Steller sea lion tracking using satellite telemetry in the western/central Aleutian Islands

Alaska Ecosystems Program

National Marine Mammal Laboratory

NOAA Alaska Fisheries Science Center

Overview

- NPFMC request

  "Information from single adult female and juveniles tagged in the central Aleutian Islands"

- Winter adult female captures/tracking
  - Southeast and Aleutian Islands
- New analyses of juvenile data

Adult female Steller sea lion tracking

- Southeast Alaska pilot project; Nov 2010
- Western/central Aleutian Islands; Oct-Nov 2011

Cast

- **NMML**: *Michelle Lander, Brian Fadely, Tom Gelatt, Carey Kuhn, Jeremy Sterling, Sharon Melin*
- **ADF&G**: *Lorrie Rea, Mike Rehberg, Kimberlee Beckmen, Greg Snegden, Justin Jenniges, Aaron Christ, Dennis McAllister*
- **Vancouver Aquarium**: *Marty Haulena*

Funding: *NOAA/NMFS, and NOAA Cooperative Agreement NA08NMF4390544 to ADFG SSL Project*

Disclaimer

Conducted under authority of MMPA/ESA Permits 14325 (ADFG) and 14326 (NMML), IACUC Protocol No. A/NW-2010-4 (NMML) and ACUC Protocol No. 2010-14R 09-28 (ADFG)

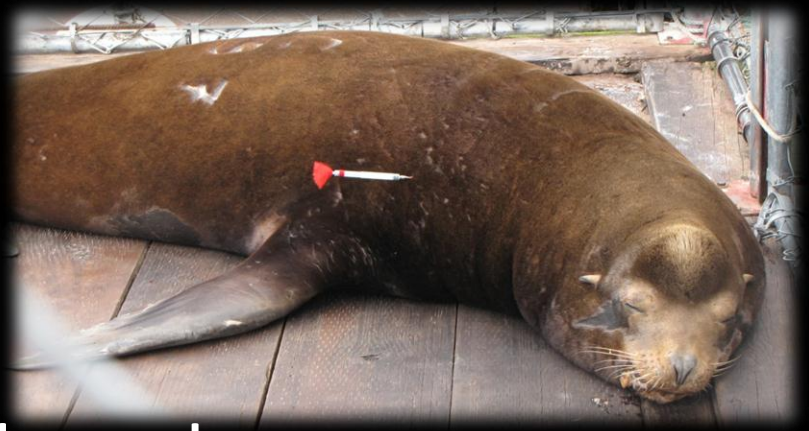
Past adult female captures - Alaska

Limited options for capture

Drug issues

Permits unobtainable

Adult female captures



Permit issued in mid-2009 allowed some captures; supported by recent work in Russia

Planned pilot project Southeast November 2010

September 2010 - California sea lion study

Medetomidine-midazolam-butorphanol

Low volume! Reversible!

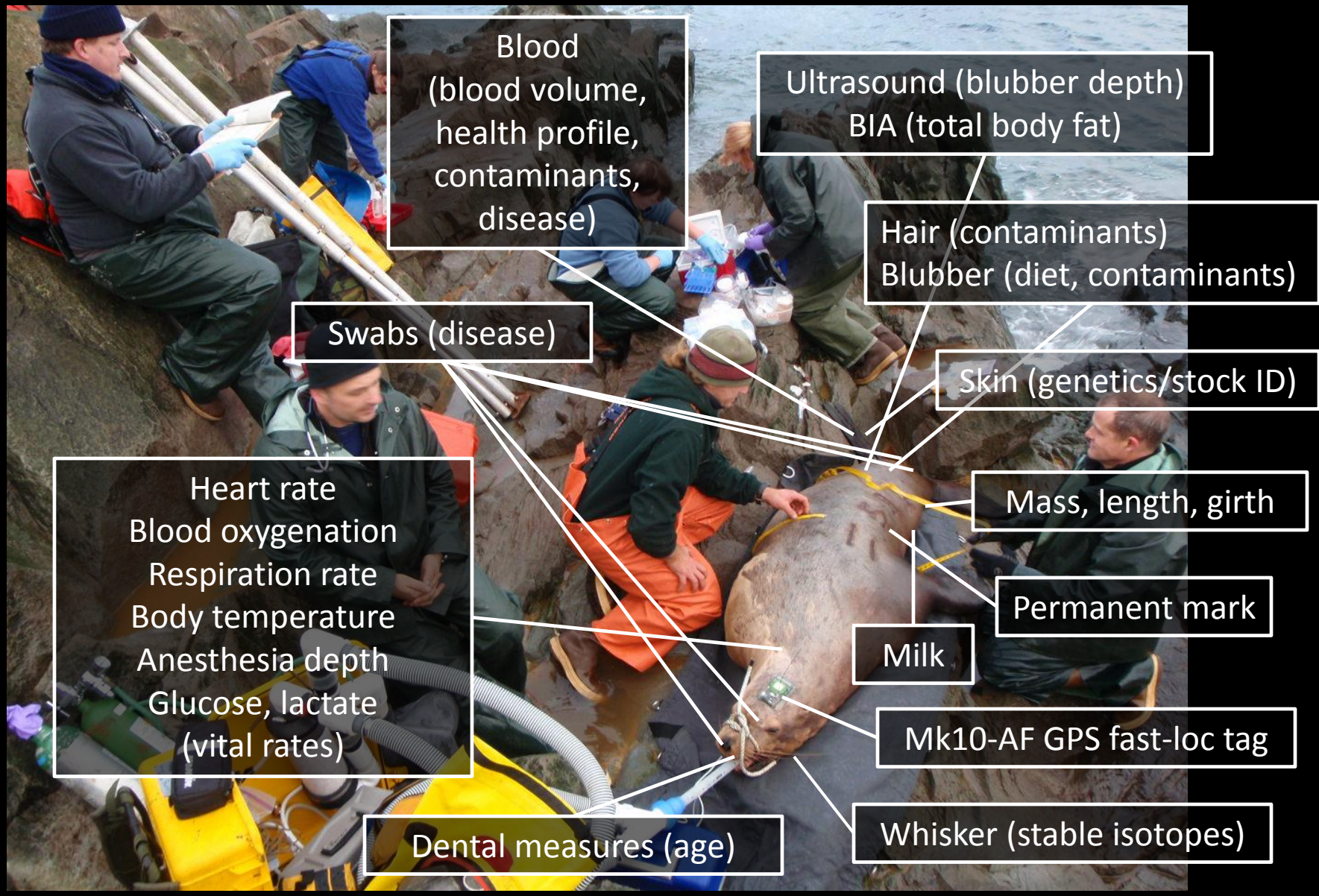
-- quick, amend the permit!!

Adult female captures

Adult female captures

Adult female captures

Methods - sampling



Adult female captures

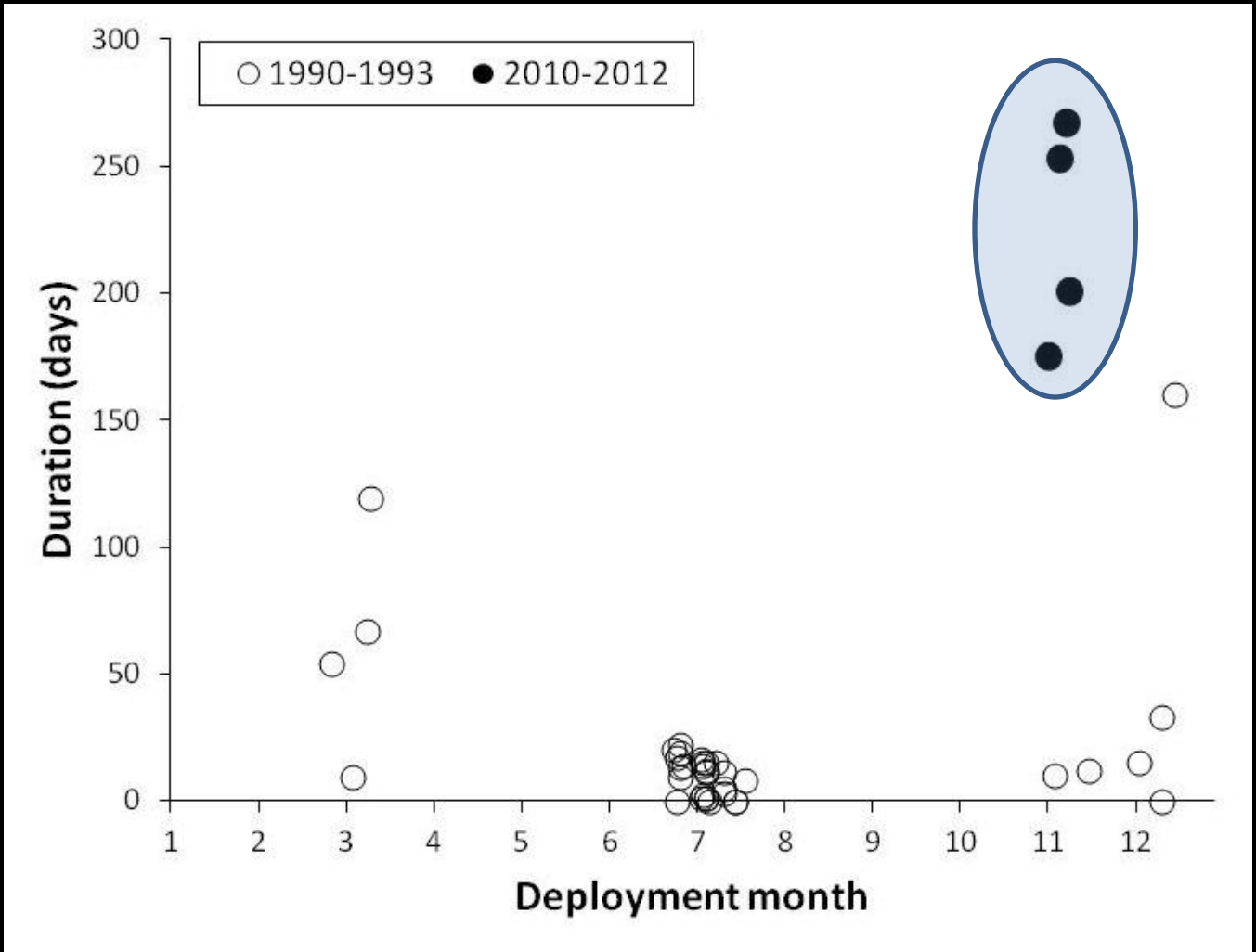
- Challenges
  - Weather/access
  - Sea lion distribution
  - Drug: dosage/sedation

