



Pacific Region

CALIFORNIA SEA LION ABUNDANCE ESTIMATION IN CANADA, 2020–21

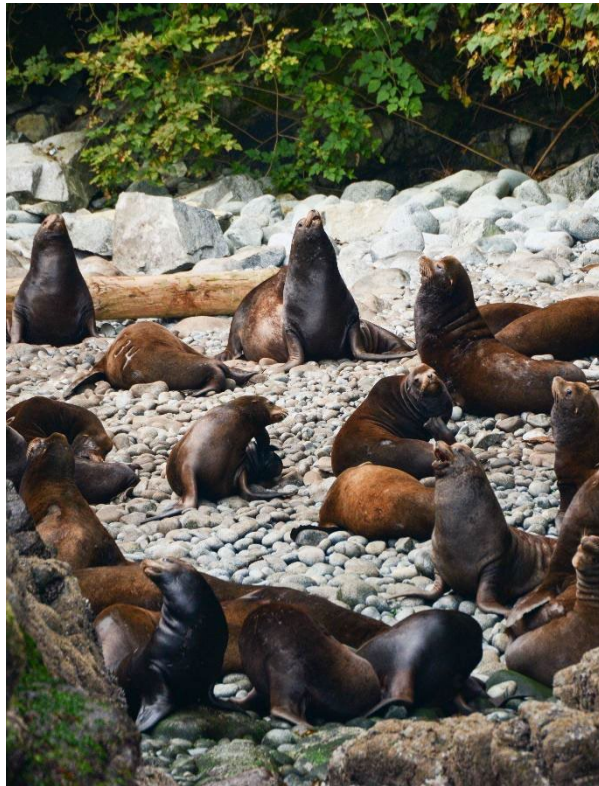


Photo (W. Szaniszló): Male California Sea Lions.

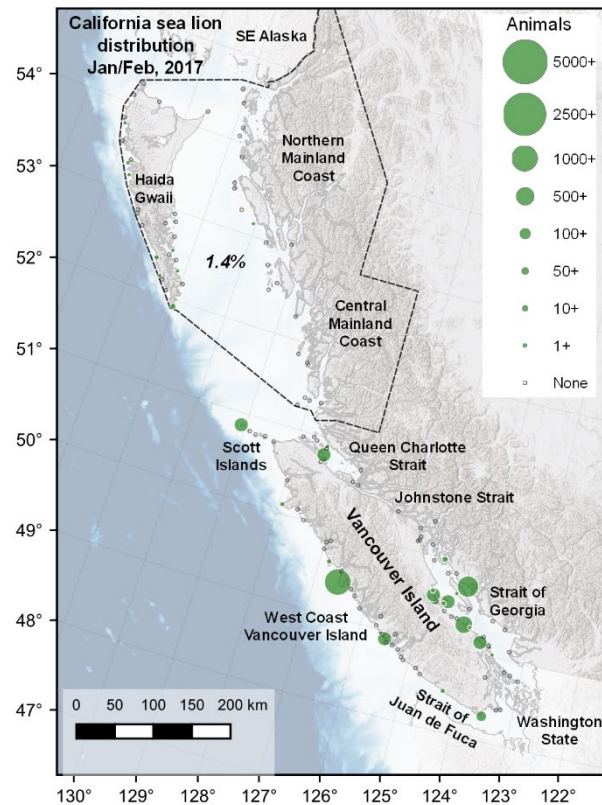


Figure 1. Distribution of California Sea Lions counted during winter surveys in 2017.

Context:

The United States (US) population of California Sea Lions (CSL) range from southeast Alaska to the Pacific coast of central Mexico. While this population does not breed in Canada, some sub-adult and adult males migrate northwards to British Columbia (BC) during the non-breeding season with an arrival in August-October and a departure in April-May. The population in coastal BC has not been fully assessed since 1985. However, opportunistic counts suggest that California Sea Lions overwintering in BC increased in abundance from approximately 1,000 animals in the mid-2000s to several thousand individuals in more recent years.

Resource Management requested that Science provide an updated estimate of the current population size and distribution, and the Potential Biological Removal (PBR) for California Sea Lions in coastal BC based on dedicated surveys in 2020–21. This information will support the Department in meeting requirements for an updated California Sea Lion population assessment for Canadian Pacific waters as required under the US Marine Mammal Protection Act (MMPA) bycatch provisions.

