



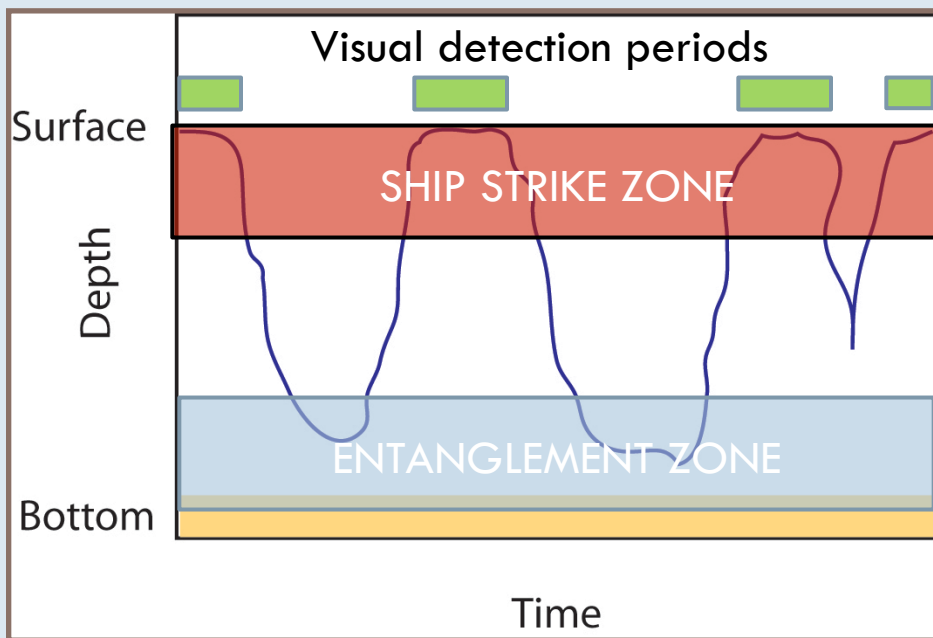
BEHAVIORAL INSIGHTS FROM TAGGING TECHNOLOGY

Susan E. Parks, PhD

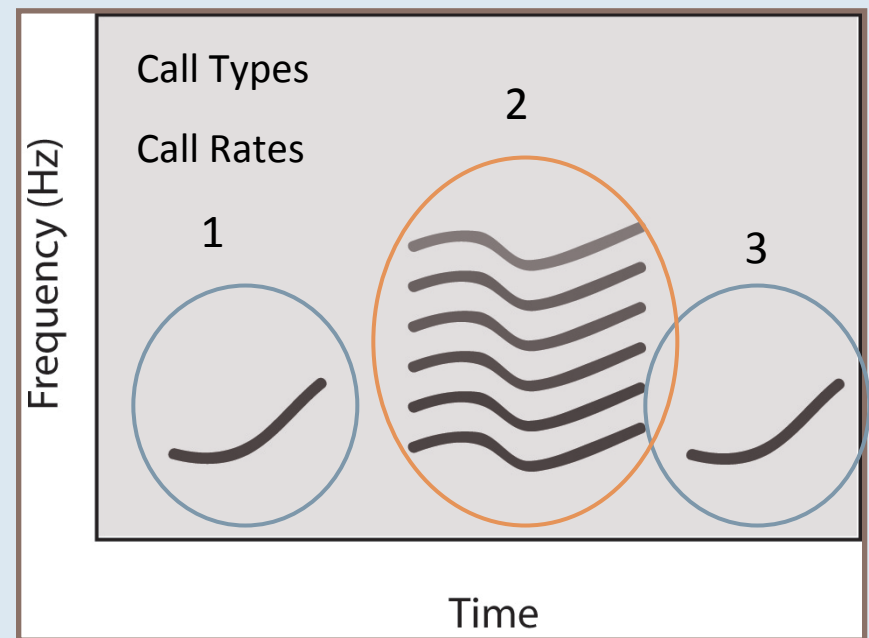
Assistant Professor, Department of Biology, Syracuse University

What does the behavior of a species tell us about detectability?

Diving behavior



Sound production



Why do we need tags?

90% of the time this is what you will see at the surface

In good weather conditions and daylight hours



What data can tags provide?

