High lights of Whale Research in Skjálfandi Bay during the last years

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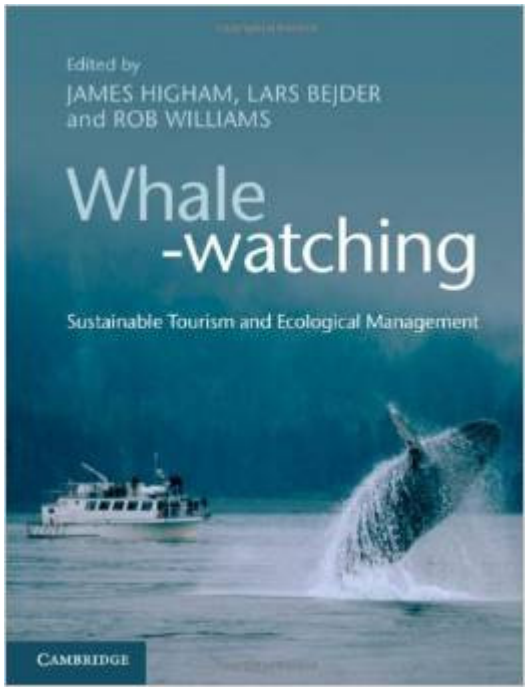
http://rannsoknasetur.hi.is/husavik/husavik

Whaling versus whale-watching:

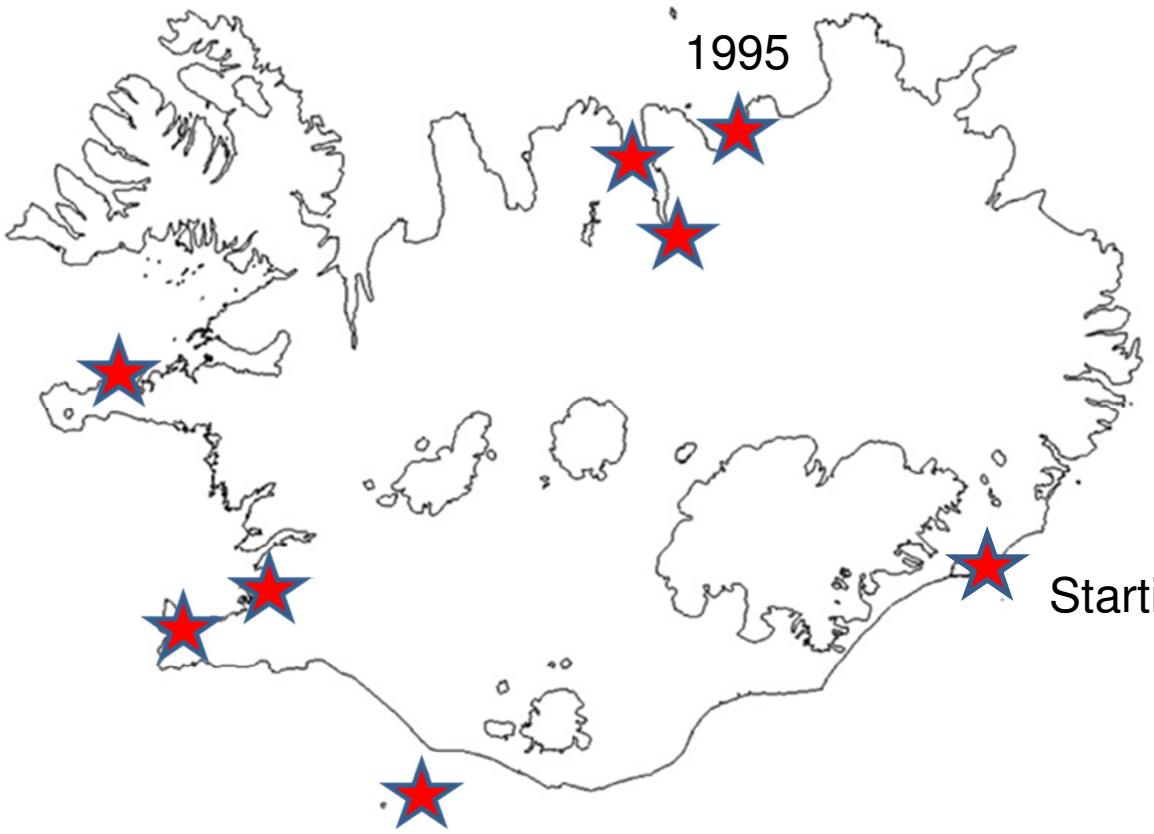
- The whaling versus whale-watching debate -The resumption of Icelandic whaling (Rasmussen, 2014)



Background

- First Feasibility Study was conducted in 1990 by Dr. Ole Lindquist & Tryggvadóttir supported by IFAW (International Fund for Animal Welfare) and they concluded that whalewatching in Iceland would be feasible.

Whale watching in Iceland



Whale watching vessels as platform of opportunity

From Reykjavik

From Keflavik

From Húsavík

Whales in Icelandic waters

Study areas

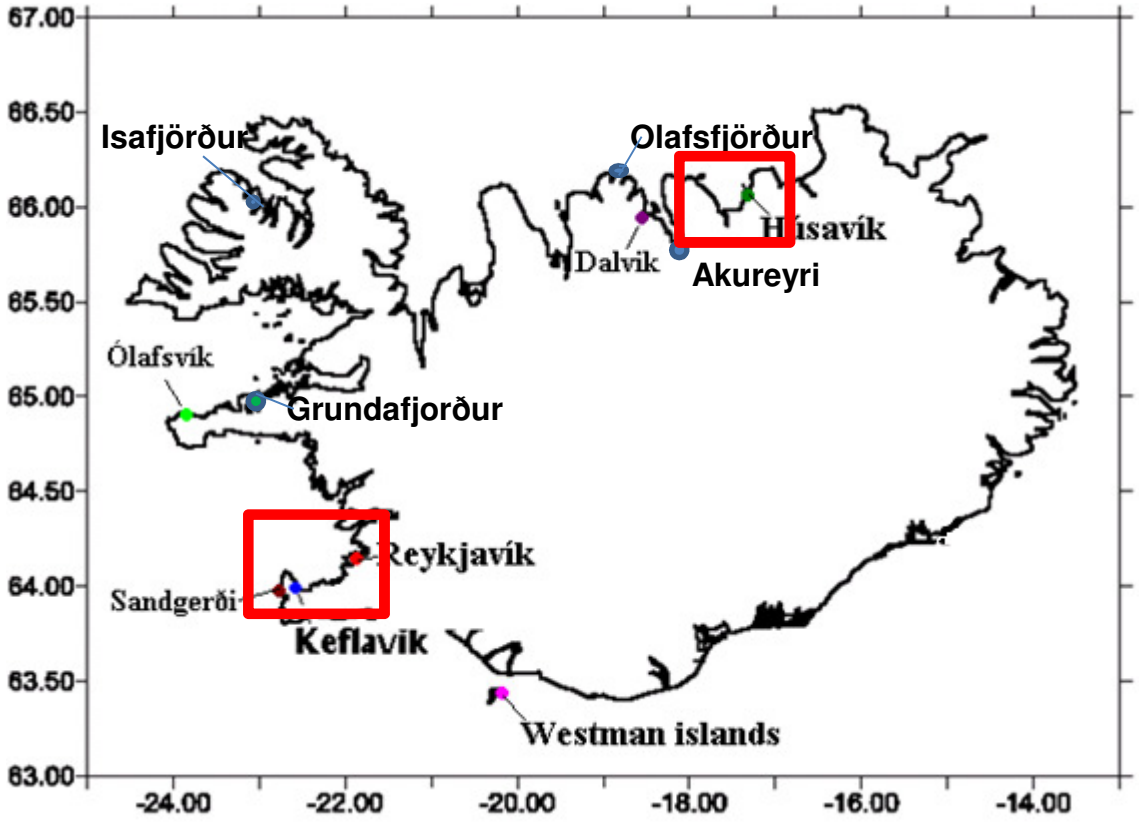
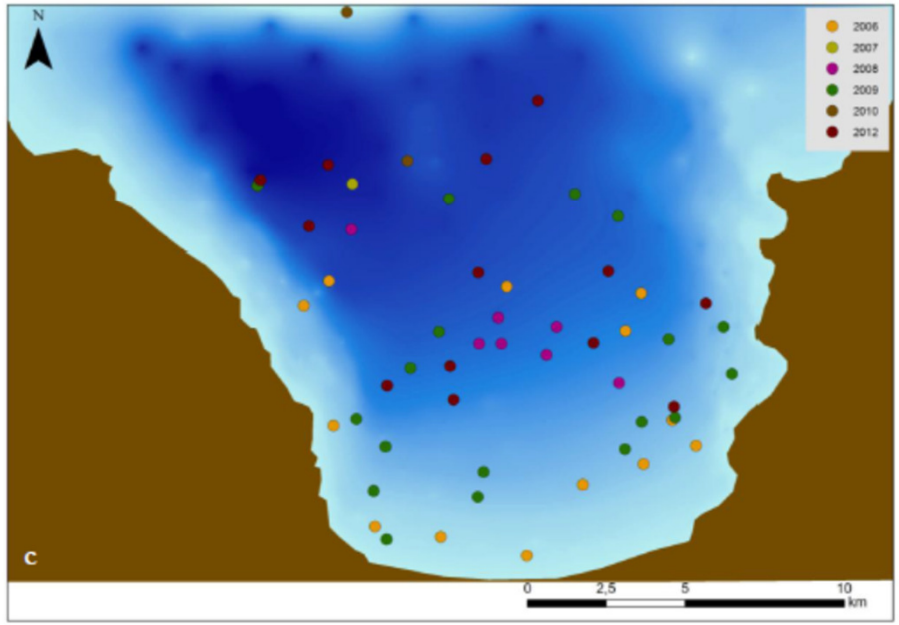
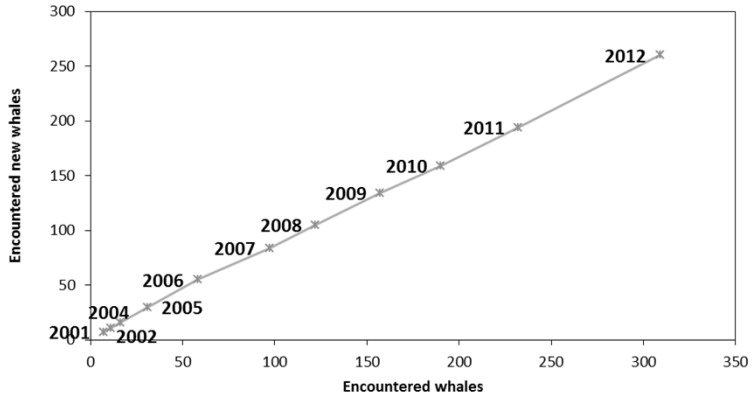

67.00
66.50
66.00
65.50
65.00
64.50
64.00
63.50
63.00
-24.00
-22.00
-20.00
-18.00
-16.00
-14.00
Isafjörður
Olafsfjörður
Húsavík
Dalvik
Akureyri
Ólafsvík
Grundafjorður
Reykjavík
Sandgerði
Keflavik
Westman islands

Photo-identification

Photo-identification

Humpback whales *(Megaptera novaeangliae)*

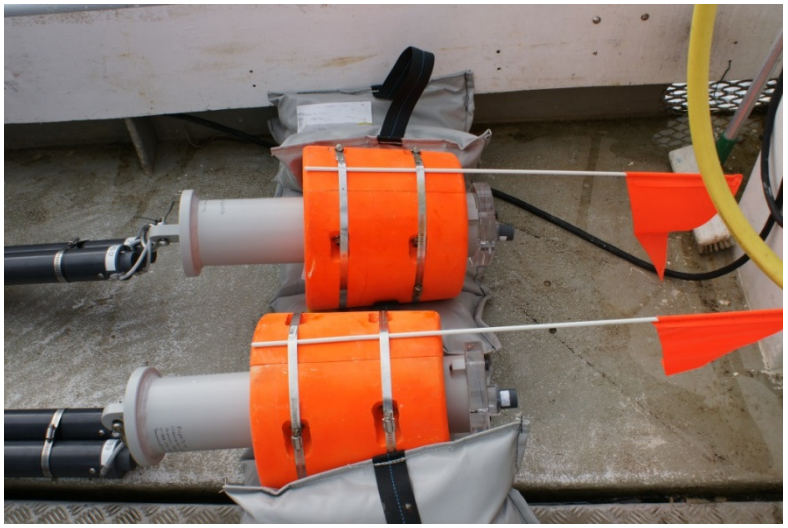


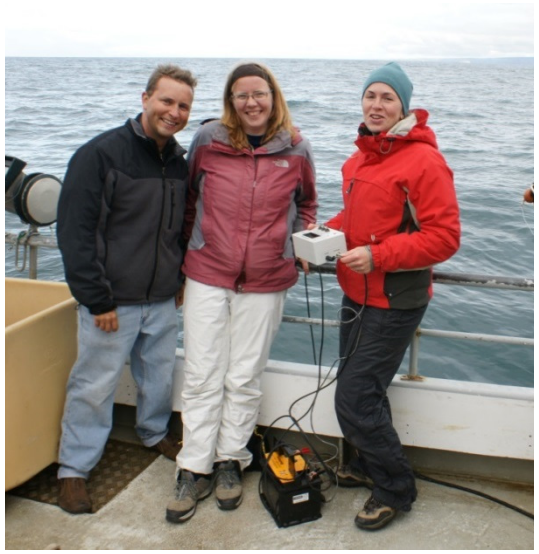


Discovery curve of humpback whale individuals during the summer research season from 2001 to 2012. Both the numbers of encountered and newly identified individuals increased. No data were available for 2003. Klotz et al (submitted)

