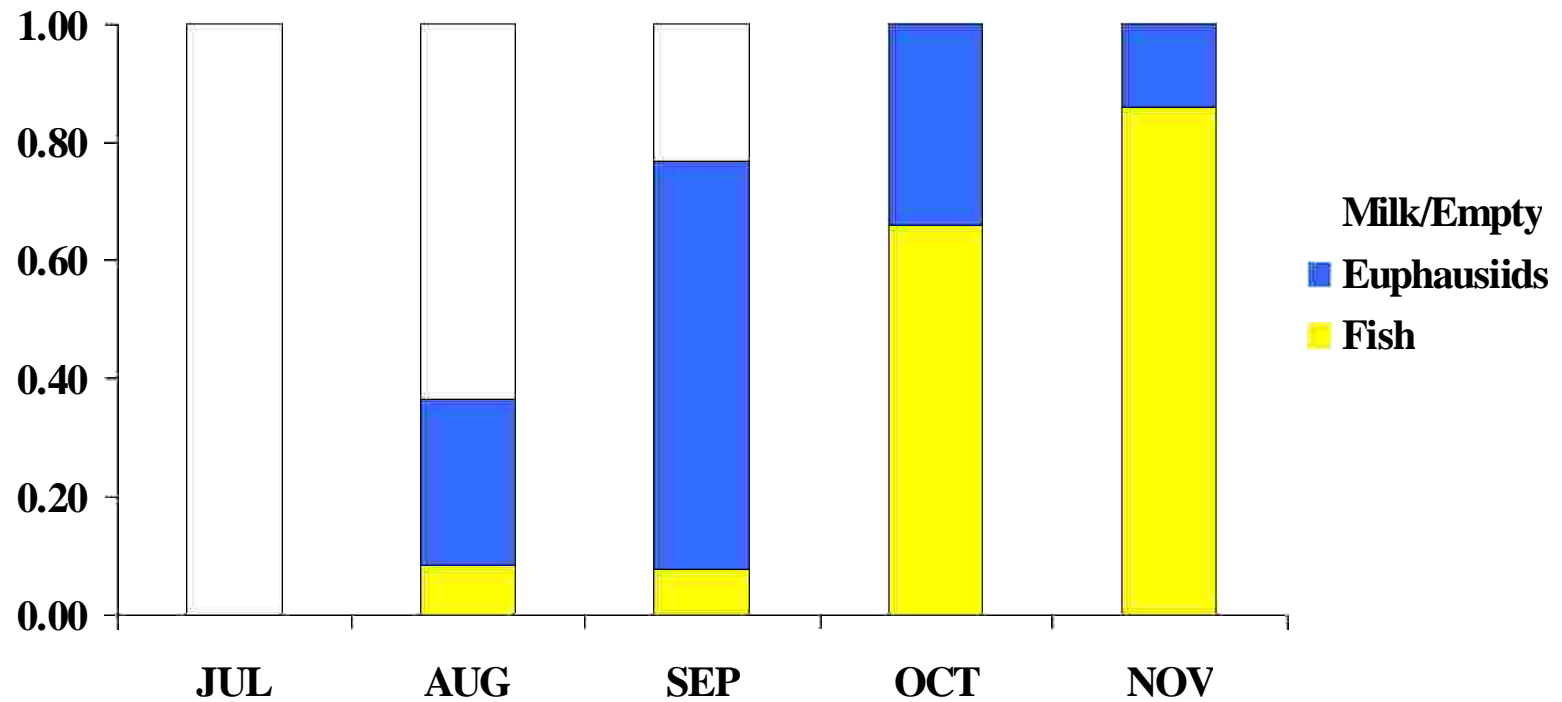
# Reproduction in harbour porpoises from the Gulf of Maine

Conception:	June
Implantation:	August
Gestation:	August - May
Birth:	mid-May
Lactation:	May - ?

