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Marine Mammal Laboratory

Aerial Surveys of Harbor Seals (*Phoca vitulina richardii*) in Behm Canal, Alaska

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Aerial Surveys of Harbor Seals (*Phoca vitulina richardii*) in Behm Canal, Alaska

Results from Surveys Conducted by
NOAA, National Marine Fisheries Service
in September 2022 and June 2023

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Introduction

The U.S. Navy maintains a number of underwater assets within Behm Canal, Alaska, at its Southeast Alaska Acoustic Measurement Facility (SEAFAC) located on Back Island in Ketchikan, Alaska[1]. Harbor seals (*Phoca vitulina richardii*) are the most abundant and most frequently encountered marine mammal in Behm Canal. The U.S. Navy partnered with the National Marine Fisheries Service (NMFS) to acquire updated information on harbor seal distribution and abundance within Behm Canal for use in impact assessment and planning.

Harbor seals inhabit coastal and estuarine waters from Baja California in Mexico to the north along the western coasts of the United States, British Columbia, and Southeast Alaska (Rice 1998). From there, the range extends west through the Gulf of Alaska and Aleutian Islands, and in the Bering Sea, north to Cape Newenham and the Pribilof Islands. Harbor seals are generally non-migratory and remain in close proximity to their natal range. Their local movements are associated with environmental and life history factors such as tide, weather, season, prey availability, and reproduction (Hastings et al. 2004, Fisher 1952, Bigg 1981, Bigg 1969, Boveng et al. 2018). They haul out on rocks, reefs, beaches, and drifting glacial ice, and they forage in marine, estuarine, and occasionally fresh waters.

Local or regional trends in harbor seal numbers in Alaska have been monitored at various time intervals since the 1970s, revealing diverse spatial patterns in apparent population trends. Where declines were observed, they seem to have been steepest in the late 1970s or early 1980s to the 1990s. For example, counts of harbor seals declined by about 80% at Tugidak Island in the 1970s and 1980s (Pitcher 1990), and numbers at Nanvak Bay in northern Bristol Bay also declined at about the same time (Jemison et al. 2006). In Prince William Sound, harbor seal numbers declined by about 63% overall between 1984 and 1997, including a 40% decline prior to the *Exxon Valdez* oil spill that occurred in 1989 (Frost et al. 1999, Ver Hoef & Frost 2003). In the Aleutian Islands, counts declined by 67% between the early 1980s and 1999, with declines of about 86% in the western Aleutians (Small et al. 2008). These areas of localized declines contrast strongly with other large regions of Alaska where harbor seal numbers have remained stable or have increased over the same period. For example, trend monitoring regions around Ketchikan and Kodiak Island increased significantly in the 1980s and 1990s and regions around Sitka and Bristol Bay were stable (Small et al. 2003).

NOAA's National Marine Fisheries Service and its co-management partners recognize 12 separate stocks of harbor seals in Alaska, which are delineated largely by genetic structure. The

[1] Naval Surface Warfare Center, Carderock Division Southeast Alaska Acoustic Measurement Facility 1 Back Island Ketchikan, AK 99901-5637 https://www.navsea.navy.mil/Home/Warfare-Centers/NSWC-Carderock/Who-We-Are/Ketchikan-Alaska/

Clarence Strait stock (Fig. 1) ranges along the east coast of Prince of Wales Island from Cape Chacon north through Clarence Strait to Point Baker and along the east coast of Mitkof and Kupreanof islands north to Bay Point, including Ernest Sound, Behm Canal, and Pearse Canal. The current abundance estimate for the Clarence Strait stock is 27,659 (SE: 3,030) harbor seals, based on aerial survey data collected from 1996 to 2015 (Fig. 2; Muto et al. 2022). The estimate of the most recent 8-year trend for the Clarence Strait population indicates that this stock has likely been stable or increasing (+138 seals per year) with only a 0.413 probability of decrease (Muto et al. 2022). The probability of decrease represents the proportion of the posterior probability distribution for the 8-year trend that fell below a value of 0 seals per year. Outside of efforts from 2007 to 2011, 2015, and 2021, there has been limited survey effort for this stock, and the recent estimates of abundance include large credible intervals (i.e., intervals used in Bayesian statistics to capture uncertainty in the estimates).

The Alaska Fisheries Science Center's (AFSC) Marine Mammal Laboratory (MML) routinely conducts aerial surveys of harbor seals across their entire range in Alaska. These aerial surveys of coastal Alaska are the primary method for monitoring and estimating the abundance of harbor seals (Muto et al. 2022). The majority of survey effort occurs during the months of August and September when a high proportion of seals come out of the water (i.e., haul out) to molt. Estimates of seals that remain in the water, and therefore are not present during the aerial count, are derived from statistical analysis of behavior informed by telemetry devices placed on harbor seals (London et al. 2012). Aerial counts, proportions of seals in the water, and environmental covariates such as tidal height and time of day, are combined into a statistical model to determine current abundance estimates of harbor seals. There is variability in the use of individual haul-out sites within a localized region; therefore, abundance estimates are calculated by stock and survey unit (stocks are divided into fixed survey units that can be surveyed in a short period during which environmental conditions are relatively constant).

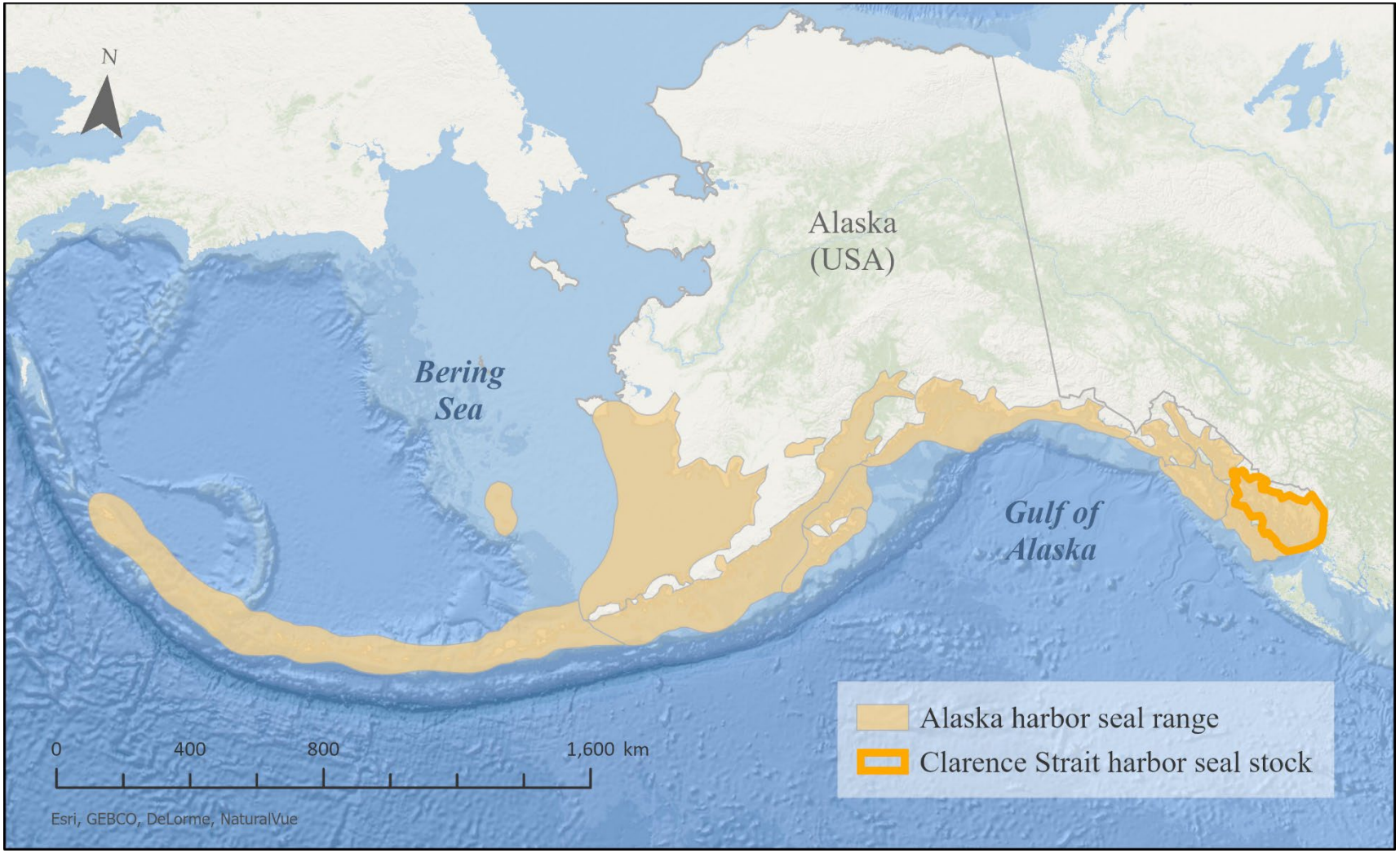

Figure 1. -- Geographic range of harbor seals in Alaska (light orange shading), highlighting the boundary of the Clarence Strait stock in the southeastern portion of the state (dark orange outline).

