

COMPARISON OF CUVIER'S BEAKED WHALE SIGNALS RECORDED IN DIFFERENT ENVIRONMENTAL CONDITIONS.

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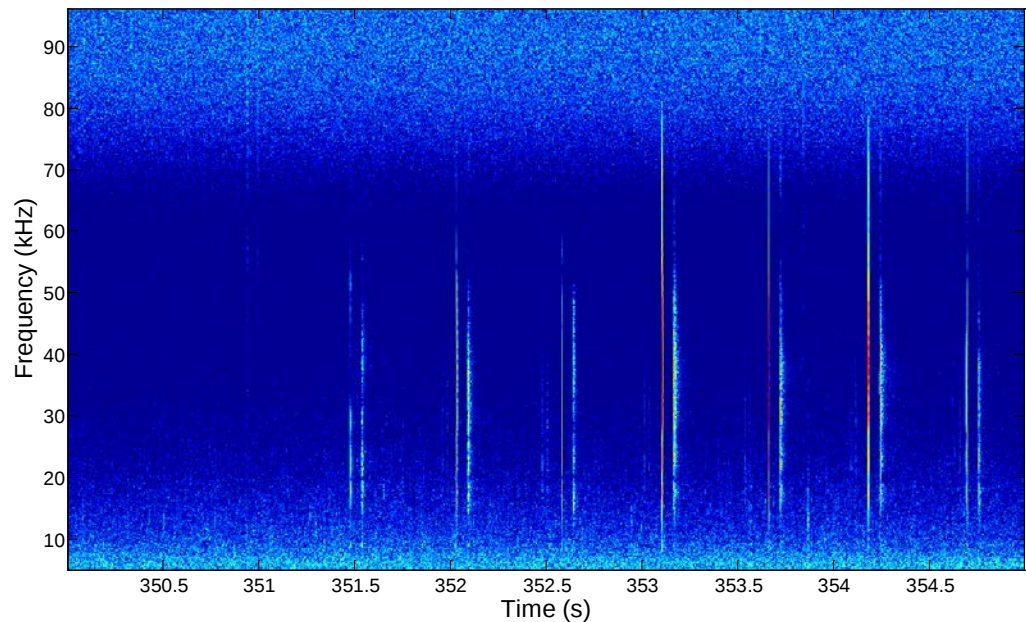
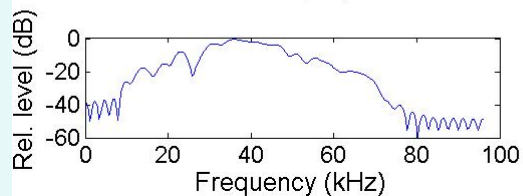
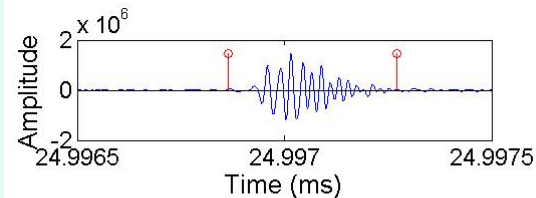
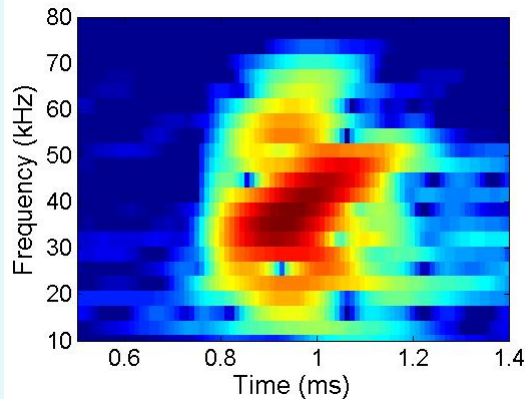
DCLDE, 2015, La Jolla

OVERVIEW

- Cuvier's beaked whale click
- Data collection
- Results
- Conclusions and perspectives