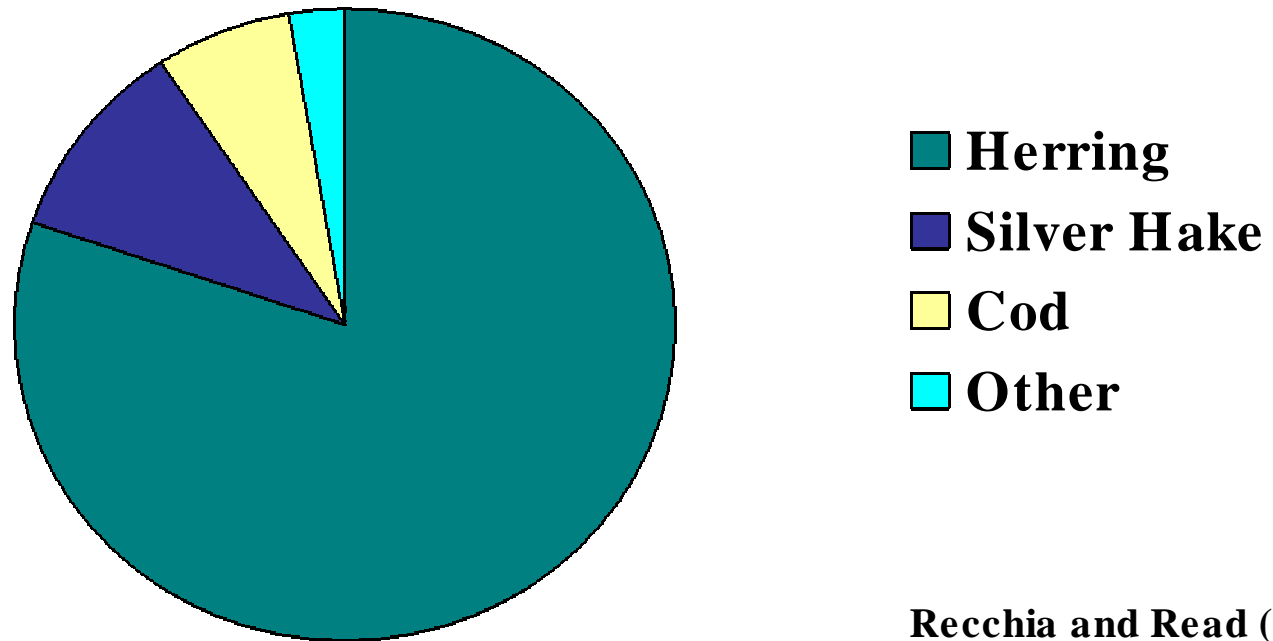




# Ontogeny of calf diet

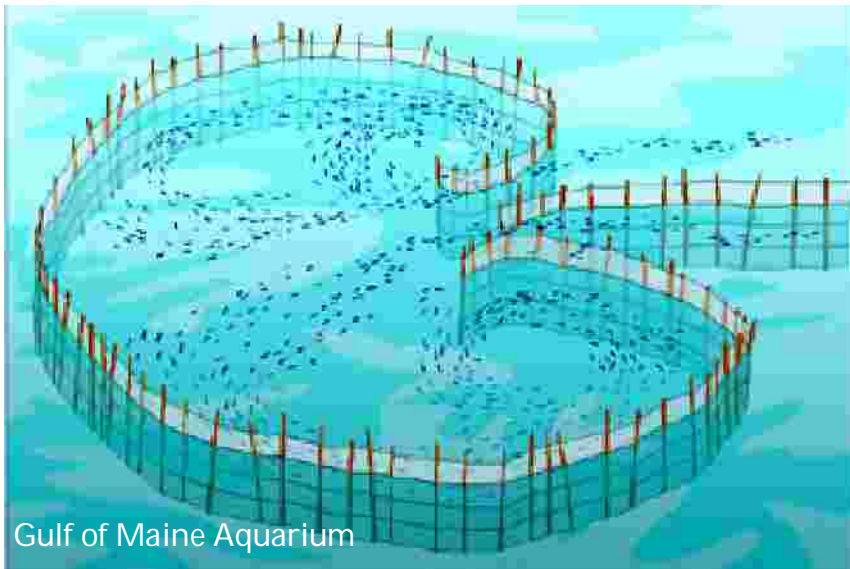


# Caloric intake of porpoises from the Bay of Fundy in summer

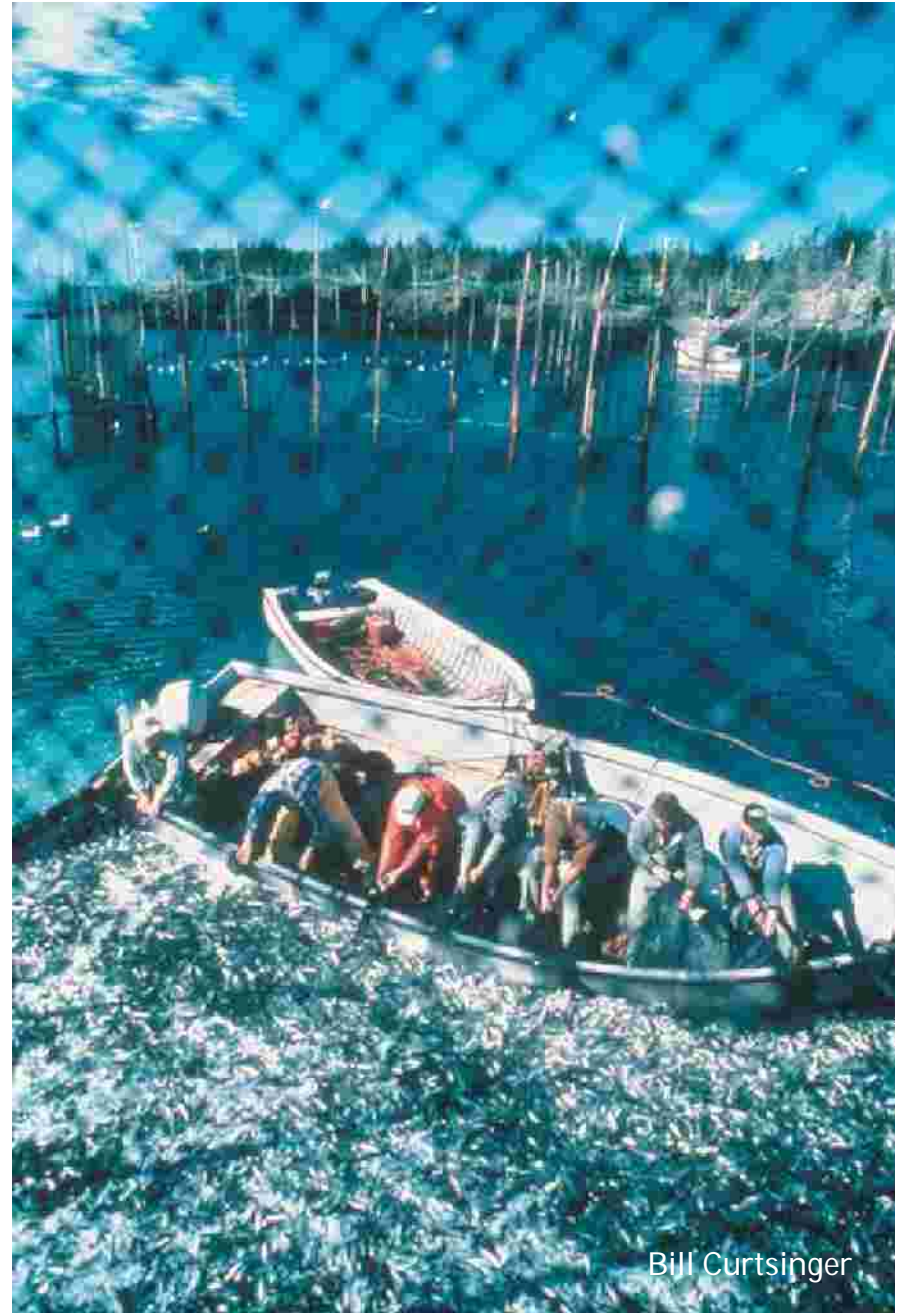




Herring are the primary prey for a wide variety of upper trophic level predators in the Bay of Fundy

