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FINAL REPORT

Satellite Tag Tracking and Behavioral Monitoring of Male California Sea lions in the Pacific Northwest to Assess Haul-out Behavior on Puget Sound Navy Facilities and Foraging Behavior in Marine Navy Testing and Training Areas

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14. ABSTRACT

To meet information needs of the US Navy, Pacific Fleet Environmental, the National Marine Fisheries Service, Marine Mammal Laboratory in collaboration with Washington Department of Fish and Wildlife conducted a study of adult male California sea lions (*Zalophus californianus*) with two objectives: 1) to estimate the number of sea lions that use Navy Facilities in Puget Sound, Washington and 2) to describe how adult male sea lions utilize the waters of Washington as marine foraging areas. To accomplish this, weekly counts of sea lions were conducted at four Navy Facilities in Puget Sound, Washington (WA) to estimate abundance and satellite dive recorders were deployed on adult male California sea lions to obtain data on the proportion of time the animals were hauled out and their distribution and diving behavior as they foraged in inland and coastal waters.

To describe distribution, haul out and diving behavior, 30 adult male California sea lions were captured using a floating trap installed outside the port security barrier at Navy Base Kitsap-Bremerton (Bremerton) in December and January in 2014 through 2016 and at Clam Bay near Manchester in February 2016. Captured animals were moved from the trap

into a transport cage and then into a squeeze cage where they were chemically sedated or anesthetized and Satellite Dive Recorders (SDRs) were attached to their dorsal pelage using epoxy glue. The SDRs transmitted "dry time" haul out, location and diving data through the Argos System satellite network.

We recorded locations for 30 animals and haul out and diving for 26 animals over a two year period (Table 1). Instruments attached to animals transmitted data to the satellite for 8 to 184 days before the instruments were lost from the animals. We estimated 59,645 hourly locations for 30 sea lions, and 234,034 dives and 12,786 hours of haul out behavior for 26 animals, representing 67 animal-months of behavior.

From the location data it became apparent that most adult male sea lions were transient visitors to the Navy Facilities in Puget Sound. Ten of 30 animals remained in Puget Sound for up to four months following instrumentation. While they were in Puget Sound, most of the activity was concentrated in the inland waters near the Navy Facilities where they were tagged, however two animals travelled to Hood Canal and used the Navy Kitsap-Bangor Naval Facility (Bangor) for hauling out and the adjacent marine waters for feeding. The majority of the instrumented animals left the vicinity of the Navy Facility where they were tagged within a month after instrumentation. Instrumented animals moved from Puget Sound to two primary destinations: north to the Straits of Georgia and the west coast of Vancouver Island, British Columbia, Canada (8 of 30 animals) or south to the Columbia River (11 of 30 animals). These movements were apparently determined by the presence of locally abundant prey. In British Columbia, the prey were spawning herring and eulachon, and in the Columbia River it was spawning eulachon. From January through March of each year, herring spawn in locally shallow marine and estuarine waters and eulachon spawn in riverine waters in the northwest.

Eleven animals that moved from Puget Sound to the Columbia River passed through the Olympic Coast National Marine Sanctuary (OCNMS) and some hauled out on traditional haul sites within the OCNMS. A total of 19 animals used the outer coast regions producing 7,398 hourly estimated locations. Of these locations, 79% occurred between the coast and the eastern edge of the NWTTA and 21% occurred within the NWTTA. Within the NWTTA, 90% of the locations occurred outside the warning sub-areas or in sub-areas W237A and W237B. There were 4,340 estimated daily locations of 14 instrumented animals that moved through the outer coastal regions, travelling a mean distance of 8.8, 14.0 and 2.0 nm offshore from the coast of Washington, Oregon and California, respectively. The maximum distances from the coast ranged from 24 to 78 nm offshore. All instrumented animals had lost their satellite tags by late May of each year with the exception of one animal that continued to be tracked to Santa Barbara Island in the California Channel Islands where it remained for the breeding season in June and July, after which it returned to Washington where it lost its tag on Bodeltah Island on the northern Washington coast in late August.

We recorded 234,034 dives greater than 4 m by 26 animals in all geographic regions during this study . The majority of dives (117,509) occurred in the WA Inland Waters. Most of the diving in the WA Inland Waters was less than 20 m, but some dives were greater than 250 m. Dives were mostly less than 4 min in duration but some longer dives were greater than 10 min. For the 26 animals, the mean dive depth was 19.9 m in 2014-2015 (year 1) and 46.1 m in 2015-2016 (year 2). The mean duration of dives was 2.7 and 3.4 min in year 1 and 2, respectively, and the maximum duration of dives was greater than 19 minutes. Maximum depth recorded for dives in the WA Inland Waters region was 348 m. There was an apparent difference in diving behavior in the WA Inland Waters region observed between the two years animals were instrumented, with deeper and longer dives occurring during the second year. The deeper diving in 2015-2016 was apparently associated with animals foraging on demersal fish in the deep water areas of Puget Sound, Hood Canal and the Straits of Juan de Fuca. In other regions, mean dive depths were similar to the WA Inland Waters but maximum depths ranged from 146 m to 444 m.

To estimate abundance of animals using the navy facilities and the surrounding areas, we used weekly counts at the facilities and haulout data from satellite telemetry. Census data were collected at the four Navy Facilities in the WA Inland Waters on a weekly basis each month of the year from 2014 through 2016 by the U.S. Navy, Washington Department of Fish and Wildlife and the Marine Mammal Laboratory. A total of 675 daily counts were recorded and used in this study. We assessed the proportion of time that animals were hauled out at Navy Facilities from the satellite records of dry-timed haulout for 26 animals. Those animals were in the vicinity of Navy Facilities in the WA Inland Waters for an average of 47% of the time in December, and 17%, 18%, 16% and 57% of the time in January, February, March and April, respectively. During the study, the animals hauled-out for 12,786 hours. The proportions of time hauled out when animals were in the vicinity of one of the Navy Facilities averaged from 37% to 48% of the time each month from December through May.

Abundance of sea lions (N) using the Navy Facilities was estimated using $N = n/p$, where n is the average monthly count at each facility and p is the proportion of time animals were hauled out at a Navy Facility during that month. Confidence intervals for the abundance estimate were constructed using a non-parametric bootstrap with 1,000

replicates. We then used the 5th smallest value and 995th largest value to provide a 99% confidence interval. Although very conservative, the selection of the largest value of the 99% confidence interval represents a maximum estimate of the number of animals using the Navy Facilities. Abundance at all of the facilities is highest in October and November, followed by March and April. Abundance is near zero in June and July. The highest abundance by facility occurred at Bremerton in November (257), Everett in October (222), Bangor in November (171) and Manchester in December (156). The estimate of abundance of sea lions using all four Navy Facilities in the inland waters of Washington was 788 (99% CI: 534-1186). The upper 99% confidence interval of 1186 animals provides a risk-averse estimate of the number of sea lions potentially affected by Navy activities at any of the Facilities in the inland waters of Washington.

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Summary

To meet information needs of the US Navy, Pacific Fleet Environmental, the National Marine Fisheries Service, Marine Mammal Laboratory in collaboration with Washington Department of Fish and Wildlife conducted a study of adult male California sea lions (*Zalophus californianus*) with two objectives: 1) to estimate the number of sea lions that use Navy Facilities in Puget Sound, Washington and 2) to describe how adult male sea lions utilize the waters of Washington as marine foraging areas. To accomplish this, weekly counts of sea lions were conducted at four Navy Facilities in Puget Sound, Washington (WA) to estimate abundance and satellite dive recorders were deployed on adult male California sea lions to obtain data on the proportion of time the animals were hauled out and their distribution and diving behavior as they foraged in inland and coastal waters.

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INTRODUCTION

The US Navy, Pacific Fleet Environmental entered into an interagency agreement with the National Marine Fisheries Service, Alaska Fisheries Science Center, National Marine Mammal Laboratory to assess how many California sea lions use Navy Facilities in Puget Sound, Washington and how sea lions utilize marine waters of Washington as foraging areas.

There are significant scientific data gaps in location of local foraging areas and percentage of time that California sea lions spend hauled out on or near Puget Sound naval facilities. Data collected from this project will contribute to the Navy's future Phase III marine mammal density modeling for training and testing activities at-sea, and within Puget Sound. Data collected in this project will also assist the Navy and NMFS in understanding abundance, movements and foraging behavior of pinnipeds in inland waters of Washington and provide reliable estimates of pinniped abundance for the NMFS Office of Protected Resources for permitting of Navy Activities under the Marine Mammal Protection Act (MMPA). In particular, integration of improved haulout percentages will lower over-predictive modeled takes which currently, due to lack of regional data, assume all pinniped species are always in-water for purposes of model assessment of takes.

The United States Navy (USN) and (NMFS) require estimates of numbers of California sea lions and Steller sea lions that haul out on structures and assets at of adjacent to Navy facilities at Bangor, Manchester, Bremerton, and Everett, Washington for permits under the Marine Mammal Protection Act (MMPA) through the Letter of Authorization process. The Navy also needs information on regional marine habitat usage by pinnipeds that relate to Navy training, testing and pile driving activities. The goal of this study was to describe the hauling behavior, proportion of time hauled out on Navy facilities and regional marine habitat usage by California sea lions relative to Navy activities. The first goal is to estimate the proportion of time that sea lions spend hauled out on Port Security Barriers in order to estimate the total number of animals using the Navy Facilities. The second goal is to describe how male California sea lions use the inland marine waters of Washington.

Censuses of sea lions were conducted at each of four bases on a weekly basis by biologists from the Navy, Washington Department of Fish and Wildlife and the National Marine Mammal Laboratory. Animals were instrumented with satellite tags to document when animals were in the water or hauled out as well as their movements and foraging behavior. The project was designed to provide a correction factor that was then applied to counts of California sea lions hauled-out to estimate the total number of animals using the Navy facility, provide monthly proportion of animals in the water and describe regional marine foraging habitats and animal foraging behavior.

Background

California sea lion (*Zalophus californianus*) males typically occupy inland and coastal waters of Washington State for up to 10 months of each year except during pupping and breeding season (May –July) when they return to rookery islands in Southern California. Adult females and juvenile animals are rarely found in Washington waters.

Male California sea lions utilize floating structures such as navigation buoys, floats and piers throughout marine waters in inland Washington waters for haulouts. They also haul out on port security barriers (PSBs) at three US Navy facilities (Bangor, Bremerton, Everett) and on floating structures at Manchester adjacent to the Manchester Navy facility. In addition at Bangor animals haul out on the surface of moored submarines. Animals spend some portion of time hauled out for resting and the remaining time in the water traveling and foraging. Individual animals tend to travel throughout the inland waters of Washington and southern British Columbia in pursuit of seasonally abundant prey such as salmon, squid, herring, eulachon and hake that aggregate for spawning. It has been recognized that California sea lions enter inland waters of Washington in August and build to seasonal high numbers in December and then become less abundant from January through March when numbers again peak in April before they depart in May for the spring migration to the breeding rookeries in Southern

California. Most of these seasonal movements appear to be in response to changes in prey abundance that occur through the autumn and winter. Four salmon species spawn in autumn and are abundant in marine waters from August through November. Squid form large aggregations in areas throughout Puget Sound in advance of spawning that occurs in January. In January and February eulachon begin spawning runs in the Frazer River in southern British Columbia and in the Columbia River in southern Washington. Herring begin spawning in March in both the Straits of Georgia and other areas of British Columbia and in various areas of Puget Sound. Finally, hake form spawning aggregations in inland waters of Washington and British Columbia between January and April. All of these prey aggregations provide seasonal attraction to California sea lions and largely determine their movements in the inland waters of Washington during autumn and winter months.

The number of California sea lions hauling out at each of the Navy facilities varies seasonally in response to local prey availability and the proportion of time that individual animals spend hauled out is unknown. To assess the total abundance of animals utilizing these facilities it is necessary to adjust sea lion counts by the proportion of time that individual animals spend hauled out. The proportion can be used to create a correction factor for count data of sea lions hauled out to yield a population estimate with an associated variance estimate.

METHODS

Census of Sea Lions

The Navy has conducted counts of California sea lions and Steller Sea Lions Navy Base Kitsap Bangor and Bremerton, the Navy Fuel Depot at Manchester and at Navy Base Everett on a weekly or monthly basis over the past decade. California sea lions are found at each of the Navy facilities and Steller Sea lions occur only at Bangor and Manchester. During the course of this study from late 2014 through June 2016 Washington Department of Fish and Wildlife conducted counts of hauled-out sea lions at Bremerton and Manchester and MML conducted counts at Everett. Count data presented in this report are a combination of counts conducted by each of the three agencies from 2014 through June 2016.

Steller sea lion (*Eumetopias jubatus*) males occupy inland waters of Washington State for up to 8 months of each year except during pupping and breeding season (May-August) when they return to rookery islands in British Columbia, the outer coasts of Washington, Oregon and California. They tend to return to Puget Sound in early October and depart by the end of May. They haul out at Bangor and a second group hauls out on floating structures adjacent to the Manchester Navy Fuel Depot. Steller sea lions have not been reported using the port security barriers at Bremerton or Everett. No efforts were made to capture or instrument Steller sea lions in this study. Counts of Steller sea lions are described in Appendix 1.

Animal Capture

Floats that serve as the base of sea lion traps were manufactured by Marine Floats, Tacoma, Washington. The floats were deployed at Naval Stations Bremerton and Everett in 2014 with the intention of installing capture traps on the floats once sea lions began using the floats. Although we had success in capturing sea lions on a similar floating trap at Everett in the mid 2000's we were not successful in getting animals to haul out on the float deployed at Everett after more than a year of effort. There was sufficient hauling area on the Everett port security barrier floats which the animals appeared to prefer over the 16' square float that we placed there. The float was removed from Naval Station Everett in 2015. Adult male California sea lions began utilizing the float that was anchored near the port security barrier at Bremerton in October 2014 within two weeks of installation (Figure 1). We installed the trap walls and doors on the Bremerton float in November 2014 and began to monitor animal use of the trap. In November and early December the trap was filled to capacity daily (Figure 1), but the sea lions were in heavy molt and could not be instrumented as the old, molting pelage to which the tags are glued would not hold a satellite tag. In Mid-December 2014 after the molt was completed, we began capture of animals for satellite tagging. In the early morning the trap was approached by a small boat, two people jumped into the large trap door, forcing the animals to the back of the trap and lowering the large trap door.

Animal Handling

A capture barge with a transfer cage and squeeze cage was secured to the rear of the trap with the transfer cage located near a small trap door in the rear wall of the sea lion trap. Two sea lions were then moved through the trap door, into the transfer cage. A single animal was then moved from the transfer cage into the squeeze cage where it was readied for handling.

Animal marking and Satellite tag attachment

All animals were marked and sampled while in the squeeze cage. In addition to the physical restraint provided by the squeeze cage, all animals received sedatives, either midazolam or a combination of midazolam and butorphanol at appropriate dosages administered intramuscularly by an attending veterinarian. In 2014 and early 2015 satellite tags were attached to 16 animals with just sedation. In December 2015 and February 2016 satellite tags were attached to 14 animals that were sedated but were also under isoflurane gas anesthesia. The anesthesia added an additional level of restraint and enhanced efficiency in satellite tag attachment. Satellite tags were attached to the dorsal surface pelage of sea lions using Devcon 5 minute epoxy (Figure 2). Each animal was also marked with white flipper tags on both front flipper.

The satellite tags were encased in foam to provide floatation once they were off the animals. Tags were labeled with return information so that when found by members of the public we could be notified of their discovery and arrangements could be made for their return.

Instrumentation

We instrumented 30 California sea lion adult and subadult males at Bremerton in December/January 2014/2015 (n=16) and December 2015 (n=6) and at Machester adjacent to the Naval Fuel Depot in February 2016 (n=8). In both years, animals were instrumented with Mk10 Satellite-linked Depth Recorders (SDRs; Wildlife Computers, Redmond, WA). The SDRs collected location, haulout and dive data and transmitted the data to satellites at pre-programmed intervals. The start of each record was the deployment date and time. The end of the record was determined by a cessation of movement in the locations, a termination of diving. The instrument was known to be on shore when there was uninterrupted haulout time (Table 1).

Haulout Data

The SDRs were programmed to collect haulout data every hour. The data were summarized in hourly histograms as the percent time the animal was hauled out in each hour at 1% resolution. The haulout time began when the instrument was dry for five consecutive minutes and ended when the instrument was wet for 50 seconds or longer.

The haulout record began the first full day after deployment and was terminated when the instrument was no longer tracking the animal because it fell off the animal. In most cases the end of the record was easily identified because the instrument stayed in the hauled out status and did not move. In 2016, a software malfunction resulted in no haulout data being collected after 29 February 2016 for any of the animals. The leap year issue was not accounted for in the operating program of the SDR and when the number of days in February exceeded 28 the instrument stopped collecting dive and haulout data.

The SDRs were pre-programmed to sample at 45 second intervals when the animals were at sea and 90 second intervals when the animals were hauled out. The SDRs were user-programmed to collect and transmit data 24 hours each day, however because satellite coverage is based on polar orbiting satellites, data were not obtained continuously but only when the satellites passed over the animals.

Satellite Data

The data transmitted to satellites were summarized by CLS America processing center (CLS America, Landover, Maryland, USA). Locations are estimated using the Doppler shift between consecutive locations and the location of the receiving satellite to estimate the location of an animal at a point in time. A quality is assigned to the location based on the estimated accuracy

of the location relative to the true position of the animal. The potential error of a location is between 150 m and 1000 m for good to poor locations, respectively.

The SDRs were programmed to collect and transmit data 24 hours each day, however because satellite coverage is based on polar orbiting satellites, data were not obtained continuously but only when the satellites passed over the animals. In addition, each satellite location had a quality associated with it that represented the estimated error for the location. We identified six geographic regions for the analysis of the satellite data: Washington Inland Waters (WA Inland Waters), Canada, Columbia River, Washington Outer coast (WA Outer Coast), Oregon Outer Coast (OR Outer Coast) and California Outer Coast (CA Outer coast) (Figure 3). We also analyzed subsets of the data in the Olympic Coast National Marine Sanctuary (OCNMS) (Figure 4) and for the Navy Northwest Training and Testing Offshore Area (NWTTA) and Warning Areas (Figure 5).

Location Data

We used the R program CRAWL to process the data obtained from the SDRs. This program uses a continuous-time correlated random walk (CTCRW) model in a state-space model framework to estimate animal movement while simultaneously accounting for error in the location transmitted from the satellite (Johnson, D., J. London, MA. Lea and J. Durban 2008. Continuous-time reandom walk model for animal telemetry data. Ecology 89:1208-1215). The continuous-time formulation allows data that have been non-uniformly collected over time (*e.g.*, satellite data that only is collected during satellite passes) to be modeled without subsampling, interpolation, or aggregation to obtain a set of locations uniformly spaced in time (Johnson et al. 2008). Our models standardized the locations in time, estimated locations at hourly intervals when locations were not obtained, and accounted for error in the location estimates.

Dive data

The amount of data that can be transmitted to a satellite on a given pass is limited to the time the satellite is overhead and the time the instrument is exposed in a dry state so that the signal can be transmitted and received. When the animal is underwater, data are collected and stored but no signals are transmitted or received by the satellite; when the animal breaks the surface or when it is hauled out, the data are transmitted in blocks. Sea lions dive frequently and generate too much data for every dive to be transmitted successfully in the limited time satellite messages can be sent. Consequently, we subsampled every 10^{th} dive resulting in transmission of about 12 dives per hour. We were interested in feeding dives and we defined them as dives greater than 4 m and longer than 10 seconds.

Diving Behavior

SDRs collected dive data based on user-programmed protocols that were determined before deployment. SDRs summarized dive depth and dive duration data over four, 6-hour periods each day and transmitted the data to satellites. Events when the instrument was submerged less than 4 m were not logged as dives. The maximum dive depth that could be measured was 1000 m. From the sub-sampled dive data, 17 depth bins were created. For each dive, the duration of the dive was recorded. The first dive depth bin represents dives between 4 m and 10 m and the last bin represents dives between 400 m and 1000 m. The upper limits of the remaining 12 bins were: 20, 30, 40, 50, ,60,70, 80,90, 100, 150, 200, 250, 300, 350,, 400 and 400 m. SDRs summarized the dive duration data over 6-hour periods and transmitted the data to satellites. Dive duration data were summarized over the same 6 hour periods. Dive durations were binned in minute blocks (0-1, 1-2 ……9-10 and > 10 minutes). A mean proportion for each of the dive depth and dive duration bins was calculated.

Sea Lion Abundance

A total of 736 counts were conducted at the four Navy bases from 2014-2016. Multiple counts within a day at a base were replaced by an average count for the day, resulting in 675 daily counts that were used in the analysis. For each month, a monthly average of the daily counts was computed (Table 3). An average of the sum of the Dec-March monthly averages for all 4 bases was computed for an average of the number of sea lions occupying all of the bases during the winter period (*n*) to be used to estimate abundance with the satellite data. Satellite transmitters were placed on twenty-six sea lions from Dec-Feb during 2015-2016. Both location and percent dry (i.e. sea lion hauled out) were predicted from measured values for each hour that the transmitter was active. The proportion of time dry (Table 2) and the proportion of time the animals was in the vicinity of one of the 4 Navy bases were used to estimate the proportion of time a seal was dry at one of the 4 Navy bases (*p*) and thus could be counted. The average *p* was computed by averaging across sea lions for the months Dec-March:

$$p = \frac{\sum_{i=1}^{26} \frac{\sum_{j}^{h_i} v_{ij} d_{ij}}{h_i}}{26}$$

where h_i is the number of hours the transmitter was active during Dec-March for the ith sea lion, v_{ij} is 1 if the ith sea lion was in the vicinity of one of the Navy bases for the jth hour and 0 otherwise, and d_{ij} is proportion of time the ith sea lion was dry during the jth hour. Abundance of sea lions (*N*) using the Navy bases was estimated with the standard estimator of $N = n/p$. Because transmitters were only on the sea lions for a limited time and only applied at 2 bases we chose to estimate the number of sea lions at a base in a month using the count data which

was available for all months and all bases. We assumed that all of the sea lions that used the bases were in the vicinity of the bases during November when the peak count occurred and sea lions were most likely hauled out during the molt. For the other months we used the average count in that month across all 4 bases divided by the count of all 4 bases in November as an estimate of the proportion of sea lions using the bases in that month (p_m^*). The number of sea lions using bases in that month was estimated as p_m^* . Likewise the number of sea lions at a particular base in a month was apportioned by the proportion of the average monthly count at each base.

Confidence intervals for the estimates were constructed using a non-parametric bootstrap. The daily counts within each month at a base were resampled with replacement. Also, we re-sampled with replacement from the 26 sea lions with transmitters. For each of the 1000 bootstrap replicates, we computed the total abundance and the estimated abundance by base within the month. We then used the 5th smallest value and 995th largest value to provide a 99% confidence interval.

RESULTS

Sea Lion Presence and abundance at Navy Facilities

Weekly censuses of California sea lions conducted by Navy personnel, Washington Department of Fish and Wildlife and Marine Mammal Laboratory are combined here to obtain average monthly abundance of at all four Navy facilities: Naval Stations Kitsap-Bangor, Naval Station Kitsap-Bremerton, Clam Bay, adjacent to Manchester Navy Fuel Depot and Naval Station Everett. The counts are of animals hauling out on the port security barriers and in addition at Bangor animals were counted that were hauled out on Navy assets. The highest counts for each month illustrate distinct patterns of California sea lion seasonal abundance that are common to all of the Navy Facilities in Puget Sound illustrated in Figure 6. In general, following the near absence of California sea lions in Puget Sound during the summer breeding season, animal abundance begins to increase in August as animals begin arriving back in NW waters. Then abundance of hauled out animals reaches a peak in November and begins decreasing in December and January at all three facilities. Late winter (February-March) abundance is approximately one third that of the maximum abundance from the previous November. This is a reflection of movement of animals out of Puget Sound into British Columbia and to the Washington Coast and into the Columbia River. And then abundance tends to increase again in March and April before animals depart in May for the summer breeding season.

Satellite tag deployments

The first tag deployments in mid-December 2014 when 9 tags were attached to adult males; in January 2015 7 tags were deployed on adult males, all at Bremerton. Following the January

deployments the sea lions stopped using the trap at Bremerton and numbers of animals using the Bremerton facility declined dramatically. Although it was our intention to deploy all 30 satellite tags in the first year of the study, the combination of the delayed molt and animal's behavior precluded this possibility. In December 2015 we deployed satellite tags on 6 male sea lions at Bremerton. Then again as in the previous year the sea lions began to leave the Bremerton Facility. In both 2015 and 2016 sea lions that left the Bremerton Facility began hauling out at Clam Bay, Manchester on floats located in the bay adjacent to the Manchester Fuel Depot. In 2015 we moved the Bremerton sea lion trap the 6.5 nautical miles to Manchester and anchored it there but the animals never utilized the trap float. In February 2016 we again moved the Bremerton trap to Manchester and small numbers of sea lions began to utilize the trap float for hauling. On 19 February the remaining 8 satellite tags were deployed on adult male sea lions captured at Manchester. The dates of all 30 tag deployments are in Table 1.

Duration of satellite tag deployments

The measure of duration of deployments of interest is the number of days the tag was known to be attached to an animal. In Table 1 it is listed as the # (number of) Days Active. The average (mean) number of days active was just over 87 days and the range was 8-184 days.

Satellite Tag Data

We recorded locations for 30 animals and haulout and diving for 26 animals over a two year period (Table 1). Instruments attached to animals transmitted data to the satellite for 8 to 184 days before the instruments were lost from the animals. We estimated 59,645 hourly locations for 30 sea lions, and 234,034 dives and 12,786 hours of haulout behavior for 26 animals, representing 67 animal-months of behavior.

We recorded hauling and dive data from 12 of 16 tags deployed in 2014-2015 season. Four tags contained programing errors such hat location data were transmitted to the satellite but no dive or hauling data were transmitted. In the 2015-2016 season all 14 tags contained software errors that cause tags to not transmit dive or hauling data on 29 February (a leap year) or later. They did however transmit location data for the full duration of the deployment.

Abundance estimation

To estimate abundance of animals using the Navy facilities and the surrounding areas, we used counts at the four facilities and haulout data from satellite telemetry. We assessed the proportion of time that animals were hauled out at Navy Facilities from the satellite records of dry-timed haulout for 26 animals. Those animals were in the vicinity of Navy Facilities in the WA Inland Waters for an average of 47% of the time in December, and 17%, 18%, 16% and 57% of the time in January, February, March and April, respectively. During the study, the animals

hauled-out for 12,786 hours. The proportions of time hauled out when animals were in the vicinity of one of the Navy Facilities averaged from 37% to 48% of the time each month from December through May (Table 2).

Census data were collected at the four Navy Facilities in the WA Inland Waters on a weekly basis each month of the year from 2014 through 2016 by the U.S. Navy, Washington Department of Fish and Wildlife and the Marine Mammal Laboratory. A total of 675 daily counts were recorded and used in this study. Abundance of sea lions (N) using the Navy Facilities was estimated using $N = n/p$, where n is the average monthly count at each facility (Table 3) and p is the proportion of time animals were hauled out at a Navy Facility during that month (Table 2). Monthly estimates of the number of California sea lions using Navy Facilities in Puget Sound, Washington are in Table 4.

Confidence intervals for the abundance estimate were constructed using a non-parametric bootstrap with 1,000 replicates. We then used the 5^{th} smallest value and 995^{th} largest value to provide a 99% confidence interval. Although very conservative, the selection of the largest value of the 99% confidence interval represents a maximum estimate of the number of animals using the Navy Facilities. Abundance at all of the facilities is highest in October and November, followed by March and April. Abundance is near zero in June and July. The highest abundance by facility occurred at Bremerton in November (257), Everett in October (222), Bangor in November (171) and Manchester in December (156) (Table 4). The estimate of abundance of sea lions using all four Navy Facilities in the inland waters of Washington was 788 (99% CI: 534-1186).

