Determining the presence of fish using NEPTUNE's passive acoustic data

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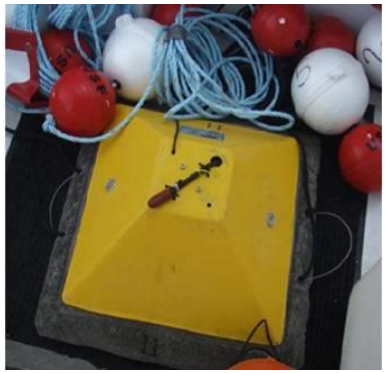
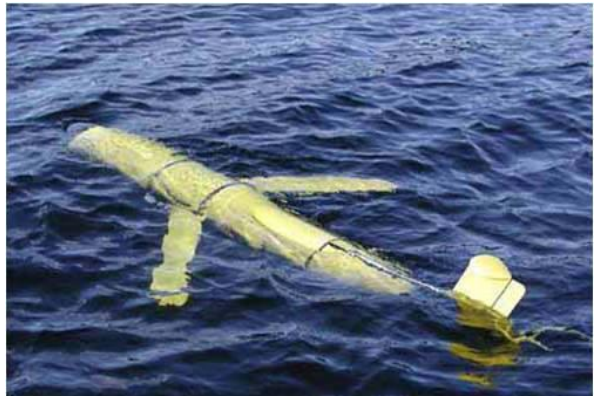
My Background

- Mapping of fish sound production using passive acoustics
  - Ph.D., University of South Florida





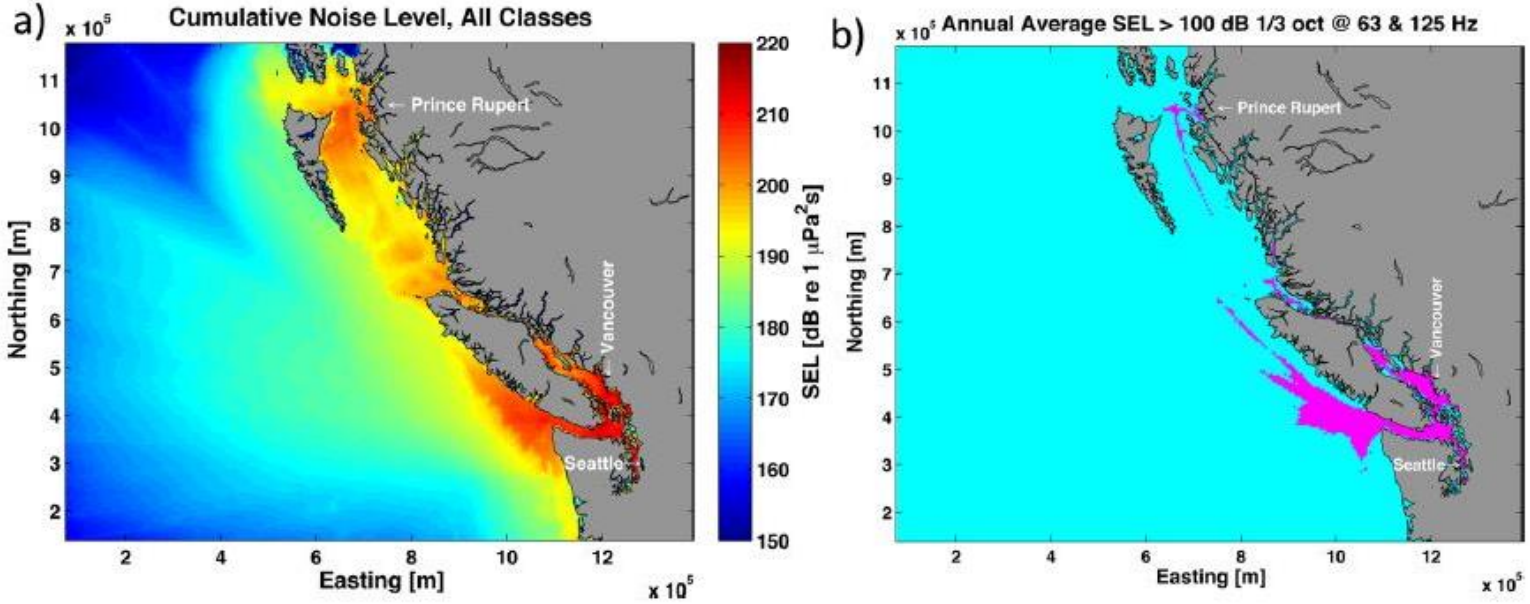

/V WEATHERBIRD I


CHEMGUARD

WCVI Bioacoustic Background

- Little documented on fish sound production in northern Pacific, especially deep-sea fish
  - In comparison to tropical and Atlantic waters