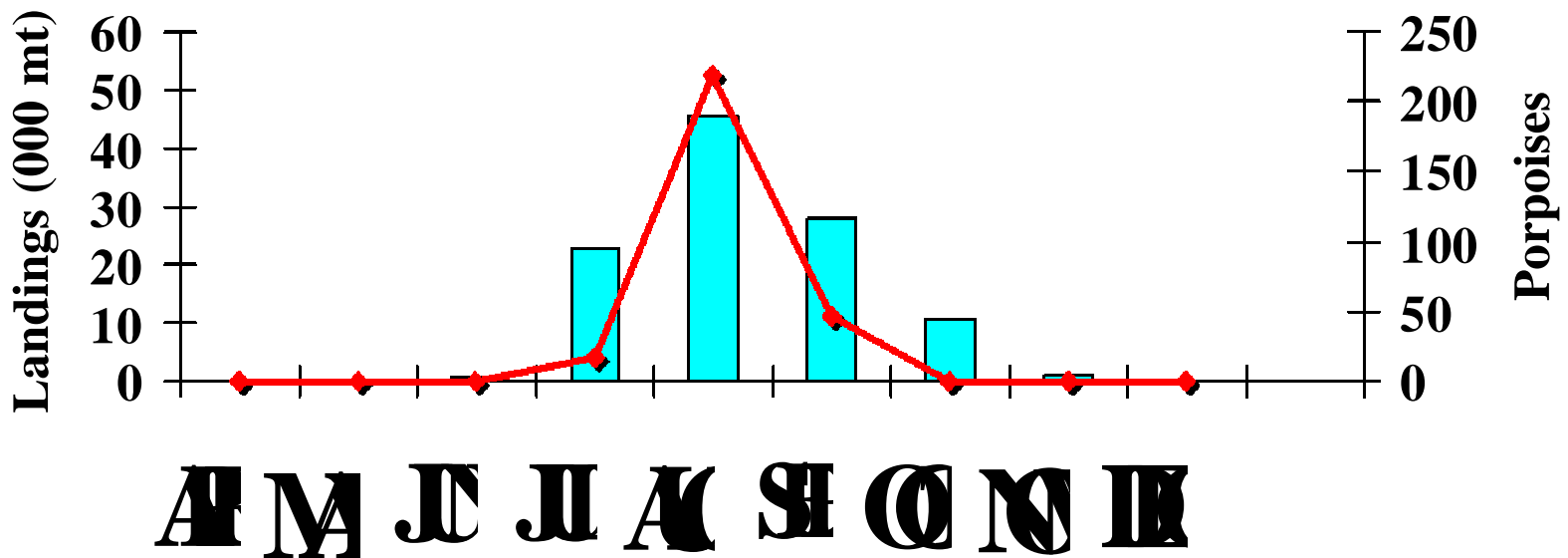


Gulf of Maine Aquarium



Bill Curtsinger

# Porpoises and Herring Weir Catches

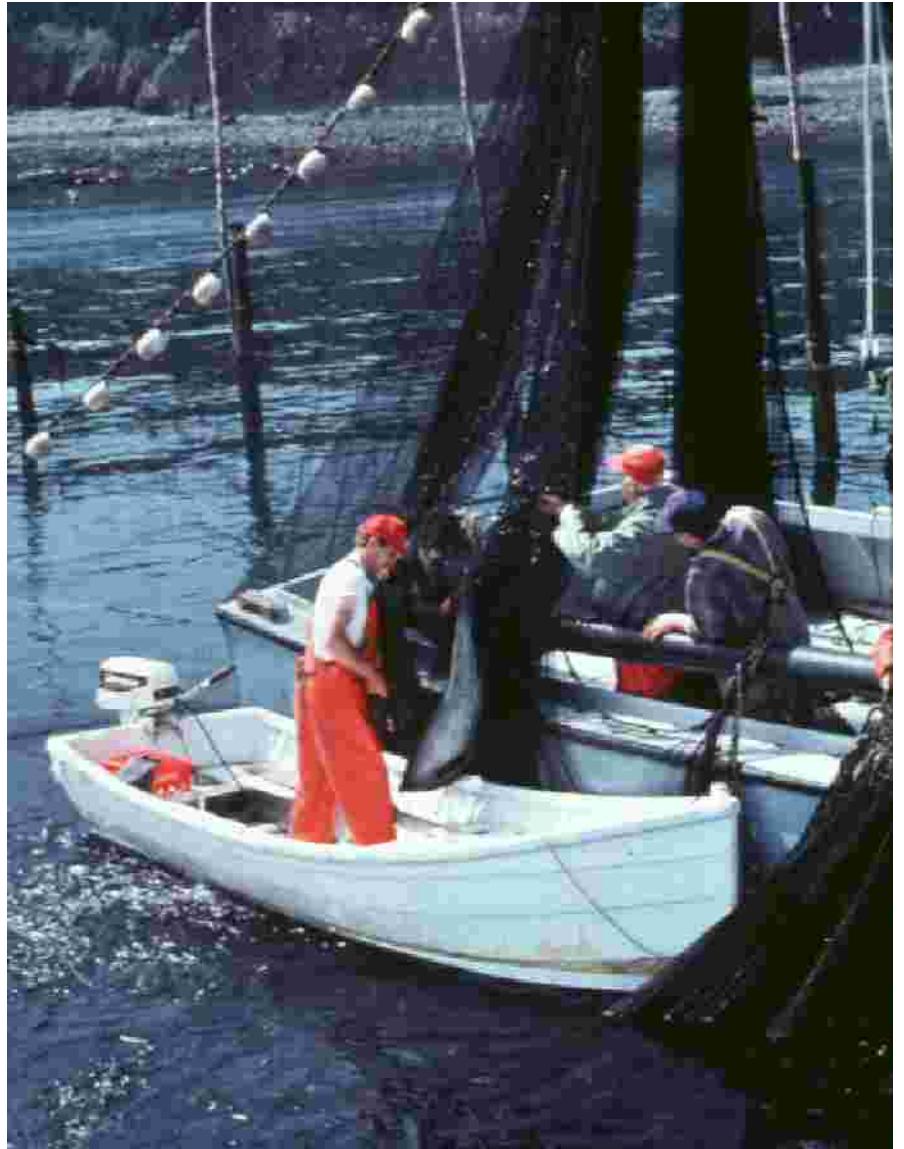


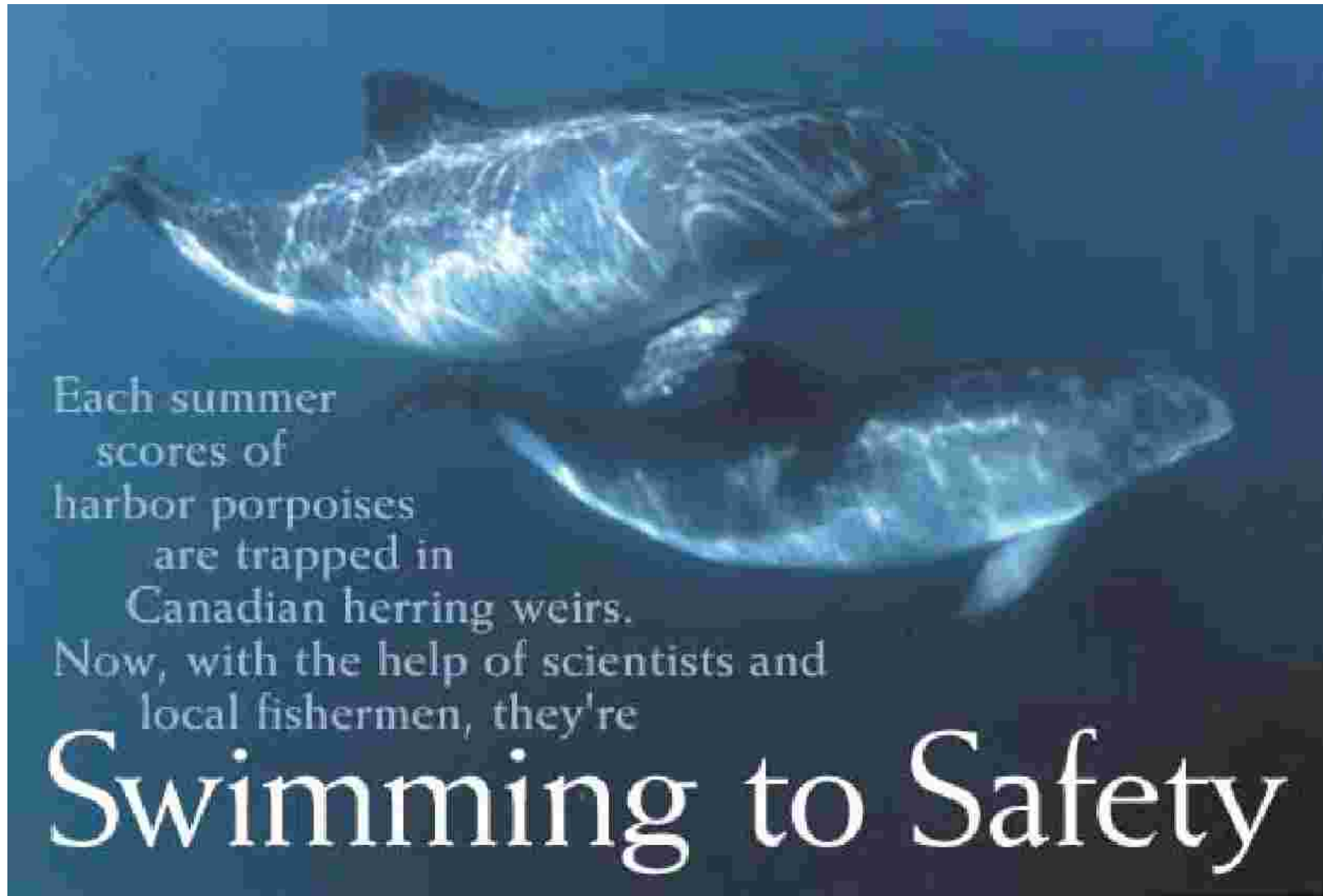
■ Landings —◆ Porpoises

Landings Data from DFO



Bill Curtsinger





Each summer  
scores of  
harbor porpoises  
are trapped in  
Canadian herring weirs.  
Now, with the help of scientists and  
local fishermen, they're