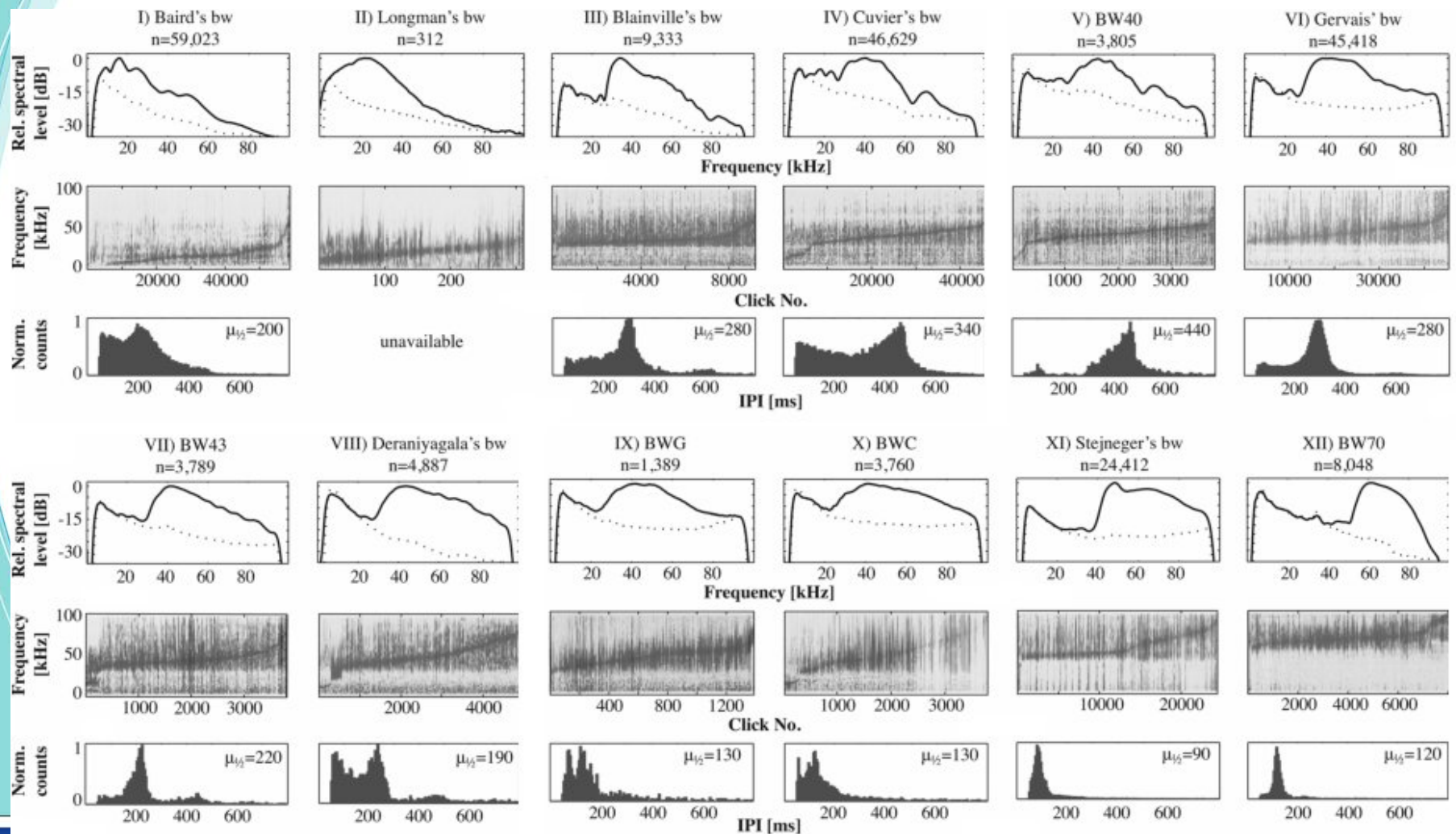
CUVIER'S BEAKED WHALE CLICKS



Johnson et al., "Beaked whale echolocate on prey, Proceedings of Royal Society, 271, 2004

Zimmer et al., "Echolocation Clicks of free ranging Cuvier's beaked whale, *Journal of the Acoustical Society of America*, vol. 117(6), 2005

BEAKED WHALE CLICKS



Baumann-Pickering S. & al, "Species-specific beaked whale echolocation signals",
Journal of the Acoustical Society of America, vol. 134(3): 2293-2301, September 2013

