What can Static Acoustic Monitoring achieve?

Nick Tregenza

Chelonia Limited
University of Plymouth

What has SAM achieved?

What can SAM achieve?

What will SAM achieve?

Literature review

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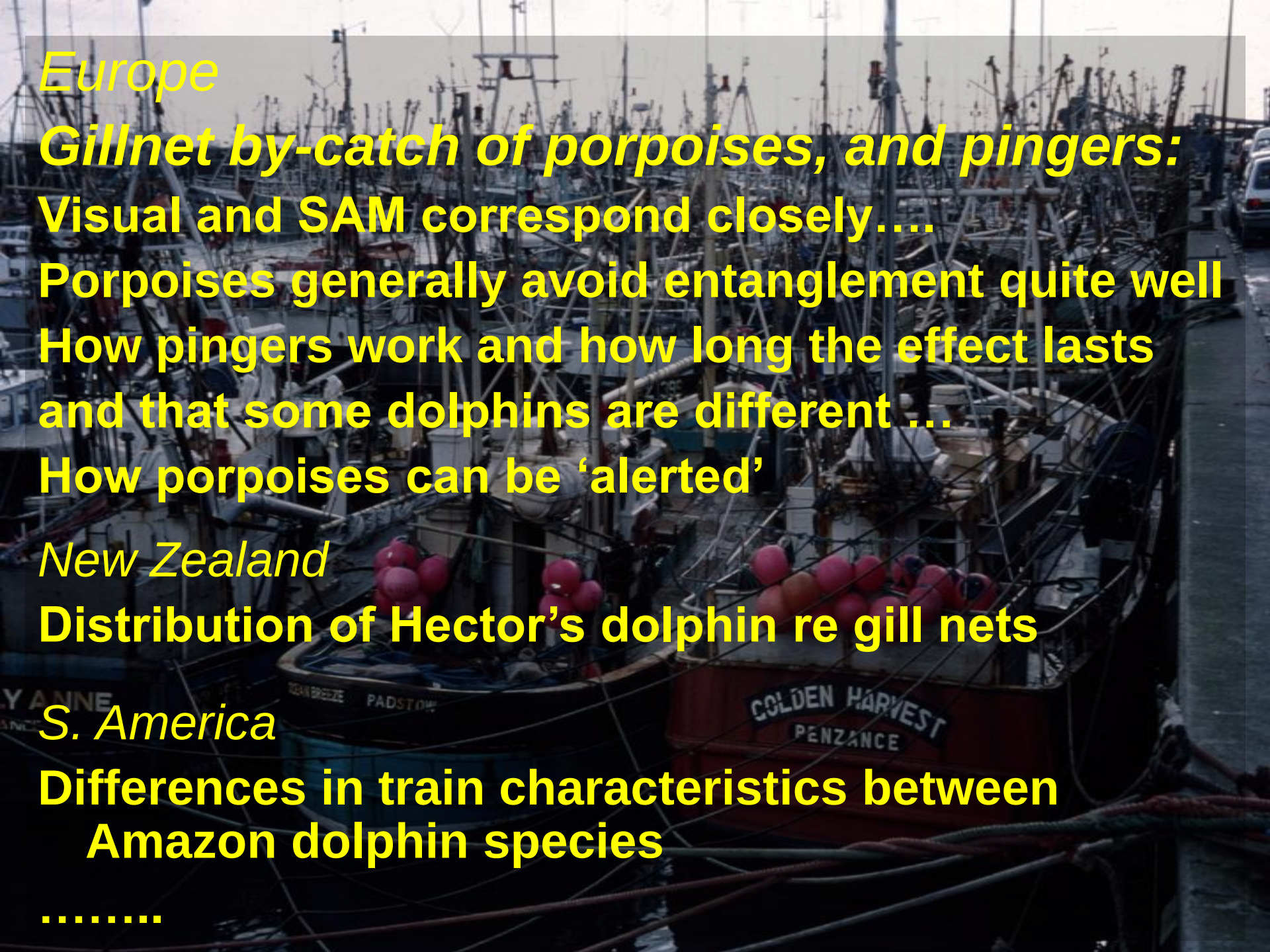


Europe

Gillnet by-catch of porpoises, and pingers:

Visual and SAM correspond closely….

Porpoises generally avoid entanglement quite well

How pingers work and how long the effect lasts and that some dolphins are different …

How porpoises can be 'alerted'

