

## Harbor Seal Movements in the Aleutian Islands

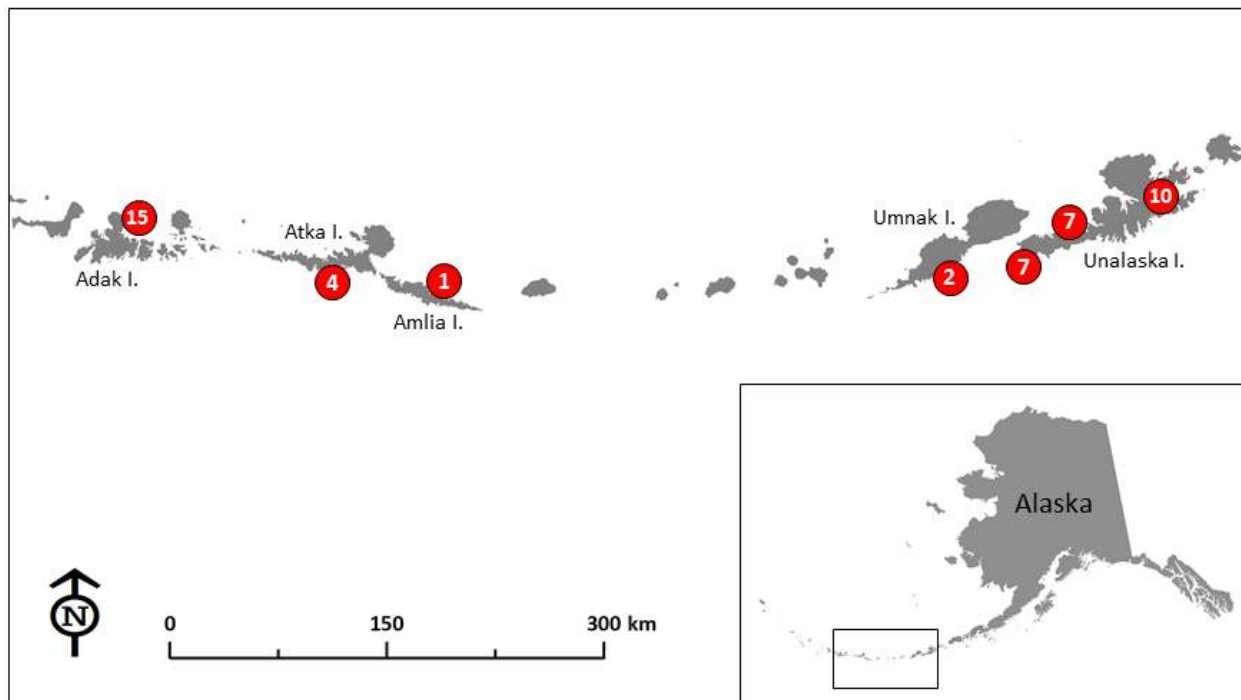
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NOAA's Alaska Fisheries Science Center, Marine Mammal Laboratory has initiated new studies on harbor seals in the Aleutian Islands during the past 2 years. In September 2014, our team captured 15 seals in Clam Lagoon on Adak Island, and in September 2015, we captured a total of 31 seals at 6 sites between Unalaska and Atka Islands (Fig. 1). All captured seals were examined, measured, and weighed to assess their physical condition; sampled for blood and tissue to analyze their genetic composition, diet, and health; and released near their capture sites. "Splash"<sup>1</sup> satellite tags were glued to hair on the heads or backs of seals that had sufficiently completed their annual "molt" (shedding and regrowth of hair and skin) (Fig. 2). These tags transmit the seals' movement, dive, and haul-out behaviors for several months, and then fall off during the seal's next molt. Seals that were large enough (i.e., adults and most sub-adults) also received a smaller "Spot"<sup>1</sup> satellite tag attached to the webbing in their hind flipper (Fig. 3). These tags are intended to stay on the seal through the molt and transmit location and haul-out data during this important period of the seal's annual cycle. This report provides preliminary results on harbor seal movements based primarily on data from the Splash satellite tags.



**Figure 1. Locations and numbers of harbor seals captured in the central and eastern Aleutian Islands during September 2014 (Adak I.) and September 2015 (all other locations).**

<sup>1</sup> "Splash" and "Spot" are types of tags produced by Wildlife Computers, Redmond, WA. References to trade names does not imply endorsement by NOAA Fisheries.