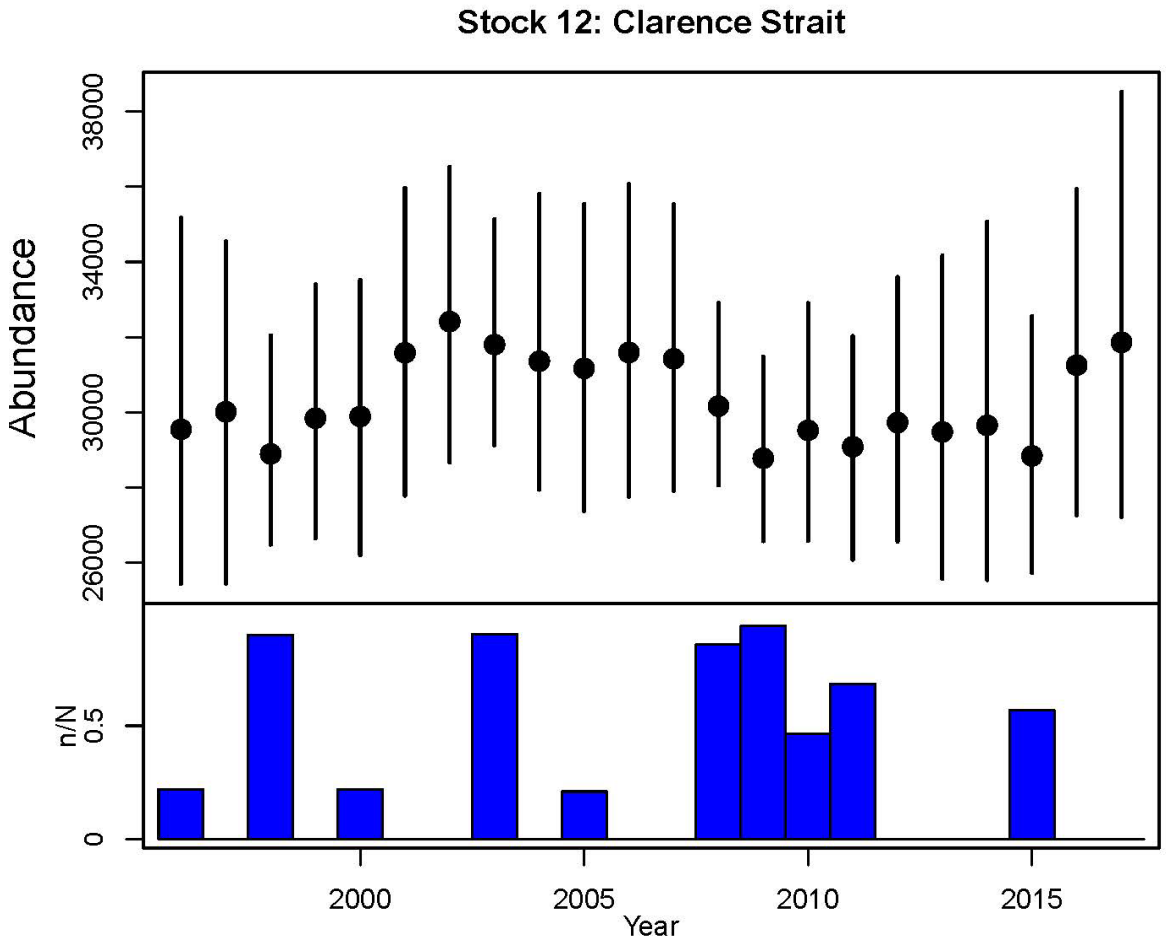

Figure 2. -- Estimated, annual total abundance of harbor seals in the Clarence Strait stock between 1996 and 2018 (Muto et al. 2022). The vertical black bars represent 95% credible intervals. The blue bars in the lower portion of the graph represent annual survey effort as a proportion of the expected number of seals that were surveyed in that year.

While NMFS does not estimate abundance or trend for individual harbor seal haul-out locations, a central database of all known haul-out sites within the state of Alaska is maintained and updated regularly (AFSC 2023). As a part of this process, "key" haul-out sites have been designated and defined as haul-out locations that contain an average of 50 or more harbor seals. The 50-animal threshold was chosen based on a natural break-point in the distribution of animals at a typical haul-out site as determined by aerial survey observations and data collection. A site with ≥ 50 animals is considered to be a haul-out location that is frequently used. Similarly, 50 animals is the threshold that designates a "large haul-out" in the Alaska Department of Fish and Game (ADF&G) Guidelines for Emerging Mariculture Industry and Marine Mammals Interactions (Alaska Department of Fish and Game 2019). These guidelines also recommend a

500-m buffer around key haul-out sites where there is overlap of activities that may cause disturbance to harbor seals.

The average number of seals assigned to each harbor seal haul-out site is calculated by dividing the survey unit abundance estimate by the number of haul-out locations in that survey unit. All haul-out sites that fall within a given survey unit are assigned the same average number of seals. "Key" haul-out site designations are revised anytime there is a new harbor seal abundance estimate and will be revised for this area in fall 2023. It is important to note that designating a location as a "key" haul-out site is only one aspect in determining the importance of a site and how it might be impacted by development or environmental change.

This project aims to provide updated abundance and distribution information for harbor seals around the U.S. Navy's SEAFAC installation in western Behm Canal and southern Clarence Strait. The Behm Canal Study Area is located within the range of the Clarence Strait stock (Muto et al. 2022) of harbor seals. It encompasses 24 NMFS survey units and 139 haul-out sites, 30 of which are considered "key" haul-out sites (Fig. 3). All NMFS survey units have alphanumeric identifiers; Back Island, where the SEAFAC complex is located, is specifically encompassed by survey unit AD61 (Fig. 4). Prior to 2022, this area was last surveyed in August and September of 2015. Aside from 2015, there has been limited survey effort for harbor seals in this area over the last 10 years. While some surveys were conducted in Southeast Alaska in August 2021, surveys in Behm Canal were not possible due to inclement weather. The AFSC's Marine Mammal Laboratory conducted 11 aerial surveys in the region during September 2022 and June 2023. Here, we report the results of those surveys.