New Zealand

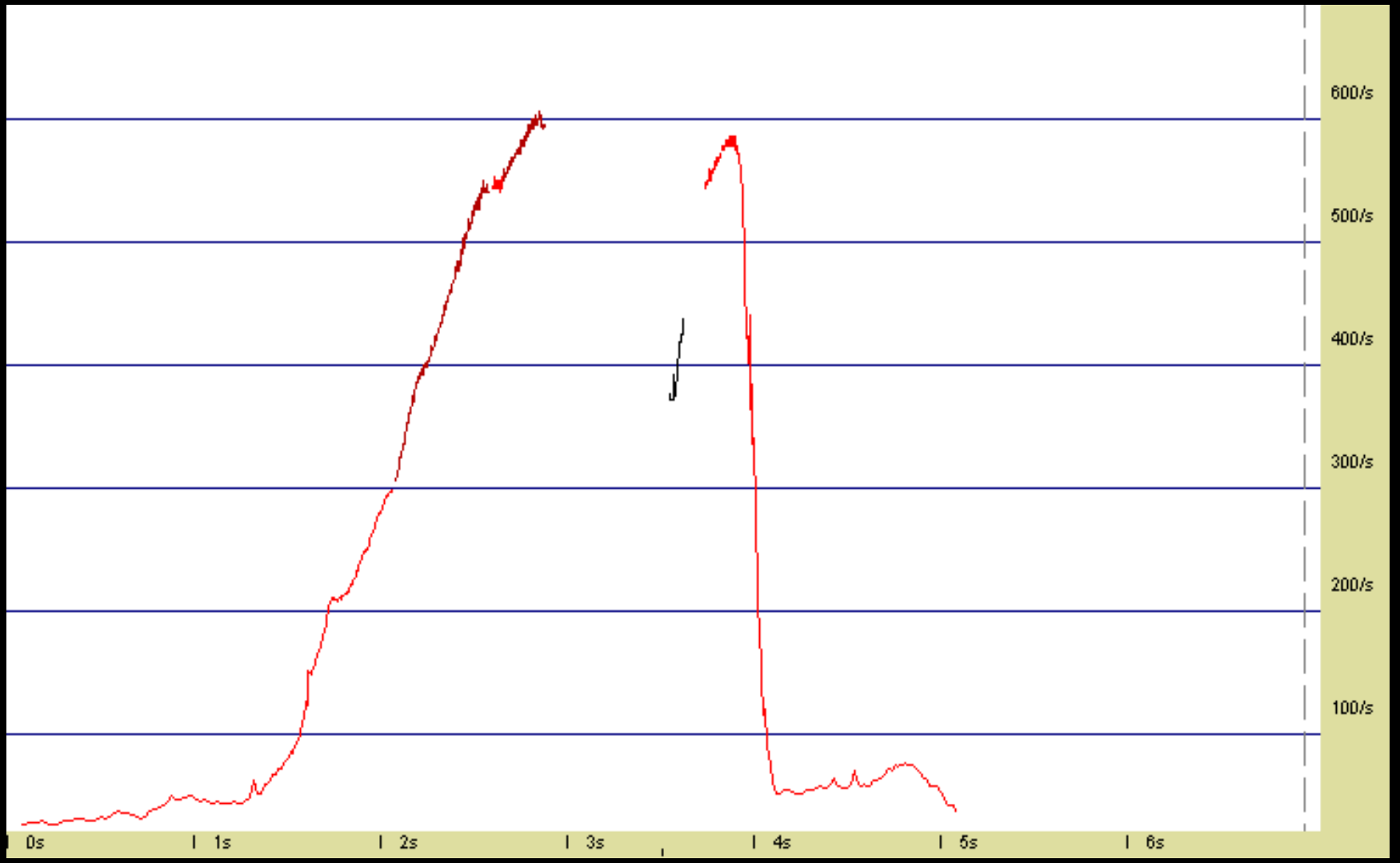
Distribution of Hector's dolphin re gill nets

S. America

Differences in train characteristics between Amazon dolphin species

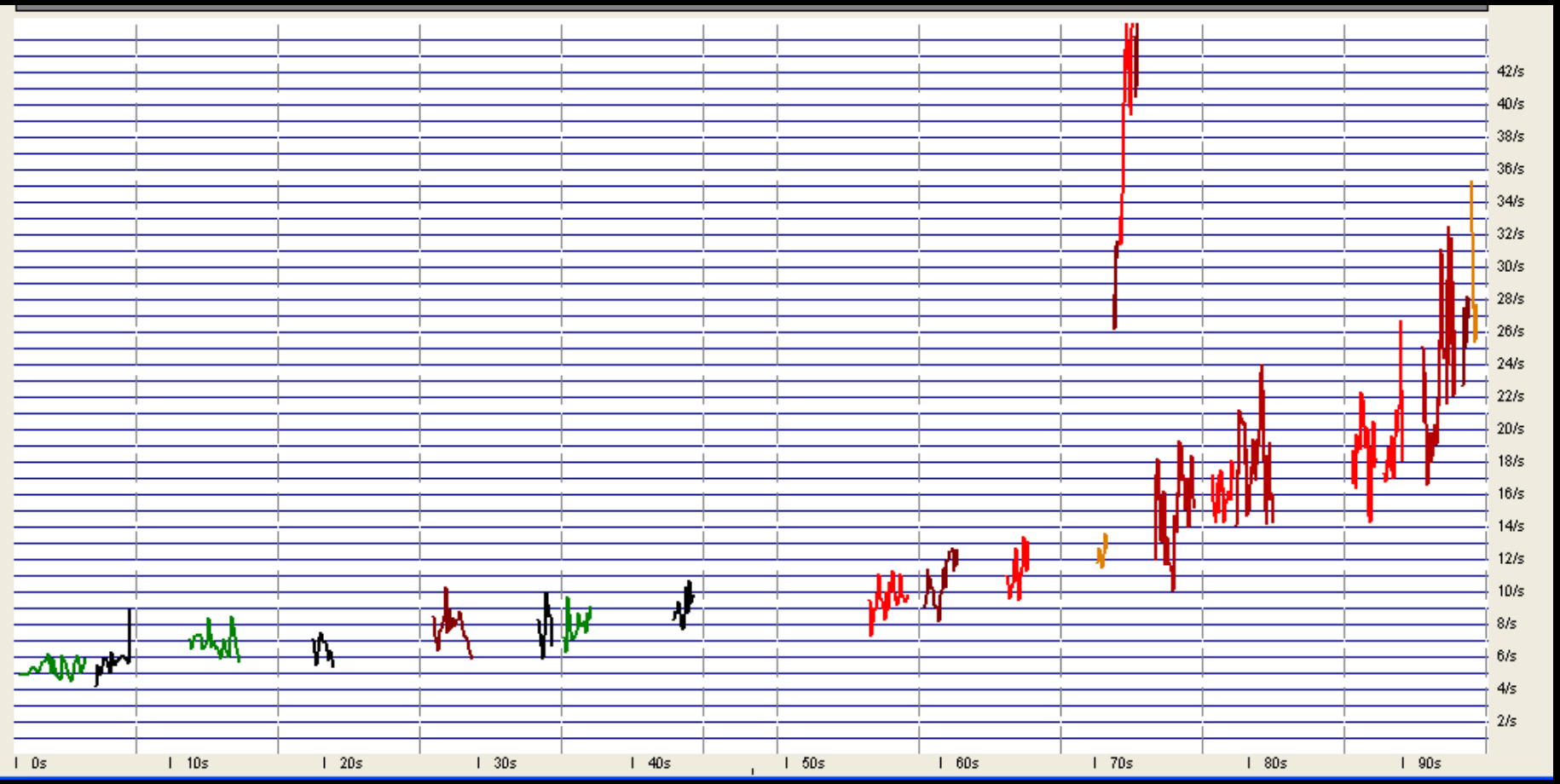
……..