# Swimming to Safety



Text & Photos by Bill Curtsinger – June 2003

# Harbour Porpoise Release Program



Grand Manan Whale & Seabird Research Station

# Porpoise Release Program 1992 - 2001



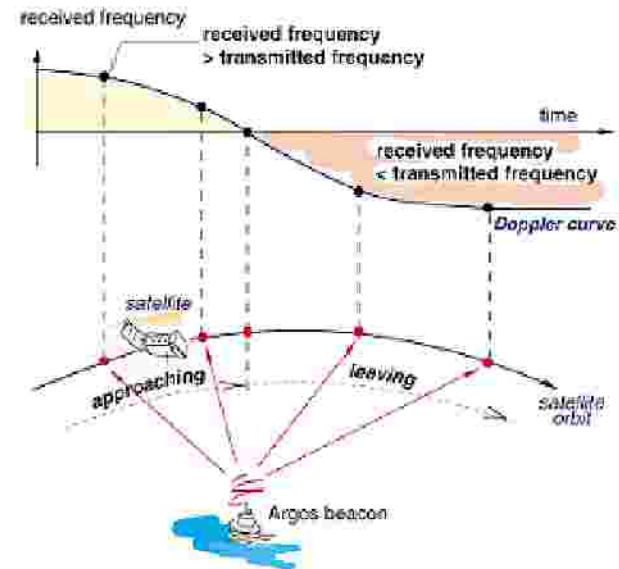
Total Captured		657
Released	588	(90%)
Died	69	(10%)



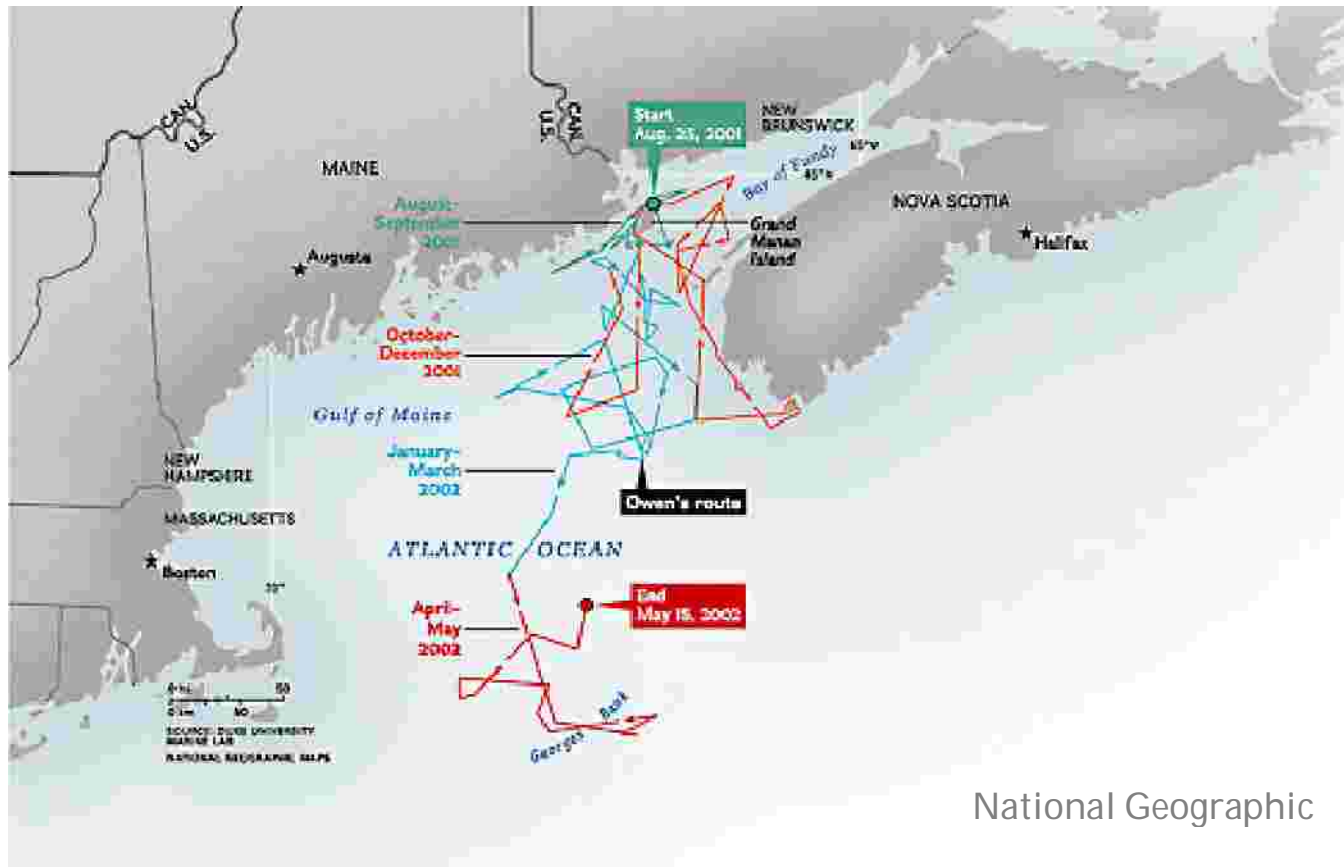
# Harbour Porpoise Release Program



"Late again! . . . This better be good!"



