COSEWIC
Status Appraisal Summary

on the

Leatherback Sea Turtle
Dermochelys coriacea

Pacific population

in Canada

ENDANGERED
2022

COSEWIC
Committee on the Status
of Endangered Wildlife
in Canada

COSEPAC
Comité sur la situation
des espèces en péril
au Canada

COSEWIC status appraisal summaries are working documents used in assigning the status of wildlife species suspected of being at risk in Canada. This document may be cited as follows:

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COSEWIC
Assessment Summary

Assessment Summary – December 2022

Common name
Leatherback Sea Turtle - Pacific population

Scientific name
Dermochelys coriacea

Status
Endangered

Reason for designation
The Pacific population of this large, long-lived marine turtle has collapsed by over 80% since the mid-1980s and is projected to decline by 96% by 2040. Adult turtles nest on beaches in Indonesia, Papua New Guinea, Solomon Islands and Vanuatu, but migrate in summer to the Northeast Pacific to forage on jellyfish, with small numbers reaching the marine waters of Pacific Canada. This species continues to be threatened by bycatch and entanglement in fishing gear, marine pollution, coastal and offshore resource development, climate change, poaching of eggs, and nesting habitat decline.

Occurrence
British Columbia, Pacific Ocean

Status history
The species was considered a single unit and designated Endangered in April 1981. Status re-examined and confirmed in May 2001. Split into two populations in May 2012. The Pacific population was designated Endangered in May 2012. Status re-examined and confirmed in December 2022.

COSEWIC
Status Appraisal Summary

Leatherback Sea Turtle, Pacific population
Tortue luth, population du Pacifique
Dermochelys coriacea

Range of occurrence in Canada (province/territory/ocean): British Columbia, Pacific Ocean

Evidence (indicate as applicable):

No new evidence supports a change in status. However, Tiwari *et al.* (2013) projected an approximate 96% reduction in abundance of mature nesting females by 2040 (less than one generation). As a result, A3bcde+4bcde was added to the criteria applied in the last assessment. Sub-criterion 'a' was excluded because declines were based on indices rather than total population counts. Sub-criteria 'c' and 'e' were added to acknowledge decline in quality of habitat (c) and effects of introduced predators on nesting grounds (e). Addition of Criterion C1 was considered, based on estimates of abundance of mature females from NMFS and USFWS (2020) and Martin *et al.* (2020), but was excluded based on uncertainty around the total number of mature individuals.

SAS 6
Wildlife species:

Change in eligibility, taxonomy or designatable units:	yes ☐ no ☒
Explanation: No new evidence is available to support a change.	

Range:

SAS 7	Change in Extent of Occurrence (EOO):	yes ☐ no ☐ unk ☒
SAS 8	Change in Index of Area of Occupancy (IAO) :	yes ☐ no ☐ unk ☒
SAS 9	Change in number of known or inferred current locations[1]:	yes ☐ no ☒ unk ☐
SAS 10	Significant new survey information	yes ☒ no ☐
Explanation: Canadian Context Neither EOO nor IAO has been determined for Leatherback Sea Turtle in the Pacific Canadian context. IAO for sea turtles is typically calculated based on nesting area (Tiwari *et al*. 2013). The Leatherback Sea Turtle does not nest in Canada. However, using the "bounding box approach," Fisheries and Oceans Canada (DFO) (2014) identified the area from the Pacific Shelf to the toe of the continental slope (2,000 m depth), excluding the mainland inlets and portions of the Strait of Georgia, as important foraging habitat for the Pacific Canadian		

[1] Use the IUCN definition of "location."

Leatherback Sea Turtle (Figure 1). DFO is currently conducting work that involves collecting jellyfish from fisheries research vessels, to develop a dataset of jellyfish distribution and abundance in Pacific Canadian waters, in order to refine important foraging habitat for Pacific Canadian Leatherback Sea Turtle (DFO 2019).