Location and Movements

From the location data it became apparent that most adult male sea lions were transient visitors to the Navy Facilities in Puget Sound. The distribution of 30 animals is presented as figures grouped by areas in the Appendix for visual inspection. Ten of 30 animals remained in Puget Sound for up to four months following instrumentation. While they were in Puget Sound, most of the activity was concentrated in the inland waters near the Navy Facilities where they were tagged, however two animals travelled to Hood Canal and used the Navy Kitsap-Bangor Naval Facility (Bangor) for hauling out and the adjacent marine waters for feeding (Appendix Figure 1). A kernel density analysis of hourly satellite tag locations clearly shows the high utilization of marine waters of central Puget Sound adjacent to Navy facilities at Bremerton and Manchester where the animals were tagged (Figure 7.) That analysis also shows there was significant foraging activity by animals in the southern and northern parts of Puget Sound.

The majority of the instrumented animals left the vicinity of the Navy Facility where they were tagged within a month after instrumentation. Instrumented animals moved from Puget Sound to two primary destinations: north to the Straits of Georgia and the west coast of Vancouver Island, British Columbia (Appendix Figure 2), Canada (8 of 30 animals) or south to the Columbia River (11 of 30 animals) (Appendix Figure 3).

All 11 animals that moved from Puget Sound to the Columbia River passed through the Olympic Coast National Marine Sanctuary (OCNMS) and some hauled out on traditional haul sites within the OCNMS (Figure 4).

A total of 19 animals used the outer coast regions producing 7,398 hourly estimated locations (Table 5). Of these locations, 79% occurred between the coast and the eastern edge of the NWTTA and 21% occurred within the NWTTA. Within the NWTTA, 90% of the locations occurred outside the warning sub-areas or in sub-areas W237A and W237B (Figure 5).

There were 4,340 estimated daily locations of 14 instrumented animals that moved through the outer coastal regions, travelling a mean distance of 8.8, 14.0 and 2.0 nm offshore from the coast of Washington, Oregon and California, respectively (Table 6). The maximum distances from the coast ranged from 24 to 78 nm offshore (Table 6).

All instrumented animals had lost their satellite tags by late May of each year with the exception of one animal that continued to be tracked to Santa Barbara Island in the California Channel Islands where it remained for the breeding season in June and July, after which it returned to Washington where it lost its tag on Bodeltah Island on the northern Washington coast in late August (Figure 8).

Dive Data and Behavior

We recorded 234,034 dives greater than 4 m by 26 animals in all geographic regions during this study (Table 7). The majority of dives (117,509) occurred while animals were in the WA Inland Waters. Histograms of dive depth and dive duration for each if the 26 individuals in the study are presented in (Appendix Figure 4). There are dive data from 12 animals in year 1 and 14 animals in year 2. The dive depth and duration of all animals are summarized and presented as means (Figure 9 &10). For the 26 animals, the mean dive depth was 19.9 m in 2014-2015 (year 1) and 46.1 m in 2015-2016 (year 2) (Table 8). Maximum dive depths for 7 animals were all less than 100 m deep. Maximum dive depths for the 19 remaining animals ranged from greater than 101 m to 200m (6 animals) and from 201 m to 300 m (11 animals). The mean duration of dives was 2.7 and 3.4 min in year 1 and 2, respectively, and the maximum duration of dives was greater than 19 minutes (Table 8) Dives were mostly less than 4 min in duration but the duration of some of the deep dives were greater than 10 min (Figure 10).

In other regions, mean dive depths were similar to the WA Inland Waters but maximum depths ranged from 146 m to 444 m (Table 8). There was a uniform pattern of deeper diving during year 2 in all geographic areas.

Satellite Tag Recovery

Twenty four of the 30 tags were recovered: 5 from Puget Sound, 5 from British Columbia, 5 from the Washington Coast, 5 from the Columbia River one from the Oregon Coast, and three from the California Coast. Only one tag remained attached to the animal for sufficiently long enough to track his movements south to Santa Barbara Island , in the California Channel Islands where he spent the 2016 summer breeding season and then migrated back north where the tag fell off the animal in late August on Bodeltah Island on the north Washington Coast. Another tag that transmitted for only 54 days with a last satellite transmission on 13 April 2016 from

Puget Sound was recovered from a rocky cove on Southeast Farallon Island in March 2017. That animal had apparently migrated to California for the breeding season and lost its tag while in transit.

DISCUSSION

There is pronounced seasonal variability in California sea lion male abundance at Puget Sound Navy facilities. The highest peak of abundance occurs in autumn and early winter, with low abundance in summer when males depart Puget Sound to return to breeding rookeries in Southern California. These seasonal changes in abundance have been recorded each year from 2012-2016 (Figure 6).

Weekly counts of California sea lion abundance at Navy facilities at Bremerton, Manchester, Bangor and Everett in 2014-2016 were used to estimate abundance at Navy facilities. The proportion of time that California sea lions hauled out when in the proximity of a Navy facility was quite consistent over the months measured ranging from 0.37 to 0.48 (or 37%-48% of the time). The correction factors range from 2.1 to 2.7 as a multiplier of monthly average census values to estimate the total abundance of sea lions using the Puget Sound Navy facilities.

The highest abundance of California sea lions at Puget Sound Navy Facilities was recorded in October for Everett, November for Bremerton and Bangor and December for Manchester (Table 4). The estimate of abundance of sea lions using all four Navy Facilities in the inland waters of Washington was 788 (99% CI: 534-1186). The upper 99% confidence interval of 1186 animals provides a risk-averse estimate of the number of sea lions potentially affected by Navy activities at any of the Facilities in the inland waters of Washington.

Male sea lion presence at Naval Station Kitsap-Bremerton in autumn and early winter appeared to be determined by local spawning of market squid and chum salmon during 2014-2015. The departure of sea lions from Bremerton in December and January apparently corresponded to decreased prey abundance as the local spawning of both squid and chum salmon was completed. In late December of both 2015 and 2016 sea lions began to haul-out on barges that were moored at Manchester approximately 6 mi from Bremerton and immediately adjacent to the Navy Fuel Depot at Manchester. In 2015 we moved the sea lion trap from Bremerton to Manchester but were not successful in having animals haul out on the trap. In February 2016 we again moved the trap to Manchester after animals had stopped using it at Bremerton and animal abundance there declined. At Manchester, between 2015 and 2016 most of the floating structures that sea lions had used in 2015 were removed, leaving a single barge in place at Clam Bay. It was being heavily used by hauling sea lions and probably because of the limited available hauling space sea lions began using the trap as a hauling area shortly after we anchored it at Manchester. This provided an opportunity for us to capture male sea lions and deploy the last group of satellite tags.

Satellite tags could not be attached to the pelage of adult male sea lions that were molting in the autumn through the month of November in both 2014 and 2015. These were later molt dates than had been observed on sea lions in Puget Sound in previous years and likely resulted from oceanographic anomalies –" the blob" in 2014 and 2015 and El Niño in 2015. Both of these oceanographic events resulted in increased sea surface temperatures and shifts in abundance and distribution of sea lions prey.

A cautionary note in looking at dive depth of animals assigned to the Columbia River: it includes dives off the mouth of the Columbia River where a deep-water canyon approaches the shore. Consequently, mean dive depths in year 2 and maximum dive depths for animals in the Columbia River are much greater than the deepest water found within the Columbia River (Table 8).

The distribution of satellite tagged adult male California sea lions in this study is instructive in understanding seasonal changes in abundance at Puget Sound Navy facilities. Only a third of satellite-tagged animals remained in Puget Sound in the months following instrumentation. Two thirds of the instrumented males moved away from Puget Sound to Canada or to the Washington Coast and to the Columbia River. These directional movements away from Puget Sound were in response to abundant prey resources in these locations rather than seasonal migration related to the breeding season. Based on the kernel density analysis males that remained in inland waters of Washington appear to have spent significant amounts of time in southern, central and northern Puget Sound. They also spent significant time in the central Straits of Juan de Fuca adjacent to the hauling site at Race Rocks, British Columbia.

From January through March of each year, herring spawn in locally shallow marine and estuarine waters and eulachon spawn in riverine waters in the northwest. In British Columbia, there were spawning eulachon and herring and in the Columbia River there were spawning eulachon. In general, it can be expected that only about a third of the adult male sea lions present at Puget Sound Navy facilities in during peak abundance in early winter of any year can be expected to remain in Puget Sound during the subsequent several months prior to their undertaking the seasonal migration back to California breeding rookeries.

Dives less than 4 m were not logged as dives. The number of dives for an animal used in the analysis ranged from 824 to 2,4104. In this report, we have used the subsampling of diving obtained from the satellite data to provide a description of diving behavior of animals using Navy facilities within inland waters of Washington and coastal waters of Washington, Oregon and California. There was an apparent difference in diving behavior in the Washington inland waters region observed between the two years animals were instrumented, with deeper and longer dives occurring during the second year (Figure 5). The deeper diving in 2015-2016 in inland waters of Washington was apparently associated with animals foraging on demersal fish in the deep water areas of Puget Sound, Hood Canal and the Straits of Juan de Fuca.

Table 1. Satellite Dive Recorder (SDR) deployments on adult male California sea lions, 2014-2016 near Bremerton and Manchester Navy facilities, Puget Sound, Washington. Number of days active is the number of days the tag was known to be attached to an animal. 'Partial' for haulout data indicates instruments that were affected by a software program error that resulted in a partial record from the deployment date through 28 February 2016. Four instruments in 2015 were programmed to collect location data only.

						Data Available				
Animal ID	Pack #	SDR	Capture date	# Days active	Last position	Location	Haulout	Dive	Recovered	Recover location
ZC2014PSM1	1	141414	12/12/14	86	3/8/15	Yes	Yes	Yes	Yes	Lower Columbia River
ZC2014PSM2	2	141415	12/12/14	103	3/25/15	Yes	Yes	Yes	Yes	Lower Columbia River
ZC2014PSM3	3	141416	12/12/14	72	2/22/15	Yes	Yes	Yes	Yes	Lower Columbia River
ZC2014PSM4	4	141417	12/12/14	52	2/2/15	Yes	Yes	Yes	Yes	Cape Flattery, WA
ZC2014PSM5	5	141418	12/15/14	157	5/21/15	Yes	Yes	Yes	Yes	Lower Columbia River
ZC2014PSM6	6	141419	12/15/14	99	3/24/15	Yes	Yes	Yes	Yes	Nanoos Bay, Canada
ZC2014PSM7	7	141420	12/15/14	58	2/11/15	Yes	Yes	Yes	Yes	Johnston Strait, Canada
ZC2014PSM8	8	141421	12/15/14	56	2/9/15	Yes	Yes	Yes	No	Price Island, Canada
ZC2014PSM9	9	141422	12/15/14	32	1/16/15	Yes	Yes	Yes	Yes	OR Outer Coast
ZC2014PSM10	10	141423	1/2/15	54	2/25/15	Yes	Yes	Yes	No	Aristazabal Island, Canada
ZC2014PSM11	11	141424	1/2/15	47	2/18/15	Yes	Yes	Yes	Yes	Hornsby Island, Canada
ZC2014PSM12	12	141425	1/2/15	94	4/6/15	Yes	No	No	Yes	Bainbridge Island, WA

Table 1 (cont.). Satellite Dive Recorder (SDR) deployments on adult male California sea lions, 2014-2016 near Bremerton and Manchester Navy facilities, Puget Sound, Washington. Number of days active is the number of days the tag was known to be attached to an animal. 'Partial' for haulout data indicates instruments that were affected by a software program error that resulted in a partial record from the deployment date through 28 February 2016. Four instruments in 2015 were programmed to collect location data only.

						Data Available				
Animal ID	Pack #	SDR	Capture date	# Days active	Last position	Location	Haulout	Dive	Recovered	Recover location
ZC2014PSM13	13	141426	1/2/15	66	3/9/15	Yes	No	No	Yes	WA Outer Coast
ZC2014PSM14	14	141427	1/2/15	94	4/6/15	Yes	No	No	Yes	Fort Casey, WA
ZC2014PSM15	15	141428	1/2/15	87	3/30/15	Yes	No	No	No	Bodeltah Island, WA
ZC2014PSM16	16	141429	1/20/15	85	4/15/15	Yes	Yes	Yes	Yes	Pt. No Pt, WA
ZC2014PSM17	17	141430	12/22/15	88	3/19/16	Yes	Partial	Yes	Yes	Grays Harbor Beach, WA
ZC2014PSM18	18	141431	12/22/15	122	4/22/16	Yes	Partial	Yes	Yes	Estavan Point, Canada
ZC2014PSM19	19	141432	12/22/15	89	3/20/16	Yes	Partial	Yes	No	
ZC2014PSM20	20	141433	12/22/15	130	4/30/16	Yes	Partial	Yes	Yes	Lower Columbia River
ZC2014PSM21	21	141434	12/22/15	182	6/21/16	Yes	Partial	Yes	No	
ZC2014PSM22	22	141435	12/22/15	112	4/12/16	Yes	Partial	Yes	Yes	Dyes Inlet, WA
ZC2014PSM23	23	141436	2/19/16	8	2/27/16	Yes	Partial	Yes	No	
ZC2014PSM24	24	141437	2/19/16	54	4/13/16	Yes	Partial	Yes	No	

Table 1 (cont.). Satellite Dive Recorder (SDR) deployments on adult male California sea lions, 2014-2016 near Bremerton and Manchester Navy facilities, Puget Sound, Washington. Number of days active is the number of days the tag was known to be attached to an animal. 'Partial' for haulout data indicates instruments that were affected by a software program error that resulted in a partial record from the deployment date through 28 February 2016. Four instruments in 2015 were programmed to collect location data only.

						Data Available				
Animal ID	Pack #	SDR	Capture date	# Days active	Last position	Location	Haulout	Dive	Recovered	Recover location
ZC2014PSM25	25	141438	2/19/16	184	8/21/16	Yes	Partial	Yes	Yes	Bodeltah Island, WA
ZC2014PSM26	26	141420	2/19/16	62	4/21/16	Yes	Partial	Yes	Yes	TriCities, WA
ZC2014PSM27	27	141422	2/19/16	54	4/13/16	Yes	Partial	Yes	No	
ZC2014PSM28	28	141441	2/19/16	17	3/7/16	Yes	Partial	Yes	No	
ZC2014PSM29	29	141442	2/19/16	110	6/8/16	Yes	Partial	Yes	Yes	Cape Mendocino, CA
ZC2014PSM30	30	141443	2/19/16	42	4/1/16	Yes	Partial	Yes	Yes	San Juan Island, WA

Table 2. Monthly proportion of time dry for adult male California sea lions calculated from satellite telemetry data in 2014, 2015, and 2016. Animals were instrumented in December, January or February near Bremerton or Manchester Naval facilities in Puget Sound, Washington.

	Month					
Animal ID	Dec	Jan	Feb	Mar	Apr	May
ZC2014PSM1	0.4	0.19	0.3	0.4		
ZC2014PSM10		0.4	0.26			
ZC2014PSM11		0.7	0.69			
ZC2014PSM16		0.5	0.51	0.59	0.37	
ZC2014PSM2	0.46	0.53	0.39	0.54		
ZC2014PSM3	0.46	0.36	0.52			
ZC2014PSM4	0.45	0.52				
ZC2014PSM5	0.57	0.41	0.37	0.41	0.42	0.4
ZC2014PSM6	0.25	0.44	0.44	0.46		
ZC2014PSM7	0.6	0.41	0.4			
ZC2014PSM8	0.44	0.53	0.32			
ZC2014PSM9	0.41	0.17				
ZC2015PSM17	0.09	0.29	0.28			
ZC2015PSM18	0.74	0.18	0.33			
ZC2015PSM19	0.86	0.27	0.29			
ZC2015PSM20	0.18	0.19	0.51			
ZC2015PSM21	0.53	0.35	0.41			
ZC2015PSM22	0.53	0.16	0.36			
ZC2015PSM23			0.52			
ZC2015PSM24			0.43			
ZC2015PSM25			0.2			
ZC2015PSM26			0.5			
ZC2015PSM27			0.33			
ZC2015PSM28			0.33			
ZC2015PSM29			0.89			
ZC2015PSM30			0.52			
Average	0.46	0.37	0.42	0.48	0.4	0.4
Std Error	0.05	0.03	0.03	0.03	0.01	0

Table 3. Summary of monthly counts of California sea lions near Navy facilities in Puget Sound, Washington in 2013, 2014, and 2015. Mean count and minimum and maximum values are in parentheses.

	Navy Facility			
Month	Bangor	Bremerton	Everett	Manchester
Jan	22 (1-48)	20 (0-46)	24 (9-64)	53 (21-110)
Feb	24 (8-56)	16 (0-44)	44 (18-71)	30 (0-97)
Mar	56 (15-104)	14 (0-39)	55 (4-113)	28 (0-100)
Apr	41 (12-106)	9 (0-29)	78 (23-215)	47 (0-100)
May	11 (0-39)	4 (0-11)	52 (10-135)	41 (18-90)
June	2 (0-8)	3 (0-10)	4 (0-24)	5 (0-22)
July	1 (0-3)	0 (0-1)	4 (0-17)	0 (0-2)
Aug	6 (0-18)	9 (0-34)	20 (6-38)	1 (0-2)
Sept	25 (6-44)	60 (0-120)	111 (44-488)	10 (0-47)
Oct	64 (13-113)	84 (0-162)	101 (39-132)	41 (0-130)
Nov	78 (5-131)	117 (5-242)	95 (14-132)	69 (25-128)
Dec	55 (18-118)	63 (0-137)	35 (14-62)	71 (26-117)

Table 4. Monthly estimates of the number of California sea lions using Navy facilities in Puget Sound, Washington in 2013, 2014 and 2015. Lower and upper 99% confidence limit in parentheses.

	Navy Facility			
Month	Bangor	Bremerton	Everett	Manchester
Jan	49 (17-87)	45 (22-75)	54 (31-89)	117 (70-187)
Feb	53 (29-96)	35 (17-63)	97 (61-159)	65 (27-131)
Mar	124 (71-208)	31 (15-55)	121 (77-196)	62 (28-112)
Apr	90 (48-164)	20 (10-35)	172 (93-294)	103 (51-177)
May	24 (9-46)	10 (4-18)	114 (62-194)	90 (49-157)
June	4 (0-9)	6 (1-13)	8 (0-23)	11 (0-29)
July	1 (0-4)	0 (0-1)	8 (0-22)	0 (0-2)
Aug	13 (4-26)	19 (5-39)	44 (21-80)	3 (0-6)
Sept	55 (32-90)	131 (72-226)	244 (92-565)	21 (0-62)
Oct	140 (73-238)	184 (85-340)	222 (136-350)	90 (20-209)
Nov	171 (102-278)	257 (142-421)	209 (131-325)	152 (80-251)
Dec	122 (56-220)	138 (75-243)	77 (46-132)	156 (85-260)

Table 5. Proportion of hourly locations of adult California sea lions that occurred in the WA, OR and CA Outer Coast Regions, between the outer coast and the eastern boundary of the Navy offshore Northwest Testing and Training Area (NWTTA), inside the NWTTA, and within sub-regions of the NWTTA. Locations were estimated from satellite telemetry data using a Correlated Random Walk model.

	Number of animals	Number of locations	% of locations
Total Outer Coast	19	7398	
Between Outer Coast and offshore NWTTA	19	5868	79.0
Inside offshore NWTTA	15	1530	21.0
NWTTA Sub-regions			
NWTTA Only	15	696	45.0
W237A	13	378	25.0
W237B	11	296	19.0
W237C	3	57	4.00
W237D	1	18	1.00
W237E	7	80	0.05
W237F	1	5	0.00

Table 6. Mean and maximum distance from the U.S. west coast of adult male California sea lions instrumented near Bremerton or Manchester Navy facilities during winter 2014-2015 and 2015-2016. Distances were calculated for each region from estimated hourly locations from satellite telemetry.

Region	Number of animals	Number of locations	Distance from coast (nm)		
			Mean	SD	Maximum
WA Outer Coast	14	1226	8.8	45.76	55.8
OR Outer Coast	7	1518	14.0	13.87	77.7
CA Outer Coast	3	1596	2.0	4.55	24.2
Total		4340			

Table 7. Proportion of diving activity by region based satellite telemetry data for adult male California sea lions instrumented near Bremerton or Manchester Navy facilities in winter 2014-2015 and 2015-2016.

Region	Number of animals	Number of dives	Mean*	SD
WA Inland Waters	26	117,509	0.53	0.36
Canada	10	44,871	0.54	0.37
Columbia River	15	47,929	0.30	0.29
WA Outer Coast	15	10,810	0.11	0.14
OR Outer Coast	6	3,822	0.06	0.07
CA Outer Coast	2	9,093	0.20	0.28
Total		234,034		

*Mean of 26 individual's dives within each geographic region

Table 8. Summary of diving by region based satellite telemetry data for adult male California sea lions instrumented near Bremerton or Manchester Navy facilities in winter 2014-2015 and 2015-2016. $Range_{max}$ is the range of maximum dive depths or dive durations.

				Depth (m)			Duration (min)		
Year	Region	Number of dives	Number of animals	Mean	SD	$Range_{max}$	Mean	SD	$Range_{max}$
2014-2015	WA Inland Waters	50,230	12	19.9	11.6	70.5-307.5	2.69	0.72	6.48-19.32
	Canada	18,829	6	34.2	16.7	129.5-435.5	2.41	0.45	7.12-11.32
	Columbia River	32,241	6	10.4	2.9	12.5-371.5	1.68	0.41	3.12-11.82
	WA Outer Coast	5,144	7	22.1	22.4	15.5-411.5	2.21	0.61	4.08-11.70
	OR Outer Coast	322	1	16.5		149.50	1.66	0.00	8.82
	CA Outer Coast	---	---	---	---	---	---	---	---
2015-2016	WA Inland Waters	67,279	14	46.1	25.8	53.0-347.5	3.35	1.20	3.75-14.92
	Canada	26,042	4	40.9	21.2	173.5-355.5	2.51	1.60	8.72-12.25
	Columbia River	15,688	9	36.1	68.1	19.0-323.5	2.50	1.74	2.62-8.92
	WA Outer Coast	5,666	8	33.0	25.1	16.0-379.5	2.38	0.75	4.25-11.00
	OR Outer Coast	3,500	5	43.9	47.5	37.0-363.5	2.53	1.32	4.25-10.42
	CA Outer Coast	9,093	2	30.8	30.5	10.5-443.5	1.65	1.22	0.95-9.55

Figure 1. Sea lion trap adjacent to the port security barrier at Naval Station Kitsap Bremerton

Figure 2_ Adult male California sea lion with newly applied satellite tag hauled out on the Port Security Barrier at Naval Base Kitsap Bremerton. The animal is also branded with a rump brand applied in the Columbia River.

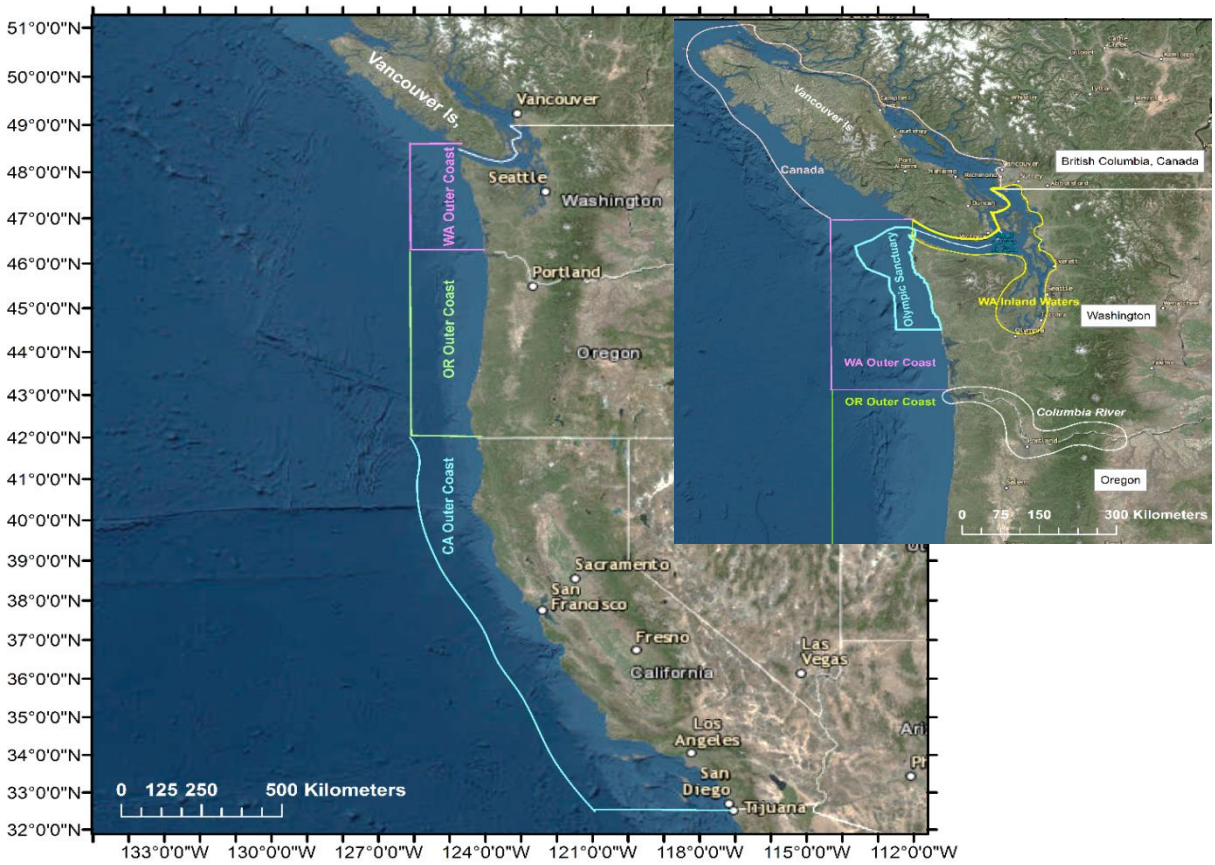


Figure 3. Geographic regions used in analysis of satellite telemetry data collected from adult male California sea lions.

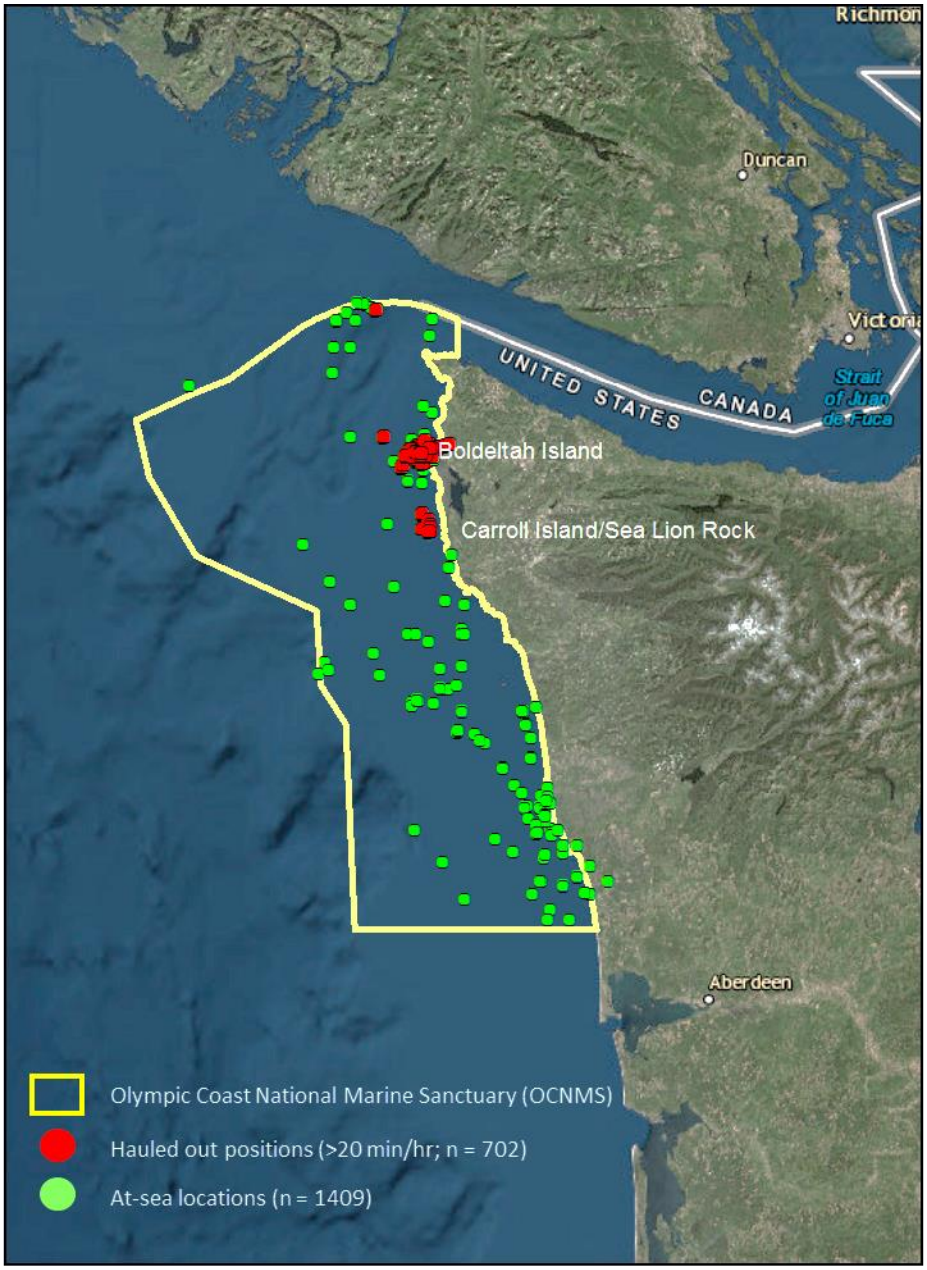


Figure 4 Estimated hourly haulout and at-sea locations for adult male California sea lions using the Olympic National Marine Sanctuary.