Courtesy of Simone
 Baumann-Pickering

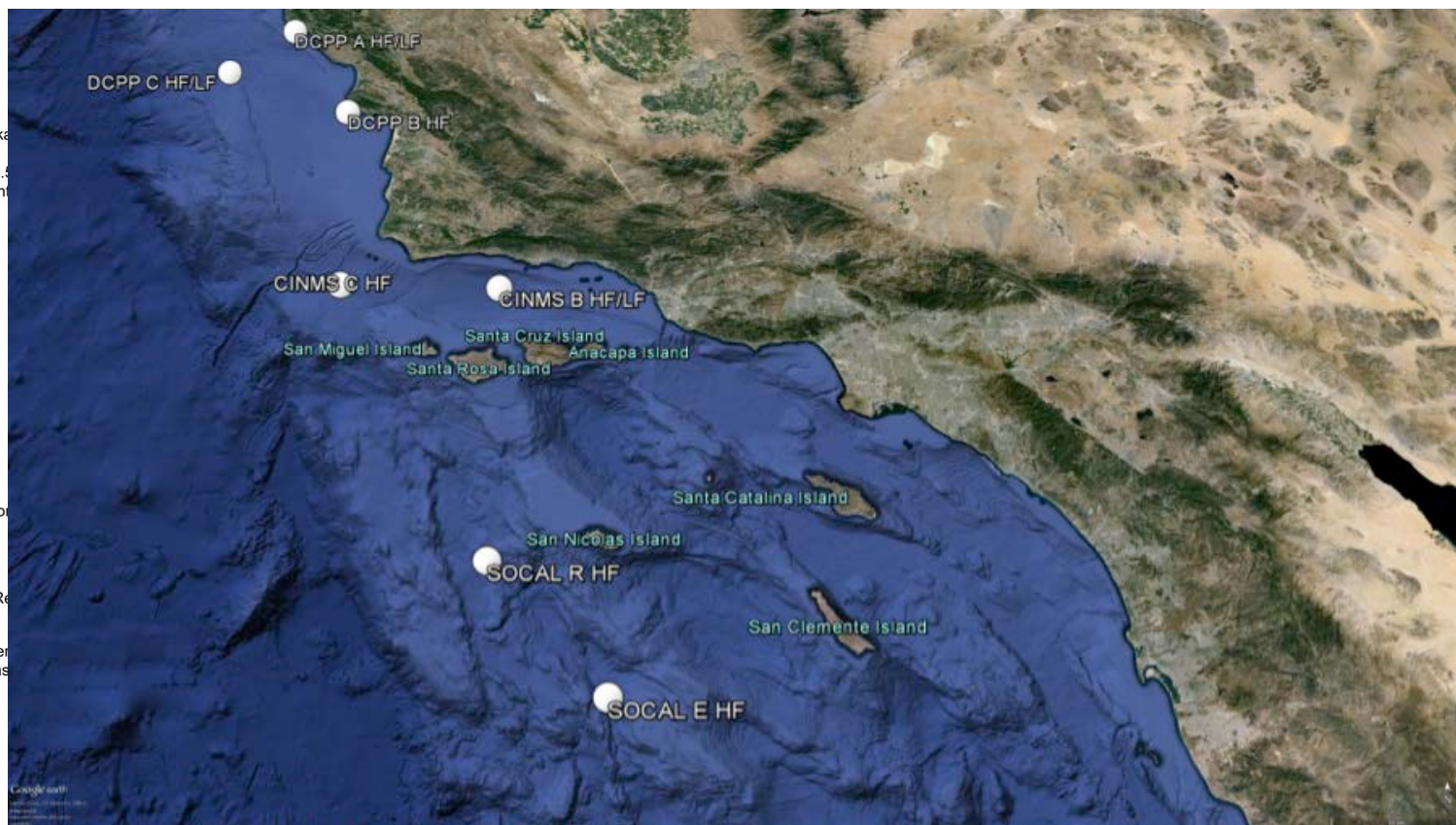
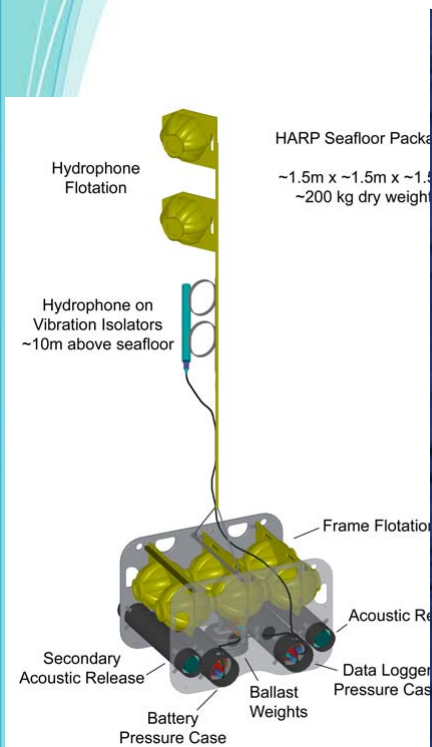
.5/07/16
 Systems

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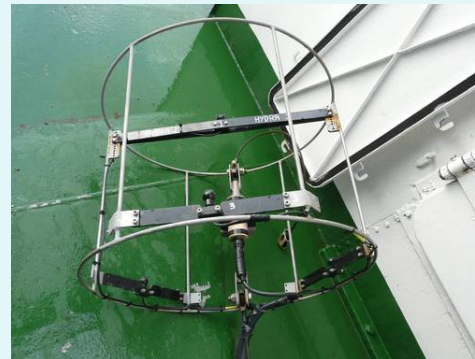
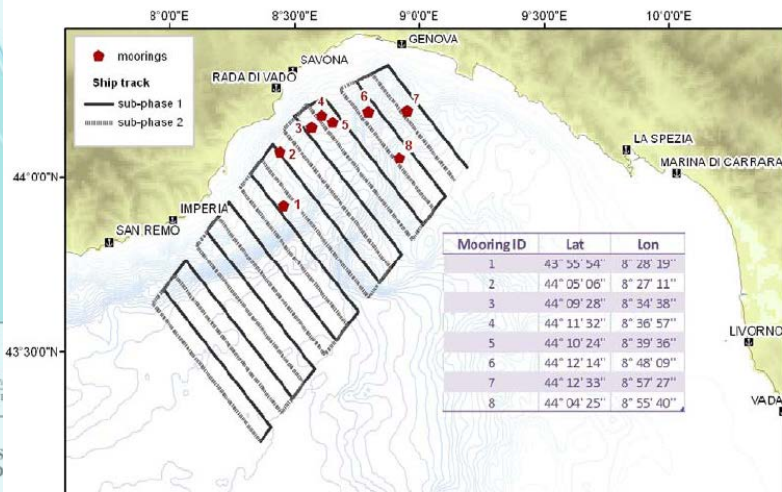
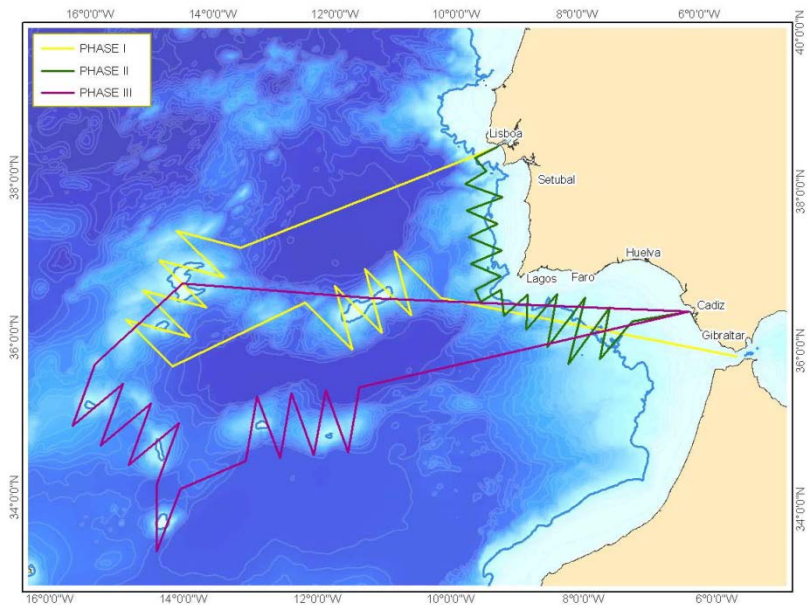
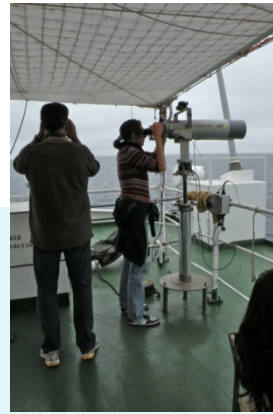