## Satellite-Linked Telemetry



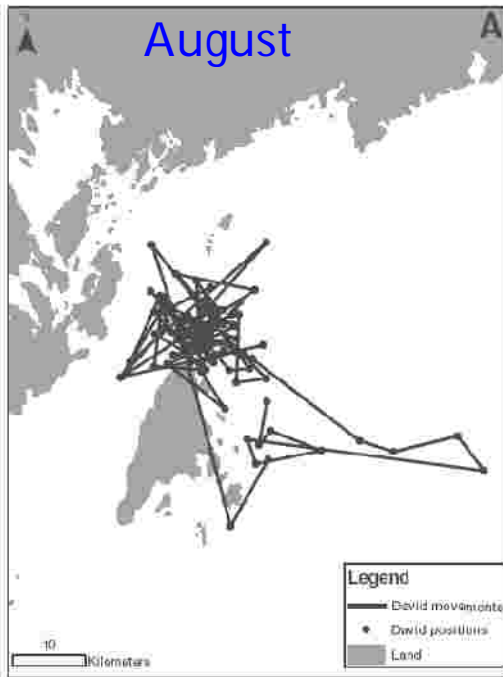
National Geographic

Movements of Owen – an adult male Porpoise

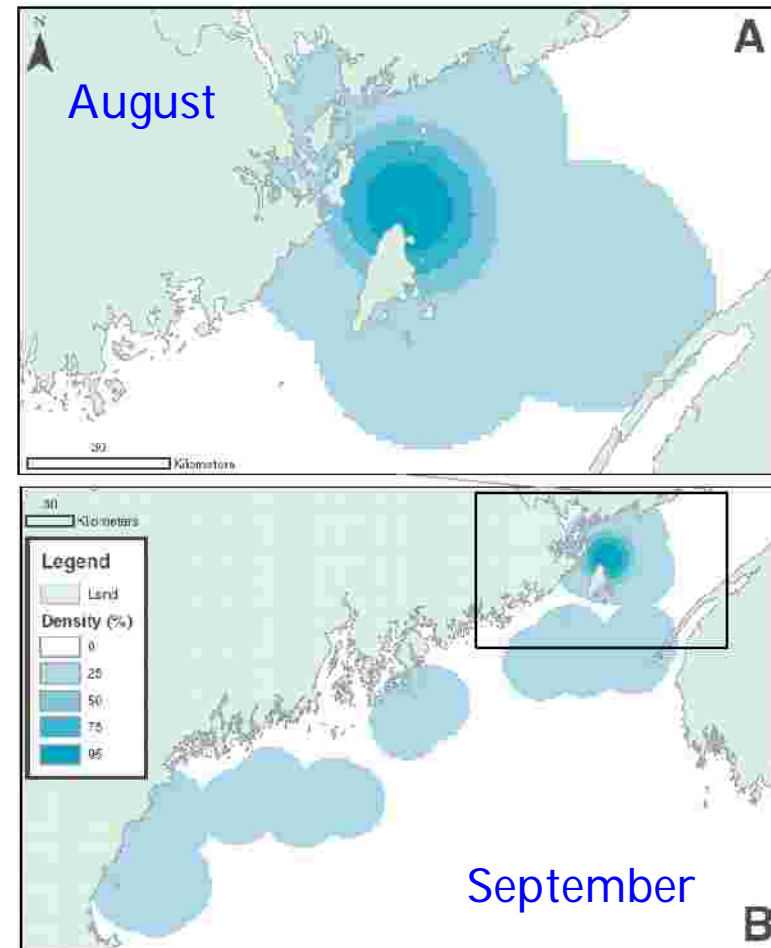
Released 25 August 2001

Last Contact 15 May 2002

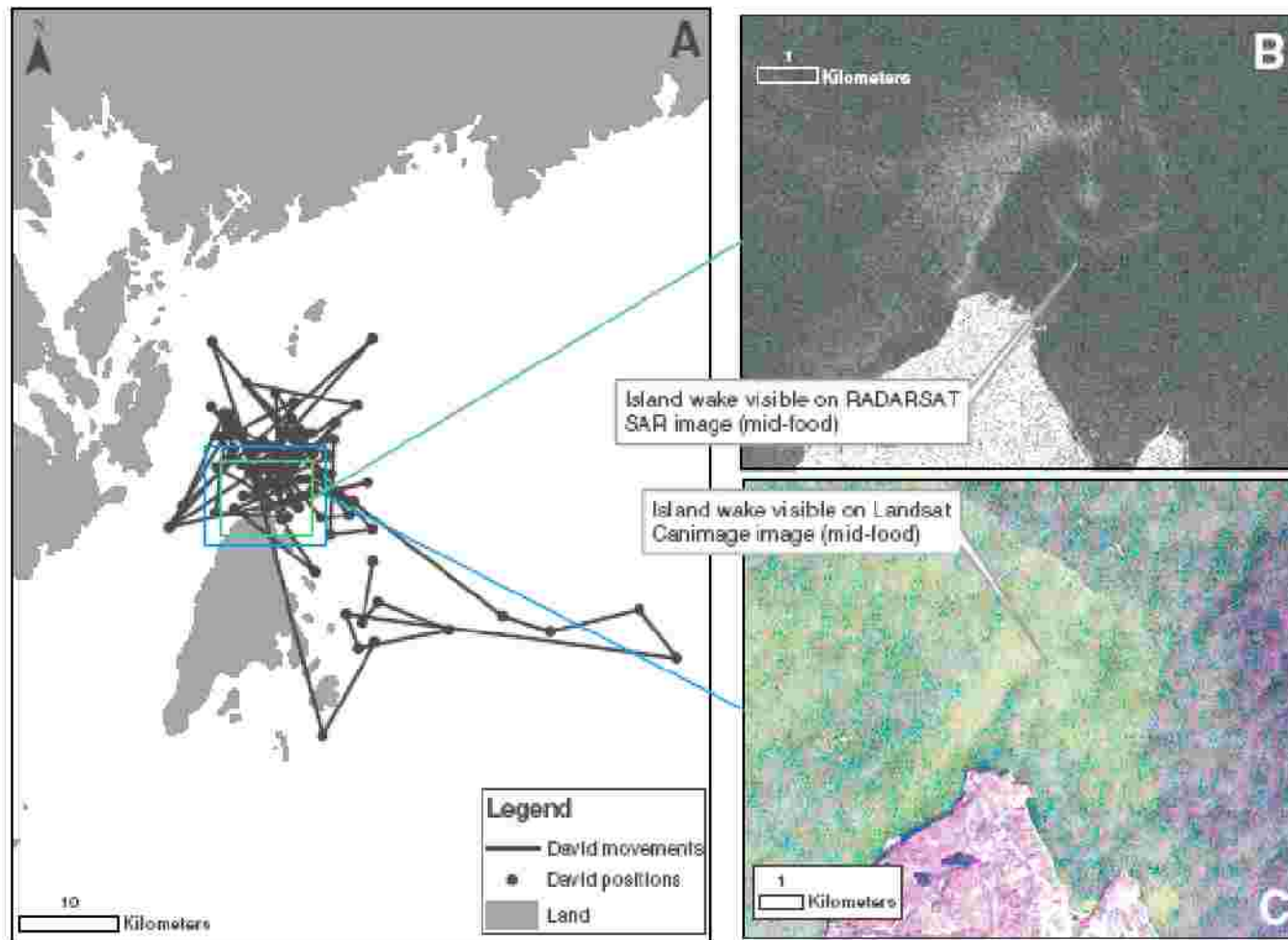
# Seasonal Movements



Movements of David  
Adult Male Porpoise  
Released 02 August 1999

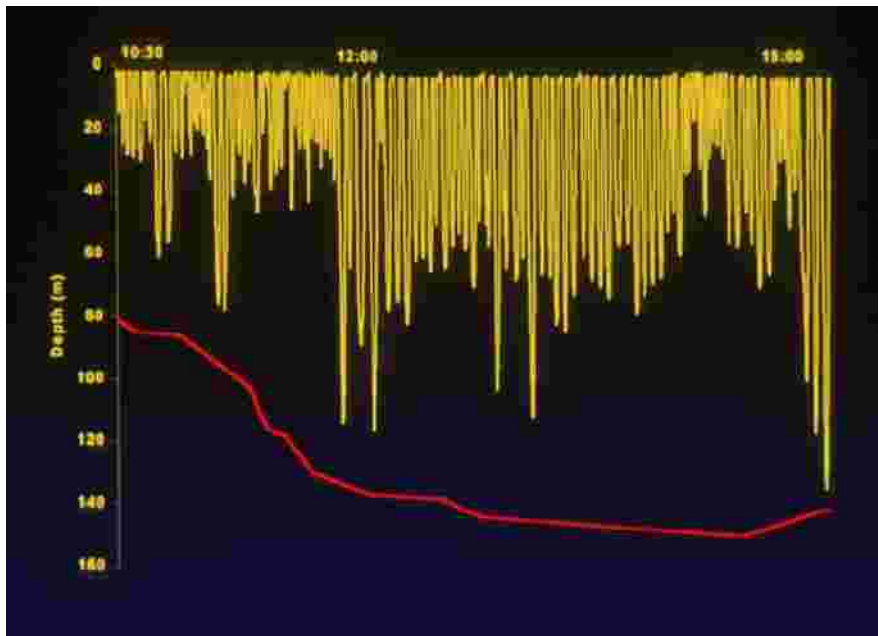


# Porpoises Exploit Fine-Scale Features



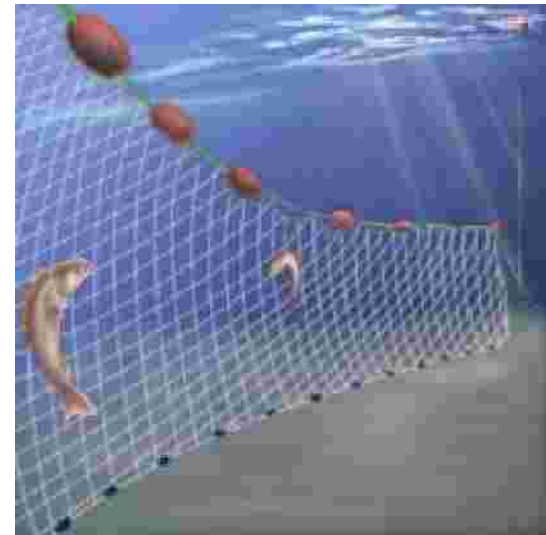