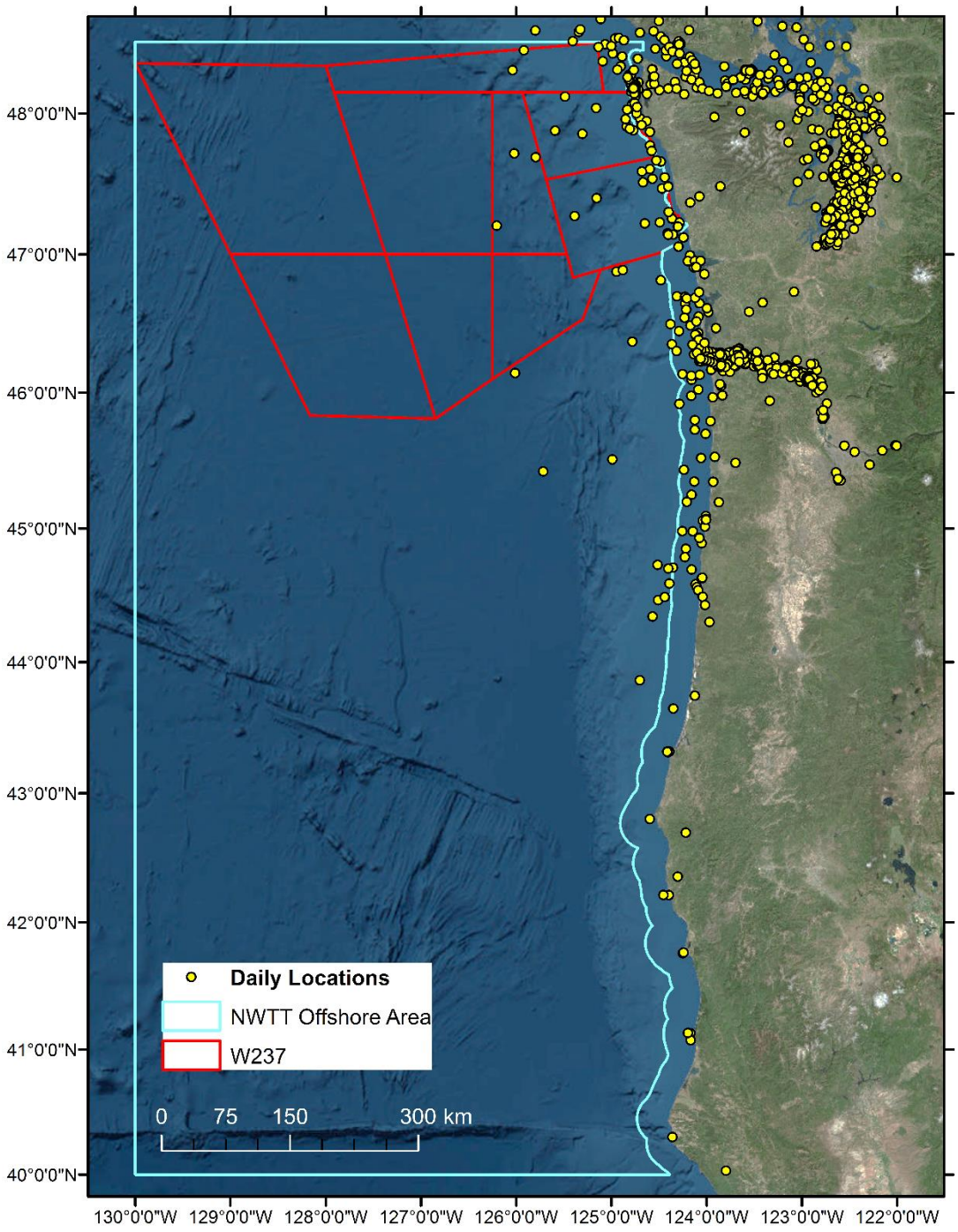


Figure 5. Estimated daily locations of adult male California sea lion males occurring within the Northwest Training and Testing Offshore Area (NWTT Offshore Area) and W237 Warning Area (W237).

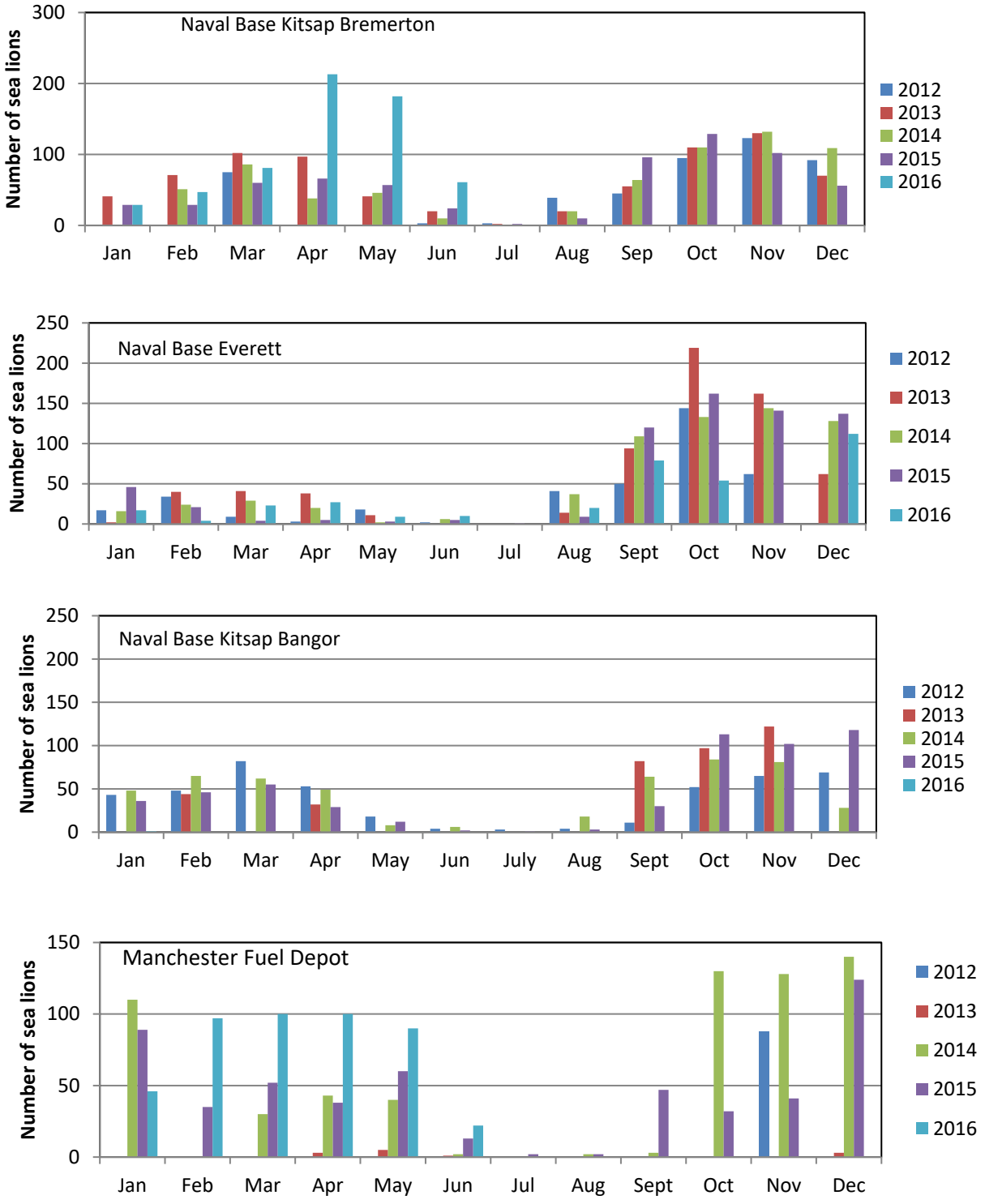


Figure 6 . Highest single monthly counts of California sea lions at Naval Base Kitsap Bremerton, Naval Base Everett and Naval Base Kitsap-Bangor, Washington 2010 – 2015.

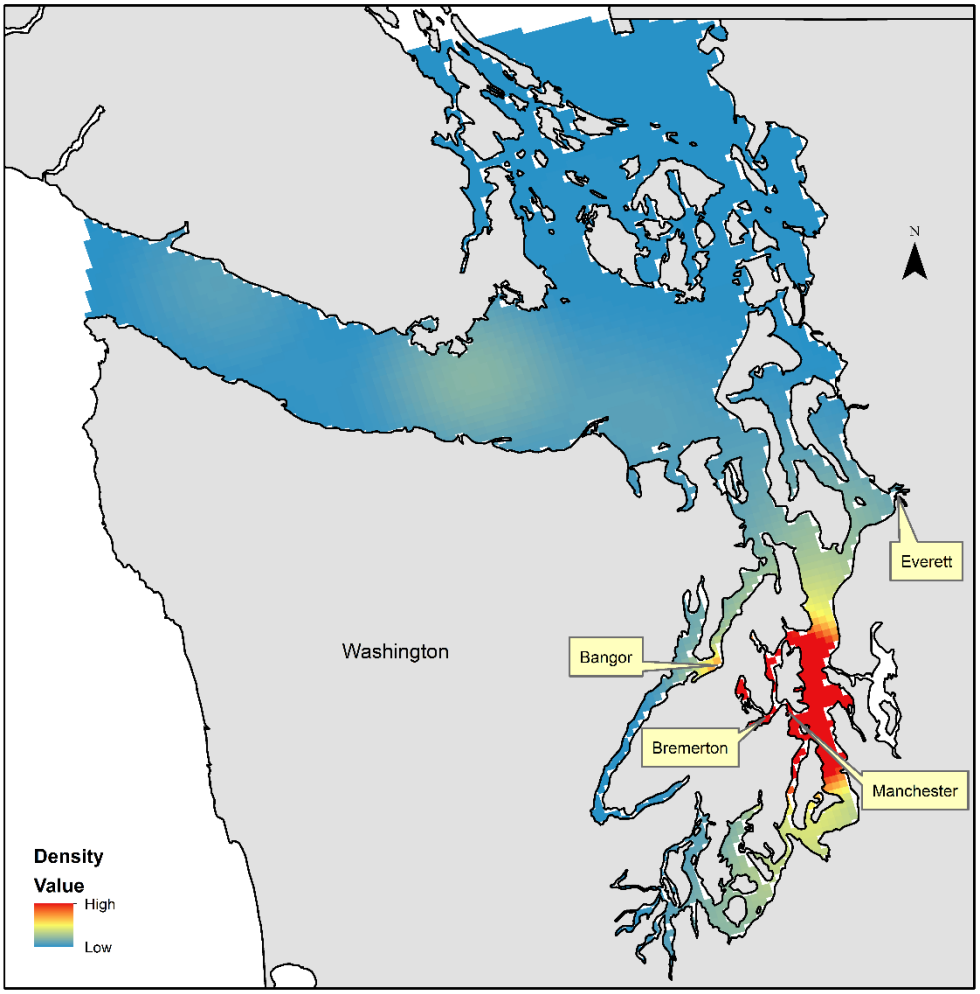


Figure 7. Kernel density analysis of estimated hourly locations of adult male California sea lions using the Washington Inland Waters region. Red indicates highest density of points and blue is lowest density of points.

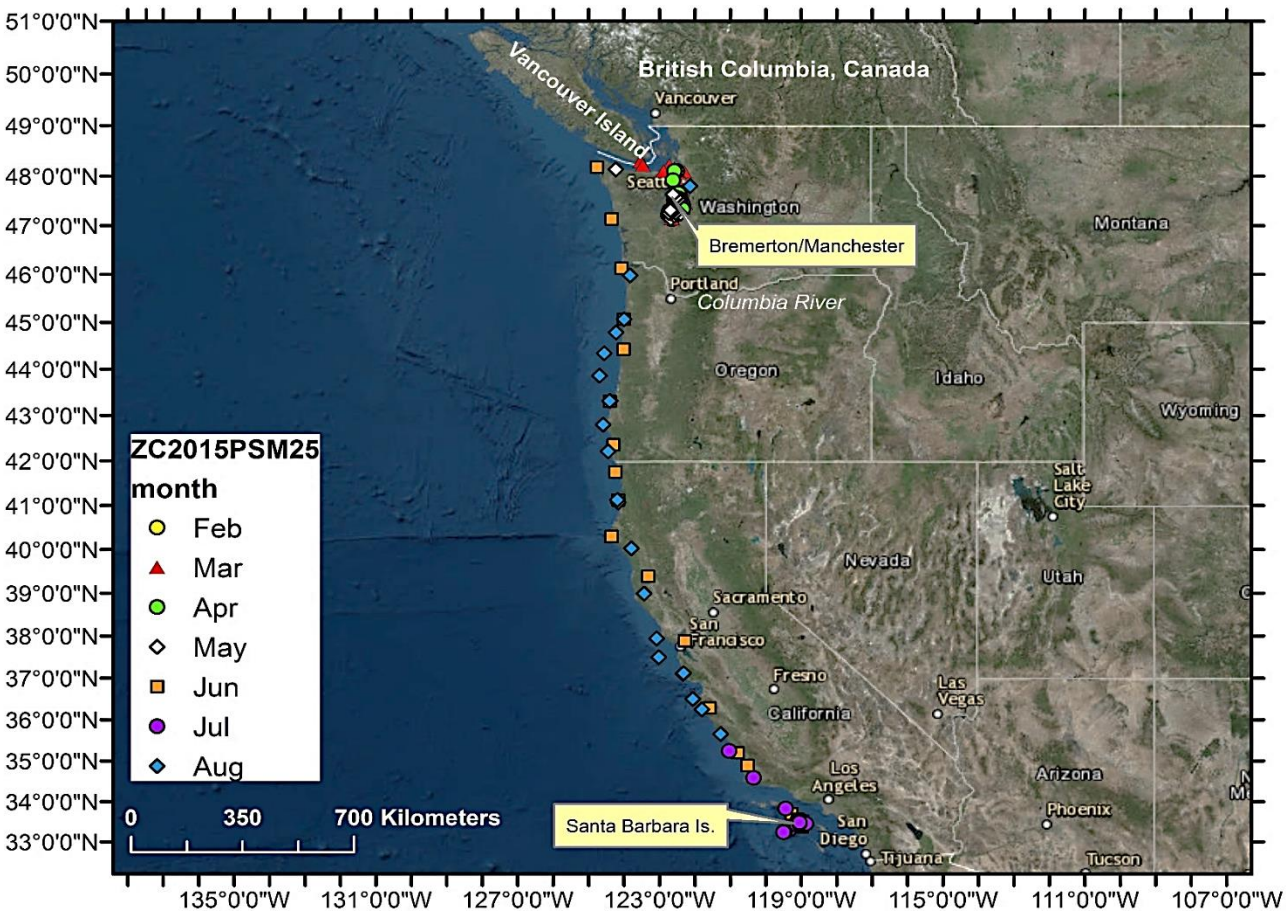


Figure 8. Monthly distribution of an adult male California sea lion instrumented at Manchester, Washington in February 2016, migrated south to Santa Barbara Island, California for the summer breeding season, and then returned to the northwest in August. Each point is the location at 00 h UTC each day estimated from a correlated random walk model based on satellite telemetry data.

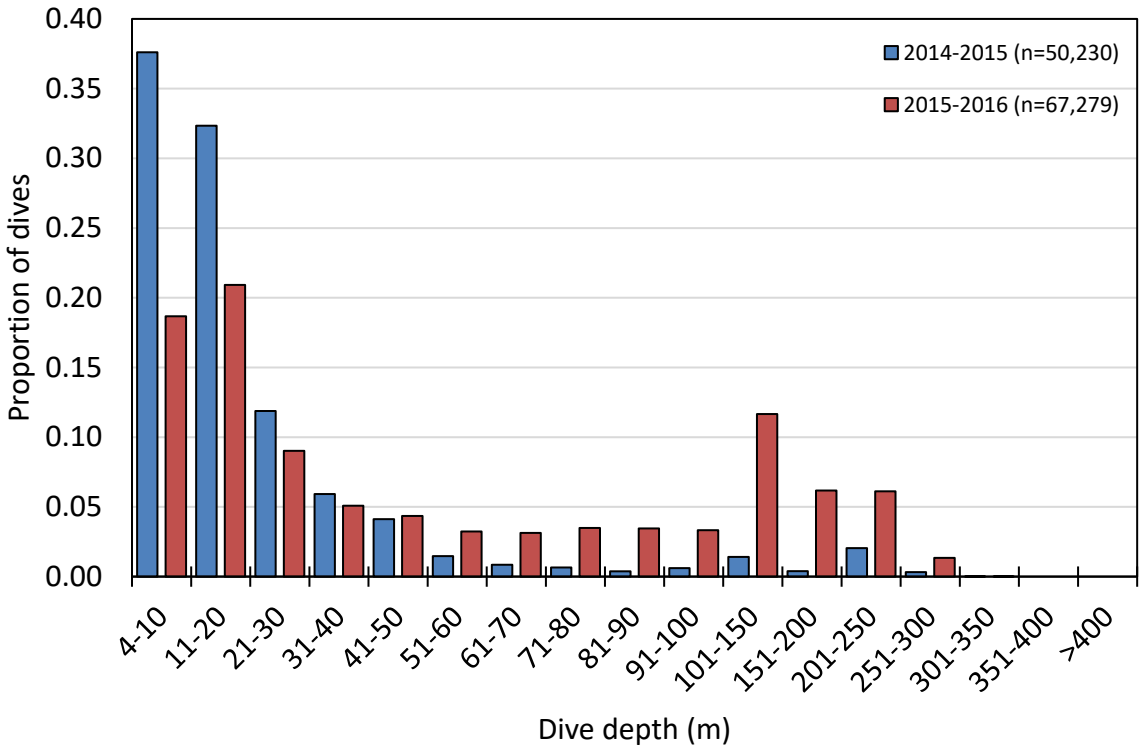


Figure 9. Proportion of dives in each depth bin for adult male California sea lions using the Inland Waters of Puget Sound region. Animals were instrumented with satellite telemetry dive recorders during December 2014/January 2015 (n=12) and December 2015/February 2016 (n=14) near Bremerton or Manchester Navy facilities in Puget Sound, Washington. Data represent sampled diving between deployment dates and May 2015 (2014-2015) or August 2016 (2015-2016).

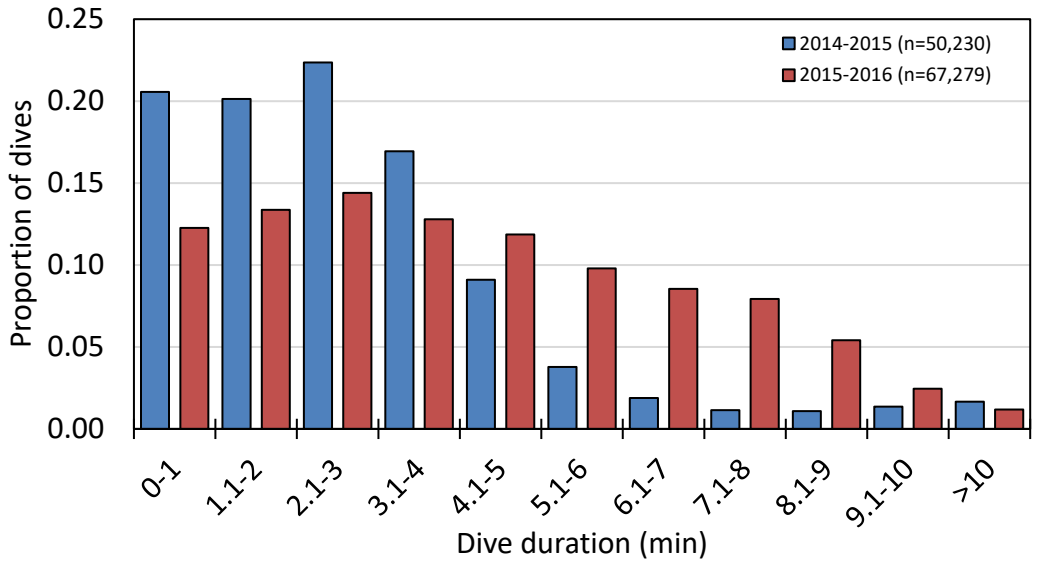
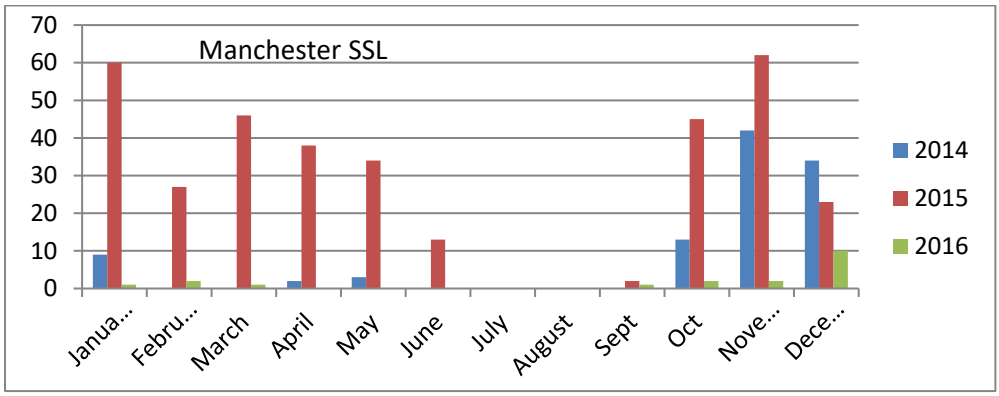


Figure 10. Proportion of dives in each dive duration bin for adult male California sea lions using the Inland Waters of Puget Sound region. Animals were instrumented with satellite telemetry dive recorders during December 2014/January 2015 (n=12) and December 2015/February 2016 (n=14) near Bremerton or Manchester Navy facilities in Puget Sound, Washington. Data represent sampled diving between deployment dates and May 2015 (2014-2015) or August 2016 (2015-2016).

Appendix 1. **Steller Sea Lion Abundance at Navy Facilities in inland waters of Washington**

Steller sea lion abundance in Puget Sound is much lower than that of Califonria sea lions and they are present in Puget Sound for less time each year. The seasonality of there abundance and their relative abundance at two sites is presented in Figure A-1. A single Steller sea lion was recorded at Naval Station Everett and Naval Station Kitsap Bremerton only once during the study where they briefly hauled out on port security barrier floats. Steller sea lion adult males and juvenile and subadult animals were present at Bangor in relatively low numbers compared to those at Manchester. The situation a Mnachester was unusual compared to the other three bases in that there were up to three floating rafts present at Manchester in 2014 and 2015 that provided ample hauling space for large numbers of Steller and California sea lions. All but one of those floating rafts were removed in late 2015 reducing the amount of available haulout space, resulting in significant decreased numbers of Steller sea lions present at Manchester throughout 2016.