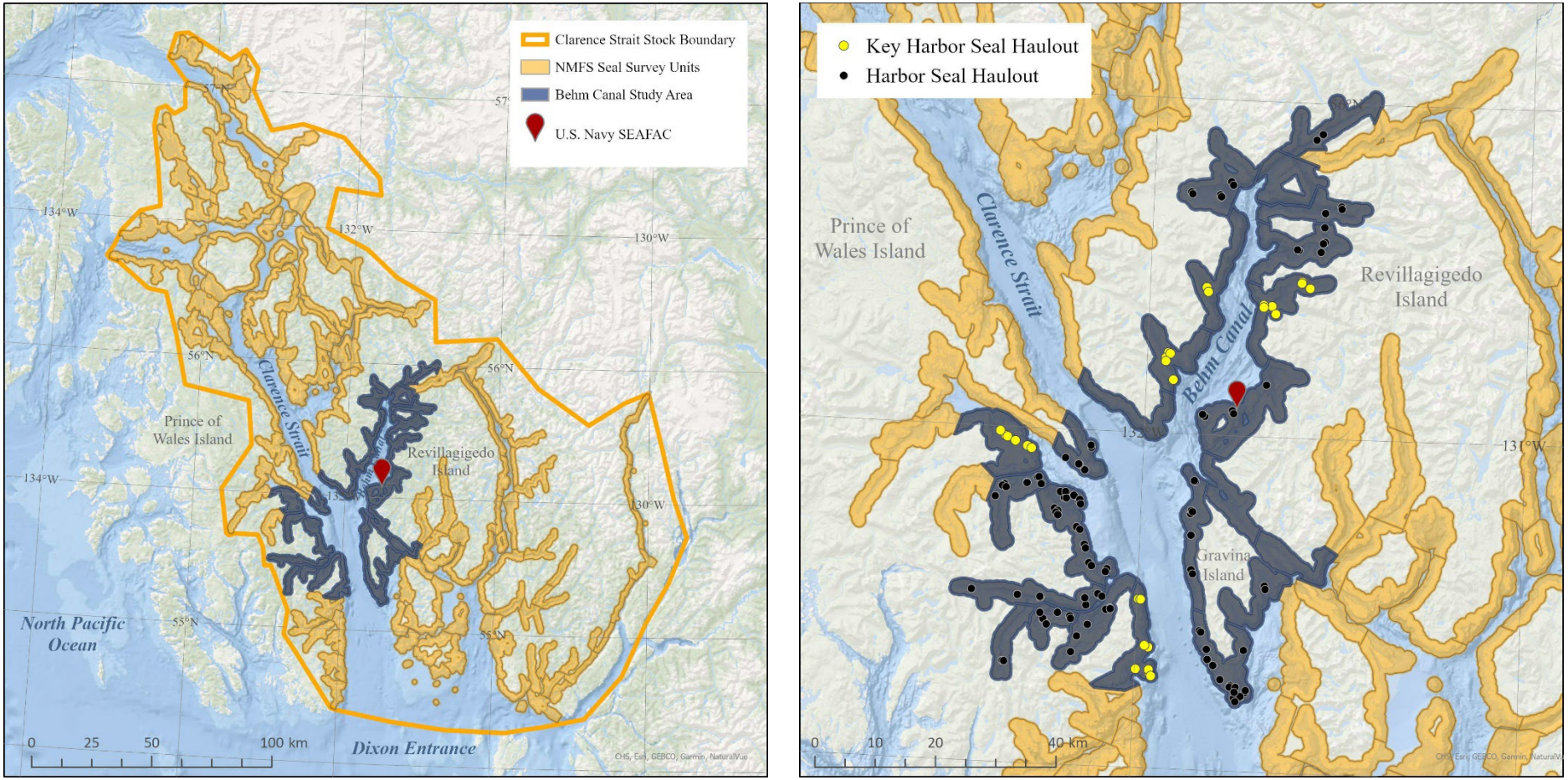

Figure 3. -- Boundary of the Clarence Strait stock of harbor seals in Southeast Alaska, showing all survey units in the stock shaded in orange and survey units in the Behm Canal Study Area shaded in blue (left). Enlarged map of the Behm Canal Study Area, which contains 24 survey units and 139 haul-out sites, 30 of which are designated as key haul-out sites shaded in yellow (right).

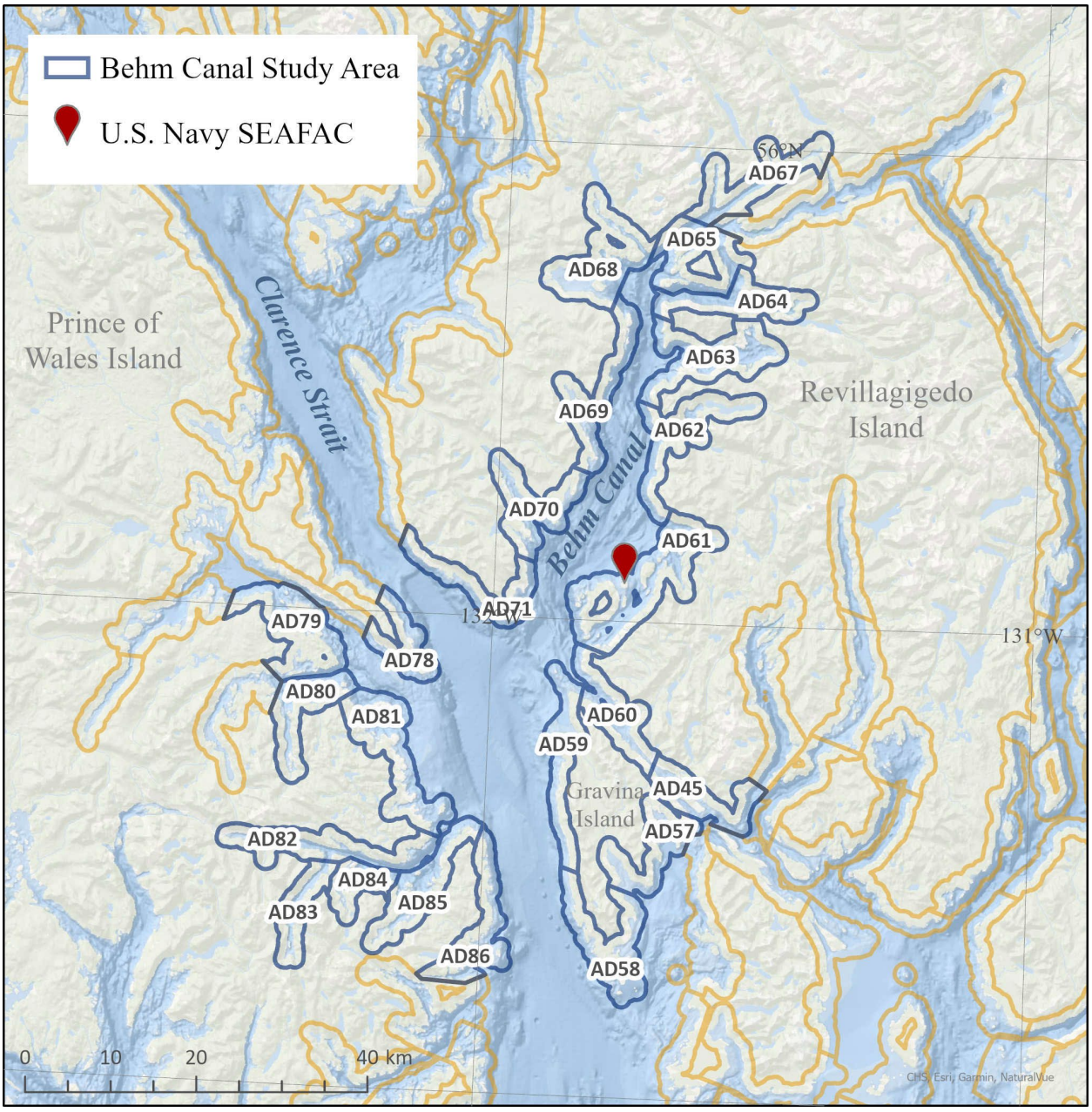

Figure 4. -- Behm Canal Study Area in Southeast Alaska, showing NMFS survey unit boundaries outlined in blue along with their corresponding alphanumeric identifiers.

Methods

In September 2022 and June 2023, we conducted aerial surveys in Behm Canal, Alaska, from a De Havilland Twin Otter fixed-wing aircraft (N56RF) owned and operated by NOAA's Aircraft Operations Center. We surveyed each known harbor seal haul-out site within seal survey units that encompass the coastline (Fig. 3). All known harbor seal haul-out sites in Alaska were previously documented from local knowledge and historical aerial surveys, and they are retained

and updated in a database managed by the MML's Polar Ecosystems Program. We categorized survey effort based on the following criteria: "full survey" when all haul-out sites within a survey unit were surveyed; "partial survey" when haul-out sites were missed within a survey unit due to low clouds or turbulent weather conditions; and "full reconnaissance survey" when the entire coastline within a survey unit was observed. To navigate throughout the survey area, locate each known haul-out site, and efficiently communicate with the pilots, we used aviation planning software (ForeFlight, Houston, TX; https://foreflight.com/) installed on tablet computers.

We planned flights to coincide with low tide, which is when we expect the highest number of seals to be hauled out. Our ideal survey window was to operate within the 3 hours before and after low tide, though actual survey time was dictated by weather and sunrise times. During each survey, we flew at a target altitude of 213–244 m (700–800 ft) and a survey speed of 100 kt. We collected our geographic position data with two GPS devices (Stratus 3 ADS-B Receiver, https://stratusbyappareo.com/products/stratus-ads-b-receivers/; and Bad Elf GPS Pro, https://bad-elf.com/pages/be-gps-2200-detail/): one to serve as our primary flight track and the other to serve as a backup flight track. We took oblique photographs from a removable side window in the aircraft using a hand-held digital single-lens reflex camera (Nikon D700) with an 80–400 mm zoom lens. Our camera was equipped with a GPS geotagger (di-GPS, Dawn Technology Limited) that embedded GPS metadata in each image. Using the GPS date/time recorded to the image metadata by the geotagger, we extracted the aircraft location for each image from the primary GPS flight track.

To analyze our digital imagery, we used open source geographic information system software (QGIS, https://www.qgis.org/) to view the spatial location of each photograph. In conjunction with the geospatial information, we reviewed all photographs in image management software (ACDSee Pro 10 XE) on high-resolution monitors and selected the best image, or series of images, to be used for counting seals at each haul-out location. We imported each image to be used for counts into a custom map template connected to our survey database. Within each map, we digitized a point on each seal in the image and recorded supplemental information, such as age class and behavioral responses to the aircraft, to each point's attributes. Each digitized point was saved directly into the database. For archival purposes, we exported each map with digitized points as a separate image.