- Increasing concern anthropogenic noise

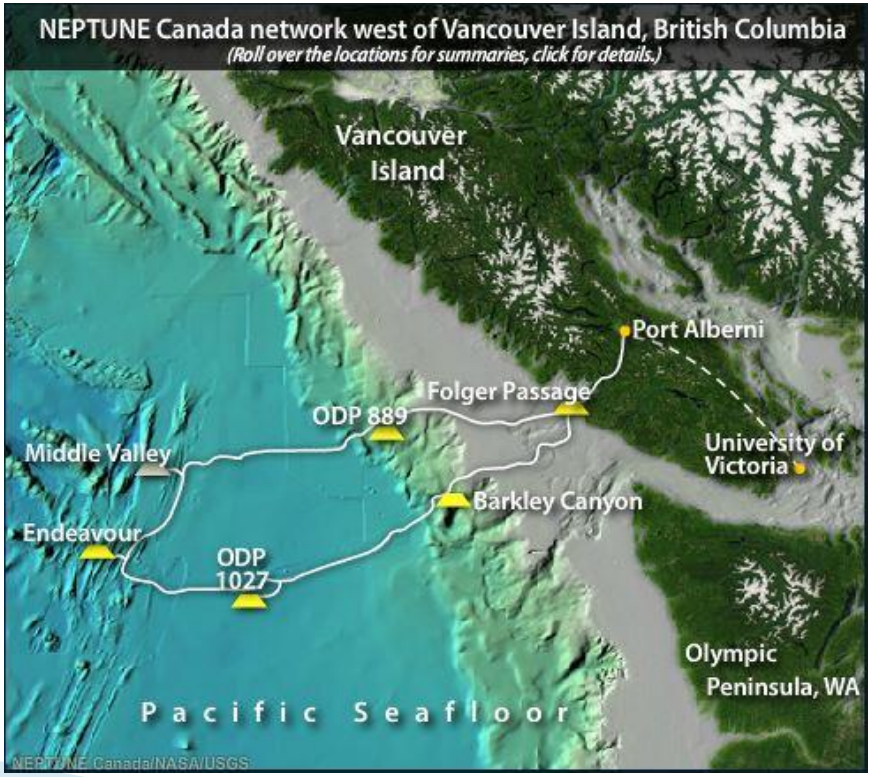


Erbe et al. 2012

Research Objectives

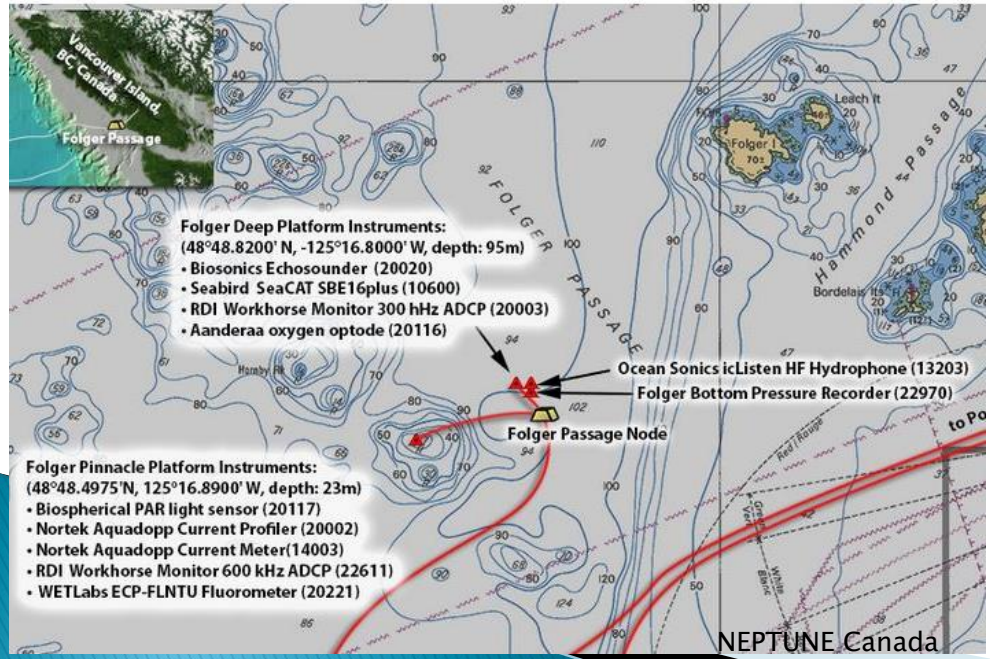
- Using NEPTUNE's passive acoustic data
  - Identify fish sound production
  - Quantify ambient noise, anthropogenic noise, self-generated noise over time