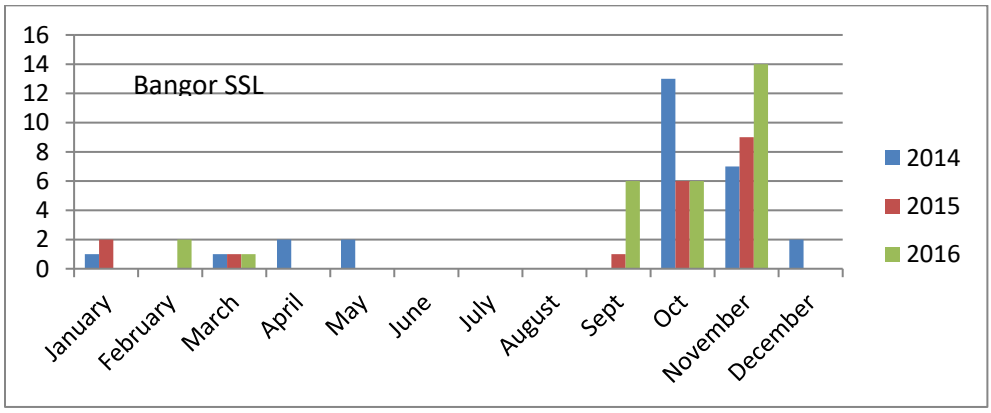
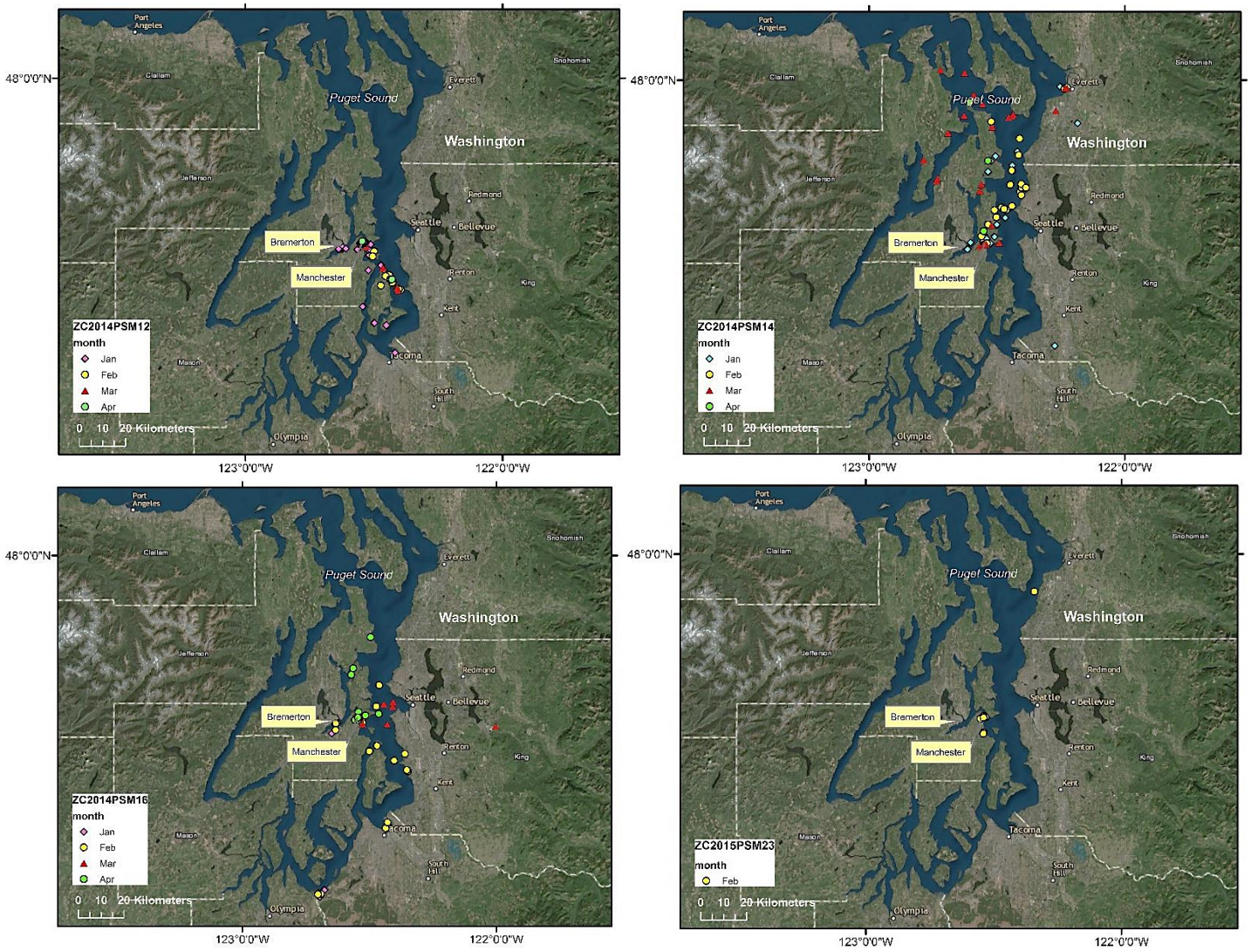
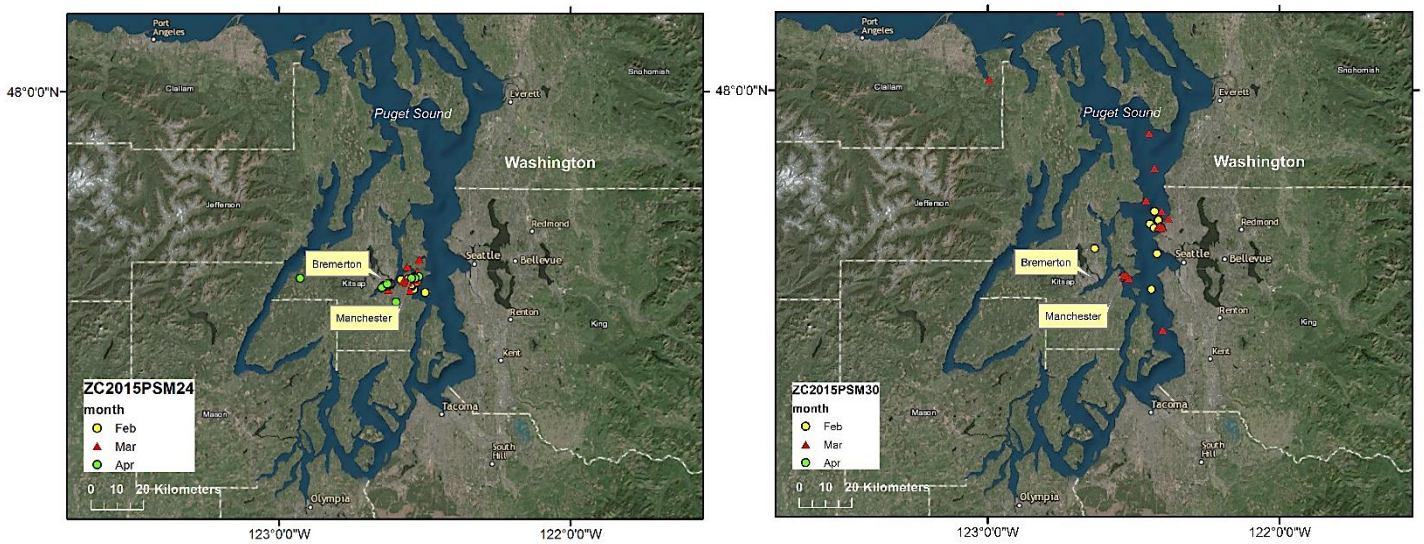


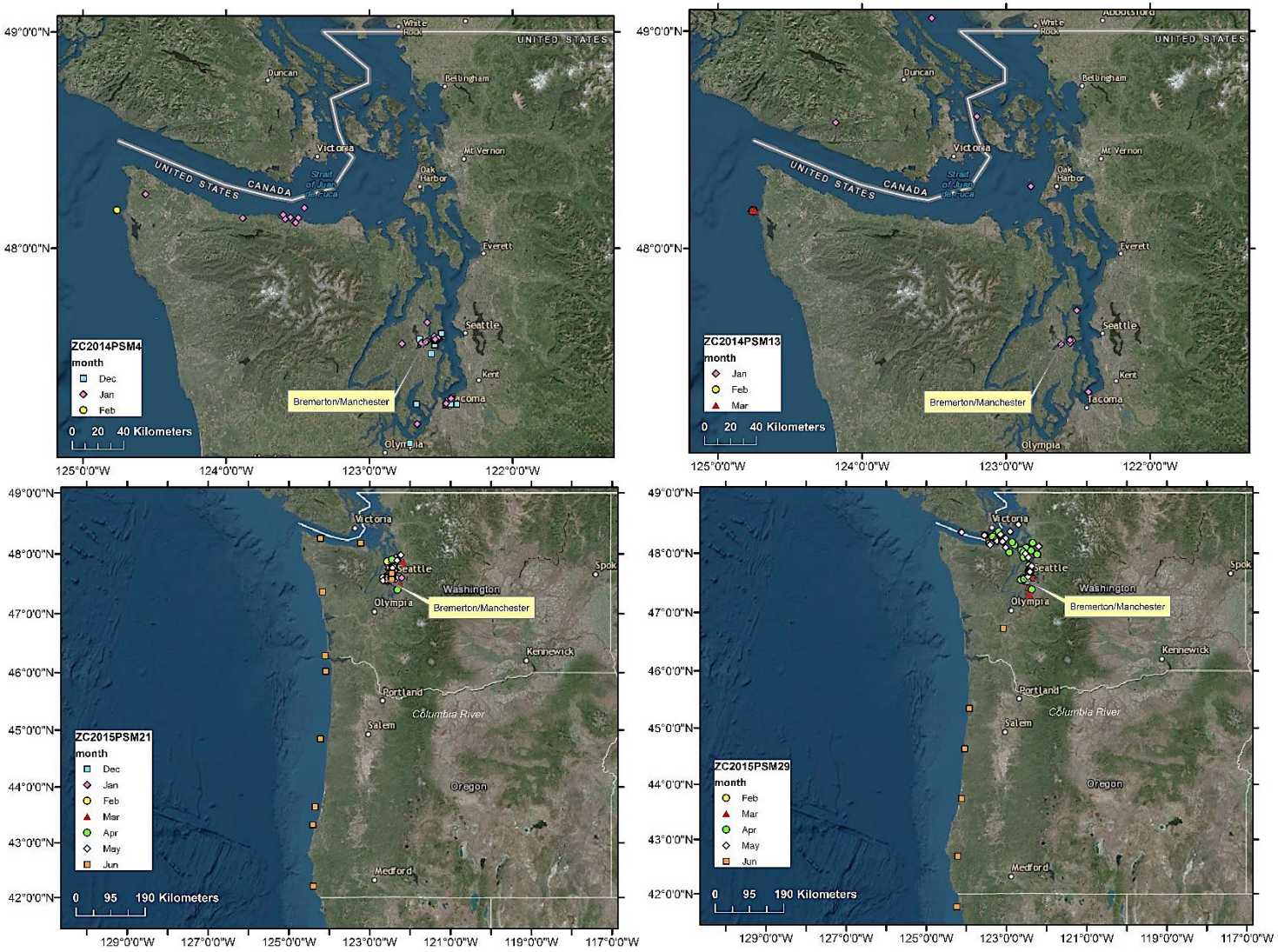
Figure A-1. Maximum monthly counts of Steller sea lion at Naval Facilities Manchester and Bangor



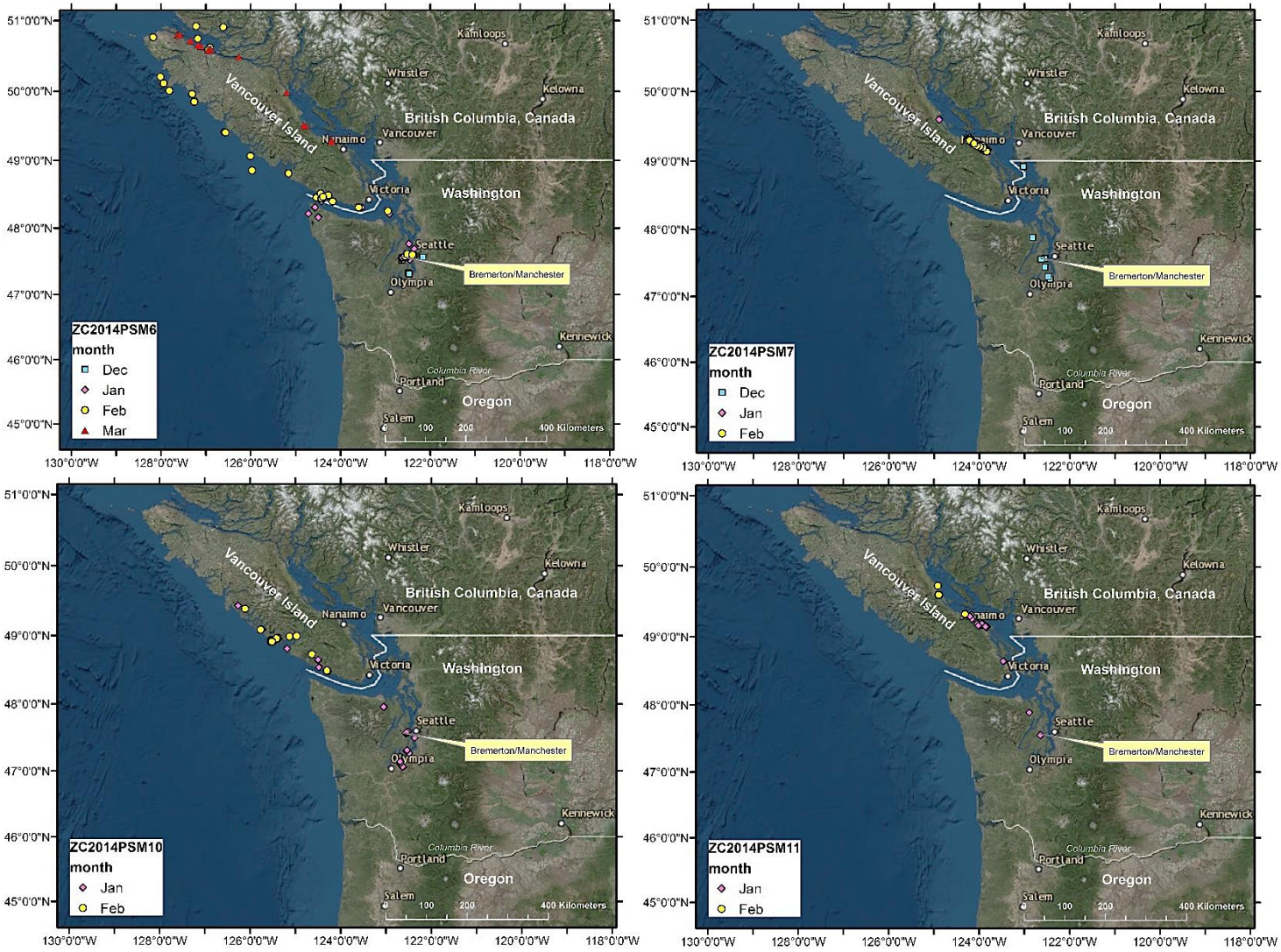
Appendix Figure 1. Monthly distribution of adult male California sea lions instrumented at Bremerton or Manchester, Washington in 2014/15 and 2015/16 that used the inland waters of Washington. Each point is the location at 00 h UTC each day estimated from a correlated random walk model based on satellite telemetry data.



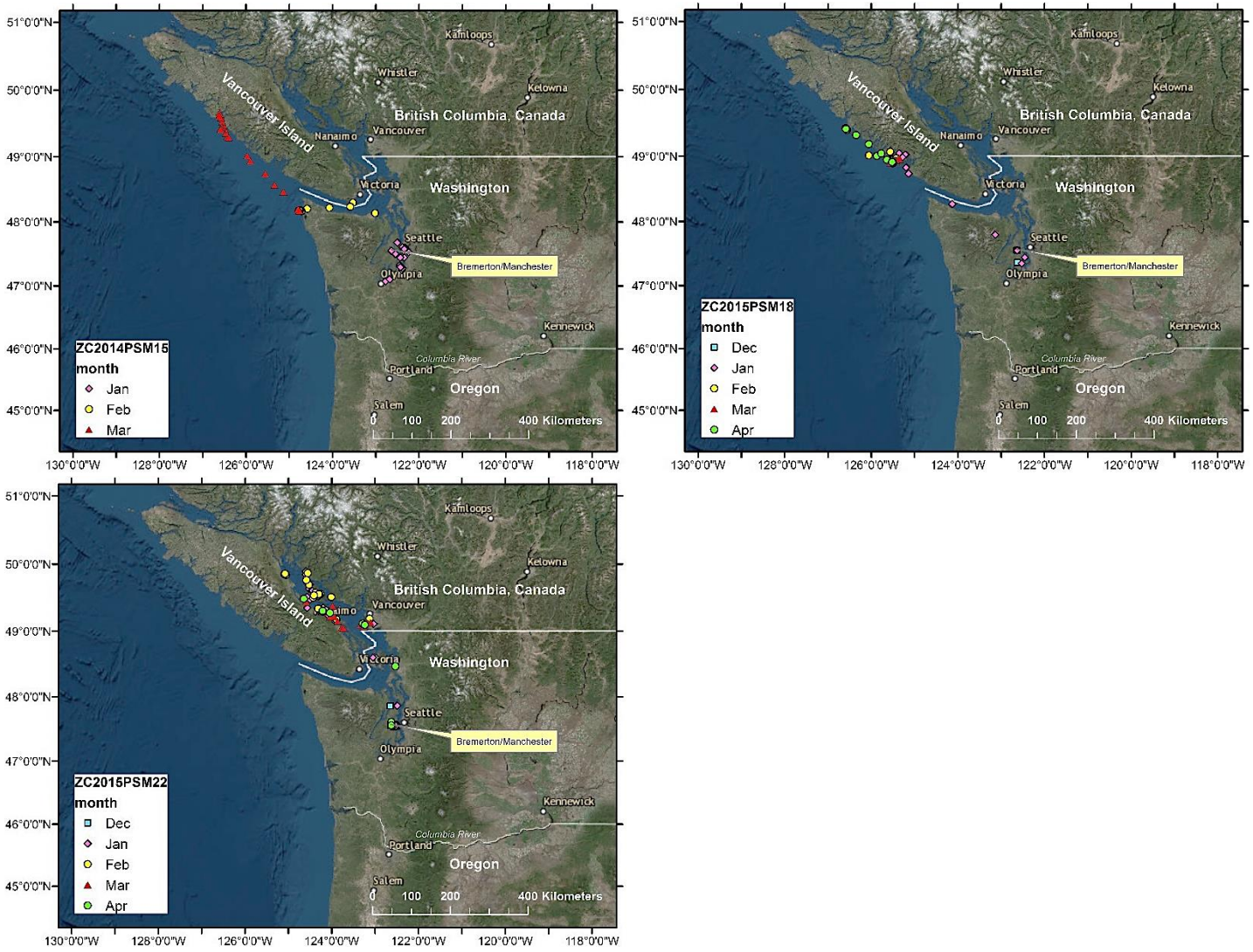
Appendix Figure 1 Continued. Monthly distribution of adult male California sea lions instrumented at Bremerton or Manchester, Washington in 2014/15 and 2015/16 that used the inland waters of Washington. Each point is the location at 00 h UTC each day estimated from a correlated random walk model based on satellite telemetry data.



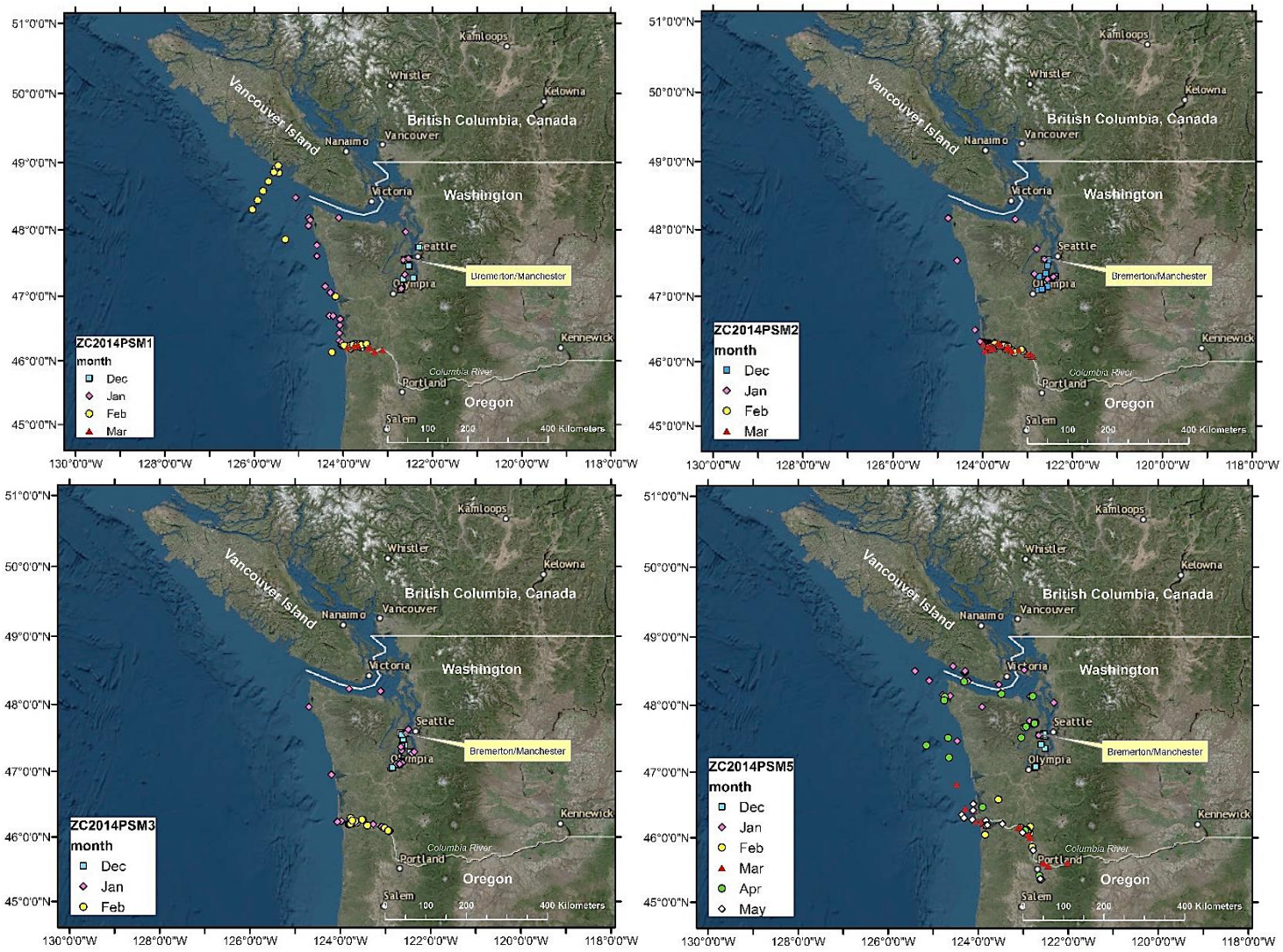
Appendix Figure 1 continued. Monthly distribution of adult male California sea lions instrumented at Bremerton or Manchester, Washington in 2014/15 and 2015/16 that mostly used the inland waters of Washington. Each point is the location at 00 h UTC each day estimated from a correlated random walk model based on satellite telemetry data.



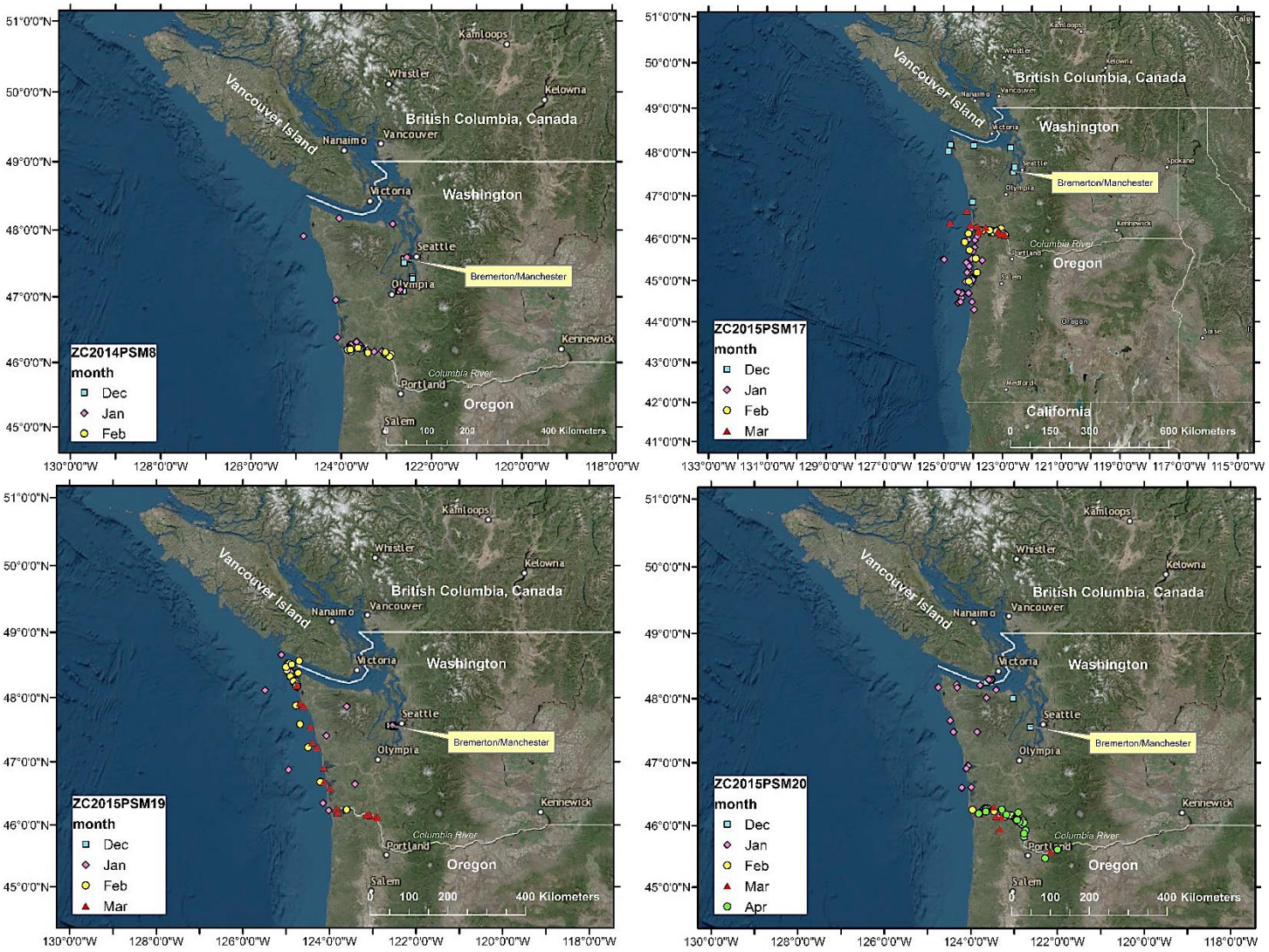
Appendix Figure 2. Monthly distribution of adult male California sea lions instrumented at Bremerton or Manchester, Washington in 2014/15 and 2015/16 that used Canadian waters. Each point is the location at 00 h UTC each day estimated from a correlated random walk model based on satellite telemetry data.



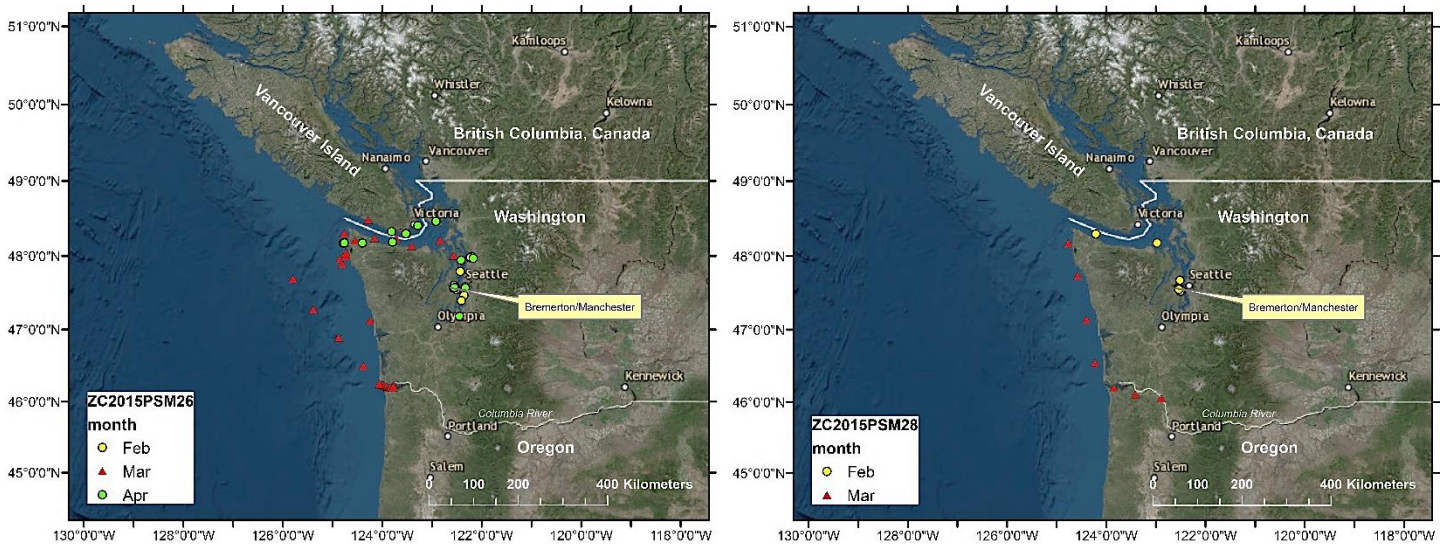
Appendix Figure 2 Continued. Monthly distribution of adult male California sea lions instrumented at Bremerton or Manchester, Washington in 2014/15 and 2015/16 that used Canadian waters. Each point is the location at 00 h UTC each day estimated from a correlated random walk model based on satellite telemetry data.