Adult female captures-results

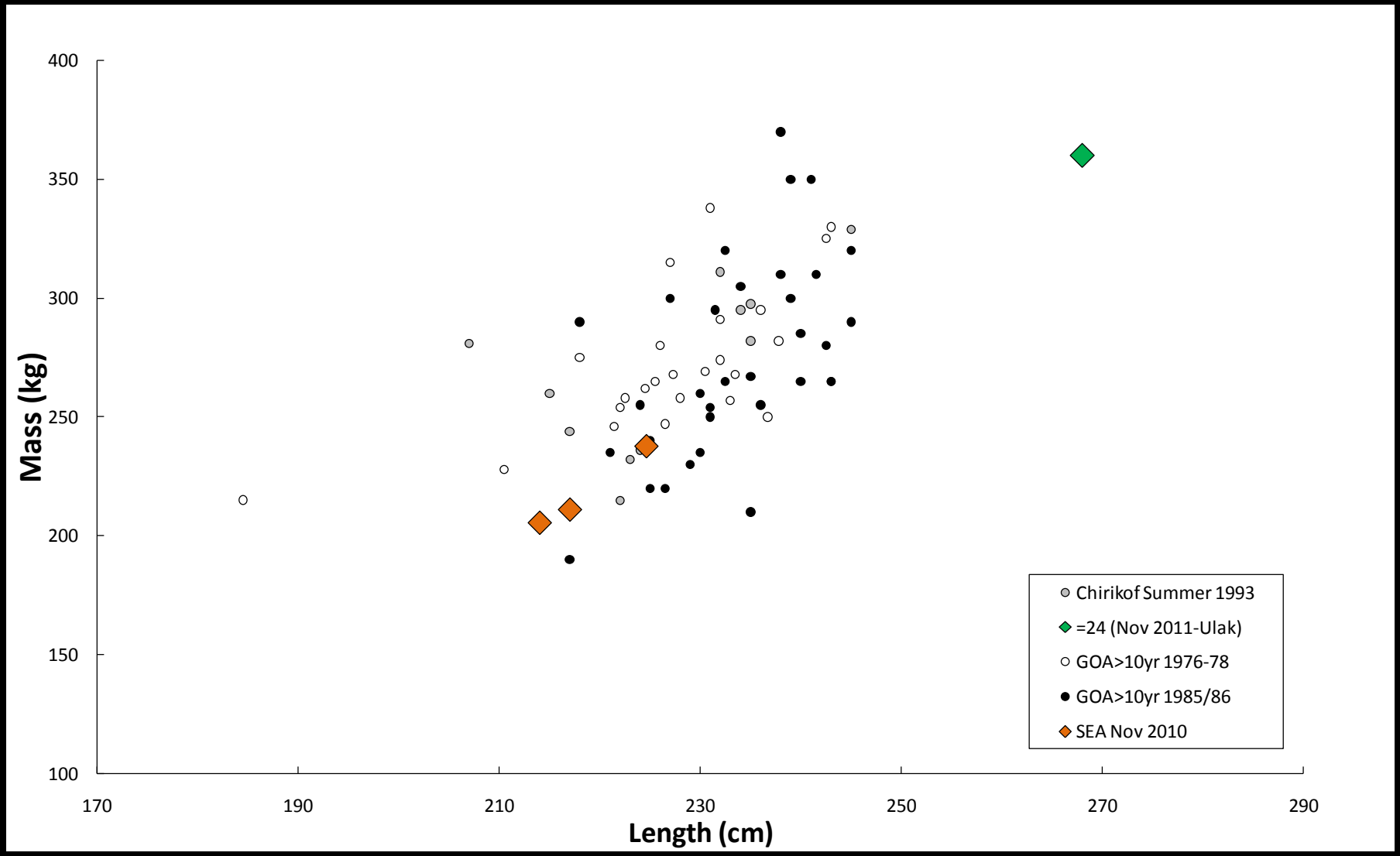
- Southeast Alaska, November 2010
  - 6 darted
  - 3 handled
- Central Aleutian Islands, November 2011
  - 4 darted
  - 1 handled

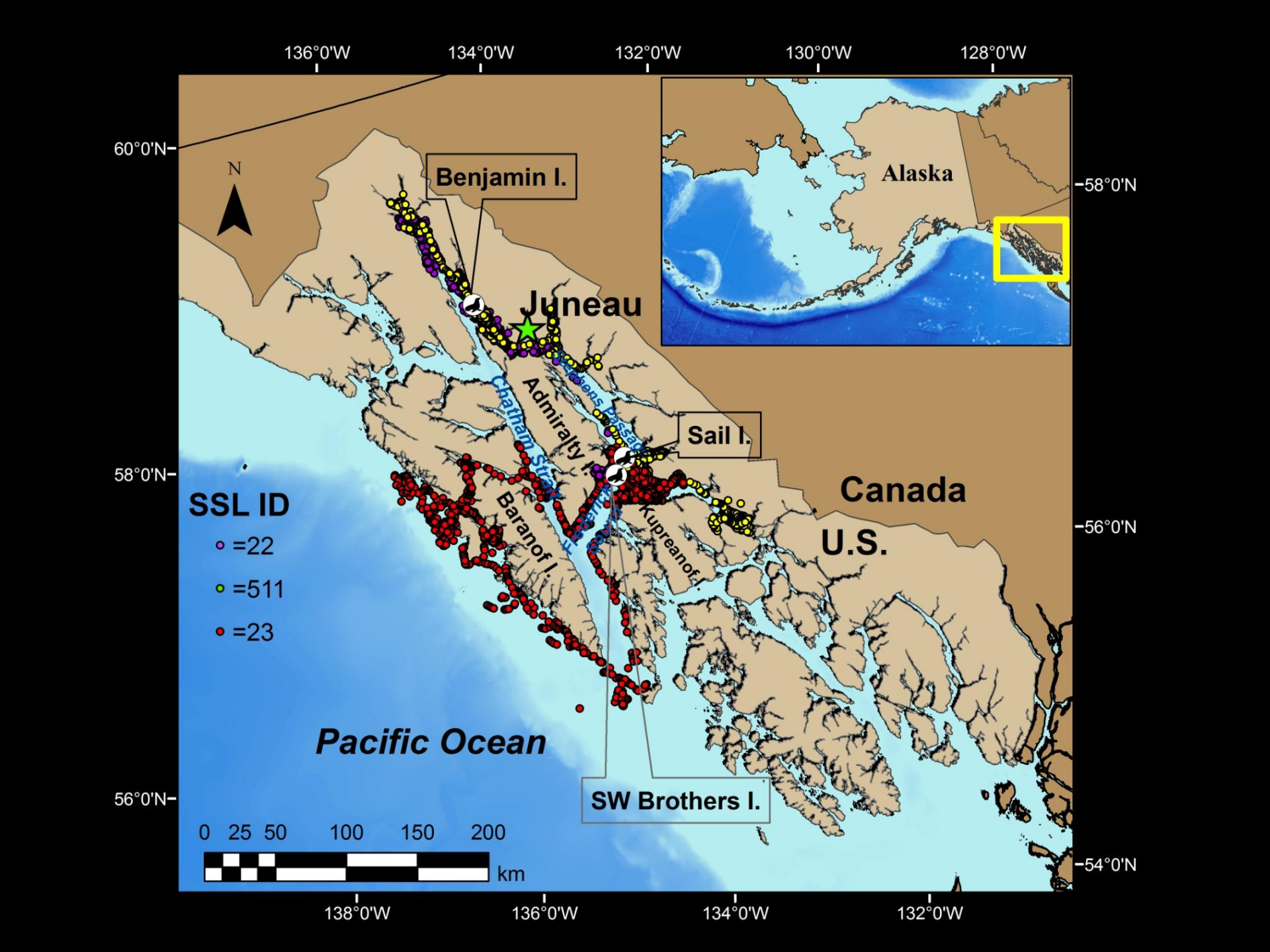
ID	Age	Loc	Mass (kg)	Handling time (hrs)	Tracking time (days)
=22	Adult	SEAK	205.5	1:57	253
=23	Adult	SEAK	211.0	2:33	202
=511	6 yrs	SEAK	237.5	2:27	267
=24	Adult	AI	360.0	1:36	176

Transmission durations for satellite tags deployed on adult female Steller sea lions in Alaska by NMFS/NMML and ADFG