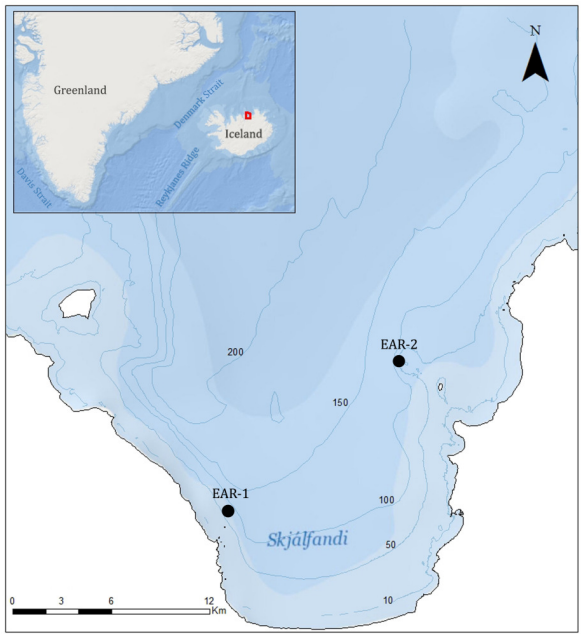
Dorsal fin (a), fluke (b) and sighting locations (c) of Mn33. Mn33 was sighted in different areas of Skjálfandi Bay, showing different location preferences between different years. (Photos: Luisa Klotz)

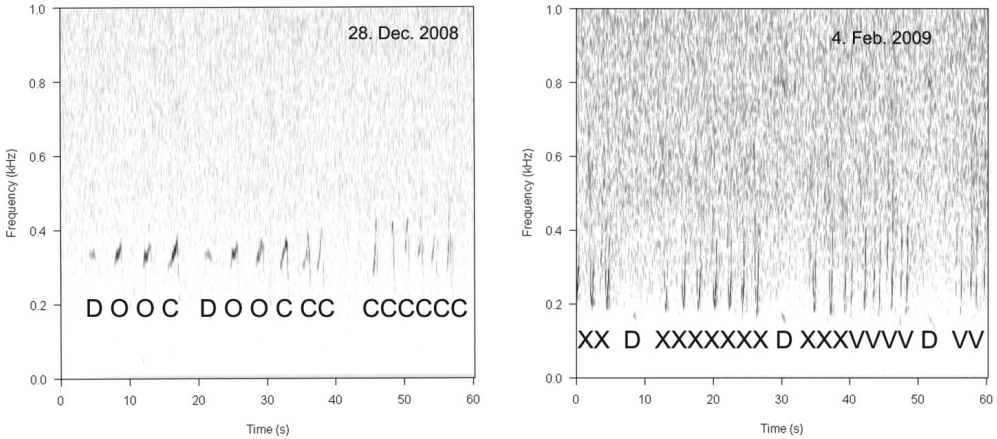
EAR's





Sound of the whales using EARs (Ecological Acoustic Recorders)





Magnúsdóttir et al. (2014)

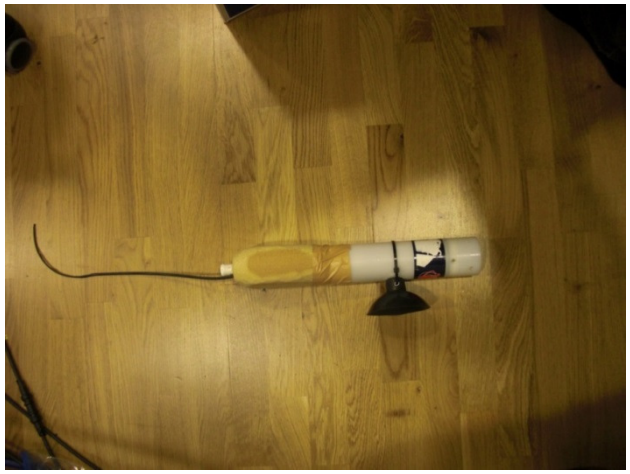
Sound of the whales using single hydrophones

AIMs

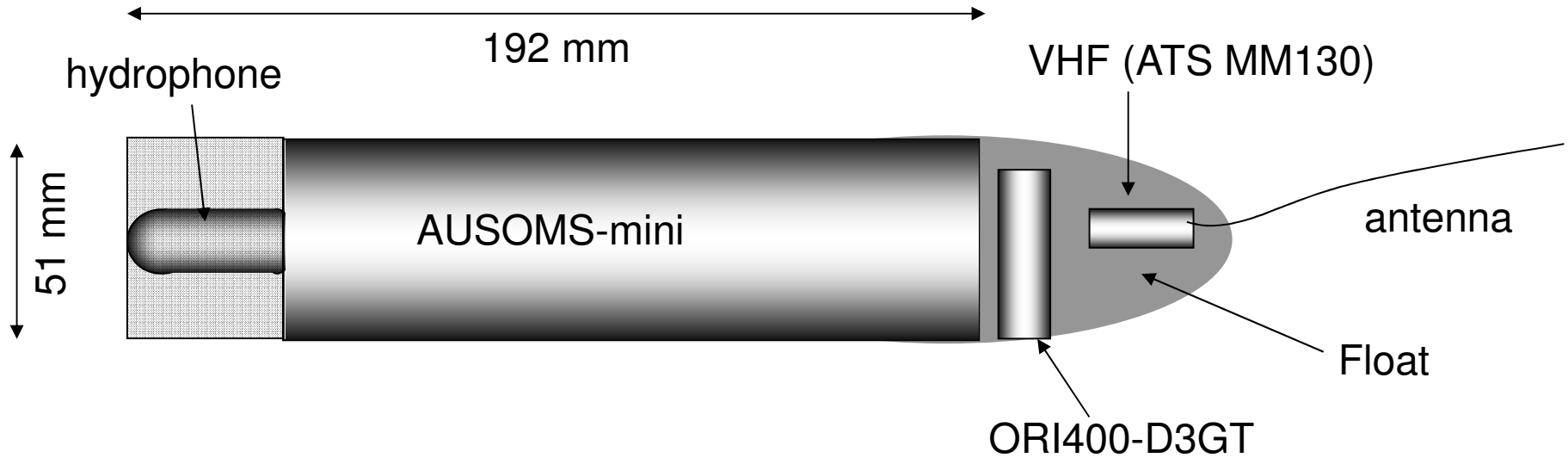
- The aim of the study was to investigate the foraging, diving behaviour and the vocalization of humpback whales and blue whales in Skjálfandi bay, Northeast Iceland

Methods

The acoustic tag consists of a hydrophone, a recorder and an acceleration and time depth recorder. The tag was attached with a Villum pole and retrieved using a VHF antenna.



AUSOMS mini (Automatic Underwater SOund Monitoring System mini)



File	mode	freq. response	recording time
WAV	44.1 kHz	40 Hz - 22 kHz	23h
WMA	LP	40 Hz - 3 kHz	1080h (220h*)

*limitation of the battery, even memory will not be full up to1080h


AQUASOUND
aqua-sound.com

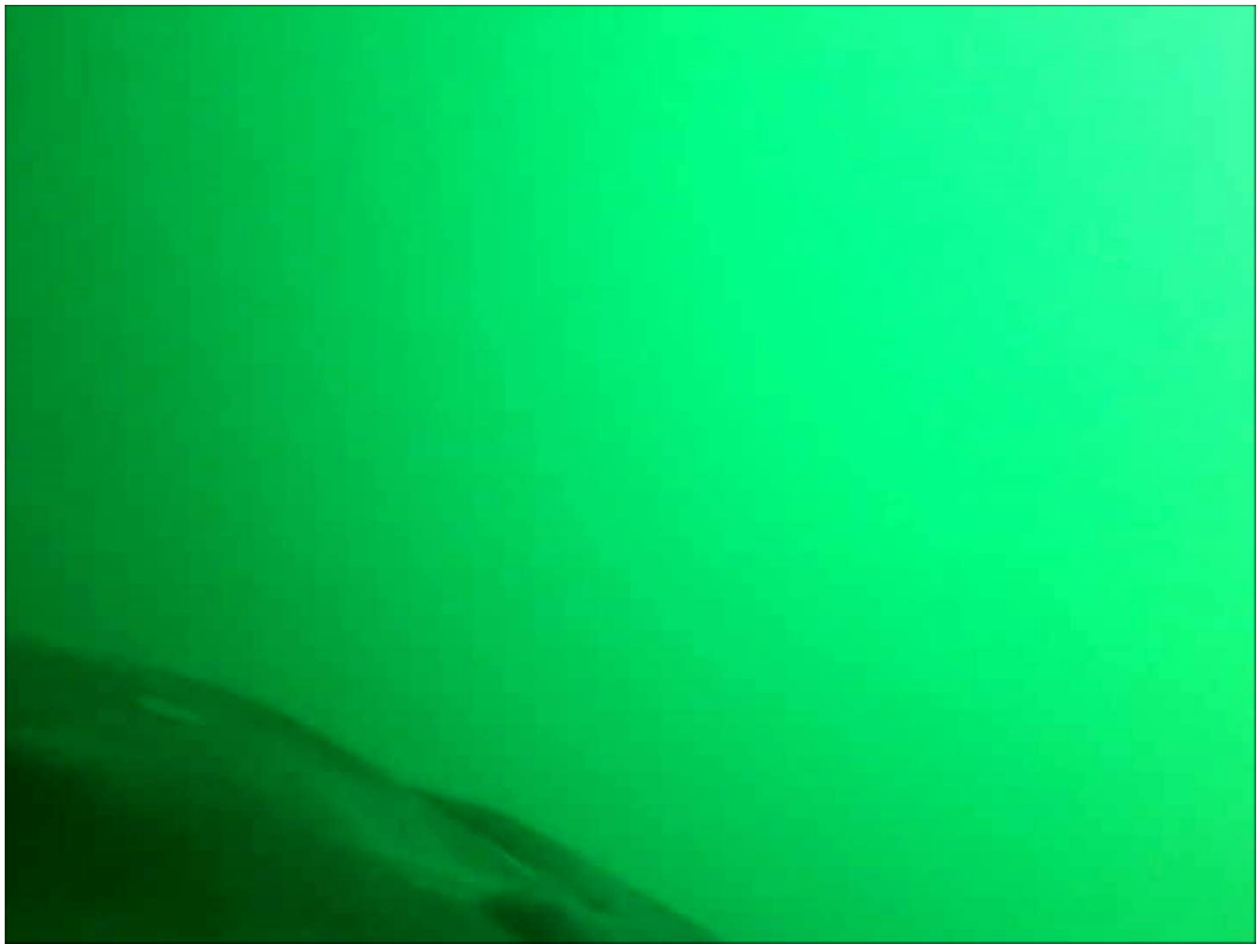
Methods

HÁSKÓLI ÍSLANDS

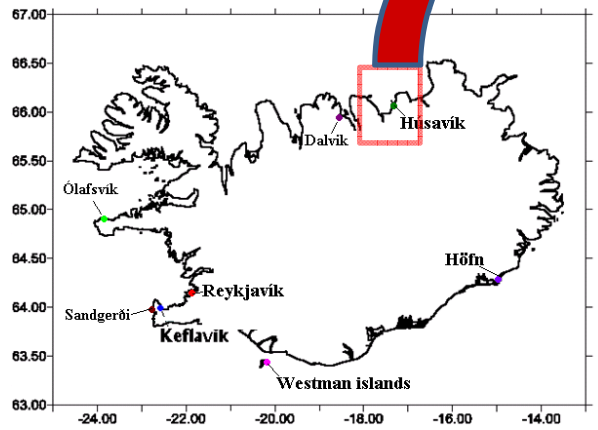
STOFNUN RANNSÓKNASETRA HÁSKÓLA ÍSLANDS

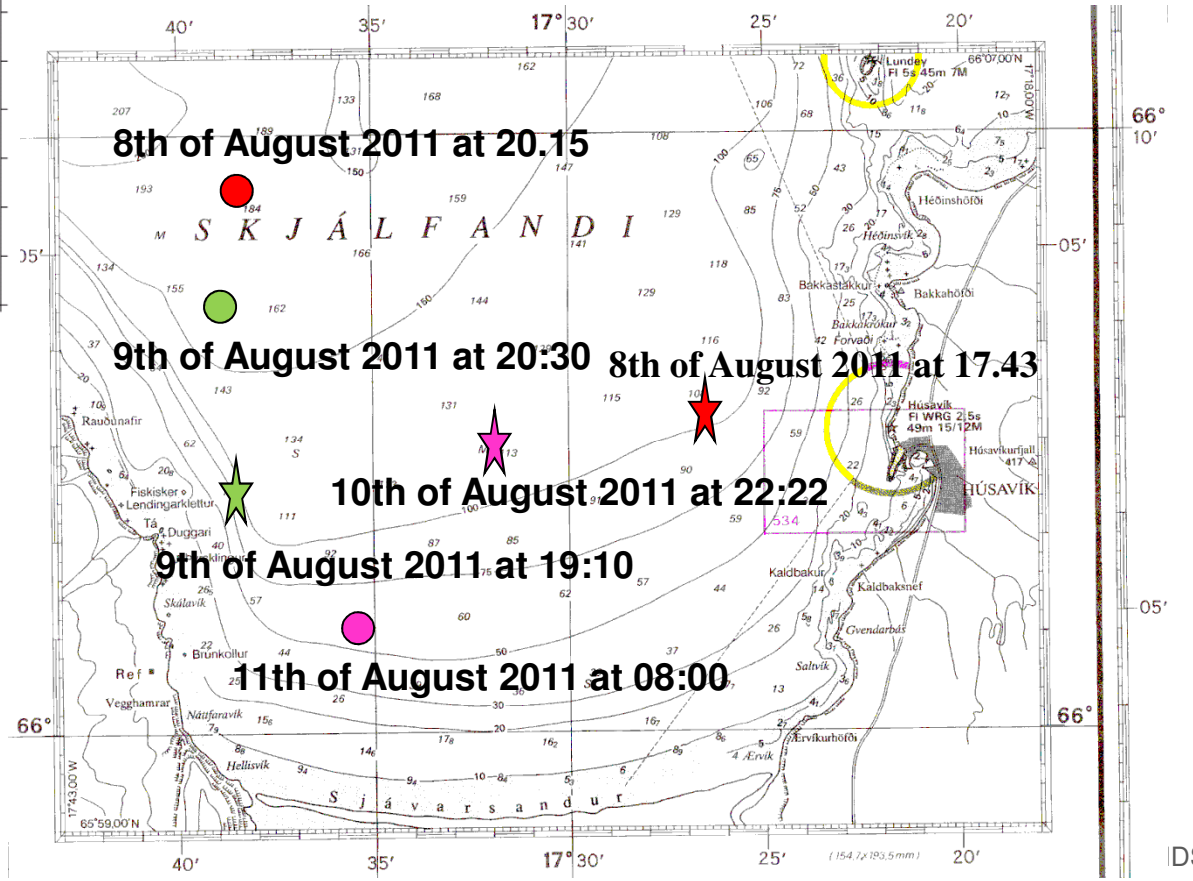
Methods

- The videologger (DVL-400-I) had acceleration logger attached as well (W1000-3MPD3GT), which included 3-axes acceleration, depth, temp, speed and compass. The tag was attached with a Villum pole and retrieved using a VHF antenna.