We only designate two age classes of harbor seals (i.e., dependent pups and non-pups) in our image-based counts. Non-pups are composed of adults, juveniles, and weaned young-of-the-year. Pups are defined as maternally-dependent young-of-the-year and are identified as small, typically light-colored seals in close proximity (touching or < 1 body length) to a larger seal that is presumed to be the mother. Pups in Alaska are born primarily in June and July. By September, pups are independent of and spaced farther from their mothers, and they are difficult to distinguish in aerial photographs from juvenile seals born in the previous year. Given this

ambiguity, we classified all counts from the September surveys as non-pups. Counts from the June surveys were classified as either non-pups or pups.

Results

In 2022 and 2023, we conducted 11 aerial surveys in the Clarence Strait region of Southeast Alaska. In 2022, 5 surveys were conducted in the fall from 9 to 13 September, and in 2023, 6 surveys were conducted in the summer from 2 to 8 June. Individual flight times ranged from 1.5 to 3.8 hours per survey for a total of 31.6 hours of flight time, and survey distances ranged from 297 to 820 km for a total of 6,539 km flown (Table 1). In 2022, effort in the Behm Canal Study Area was limited by widespread fog and thick, low cloud layers throughout the survey area. Due to weather, we were only able to conduct one flight with partial survey effort (on 9 September 2022) in NMFS survey unit AD61, which is where the U.S. Navy SEAFAC operation site is also located. In 2023, despite encountering heavy rain during some flights, we were able to conduct multiple surveys in the Behm Canal Study Area, including surveys of NMFS survey unit AD61 on five of the six surveys. Flight tracks and effort for each survey unit are shown in Figure 5 for the surveys in 2022 and Figure 6 for the surveys in 2023.

Table 1. -- Summary of survey effort for aerial surveys of harbor seals in the Clarence Strait region of Southeast Alaska conducted by AFSC during September 2022 and June 2023.

Survey Date	Flight Time (h)	Flight Distance (km)	Number of Photos
09 Sep 2022	2.3	535	92
10 Sep 2022	3.2	680	110
11 Sep 2022	3.8	820	366
12 Sep 2022	3.7	796	249
13 Sep 2022	3.2	665	109
02 Jun 2023	1.5	297	60
03 Jun 2023	2.4	457	128
04 Jun 2023	2.0	454	199
06 Jun 2023	2.3	684	152
07 Jun 2023	3.8	414	366
08 Jun 2023	3.4	737	477
Total	31.6	6,539	2,308

Overall, we took 2,308 photographs of harbor seals (Table 1), and after review, selected 482 images as the best, non-duplicative images to use for counts (e.g., Figs. 7–8). Total daily counts of harbor seals encountered during the surveys ranged from 119 to 2,267 animals (Table 2). In the Behm Canal Study Area, counts for each day and survey unit are summarized in Table 3.

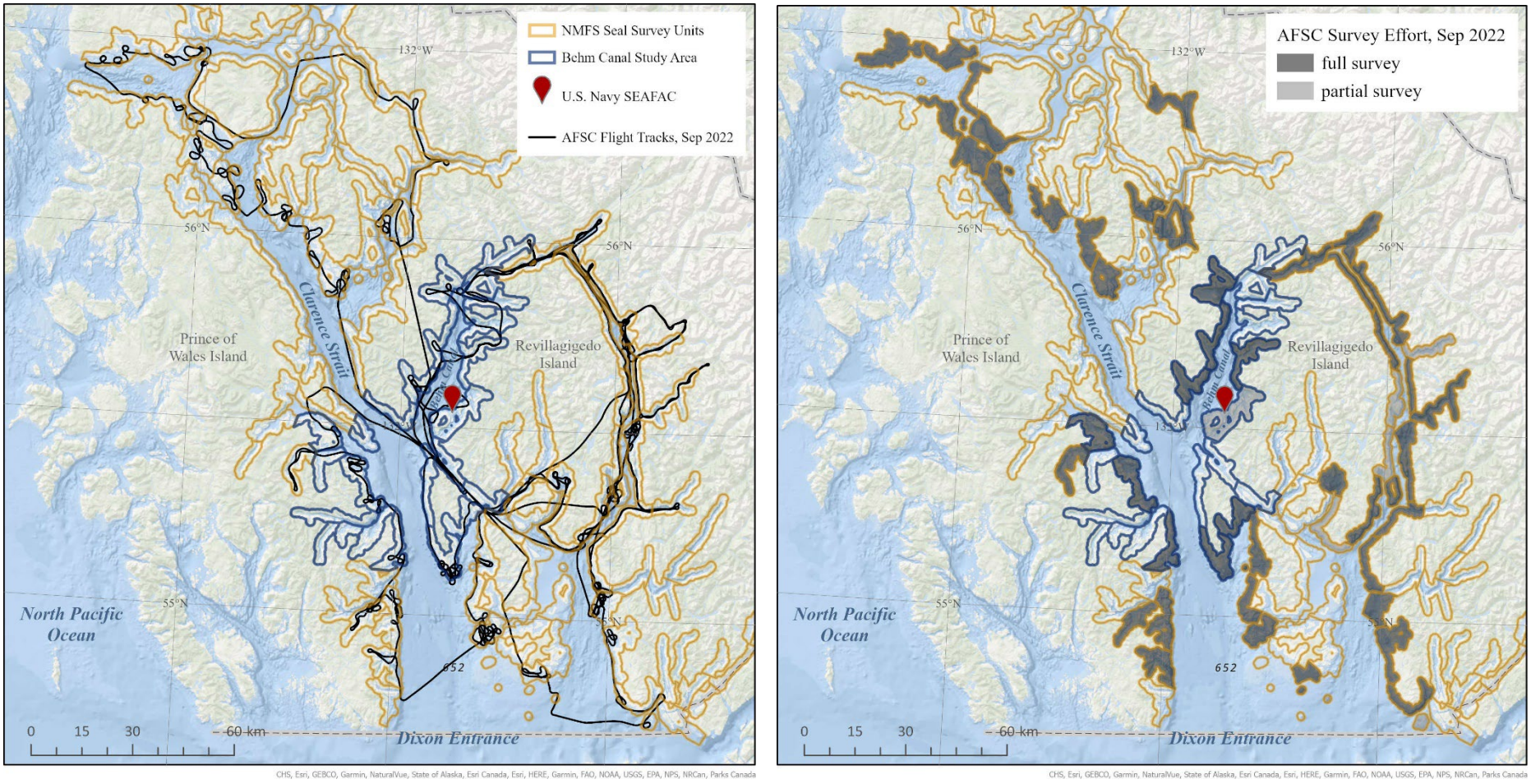

Figure 5. -- Flight tracks (left) and survey effort (right) conducted in the Clarence Strait region of Southeast Alaska, by AFSC during September 2022. The Behm Canal Study Area is outlined in blue.