- Individual behavior

- ▣ Dive profile information

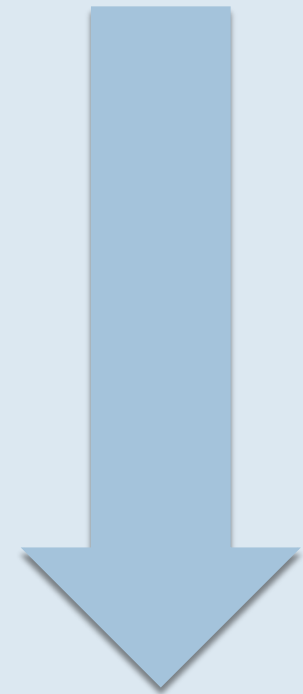
- ▣ Position data

- ▣ Detailed 3-D subsurface movement

- ▣ Acoustic recordings of sound production

- ▣ Combined position/subsurface/acoustic tags

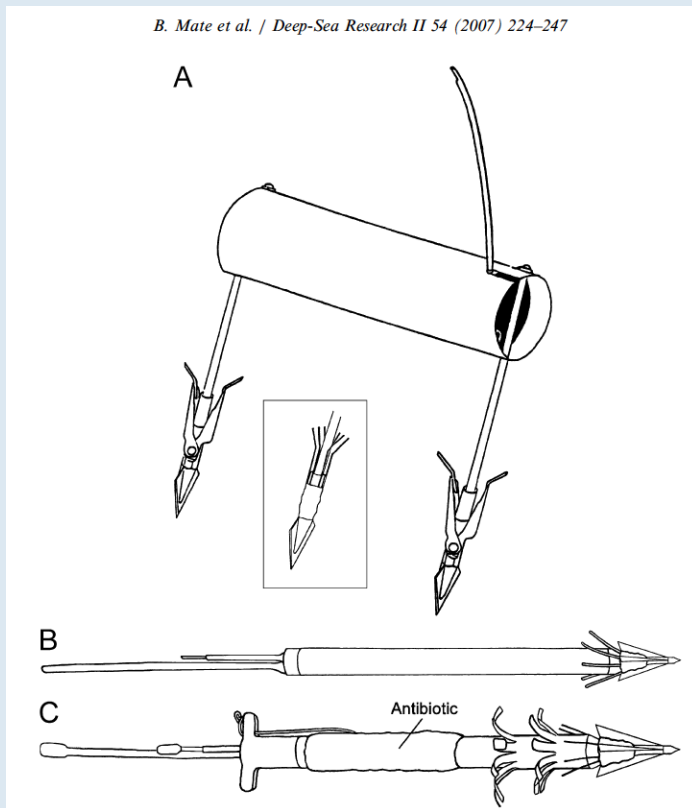
Lowest cost/least
detail/longest duration



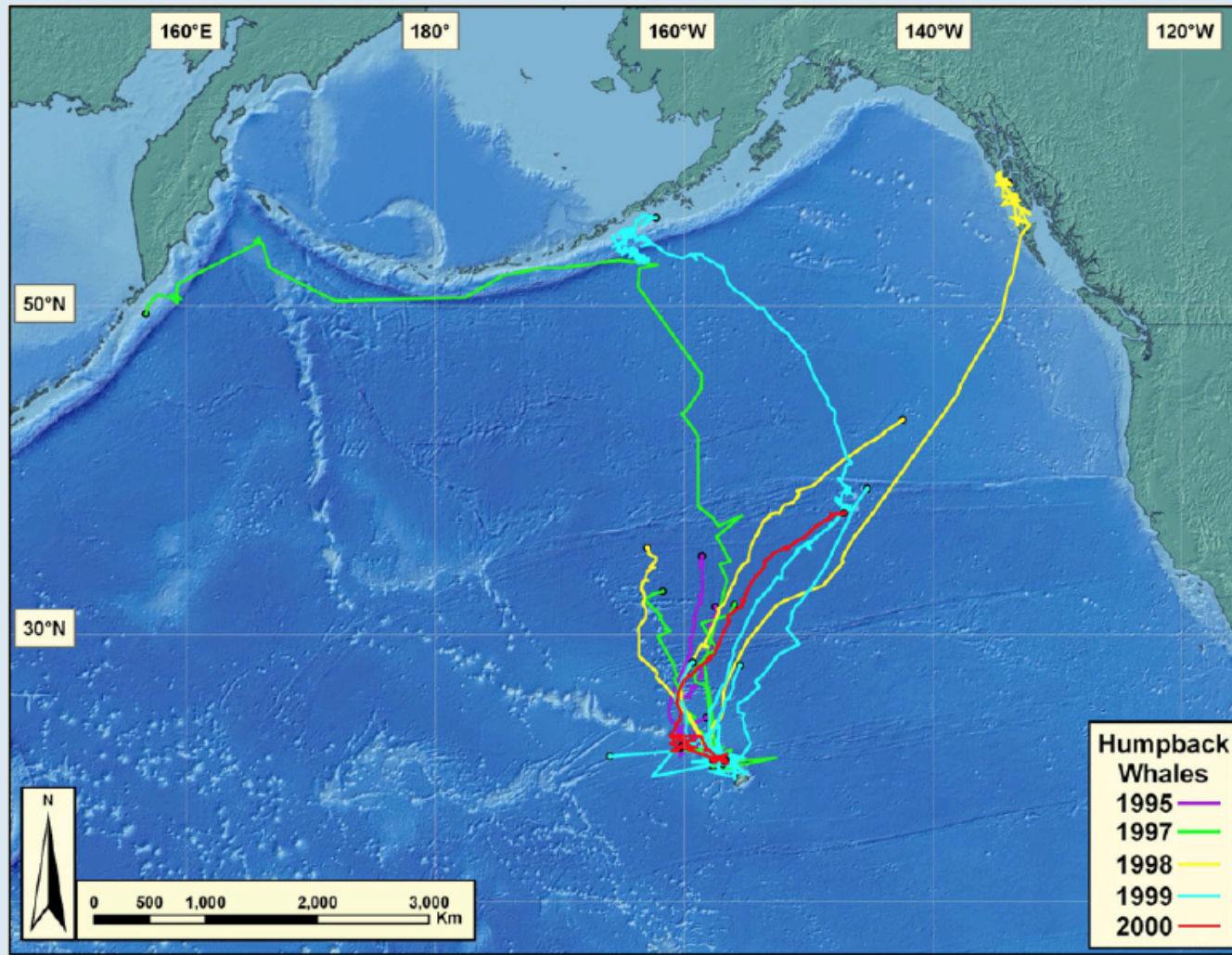
Highest cost/most
detail/shortest duration