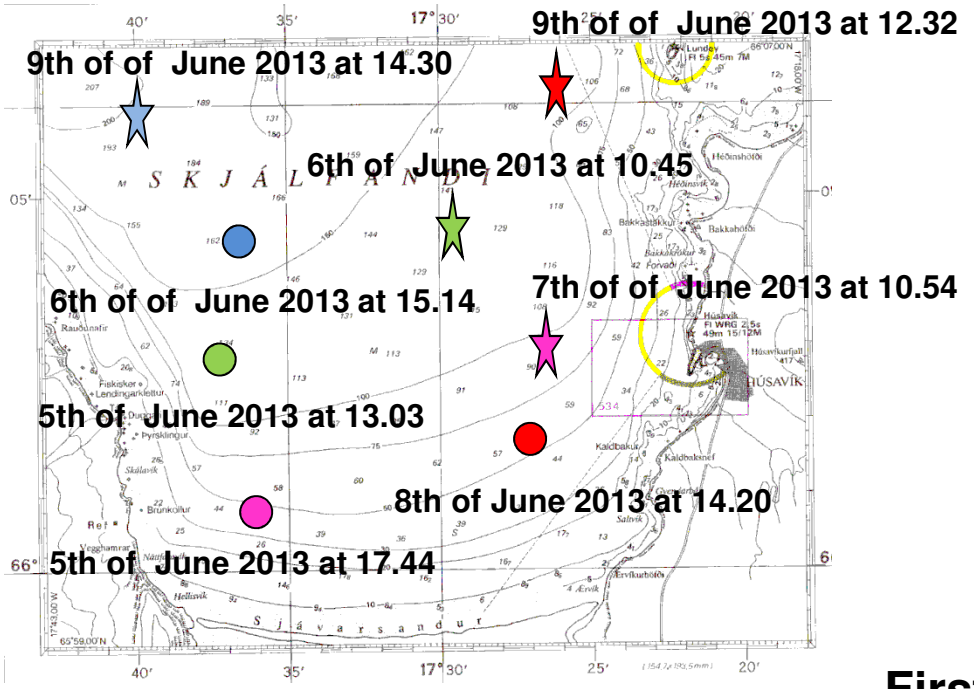
Results: 2011





Results: 2013

Four acoustic tags:

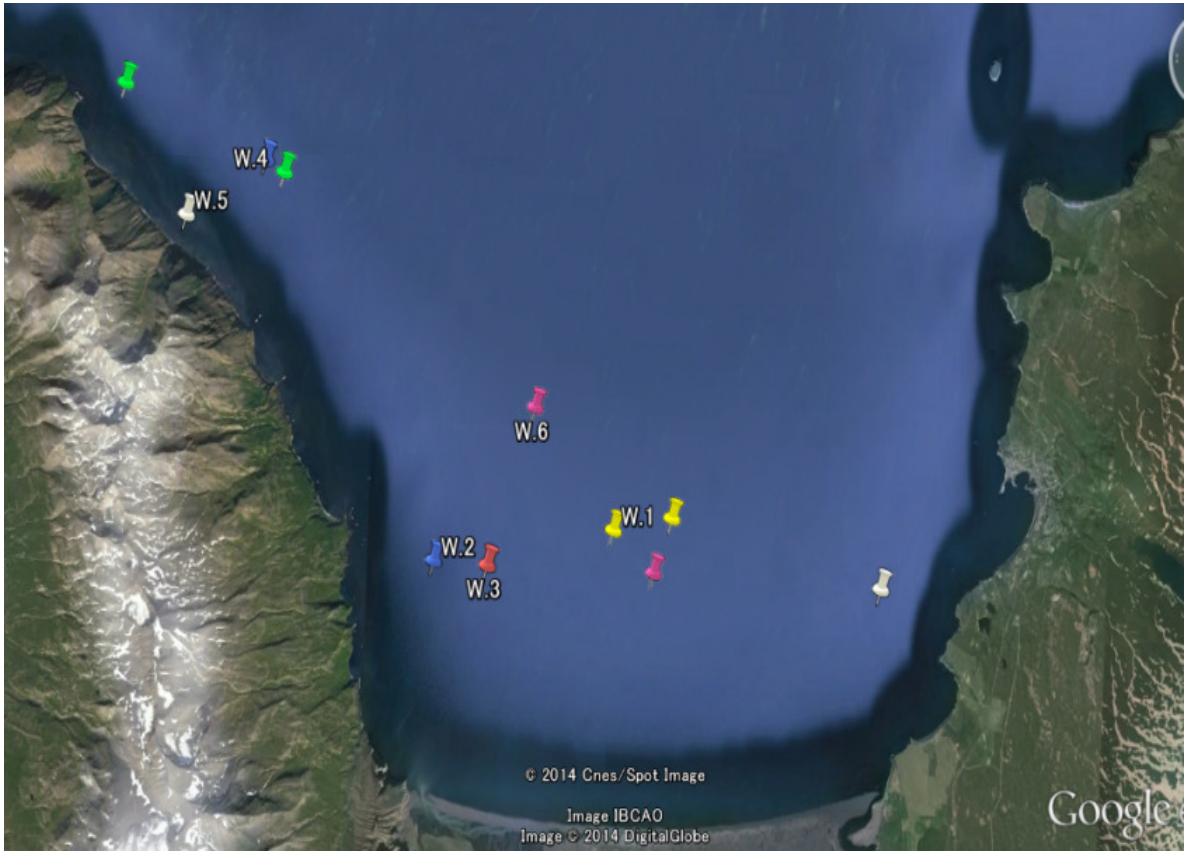


Two Camera tags:

First whale: Tagged, June 5, 2013. 16:35
Retrieved, June 6, 2013. 10:47
Second whale: Tagged, June 7, 2013. 13:59
Retrieved, June 8, 2013. 16:54

Results: 2014

Six Camera tags:



Results: 2014

	Duration (hour)	Accelerometer (hour)	Video (hour)	Hydrophone (hour)
Whale 1	12.5	12.5	11.5	12.5
Whale 2	13.1	13.1	7.3	13.1
Whale 3	60 sec	60 sec	60 sec	N
Whale 4	17.2	17.2	12.5	N
Whale 5	6.6	6.6	6.6	6.6
Whale 6	4.2	4.2	4.2	N
TOTAL	53.5	53.5	42.0	32.2

Diving behaviour 2011

- First humpback whale dove to a maximum depth of 165 m
- Second humpback whale dove to a maximum depth of 124 m
- Third humpback whale dove to a maximum depth of 165 m

Diving behaviour 2013 and 2014

- From two humpback whales tagged in 2013, the maximum dive depth recorded was 53 m
- In 2014, the maximum dive depth was 173 m

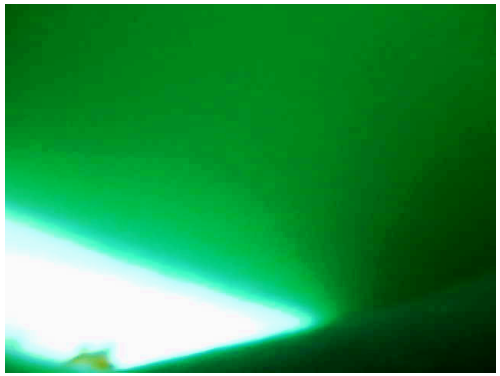
Feeding behaviour 2013 and 2014

- 70 to 80% of the feeding in 2013 were single lunge dives at shallow depth
- In 2014, the humpback whales tend to undergo 4 or more lunges per dive at around 40 m in depth

Feeding behaviour 2013 and 2014

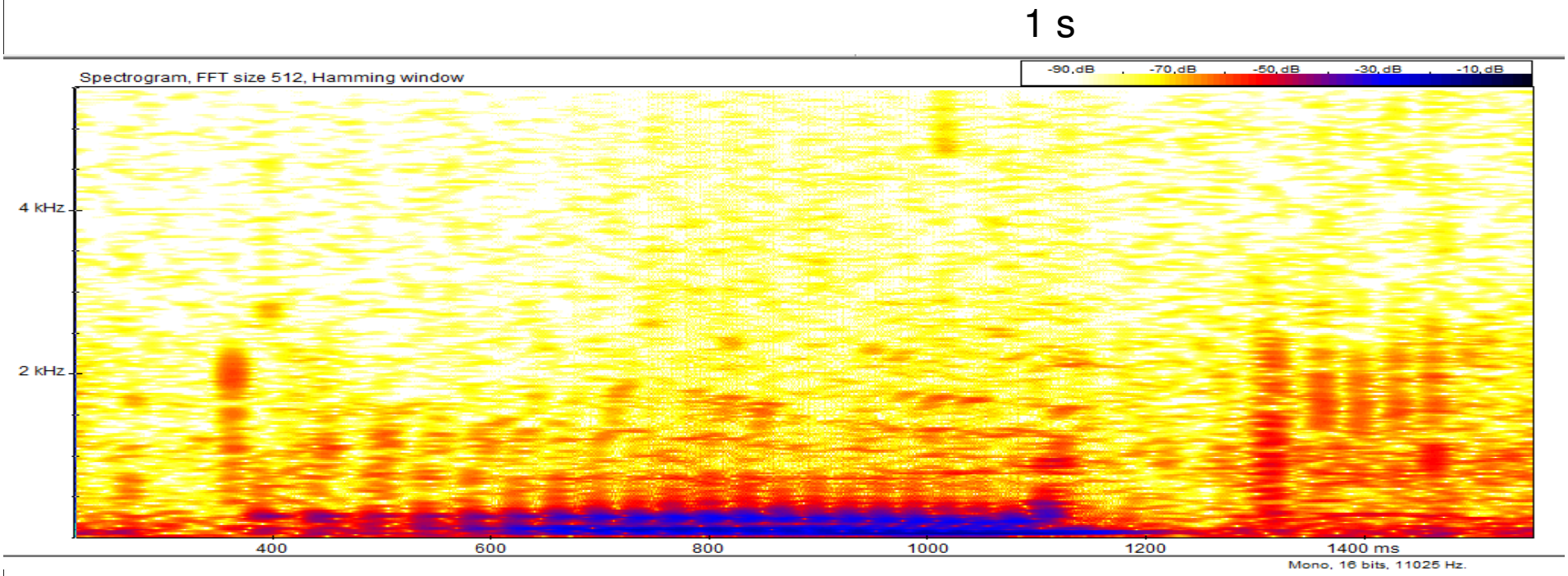
- In 2013, mainly krill was observed on video
- In 2014, both krill and fish

Feeding on fish; 140629(002), clip 001, 1:40



Krill or shrimp; 140628, clip 025, 08;54

Example of sound recordings of a humpback whale



Results: 2011

Calls detected from humpback whales:

2 calls / 2h32m (Animal 1)

0 call / 1h20m (Animal 2)

47 calls / 9h38m (Animal 3)

Distance from the tag to the blowhole

Animal 1 < 4m
Animal 3 < 4m

Vocalizations

	SL (dB*)	Initial (Hz)	Final (Hz)	duration (ms)
Animal 1	167	2200	1200	316
	167	1900	1400	463
Animal 3	155	1200	900	182
	159	430	490	1360
	167	150	550	617
	162	180	570	325
	165	260	470	762

Estimated source level: 155 to 167 dB re 1uPa rms

*dB re 1uPa rms

16384 FFT size with Blackmann-Harris window

Overall system sensitivity -170 dB re V rms /1uPa.

Adobe Audition 1.5 (Adobe Systems Inc., USA)

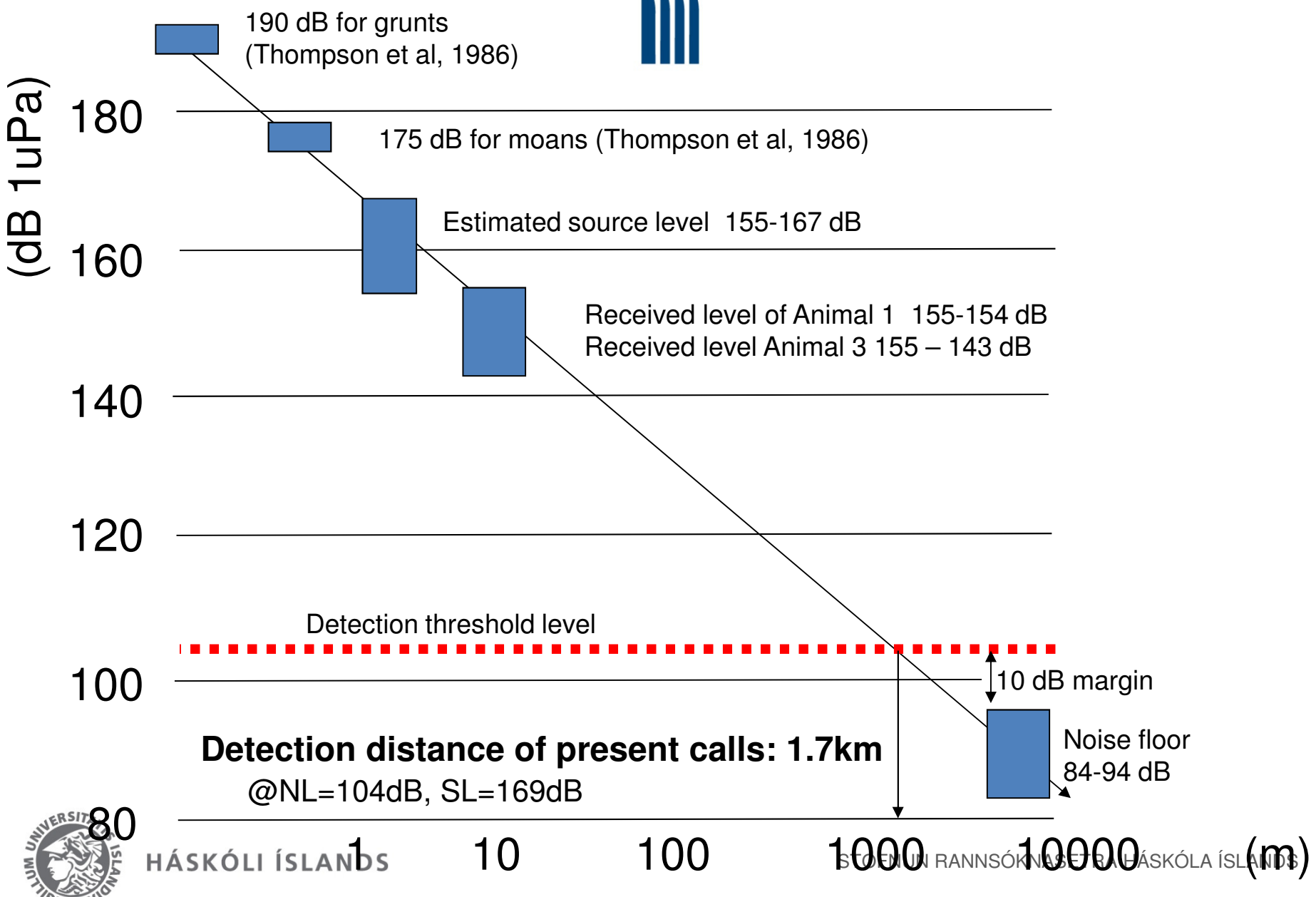

190 dB for grunts
(Thompson et al, 1986)
175 dB for moans (Thompson et al, 1986)
Estimated source level 155-167 dB
Received level of Animal 1 155-154 dB
Received level Animal 3 155 – 143 dB
Detection threshold level
10 dB margin
Noise floor
84-94 dB
Detection distance of present calls: 1.7km
@NL=104dB, SL=169dB
(dB 1uPa)
180
160
140
120
100
80
1
10
100
1000
10000
(m)