DATA COLLECTION: Workshop dataset



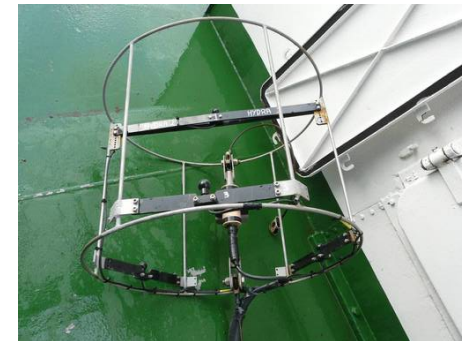
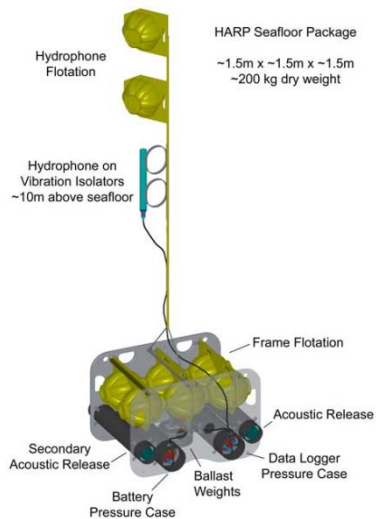
Sean M. Wiggins, John A. Hildebrand, High-frequency Acoustic Recording Package (HARP) for broad-band, long-term marine mammal monitoring, Proceedings of the International Symposium on Underwater Technology 2007

NURC SEA TRIALS



ENVIRONMENTAL CONDITIONS

Location	Recording systems	Experiment
Pacific	HARP (Bottom Device, BD)	SOCAL_E
Atlantic	CPAM (Towed Array, TA)	Sirena 2010
Mediterranean Sea	CPAM (Towed Array, TA)	Sirena 2011
Mediterranean Sea	Hydra (Bottom Device, BD)	Sirena 2011

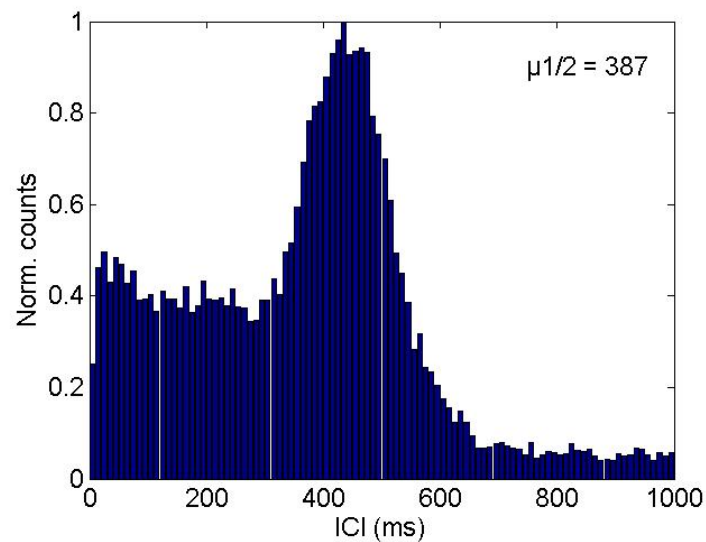
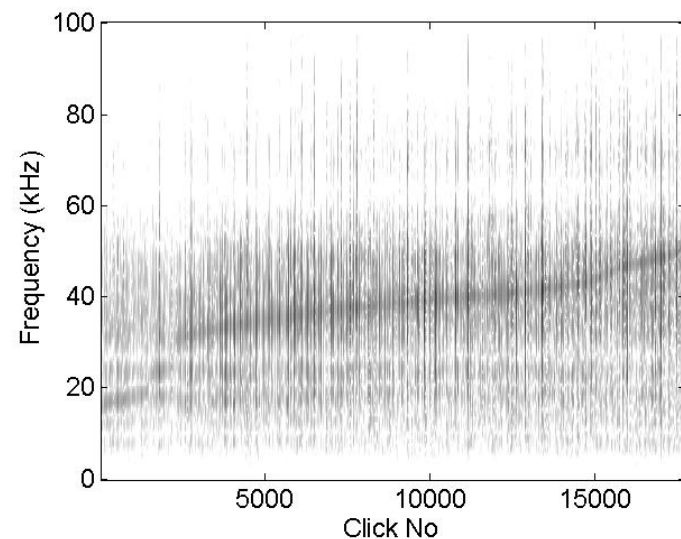
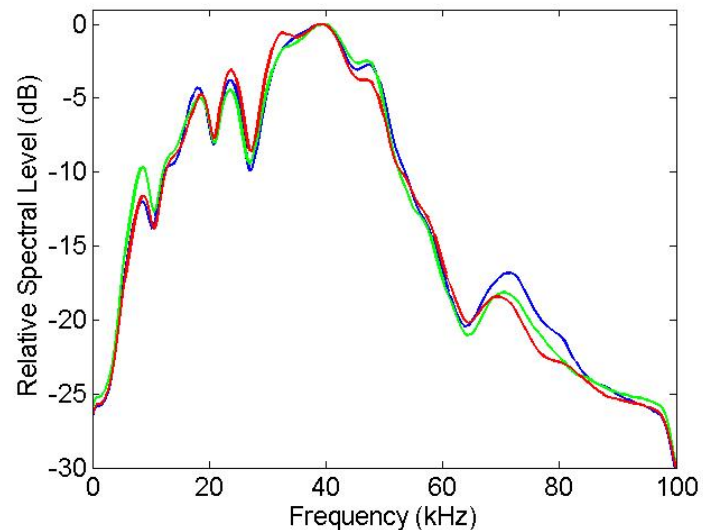