Satellite and Fast-loc GPS tags

B. Mate et al. / Deep-Sea Research II 54 (2007) 224–247

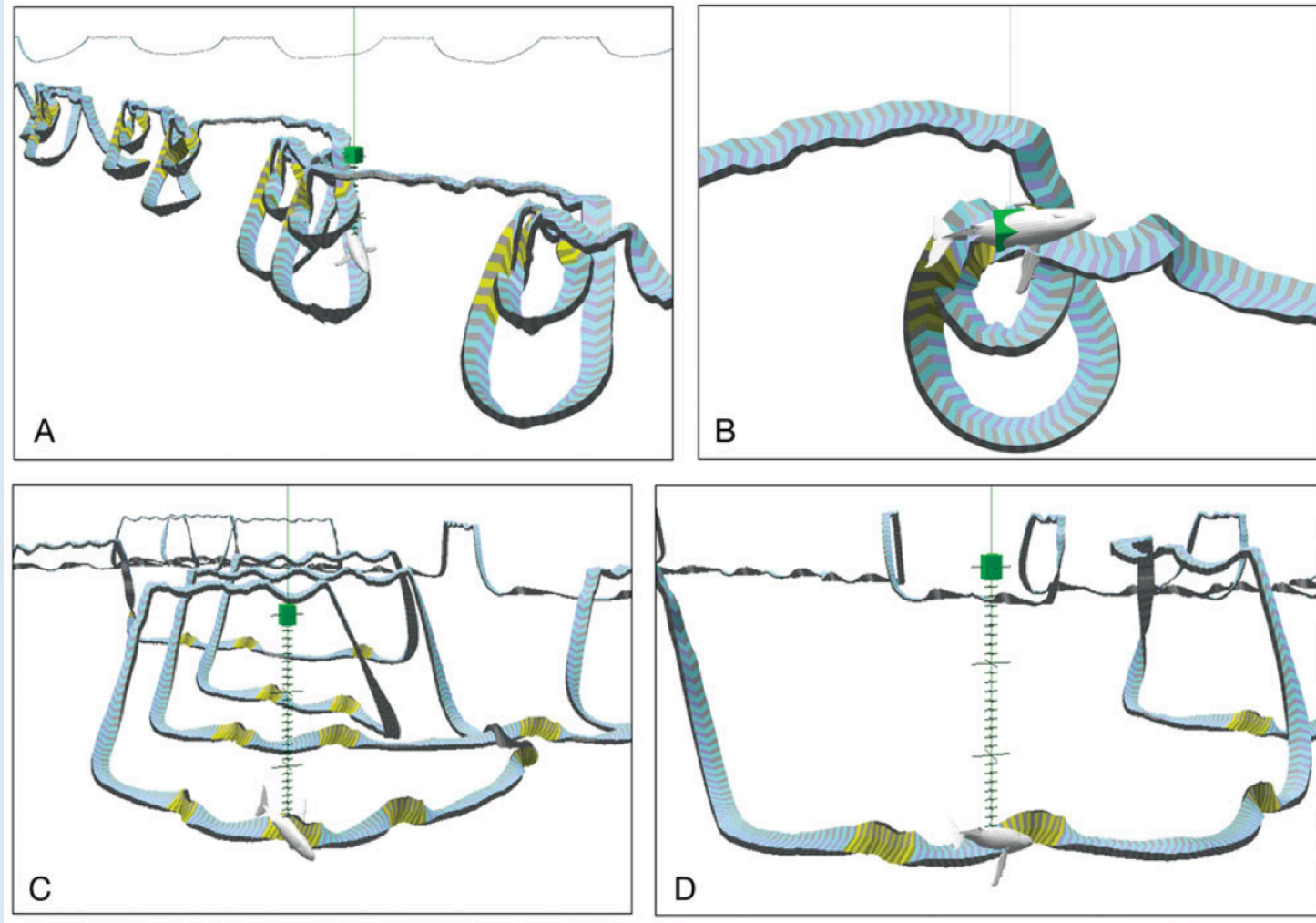


Satellite and GPS tags



Mate et al. 2007. Deep-Sea Research II 54 224-247

3D subsurface behavior tags



Friedlaender et al. 2009. Mar Ecol Prog Ser 395: 91-100

Acoustic tags

Audio recordings, Acceleration, Orientation, and Pressure to track subsurface whale behavior.



Dtag



Acousonde

Right whale case study



- Endangered species (~500 individuals)
- Habitat in high human use areas
- Well studied population with known life-history for all individuals since 1980
- Mortality from vessel collisions and entanglement in fishing gear