Photo-identification

Blue whales (*Balaenoptera musculus*)

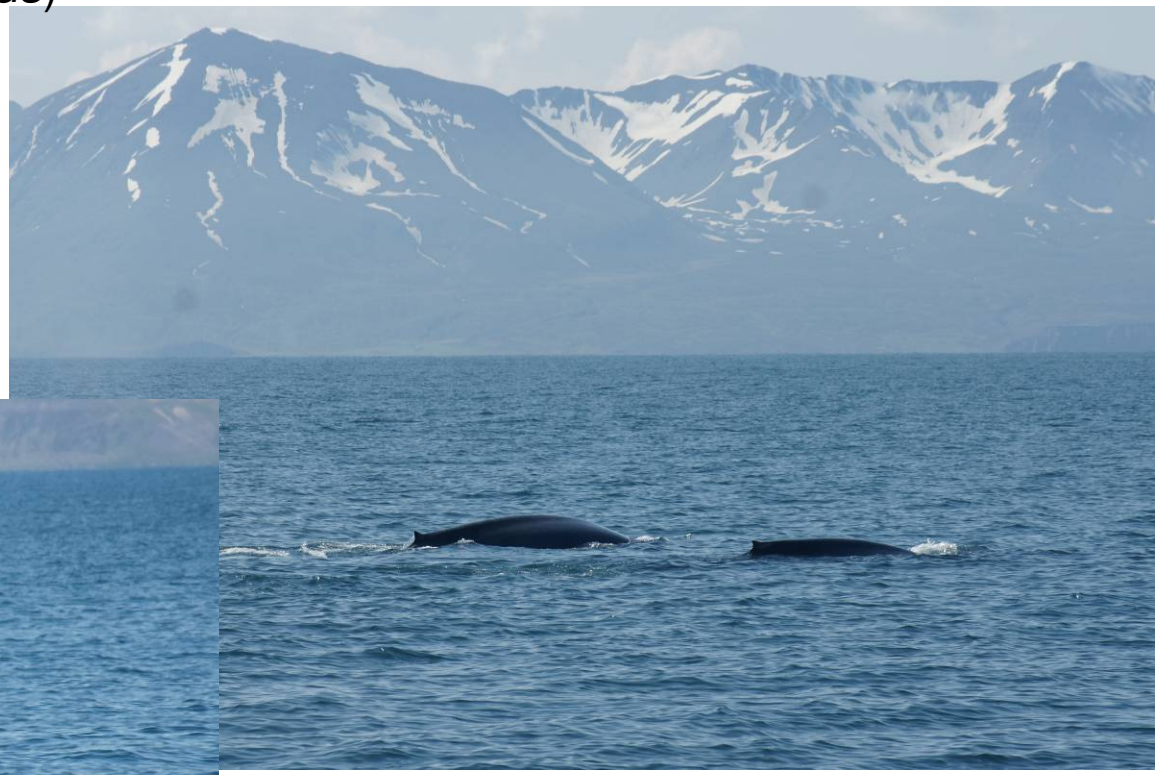
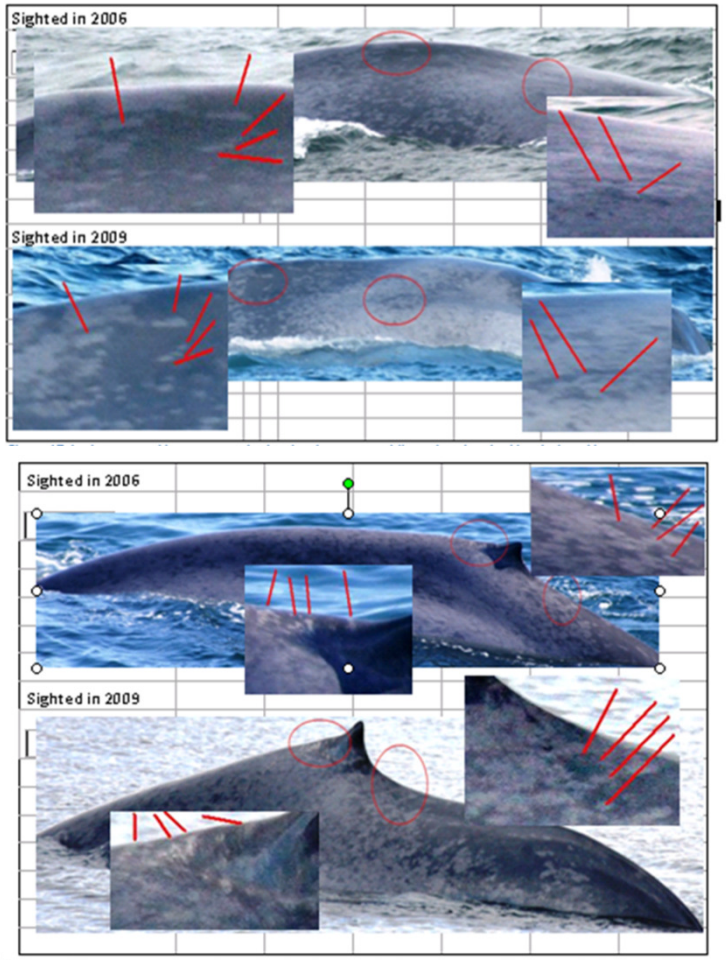
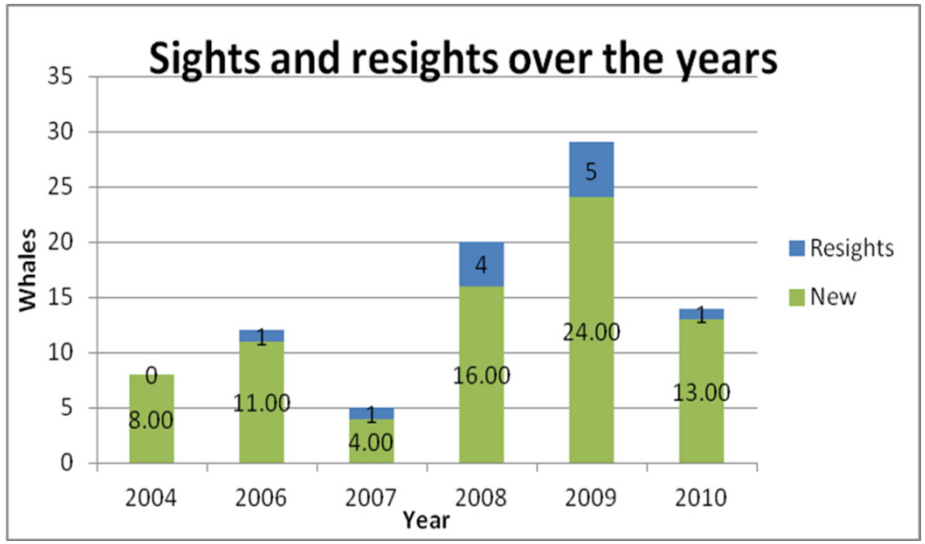


Photo-identification

Blue whales (*Balaenoptera musculus*)





Showing the total of whales encountered divided into new and resights (Johansen, 2010)

Johansen, 2010

Photo-identification

Blue whales (*Balaenoptera musculus*)

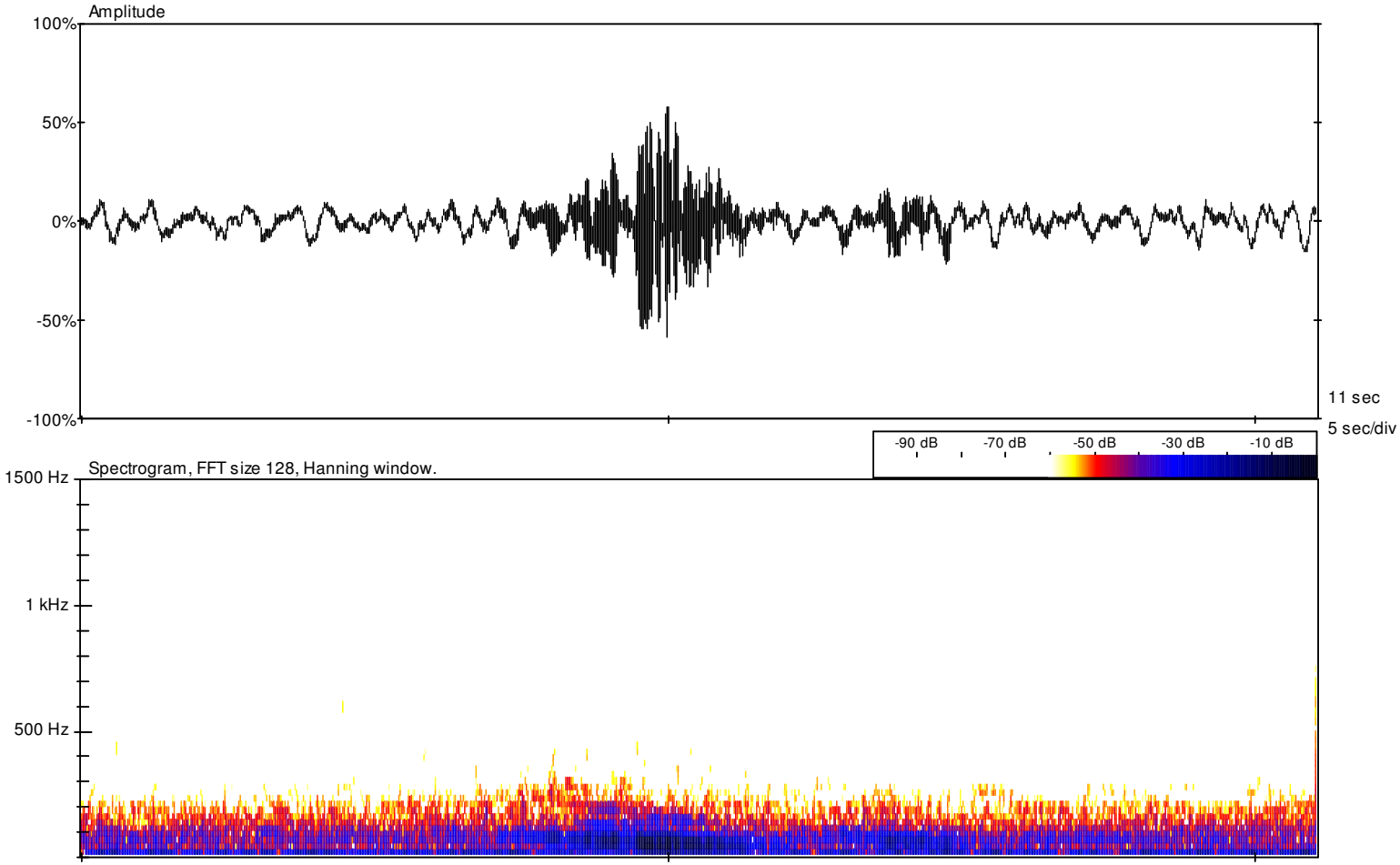
2014:

	Number of whale
Re-sight	15
New whales	23
Total	38

(Allard, 2014)

Resighting	Years of sighting
3	2009-2011-2014
5	2009-2014
6	2008-2014
8	2004-2006-2009-2011-2012-2014
9	2009-2011-2012-2014
10	2009-2011-2014
13	2006-1009-2011-2012-2014
17	2009-2014
37	2009-2014
43	2009-2014
45	2009-2014
74	2010-2011-2012-2014
80	2010-2014
93	2012-2014
95	2012-2014