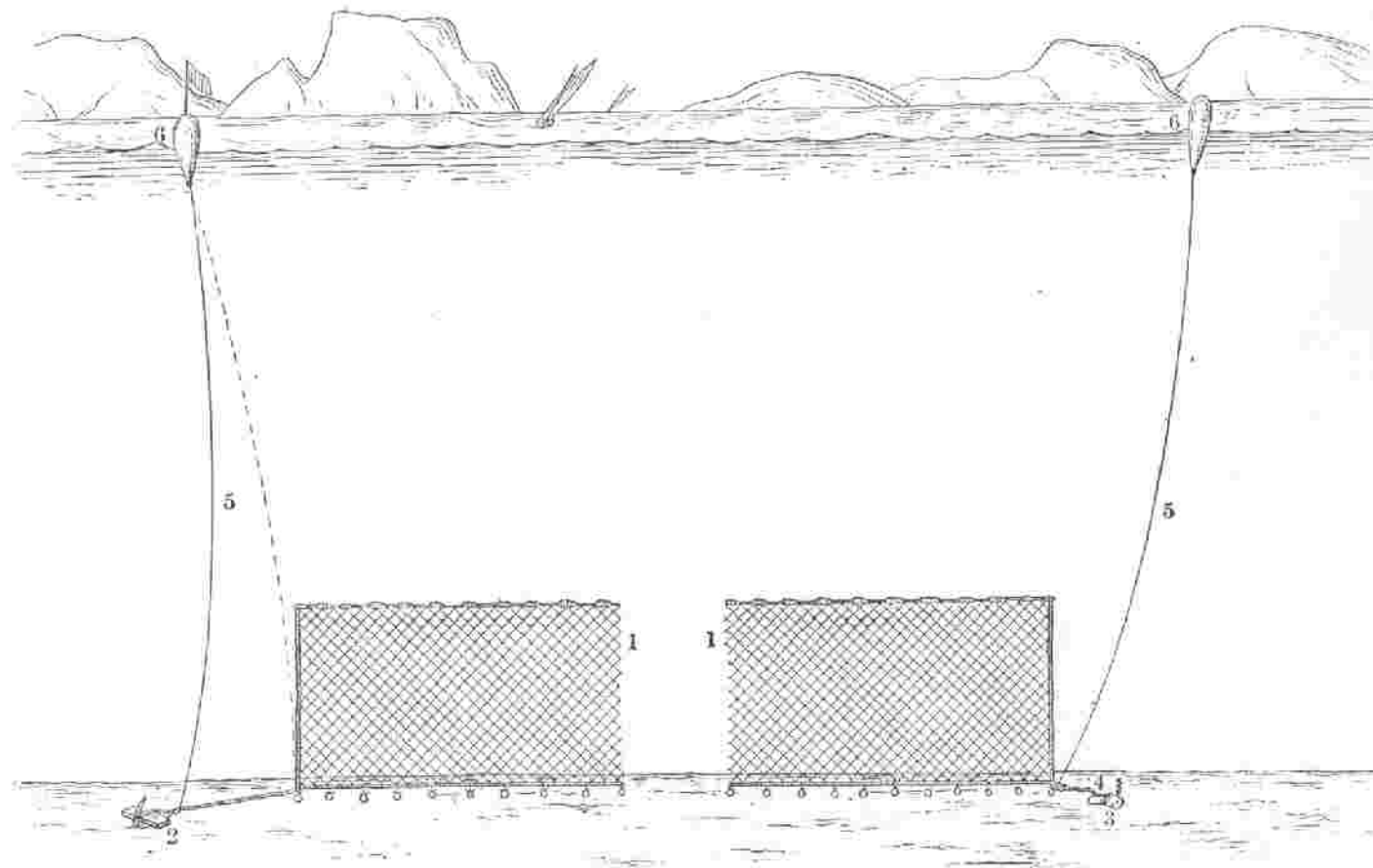
Passamaquoddy Porpoise Hunt at the Long Eddy ~ 1880



Despite their small size, porpoises can dive to the deepest part of the Bay of Fundy - to 226 meters

## By-Catch of Harbour Porpoises in Bottom Set Gill Nets





Another feature of the net fishing is that, in addition to the various species of cod which have been taken, porpoises (locally called “puffers”) have been caught...”