Right whale satellite tag data

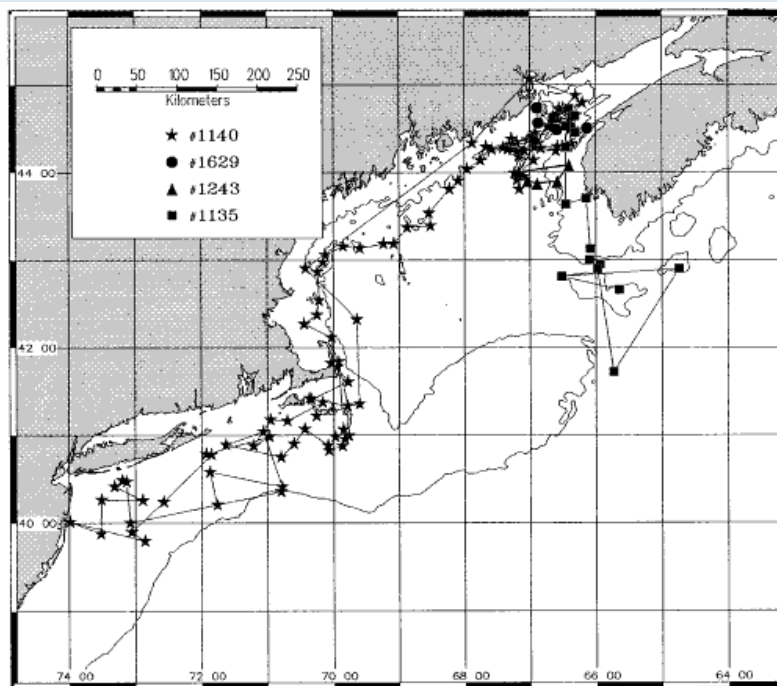
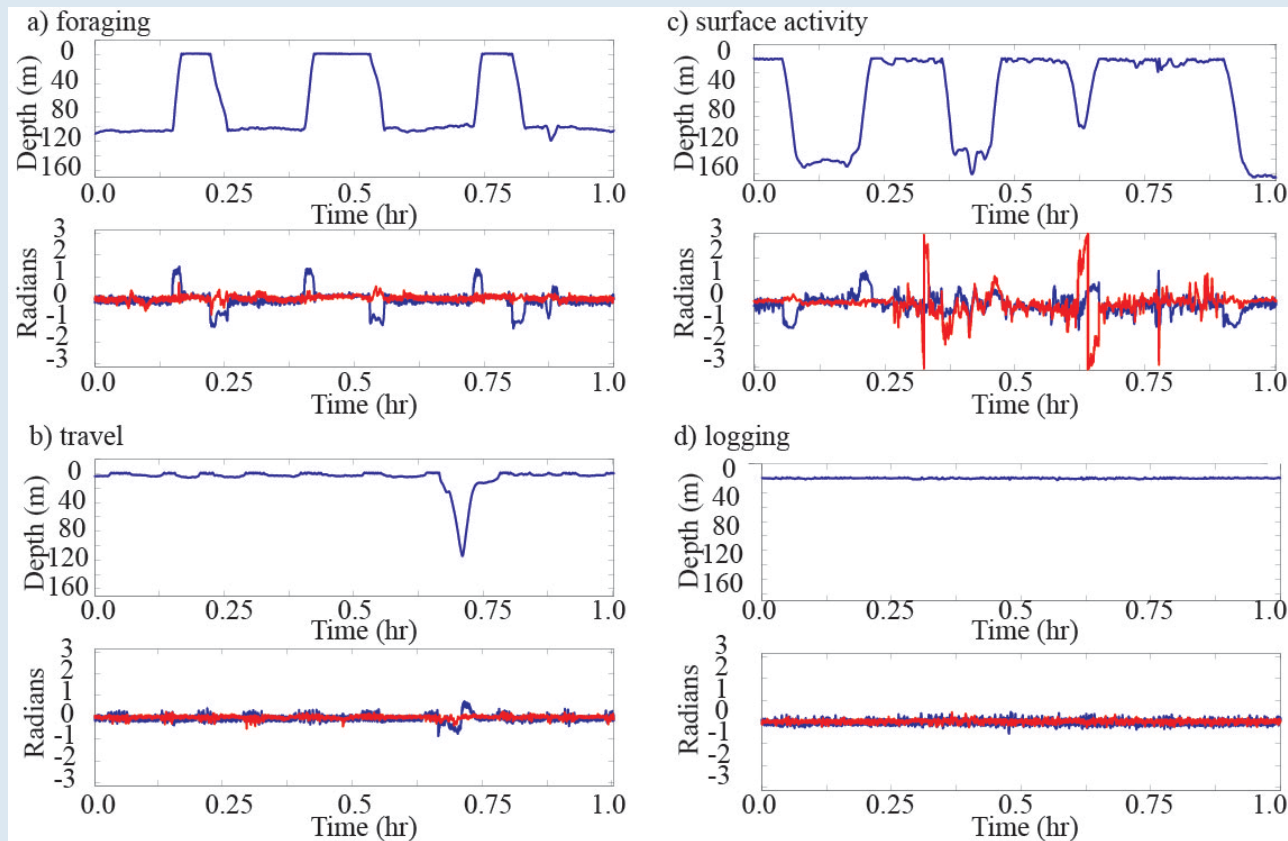


Fig. 4. Satellite-monitored movements of 4 female right whales radiotagged in the Bay of Fundy, including a pregnant female (#1135), and 3 females with calves.

Mate, B.R.; Nieuwkirk, S.L.; Kraus, S.D. 1997. J. Wildlife Management 61(4), 1393-1405.

- Tags implanted in 9 right whales
1989-1991, 9 in 2000
- Average tag duration transmission ~ 32 days
- Nursing female, #1140, crossed New York shipping lanes 2 times in 1990