Behaviour can be recognised:



Porpoise feeding buzz: data from Paul Fisher, Shetland

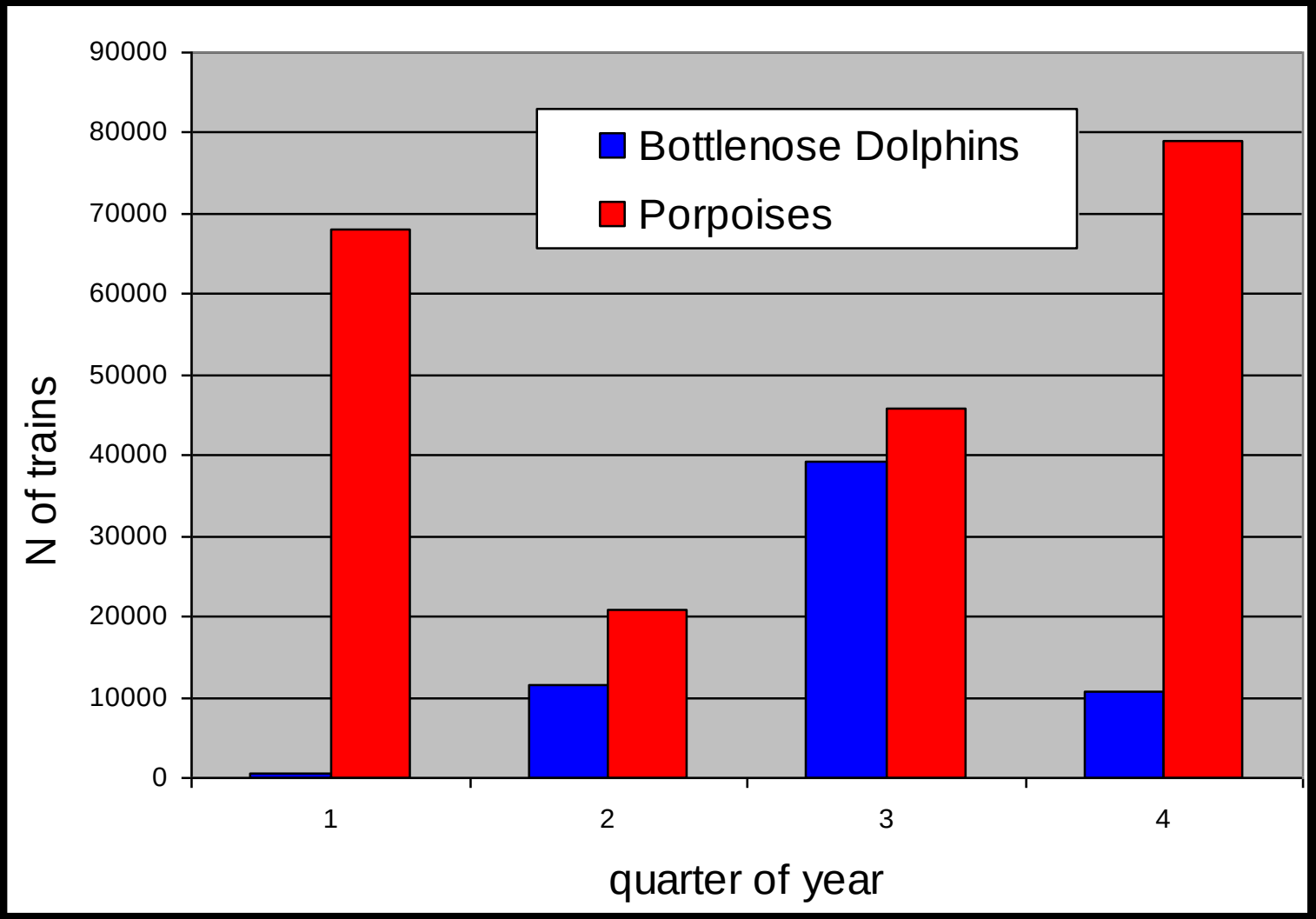
porpoise approach sequence:



Wind farms

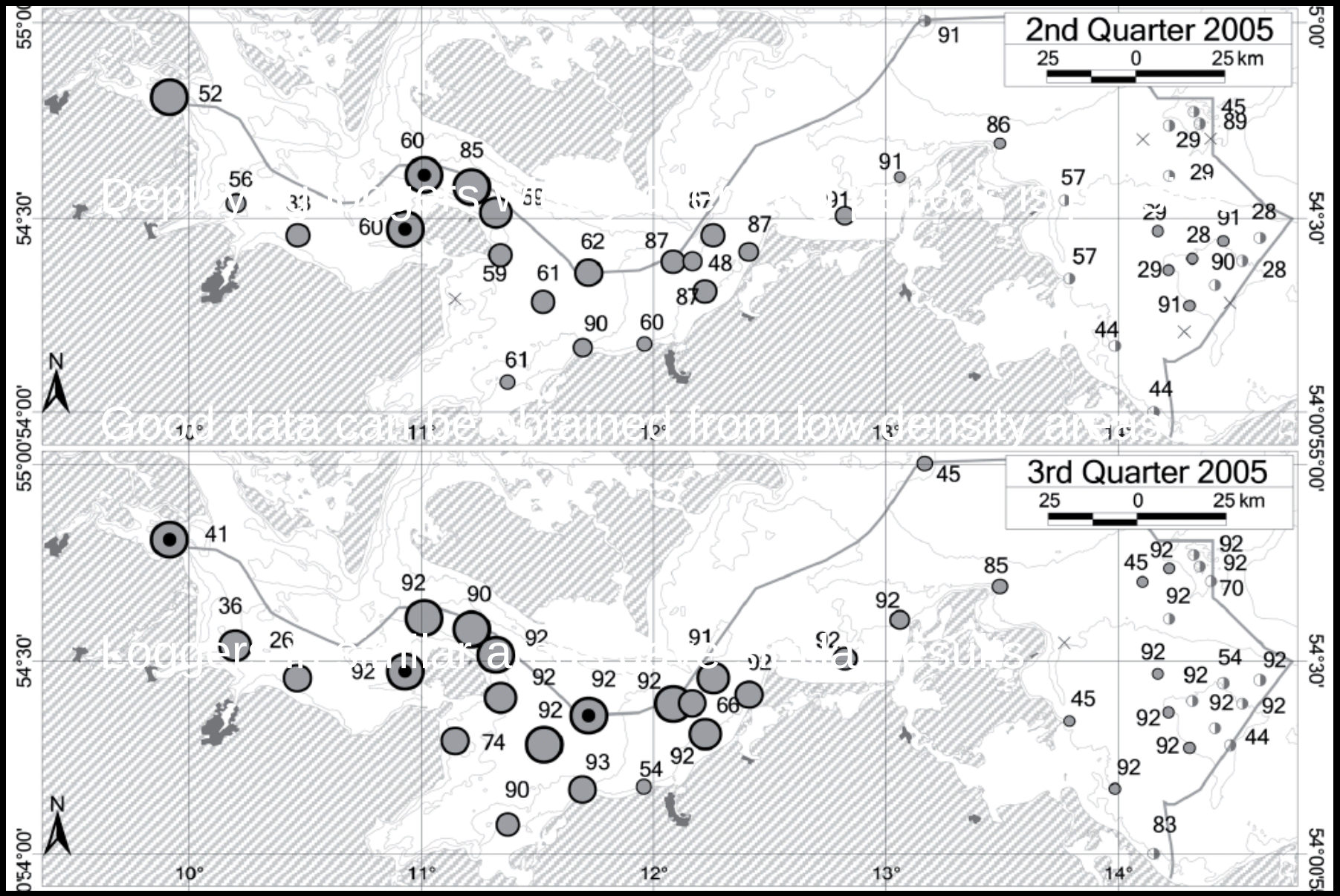
- **Very brief displacement of porpoises out to 20km.** *NERI*.
- **Report on longer term effects awaited** *Diederichs et al*