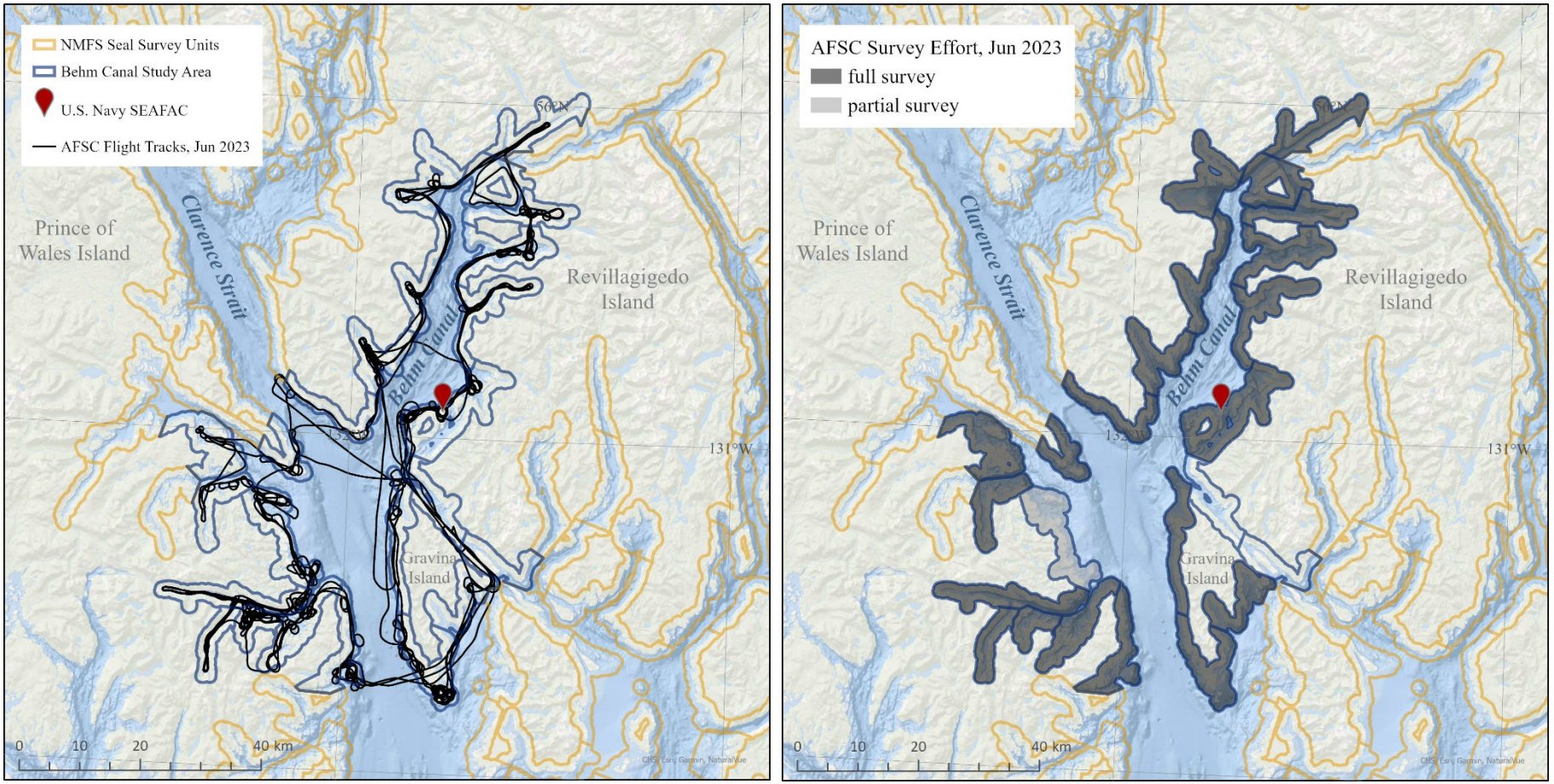

Figure 6. -- Flight tracks (left) and survey effort (right) conducted in the Clarence Strait region of Southeast Alaska, by AFSC during June 2023. The Behm Canal Study Area is outlined in blue.

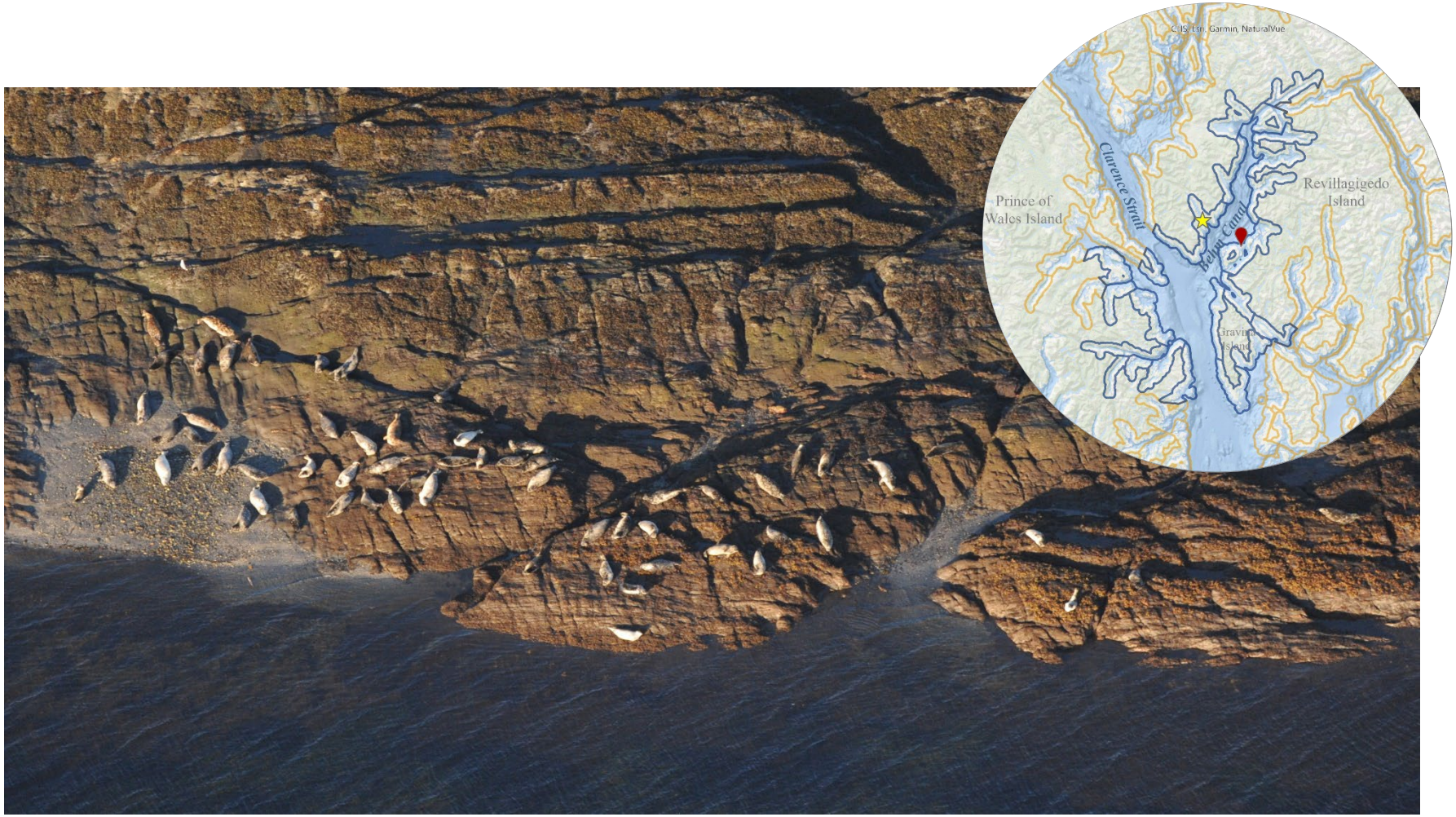

Figure 7. -- Harbor seals hauled out in Behm Canal, Alaska (55°36” N 131°56” W; yellow star location on map inset) on 10 September 2022. Red marker on the inset map indicates location of the U.S. Navy SEAFAC operational site. Photo taken under NMFS Permit No. 23858.