**Figure 2. Splash satellite tag attached to the head of an adult male harbor seal.**



**Figure 3. Spot satellite tag attached to the hind flipper of an adult male harbor seal.**

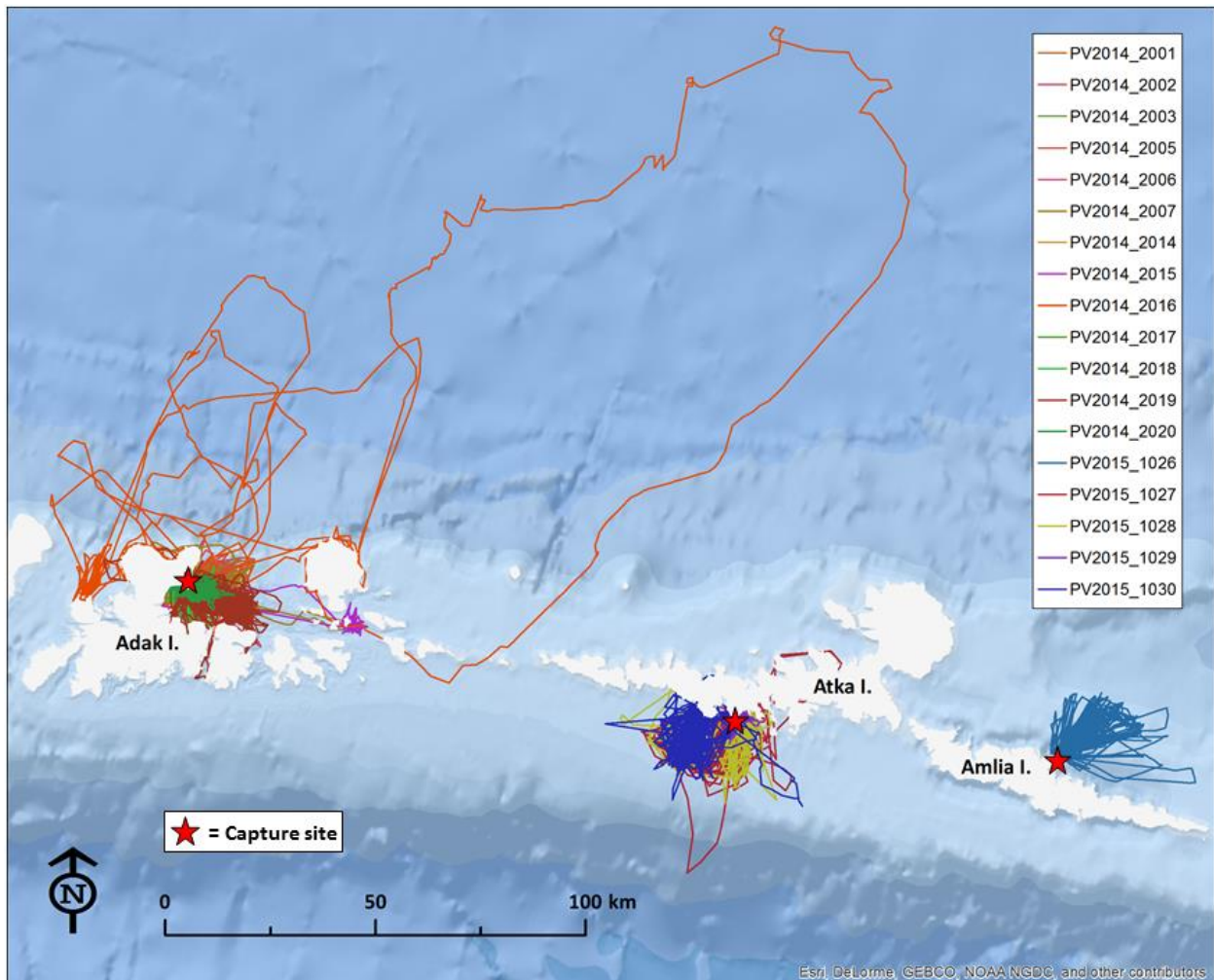
A total of 13 Splash tags were deployed on seals in 2014 and 27 Splash tags were deployed in 2015 (Table 1). The average tag transmission durations were 206 days (SD = 17) and 142 days (SD = 46), respectively.