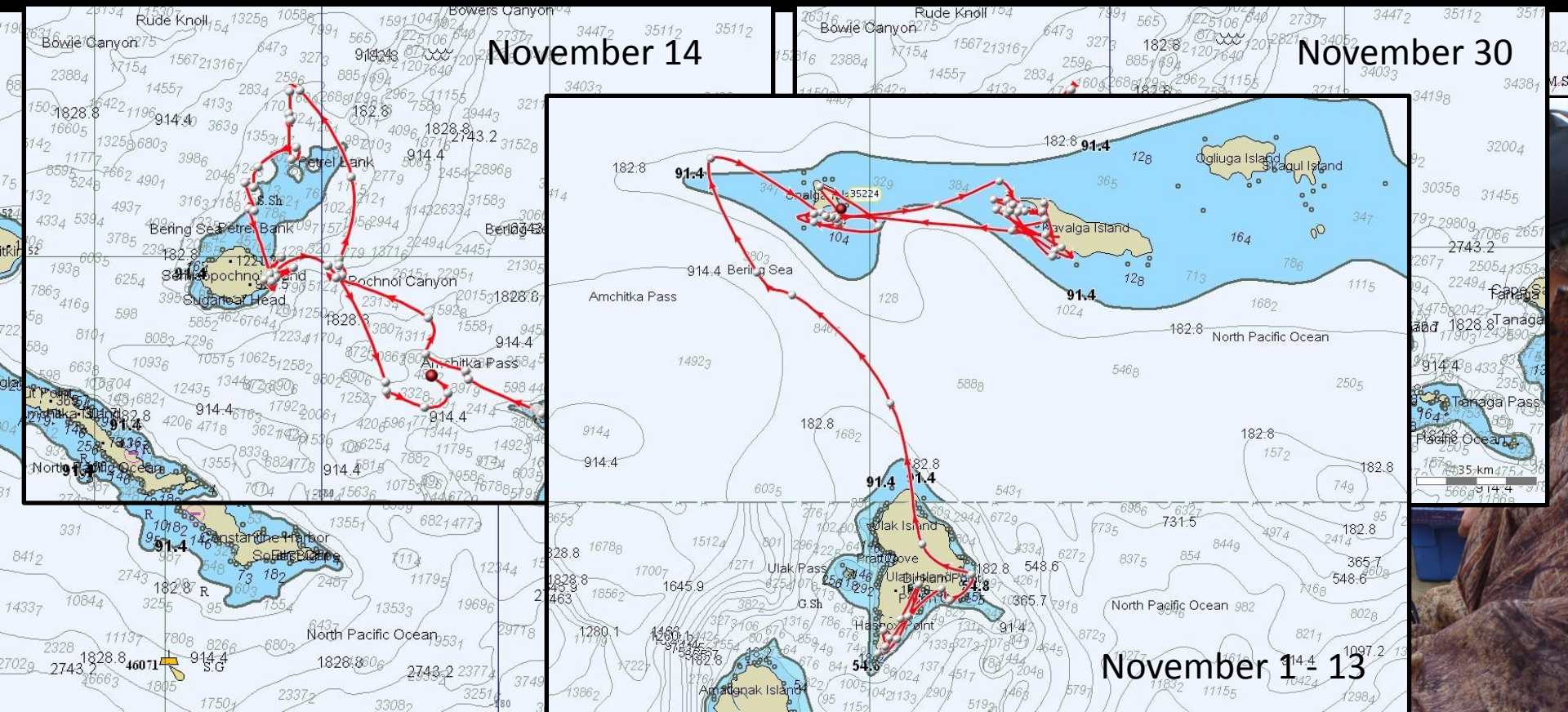


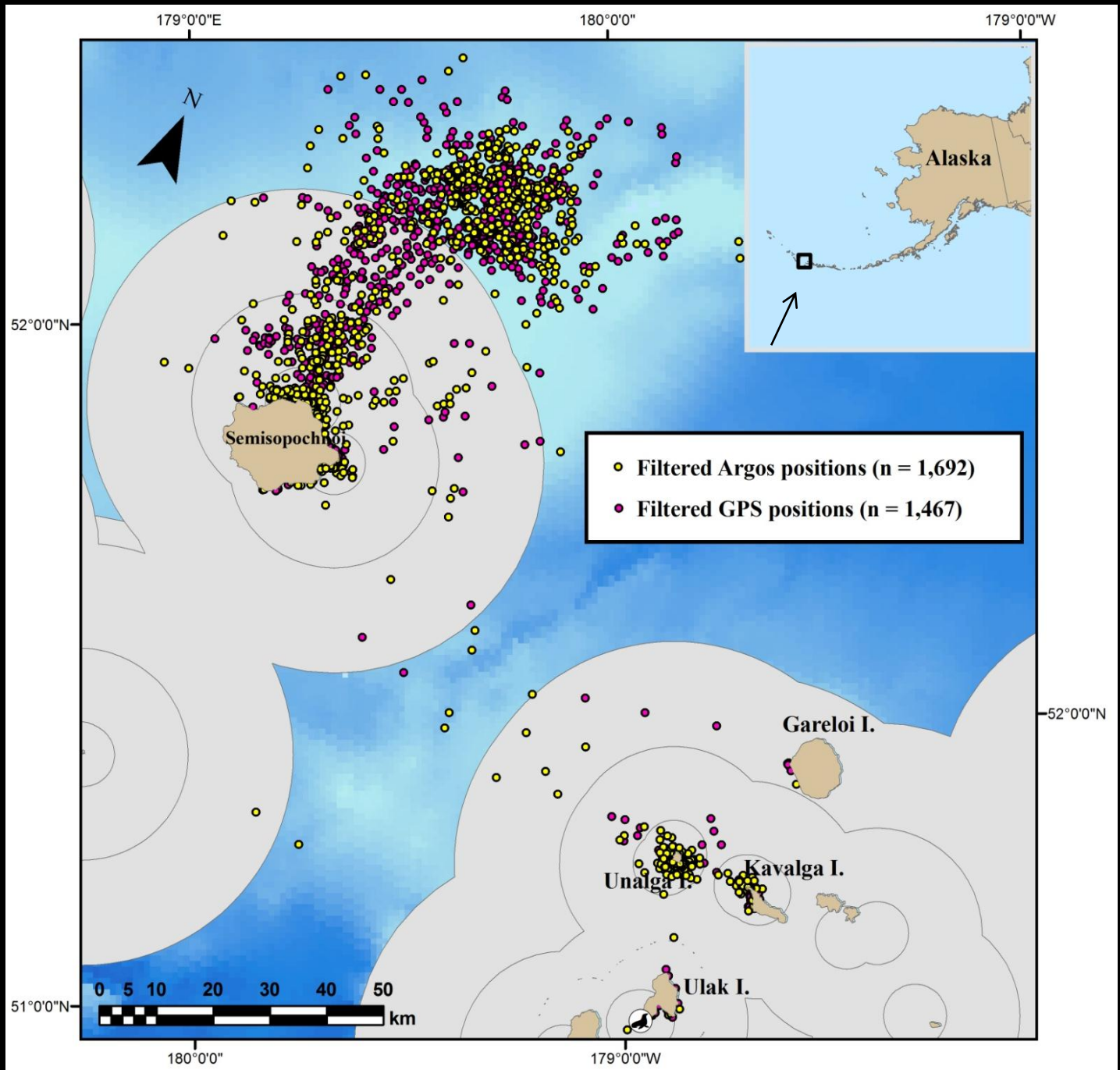
Adult female size

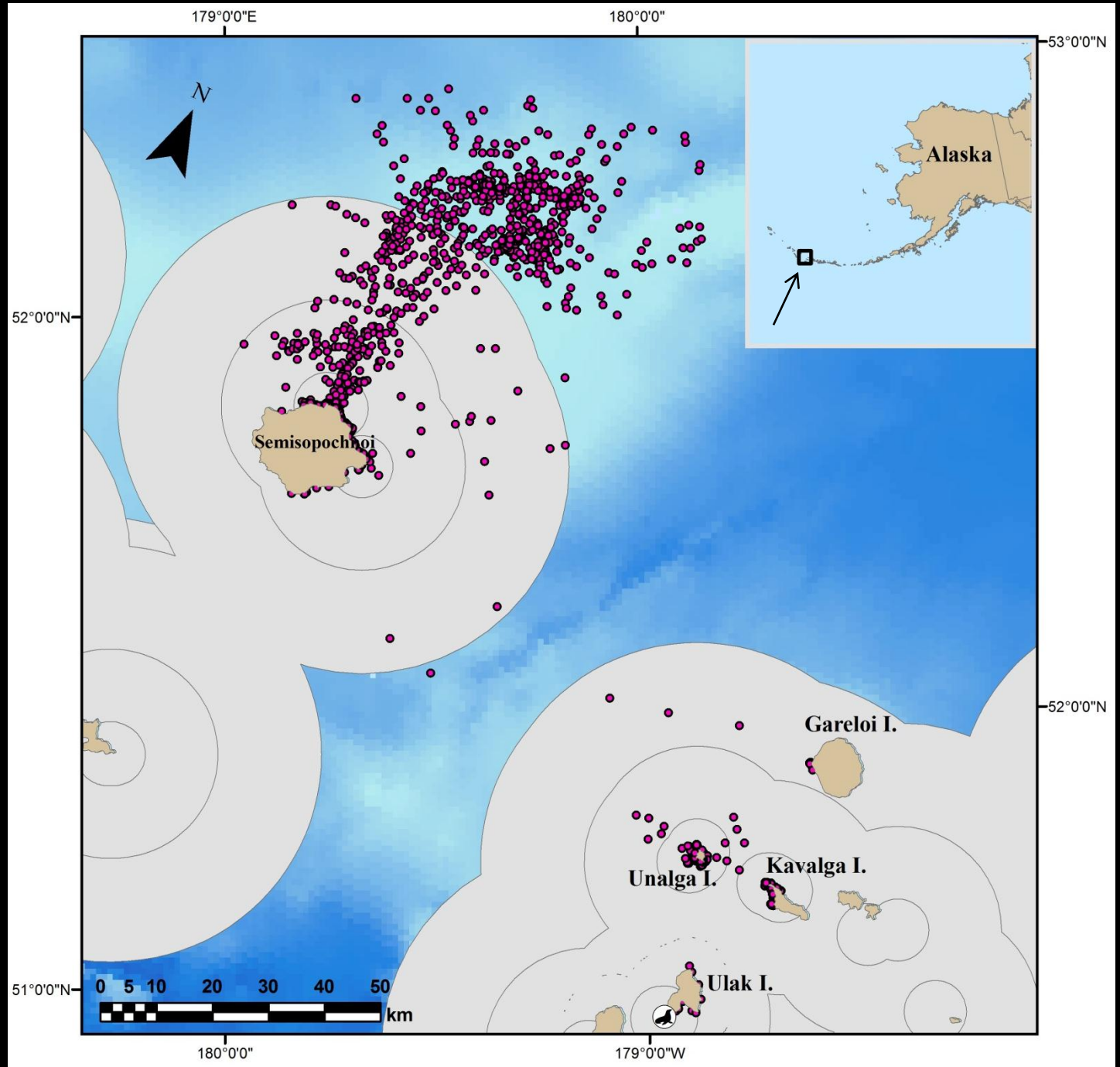



136°0'W
134°0'W
132°0'W
130°0'W
128°0'W
60°0'N
58°0'N
56°0'N
54°0'N
138°0'W
136°0'W
134°0'W
132°0'W
N
Alaska
Benjamin I.
Juneau
Admiralty I.
Chatham Strait
Frederick Sound
Stephens Passage
Sail I.
Canada
U.S.
Baranof I.
Kupreanof I.
SW Brothers I.
Pacific Ocean
SSL ID
=22
=511
=23
0 25 50 100 150 200
km