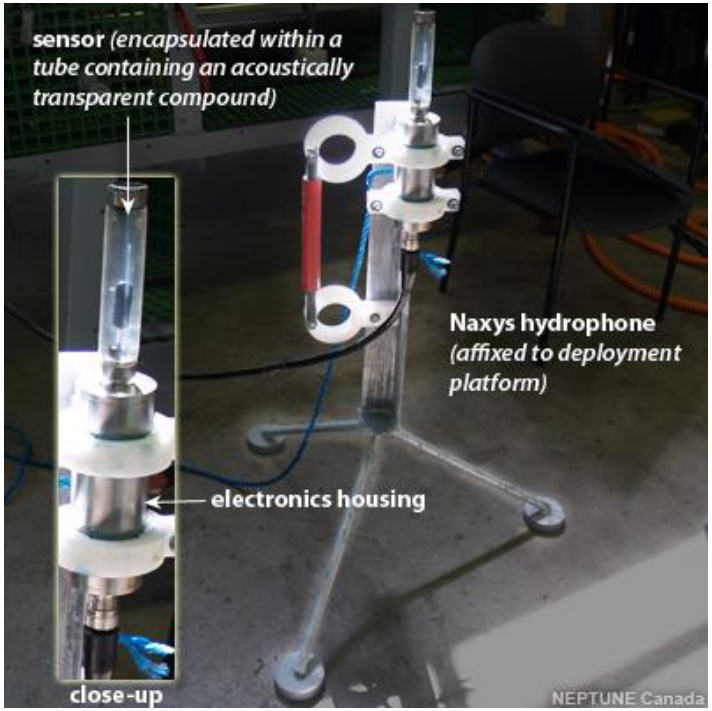
    - **Folger Passage**
    - Barkley Canyon



NEPTUNE's Passive Acoustic Data

- Sample rate 96,000 Hz
- Continuous sampling
  - Files are 5 minutes in duration
- Deployed August 28, 2009 ~ July 19, 2011
  - **June 2010 – May 2011**
  - **90,000+ files, 4+ TB**