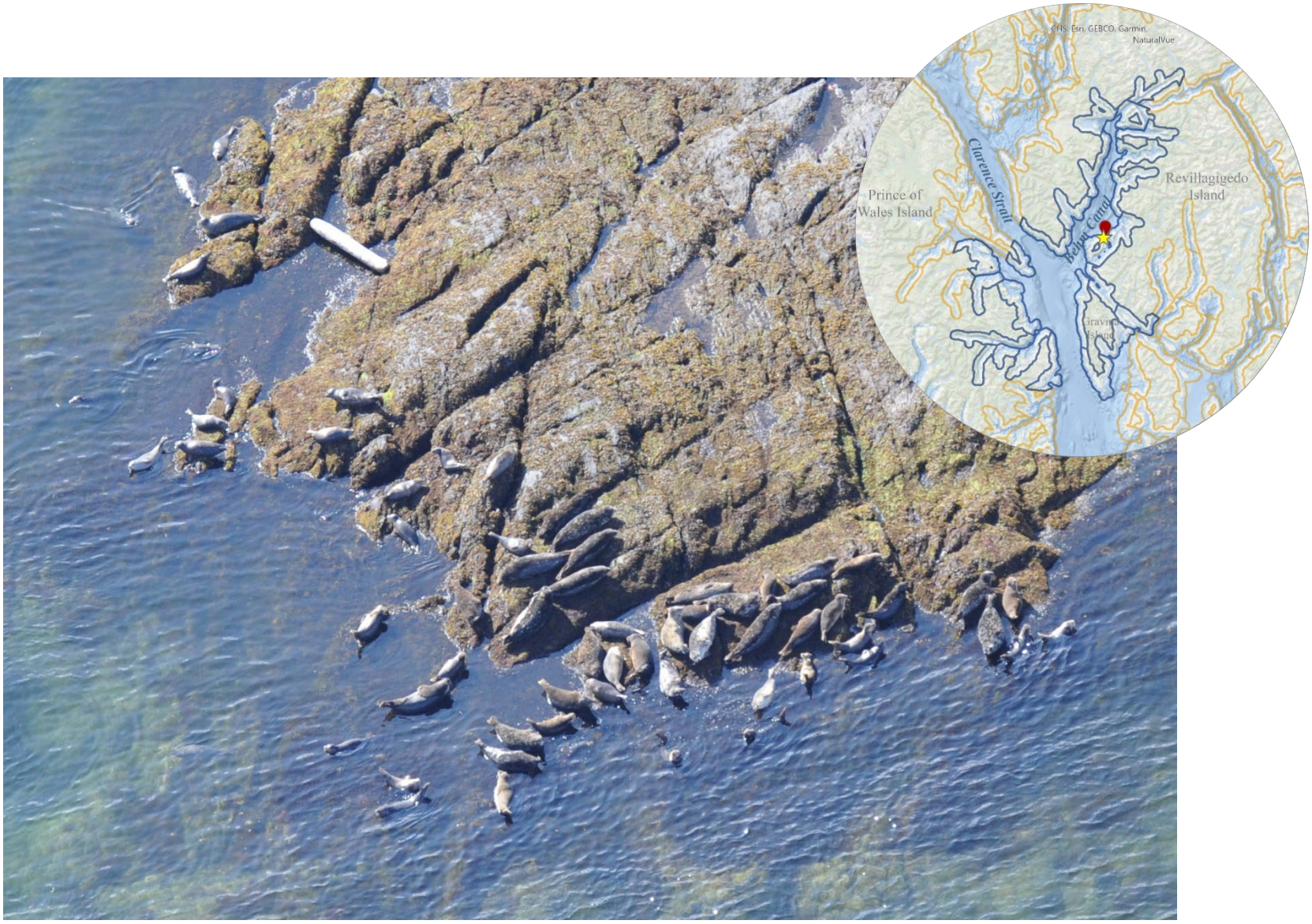

Figure 8. -- Harbor seals hauled out in Behm Canal, Alaska (55°32” N 131°45” W; yellow star location on map inset) on 3 June 2023. Red marker on inset map indicates location of the U.S. Navy SEAFAC operational site. Photo taken under NMFS Permit No. 23858.

Table 2. -- Total daily counts of harbor seals in the Clarence Strait region of Southeast Alaska from aerial surveys conducted by AFSC during September 2022 and June 2023. Aux = auxiliary counts (i.e., counts of harbor seals made during the flight that were not captured in photographs).

Survey Date	Non-Pup	Pup	Aux	Total Count
09 Sep 2022	429	0	0	429
10 Sep 2022	482	0	0	482
11 Sep 2022	2,267	0	0	2,267
12 Sep 2022	1,133	0	0	1,133
13 Sep 2022	579	0	0	579
02 Jun 2023	119	0	0	119
03 Jun 2023	325	16	0	341
04 Jun 2023	299	11	1	311
06 Jun 2023	475	43	0	518
07 Jun 2023	1,301	106	0	1,407
08 Jun 2023	1,325	142	0	1,467

Table 3. -- Counts of harbor seals in the Behm Canal Study Area by date and survey unit from aerial surveys conducted by AFSC during September 2022 and June 2023. Survey units with no seals detected were omitted. Aux = auxiliary counts (i.e., counts of harbor seals made during the flight that were not captured in photographs).

Survey Date	Survey Unit	Non-Pup	Pup	Aux	Total Count
09 Sep 2022	AD62	31	0	0	31
10 Sep 2022	AD62	41	0	0	41
10 Sep 2022	AD68	20	0	0	20
10 Sep 2022	AD69	45	0	0	45
10 Sep 2022	AD70	120	0	0	120
12 Sep 2022	AD57	4	0	0	4
12 Sep 2022	AD58	151	0	0	151
12 Sep 2022	AD79	68	0	0	68
12 Sep 2022	AD81	166	0	0	166
12 Sep 2022	AD86	40	0	0	40
02 Jun 2023	AD57	5	0	0	5
02 Jun 2023	AD58	38	0	0	38
02 Jun 2023	AD59	20	0	0	20
02 Jun 2023	AD61	56	0	0	56
03 Jun 2023	AD57	4	0	0	4
03 Jun 2023	AD58	77	0	0	77
03 Jun 2023	AD61	74	0	0	74
03 Jun 2023	AD62	54	8	0	62
03 Jun 2023	AD63	49	3	0	52
03 Jun 2023	AD67	26	0	0	26

Survey Date	Survey Unit	Non-Pup	Pup	Aux	Total Count
03 Jun 2023	AD69	20	2	0	22
03 Jun 2023	AD70	21	3	0	24
04 Jun 2023	AD78	25	0	0	25
04 Jun 2023	AD81	123	0	0	123
04 Jun 2023	AD82	15	1	0	16
04 Jun 2023	AD84	46	3	0	49
04 Jun 2023	AD85	26	0	0	26
04 Jun 2023	AD86	64	7	1	72
06 Jun 2023	AD57	16	0	0	16
06 Jun 2023	AD58	111	6	0	117
06 Jun 2023	AD61	49	0	0	49
06 Jun 2023	AD62	94	22	0	116
06 Jun 2023	AD63	74	8	0	82
06 Jun 2023	AD64	20	1	0	21
06 Jun 2023	AD68	31	1	0	32
06 Jun 2023	AD70	63	4	0	67
06 Jun 2023	AD71	17	1	0	18
07 Jun 2023	AD61	80	2	0	82
07 Jun 2023	AD62	123	31	0	154
07 Jun 2023	AD63	77	7	0	84
07 Jun 2023	AD64	18	2	0	20
07 Jun 2023	AD68	47	2	0	49
07 Jun 2023	AD69	36	1	0	37
07 Jun 2023	AD70	89	16	0	105
07 Jun 2023	AD71	13	0	0	13
07 Jun 2023	AD78	62	0	0	62
07 Jun 2023	AD79	115	5	0	120
07 Jun 2023	AD80	167	1	0	168
07 Jun 2023	AD81	196	5	0	201
07 Jun 2023	AD82	32	4	0	36
07 Jun 2023	AD84	129	19	0	148
07 Jun 2023	AD85	44	4	0	48
07 Jun 2023	AD86	73	7	0	80
08 Jun 2023	AD61	57	0	0	57
08 Jun 2023	AD62	103	25	0	128
08 Jun 2023	AD63	120	13	0	133
08 Jun 2023	AD64	13	0	0	13
08 Jun 2023	AD67	30	2	0	32
08 Jun 2023	AD68	44	1	0	45
08 Jun 2023	AD69	34	2	0	36
08 Jun 2023	AD70	89	21	0	110
08 Jun 2023	AD78	17	0	0	17

Survey Date	Survey Unit	Non-Pup	Pup	Aux	Total Count
08 Jun 2023	AD79	96	1	0	97
08 Jun 2023	AD80	105	3	0	108
08 Jun 2023	AD81	255	12	0	267
08 Jun 2023	AD82	69	11	0	80
08 Jun 2023	AD84	98	20	0	118
08 Jun 2023	AD85	69	5	0	74
08 Jun 2023	AD86	126	26	0	152

Harbor seals were distributed throughout the Behm Canal Study Area and its surrounding waters. In regions that were surveyed during September 2022, the highest counts of seals (> 50 animals) occurred near the western entrance of Behm Canal (in survey unit AD70), on the eastern side of Prince of Wales Island (survey units AD79 and AD81), and on the southern side of Gravina Island (survey unit AD58) (Fig. 9). During June 2023, the highest counts of seals occurred near the entrance of Behm Canal and to the northeast along the eastern side of the canal (AD70, AD61–63) as well as the eastern side of Prince of Wales (AD78–82, AD84–86), and the southern side of Gravina Island (AD58) (Fig. 10).