Bottlenose and porpoise monitoring



Cardigan Bay, Wales. CCW / Seawatch Foundation

Porpoise monitoring in low-density areas



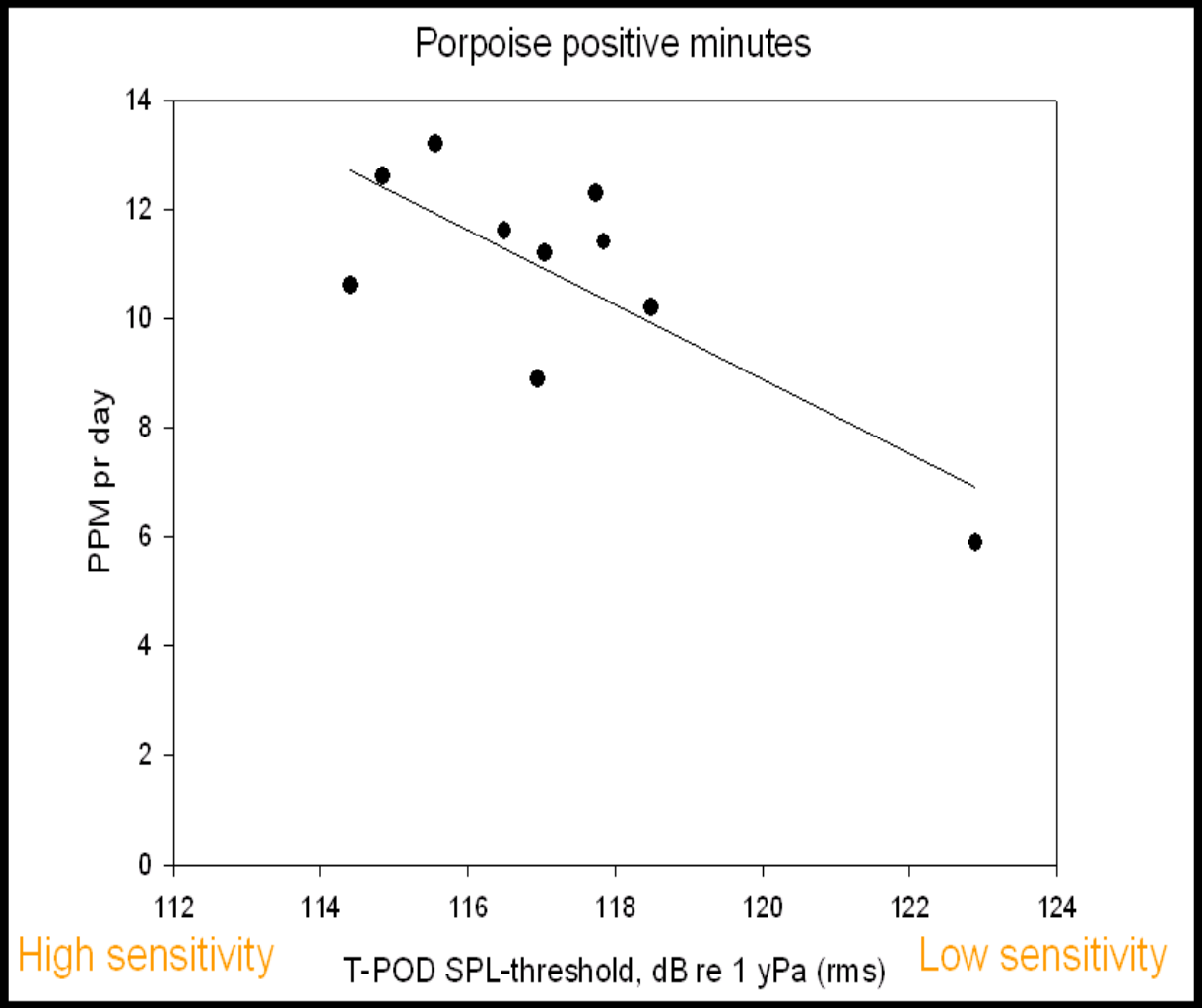
Verfuß, U. K.; Meding, A.; Honnef, C. G.; Dähne, M. & Benke, H. (2007): JMBA

What has SAM achieved?

What can SAM achieve?