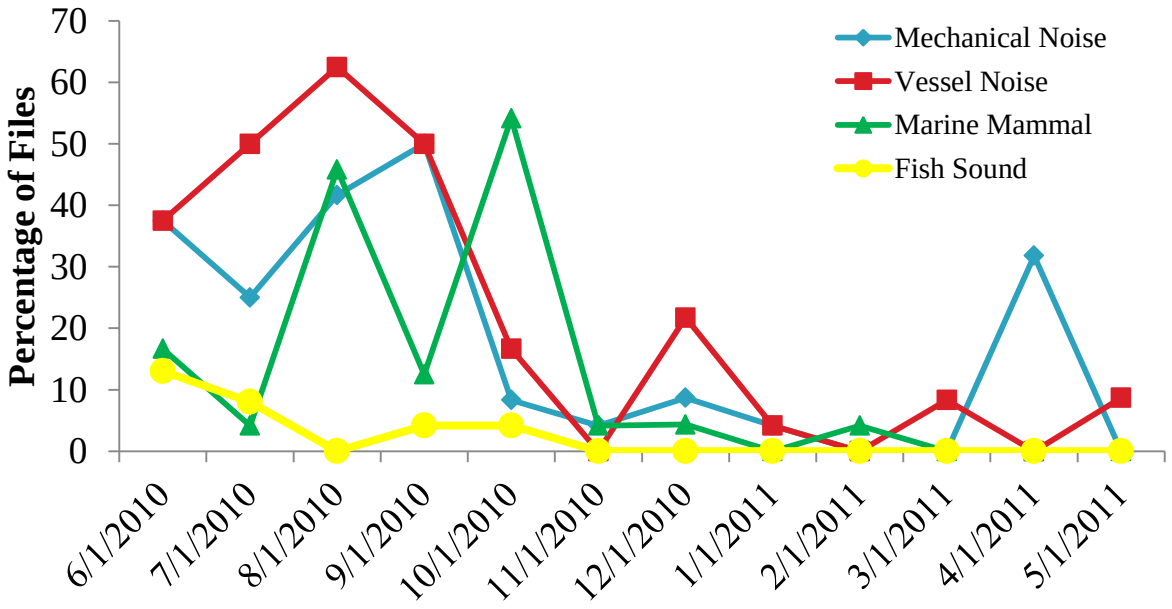


Passive Acoustic Data Analysis

- **Manual Analysis**
  - Examined one file per hour for one day in every month between June 2010 and May 2011
- **Automated Analysis**
  - Calculated the overall RMS values for two files every hour, every day between June 2010 and May 2011
  - Create a 100 Hz bandwidth composite spectrogram and examined amplitude within varying bandwidths

Passive Acoustic Data Results

Manual Analysis

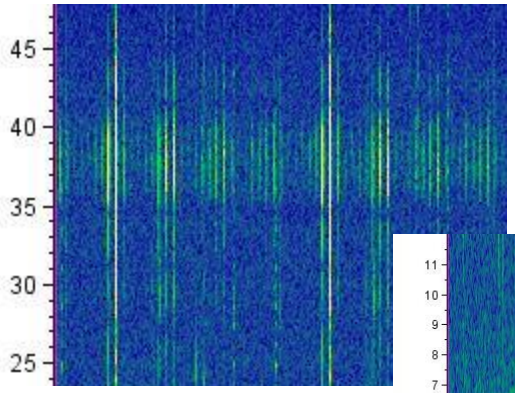


Percentage of files by month

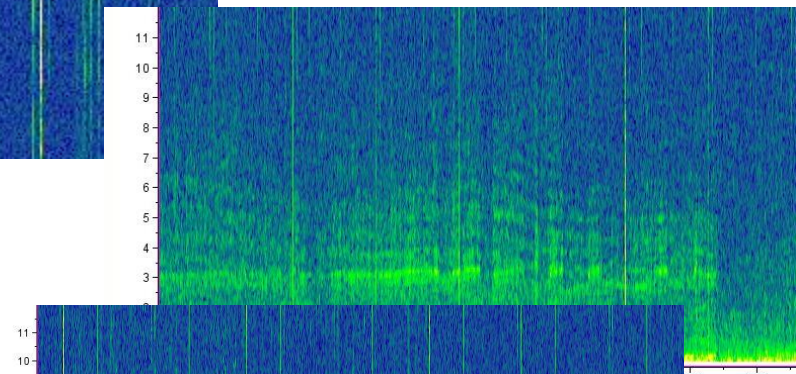
	Mechanical Noise	Vessel Noise	Marine Mammal	Fish Sound
06/26	38	38	17	13
07/24	25	50	4	8
08/21	42	63	46	0
09/18	50	50	13	4
10/16	8	17	54	4
11/13	4	0	4	0
12/11	9	22	4	0
01/08	4	4	0	0
02/05	0	0	4	0
03/05	0	8	0	0
04/02	32	0	0	0
05/01	0	9	0	0