Blue whale call



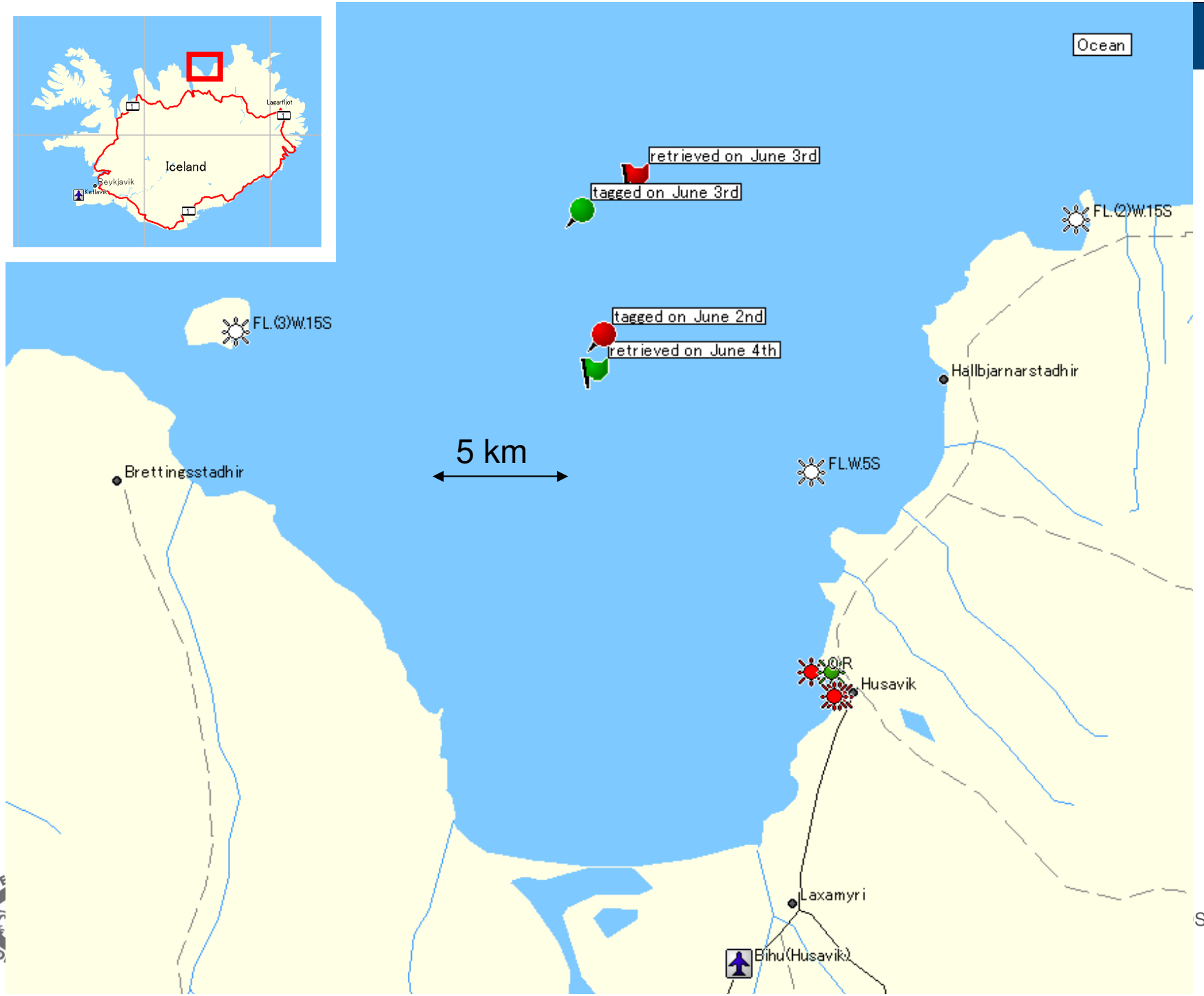
Blue whale calls

Iversen et al, 2010

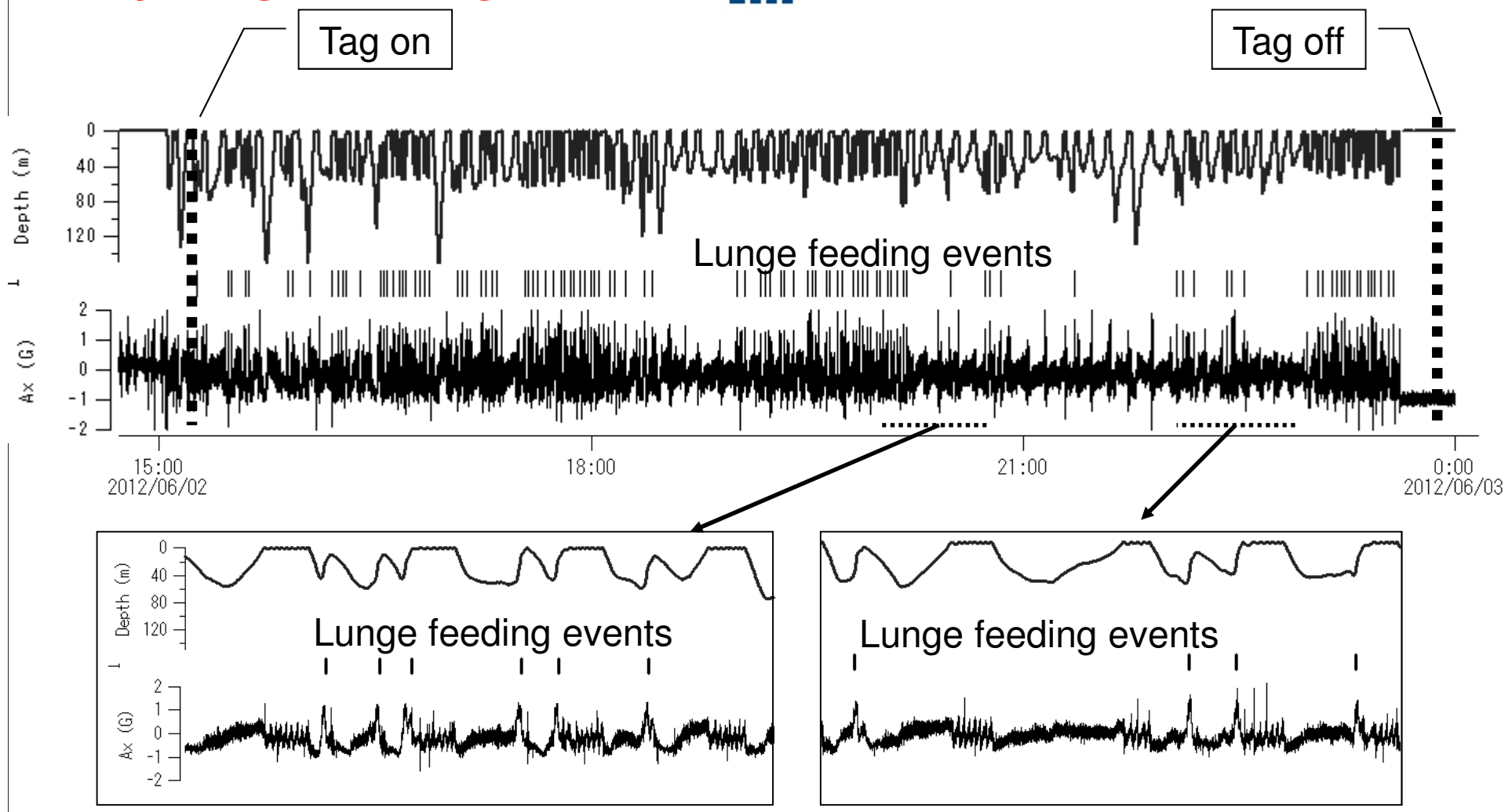
Type of sound	Number of calls, N	Frequency area (Hz)		Average frequencies (Hz ± St dev)		Average duration (s. ± St dev)
Constant	27	044	103	69 ± 14	68 ± 14	0,56 ± 0,23
Upswept	17	68	71	44 ± 13	93 ± 14	0,67 ± 0,23
Arch	5	59	85	75 ± 8	75 ± 9	0,45 ± 0,04
Downswept	11	22	88	62 ± 18	51 ± 18	0,84 ± 0,51

A total of 85 blue whale calls were analysed containing 24 calls of moderate length (1,93 s. ± 0,86 s.) and one moan of 1,91 s. in duration and 60 short calls (0,63 s. ± 0,31 s.). The short calls were divided into four call types


© Sabrina Brando

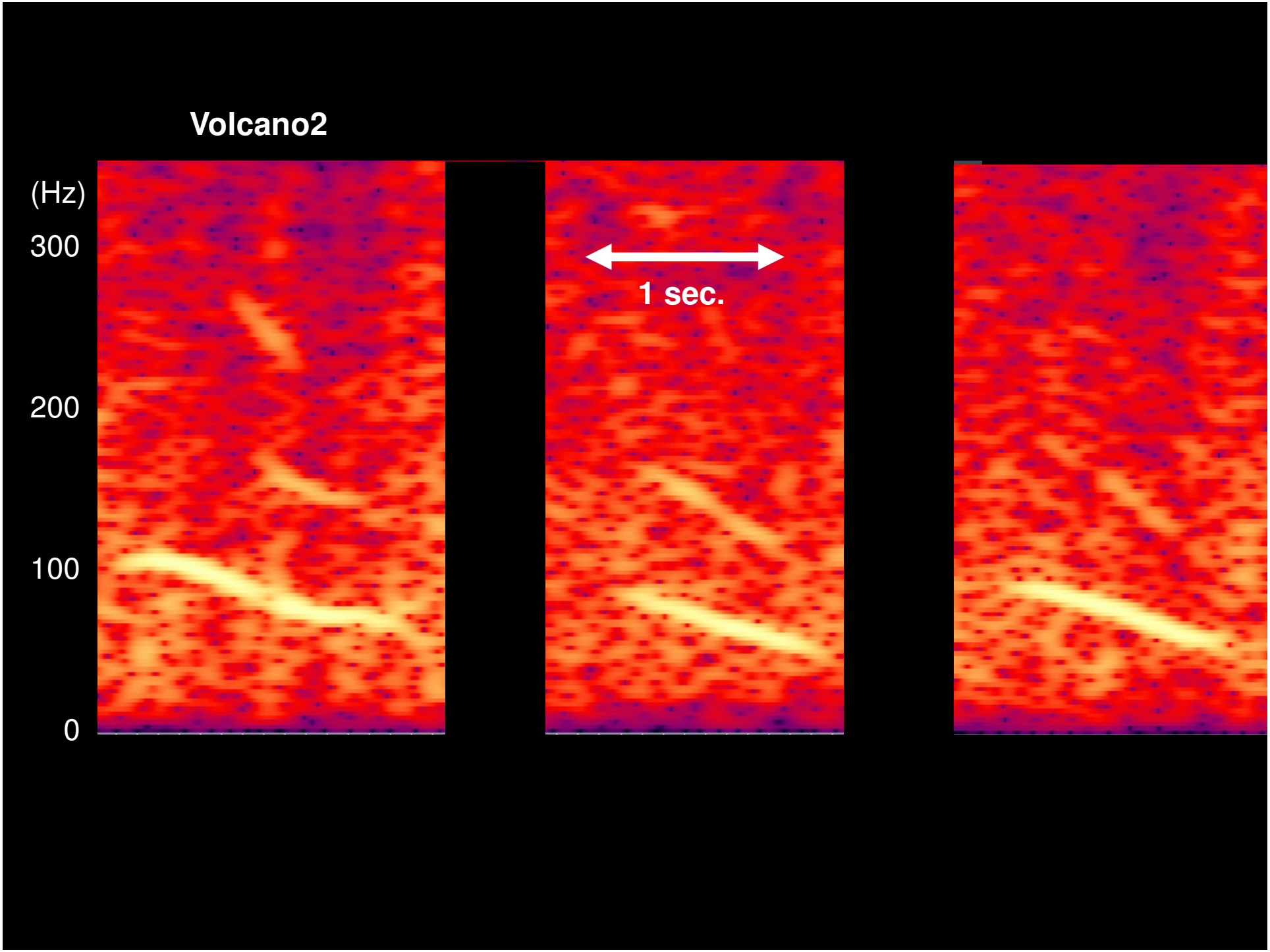

Iceland
Reykjavik
Keflavik
Egilsstadir
Ocean
retrieved on June 3rd
tagged on June 3rd
FL.(2)W.15S
FL.(3)W.15S
tagged on June 2nd
retrieved on June 4th
Hallbjarnarstadhir
5 km
Brettingsstadhir
FL.W.5S
O.R
Husavik
Laxamyri
Bihu(Husavik)

Many lunge feeding events

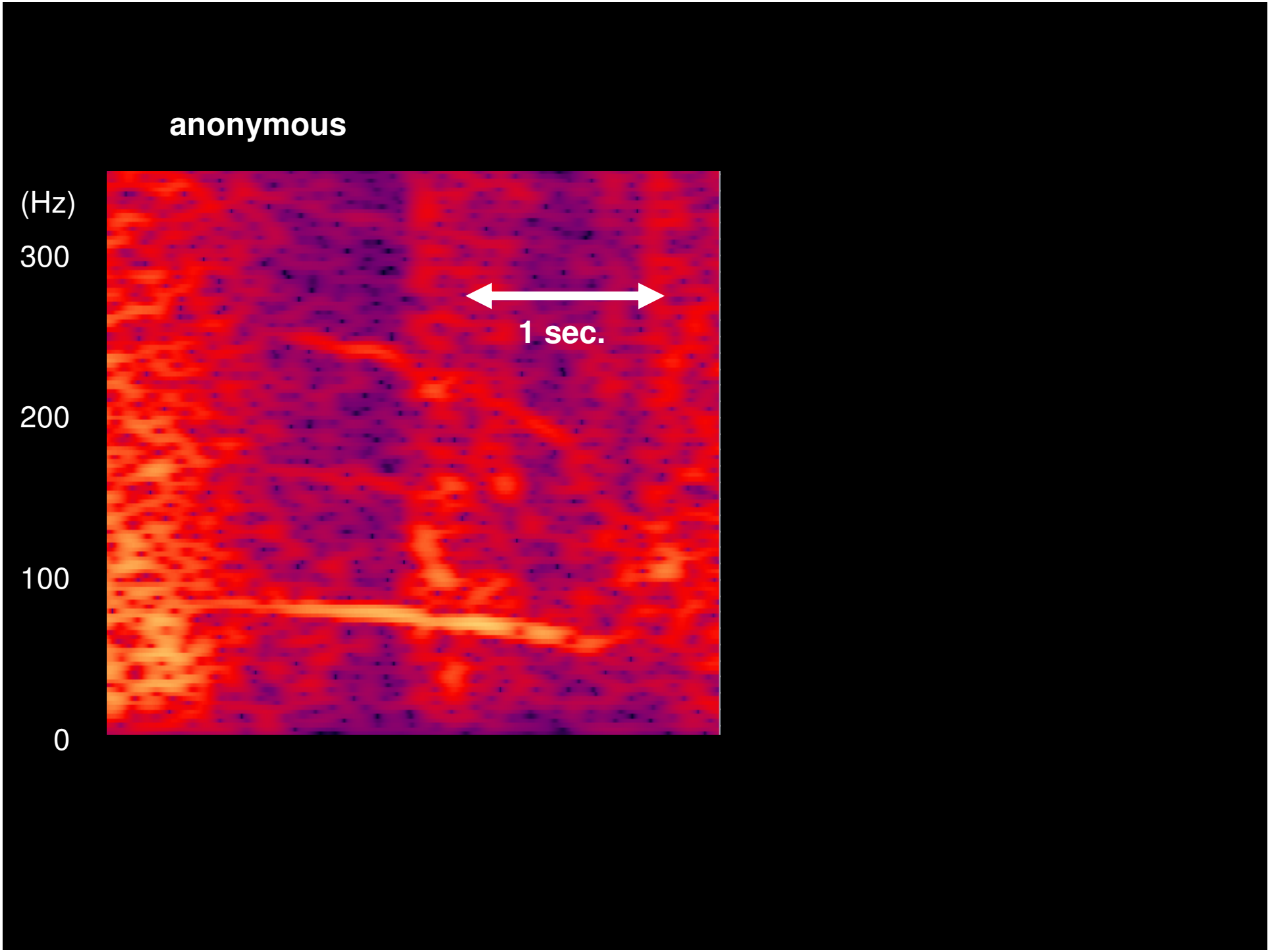


HÁSKÓLI ÍSLANDS

Akamatsu et al, 2014


Volcano2
(Hz)
300
200
100
0
1 sec.

anonymous



Very few calls were detected.