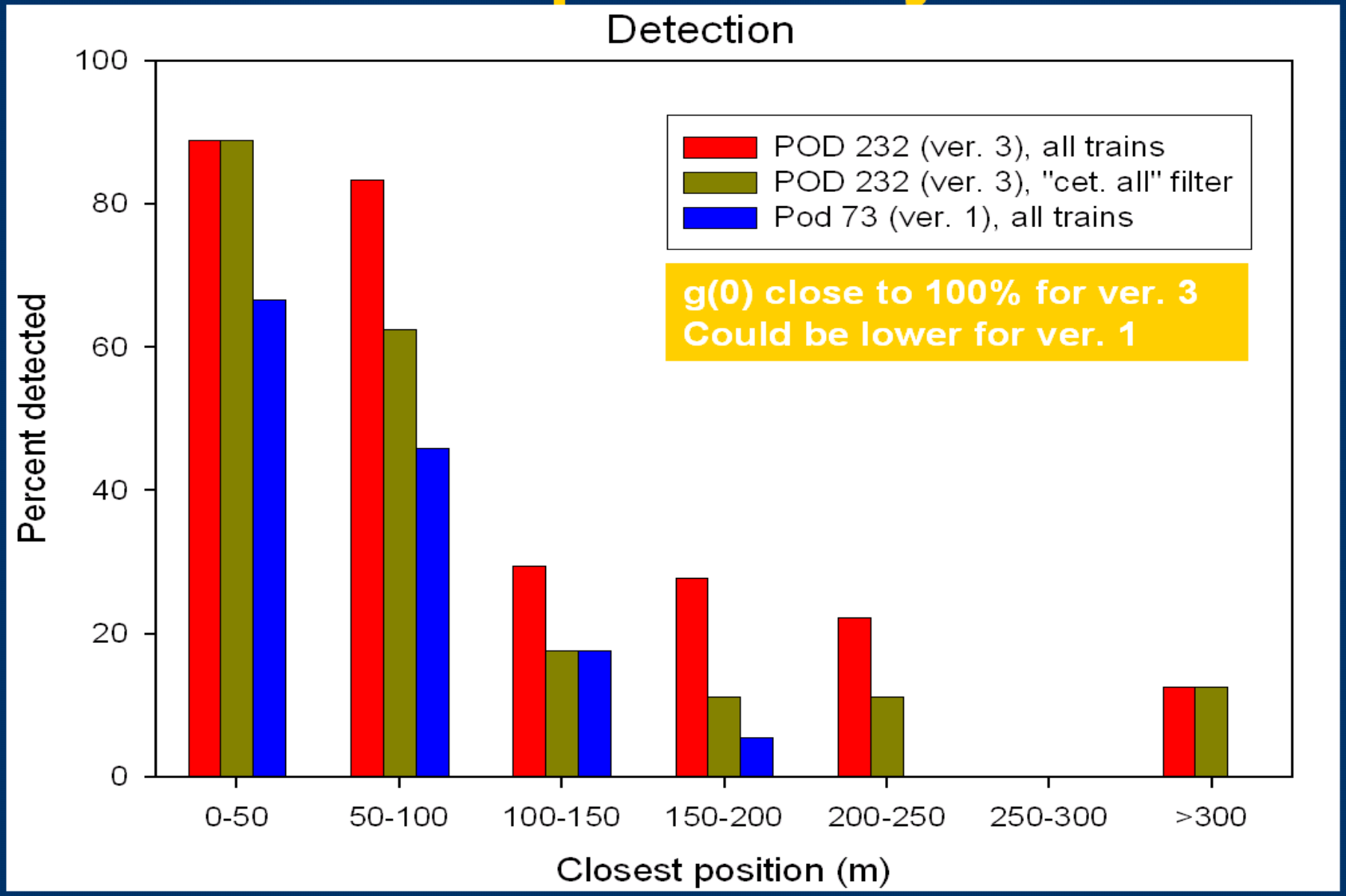
What will SAM achieve?

Acoustic sensitivity v. detection rates



Kyhn, L.A.1,2, Tougaard, J.1, Wahlberg, M. 2, Teilmann, J. 1, Jørgensen, P. B. 1 and N. I. Beck1

Radial detection probability



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Can we measure small population trends?

- Smaller differences must be measured
- Diverse conditions: noise, dolphins, water depth, behaviours, mooring conditions
- Data integration over larger areas
- Changing population distribution
- Loss of loggers
- Cost-effective

What has SAM achieved?

What can SAM achieve?

Monitoring population trends

- Other methods
- SAM study design
- Static acoustic monitor design

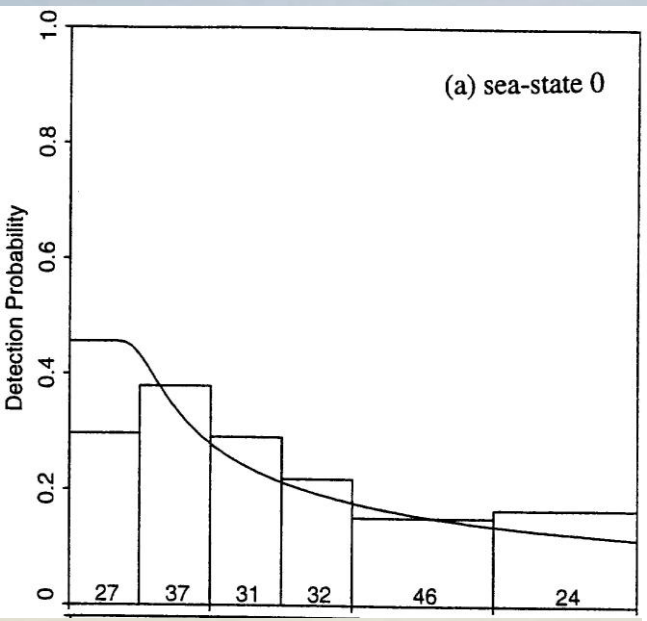
What will SAM achieve?