**Table 1. Age-class, sex, and Splash tag information from harbor seals tagged in the Aleutian Islands.**

Seal ID	Age-class	Sex	Tag start	Tag end	Tag duration (days)
PV2014_2001	Adult	Female	02-Sep-2014	08-Apr-2015	217
PV2014_2002	Adult	Female	02-Sep-2014	30-Mar-2015	208
PV2014_2003	Adult	Female	02-Sep-2014	25-Mar-2015	203
PV2014_2005	Subadult	Female	03-Sep-2014	02-Apr-2015	211
PV2014_2006	Subadult	Female	07-Sep-2014	18-Apr-2015	223
PV2014_2007	Weaned pup	Male	08-Sep-2014	22-Feb-2015	167
PV2014_2014	Adult	Female	02-Sep-2014	15-Mar-2015	193
PV2014_2015	Adult	Female	02-Sep-2014	28-Mar-2015	207
PV2014_2016	Subadult	Male	02-Sep-2014	27-Apr-2015	236
PV2014_2017	Subadult	Female	02-Sep-2014	22-Mar-2015	200
PV2014_2018	Adult	Male	07-Sep-2014	23-Mar-2015	196
PV2014_2019	Subadult	Male	09-Sep-2014	14-Apr-2015	217
PV2014_2020	Adult	Female	10-Sep-2014	24-Mar-2015	195
PV2015_1000	Weaned pup	Female	07-Sep-2015	25-Jan-2016	140
PV2015_1001	Subadult	Female	07-Sep-2015	02-Dec-2015	86
PV2015_1002	Adult	Male	07-Sep-2015	12-Mar-2016	187
PV2015_1003	Adult	Female	08-Sep-2015	22-Feb-2016	166
PV2015_1004	Subadult	Female	08-Sep-2015	25-Dec-2015	108
PV2015_1005	Weaned pup	Female	08-Sep-2015	22-Nov-2015	75
PV2015_1006	Subadult	Female	08-Sep-2015	03-Mar-2016	176
PV2015_1007	Subadult	Male	08-Sep-2015	02-Jan-2016	115
PV2015_1008	Subadult	Female	09-Sep-2015	19-Feb-2016	163
PV2015_1009	Subadult	Female	09-Sep-2015	30-Sep-2015	22
PV2015_1010	Adult	Male	11-Sep-2015	12-Jan-2016	124
PV2015_1013	Adult	Female	11-Sep-2015	09-May-2016	241
PV2015_1014	Adult	Male	11-Sep-2015	22-Feb-2016	164
PV2015_1015	Adult	Female	11-Sep-2015	11-Mar-2016	181
PV2015_1016	Adult	Male	12-Sep-2015	22-Feb-2016	163
PV2015_1017	Adult	Male	12-Sep-2015	20-Jan-2016	130
PV2015_1020	Adult	Male	13-Sep-2015	13-Feb-2016	153
PV2015_1021	Weaned pup	Female	13-Sep-2015	10-Jan-2016	119
PV2015_1022	Weaned pup	Male	13-Sep-2015	07-Feb-2016	147
PV2015_1023	Adult	Female	13-Sep-2015	03-Nov-2015	50
PV2015_1024	Subadult	Female	17-Sep-2015	27-Feb-2016	163
PV2015_1025	Subadult	Female	17-Sep-2015	15-Mar-2016	181
PV2015_1026	Adult	Male	19-Sep-2015	24-Feb-2016	158
PV2015_1027	Adult	Male	21-Sep-2015	06-Mar-2016	167
PV2015_1028	Adult	Female	21-Sep-2015	29-Mar-2016	190
PV2015_1029	Adult	Female	22-Sep-2015	29-Jan-2016	129
PV2015_1030	Adult	Female	22-Sep-2015	08-Feb-2016	140



Figures 4-6 show the movement tracks of the tagged seals, as predicted by an animal movement model that reduces the effects of uncertainty in the Argos satellite geo-locations. Most seals (29 of 40) made very short movements for the duration of their tag's deployment, remaining within about 25 km of where they were tagged and released. These seals' tracks are mostly overlapping and difficult to discern in the figures below. Seven seals moved moderate distances between two or more haul-out sites and made short trips from each location. Only 4 seals made long-distance trips of more than 200 km from their capture site. Seal PV2014\_2016 made repeated trips from Adak Island into the Bering Sea (Fig. 4) and was the only seal to make foraging-type movements to deep waters beyond the continental shelf. Four other seals' tracks extended off of the shelf or over the slope for brief periods, but these were likely either transiting-type movements or due to geo-locations with large uncertainty that were not filtered out by the model. Seal PV2015\_1007 made a trip from Unalaska Island to Amukta Pass and back, Seal PV2015\_1008 made two separate trips from Unalaska Island to the eastern Bering Sea shelf, and Seal PV2015\_1021 moved from Unalaska Island to the north side of the Alaska Peninsula and made repeated trips to the eastern Bering Sea shelf from there (Fig. 6). Quantitative analyses of movement, dive, and haul-out behaviors will be made available in future publications.



