# Marine Mammals – Steller Sea Lion Distribution

## description

Steller sea lions *(Eumetopias jubatus)* are one of two species of sea lions found in the BC Marine Conservation Analysis (BCMCA) study area. Often found together with California sea lions, they are tan to chocolate brown in colour and are larger, with the males weighing up to 1000 kilograms and reaching 3 metres in length. Steller sea lions have a mane of fur around their neck and their vocalizations sound like roars.

There are two genetically distinct populations that inhabit the cool-temperate coastal waters of the North Pacific Ocean from California, north to the Bering Strait, and south along the Asian coast to Japan, the eastern and western populations. They are the largest member of the family *Otariidae* and the only one that resides year-round and breeds in Canadian waters. To breed, sea lions tend to return to the same location where they were born and breeding takes place primarily during June and July. Breeding locations are usually rocky outcrops called rookeries. During summer, non-breeding animals congregate and rest at year-round haulout sites. All age groups and both genders use these haulouts locations during the rest of the year when they are not foraging at sea. Some haulouts are used only during winter; these tend to be found in more protected waters.

Data illustrated are modelled values representing the distribution of Steller sea lions in terms of relative densities. These density estimates are based upon sea lion observations recorded during systematic surveys in the summers of 2004, 2005 and 2006, and environmental parameters including latitude, longitude, and depth. Survey results and modelling work has been peer reviewed (Williams and O'Hara, 2010; Williams and Thomas, 2007). Distribution illustrated here is restricted to the extents surveyed (Figure 1).

Data were received in 2010 as points with values and coordinates. The points were plotted and converted to a comprehensive 2 nautical mile by 2 nautical mile grid. Density values were classified for illustration into 8 classes based on Jenks natural breaks classification. The Jenks' natural breaks classification scheme (automated in ESRI ArcGIS software) (Jenks, 1977 and Fisher, 1958) determines the best arrangement of values into classes by iteratively comparing sums of the squared difference between observed values within each class and class means. The "best" classification identifies breaks in the ordered distribution of values that minimizes within-class sum of squared differences, and thus identifies classes that are most homogenous within.

Estimated density values range from zero to seven sea lions per square kilometre and the vast majority of density values are at the low end of the range.

PHOTO: RUTH JOY

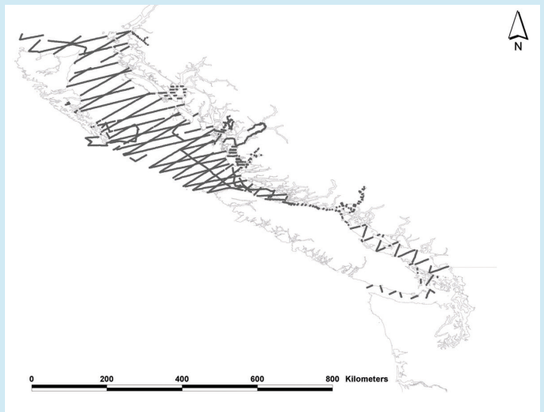


FIGURE 1. TRACKLINES THAT ILLUSTRATE THE SPATIAL EXTENTS OF RELATED SURVEY EFFORT.

## data sources

- Rob Williams, UBC Marine Mammal Research Unit

## data resolution

- Estimates were generated for midpoints of grid cells measuring 2 nautical miles by 2 nautical miles. The data are illustrated in this grid cell format.

## date of analysis

- Peer-reviewed publications describing data collection and estimation of distribution and abundance were published in 2007 and 2010.

## date collected

- Systematic sighting surveys were undertaken in the summers of 2004, 2005 and 2006.

## reviewers

- Rob Williams, UBC Marine Mammal Research Unit

## reviewer comments

- None provided.

## caveats of use

- Modelled distribution is for the area covered by systematic surveys, and during the temporal extent of the surveys (Figure 1). While data are lacking for areas and seasons beyond the illustrated data, this does not imply these areas are of no importance to marine mammals.
- Survey data for two additional years may be available from Raincoast Conservation. Recommend compiling all years of data. See: *www.raincoast.org/files/WAS_report/whats_at_stake_ver1.pdf*
- Recommended date of expiry for use of these data in a marine planning context: None provided.

## map, feature data and metadata access

- Visit *www.bcmca.ca/data* for more information.

## references


- Fisher, W. D. On grouping for maximum homogeneity. *Journal of the American Statistical Association.* 1958. 53, 789-798.
- Jenks, G. F. Optimal data classification for choropleth maps. *Occasional paper No. 2. Lawrence, Kansas: University of Kansas, Department of Geography.* 1977.
- Williams, R. and Thomas, L. 2007. Distribution and abundance of marine mammals in coastal waters of British Columbia, Canada. *Journal of Cetacean Research and Management.* 9(1):15–28.
- Williams, R. and O'Hara, P. 2010. Modelling ship strike risk to fin, humpback and killer whales in British Columbia, Canada. *Journal of Cetacean Research and Management.* 11(1):1-8.

# BCMCA Atlas

## Marine Mammals

## Steller Sea Lion Distribution

### Legend

**Estimated Sea Lion Density**
(sea lions per square kilometre)

high

low

Notes:
- Sea lion densities range from 0 - 7 sea lions per square kilometre.
- Classification based on 8 natural breaks.

**Data Sources:**
Rob Williams

**Base Data:**
ESRI Base Data, GeoBase, GeoBC, NOAA, Natural Resources Canada, USGS, Washington State Government

**Thematic Data:**
For more information on data sources and methods please refer to the facing page to this map

**Projection:** BC Albers NAD83

0 25 50 75 100 125 150
Kilometres

0 25 50 75
Nautical Miles

1:4,250,000 *

* Written scales are approximate and are based on a 11 x 17 inch paper size.

Prepared for:

BC Marine Conservation Analysis

Map template by Caslys Consulting Ltd.

August 16, 2010

Alaska

Haida Gwaii

British Columbia

Vancouver Island

Washington

PACIFIC OCEAN

Nass River

Skeena River

Fraser River

142°W 140°W 138°W 136°W 134°W 132°W 130°W 128°W 126°W 124°W 122°W

54°N 52°N 50°N 48°N 46°N

**Inset Map** 1:500,000*

Note: The inset has been provided to illustrate the level of detail available in the data. The inset is for illustrative purposes only and does not imply any significance to this region.