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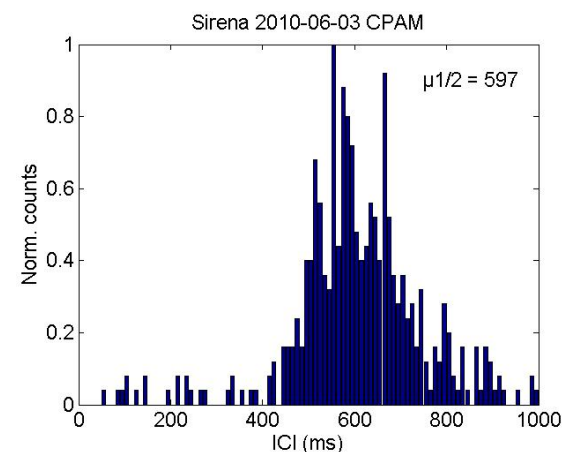
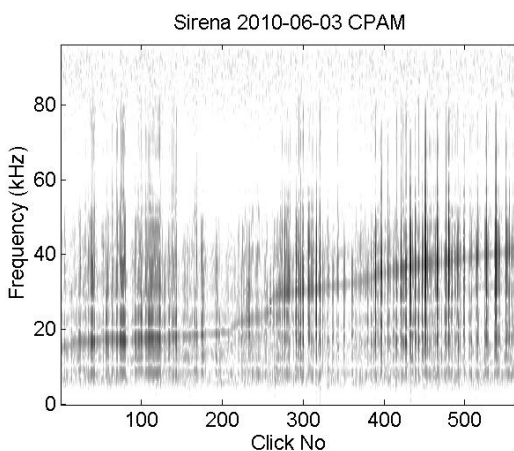
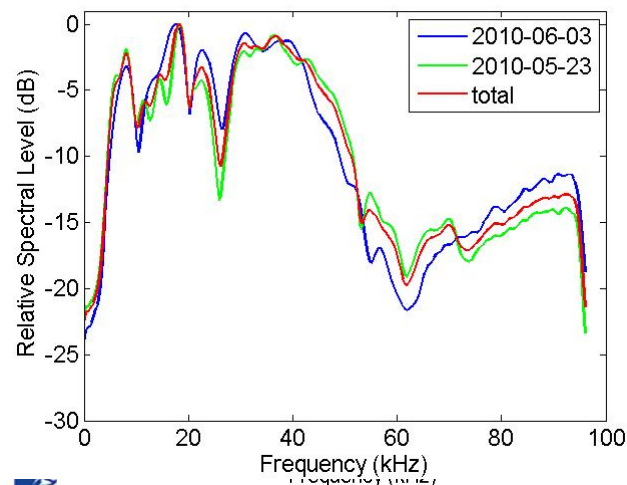
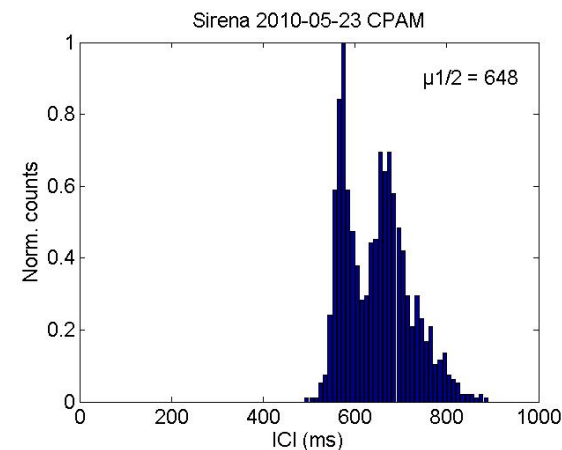
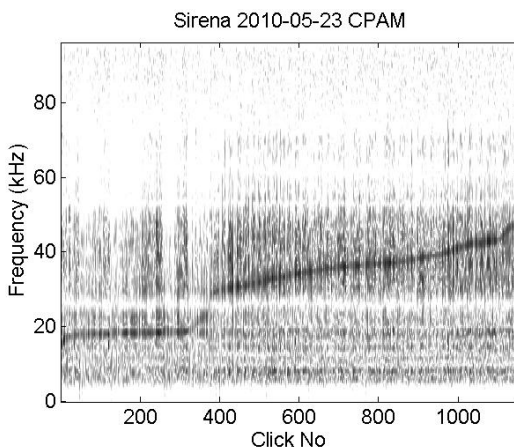
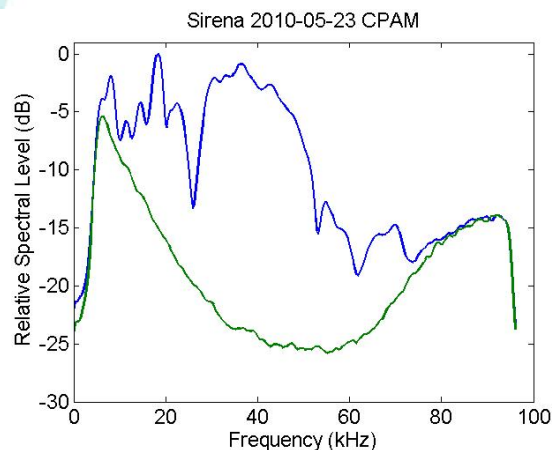