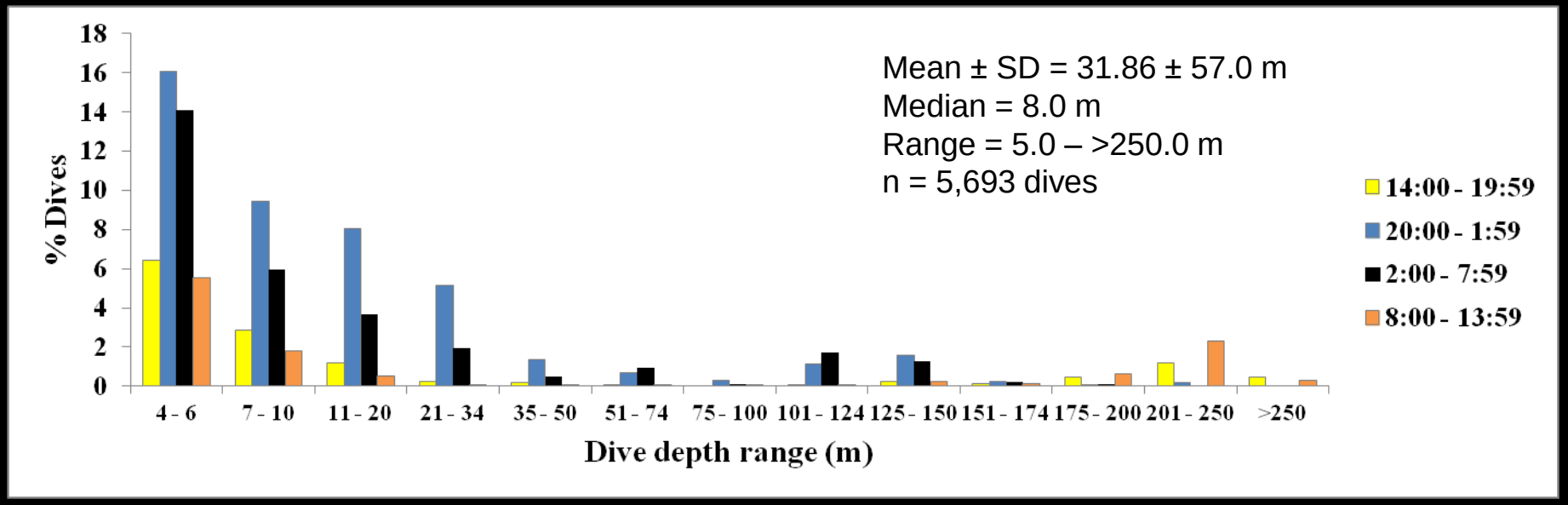
Steller sea lion adult female (=24)
November 1, 2011 – 24 April, 2012 (175 days)

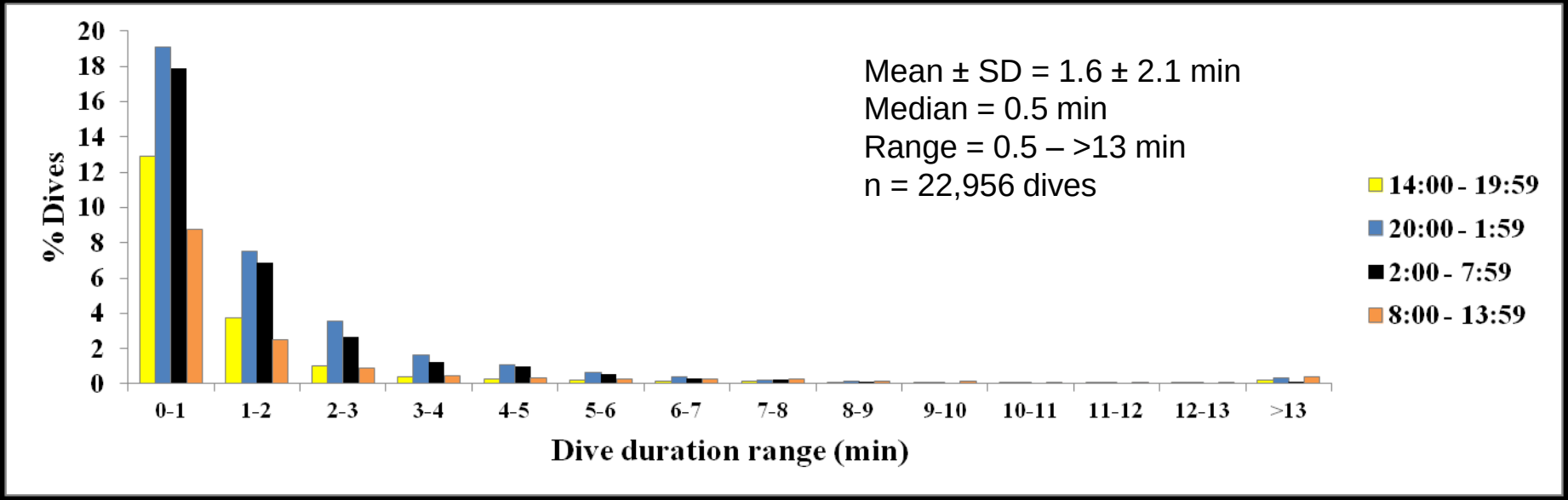


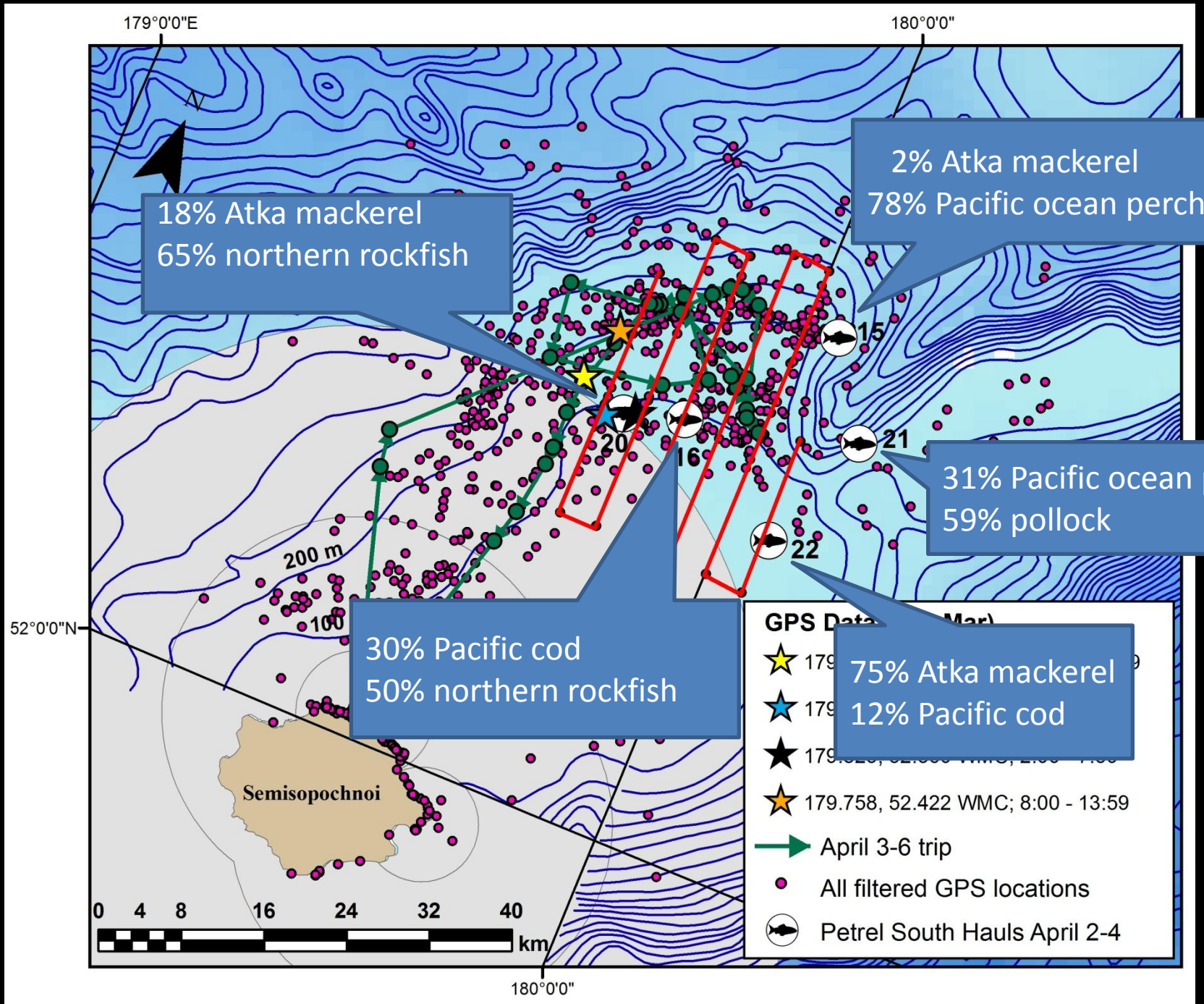

179°0'0"E
180°0'0"
179°0'0"W
52°0'0"N
51°0'0"N
N
Alaska
Semisopochnoi
Filtered Argos positions (n = 1,692)
Filtered GPS positions (n = 1,467)
Gareloi I.
Kavalga I.
Unalga I.
Ulak I.
0 5 10 20 30 40 50
km