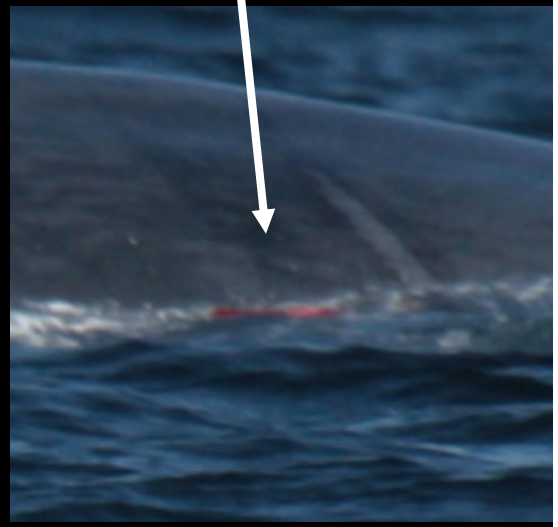
3 calls / 8h45m (Volcano 2)

1 call / 13h02m (Anonymous)

	recorded time		Initial (Hz)	Final (Hz)	duration (ms)
Volcano 2	19:20:15		105	67	1254
	19:39:55		83	48	990
	22:38:27		86	56	1096
Anonymous	23:29:57		86	59	1943

Distance from the tag to the blowhole

Volcano2 < 5m
Anonymous : 14m



Dorsal fin

Tagged position

Vocalizations

	recorded time	SL (dB*)	Initial (Hz)	Final (Hz)	duration (ms)
Volcano 2	19:20:15	168.8	105	67	1254
	19:39:55	168.0	83	48	990
	22:38:27	158.6	86	56	1096
Anonymous	23:29:57	162.0	86	59	1943

Estimated source level: 158 to 169 dB re 1uPa rms

*dB re 1uPa rms

16384 FFT size with Blackmann-Harris window

Overall system sensitivity -170 dB re V rms /1uPa.

Adobe Audition 1.5 (Adobe Systems Inc., USA)

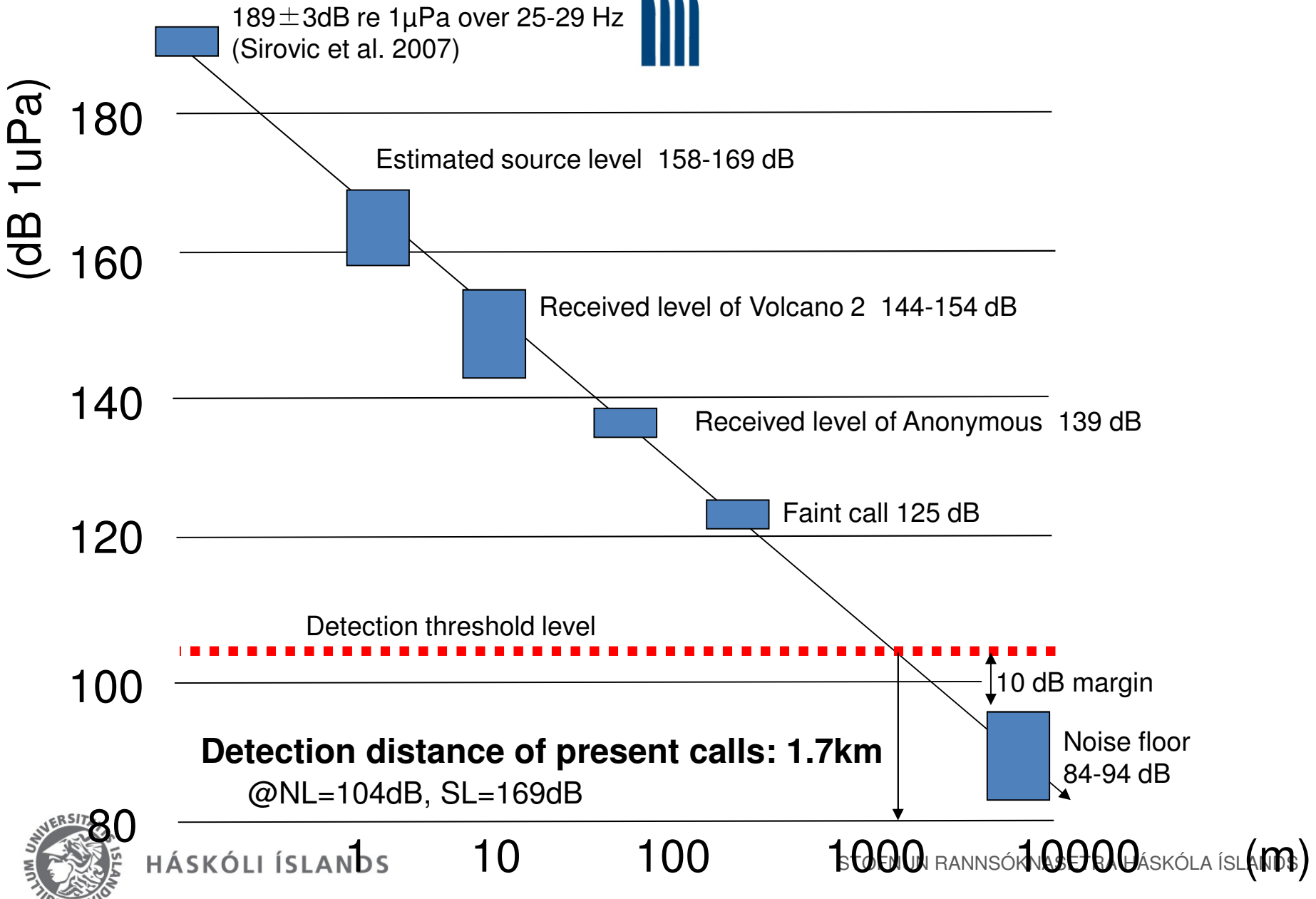
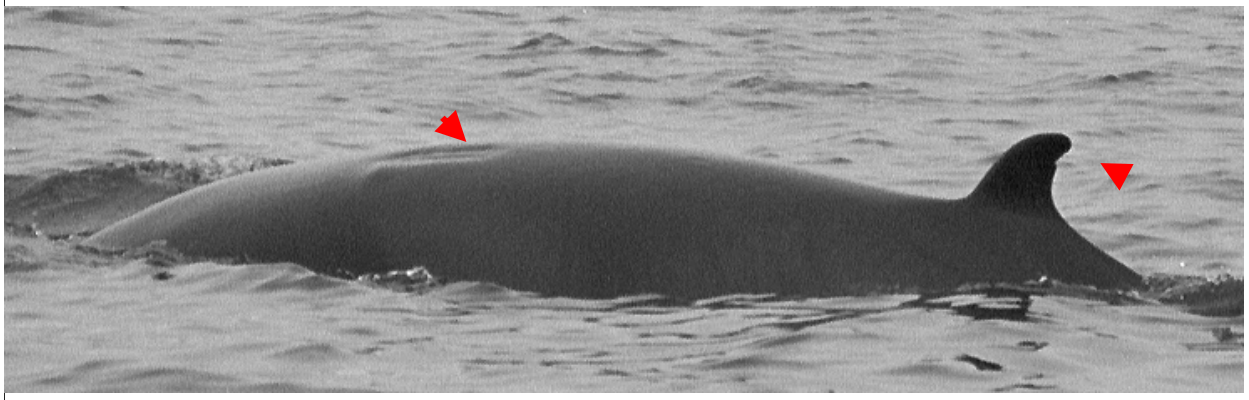
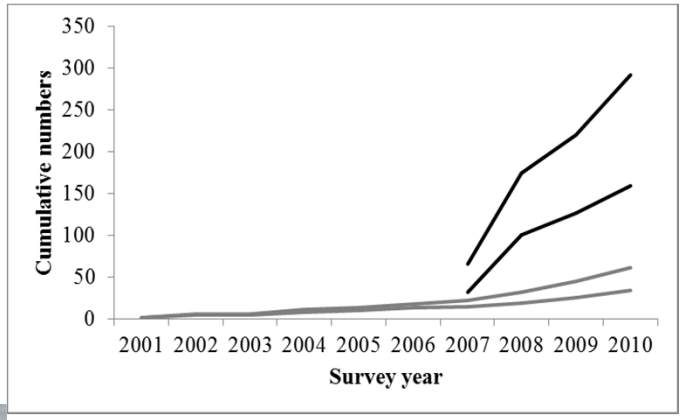

189±3dB re 1µPa over 25-29 Hz
(Sirovic et al. 2007)
(dB 1uPa)
180
160
140
120
100
80
Estimated source level 158-169 dB
Received level of Volcano 2 144-154 dB
Received level of Anonymous 139 dB
Faint call 125 dB
Detection threshold level
10 dB margin
Noise floor
84-94 dB
Detection distance of present calls: 1.7km
@NL=104dB, SL=169dB
1
10
100
1000
10000
(m)

Photo-identification

Minke whales (*Balaenoptera acutorostrata)*





The discovery curve is established by plotting the cumulative number of newly identified and catalogued minke whales each year, in (1) Faxaflói Bay from 2007 to 2010 (black line) (2) in Skjálfandi Bay from 2001 to 2010 (grey line) inclusive. (a) cumulative number of all classes individuals (b) cumulative number of marked (DEM) individuals. (Bertulli et al, 2013).

Photo of a minke whale (DEM24) sighted first in Skjálfandi Bay in July 2002, re-sighted in Faxaflói Bay (DEM162) in April 2010.
Photos: ©Húsavík Whale Museum, ©Chiara G. Bertulli

Stability of marks

Bertulli et al (in press)

Table 2. Prevalence and abundance of marks: (a) minke whales, *Ba* (b) white-beaked dolphins, *La*

Mark type (*Ba*)	ni	pi	li	ri	ai	Ai range
Notch	77	0.089	1.57	0.033	1.32	0-4
Leading Notch	43	0.059	1.34	0.019	1.13	0-4
Distinct notch	44	0.073	1.10	0.019	0.93	0-1
Leading Distinct	1	0.002	1.00	4.336e-4	0.84	0-1
Protruding piece	1	0.002	1.00	4.336e-4	0.84	0-1
Mottling	7	0.013	1.00	0.003	0.84	0-1
Hypo-pigmentation	0	-	-	-	-	-
Fin patch	5	0.009	1.00	0.002	0.84	0-1
White mark	203	0.371	5.49	0.088	4.62	0-22
Black mark	84	0.154	12.00	0.036	10.10	0-30
Cookie bite	199	0.365	3.26	0.086	2.75	0-21
Lamprey bite	294	0.538	6.12	0.127	5.15	0-28
Skidding	52	0.095	1.62	0.022	1.36	0-5
Scrape thin	70	0.128	1.71	0.030	1.44	0-7
Scrape thick	4	0.008	4.00	0.002	3.37	0-4
Tooth rake	0	-	-	-	-	-
Wound	1	0.002	1.00	4.336e-4	0.84	0-1
Anthropogenic scar	0	-	-	-	-	-
Blister	558	0.002	9.62	0.242	8.58	0-80
Back indentation	8	0.014	1.00	0.004	0.84	0-1
Amputation	10	0.018	1.00	0.004	0.84	0-1
Deformation	0	-	-	-	-	-
Tattoo-like	0	-	-	-	-	-
Herpes-like	600	0.003	300.00	0.260	252.60	0-300
Wart-like	8	0.014	8.00	0.004	6.74	0-8
Miscellaneous	37	0.067	2.06	0.016	1.73	0-37
Total marks	**2306**	**4.221**	**5.01**	**1.000**	**4.22**	**0-300**

Photo-identification

White-beaked dolphins (*Lagenorhynchus albirostris*)

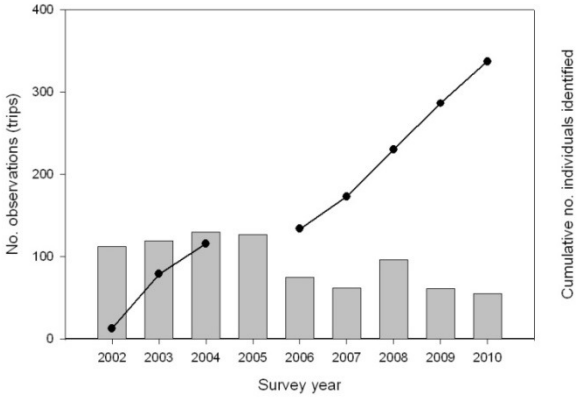
***(a)* Faxaflói Bay June 2009**

***(b)* Skjálfandi Bay August 2009**

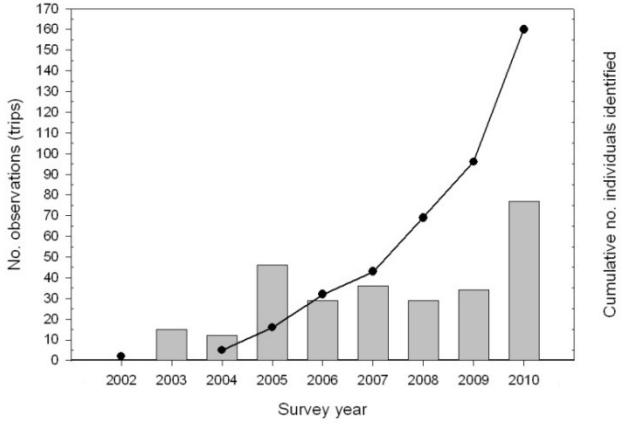
***(c)* Faxaflói Bay April 2010**

Dorsal fin profile of white-beaked dolphin photo-identified as DEM205 I n Faxaflói Bay and re-sighted in Skjálfandi Bay as DEM112.
Photos: ©Chiara G. Bertulli (a, c) and ©Christian Schmidt (b).