SOCAL_E RESULTS (PACIFIC, BD)

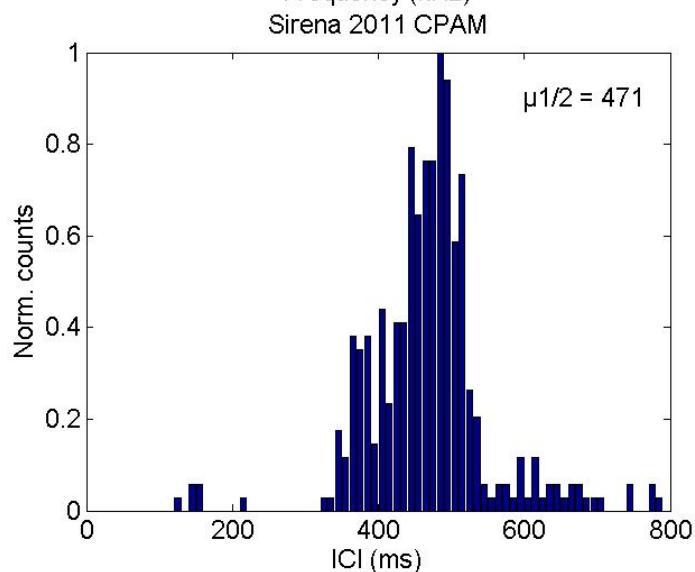
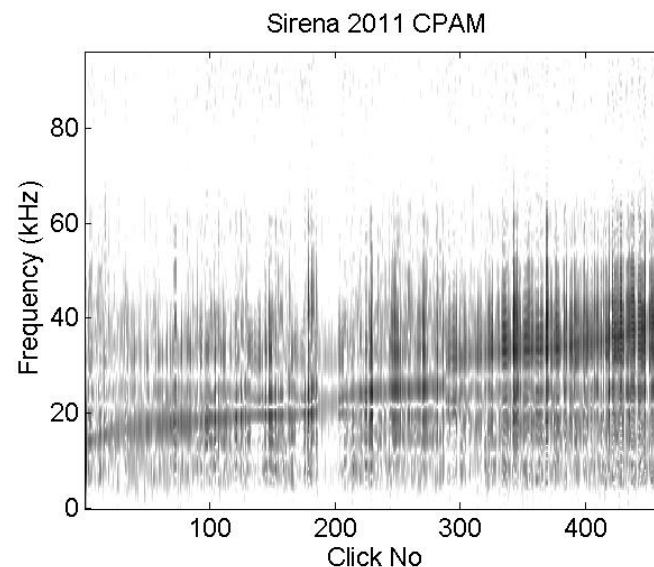
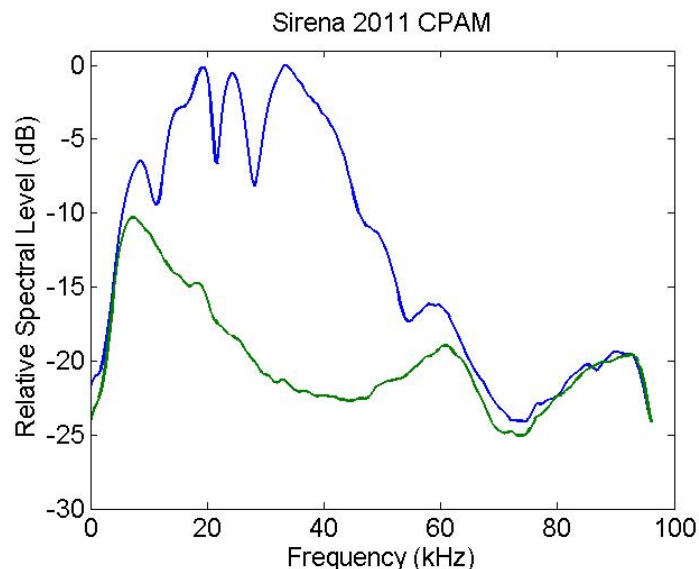


Peak F (kHz)	38.7 (23, 46)
Cen. F (kHz)	36.5 (30, 42)
ICI (ms)	387 (78, 575)
Duration (μs)	390 (225, 690)
N clicks	17738

SIRENA 2010 CPAM RESULTS (ATLANTIC, TA)