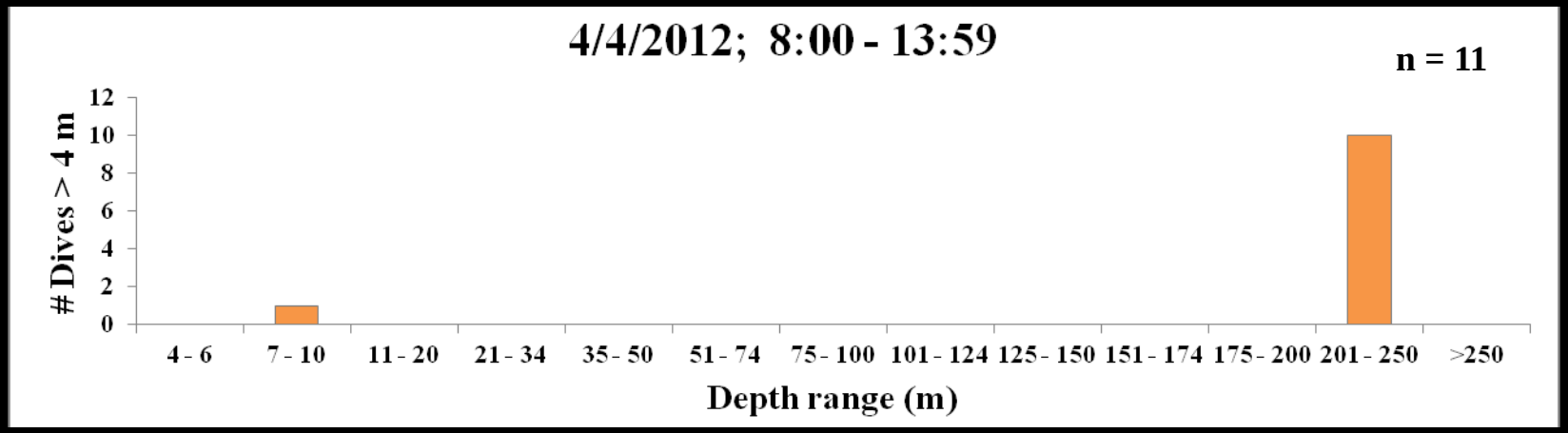

179°0'0"E
180°0'0"
53°0'0"N
52°0'0"N
51°0'0"N
180°0'0"
179°0'0"W
N
Alaska
Semisopochnoi
Gareloi I.
Unalga I.
Kavalga I.
Ulak I.
0 5 10 20 30 40 50
km

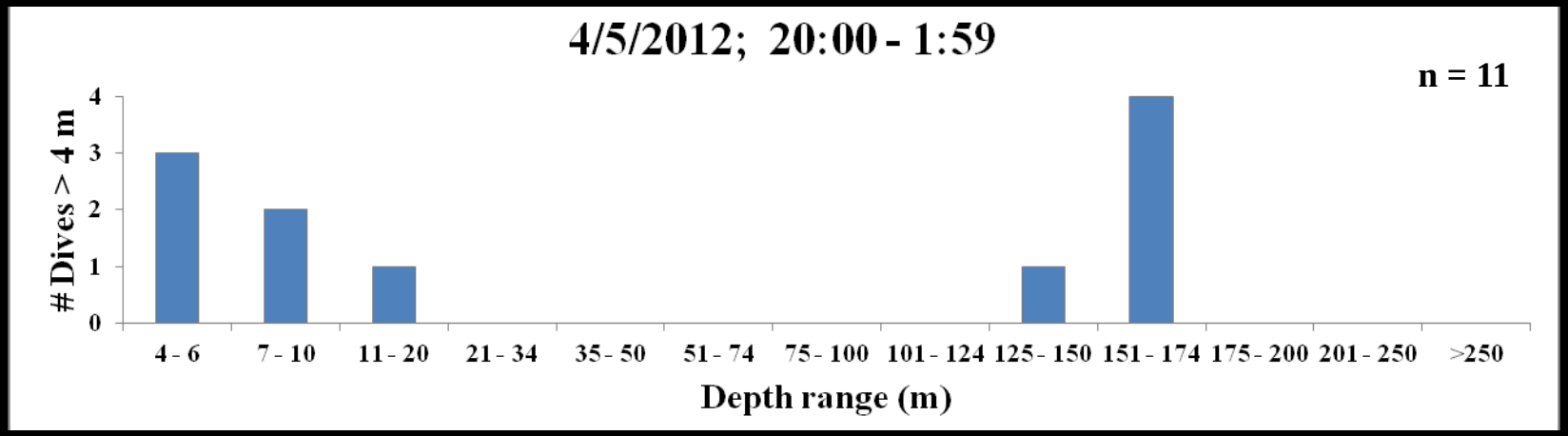
Dive profile of adult female “=24”

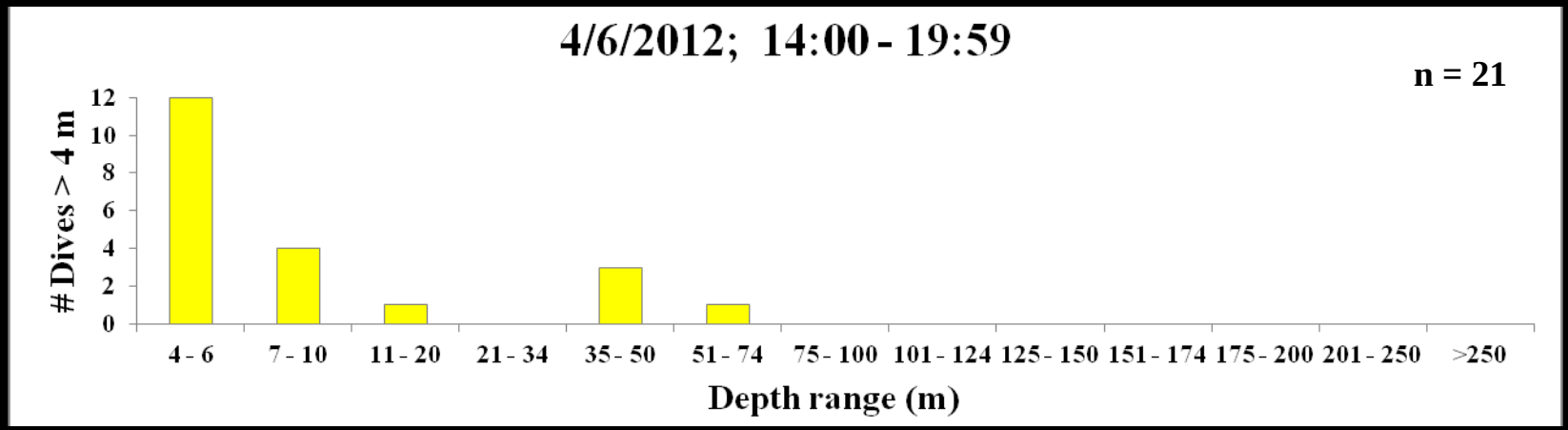


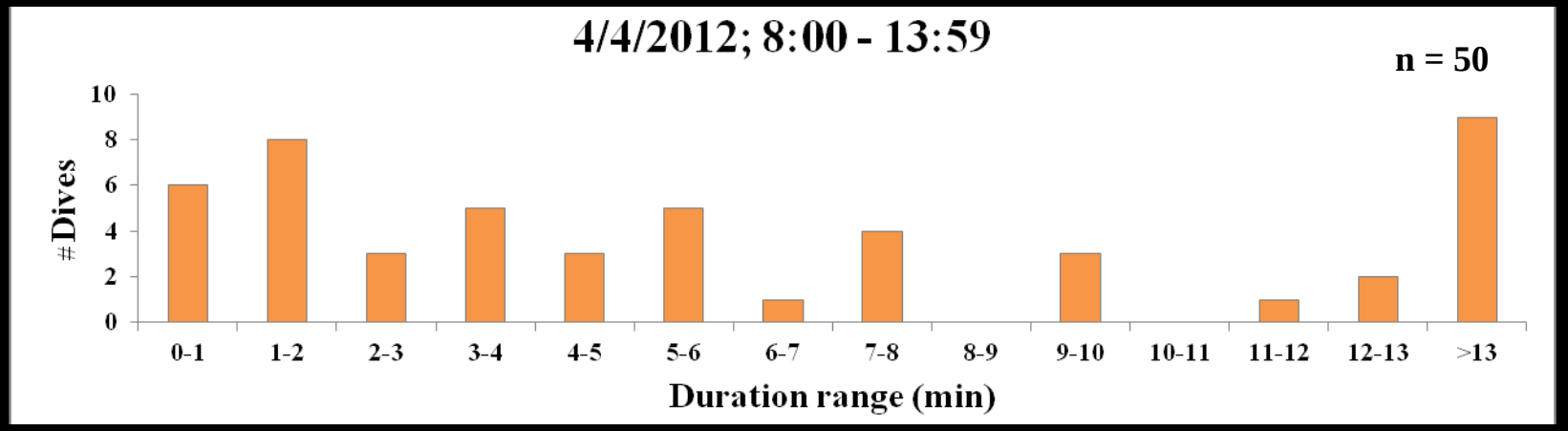


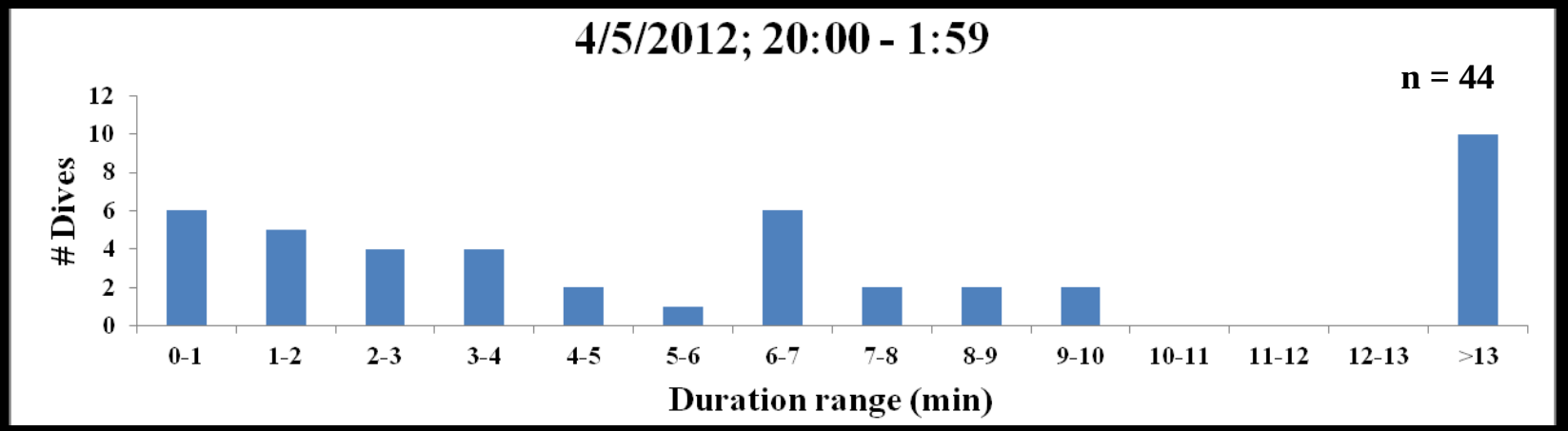

179°0'0"E
180°0'0"
52°0'0"N
N
18% Atka mackerel
65% northern rockfish
2% Atka mackerel
78% Pacific ocean perch
31% Pacific ocean perch
59% pollock
30% Pacific cod
50% northern rockfish
75% Atka mackerel
12% Pacific cod
15
20
16
21
22
200 m
100
Semisopochnoi
0 4 8 16 24 32 40
km
GPS Data
179.758, 52.422 WMC; 8:00 - 13:59
April 3-6 trip
All filtered GPS locations
Petrel South Hauls April 2-4