# Harbour Porpoise By-Catch in the Gulf of Maine

Year	Porpoises
1990	2900
1991	2000
1992	1200
1993	1400
1994	2100



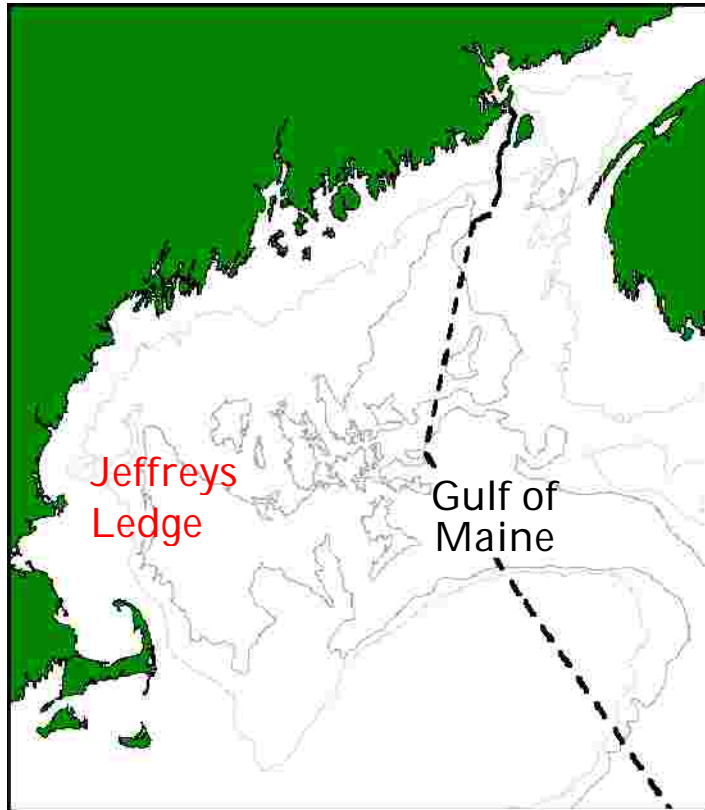
# The New Hampshire Pinger Experiment

15 participating fishermen  
15 independent observers

Tightly-controlled, double-blind experiment



# The New Hampshire Pinger Experiment



# The New Hampshire Pinger Experiment

	Active	Control
Nets	421	423
Cod (kg)	59.2	61.0
Porpoises	2	25



# Harbor Porpoise Take Reduction Plan

December 1998

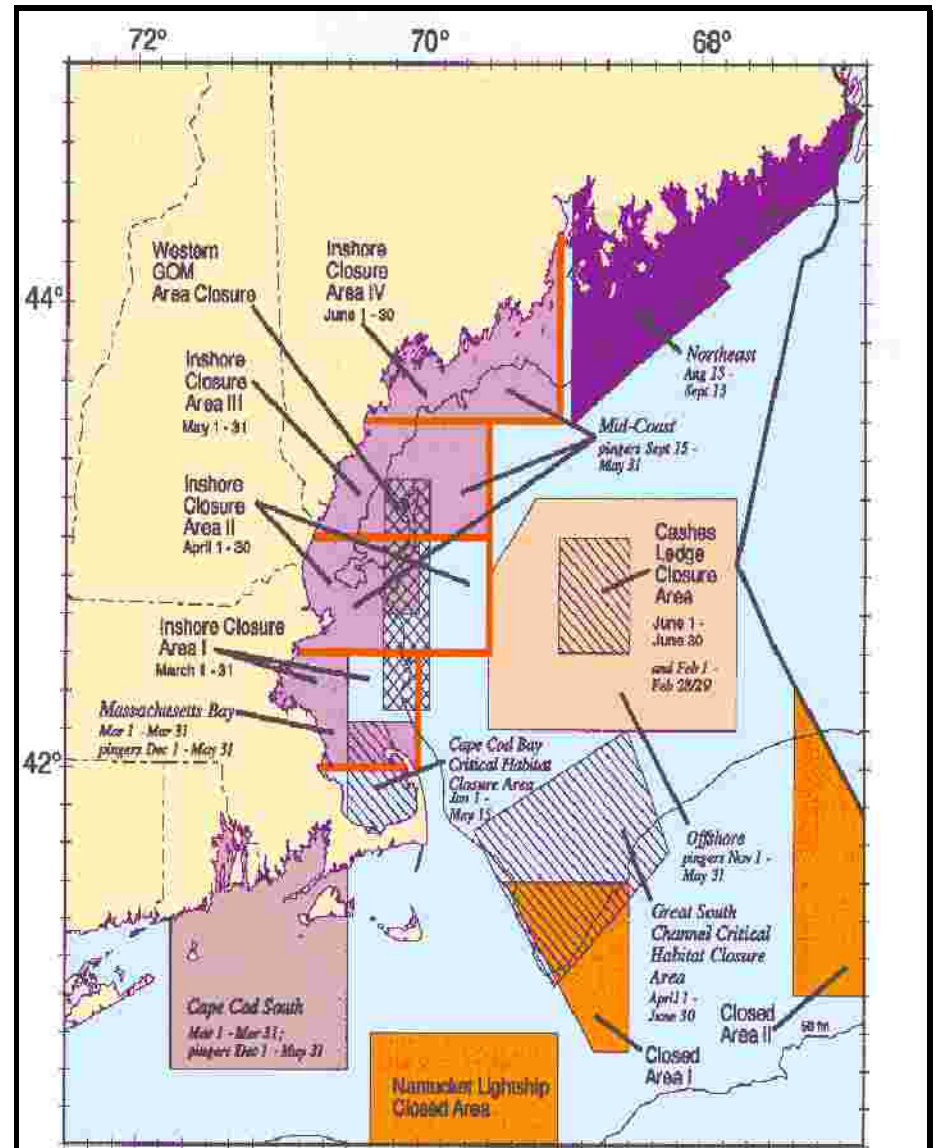


Chart of closures under the Gulf of Maine component of the Harbor Porpoise Take Reduction Plan and closures under the Northeast Multispecies Fishery Management Plan

# Harbour Porpoise By-Catches in the Gulf of Maine

Year	By-Catch
1992-1996	1,667
1997	782
1998	332
1999	270
2000	507
2001	53



Current PBR = 747

# Harbour Porpoise By-Catches in the Gulf of Maine

Year	By-Catch
1992-1996	1,667
1997	782
1998	332
1999	270
2000	507
2001	53
2002	444
2003	592
2004	654

Current PBR = 747



# Harbour Porpoise By-Catches in the Gulf of Maine

Federal observers monitored 217 sink gill net trips in 2003

A total of 173 trips were not in compliance with the TRP

Fishing in closed areas (18 trips)

Fishing without pingers (155 trips)



Cox et al. (2007) Conservation Biology 21: 1155

The porpoises have taught us much...