West Pacific Ocean Context
The Pacific Canadian population of Leatherback Sea Turtle is distinct from the Atlantic Canadian population (Pacific Leatherback Turtle Recovery Team (PLTRT) 2006; COSEWIC 2012). Recent work confirms that these two designatable units meet the criteria for discreteness and evolutionary significance recently outlined by COSEWIC (Appendix F5, Operations and Procedures Manual), including distinguishing heritable markers, natural geographic disjunction, and independent evolutionary trajectory for an evolutionarily significant period. Genetic structure reflects global radiation from a single mtDNA lineage with the most divergent haplotypes indicating separation between Atlantic and Indo-Pacific Ocean populations approximately 170,000 years BP (Duchene *et al.* 2012). Recent published and unpublished genetic evidence (National Marine Fisheries Service and U.S. Fish and Wildlife Service 2020) supports the existence of seven genetically discrete populations globally, which are congruent with the seven regional management units (RMUs) described by Wallace *et al*. (2010). These populations are separated by behaviour (males and females return to waters near natal nesting beaches to mate) and physical factors (land masses, oceanographic features, currents).

The Pacific Canadian population is part of the broader West Pacific Ocean (WPO) Regional Management Unit (RMU) (Wallace *et al*. 2010) of Leatherback Sea Turtle. Leatherback Sea Turtles from the WPO RMU nest primarily in Papua Barat, Indonesia, Papua New Guinea, and the Solomon Islands, with minor nesting in Vanuatu (Tiwari *et al*. 2013). The large nesting population that existed previously in Malaysia is now functionally extinct (Chan and Liew 1996; Tiwari *et al.* 2013). The WPO RMU extends north into the Sea of Japan, northeast and east into the North Pacific to the west coast of North America (including coastal British Columbia), west to the South China Sea and Indonesian Seas, and south into the high-latitude waters of the western South Pacific and Tasman Sea (Benson *et al.* 2011; Tiwari *et al.* 2013) (Figure 2). In their assessment of this RMU for the IUCN, Tiwari *et al*. (2013) include an estimated area of occupancy (AOO) "in excess of 2,000 km^2" and an estimated extent of occurrence (EOO) of 134,405,260 km^2 (AOO is calculated as the linear distribution of nesting sites within the EOO, multiplied by 2 km; EOO, as the total area included within the geo-referenced boundaries of the WPO RMU). NMFS and USFWS (2020) recently adopted these values without revision.

Population Information:

SAS 11	Change in number of mature individuals:	yes ☒ no ☐ unk ☐
SAS 12	Change in population trend:	yes ☐ no ☒ unk ☐
SAS 13	Change in severity of population fragmentation:	yes ☐ no ☒ unk ☐
SAS 14	Change in trend in area and/or quality of habitat:	yes ☐ no ☒ unk ☐
SAS 15	Significant new survey information	yes ☒ no ☐

Explanation:

Numbers, population trend, and survey information

Pacific Canadian Context
Sightings of Leatherback Sea Turtles off the coast of British Columbia are rare. Spaven *et al*. (2009) summarized 119 Leatherback Sea Turtle sightings in Pacific Canadian waters from 1931 to 2009, drawn from a literature review, questionnaires, and an educational outreach campaign, as well as from 21 ship-based surveys for cetaceans (2002–2008) and 4 dedicated aerial surveys (2005–2007) (Figure 3). Since then, an additional 35 Leatherback Sea Turtle sightings have been recorded, for a total of 154 records from 1931 to 2021 off the British Columbia coast (Spaven pers. comm. 2021). Of the 68 sightings in Canadian waters between 2000 and 2022, 87% occurred between July and September (Appendix 1). There was an apparent decline in sightings between 2000 and 2010 (47) and between 2011 and 2022 (21). It is reasonable to suspect that the recent paucity of sightings off Pacific Canada reflects the sharply declining WPO