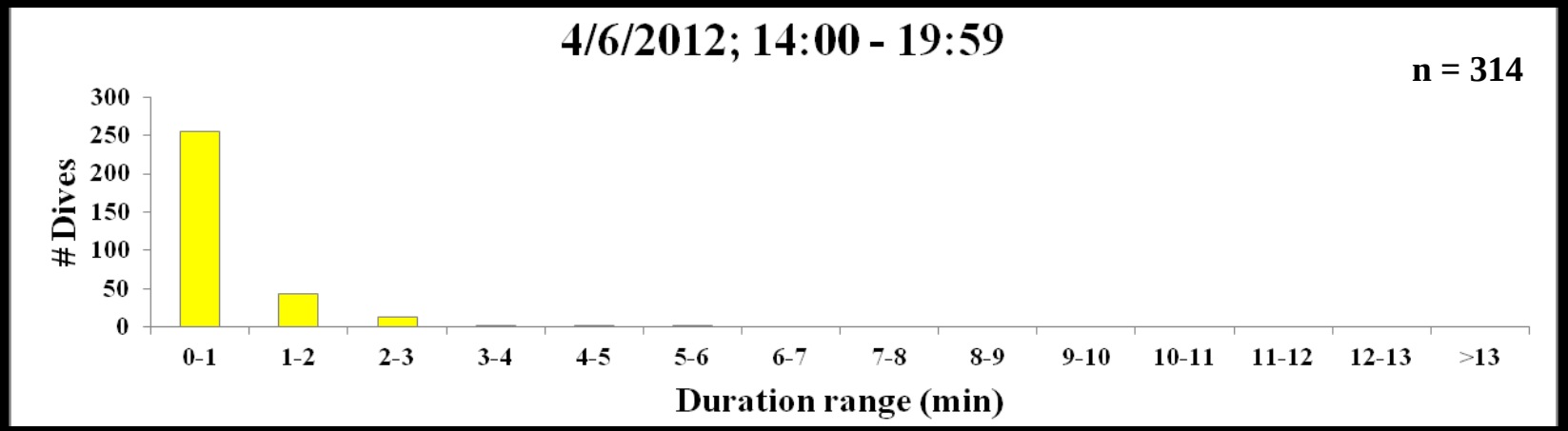

4/4/2012; 8:00 - 13:59
n = 11
# Dives > 4 m
0
2
4
6
8
10
12
4 - 6
7 - 10
11 - 20
21 - 34
35 - 50
51 - 74
75 - 100
101 - 124
125 - 150
151 - 174
175 - 200
201 - 250
>250
Depth range (m)


4/5/2012; 20:00 - 1:59
n = 11
# Dives > 4 m
0
1
2
3
4
4 - 6
7 - 10
11 - 20
21 - 34
35 - 50
51 - 74
75 - 100
101 - 124
125 - 150
151 - 174
175 - 200
201 - 250
>250
Depth range (m)


4/6/2012; 14:00 - 19:59
n = 21
# Dives > 4 m
0
2
4
6
8
10
12
4 - 6
7 - 10
11 - 20
21 - 34
35 - 50
51 - 74
75 - 100
101 - 124
125 - 150
151 - 174
175 - 200
201 - 250
>250
Depth range (m)


4/4/2012; 8:00 - 13:59
n = 50
# Dives
0
2
4
6
8
10
0-1
1-2
2-3
3-4
4-5
5-6
6-7
7-8
8-9
9-10
10-11
11-12
12-13
>13
Duration range (min)

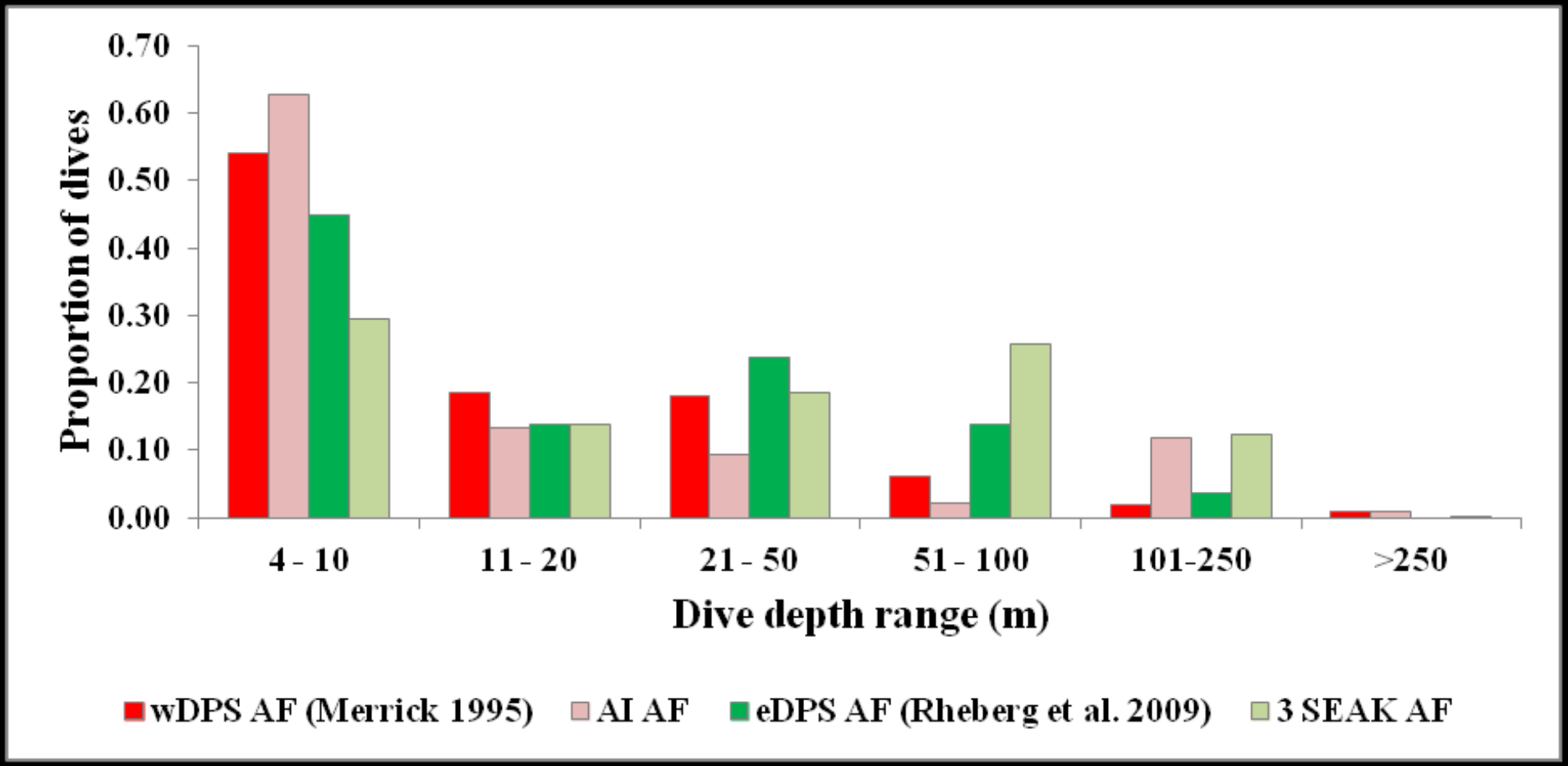

4/5/2012; 20:00 - 1:59
n = 44
# Dives
0
2
4
6
8
10
12
0-1
1-2
2-3
3-4
4-5
5-6
6-7
7-8
8-9
9-10
10-11
11-12
12-13
>13
Duration range (min)


4/6/2012; 14:00 - 19:59
n = 314
# Dives
0
50
100
150
200
250
300
0-1
1-2
2-3
3-4
4-5
5-6
6-7
7-8
8-9
9-10
10-11
11-12
12-13
>13
Duration range (min)

Adult female winter attendance behavior

	Duration (hours)	
	Central Aleutian (1)	Southeast (3)
dry	4.6±7.6 (n=165) 0.3 - 48	5.1±9.1 (n=1101) 0.3 - 97.3
wet	5.6±10.3 (n=155) 0.3 - 80	8.6±17.2 (n=1108) 0.3 - 133.3

Alaska adult female Steller sea lion dive profiles



Adult female captures – next steps

- October 2012 capture trip planned
- Continued analysis of data
- Analysis of remote camera data to improve understanding of sea lion distribution