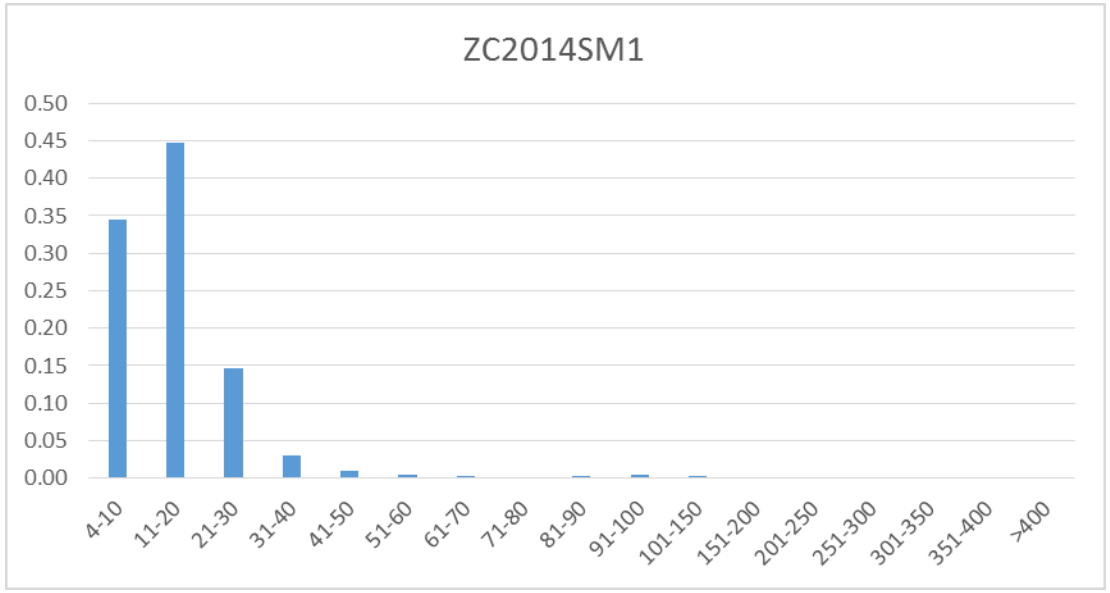
Appendix Figure 3. Monthly distribution of adult male California sea lions instrumented at Bremerton or Manchester, Washington in 2014/15 and 2015/16 that used the Columbia River. Each point is the location at 00 h UTC each day estimated from a correlated random walk model based on satellite telemetry data.



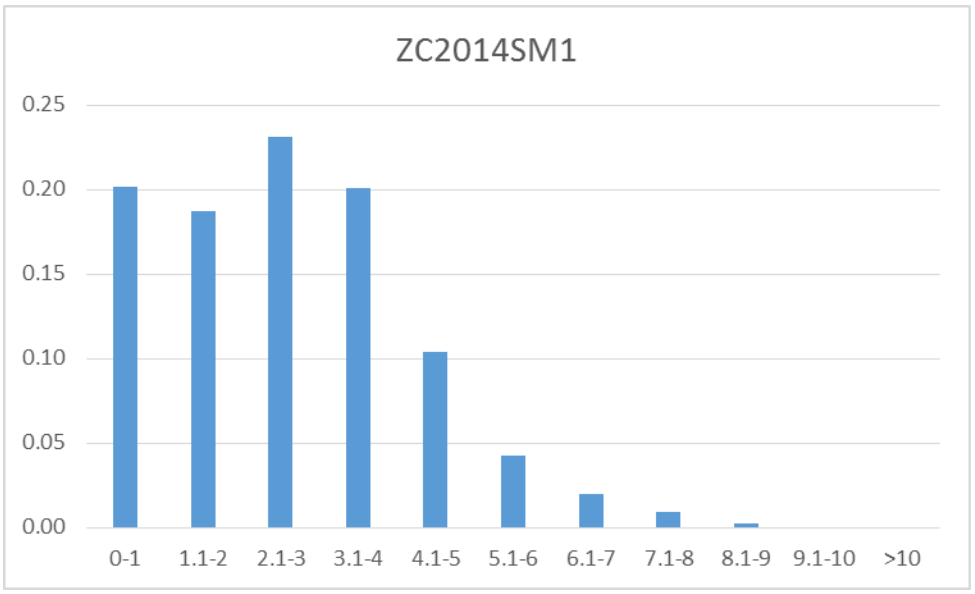
Appendix Figure 3 Continued. Monthly distribution of adult male California sea lions instrumented at Bremerton or Manchester, Washington in 2014/15 and 2015/16 that used the Columbia River. Each point is the location at 00 h UTC each day estimated from a correlated random walk model based on satellite telemetry data.



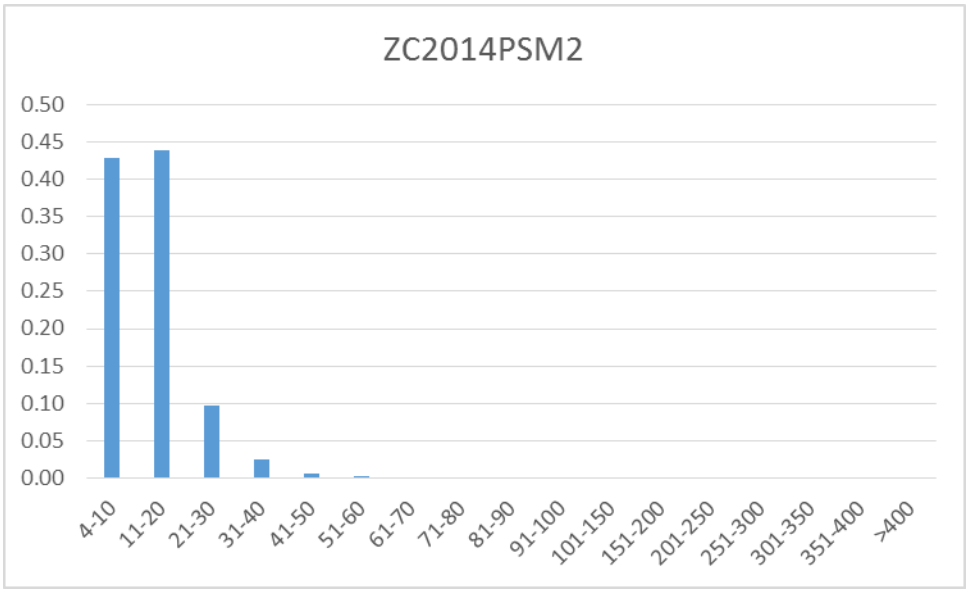
Appendix Figure 3 Continued. Monthly distribution of adult male California sea lions instrumented at Bremerton or Manchester, Washington in 2014/15 and 2015/16 that used the Columbia River. Each point is the location at 00 h UTC each day estimated from a correlated random walk model based on satellite telemetry data.



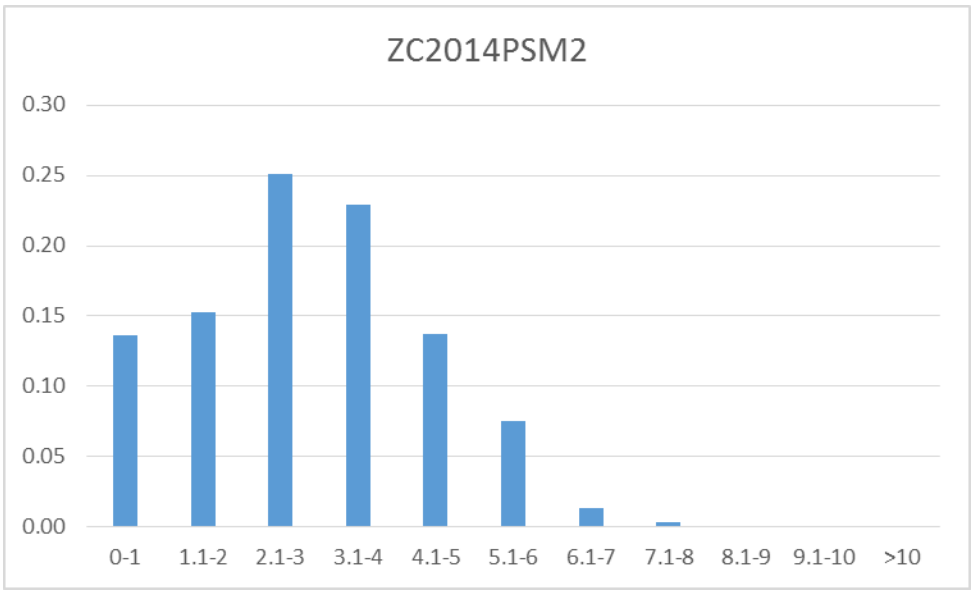
Appendix Figure 4. Dive Duration and Depth of recorded dives for 26 California sea lion adult males, 2014 – 2016 while in inland waters of Washington. Animals Instrumented in Puget Sound Washington at Navy facilities.



Duration



Depth



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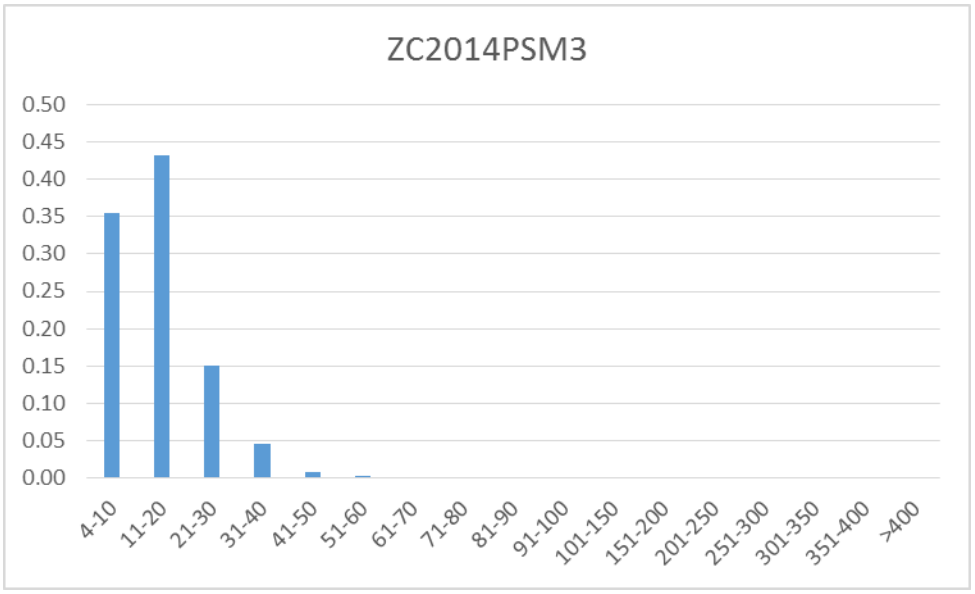

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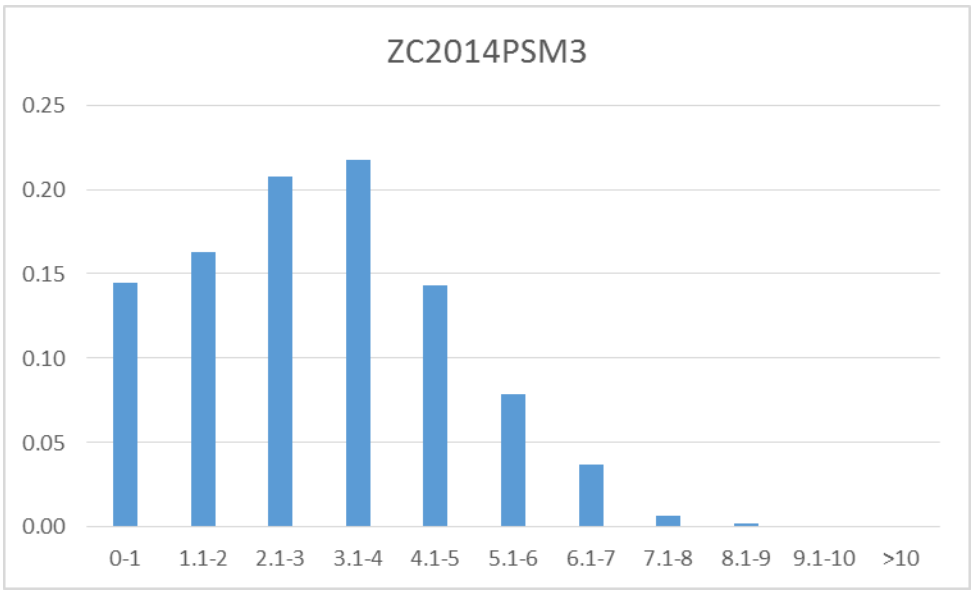

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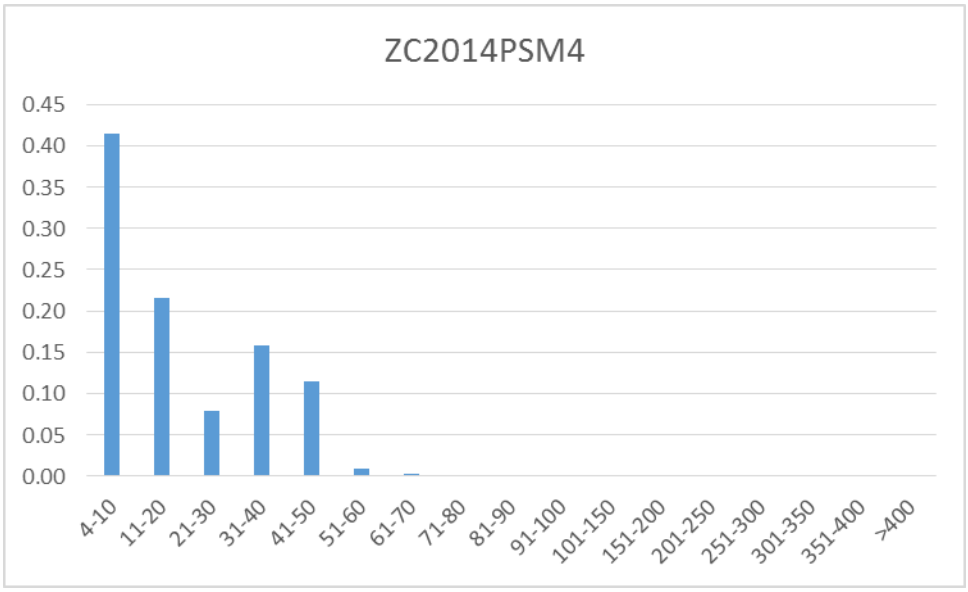

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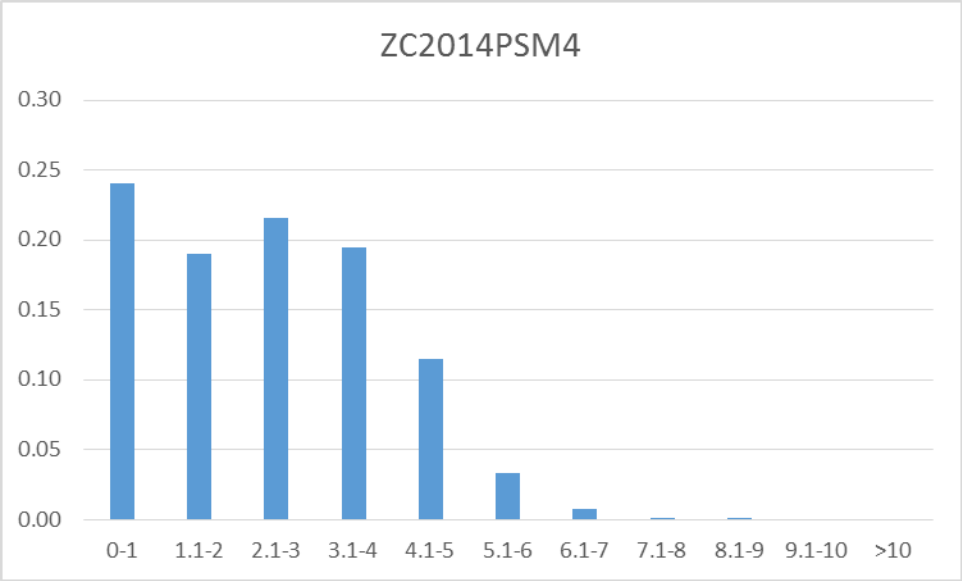

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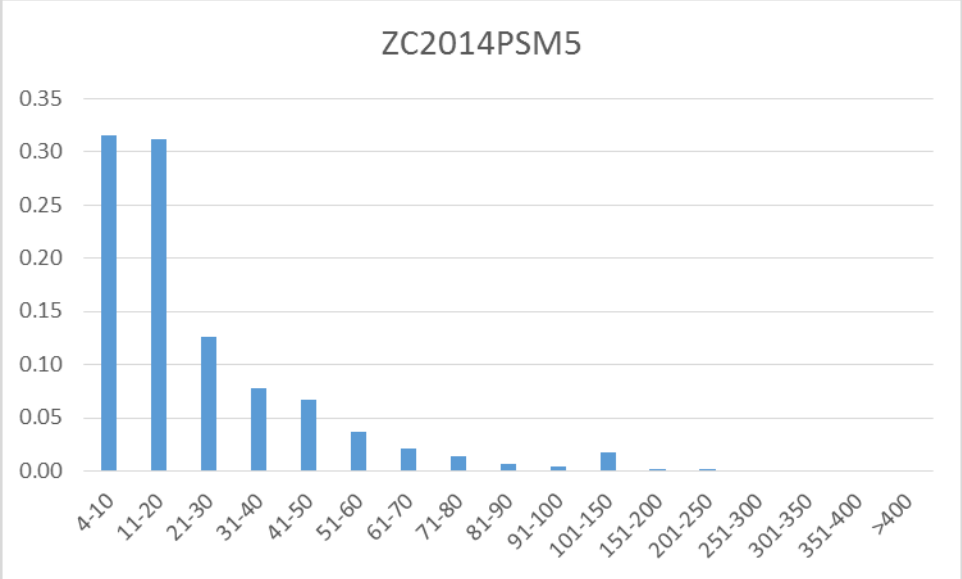

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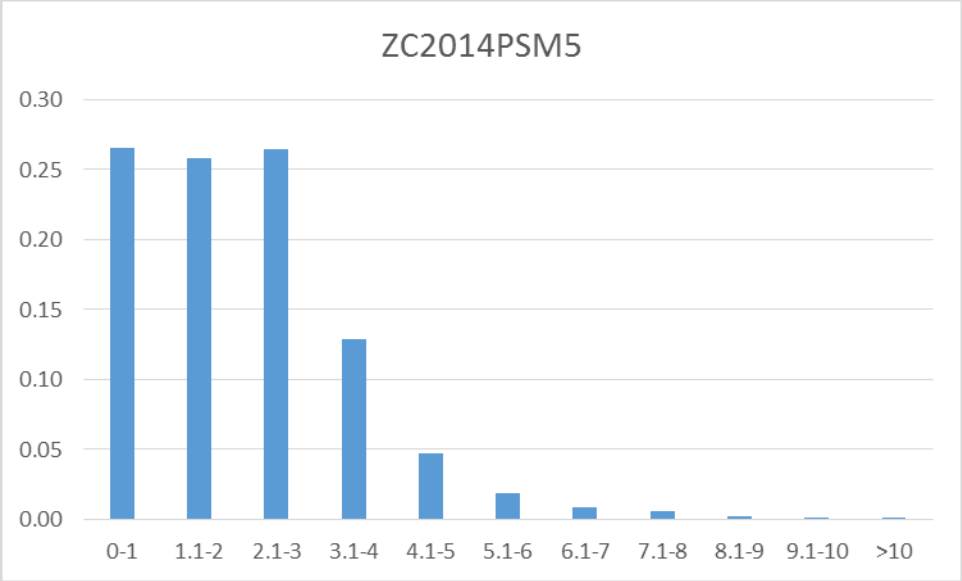

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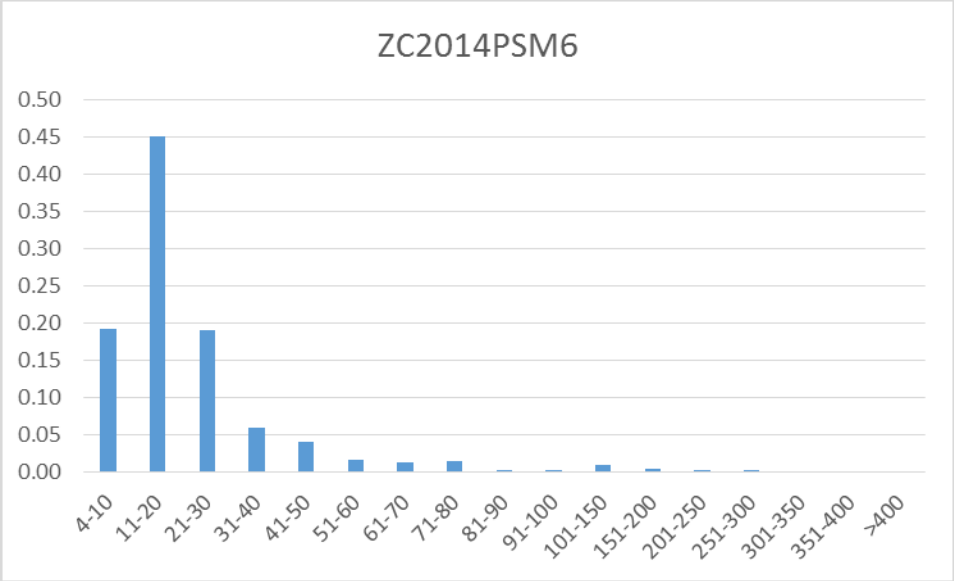

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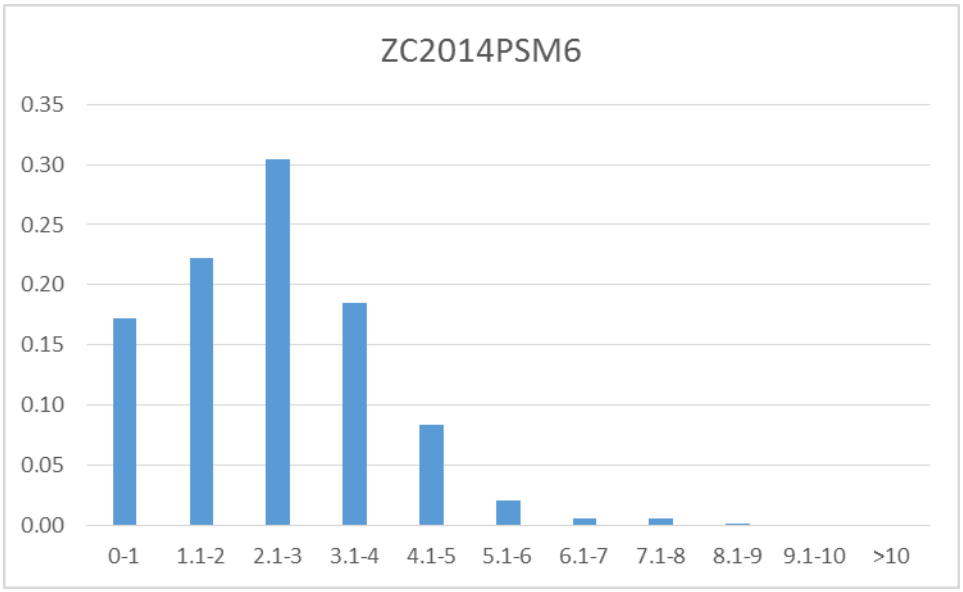

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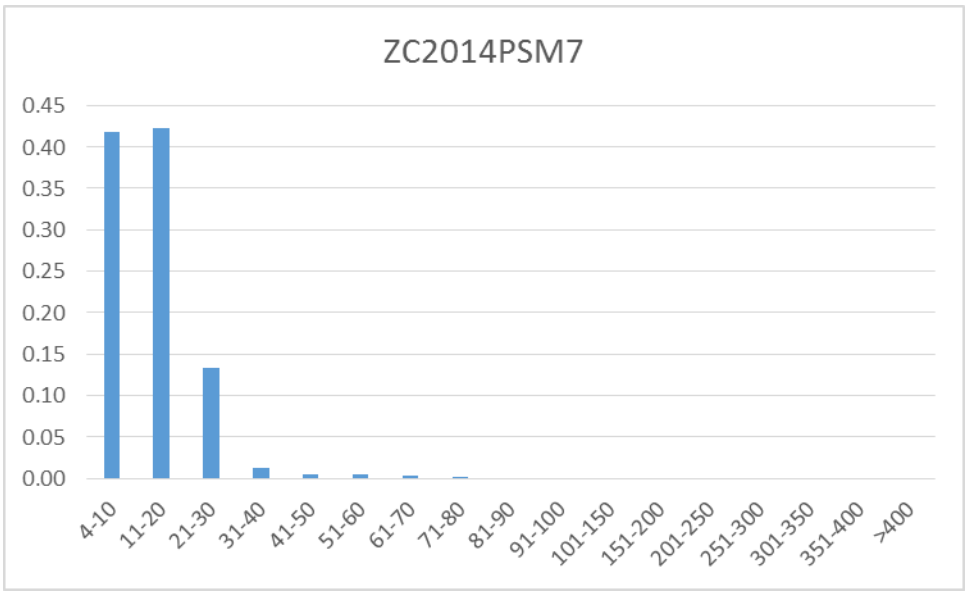

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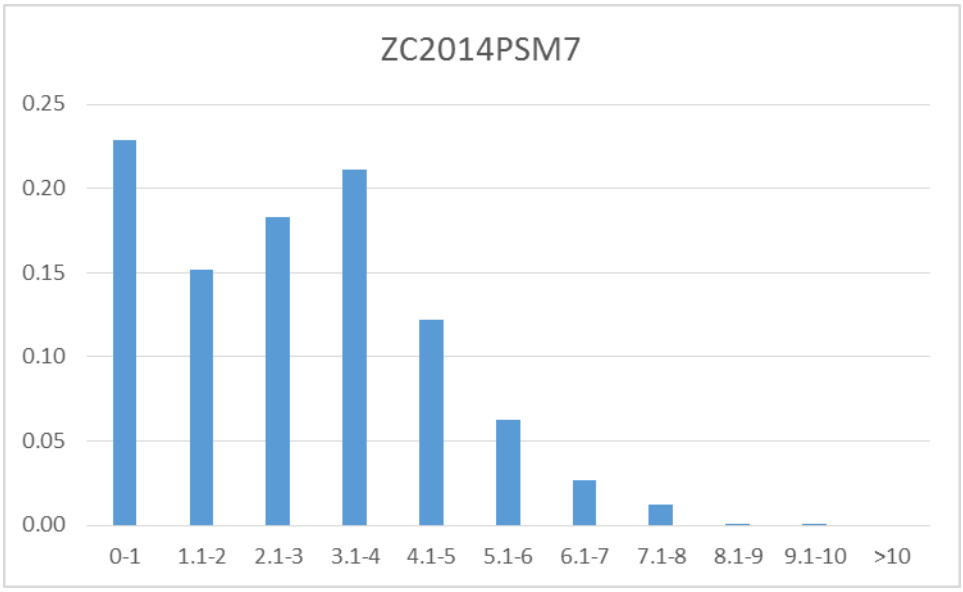

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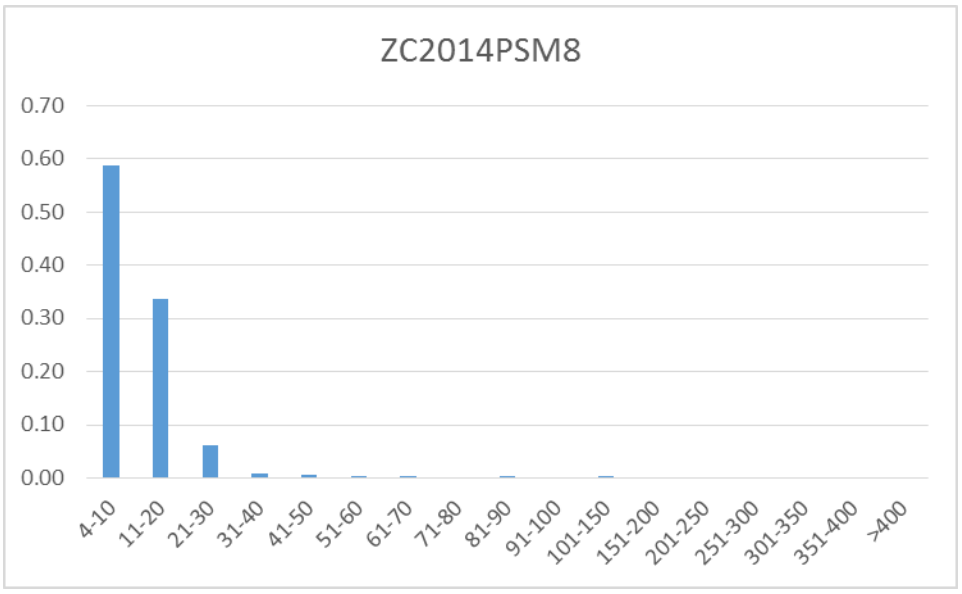