Leatherback Sea Turtle RMU and that if the number in this RMU were increasing, more individuals would likely be reported in waters of Canadian jurisdiction. Benson *et al.* (2011) deployed 126 satellite transmitters on Leatherback Sea Turtles at western Pacific nesting beaches and at one eastern Pacific foraging ground (n=37; deployments made in neritic waters of Monterey Bay and San Mateo County, California) from 2000 to 2007. Following release, 89% (n=33) of turtles tagged on the foraging grounds moved immediately southwest towards the eastern equatorial Pacific (EEP); 8% (n=3) initially moved northward as far as Oregon before moving to the EEP (Figure 4). These animals are part of the foraging group of Leatherback Sea Turtles, including adults and subadults of both sexes, in the California Current Ecosystem, which stretches north through the state of Washington and slightly into southern Canadian waters (Benson *et al.* 2011, 2020; Martin *et al*. 2020). Although none of the satellite-tagged animals strayed into Canadian waters, it is entirely plausible that others taking the same trajectory might.

Western Pacific Context

The National Marine Fisheries Service, in collaboration with the U.S. Fish and Wildlife Service, (2020) conducted a status review of the Leatherback Sea Turtle under the *Endangered Species Act*. This assessment estimated a total index of nesting female abundance (data on the number of adult males are not available for any Leatherback Sea Turtle populations) in the WPO RMU to be 1,277 individuals. This index is based on what the authors assessed as the best available data for the WPO RMU and considers only two beaches: Jamursba-Medi and Wermon, both Bird's Head Peninsula beaches in Indonesia (NMFS and USFWS 2020). They are the only beaches that met the analysis criteria of recent (as of 2014) available data and consistent monitoring (NMFS and USFWS 2020). The beaches at Bird's Head account for approximately 50% to 75% of the Western Pacific RMU and represent the last sizeable nesting population in the entire Pacific (Tapilatu *et al.* 2013; Benson *et al.* 2020; Martin *et al*. 2020; NMFS and USFWS 2020). This population estimate is consistent with the declining trend noted by Tapilatu *et al*. in 2013 (5.9% decline per year at primary western Pacific beaches since 1984) and with the calculations made by Tiwari *et al*. in 2013 (-7% decline per year); Benson *et al*. in 2020 (-5.6% annual decline); and Martin *et al*. in 2020 (-6.1% decline).

Tiwari *et al.* (2013) compiled abundance-based time-series datasets of nesting females from all index beaches (including beaches in Indonesia, Papua New Guinea, Solomon Islands, and Malaysia) for the WPO RMU. The time-series datasets are from 5 to 20+ years in length and consist of data on either monitored nesting activities (tracks or nests) or individual nesting females. The authors calculated annual and overall population trends for each rookery within the WPO RMU and then calculated the average WPO RMU trend by weighting WPO rookery population trends by historical WPO rookery abundance relative to historical WPO population abundance. They only included time-series datasets of $\geq$10 years in trend estimations. The most recent year for which abundance data was available (except for the Solomon Islands) was 2010. The authors described an 83% decline during the past three generations (based on ~30-year generation time) and predicted a population decline of 96% by the year 2040 (or one generation) (Tiwari *et al.* 2013).

Martin *et al*. (2020) looked at nest count data from 2001 to 2017 for the Bird's Head beaches to determine both a population trend and an index of nesting female abundance. They inputted data for months when there were no nest count data available. Their results ranged from 515 to 1,224 nesting females in the population, with a median value of 790 total nesters.

NMFS and USFWS (2020) note that monitoring on beaches outside of the Bird's Head Peninsula is extremely challenging and conclude that the declining nest trend and low reproductive output has left Leatherback Sea Turtles in the WPO RMU at an elevated risk of extinction.