Juvenile sea lion movement analysis

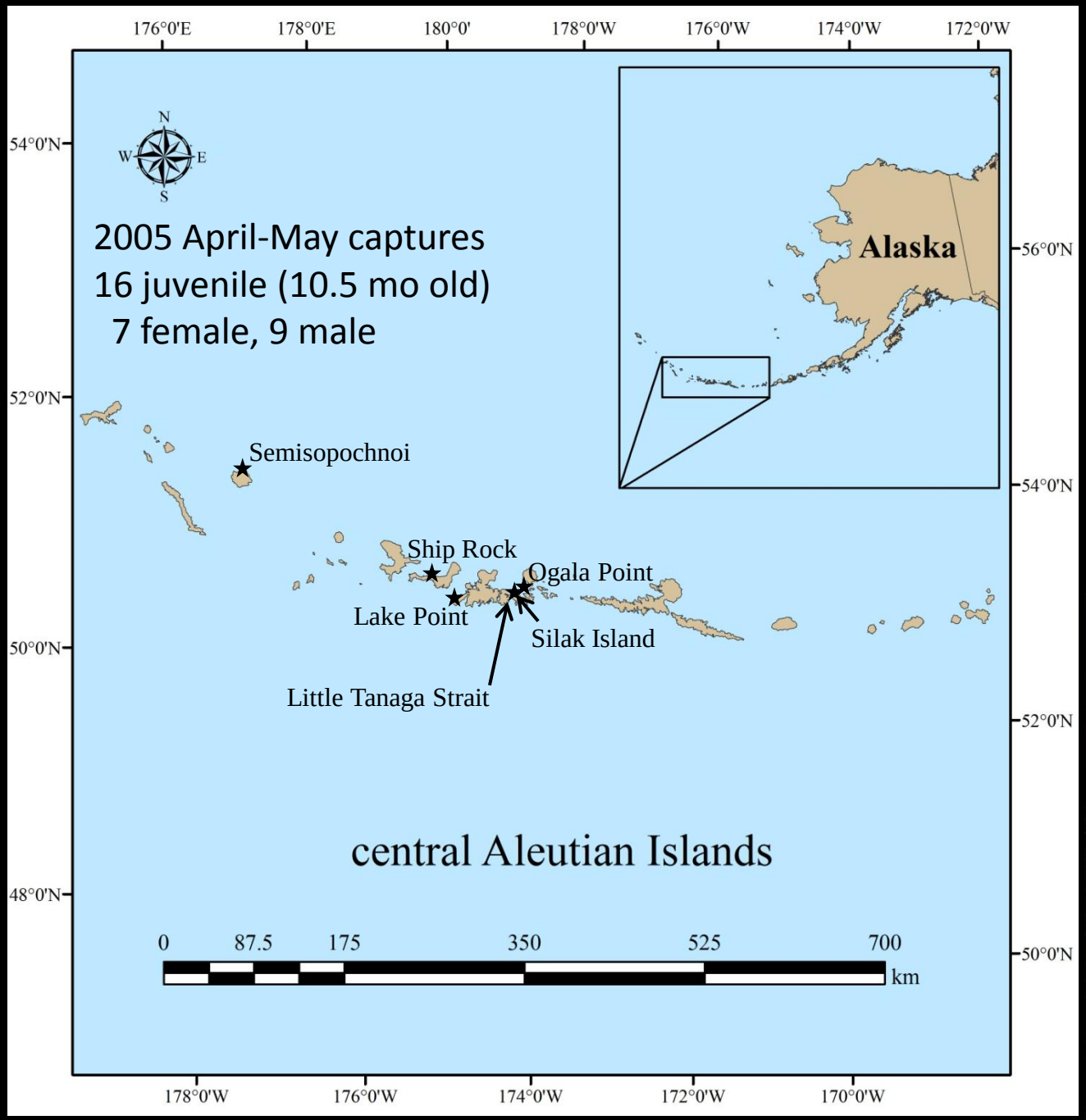
NOAA Technical Memorandum NMFS-AFSC-218

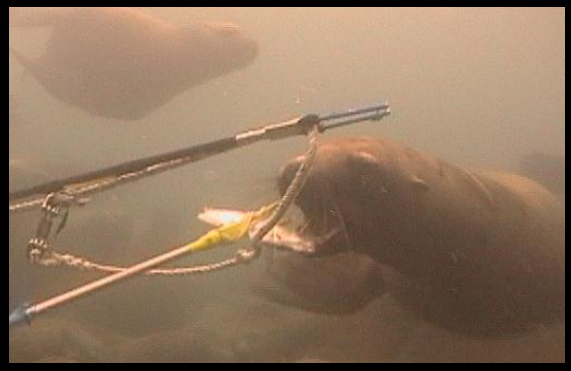
Diving Behaviors and Movements of Juvenile Steller Sea Lions (*Eumetopias jubatus*) Captured in the Central Aleutian Islands, April 2005

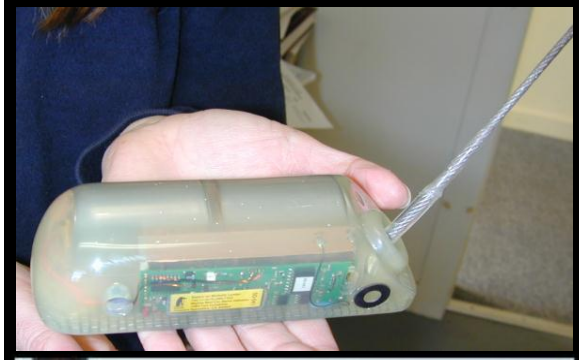
by
M. E. Lander, D. S. Johnson, J. T. Sterling, T. S. Gelatt, and B. S. Fadely

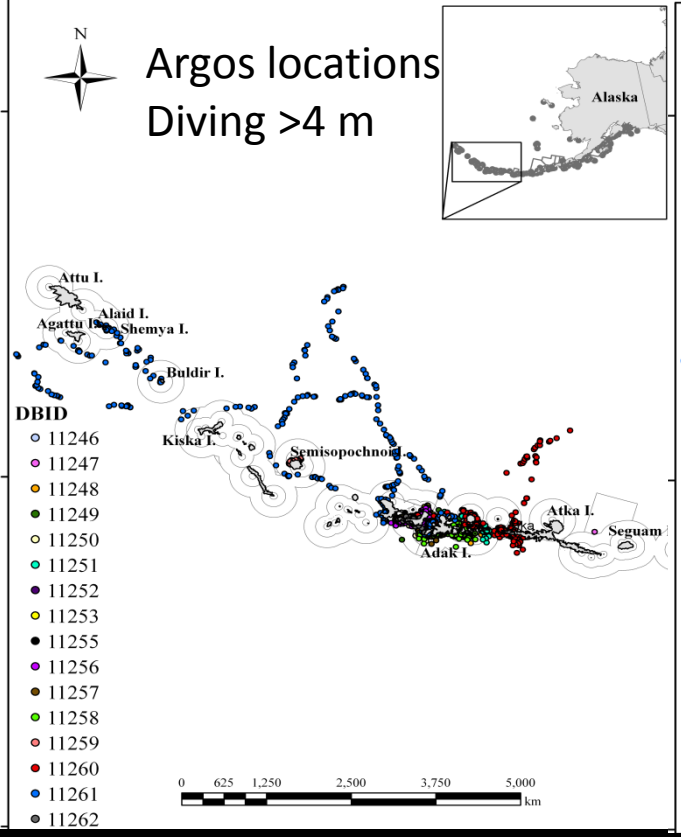
U.S. DEPARTMENT OF COMMERCE
National Oceanic and Atmospheric Administration
National Marine Fisheries Service
Alaska Fisheries Science Center

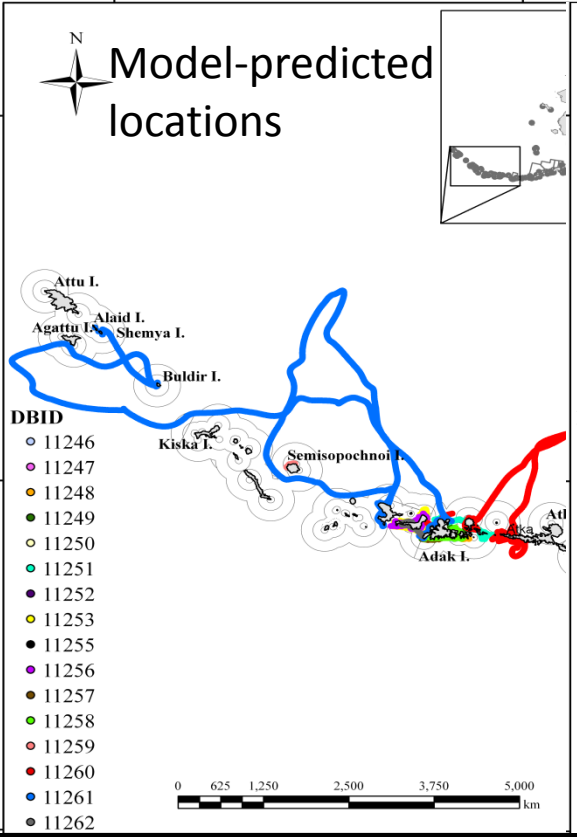
March 2011

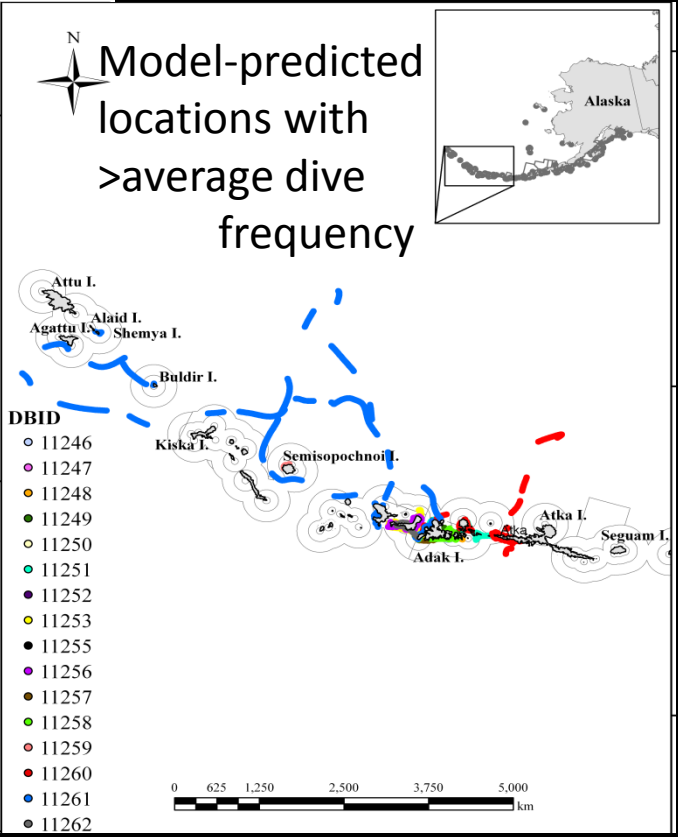

176°0'E
178°0'E
180°0'
178°0'W
176°0'W
174°0'W
172°0'W
54°0'N
52°0'N
50°0'N
48°0'N
56°0'N
N
W
E
S
2005 April-May captures
16 juvenile (10.5 mo old)
7 female, 9 male
Alaska
Semisopochnoi
Ship Rock
Ogala Point
Lake Point
Silak Island
Little Tanaga Strait
central Aleutian Islands
0
87.5
175
350
525
700
km
178°0'W
176°0'W
174°0'W
172°0'W
170°0'W