Right whale dive profiles

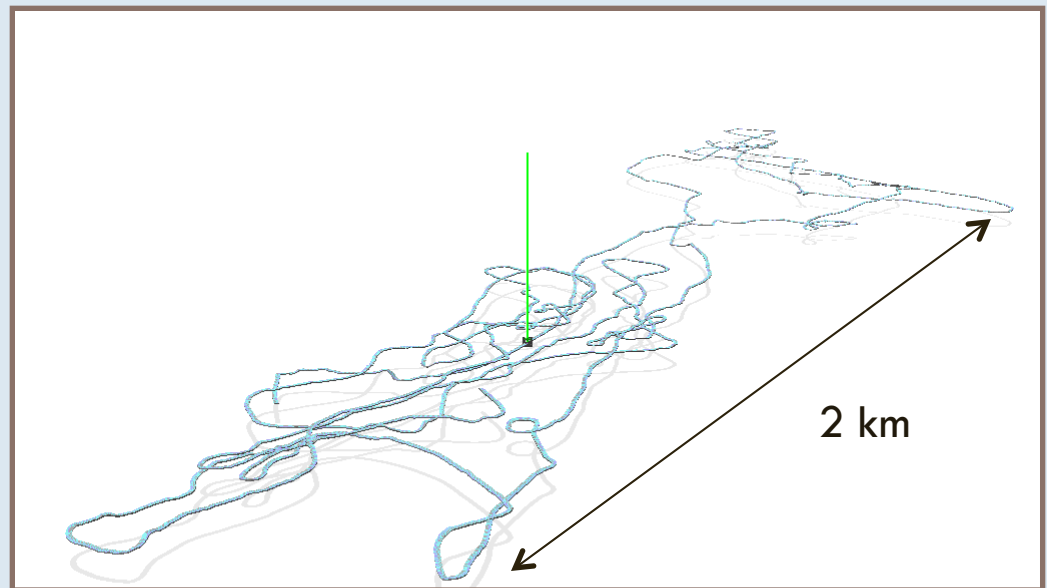
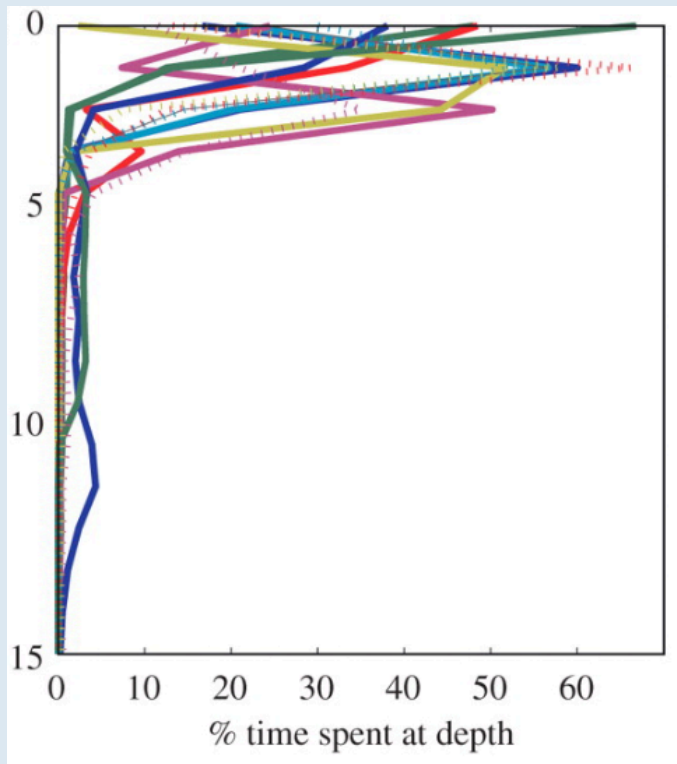


- Dive profiles for four common behaviors of right whales in the Bay of Fundy, Canada from 45 tag deployments between 2000-2005.

Parks, S.E. et al 2011. *Endangered Species Research*, 15, 63-76.