***(a)* Faxaflói Bay**



***(b)* Skjálfandi Bay**



Showing relation between number of photo-identification surveys and cumulative numbers of IDs taken in (a) Faxaflói Bay from 1999 to 2010 and in (b) Skjálfandi Bay from 2002 to 2010: (a) cumulative rate of identification of white-beaked dolphins (*L. albirostris*) (line) over time ("rate of discovery"), and (b) number Bertulli et al (in press)

Stability of marks

Bertulli et al (in press)

Mark type (*La*)	ni	pi	li	ri	ai	Ai range
Notch	195	0.182	1.73	0.126	1.46	0-7
Leading Notch	17	0.013	2.12	0.011	1.78	0-6
Distinct notch	88	0,114	1.24	0.057	1.04	0-2
Leading Distinct	0	-	-	-	-	-
Protruding piece	5	0.008	1.00	0.003	0.84	0-1
Mottling	13	0.021	1.00	0.008	0.84	0-1
Hypo-pigmentation	15	0.024	1.00	0.010	0.84	0-1
Fin patch	88	0.014	9.78	0.057	8.23	0-1
White mark	20	0.007	5.00	0.013	4.21	0-12
Black mark	371	0.055	10.91	0.239	9.19	0-100
Cookie bite	0	-	-	-	-	-
Lamprey bite	53	0.034	2.52	0.034	2.12	0-8
Skidding	20	0.019	1.67	0.013	1.41	0-4
Scrape thin	223	0.138	2.59	0.144	2.18	0-13
Scrape thick	0	-	-	-	-	-
Tooth rake	109	0.072	2.42	0.070	2.04	0-9
Wound	39	0.034	1.86	0.025	1.57	0-14
Anthropogenic scar	27	0.009	4.50	0.017	3.79	0-8
Blister	20	0.002	20.00	0.013	16.84	0-20
Back indentation	3	0.005	1.00	0.002	0.84	0-1
Amputation	22	0.030	1.16	0.014	0.98	0-1
Deformation	1	0.002	1.00	6.447e-4	0.84	0-1
Tattoo-like	52	0.003	26.00	0.033	21.89	0-23
Herpes-like	0	-	-	-	-	-
Wart-like	0	-	-	-	-	-
Miscellaneous	170	0.056	4.86	0.110	4.09	0-40
Total marks	**1551**	**0.842**	**2.92**	**1.000**	**2.46**	**0-100**

Migration of a white-beaked dolphin

Fig. 2. A satellite tag (SPOT5, Wildlife Computers, WA, USA) was attached to the dorsal fin of the male dolphin.

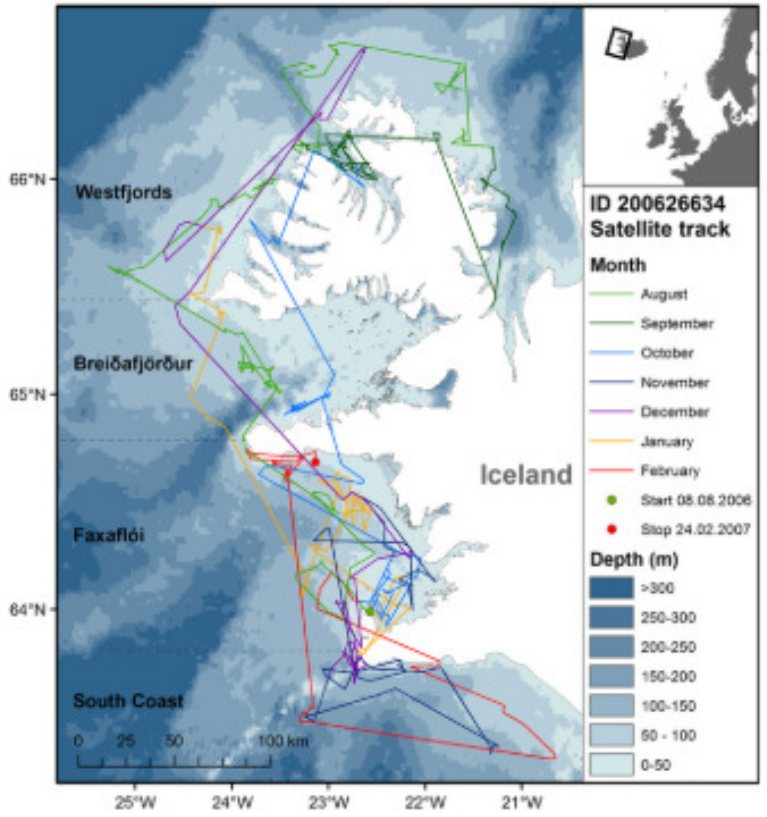


Fig. 3. A small map of Iceland with an enlargement of western Iceland showing the movements of a white-beaked dolphin equipped with a satellite transmitter. Transmissions started on 8 August 2006 (green dot, Garður harbor) and stopped on 24 February 2007 (red dot). Different colour lines show the distance covered by the tagged animal in different months. The area west and south of Iceland was divided in four parts corresponding to the location: Area 1: The Westfjords, Area 2: Breiðafjörður, Area 3: Faxaflói and Area 4: South Coast. An acoustic A-tag was placed on a second dolphin at the green dot. The acoustic tag was recovered approximately 6 NM northeast of the lighthouse in Garður (the star).

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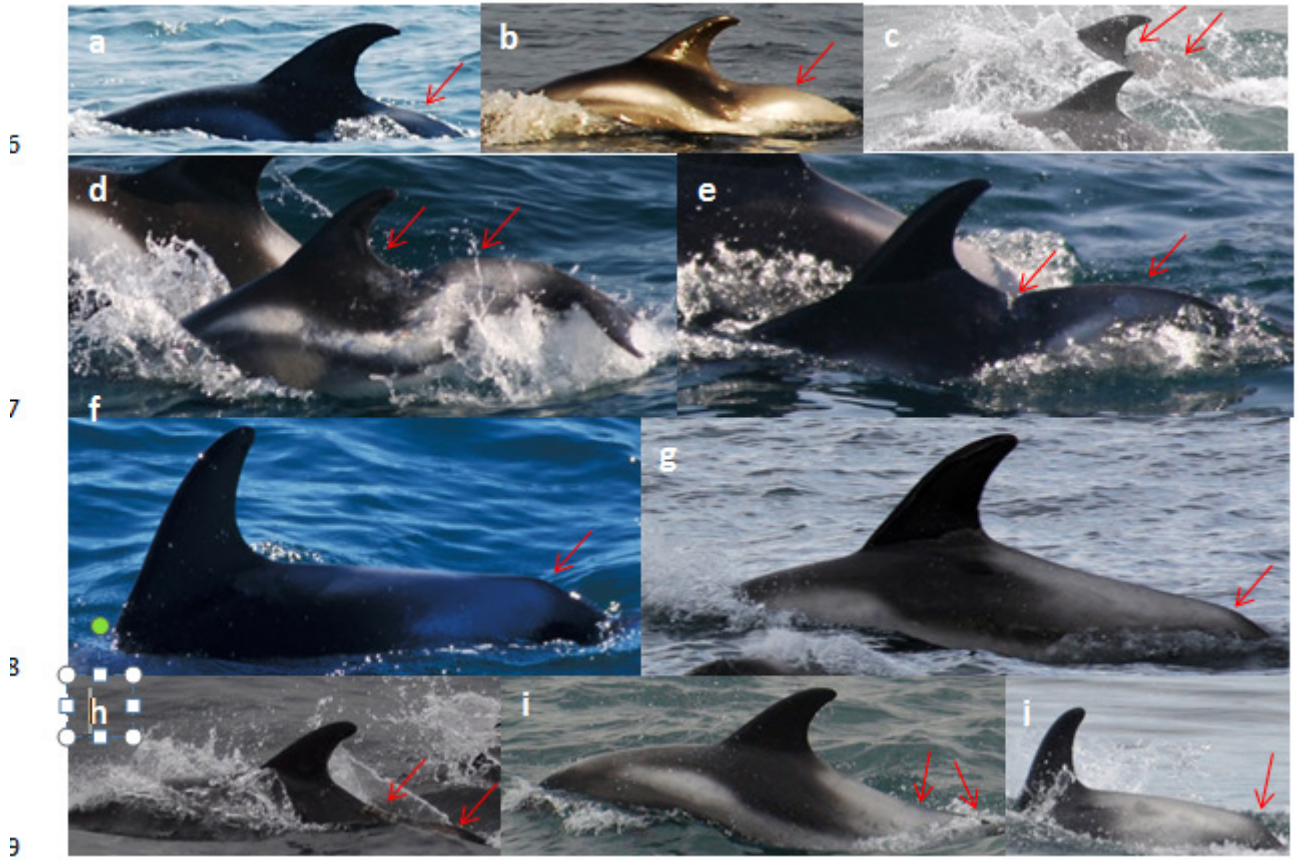
Rasmussen et al,2013

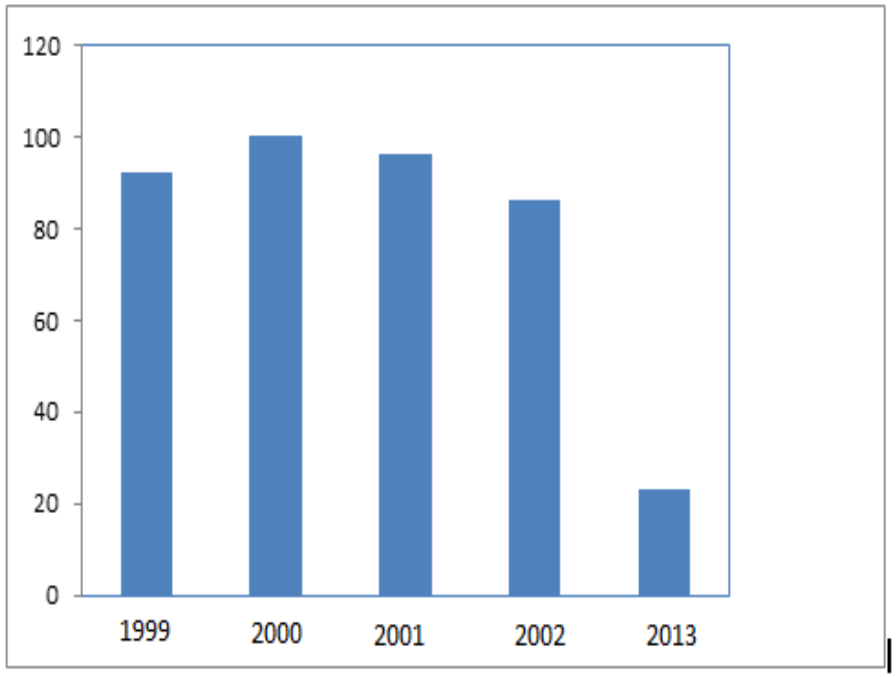
Vertebral column deformities



Six cases of kyphosis, kyphoscoliosis and lordosis collected in Icelandic waters (Bertulli et al, in press)

Sighting data

Decreasing of sighting rate of the Icelandic white-beaked dolphins in the South western part of Iceland – possible threats to the population?