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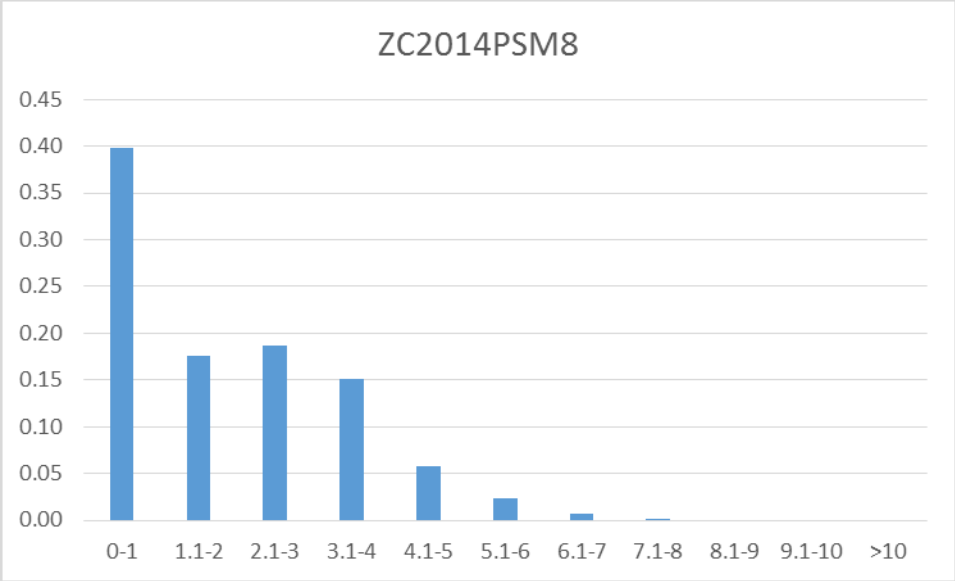

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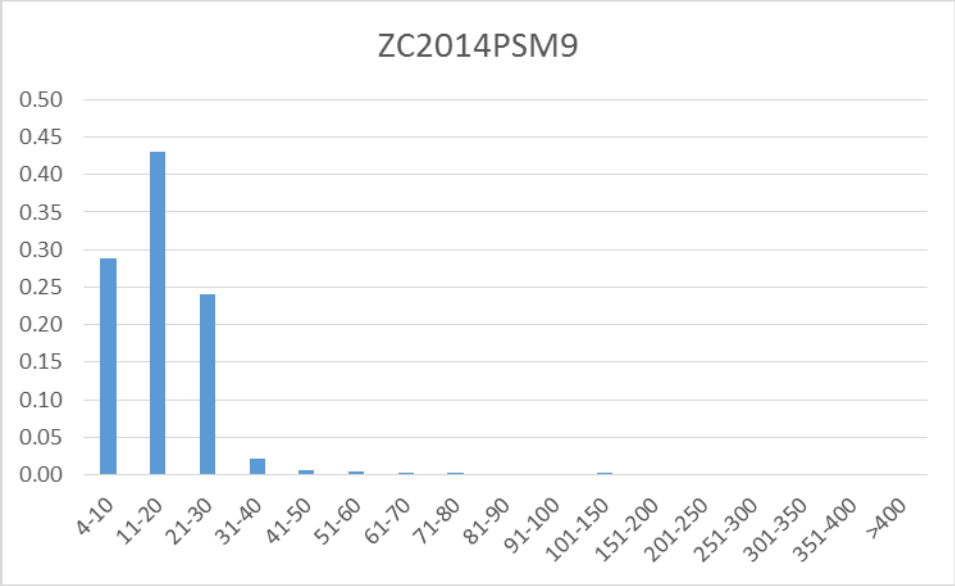

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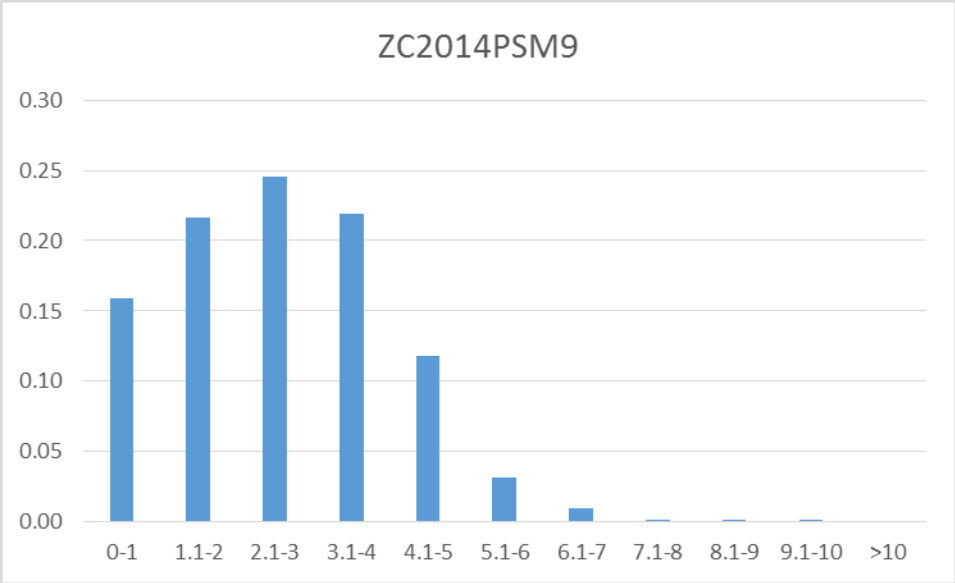

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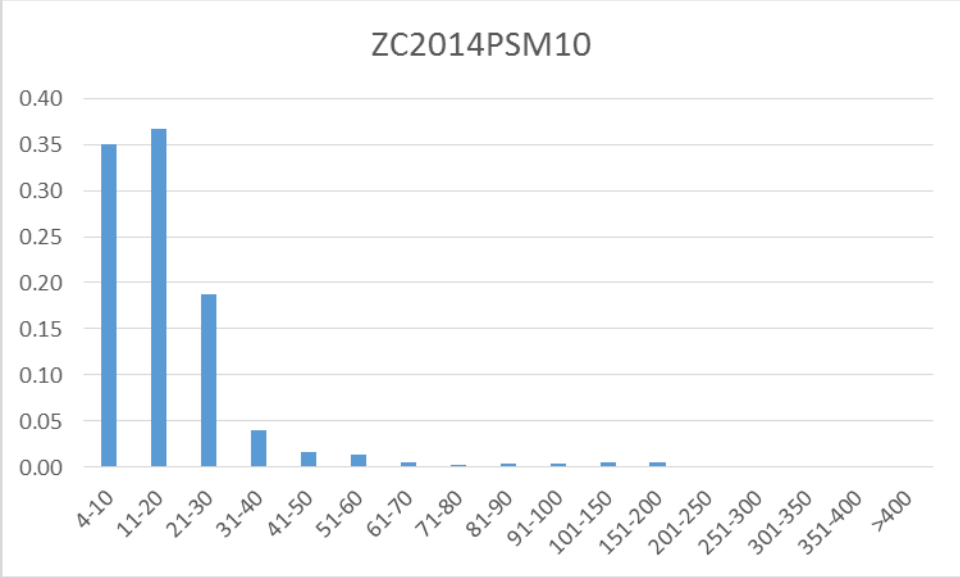

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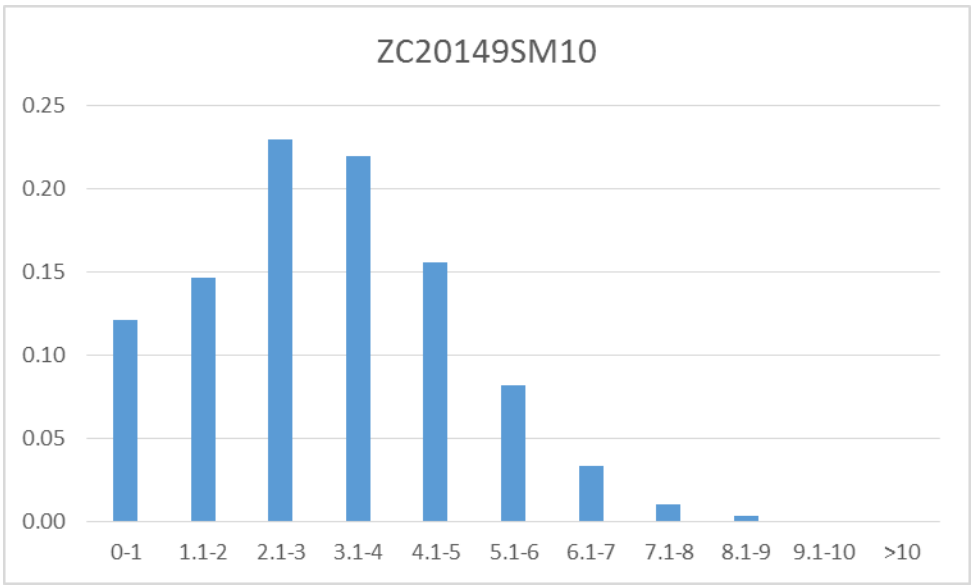

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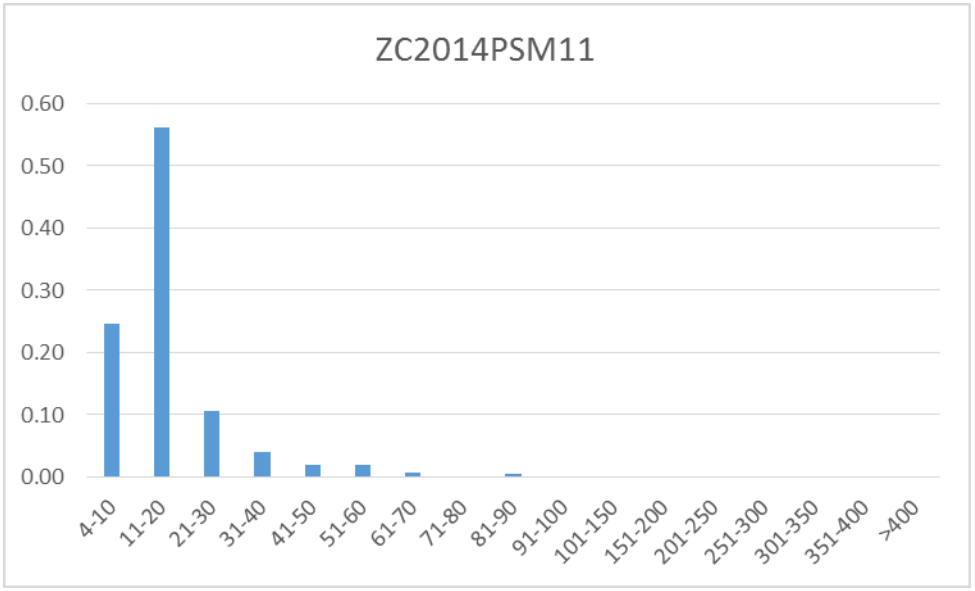

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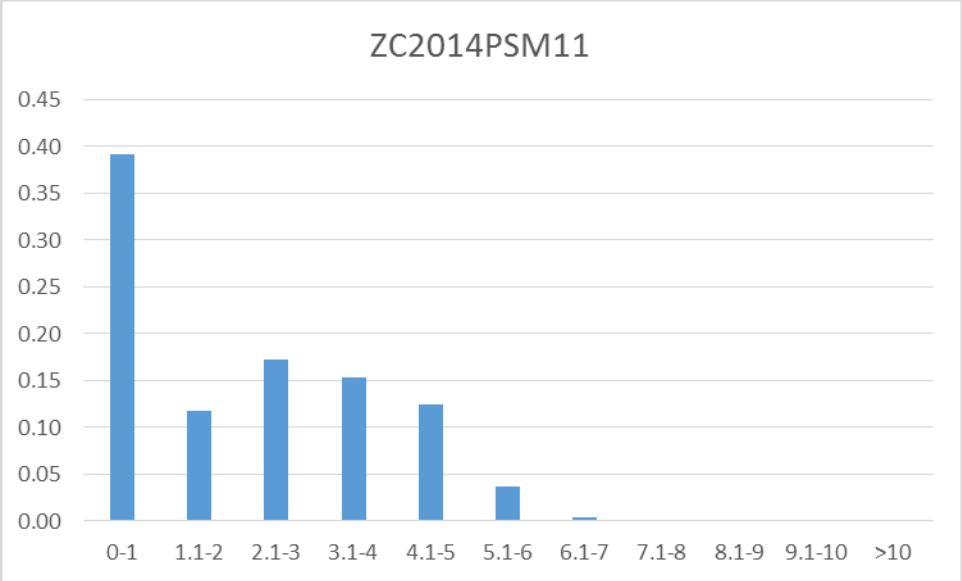

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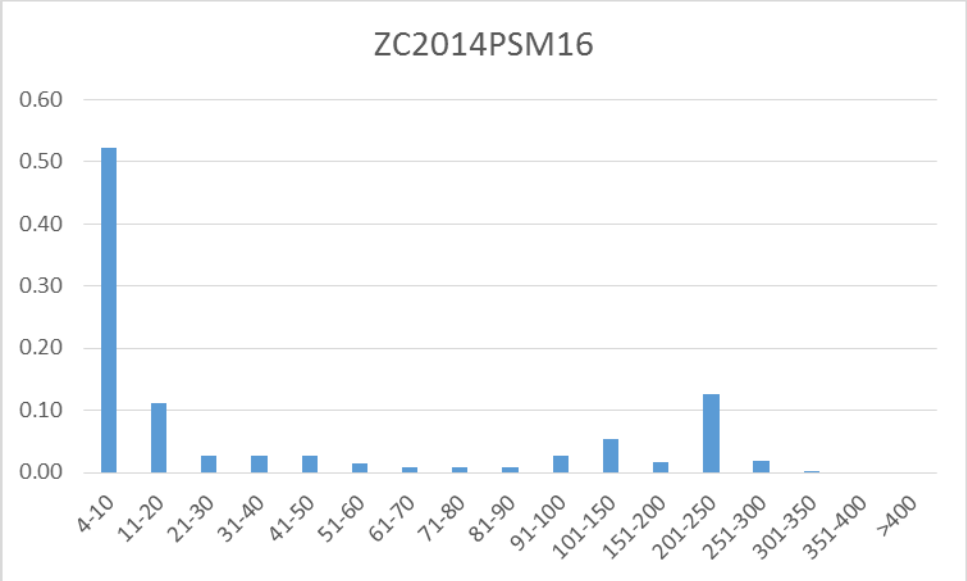

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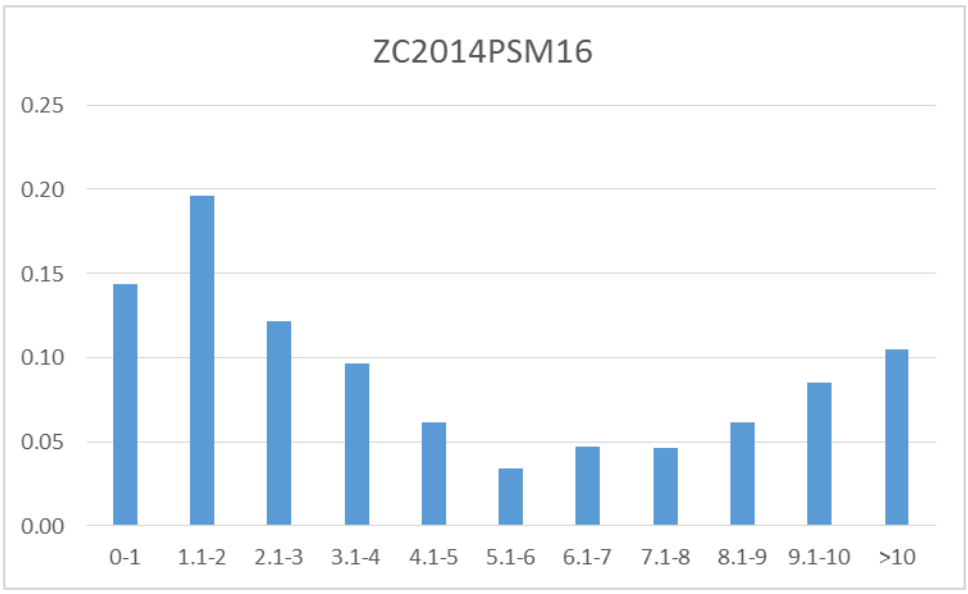

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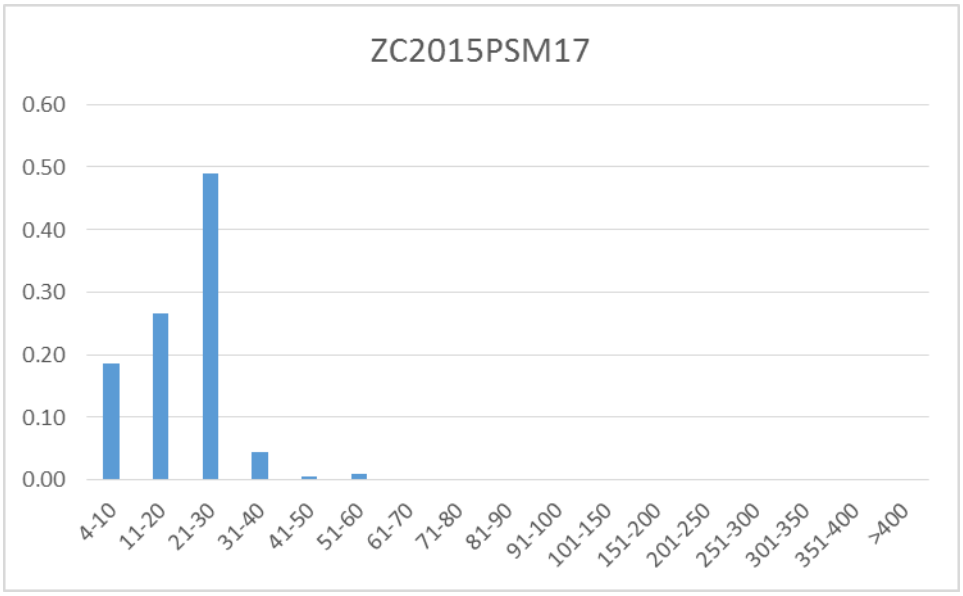

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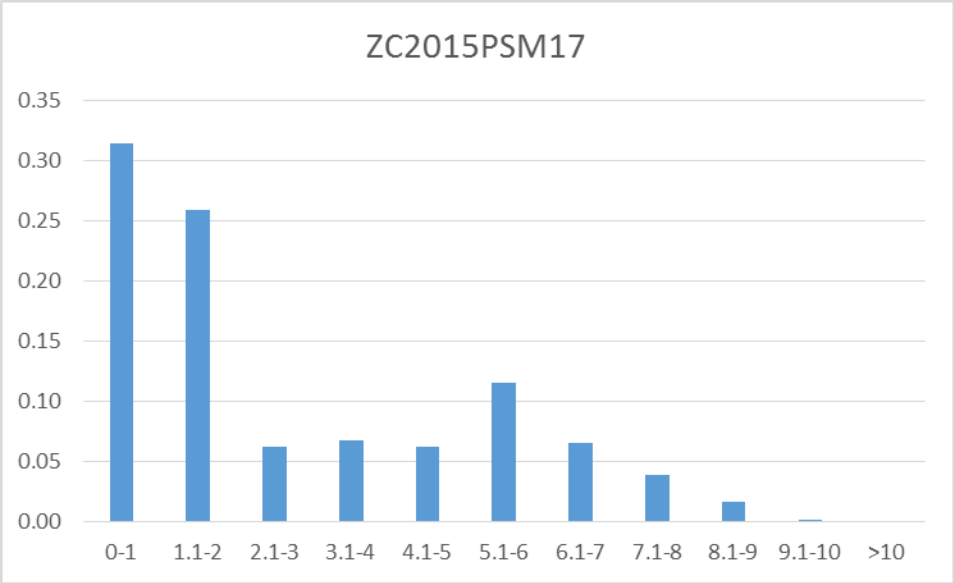

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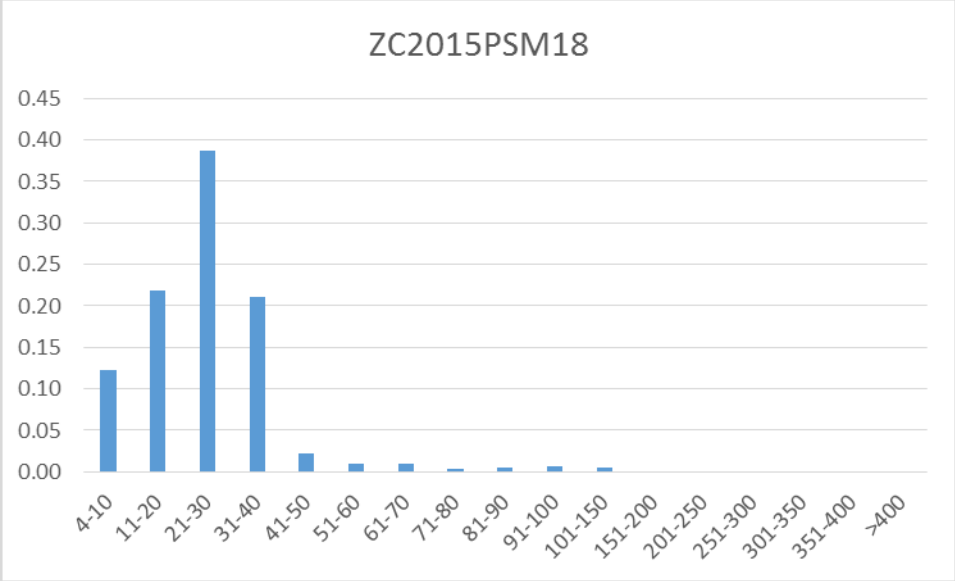

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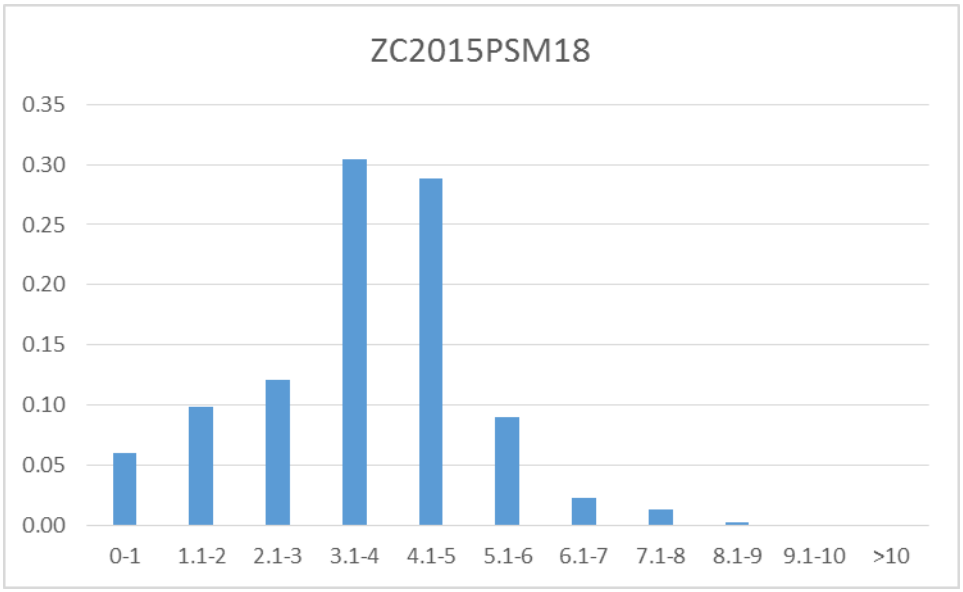

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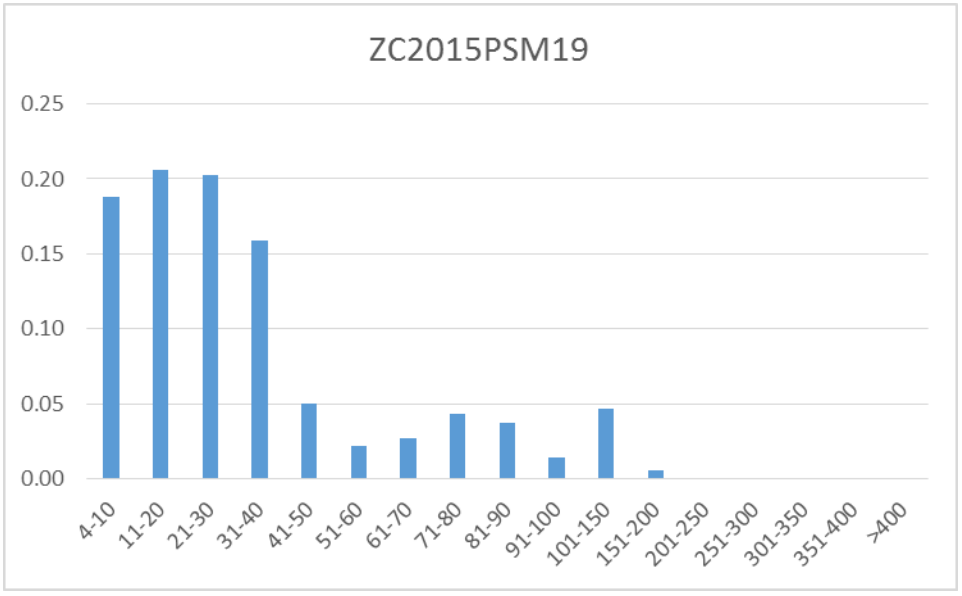

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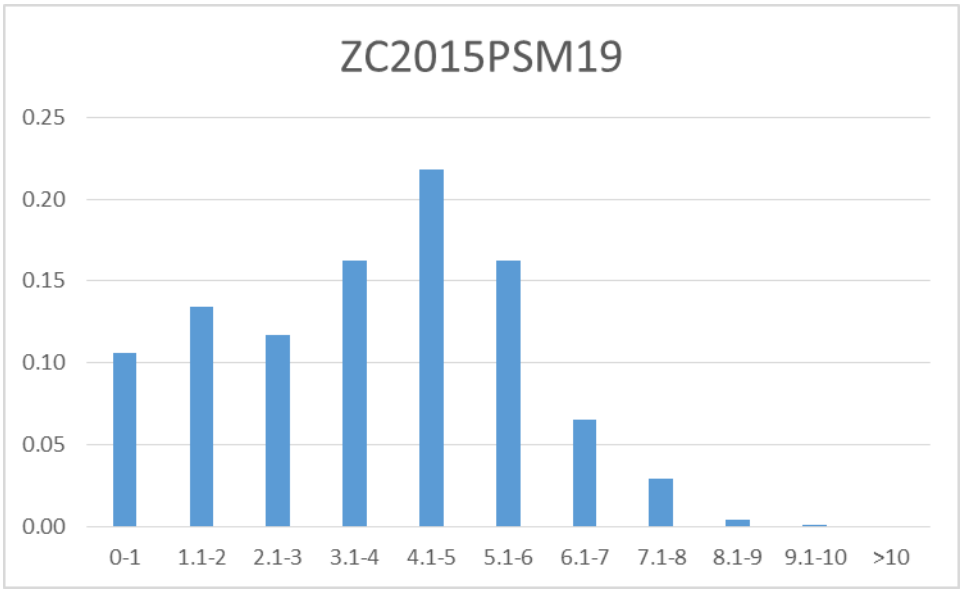