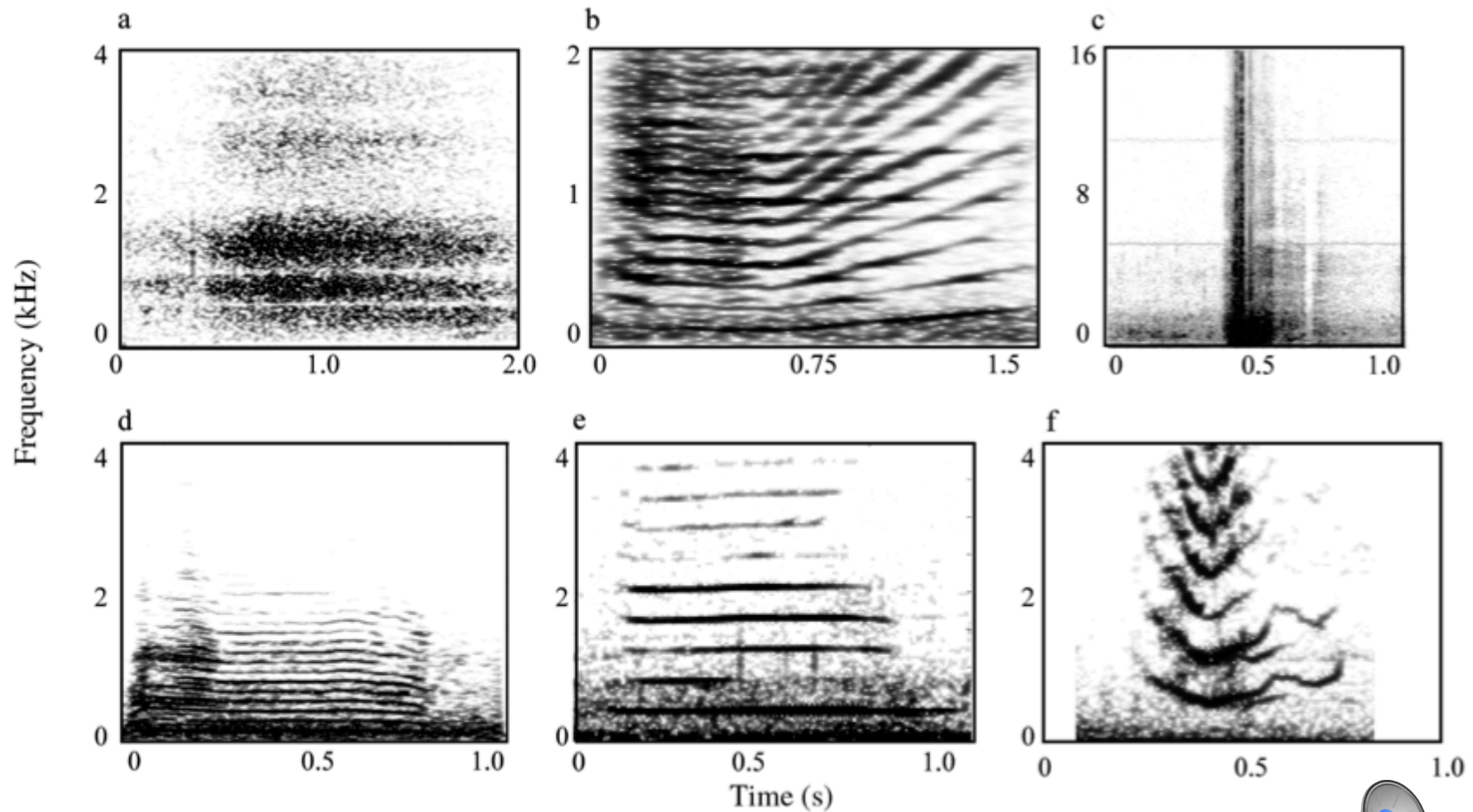
Habitat dependent foraging behavior

Feeding right whales spent > 90% of their time just below the surface
In Cape Cod Bay, April 2009



Parks, S.E., Warren, J.D., Stamieszkin, K., Mayo, C.A., Wiley, D. (2012) *Biology Letters*. 8(1) 57-60.