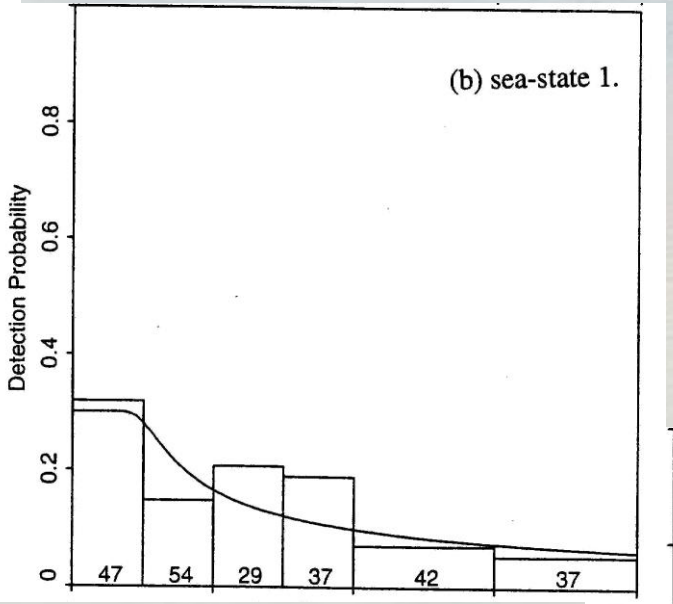
Some alternatives to SAM

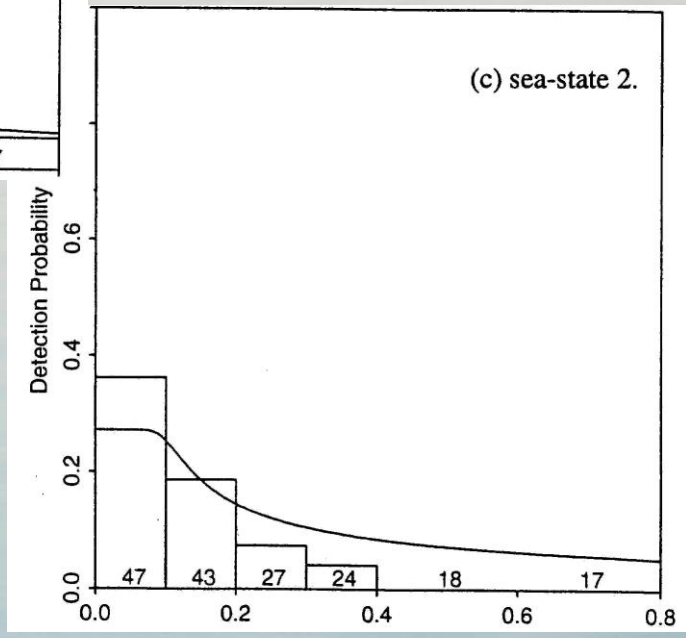
Ship based visual line transect

- Very high cost per detection (5000€ SCANS II)
- Complex detection function for small cetaceans

SCANS 1
DISTANCE detection functions







At least two process are distorting the detection function.

Detection on the trackline, g(0), is low, so that errors in estimating it are a big problem.

Some alternatives to SAM

Ship based visual line transect

- Very high cost per detection (5000€ SCANS II)
- Complex detection function for small cetaceans
- Animals move towards the boat, or away; factors >3
- Not enough data to assess multiple sources of bias
- Error estimates are too low

Acoustic line transect

- Animals moving towards or away are a dreadful problem. Detection range 300m? Effective strip width 27m?

Static acoustic monitoring ~

- Very low cost per detection (< 2€)
- Consistent ‘observers’
- Ideal detection function, minimal responsive movement
- Behavioural information
- Some species discrimination
- Automated analysis
- The only method that can measure small trends in low density areas.
- Potentially the most precise method elsewhere?

What has SAM achieved?

What can SAM achieve?

Monitoring population trends

- Available methods
- Study design
- Monitor design

What will SAM achieve?

Sampling regimes

Spatially random deployments are too difficult, so:

1. Identify habitat compartments. (Use biological insight initially, model spatial density variation later.)

2. Sample in convenient monitoring positions across as many compartments as possible.

3. Weight trend values by the compartment sizes.

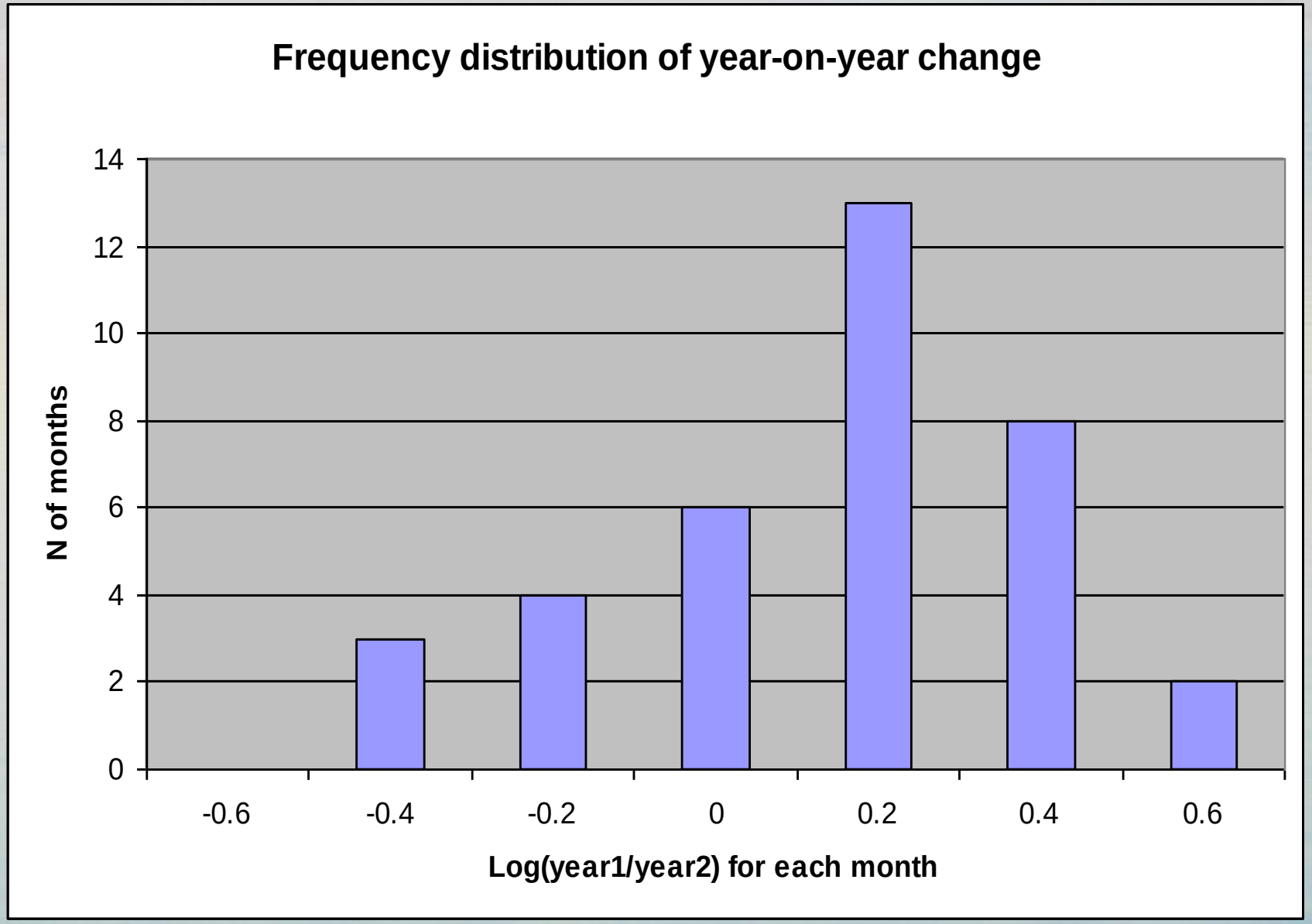
Operational statistic

Seasonal change is large and varied so:

compare months in successive years
same place
same or equivalent loggers

to get a set of monthly year-to-year trend values.

Monthly trends, three sites, 2005 to 2006



CV = 0.37

Data: Chris Pierpoint

What has SAM achieved?

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- Available methods
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What will SAM achieve?

Monitors

‘False positive’ clicks cannot be avoided

- All systems depend on software to clean up the data
- must make false positives a small fraction of true positives
- hard where there are no porpoises!

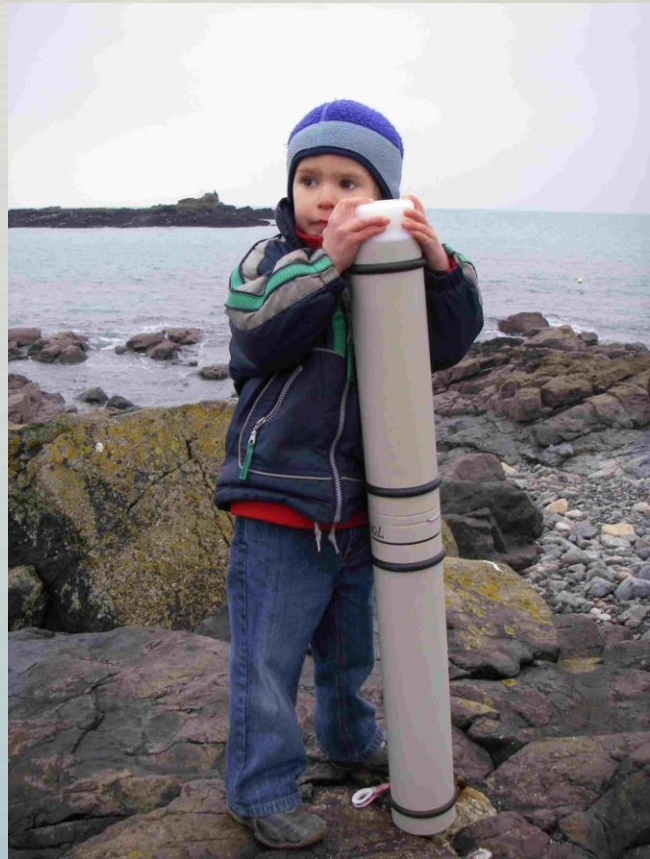
Current performance of the T-POD, in normal use:

- Propellers, rain etc. 10 false positives / million clicks.
  False positive rate falls at high noise levels
- Boat sonars <100 false positives / million clicks.

Monitors: ideally….

- **Log frequency, intensity, duration and bandwidth of each click**
- **Log 20-160kHz clicks**
- **Log noise levels**
- **Log attitude**
- **Tightly standardised**

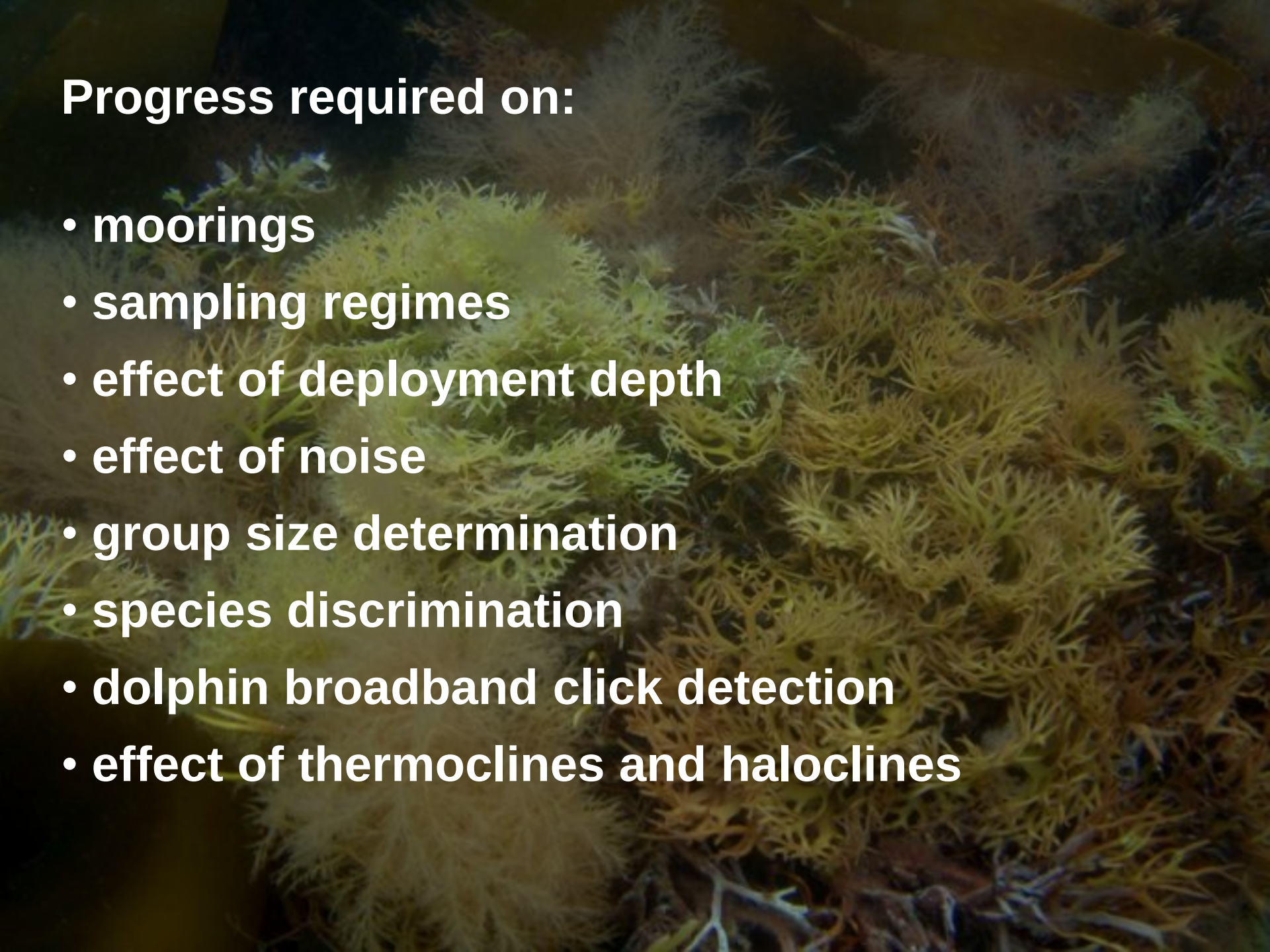
  ….the C-POD
- **Computer-free, rapid servicing at sea**
- **Run 12+ months on alkaline cells**