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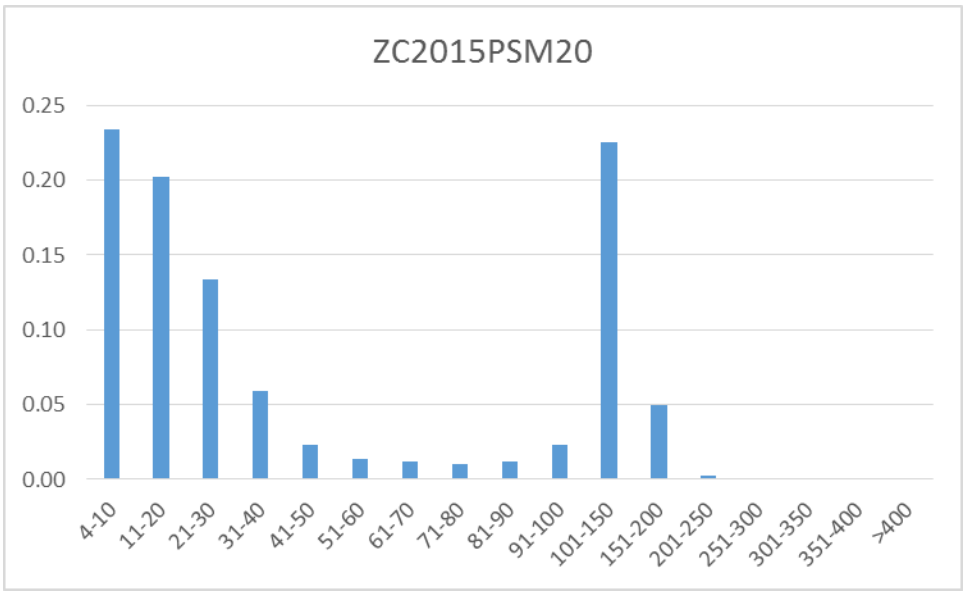

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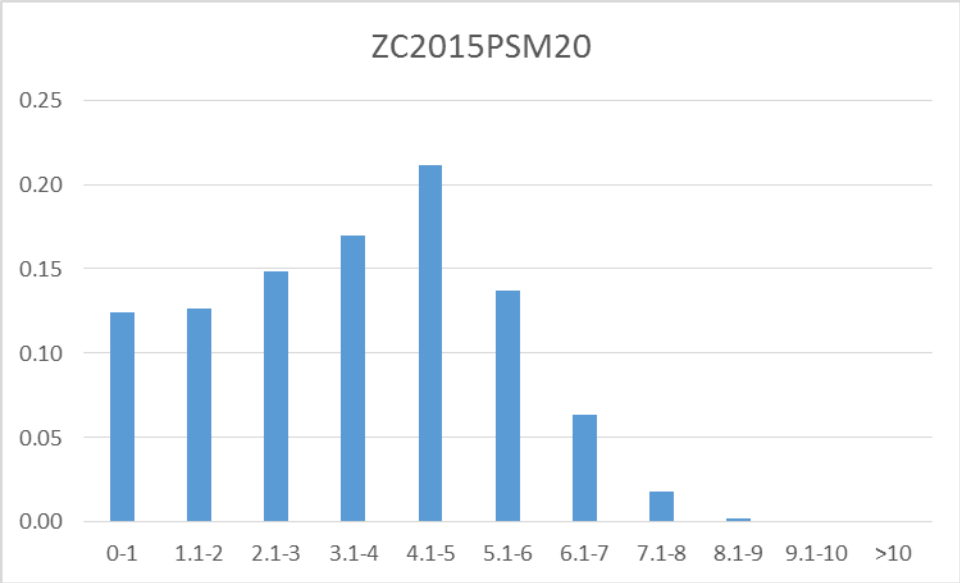

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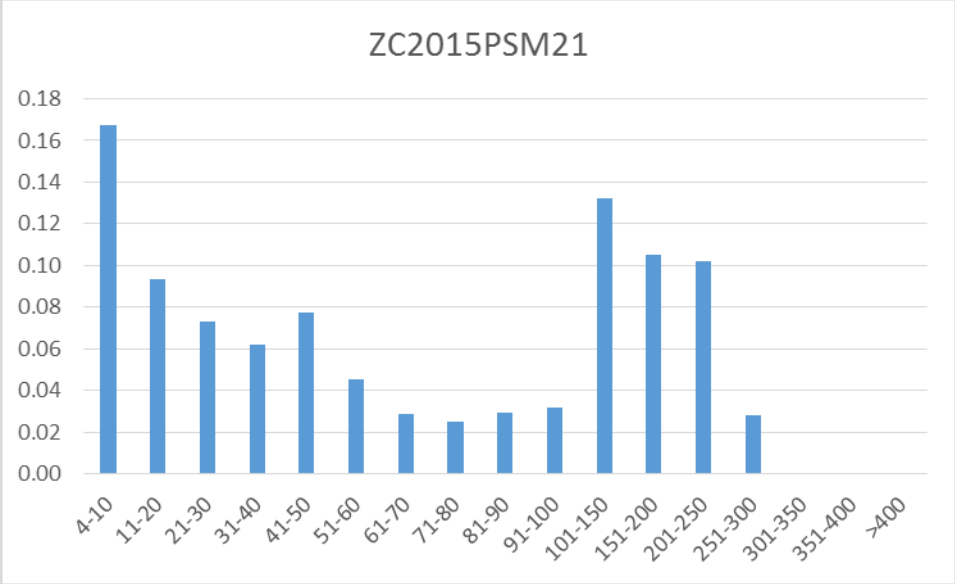

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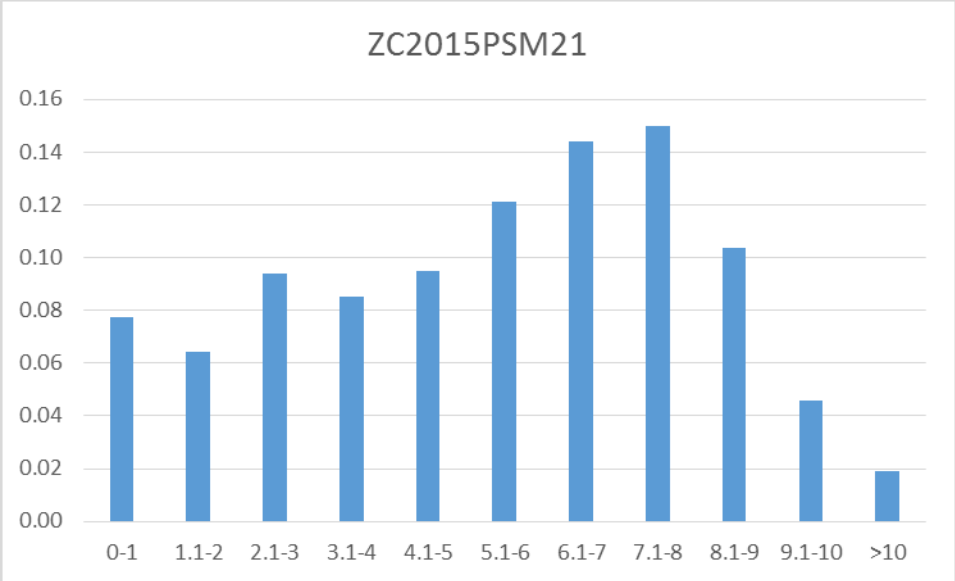

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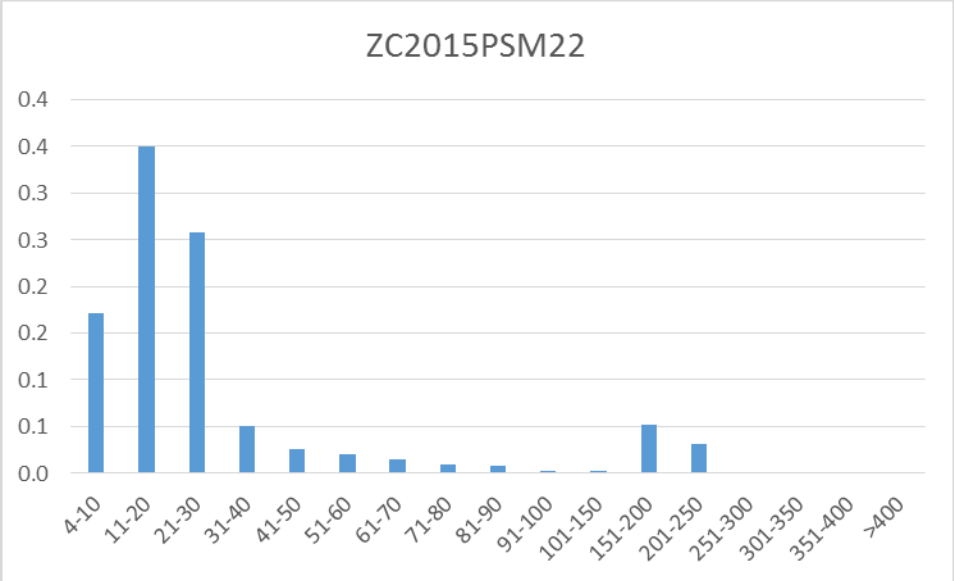

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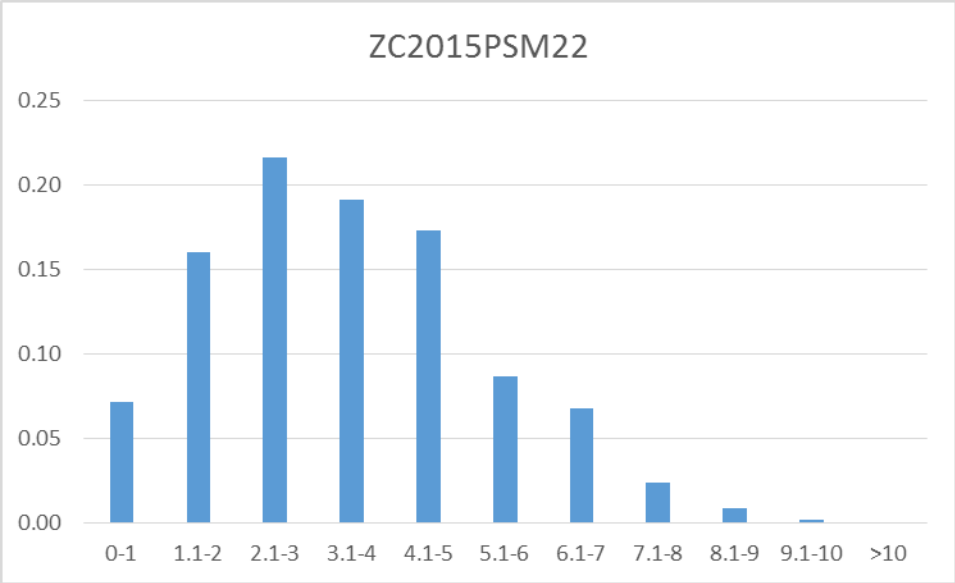

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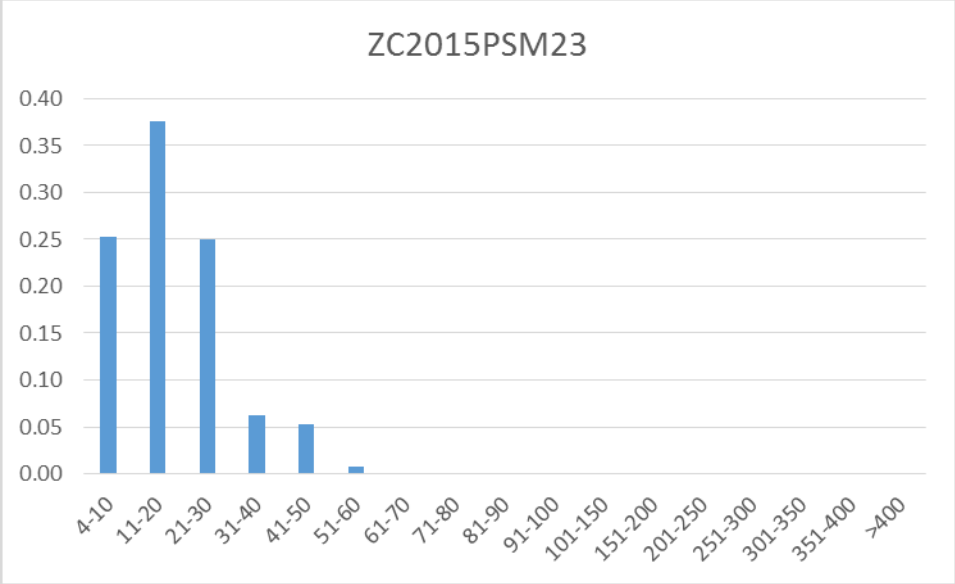

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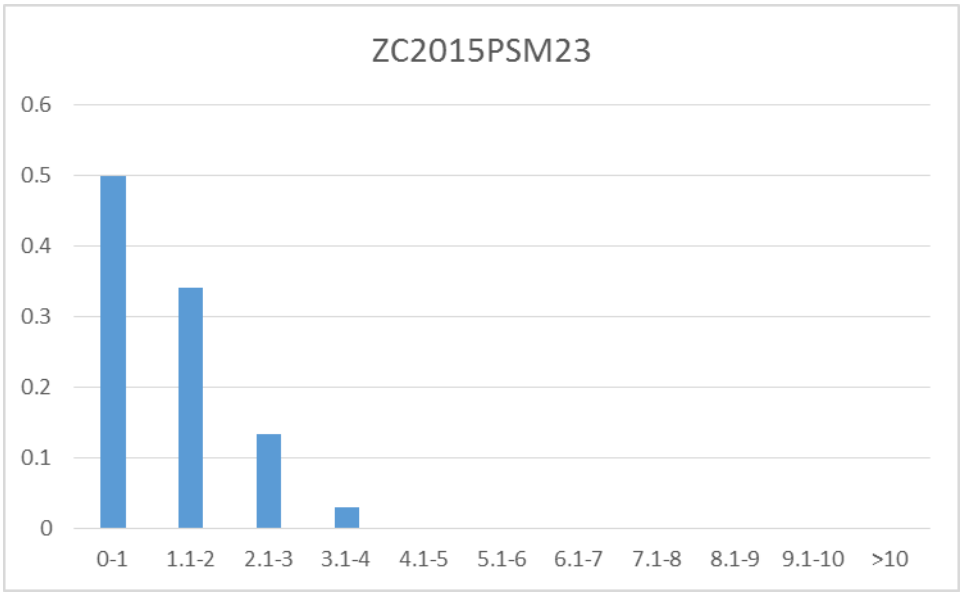

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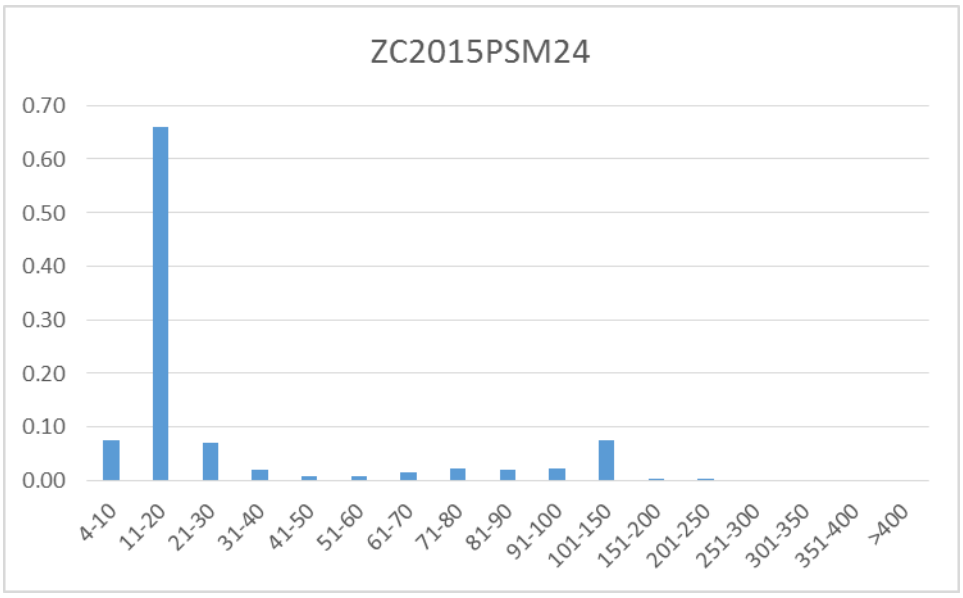

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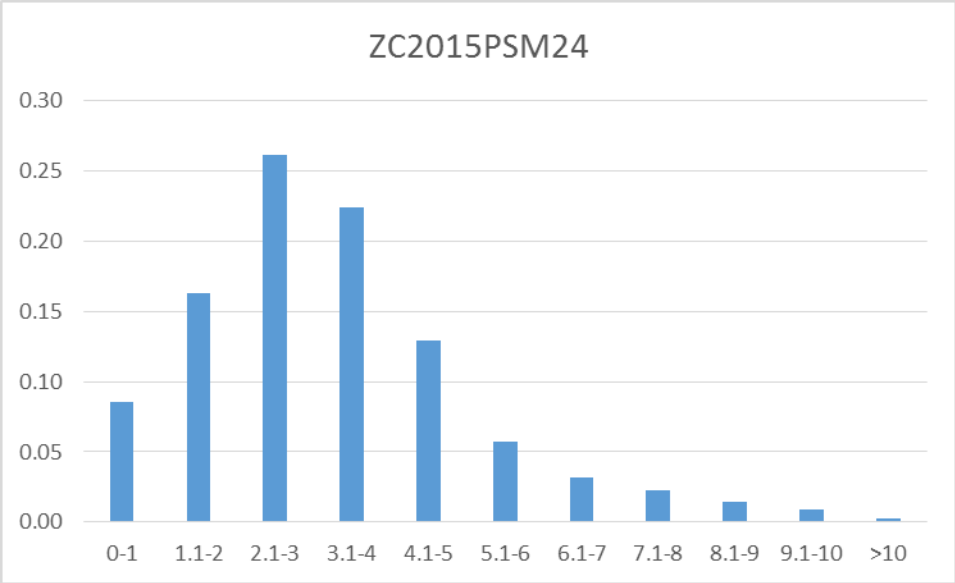

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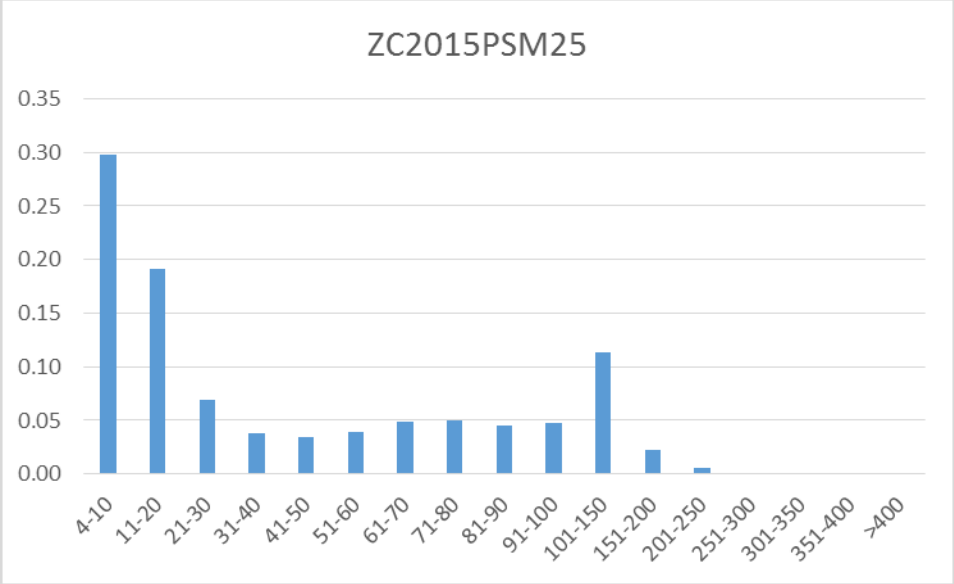

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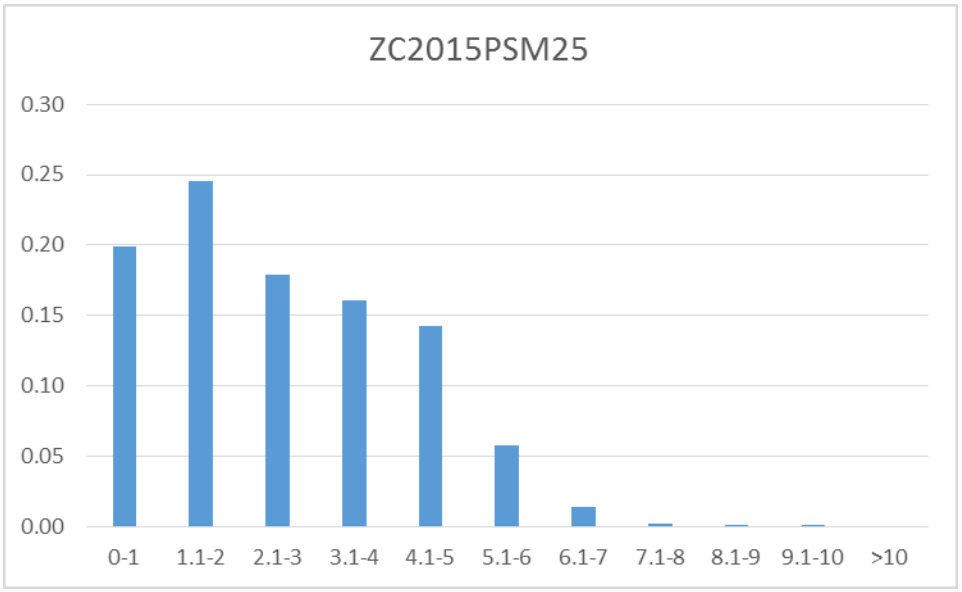

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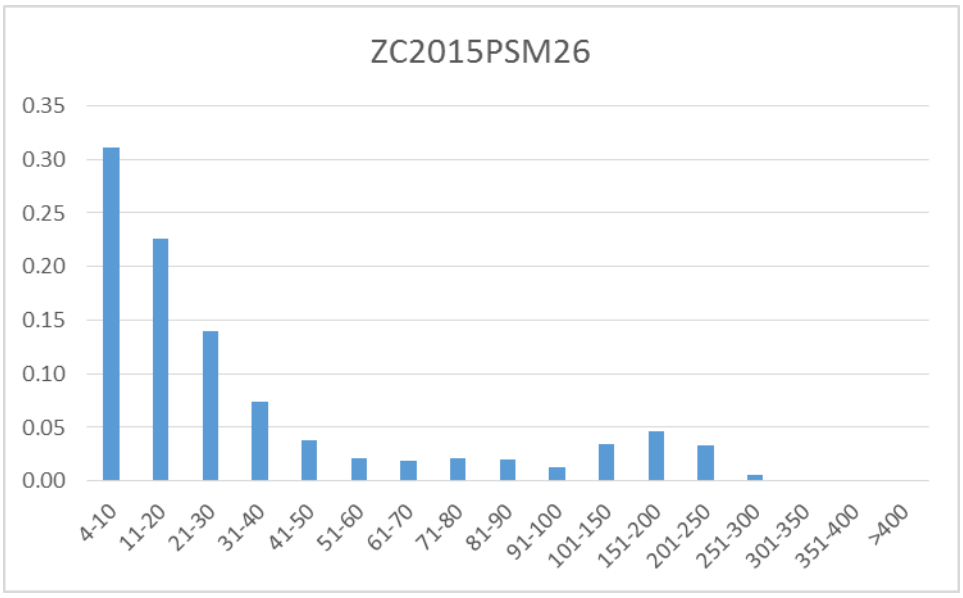

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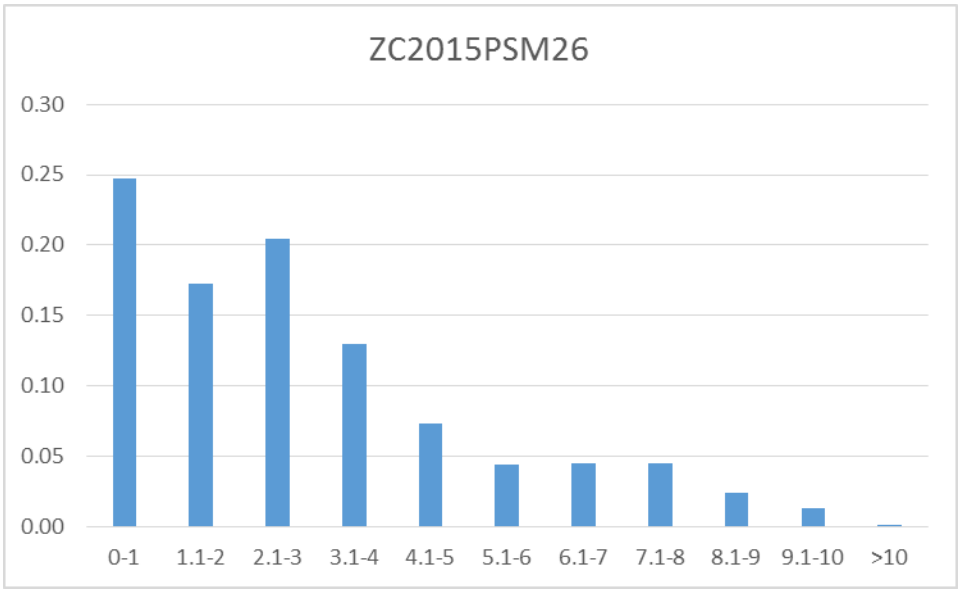

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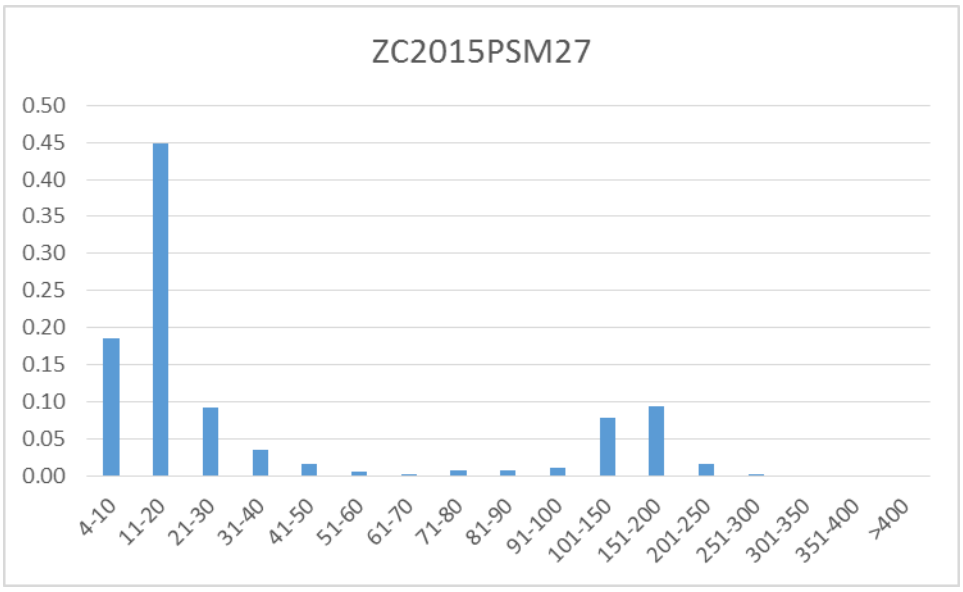

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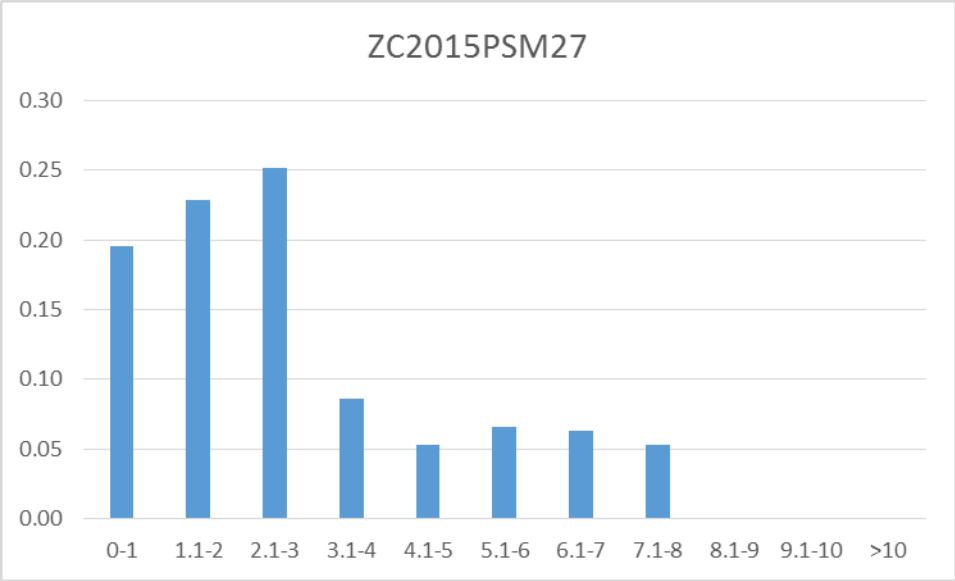