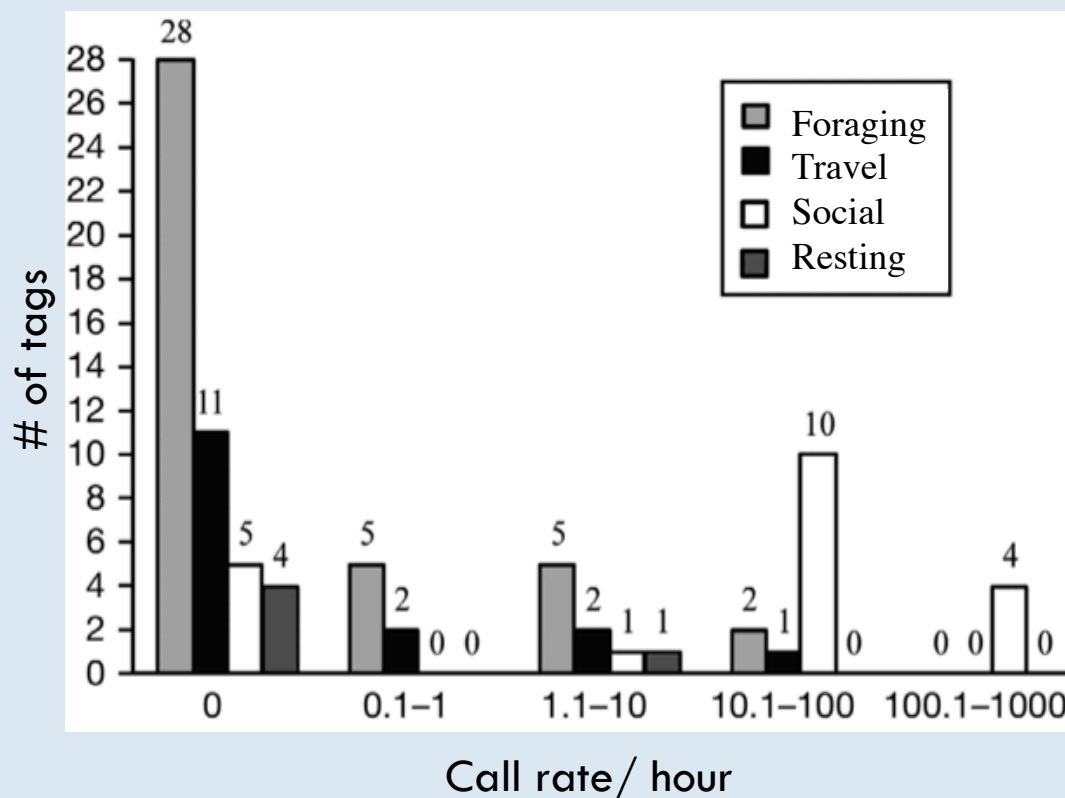
Right whale acoustics



Parks, S.E. et al 2011. *Endangered Species Research*, 15, 63-76.



Right whale call rates by behavior



- Most right whales had very low call rates unless socializing

Summary of tag findings

- Habitat use and movement patterns
- Behavioral activities and dive patterns by habitat
- Call characteristics and individual call rates
- Important and significant variation in behaviors by season, habitat, and behavior

Attachment methods

Invasive attachments (penetrating)

- Pro
 - ▣ Only way to get long term attachments
 - ▣ Can be deployed remotely
- Con
 - ▣ Causes physical damage to animal
 - ▣ Can potentially impact individual health

Non-invasive attachments (surface)

- Pro
 - ▣ Does not harm the animal
- Con
 - ▣ Short-term attachment (hours to days)
 - ▣ Typically pole deployed

Deployment methods for large whales

Pole deployment

□ Pros

- ▣ Control of placement location
- ▣ Can be used with many types of tags

□ Cons

- ▣ Requires a very close approach to a whale

Air launched deployment

□ Pros

- ▣ Increased range for deployment (i.e. likely to have higher deployment rates)

□ Cons