It should be noted that estimating population abundance in a marine species is challenging, particularly for species like sea turtles that are highly migratory on an oceanic scale. Sea turtles lay their eggs on nesting beaches, where eggs and nests are easily counted. Sea turtle nest counts are commonly used globally as an index of abundance and population trends (as above). NMFS and USFWS (2020) note many caveats when using nest trend data including the following: (1) adult females only account for a small percentage of the population, and trends in nester abundance may not be an index for the remainder of the population; (2) calculations assume a stable age distribution; and (3) time-series surveys do not always span one generation,

or the multiple generations required to reach a stable age distribution. Studies investigating the biases associated with these traditional metrics suggest that they may produce estimates of adult female abundance that are significantly higher than reality—in some cases by a factor of ~2 (Tucker 2010; Weber *et al.* 2013; Esteban *et al.* 2017; Casale and Ceriani 2020; Ceriani *et al.* 2021).

Quality of Habitat
Habitat conditions do not seem to be primarily responsible for the declining trend in the numbers of western Pacific Leatherback Sea Turtle in either its foraging or nesting areas (Benson *et al.* 2020; NMFS and USFWS 2020). There is no evidence of deteriorating foraging habitat or prey abundance for WPO RMU leatherback turtles that would cause a large-scale shift away from central California waters; however, habitat degradation of nesting beaches has in part contributed to reduced recruitment in this RMU (Benson *et al.* 2020). Nesting beaches are dynamic, high-energy beaches that are subject to erosion (in some areas, erosion routinely removes entire beaches) and to high tides which inundate nests (NMFS and USFWS 2020). Although the long reproductive lifespan of the Leatherback Sea Turtle generally accommodates some years of nest loss, the low abundance of nests within the WPO RMU means that the loss or continued loss of nests over time becomes a concern (NMFS and USFWS 2020).

SAS 16
Threats:

Change in nature and/or severity of threats:	yes ☐ no ☒ unk ☐

Explanation:
The threats to this population persist, as described in detail in the literature (Bellagio Report 2007; Wallace *et al.* 2011; Tapilatu *et al.* 2013; Tiwari *et al.* 2013; DFO 2019; Benson *et al.* 2020; Martin *et al.* 2020; NMFS and USFWS 2020). Fisheries bycatch is widely considered to be the major obstacle to the recovery of this population (Benson *et al.* 2011; Tiwari *et al.* 2013; Benson *et al.* 2020; Martin *et al.* 2020; NMFS and USFWS 2020). Additional primary threats include overutilization (through the legal and illegal harvest of leatherback turtles and their eggs) and low hatching success (due to high sand temperatures, erosion, and predation by feral pigs and dogs). There is also growing concern about sea turtles' capacity to persist in a warming world. For example, projected climate warming, which notably affects egg incubation (i.e., warmer temperatures cause female-biased sex ratios and higher embryo mortality), may have sublethal effects for all life stages, ultimately affecting population viability (Maurer *et al.* 2021). A comprehensive list of threats is provided in Table 1.

SAS 17
Protection:

Change in effective protection:	yes ☐ no ☒ unk ☐

Explanation:
There is no change since the last assessment (COSEWIC 2012). However, despite legislative protection in all four of the nations where the WPO RMU Leatherback Sea Turtle nests (i.e., Indonesia, Papua New Guinea, Solomon Islands, and Vanuatu), laws are typically not enforced or followed (NMFS and USFWS 2020). As a result, most Leatherback Sea Turtle nesting beaches (except Jamursba-Medi and Wermon, where there are well-established, long-term monitoring programs) have minimal or no protection from poaching of nesting females and/or their eggs or from other anthropogenic threats (e.g., coastal development, pollution) (Wallace and Saba 2009; NMFS and USFWS 2020).

SAS 18
Rescue Effect:

Change in evidence of rescue effect:	yes ☐ no ☒
Explanation: No change since last assessment. Only the Eastern Pacific Ocean population (EPO) has the potential to provide immigrants, but it too is Critically Endangered (IUCN 2022).	