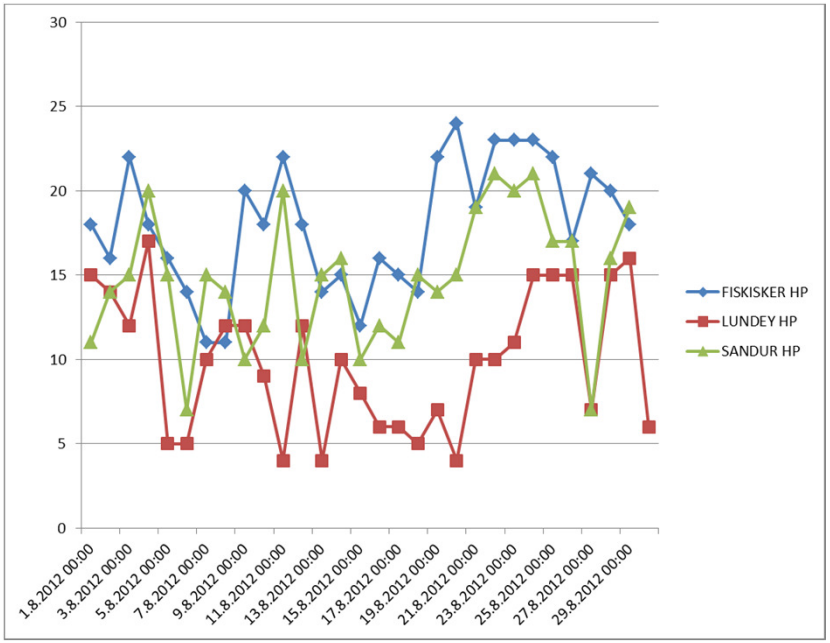
The figure shows changes in sightings percentages (%) of white-beaked dolphins in July from 1999 to 2013 off Reykjanes Peninsula in the Southwestern part of Iceland. (Rasmussen, 2013)

Porpoises

Phocoena phocoena

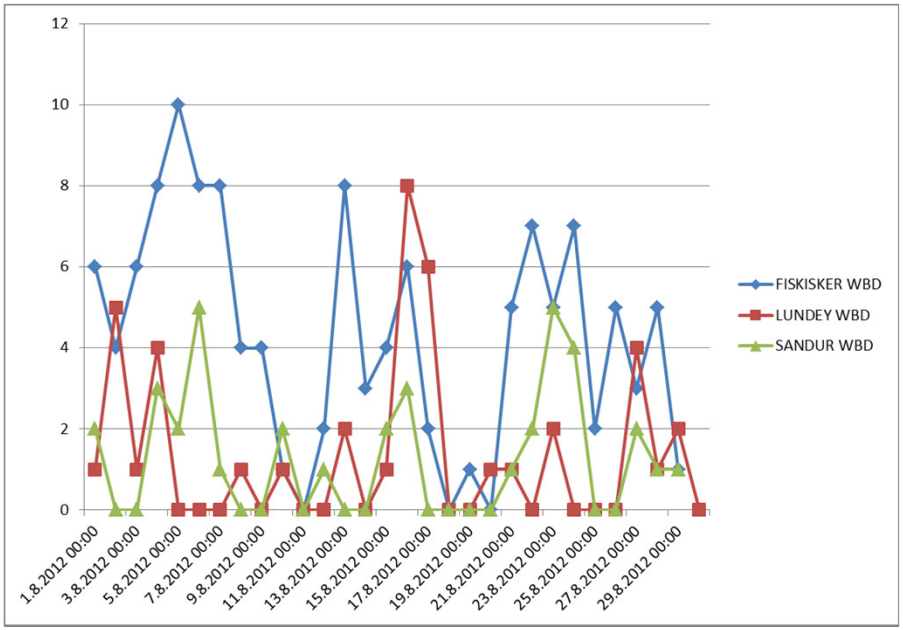
Porpoises

Phocoena phocoena



White-beaked dolphins

Lagenorhynchus albirostris



Luisa and Rasmussen, 2013

By-caught harbour porpoises

By-caught harbour porpoises

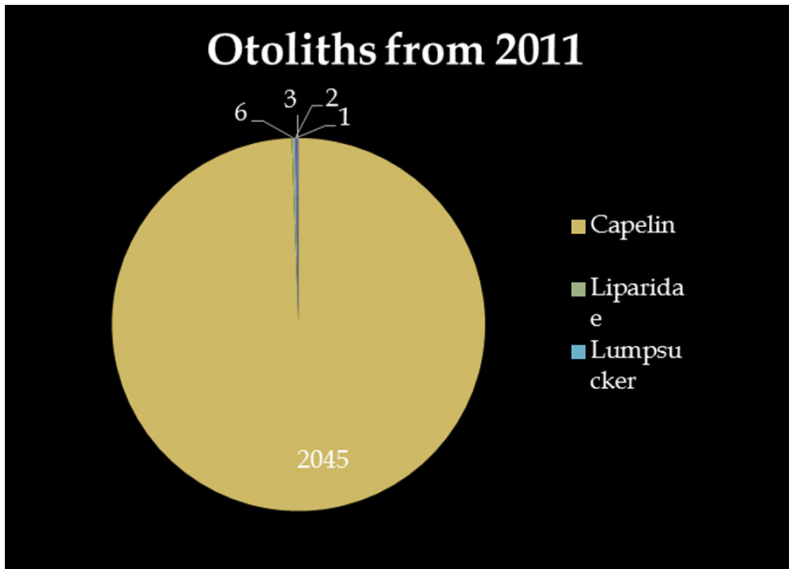
- A total of 23 porpoises were retrieved in 2011. A total of 5 porpoises were retrieved in 2012. Dissections were done in June and June 2012 in the basement of the Whale Museum during a Marine Mammal field course in Húsavík

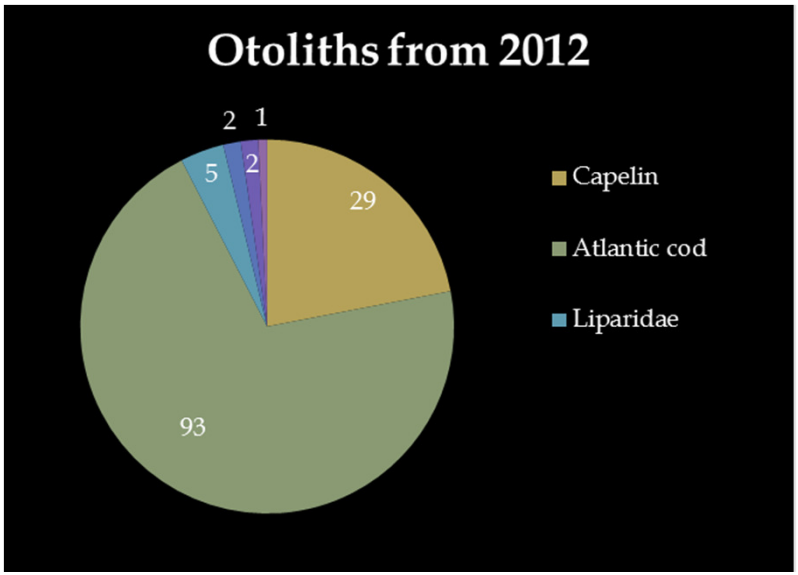
By-caught harbour porpoises

Gender + maturity/year	2011	2012	2011+2012
Females in total	137 (n=11, SD=22,2)	122,5 (n=4, SD=6,2)	133,2 (n=15, SD=20,1)
Immature	125,7 (n=5, SD=9,3)	122,5 (n=4, SD=6,2)	124,3 (n=9, SD=7,8)
Mature	138 (n=2, SD=12,0)	0	138 (n=2, SD=12,0)
Mature + pregnant	146,5 (n=6, SD=26,0)	0	146,5 (n=6, SD=26,0)
Pregnant	150,7 (n=4, SD=31,8)	0	150,7 (n=4, SD=31,8)
Females + males in total	127,8 (n=23, SD=18,5)	123,8 (n=5, SD=6,1)	127 (n=28, SD=17,2)
Immature females + males	124,2 (n=14, SD=12,0)	123,8 (n=5, SD=6,1)	124,1 (n=19, SD=10,6)
Mature females + males	143,7 (n=9, SD=21,2)	0	143,7 (n=9, SD=21,2)
Males in total	127 (n=12, SD=13,8)	129 (n=1)	127,2 (n=13, SD=13,2)
Immature	123,3 (n=9, SD=13,8)	129 (n=1)	123,9 (n=10, SD=13,1)
Mature	138,2 (n=3, SD=6,1)	0	138,2 (n=3, SD=6,1)

Koponen, 2013

By-caught harbour porpoises





Koponen, 2013

Northern bottlenose whales (*Hyperoodon ampullatus*)

Rasmussen and Miller, 2009

A total of six different individuals of Northern bottlenose whales came into the shallow fjord (water depth up to 30 m), Eyjafjördur near the town Akureyri (65.681833 N, 18.08670 W). Two to six different individuals stayed in the fjord between 18th of August – 6th of October 2008.

Photo-identification


12 ÞRIÐJUDAGUR 23. SEPTEMBER 2008 MORGUNBLAÐIÐ

FRÉTTIR

Dó ekki alveg til einskis, greyið

■ Nemar á alþjóðlegu sjávarspendýranámskeiði fengu óvænta ábót ■ Haus andarnefjunnar sem drapst rannsakaður í Bandaríkjunum ■ Reynt að komast að því hvaða tíðni andarnefjur nota við matarleit

FRÉTTASKÝRING

Djöfull að draga

Einar í Nesi

Segja má að Einar Ásmundsson í Nesi í Höfðahverfi hafi verið fyrsti haffræðingur landsins. Einar, sem lést á ofanverðri 19. öld, var bóndi og sjálfmenntaður í haffræðum. Svo skemmtilega vill til að rannsóknarbátur Hafrannsóknarstofnunar á Akureyri heitir Einar í Nesi og auðvitað ekki tilviljun enda nefndur í höfuðið á áðurnefndum bónda og þegar fréttist af því að andarnefjan hefði fest sig í bauju á Pollinum í síðustu viku var farið að svipast um eftir honum – á Einari í Nesi. Ekki sást skepnan í það skiptið en það er líklega tilviljun að andarnefjuna skyldi reka á land einmitt á jörðinni Nesi í Höfðahverfi. Eða hvað?

Úr seinni dúettinum

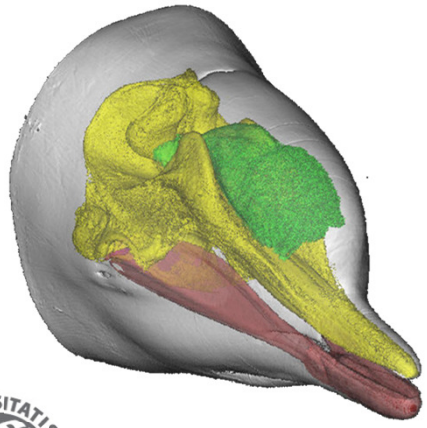
Farbann framlengt í níunda skipti

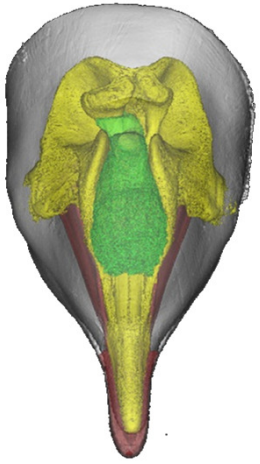
■ Fyrrverandi framkvæmdastjóri VSP minnsta kosti nítján mánuði í farbanni
■ Jón Steinar Gunnlaugsson vildi að farbannsúrskurðurinn yrði felldur úr gildi

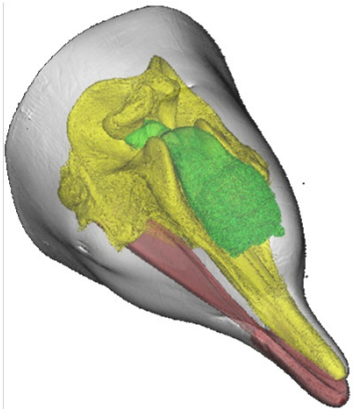
Í HNOTSKURN

Ökumaður undir áhrifum lyfjablöndu

Studies on dead whales







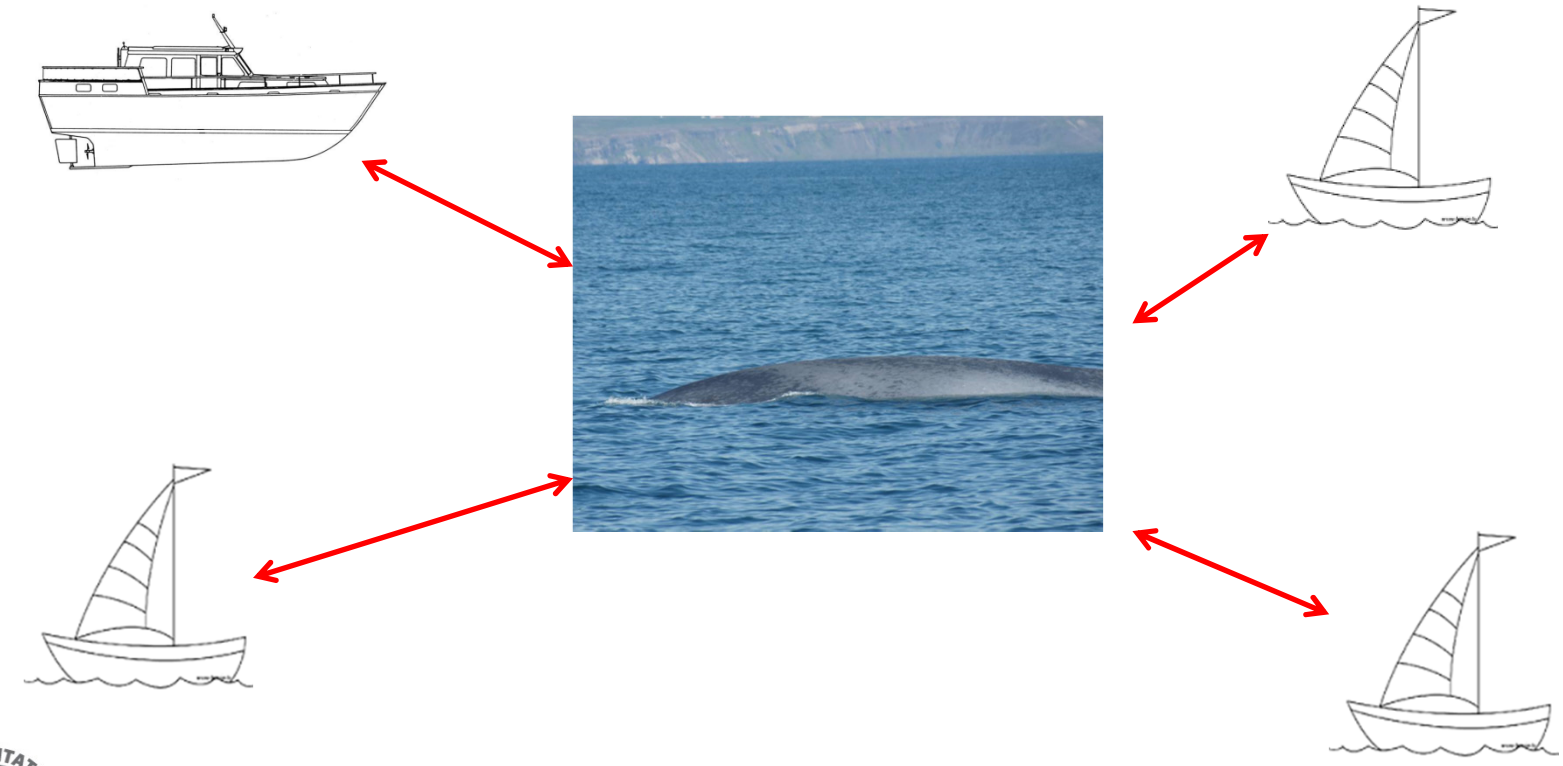
HÁSKÓLI ÍSLANDS

Cranford et al, 2011

STOFNUN RANNSÓKNASETRA HÁSKÓLA ÍSLANDS

Summer 2015:

- Localization of calling blue whales:



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