This Science Advisory Report is from the October 24–28, 2022 National Marine Mammal Peer Review Committee meeting on Population Status Assessment for California Sea Lions in British Columbia. Additional publications from these meetings will be posted on the [Fisheries and Oceans Canada \(DFO\) Science Advisory Schedule](#) as they become available.

SUMMARY

- Abundance of California Sea Lions overwintering in southern British Columbia (BC) was estimated through five monthly aerial photographic surveys conducted from November 2020 to March 2021. The surveys were restricted to southern BC as few animals have been documented further north.
- California Sea Lion abundance was also estimated from the 2009-10 and 2017 Steller Sea Lion surveys which covered all sea lion haulouts in BC.
- To account for sea lions at sea and therefore not photographed during surveys, monthly correction factors derived from satellite tags deployed on sea lions in nearby Puget Sound (Washington, US) between 2014–16, were applied.
- The surveys flown in winter of 2009–10 and 2017 estimated 4,200 (95% CI 3,600–4,900) and 11,800 (95% CI 9,900–4,000) California Sea Lions, respectively.
- A mean abundance of 13,600 (95% CI 11,300–16,300) California Sea Lions was estimated in 2020–21. This represents a threefold increase since 2009–10 and no significant increase since 2017.
- While abundance remained consistent across monthly surveys in 2020–21, there was redistribution of animals.
- Potential Biological Removal (PBR) for 2020–21 in BC, using a recovery factor of 1.0 and adjusting for the proportion of time California Sea Lions spent in BC, was 433 individuals.

BACKGROUND

Species Biology

Following the implementation of the *Marine Mammal Protection Act* in 1975, the US population of California Sea Lions (*Zalophus californianus*) recovered from commercial harvest and predator control measures. In recent years, the population has stabilized around carrying capacity, and was last estimated to be 257,606 animals in 2014. The associated Potential Biological Removal (PBR) was estimated to be 14,011 sea lions per year.

The US population of California Sea Lions breeds at rookery sites in southern California and the Coronados Islands (Mexico) during May-June, after which sub-adult and adult males typically migrate northward over the fall and winter to sites in Oregon, Washington, and British Columbia (BC) with a limited number of sightings in southern Alaska. California Sea Lions are an indicator species for the California Current Ecosystem, with survival of pups and yearlings strongly linked to both large and small-scale changes in ocean conditions within the ecosystem. Animals start arriving in coastal BC as early as August, and often share haulout sites with Steller Sea Lions. Typically large numbers of individuals are observed by October, with a departure from BC waters by May. An average residency of seven months (from October to the end of April), was used to represent the period during which the majority of the animals remain in BC.

California Sea Lions are highly mobile, and animals range widely during the non-breeding season with their distribution thought to be highly influenced by prey availability. There is

evidence that the proportion of the total population overwintering in BC has increased in recent years, and that the range of overwintering haulouts has expanded in southern BC (Figure 1). These increases in abundance and range in Canadian Pacific waters have raised questions over the past decade about potential impacts on local ecosystems, including competition for prey resources, and impacts on local fisheries.

ASSESSMENT

Overwintering Abundance

A series of five standardized aerial surveys of southern BC sea lion haulout sites was completed from November 2020 through March 2021. The monthly surveys were restricted to southern BC as few animals have been documented further north (Figure 1). As California Sea Lions are considered to be highly transitory, the replicate surveys allowed for an exploration of the temporal variation in counts and abundance in BC over the winter period.

Monthly counts ranged from ~5,400 to 6,200 California Sea Lions over the winter surveys. There was limited variation in the total count from month to month, and as a result the counts were relatively stable with a maximum difference of 12.5% between months.

The total population overwintering in Canadian Pacific waters was estimated by applying monthly species-specific correction factors to counts of animals hauled out on land to account for animals that were at sea and missed during surveys. Correction factors were developed for California Sea Lions tagged in neighboring Washington State in an area contiguous with southern survey areas in BC. Adjusting for animals not hauled out at the time of the survey, the monthly winter population estimates ranged from 12,800 to 14,600 individuals, leading to an average total abundance of California Sea Lions estimated to be overwintering in BC in 2020–21 of 13,600 (95% CI 11,300–16,300) individuals (Figure 2a). This represents a three-fold increase from the 4,200 (95% CI 3,600–4,900) California Sea Lions estimated to be overwintering in coastal BC during winter 2009–10, and no significant increase since the 11,800 (95% CI 9,900–14,000) sea lions estimated in 2017 (Figure 2b).