What can SAM achieve?

It provides a very clean basis from which to measure:

Habitat usage
Environmental impacts
Behaviour
Small population trends
Densities

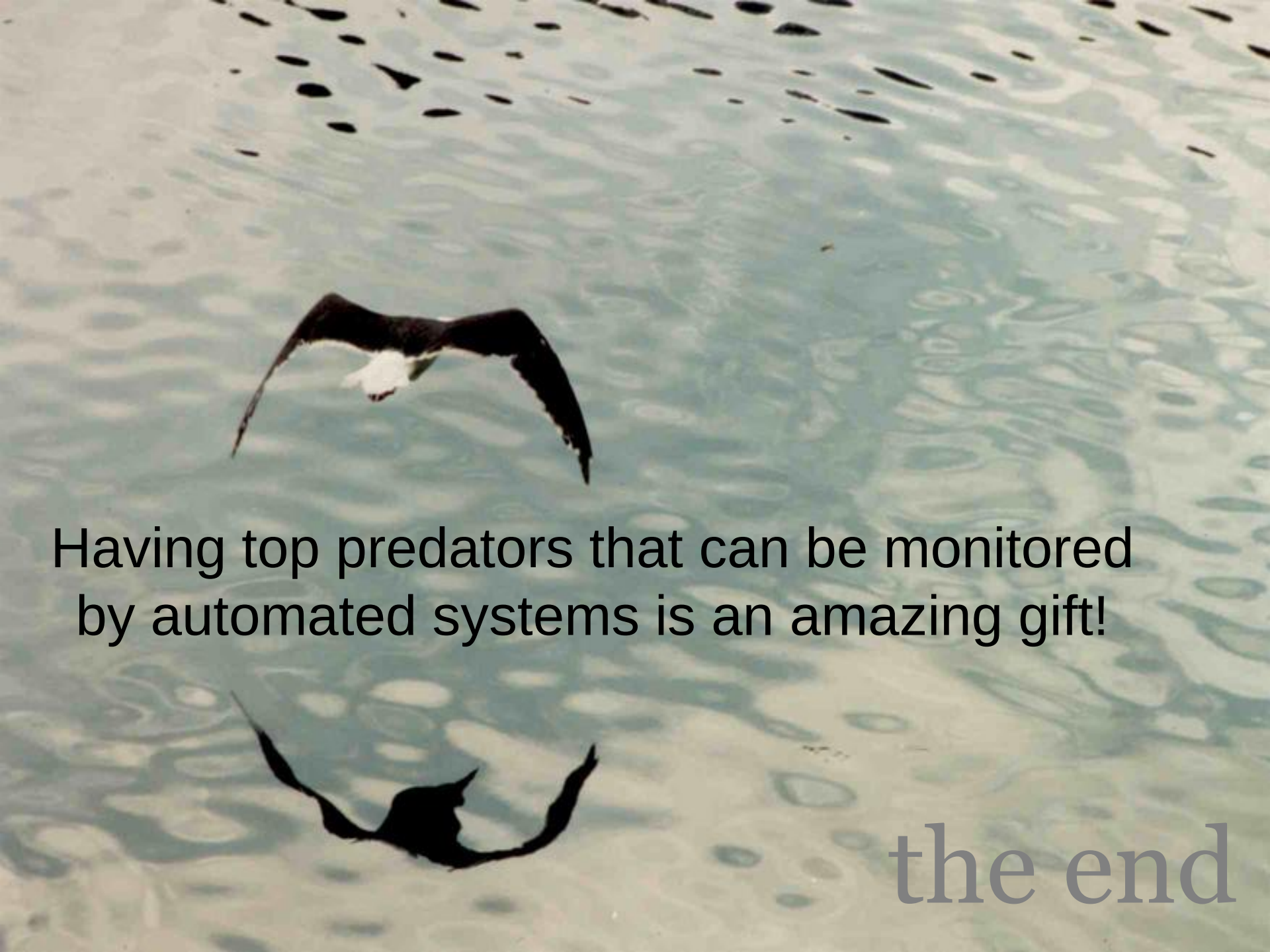


Progress required on:

- moorings
- sampling regimes
- effect of deployment depth
- effect of noise
- group size determination
- species discrimination
- dolphin broadband click detection
- effect of thermoclines and haloclines

What will SAM achieve? (and by when?)

- Monitor small population trends (5yr)
- Identify local trends (0yr)
- Contribute more to understanding the ecosystem than line transects (10yr)
- Replace line transects in many contexts (5+yr)
- Distinguish groups within Delphinidae (4yr)
- Monitor deep diving species at depth (1-3yr)
- Distinguish juvenile porpoises from adults (1yr)
- Identify seasonal feeding strategies (5+ yr)



Having top predators that can be monitored by automated systems is an amazing gift!

the end

frequency of clicks