Passive Acoustic Data Results

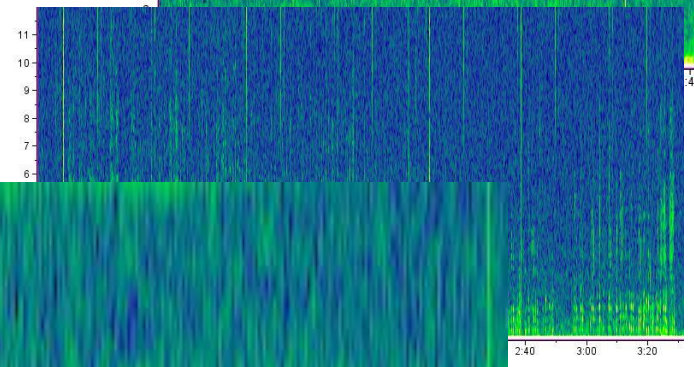
- Mechanical noise



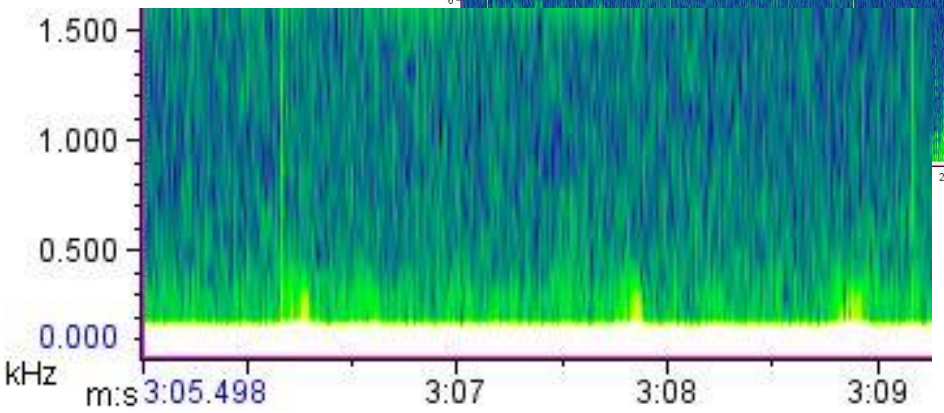
- Vessel noise



- Marine mammal sounds



- Fish sounds