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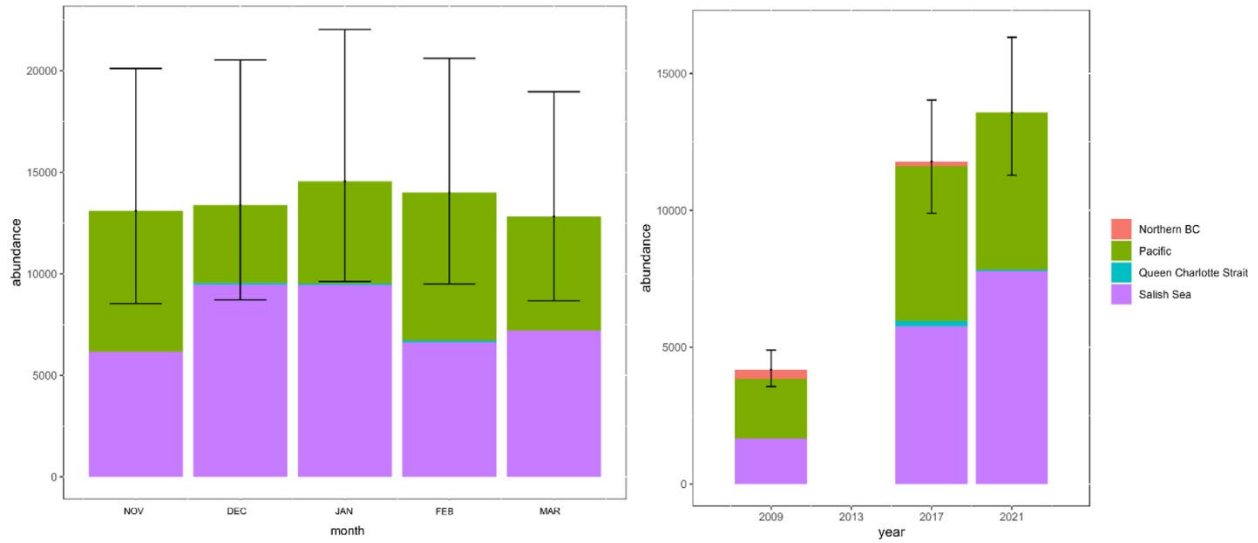


Figure 2. Average estimated abundance with 95% Confidence Intervals (CI) of California Sea Lions hauled out during a) monthly 2020–2021 winter sea lion surveys (November–March) and b) 2009–2021 winter sea lion surveys.

Distribution

While on average 51% of animals were found in the Salish Sea region, 49% in the Pacific region and <1% in the Queen Charlotte Strait region, there was redistribution of animals among sites and regions throughout the winter months (Figures 2 and 3). Animals appear to have progressively become more concentrated at select sites over the winter, possibly to exploit concentrations of the late-winter herring spawn.