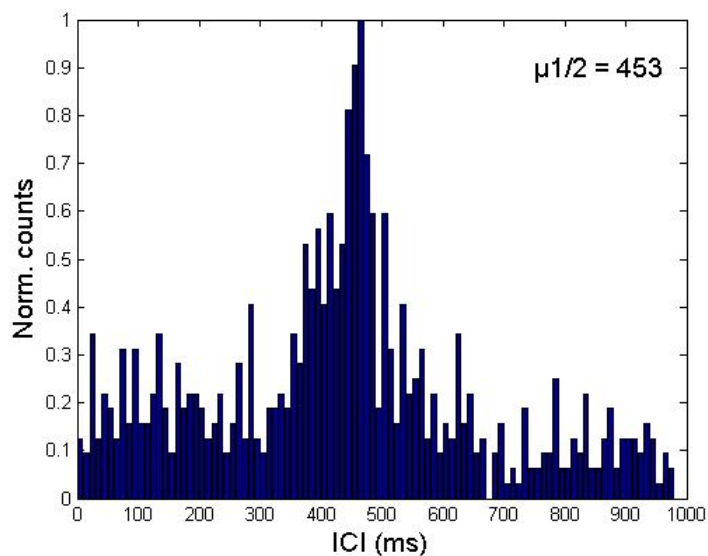
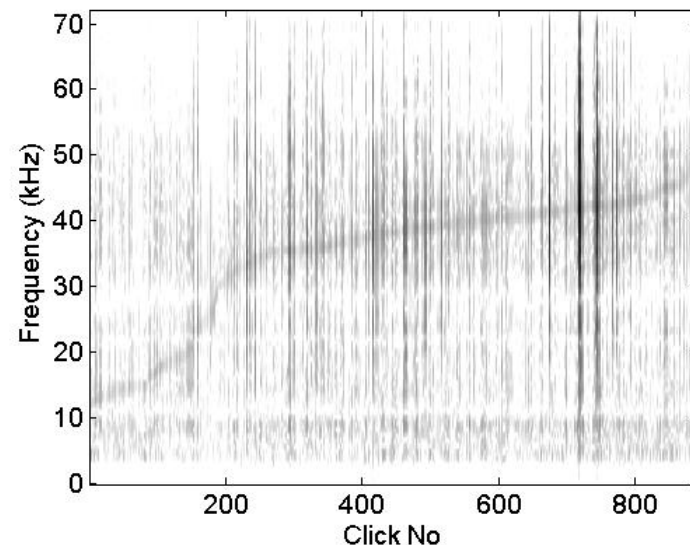
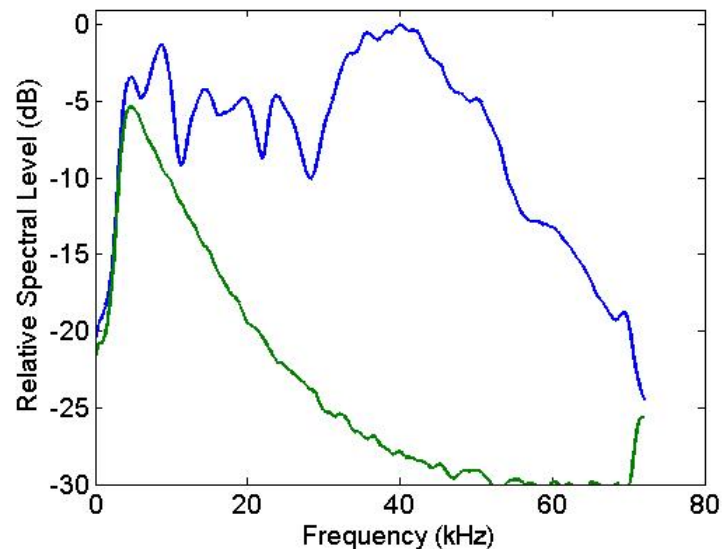


SIRENA 2011 CPAM RESULTS (MED., TA)