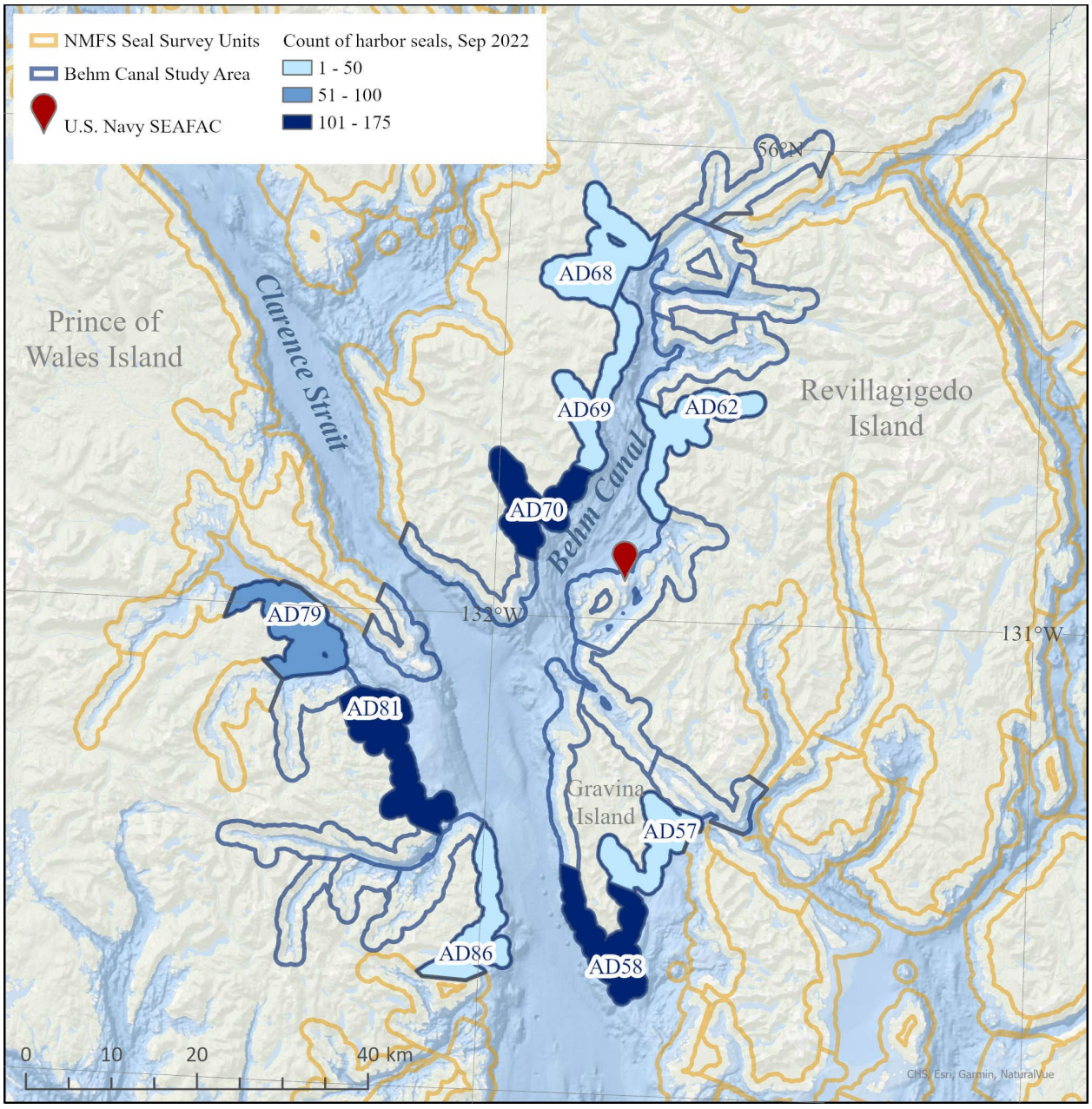

Figure 9. -- Binned counts of harbor seals by survey unit from aerial surveys in the Behm Canal Study Area conducted by AFSC from 9 to 13 September 2022. Survey units are labeled with their corresponding alphanumeric identifiers. Only survey unit AD62 was surveyed on two different days (9 and 10 September 2022); both counts fell within the same count bin.

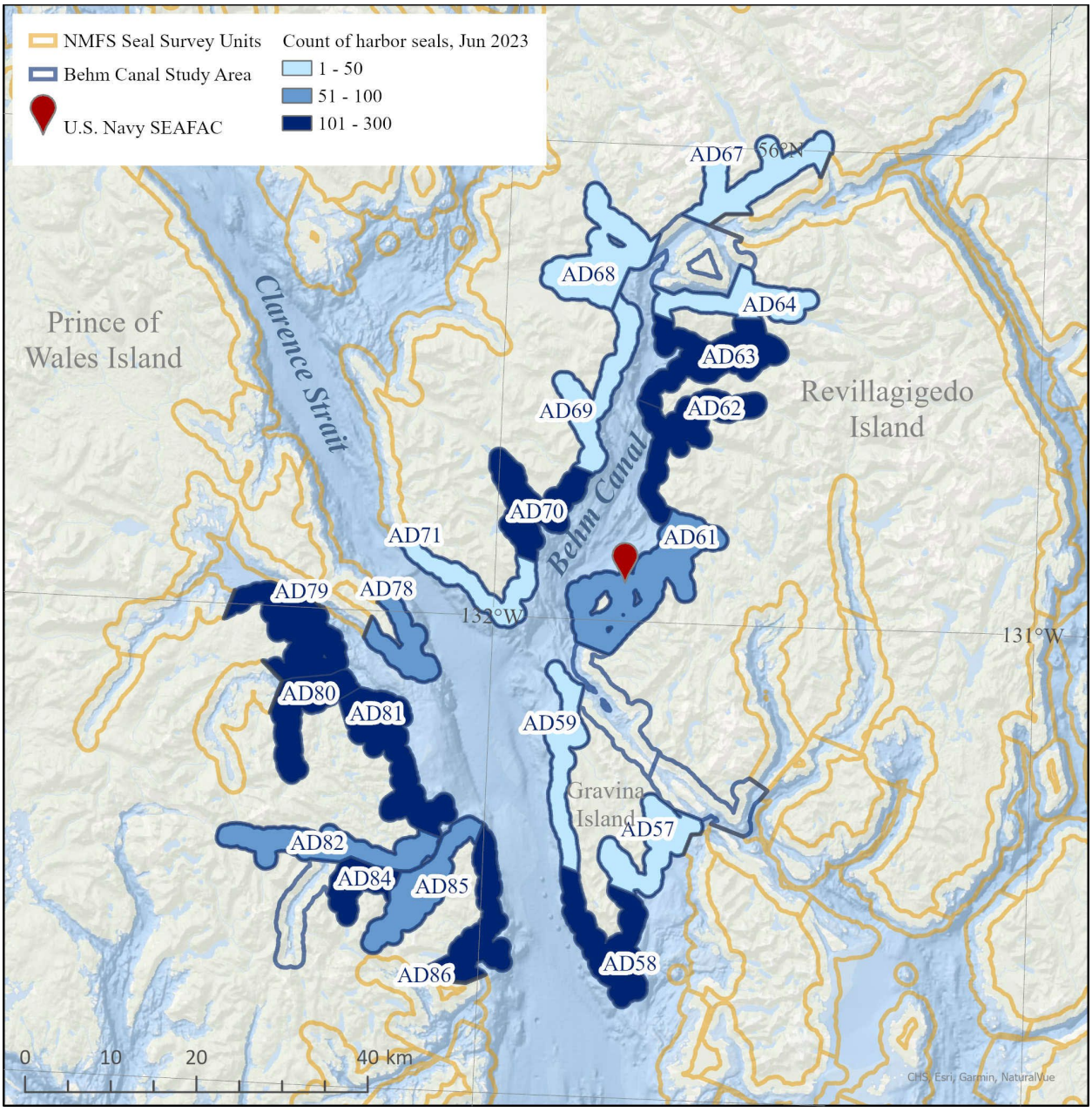

Figure 10. -- Binned counts of harbor seals by survey unit from aerial surveys in the Behm Canal Study Area conducted by AFSC from 2 to 8 June 2023. Survey units are labeled with their corresponding alphanumeric identifiers. Surveys units flown on multiple days show the highest daily count.

Discussion

Overall, we experienced unusually good weather for survey flights staged from Ketchikan, Alaska between 9 and 13 September 2022, and we were able to survey a substantial portion of the Clarence Strait stock. The optimal time for surveys (i.e., 3 hours before and after the lowest low tide) typically started before sunrise and presented challenges when photographing in low ambient light. As the low tide window shifted later each day, we were able to extend the duration of each flight and cover longer distances to survey more harbor seal haul-out sites. Despite the relatively good weather, we continued to encounter low altitude fog in the mornings around the Behm Canal Study Area. While we were able to fly survey units in the study area on multiple days (9, 10, and 12 September), the persistent fog significantly impacted our ability to get coverage of some of the smaller fjords and limited our effort to conduct multiple surveys of the eastern side of the canal on the northwestern side of Revillagigedo Island (including survey unit AD61).

During June 2023, we were able to get better survey coverage in the Behm Canal Study Area. Despite heavy rain at times, we were able to conduct full effort in all survey units except one (AD81). We did not attempt to survey units on the north side of Gravina Island (AD45 and AD60) because of their proximity to the Ketchikan International Airport and other areas of high air traffic. In addition to better coverage, we were able to conduct repeated surveys (i.e., surveys of the same unit on multiple days) for all but one of the survey units in the Behm Canal Study Area. Most of the survey units (82%) had survey coverage on three or more days, including AD61 (the location of the SEAFAC operational site) which was surveyed on five of the six survey days. Repeated surveys are important as counts can vary each day.