- ▣ Decreased control of placement

Feasibility and limitations

□ Feasibility

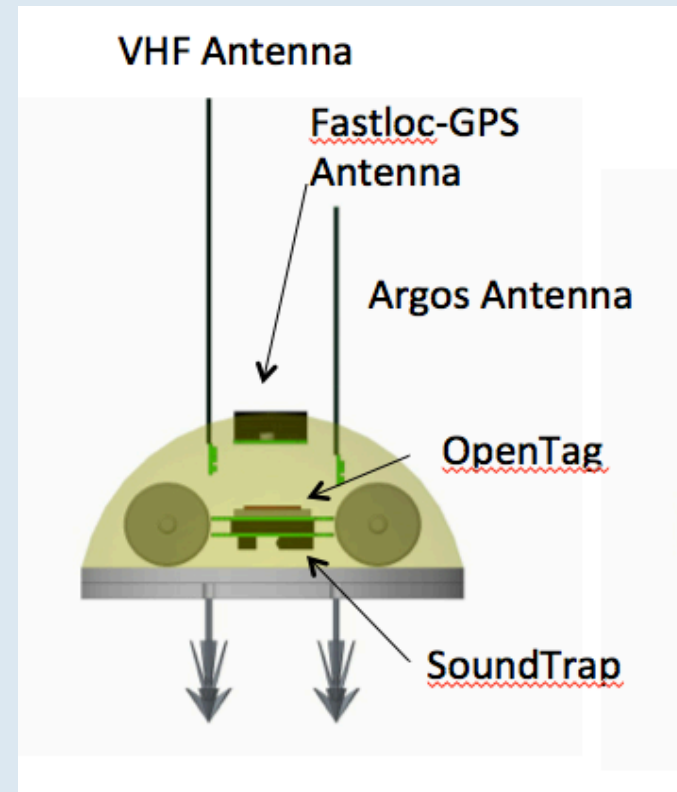
- ▣ Common practice, commercially available tags
- ▣ Provide data that can not be obtained with other methods

□ Limitations

- ▣ Cost → High cost of (some) tags, high costs of deployment efforts for ship and personnel time
- ▣ Sample size → Typically limited sample size due to cost and weather constraints

Which tags?

- Habitat use → Satellite tag/TDR
- Occupancy and movement → Satellite tag/TDR
- Acoustic detectability → Acoustic tags
- All of the above → Combination tags that incorporate all of the above



Acknowledgements

Institutions and People

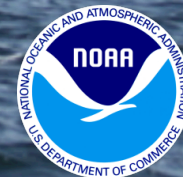
- Woods Hole Oceanographic Institution
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- Provincetown Center for Coastal Studies
- Stony Brook University
- University of New Hampshire
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- WHOI

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- IACUC approvals from WHOI, Cornell University, Penn State and Syracuse University.



List of references from the talk

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