SAS 19
Quantitative Analysis:

Change in estimated probability of extirpation:	yes ☐ no ☒ unk ☐
Explanation: No significant change since the last assessment (COSEWIC 2012). However, as NMFS and USFWS (2020) emphasize, this population is “at high risk of extinction now (i.e., at present), rather than on a trajectory to become so in the foreseeable future.”	

Summary and Additional Considerations [e.g., recovery efforts; summarize exactly what has changed since the previous assessment]

The apparent infrequent presence of Leatherback Sea Turtle off the coast of British Columbia presents a challenge to its study (see notes on SAS 11, 12, and 15). Whether this scarcity is due to actual distributional patterns or simply to the precipitous decline of the Leatherback Sea Turtle in the WPO RMU, is not yet well understood. Nonetheless, since the previous COSEWIC assessment (2012), DFO (2014) has identified important habitat for Pacific Canadian Leatherback Sea Turtle and it completed its Pacific Canadian Leatherback Action Plan in 2019. Ongoing work is largely centred on collecting jellyfish from fisheries research vessels to assess their distribution and abundance in Pacific Canadian waters in order to better refine important foraging habitat (DFO 2019).

The primary additional consideration is that this population, which was already at high risk during the last COSEWIC assessment (2012), has continued its downward trajectory (Benson *et al.* 2011; Tapilatu *et al.* 2013; Tiwari *et al.* 2013; Benson *et al.* 2020; Martin *et al.* 2020; NMFS and USFWS 2020).

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INFORMATION SOURCES

Avens, L., L.R. Goshe, G.R. Zug, G.H. Balazs, S.R. Benson, and H. Harris. 2020. Regional comparison of leatherback sea turtle maturation attributes and reproductive longevity. Marine Biology 167:4.

Avens, L., J.C. Taylor, L.R. Goshe, T.T. Jones, and M. Hastings. 2009. Use of skeletochronological analysis to estimate the age of leatherback sea turtles (*Dermochelys coriacea*) in the western North Atlantic. Endangered Species Research 8:165-177.

Bellagio Report. 2007. Bellagio Sea Turtle Conservation Initiative: strategic planning for long-term financing of Pacific Leatherback conservation and recovery. Terengganu, Malaysia.

Benson, S.R., T. Eguchi, D.G. Foley, H. Bailey, C. Hitipeuw, B.P. Samber, R.F. Tapilatu, V. Rei, P. Ramohia, J. Pita, and P.H. Dutton. 2011. Large-scale movements and high-use areas of western Pacific leatherback turtles, *Dermochelys coriacea*. Ecosphere 2(7):1-27. https://doi.org/10.1890/ES11-00053.1

Benson, S.R., K.A. Forney, E.L. LaCasella, J.T. Harvey, and J.V. Carretta. 2020. A long-term decline in the abundance of endangered leatherback turtles, *Dermochelys coriacea*, at a foraging ground in the California Current Ecosystem. Global Ecology and Conservation 24. https://doi.org/10.1016/j.gecco.2020.e01371

Bjorndal, K.A., J. Parsons, W. Mustin, and A.B. Bolten. 2013. Threshold to maturity in a long-lived reptile: interactions of age, size, and growth. Marine Biology 160:607-616. https://link.springer.com/article/10.1007/s00227-012-2116-1

Bjorndal, K.A., J. Parsons, W. Mustin, and A.B. Bolten. 2014. Variation in age and size at sexual maturity in Kemp's ridley sea turtles. Endangered Species Research 25:57-67. http://dx.doi.org/10.3354/esr00608

Caillouet, C.W. Jr., D.J. Shaver, A.M. Landry Jr., D.W. Owens, and P.C.H. Pritchard. 2011. Kemp's ridley sea turtle (*Lepidochelys kempii*) age at first nesting. Chelonian Conservation and Biology 10:288-293.