Total daily counts of harbor seals in the greater Clarence Strait region in 2022 varied considerably due to the different geographic regions that were surveyed each day. The highest counts occurred on 11 and 12 September, with 2,267 and 1,133 seals, respectively. These were also the longest flights with the most images collected, and were our farthest north (11 September) and south (12 September) surveys from Revillagigedo Island. Only one survey unit (AD62) was surveyed on two different dates. In 2023, the highest daily counts of harbor seals occurred on 7 and 8 June, with 1,407 and 1,467 seals, respectively; these were the longest flights with the most survey coverage throughout the Behm Canal Study Area.

While raw counts by themselves are not complete measures of abundance, they can provide insight into potential trends as our surveys consistently occur during similar months and tidal heights across years (see discussion below regarding the later timing of the surveys in 2022). To evaluate trends in the relative abundance of harbor seals specifically within the Behm Canal Study Area, we compared counts from the five survey units with key haul-out sites (i.e., survey units AD62, AD69, AD70, AD79, and AD86) to counts in those units from previous years. We also compared counts in survey unit AD61, which encompasses the U.S. Navy SEAFAC operational site. In general, most of the counts in these survey units in 2022 and 2023 appear to

show a downward trend (e.g., survey units AD62, AD70, AD79, and AD86 in Fig. 11). While the values compared here are raw counts (i.e., they are not corrected for animals in the water or other environmental factors), they suggest that there may have been fewer seals in survey units with key haul-out sites in 2022 and 2023 than in previous years. However, the relatively few survey units covered makes it difficult to determine whether these observations are indicative of a decrease in abundance of the entire Clarence Strait stock, which requires a full stock assessment analysis.

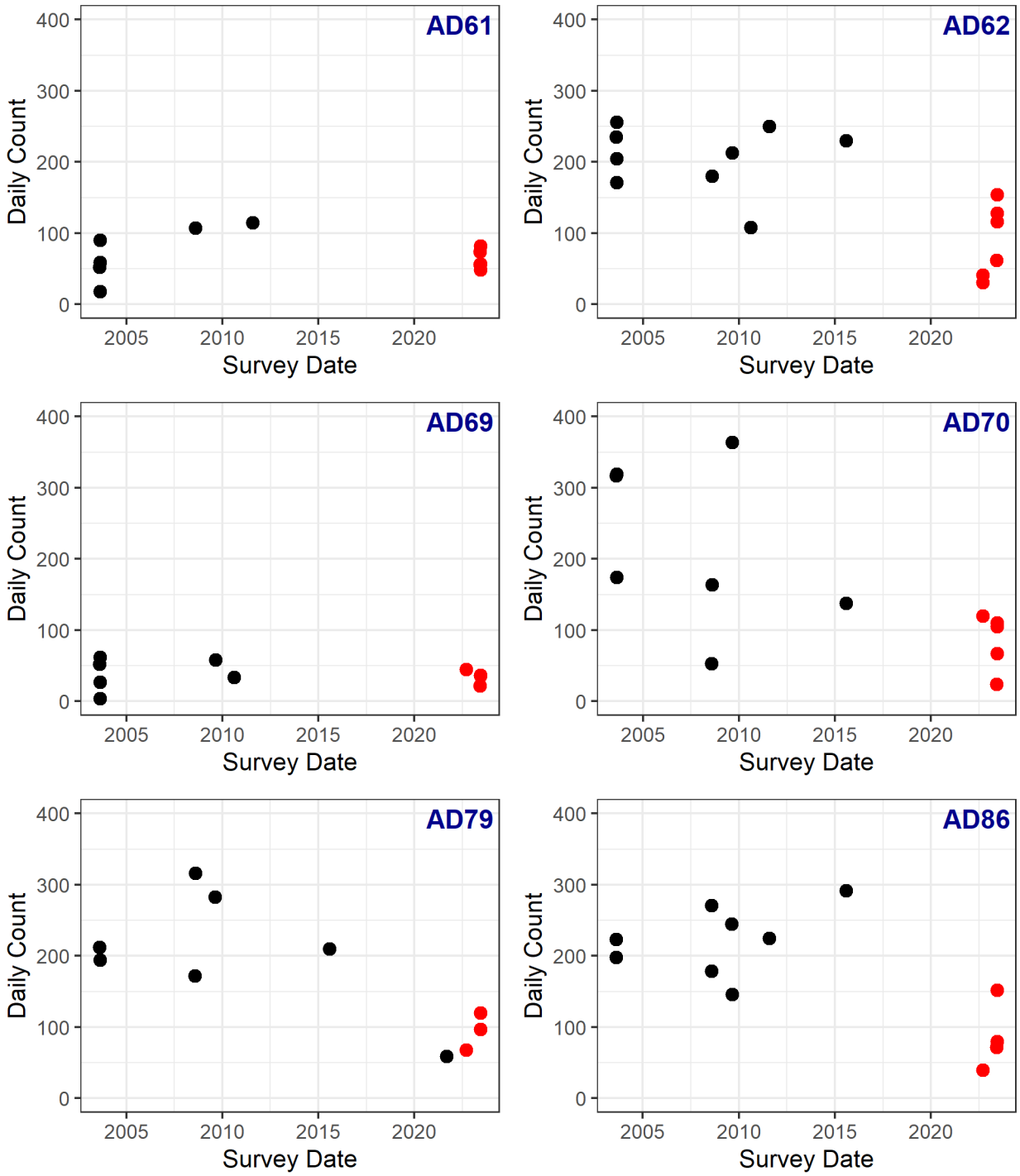

Figure 11. -- Daily counts of harbor seals from aerial surveys conducted from 2003 to 2023 in survey units with key haul-out locations in the Behm Canal Study Area (i.e., survey units AD62, AD69, AD70, AD79, and AD86). Survey unit AD61, which encompasses the U.S. Navy SEAFAC operational site is also shown. Counts from 2022 and 2023 are highlighted in red.

There are a variety of extrinsic factors (i.e., external factors, such as weather, tidal height, time of day, time of year, prey distribution, and human activities) and intrinsic factors (i.e., internal/biological factors, such as reproductive status, timing of molt, age, sex, and body condition) that can influence harbor seal haul-out behavior. In this study, we aimed to fly surveys near low-tide when seals were more likely to be hauled-out of the water. The timing of our 2022 flights in mid-September, occurred just after the typical molting period for harbor seals. It is possible that these fall surveys resulted in lower counts of harbor seals than counts from previous survey seasons that occurred earlier in the summer during pupping and molting. While there is potential to correct for seasonal differences in counts, it would require a significant amount of data collected on a finer scale. During June 2023, which coincides with pupping, our counts were slightly higher than in 2022 for three of the five survey units with key haul-out sites in the Behm Canal Study Area (i.e., survey units AD62, AD79, and AD86). Despite these higher counts, there still appeared to be an overall downward trend.

Aerial surveys of harbor seal haul-out sites throughout Alaska are conducted annually and provide information on trends in abundance. Harbor seal abundance is estimated at the survey unit and stock level and is an important metric that allows monitoring of population trends over time. Abundance estimates also allow us to better understand population dynamics and aid in decision making processes in the context of management and conservation issues. Estimates of average annual harbor seal abundance included in this report are calculated from aerial survey data collected during 1996–2018. We expect to have updated abundance estimates for all harbor seal stocks, including the Clarence Strait stock, by 2024. These updated numbers will be reviewed and published as part of the 2024 Marine Mammal Stock Assessment Reports (SARs).

To obtain current information on trends and abundance, it is important for NOAA to conduct consistent annual surveys of harbor seals in Alaska. This is not always possible due to funding constraints and mission priorities, so the ability to collaborate with other government agencies, such as the U.S. Navy, allows NOAA a unique opportunity to collect data from areas that otherwise may not receive survey effort every year. This also allows NOAA to collect updated counts from important harbor seal habitats that are exposed to a variety of marine activities that may impact harbor seal behavior, such as industrial noise, mariculture, and fishing. Harbor seal abundance combined with information on anthropogenic activity could help measure the extent of these impacts. The main goal and purpose of conducting aerial surveys of harbor seals is to track trends and abundance over time, but it is also important to make this information accessible to other government agencies and stakeholders so that it can be used as a resource for making science-based decisions. Sharing data (e.g., AFSC 2019) and resources among agencies to meet a common goal is important as it promotes positive cross-agency relationships and opportunities for collaboration.

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