...but there's a lot left to learn

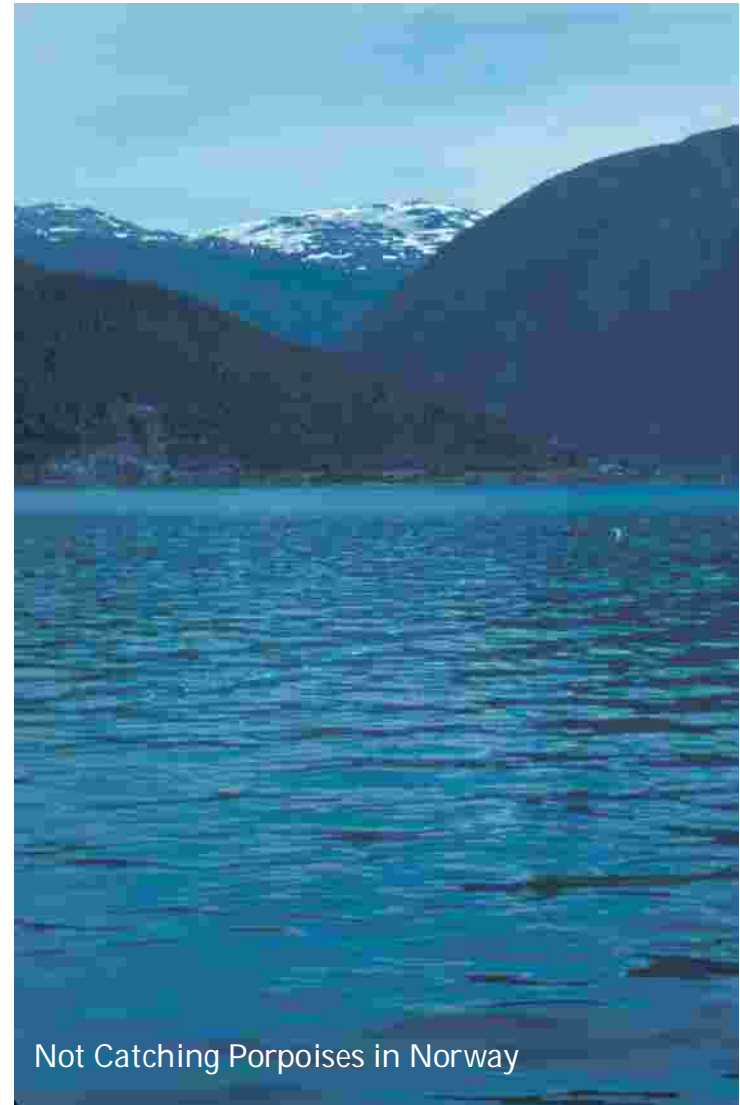
# Of course, things don't always work out...



Sinking of the Nan Carolyn



The Monterey Bay Weir Fiasco



Not Catching Porpoises in Norway



Harbour Porpoise *Phocoena phocoena*



Burmeister's Porpoise *Phocoena spinipinnis*



Vaquita *Phocoena sinus*



Spectacled Porpoise *Phocoena dioptrica*



Finless Porpoise *Neophocaena phocaenoides*



Dall's Porpoise *Phocoenoides dalli*

# Conservation of the Vaquita



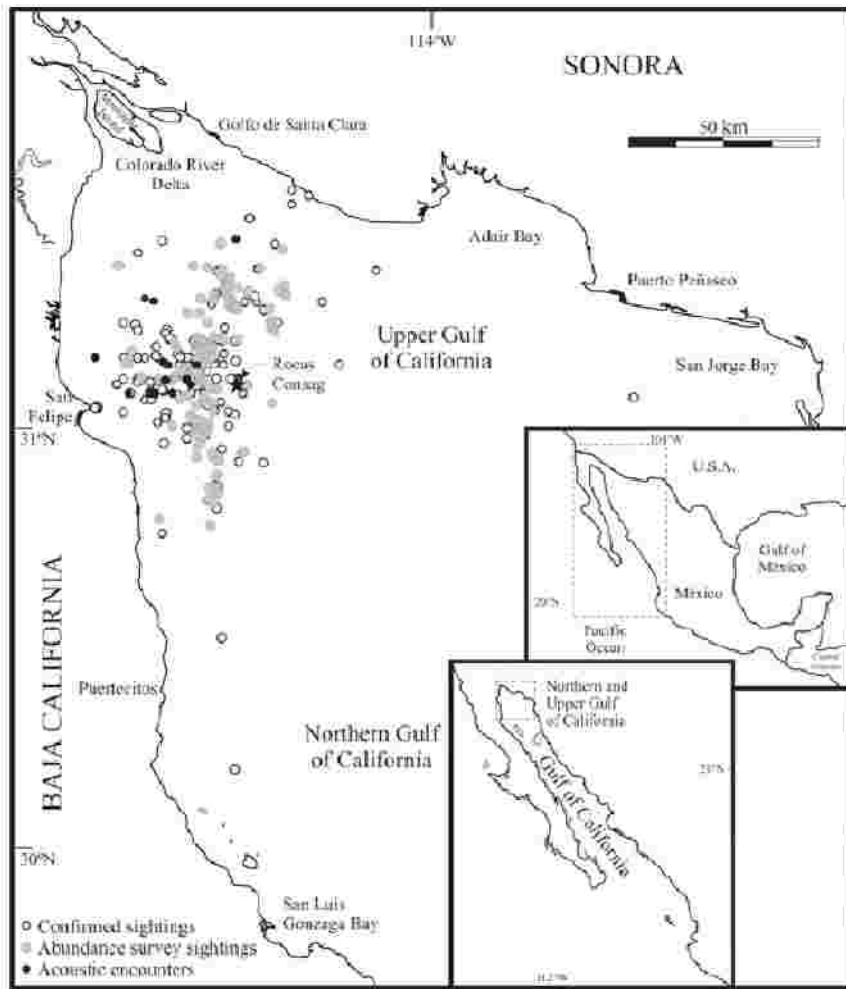
# Biology of the Vaquita *Phocoena sinus*



Alejandro Robles

- Most restricted range of any cetacean
- Endemic to the Upper Gulf of California
- Even smaller than harbour porpoises
- Do not breed annually
- Shy and difficult to observe at sea

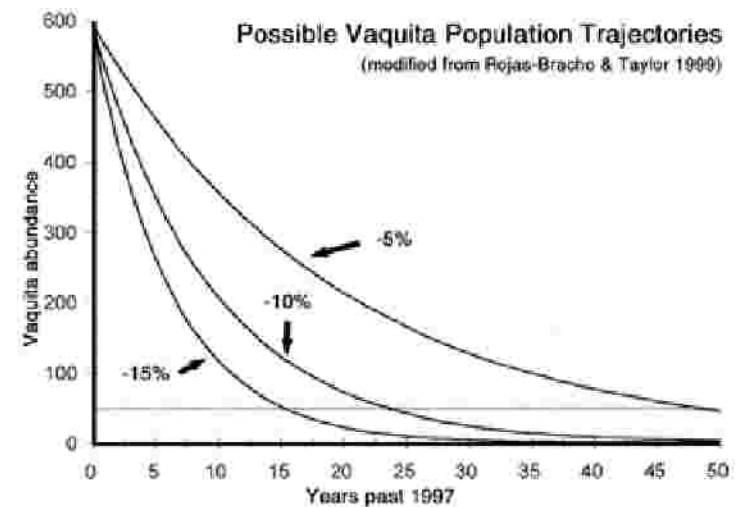
Almost all information comes from specimens killed in gill net fisheries



Rojas-Bracho et al. (2006)

The modern range of the vaquita is limited to 4,000 km<sup>2</sup>

Current population size is likely about 150 individuals



# Thanks for all the fish...

## Collaborators:

Per Berggren

Tara Cox

David Gaskin

Dave Johnston

Heather Koopman

Scott Kraus

Krystal Tolley

Andrew Westgate

Bill Watkins

Kim Urian

Weir & Gill Net Fishermen

## Funding Agencies:

HSUS

IFAW

MMC

ONR

National Geographic

NOAA

NSERC

WWF – Canada

WWF – US