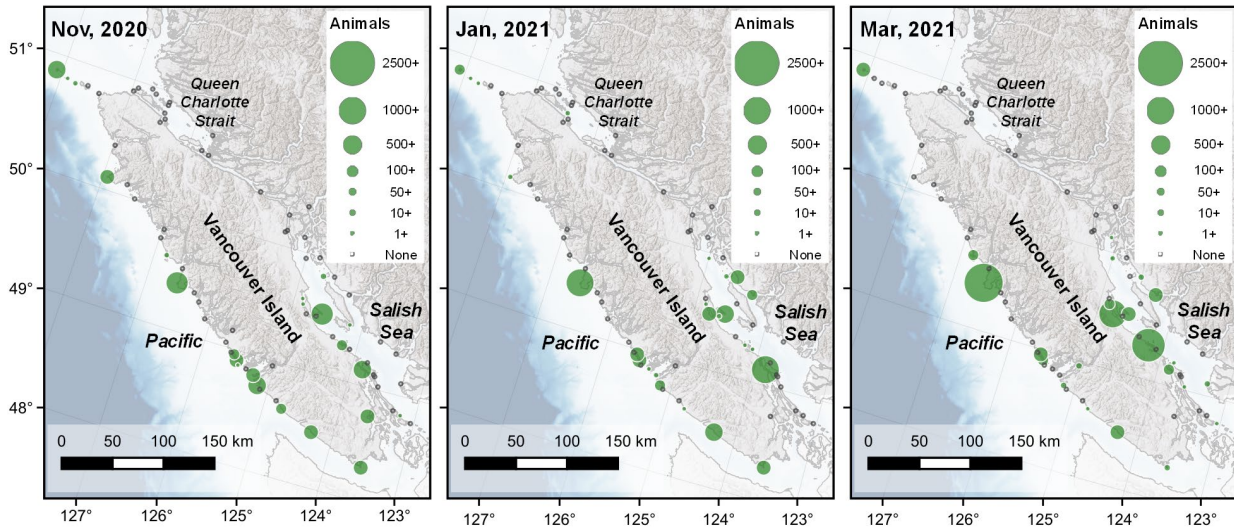


Figure 3. Map showing distribution of California Sea Lions counted in southern British Columbia during winter 2020–2021. Symbol sizes are proportional to the total number of animals counted at each site. Black circles indicate sites that were surveyed with no animals present.

Potential Biological Removal (PBR)

The PBR for the portion of California Sea Lions overwintering in Canadian Pacific waters is 433 when calculated using an N_{MIN} of 12,539, a recovery factor of 1.0 and the default R_{MAX} of 12%. A recovery factor of 1.0 was used for this population due to its overall abundance, its expanded use of haulout sites, and the available data. PBR takes into account all removals (e.g., aquaculture sites, bycatch, harvest).

Sources of Uncertainty

California Sea Lions are highly mobile, and their distribution is strongly linked to key prey species. Although all known haulout sites in southern BC were surveyed, and we assume numbers of animals migrating to northern BC remains low, it is possible that animals at previously unknown haulout sites were missed.

There is uncertainty associated with applying the correction factors for animals captured in Washington in 2014–16 to animals overwintering in BC in from 2009–21. Behaviour could be different between animals foraging in different locations and in different years.

There is uncertainty associated with the timing of arrival and departure of animals in BC, potentially affecting estimates of residence time. This may affect our estimate of PBR as we corrected the annual PBR for the amount of time animals are found in BC. Furthermore, if only male California Sea Lions are present in BC, the underlying assumptions of PBR are not being respected and therefore, the resulting value may not accomplish the intended management objective.

CONCLUSIONS AND ADVICE

The mean total abundance estimate for California Sea Lions overwintering in BC waters in 2020–21 was 13,600 (95% CI 11,300–16,300) individuals. This represents a threefold increase since 2009–10, and no significant increase since 2017. While abundance remained consistent across monthly surveys in 2020–21, there was a redistribution of animals. The PBR for California Sea Lions overwintering in BC, based on the average estimated abundance in winter 2020–21 and adjusted for the proportion of time spent in BC, was 433 individuals.

OTHER CONSIDERATIONS

The threefold increase in animals overwintering in Canadian Pacific waters since 2009–10 cannot be solely explained by an increase in the overall US population of California Sea Lions, which appears to have stabilized in recent years. A redistribution/increase in the proportion of males overwintering in coastal BC may be linked to changes in prey availability in other parts of the range.

Assessments of potential resource competition with Steller Sea Lions would benefit from consideration of abundance, distribution, and diet of California Sea Lions.

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SOURCES OF INFORMATION

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Carretta, J.V., Oleson, E.M., Forney, K.A., Muto, M.M., Weller, D.W., Lang, A.R., Baker, J., Hanson, B., Orr, A.J., Barlow, J., Moore, J.E. and Brownell Jr., R.L. 2022. US Pacific marine mammal stock assessments: 2021. US Department of Commerce, NOAA Technical Memorandum NMFS-SWFSC-663.

Delong, R.L., Melin, S.R., Harris, J.D., Gearin, P., Orr, A.J., Laake, J.L., Jeffries, S., Lambourn, D., and Oliver, J. 2017. 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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