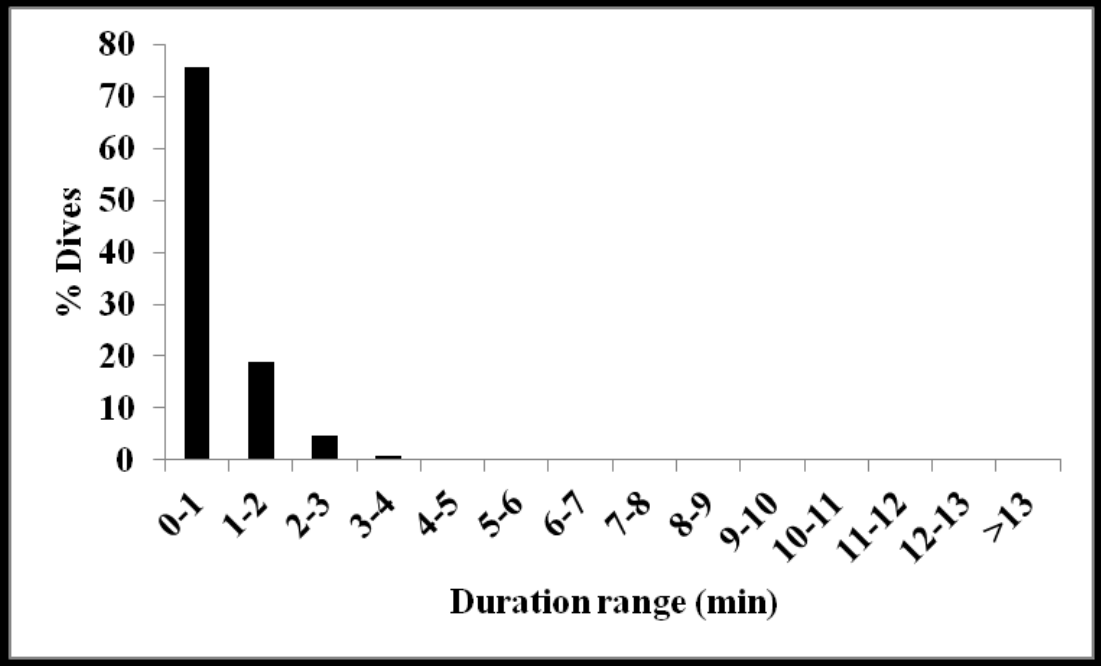




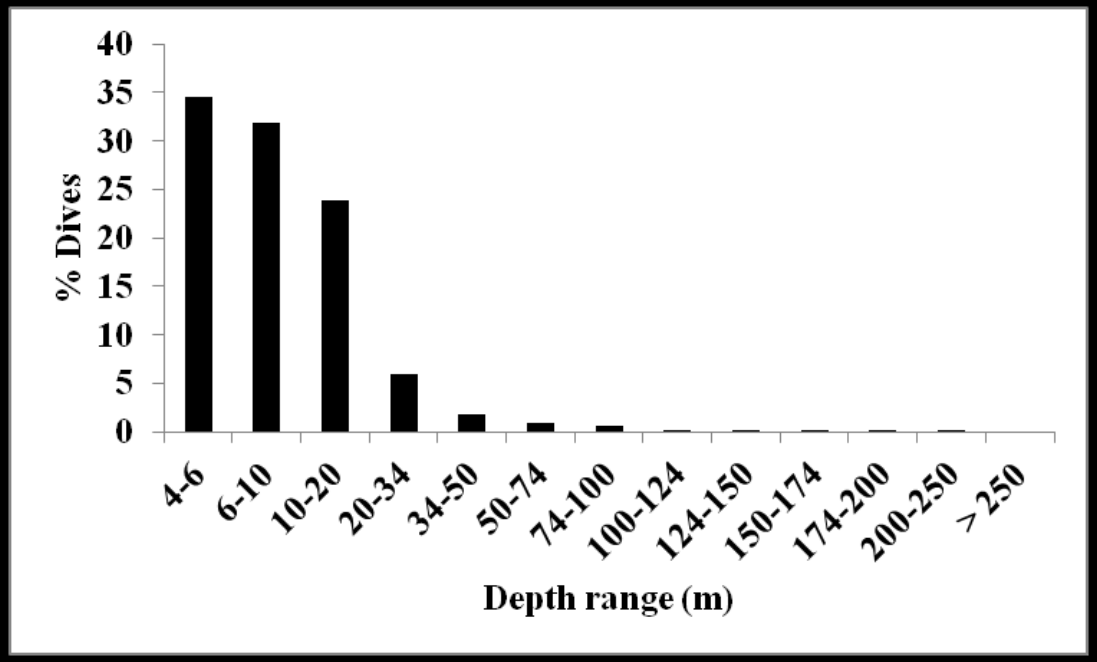




Critical Habitat Zone	Argos Locations Diving > 4 m (n = 16)	Predicted Locations Diving > 4 m (n = 16)	Predicted Locations > ave. dive frequency (n = 16)
0 – 10 nmi	68.30	69.49	65.37
10 – 20 nmi	23.71	23.69	26.21
Foraging Areas (> 20 nmi)	0.04	0.00	0.00
> 20 nmi	7.96	6.82	8.42



Mean ± SD = 0.8 ± 0.6 min
Median = 0.5 min
Range = 0.5 – > 13 min
n = 155,620 dives

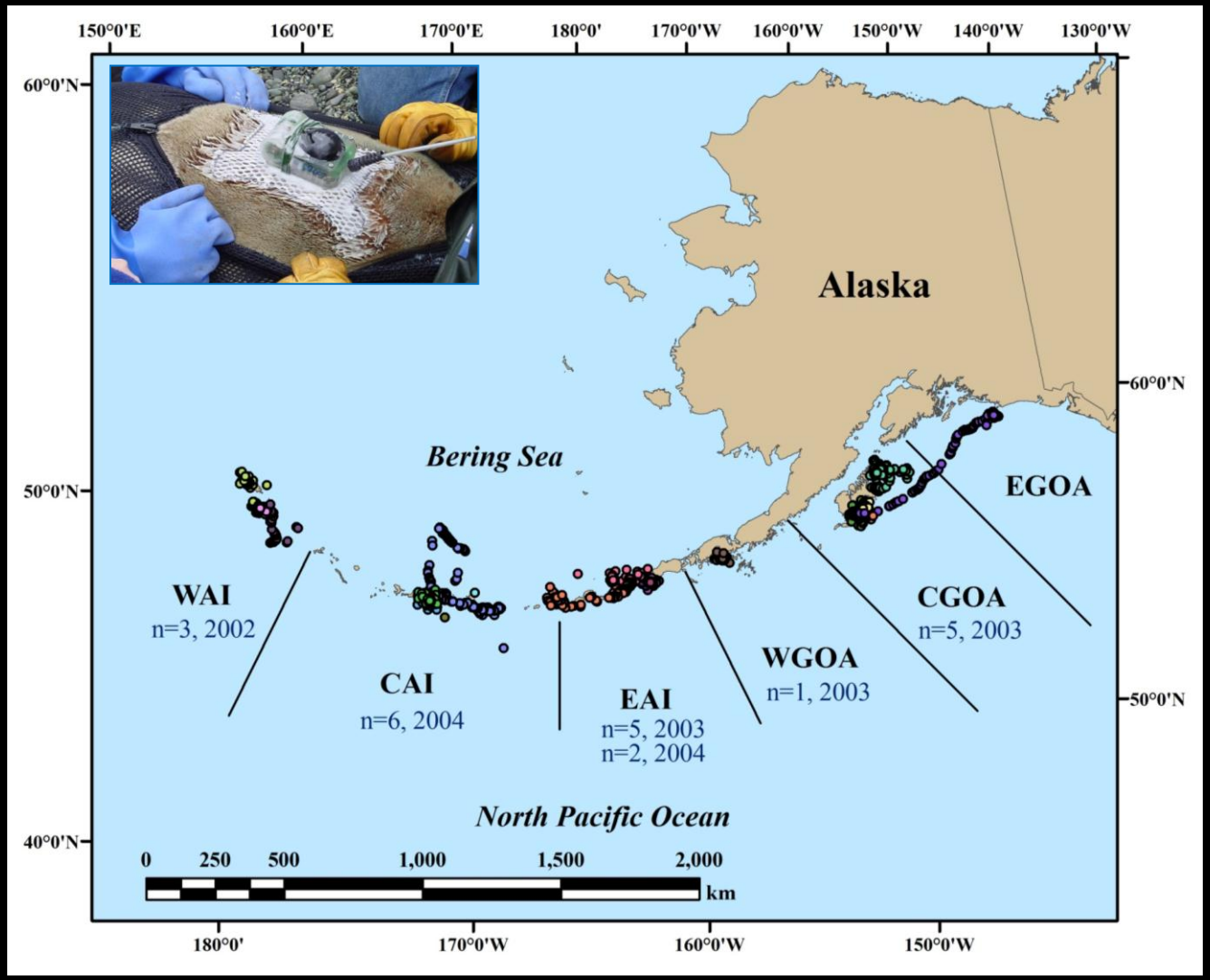


Mean ± SD = 11.8 ± 12.6 m
Median = 8.0 m
Range = 5.0 – 255.0 m
n = 89,993 dives

Juvenile Attendance Behavior (n=16 SSL)

State	Mean time (hrs)	SD (hrs)	Min (hrs)	Max (hrs)
Dry (n=589)	10.5	7.1	1.0	58.7
Wet (n=553)	14.0	19.6	0.3	280.0

Additional juvenile sea lion data for EIS consideration



Juvenile deployments (NMML/ADFG)