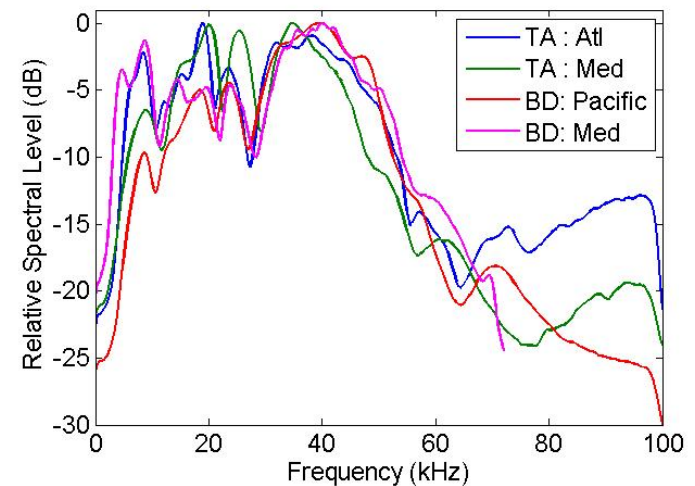
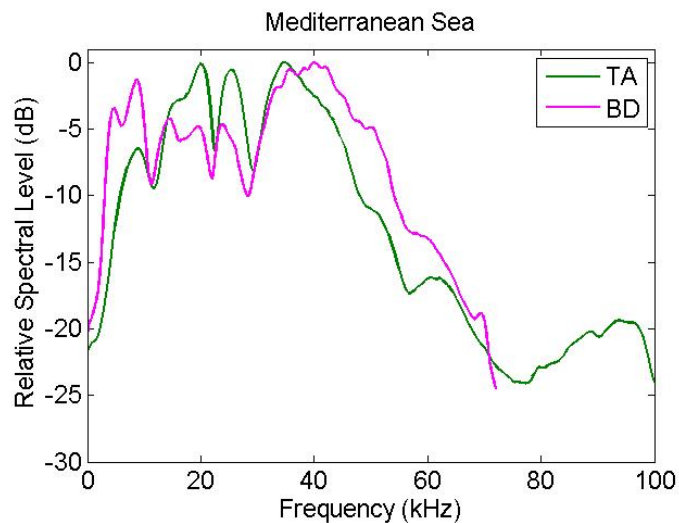
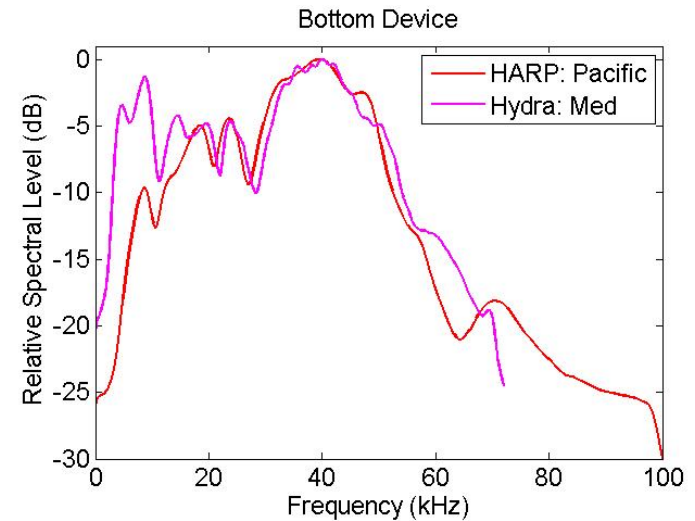
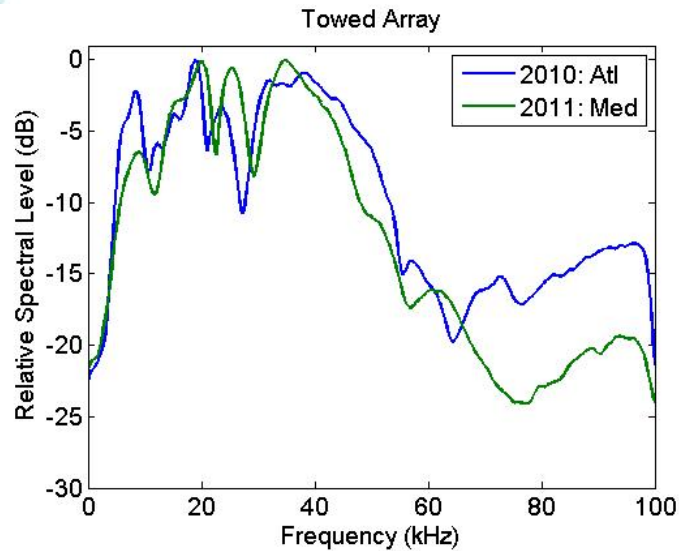
Peak F (kHz)	24.4 (17,36)
Cen. F (kHz)	28.0 (22,34)
ICI (ms)	471 (375, 536)
Duration (μs)	682 (458, 1005)
N clicks	466

SIRENA 2011 HYDRA RESULTS (MED., BD)



Peak F (kHz)	38.2 (16, 43)
Cen. F (kHz)	31.2 (24, 38)
ICI (ms)	453 (124, 937)
Duration (μs)	590 (375, 861)
N clicks	893

MEAN SPECTRUM COMPARISON



Click parameters

	Sirena2010 CPAM 06_03	Sirena2010 CPAM 05_23	Sirena2011 CPAM	Sirena 2011 Hydra	Socal_E
Peak F (kHz)	30.0 (17, 39)	33.7 (18, 42.3)	24.4 (17,36)	38.2 (16, 43)	38.7 (23, 46)
Cen. F (kHz)	31.3 (25, 37)	32.6 (24.5, 36.5)	28.0 (22,34)	31.2 (24, 38)	36.5 (30, 42)
ICI (ms)	598 (474, 780)	648 (562, 745)	471 (375, 536)	453 (124, 937)	387 (78, 575)
Duration (μs)	479 (355, 639)	692 (421, 901)	682 (458, 1005)	590 (375, 861)	390 (225, 690)
N clicks	567	1154	466	893	17738

CONCLUSIONS

■ Towed array / Bottom Device

- First impression to be confirmed with BD : more clicks per time unit
- Higher peak frequency with BD
- More spreading in ICI with BD (to be quantified)
 - Multiple animals ?
 - More variability in individual animal's ICI ?

■ Location (Pacific, Atlantic, Mediterranean Sea)

- No particular differences in spectrum shape
- The 2 recordings in NE Atlantic have a median ICI 600ms +, versus 400- 500 ms

Acknowledgments

- NURC (CMRE),
 - Walter Zimmer, David Hughes, Luigi Troiano
- All participants of Sirena 10 & 11 cruises
- Captain and crew of RV Alliance
- Workshop Organizers
 - Organization
 - Such a rich dataset