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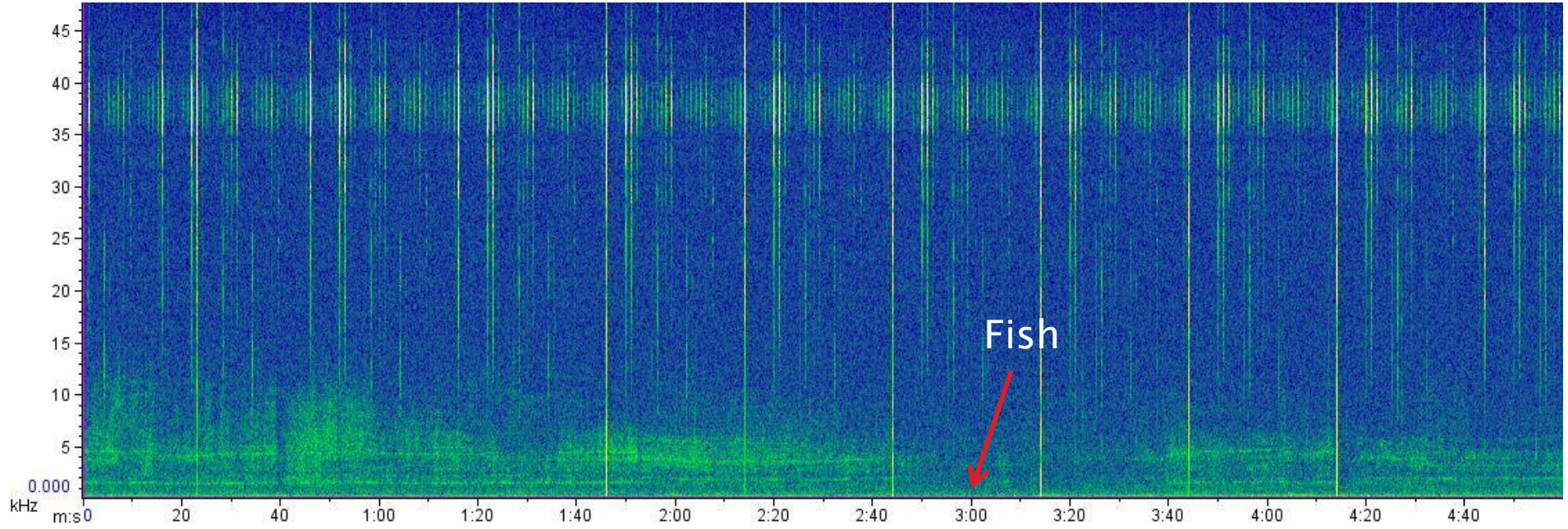
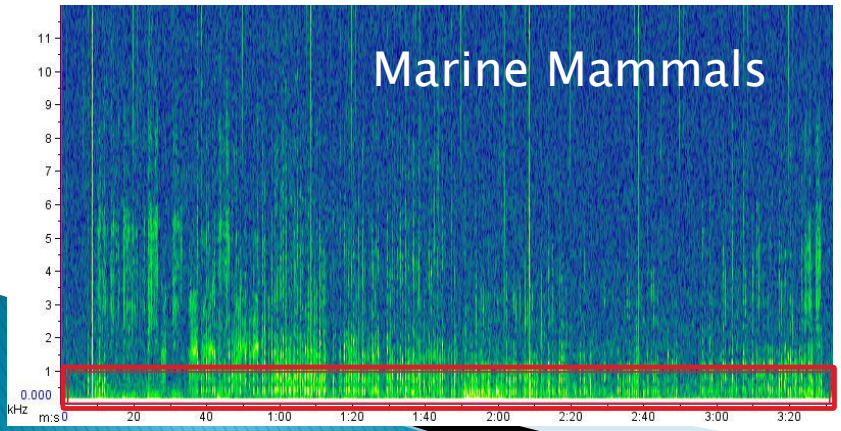
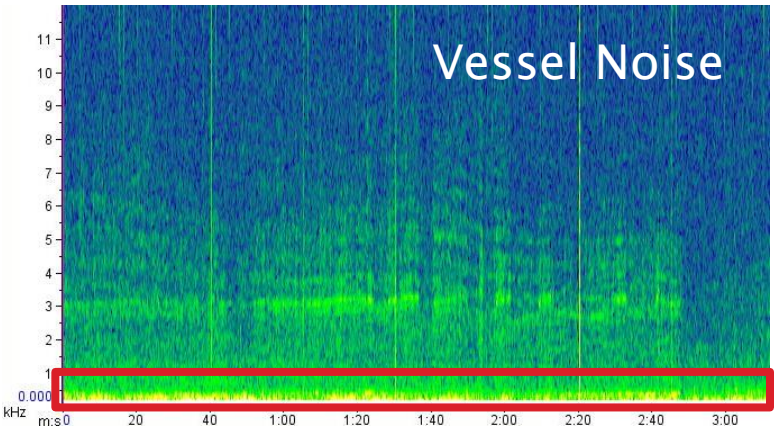
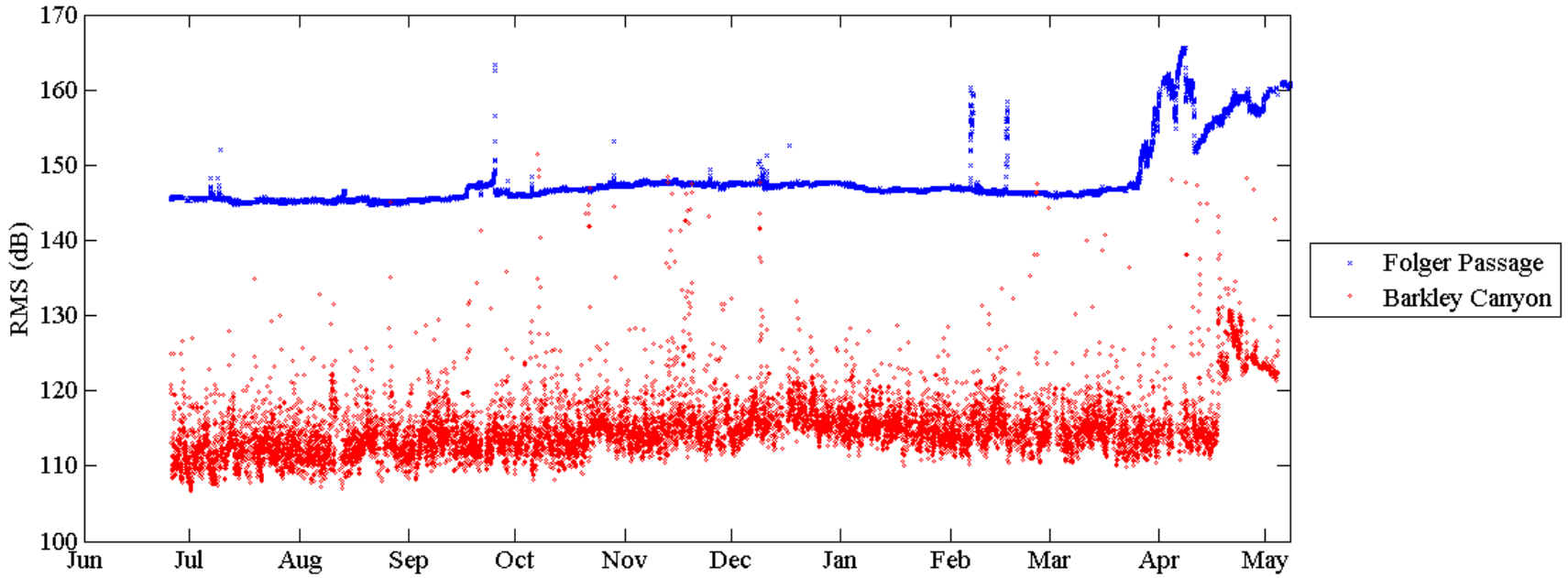