**Figure 4. Predicted movement tracks of 18 harbor seals tagged in the central Aleutian Islands during September 2014 (Adak I.) and September 2015 (Atka and Amlia Is.).**

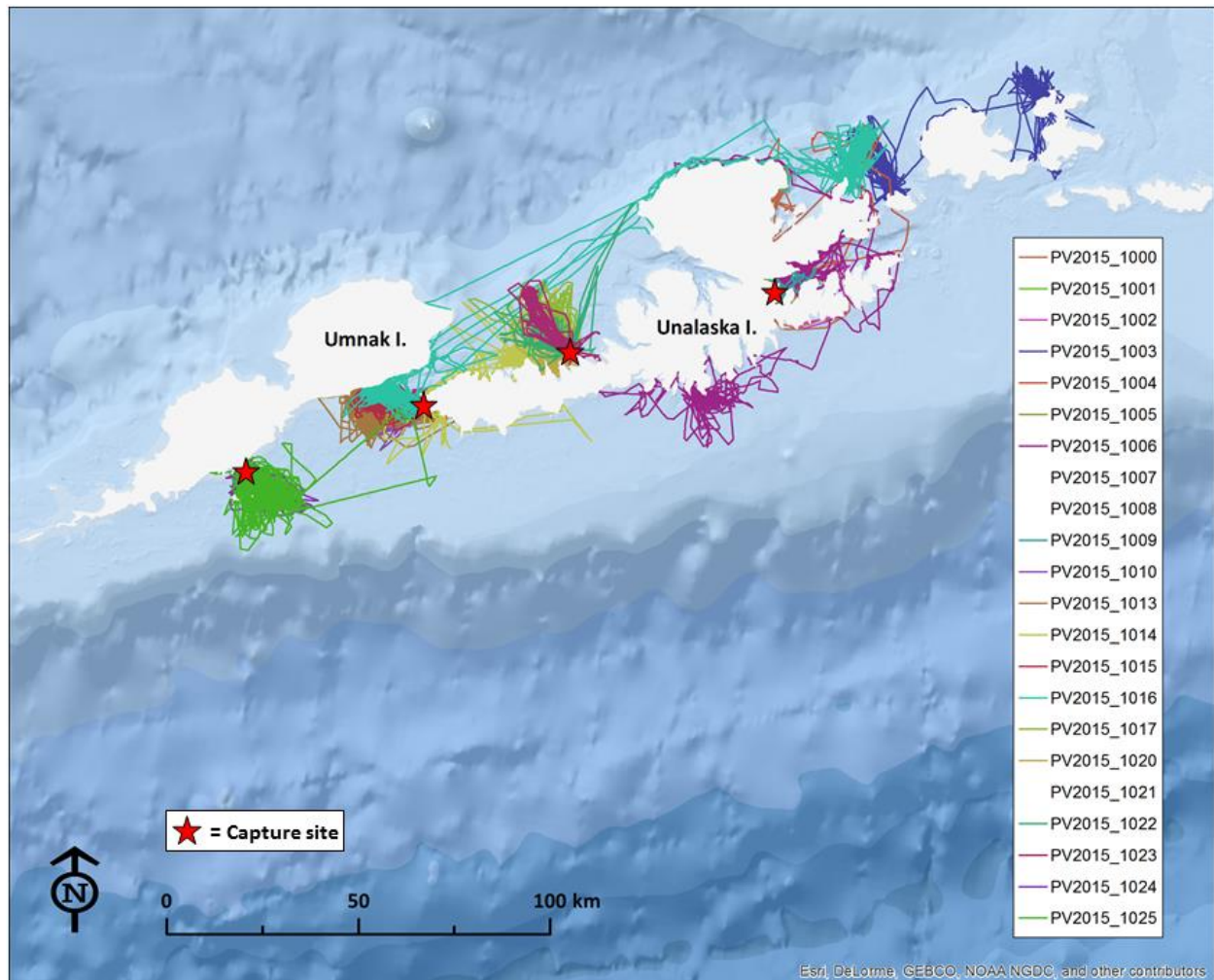
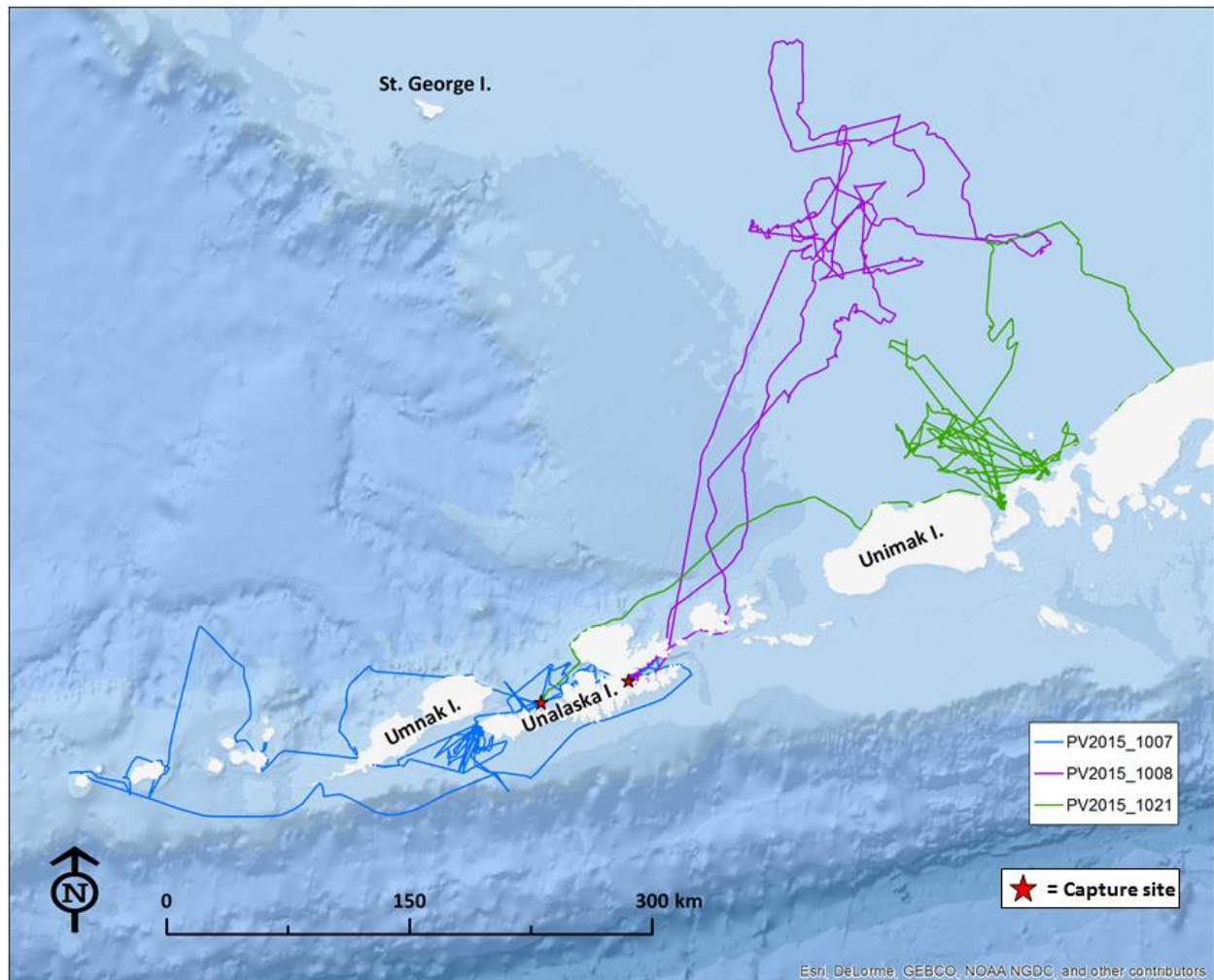


Figure 5. Predicted movement tracks of 19 harbor seals tagged in the eastern Aleutian Islands during September 2015.



**Figure 6. Predicted movement tracks of 3 harbor seals tagged in the eastern Aleutian Islands during September 2015.**

### **Acknowledgments**

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