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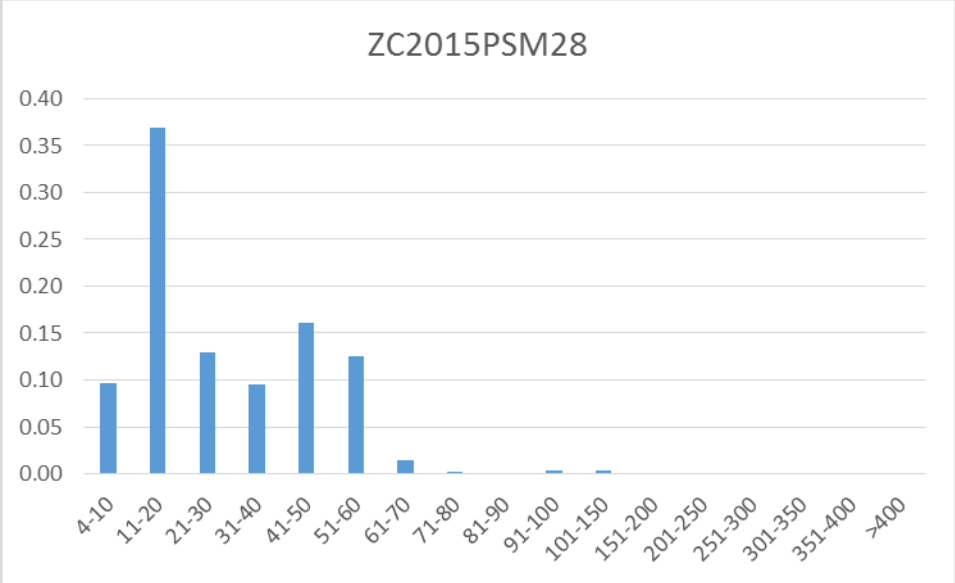

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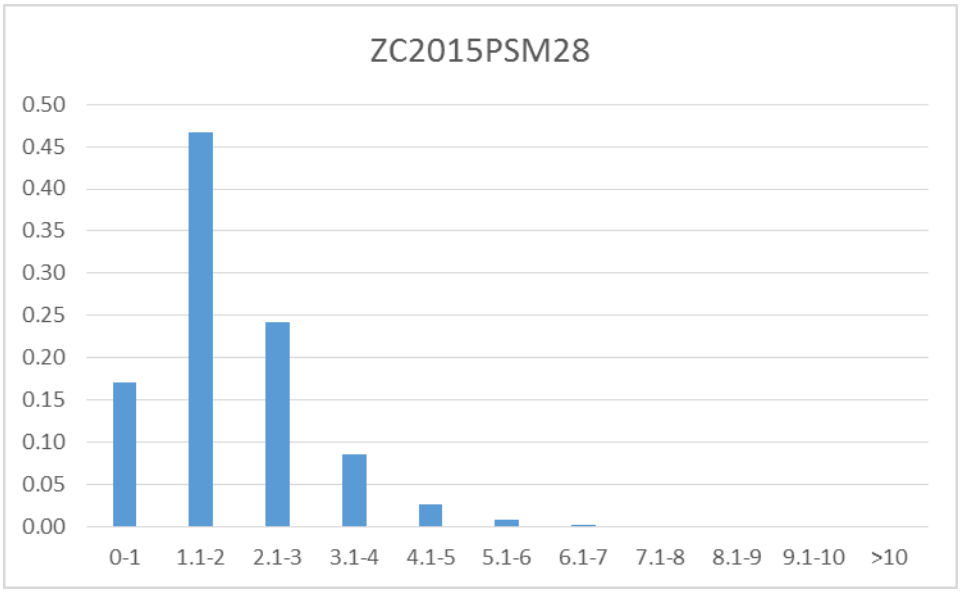

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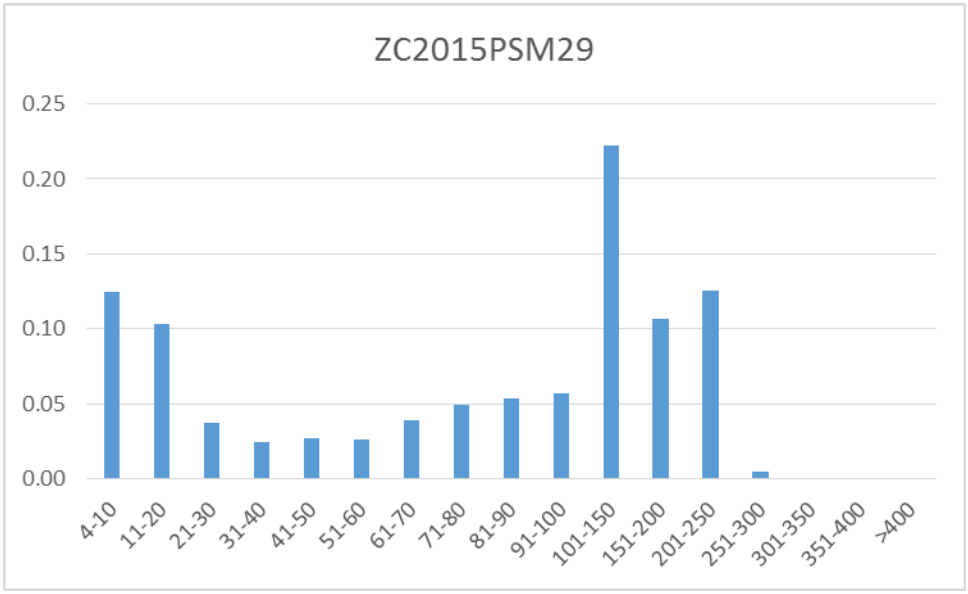

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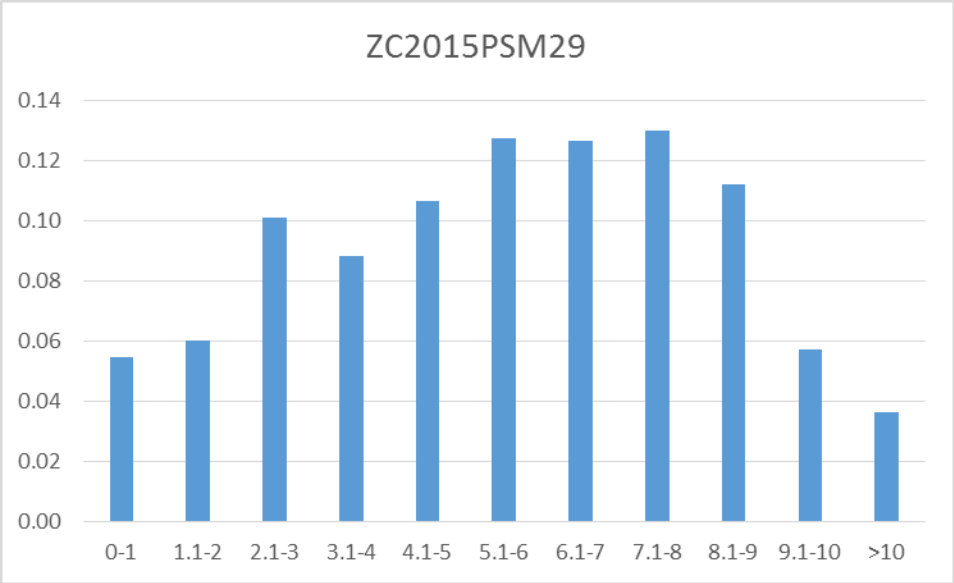

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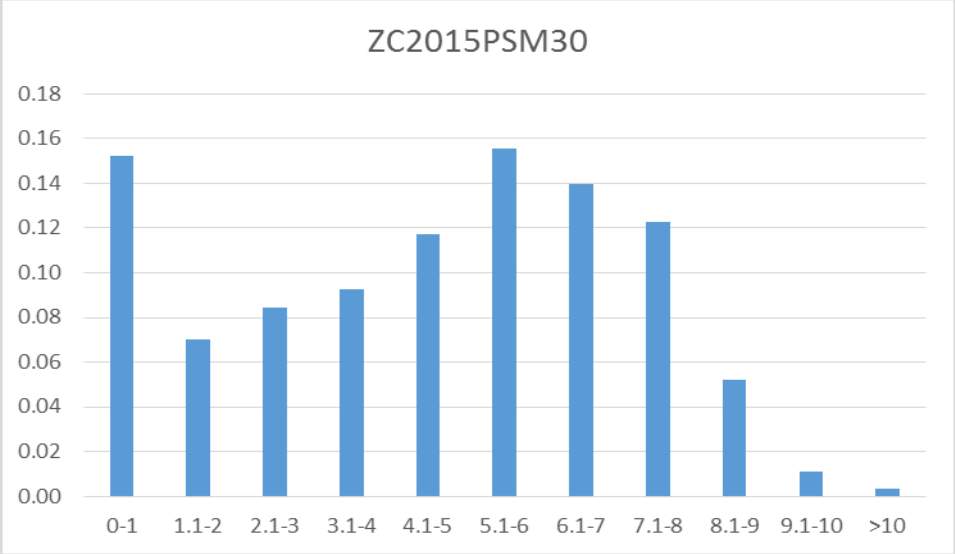

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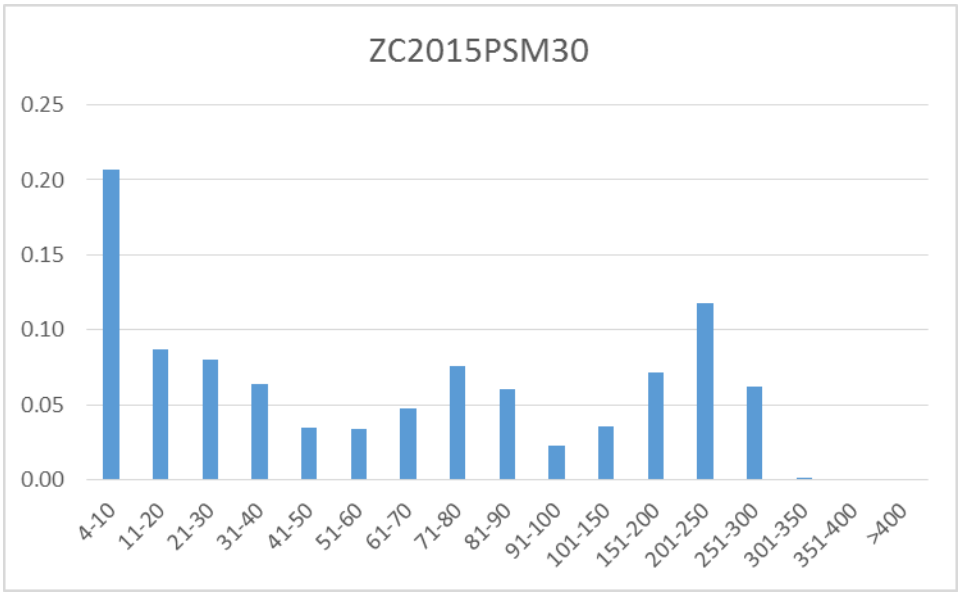
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81-90
91-100
101-150
151-200
201-250
251-300
301-350
351-400
>400

Depth

Appendix 2. Counts of California sea lions at Bangor, Bremerton, Everett and Manchester Navy facilities, 2014 – 2016, conducted by Navy, Washington Department of Fish and Wildlife and NMFS/AFSC/NMML.

Table A. Individual counts at Bangor.

Date	Zc	Date	Zc	Date	Zc	Date	Zc
1/13/2014	48	10/14/2014	64	7/14/2015	0	3/29/2016	72
1/23/2014	2	10/21/2014	84	7/21/2015	1	4/5/2016	106
1/28/2014	43	11/4/2014	61	7/28/2015	0	4/12/2016	61
2/6/2014	26	11/10/2014	81	8/4/2015	3	4/19/2016	49
2/18/2014	15	11/18/2014	91	8/11/2015	3	4/26/2016	62
2/25/2014	42	11/25/2014	81	8/18/2015	2	5/3/2016	39
3/4/2014	65	12/2/2014	61	8/25/2015	3	5/10/2016	18
3/11/2014	56	12/9/2014	18	9/1/2015	24	5/17/2016	11
3/18/2014	62	12/16/2014	28	9/8/2015	6	5/24/2016	6
3/25/2014	15	12/30/2014	19	9/15/2015	11	5/31/2016	11
4/1/2014	49	1/6/2015	35	9/22/2015	25	6/7/2016	5
4/8/2014	37	1/14/2015	24	9/29/2015	30	6/14/2016	2
4/15/2014	27	1/21/2015	27	10/6/2015	41	6/21/2016	0
4/22/2014	22	1/27/2015	36	10/13/2015	86	6/28/2016	0
4/29/2014	17	2/3/2015	32	10/20/2015	74	7/5/2016	1
5/6/2014	17	2/10/2015	17	10/27/2015	113	7/12/2016	2
5/13/2014	6	2/17/2015	16	11/3/2015	81	7/18/2016	0
5/20/2014	8	2/24/2015	12	11/9/2015	102	8/2/2016	0
6/3/2014	2	3/3/2015	46	11/10/2015	100	8/9/2016	0
6/10/2014	1	3/10/2015	26	11/17/2015	5	8/16/2016	4
6/17/2014	0	3/17/2015	55	11/24/2015	23	8/23/2016	2
6/24/2014	1	3/24/2015	37	12/1/2015	81	9/6/2016	20
7/1/2014	0	3/31/2015	42	12/8/2015	65	9/13/2016	21
7/8/2014	0	4/7/2015	48	12/22/2015	118	9/20/2016	28
7/15/2014	0	4/14/2015	29	12/29/2015	33	9/27/2016	18
7/22/2014	0	4/21/2015	12	1/5/2016	10	10/4/2016	13
7/29/2014	3	4/28/2015	14	1/12/2016	1	10/11/2016	31
8/5/2014	11	5/5/2015	12	1/19/2016	2	10/18/2016	35
8/12/2014	11	5/12/2015	2	1/26/2016	16	10/25/2016	99
8/19/2014	15	5/19/2015	0	2/2/2016	27	11/1/2016	131
8/26/2014	18	5/26/2015	1	2/10/2016	8	11/7/2016	130
9/2/2014	18	6/2/2015	3	2/16/2016	16	11/15/2016	69
9/9/2014	35	6/9/2015	8	2/23/2016	56	11/22/2016	35
9/16/2014	26	6/18/2015	2	3/1/2016	48	11/29/2016	96
9/23/2014	44	6/23/2015	0	3/8/2016	65	12/13/2016	74
9/30/2014	42	6/30/2015	0	3/15/2016	95		
10/7/2014	60	7/7/2015	1	3/22/2016	104		

Table B. Individual counts at Bremerton.

Date	Zc	Date	Zc	Date	Zc	Date	Zc
2/3/2014	28	6/3/2014	6	3/10/2015	0	2/4/2016	0
2/4/2014	28	6/10/2014	2	3/17/2015	4	2/11/2016	2
2/5/2014	28	6/24/2014	0	3/25/2015	4	2/16/2016	5
2/6/2014	13	7/1/2014	0	3/31/2015	1	2/16/2016	4
2/17/2014	17	7/1/2014	0	4/7/2015	3	2/23/2016	4
2/18/2014	8	7/1/2014	0	4/14/2015	2	2/24/2016	2
2/19/2014	44	7/1/2014	0	4/18/2015	4	3/8/2016	16
2/25/2014	34	7/1/2014	0	4/21/2015	2	3/9/2016	0
3/4/2014	25	7/1/2014	0	4/28/2015	0	3/11/2016	12
3/6/2014	2	7/1/2014	0	5/12/2015	0	3/11/2016	23
3/6/2014	6	7/1/2014	0	5/19/2015	2	3/14/2016	13
3/6/2014	13	7/1/2014	0	5/26/2015	2	3/15/2016	28
3/6/2014	15	7/8/2014	0	6/9/2015	0	3/18/2016	14
3/6/2014	16	7/15/2014	0	6/15/2015	5	3/29/2016	11
3/6/2014	14	7/16/2014	0	6/18/2015	3	3/31/2016	16
3/11/2014	35	7/22/2014	0	6/23/2015	0	4/1/2016	11
3/13/2014	18	7/24/2014	0	6/30/2015	0	4/10/2016	8
3/13/2014	19	7/29/2014	0	7/8/2015	0	4/12/2016	8
3/13/2014	21	8/12/14	0	7/14/2015	0	4/19/2016	29
3/13/2014	21	8/19/14	0	7/15/2015	0	4/22/2016	27
3/13/2014	25	8/26/14	0	7/21/2015	1	4/26/2016	3
3/13/2014	25	8/27/14	34	7/28/2015	1	4/27/2016	16
3/13/2014	26	9/16/14	54	8/4/2015	3	5/5/2016	7
3/13/2014	25	9/17/14	68	8/11/2015	9	5/10/2016	11
3/13/2014	29	10/29/14	133	8/18/2015	5	5/11/2016	8
3/13/2014	28	11/6/2014	168	8/18/2015	7	5/17/2016	4
3/18/2014	39	11/18/2014	156	8/25/2015	0	5/19/2016	9
3/18/2014	37	11/18/14	116	9/1/2015	41	5/20/2016	6
3/21/2014	24	11/21/2014	79	9/8/2015	55	5/24/2016	8
3/21/2014	23	11/24/2014	174	9/15/2015	83	5/25/2016	6
3/25/2014	11	12/4/2014	134	9/15/2015	69	5/31/2016	4
3/26/2014	2	12/5/2014	128	9/16/2015	120	6/2/2016	10
3/27/2014	23	12/10/2014	79	9/18/2015	87	6/14/2016	3
4/1/2014	15	12/16/14	55	9/22/2015	72	6/15/2016	9
4/1/2014	16	12/17/2014	44	9/29/2015	95	6/21/2016	1

4/1/2014	18	12/21/2014	45	10/13/2015	104	6/22/2016	3
4/1/2014	20	12/23/2014	47	10/20/2015	57	6/24/2016	2
4/1/2014	18	12/28/2014	52	10/21/2015	162	6/27/2016	0
4/4/2014	16	12/29/2014	36	10/22/2015	91	6/28/2016	0
4/8/2014	5	12/30/2014	47	11/3/2015	242	7/6/2016	0
4/9/2014	4	1/2/2015	11	11/10/2015	141	7/12/2016	0
4/14/2014	10	1/5/2015	27	11/16/2015	232	7/26/2016	0
4/15/2014	7	1/5/2015	0	11/17/2015	5	8/9/2016	11
4/22/2014	5	1/6/2015	42	11/22/2015	190	8/16/2016	8
4/29/2014	6	1/8/2015	32	11/24/2015	46	8/19/2016	15
5/2/2014	0	1/11/2015	27	11/30/2015	125	8/23/2016	20
5/6/2014	1	1/12/2015	46	12/1/2015	137	9/2/2016	25
5/6/2014	1	1/14/2015	18	12/6/2015	5	9/13/2016	21
5/6/2014	2	1/16/2015	25	12/7/2015	6	9/14/2016	71
5/6/2014	2	1/17/2015	36	12/8/2015	106	9/15/2016	77
5/6/2014	2	1/18/2015	36	12/8/2015	6	9/20/2016	0
5/6/2014	2	1/20/2015	33	12/10/2015	45	9/21/2016	79
5/6/2014	2	1/21/2015	24	12/14/2015	111	9/22/2016	70
5/6/2014	2	1/27/2015	16	12/15/2015	0	9/27/2016	1
5/13/2014	1	1/31/2015	23	12/18/2015	19	10/4/2016	54
5/20/2014	1	2/2/2015	22	12/22/2015	115	10/11/2016	0
6/3/2014	5	2/3/2015	18	12/29/2015	24	10/18/2016	44
6/3/2014	6	2/4/2015	21	1/4/2016	6	10/25/2016	108
6/3/2014	7	2/10/2015	15	1/5/2016	8	11/7/2016	68
6/3/2014	5	2/12/2015	12	1/6/2016	8	11/15/2016	52
6/3/2014	6	2/17/2015	9	1/16/2016	2	11/22/2016	56
6/3/2014	6	2/24/2015	12	1/19/2016	2	11/29/2016	17
6/3/2014	5	3/3/2015	3	1/26/2016	1	12/14/2016	112
6/3/2014	6	3/9/2015	0	1/27/2016	17	12/16/2016	83

Table C. Individual counts at Everett.

Date	Zc	Date	Zc	Date	Zc	Date	Zc
1/3/2014	11	7/1/2014	0	12/23/2014	14	6/9/2015	1
1/7/2014	64	7/8/2014	0	12/30/2014	17	6/16/2015	0
1/13/2014	25	7/12/2014	15	1/5/2015	28	6/23/2015	2
1/21/2014	15	7/15/2014	0	1/5/2015	29	6/30/2015	0
1/22/2014	15	7/18/2014	17	1/7/2015	33	7/14/2015	2
1/28/2014	25	7/22/2014	1	1/8/2015	23	7/21/2015	2
1/30/2014	26	7/29/2014	0	1/13/2015	19	7/21/2015	2

2/12/2014	51	8/12/2014	10	1/14/2015	22	7/28/2015	0
2/14/2014	51	8/13/2014	20	1/20/2015	29	8/11/2015	6
2/18/2014	48	8/15/2014	20	1/21/2015	18	8/18/2015	12
2/24/2014	71	8/20/2014	20	1/22/2015	9	8/25/2015	38
2/25/2014	70	8/26/2014	34	1/26/2015	14	9/23/2015	100
2/26/2014	70	9/8/2014	488	1/27/2015	26	9/29/2015	126
3/3/2014	67	9/9/2014	46	1/29/2015	36	10/13/2015	132
3/5/2014	66	9/10/2014	44	2/4/2015	47	10/20/2015	112
3/6/2014	81	9/15/2014	53	2/10/2015	18	10/28/2015	39
3/6/2014	80	9/16/2014	64	2/17/2015	29	11/3/2015	104
3/10/2014	51	9/16/2014	54	2/19/2015	30	11/10/2015	93
3/12/2014	74	9/23/2014	62	2/20/2015	49	11/17/2015	14
3/13/2014	78	9/24/2014	77	2/23/2015	42	12/1/2015	56
3/13/2014	73	9/30/2014	54	2/24/2015	38	12/28/2015	32
3/17/2014	75	10/1/2014	102	2/26/2015	27	1/13/2016	27
3/18/2014	86	10/3/2014	108	3/2/2015	23	1/20/2016	29
3/21/2014	65	10/6/2014	103	3/10/2015	36	1/26/2016	17
3/25/2014	26	10/8/2014	62	3/11/2015	33	2/1/2016	32
3/26/2014	35	10/14/2014	110	3/16/2015	37	2/9/2016	33
3/27/2014	38	10/16/2014	132	3/17/2015	56	2/16/2016	47
4/1/2014	59	10/17/2014	103	3/19/2015	43	2/16/2016	49
4/4/2014	52	10/20/2014	127	3/23/2015	56	2/23/2016	36
4/8/2014	47	10/21/2014	102	3/24/2015	60	3/1/2016	4
4/10/2014	53	10/23/2014	106	3/31/2015	66	3/7/2016	34
4/15/2014	38	10/27/2014	113	4/2/2015	61	3/14/2016	52
4/21/2014	54	10/28/2014	60	4/6/2015	57	3/21/2016	81
4/22/2014	23	10/29/2014	102	4/8/2015	55	3/21/2016	84
4/29/2014	46	11/5/2014	128	4/14/2015	66	3/28/2016	113
5/2/2014	10	11/12/2014	108	4/16/2015	64	4/4/2016	174
5/6/2014	34	11/14/2014	101	4/20/2015	65	4/11/2016	215
5/13/2014	16	11/17/2014	98	4/22/2015	54	4/19/2016	192
5/13/2014	14	11/18/2014	132	4/27/2015	51	4/25/2016	182
5/20/2014	12	11/24/2014	83	4/28/2015	57	4/25/2016	187
5/27/2014	10	11/25/2014	109	4/30/2015	52	5/5/2016	135
5/29/2014	11	11/28/2014	72	5/4/2015	57	5/10/2016	115
6/3/2014	6	12/2/2014	62	5/11/2015	69	5/16/2016	93
6/10/2014	0	12/3/2014	42	5/12/2015	40	5/23/2016	102
6/16/2014	0	12/9/2014	25	5/14/2015	75	5/23/2016	104
6/17/2014	3	12/11/2014	24	5/18/2015	50	5/31/2016	64
6/20/2014	0	12/12/2014	53	5/19/2015	41	6/6/2016	24

6/24/2014	0	12/16/2014	39	5/26/2015	24
6/25/2014	0	12/17/2014	20	5/27/2015	27
6/30/2014	0	12/22/2014	34	6/3/2015	18

Table D. Individual counts at Manchester.

Date	Zc	Date	Zc	Date	Zc	Date	Zc
1/7/2014	35	7/24/2014	0	3/17/2015	30	1/19/2016	33
1/8/2014	39	7/29/2014	0	3/18/2015	52	1/26/2016	21
1/14/2014	110	8/7/2014	2	3/31/2015	46	1/27/2016	40
1/15/2014	80	8/12/2014	0	4/14/2015	28	2/4/2016	0
1/16/2014	91	9/9/2014	3	4/21/2015	23	2/11/2016	16
1/17/2014	65	9/23/2014	1	4/28/2015	38	2/16/2016	97
1/21/2014	65	10/6/2014	0	5/11/2015	60	2/18/2016	79
1/24/2014	40	10/14/2014	24	5/12/2015	34	2/19/2016	21
1/27/2014	33	10/21/2014	130	5/19/2015	33	2/23/2016	56
2/5/2014	0	10/28/2014	104	5/26/2015	22	2/24/2016	43
2/25/2014	0	11/3/2014	97	6/9/2015	13	3/11/2016	41
3/5/2014	3	11/10/2014	101	6/18/2015	0	3/14/2016	0
3/6/2014	0	11/18/2014	74	6/23/2015	0	3/18/2016	30
3/13/2014	5	11/25/2014	128	7/15/2015	0	3/21/2016	23
3/21/2014	29	12/2/2014	90	7/24/2015	2	3/31/2016	100
3/26/2014	15	12/9/2014	77	7/28/2015	0	4/1/2016	48
3/27/2014	30	12/16/2014	117	8/11/2015	2	4/7/2016	70
3/28/2014	29	12/23/2014	94	8/18/2015	1	4/10/2016	100
4/1/2014	0	12/30/2014	64	8/25/2015	1	4/22/2016	80
4/4/2014	32	1/5/2015	30	9/8/2015	0	4/27/2016	83
4/10/2014	34	1/8/2015	36	9/15/2015	26	5/5/2016	90
4/14/2014	34	1/12/2015	89	9/22/2015	47	5/11/2016	31
4/14/2014	43	1/14/2015	60	9/29/2015	0	5/19/2016	30
4/22/2014	36	1/16/2015	65	10/13/2015	21	5/20/2016	40
5/2/2014	23	1/21/2015	47	10/20/2015	32	5/23/2016	88
5/6/2014	25	1/22/2015	61	10/27/2015	16	6/2/2016	22
5/6/2014	40	1/27/2015	57	11/3/2015	30	6/22/2016	0
5/8/2014	29	2/4/2015	24	11/10/2015	41	6/24/2016	0
5/21/2014	18	2/10/2015	27	11/17/2015	25	9/2/2016	0
6/2/2014	2	2/12/2015	35	11/24/2015	56	9/21/2016	0
6/18/2014	2	2/17/2015	13	12/8/2015	26	10/24/2016	0

7/1/2014	0	2/24/2015	19	12/15/2015	75	12/29/2016	33
7/2/2014	0	2/27/2015	16	12/22/2015	63		
7/15/2014	0	3/6/2015	24	1/5/2016	39		
7/22/2014	0	3/10/2015	22	1/6/2016	35		