Passive Acoustic Data Results

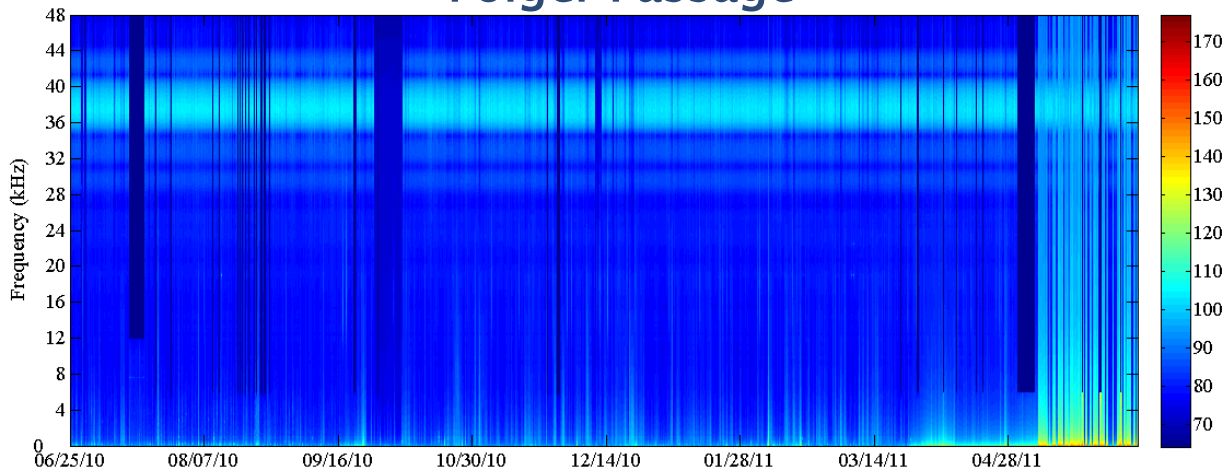
Automated Analysis – Overall RMS values



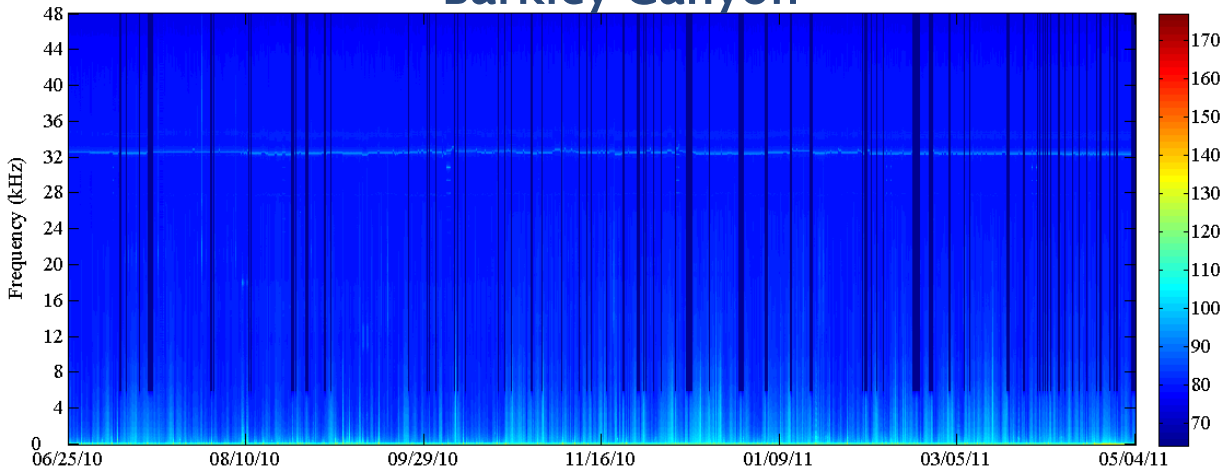
Passive Acoustic Data Results

Automated Analysis – Composite Spectrogram

Folger Passage



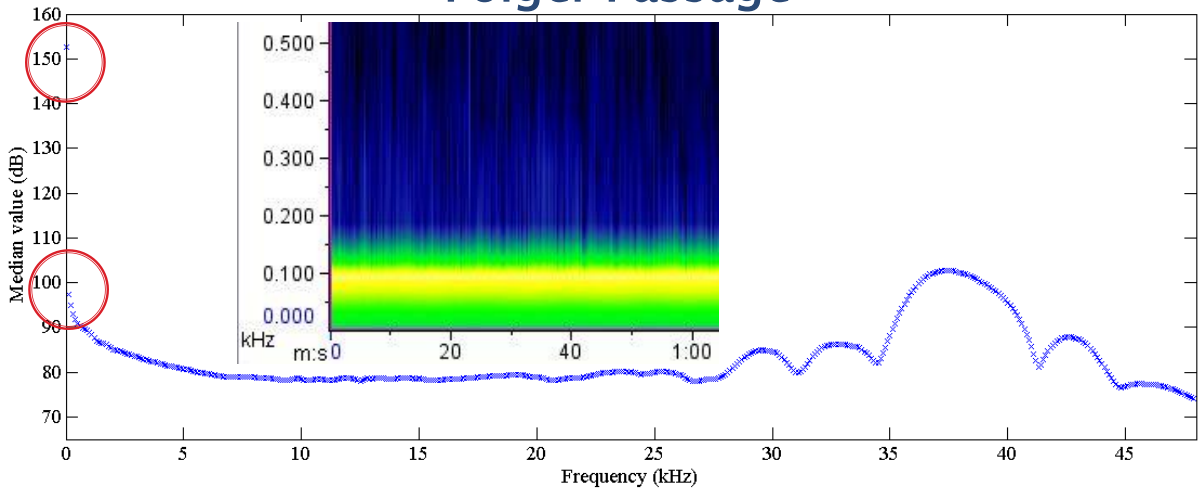
Barkley Canyon



Passive Acoustic Data Results

Automated Analysis – Median values by bandwidth

Folger Passage



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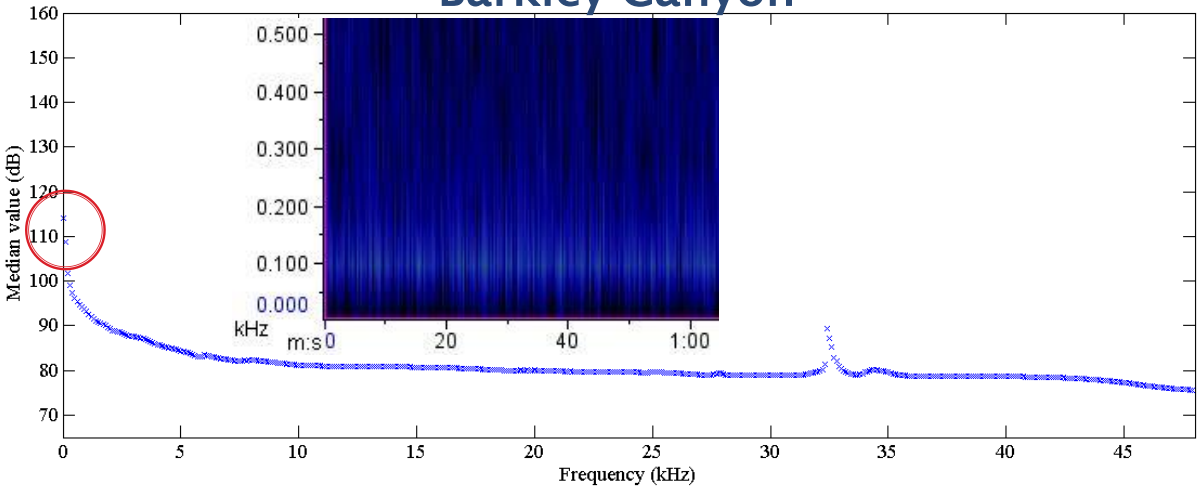

Future Work, Challenges

- Further analysis of acoustic files
  - Analysis of video data corresponding to potential fish sounds

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- Reduction in self-generated noise
  - Quiet times
- Deep Sea Research II thematic issue on NEPTUNE research
- Greater involvement of citizen scientists

Funding

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Acknowledgements

- Rodney Rountree
- Corinne Pomerleau