Casale, P., and S.A. Ceriani. 2020. Sea turtle populations are overestimated worldwide from remigration intervals: correction for bias. Endangered Species Research 41:141-151. https://doi.org/10.3354/esr01019

Ceriani, S.A., B. Brost, A.B. Meylan, P.A. Meylan, and P. Casale. 2021. Bias in sea turtle productivity estimates: error and factors involved. Marine Biology 168:41. https://doi.org/10.1007/s00227-021-03843-w

Chan, E.H., and H.C. Liew. 1996. Decline of the leatherback population in Terengganu, Malaysia, 1956-1995. Chelonian Conservation and Biology 2:196-203.

COSEWIC. 2001. COSEWIC assessment and update status report on the Leatherback Turtle *Dermochelys coriacea* in Canada. Committee on the Status of Endangered Wildlife in Canada. Ottawa. vii + 25 pp.

COSEWIC. 2012. COSEWIC assessment and status report on the Leatherback Sea Turtle *Dermochelys coriacea* in Canada. Committee on the Status of Endangered Wildlife in Canada. Ottawa. xv + 58 pp. https://publications.gc.ca/collections/collection_2013/ec/CW69-14-116-2012-eng.pdf

DFO (Fisheries and Oceans Canada). 2014. Advice relevant to the identification of critical habitat for Leatherback Sea Turtles (Pacific Population). Fisheries and Oceans Canada, Canadian Science Advisory Secretariat Science Advisory Report 2013/075.

DFO (Fisheries and Oceans Canada). 2019. Action Plan for the Leatherback Sea Turtle (*Dermochelys coriacea*) in Canada (Pacific population). Species at Risk Act Action Plan Series. Fisheries and Oceans Canada, Ottawa. iii + 23 pp.

Eckert, K.L., B.P. Wallace, J.G. Frazier, S.A. Eckert, and P.C.H. Pritchard. 2012. Synopsis of the biological data on the leatherback sea turtle (*Dermochelys coriacea*). U.S. Department of Interior; Fish and Wildlife Service, Biological Technical Publication BTP-R4015-2012, Washington, D.C.

Esteban, N., J.A. Mortimer, and G.C. Hayes. 2017. How numbers of nesting sea turtles can be overestimated by nearly a factor of two. Proceedings of the Royal Society B 284:20162581. http://dx.doi.org/10.1098/rspb.2016.2581

Fisheries and Oceans Canada (DFO). 2014. Advice relevant to the identification of critical habitat for Leatherback Sea Turtles (Pacific Population). Fisheries and Oceans Canada, Canadian Science Advisory Secretariat Science Advisory Report 2013/075.

Fisheries and Oceans Canada (DFO). 2019. Action Plan for the Leatherback Sea Turtle (*Dermochelys coriacea*) in Canada (Pacific population). Species at Risk Act Action Plan Series. Fisheries and Oceans Canada, Ottawa. iii + 23 pp.

Hitipeuw, C., P.H. Dutton, S.R. Benson, J. Thebu, and J. Bakarbessy. 2007. Population status and inter-nesting movement of leatherback turtles, *Dermochelys coriacea*, nesting on the northwest coast of Papua, Indonesia. Chelonian Conservation and Biology 6:28-36.

IUCN 2022. The IUCN Red List of Threatened Species. Version 2022-2. https://www.iucnredlist.org

James, M.C. 2001. Update COSEWIC status report on the leatherback turtle *Dermochelys coriacea* in Canada, *in* COSEWIC assessment and update status report on the leatherback turtle *Dermochelys coriacea* in Canada. Committee on the Status of Endangered Wildlife in Canada. Ottawa. 1-25 pp.

Martin, S.L., Z. Siders, T. Eguchi, B. Langseth, A. Yau, J. Baker, R. Ahrens, and T.T. Jones. 2020. Assessing the population-level impacts of north Pacific loggerhead and western Pacific leatherback turtle interactions in the Hawaii-based shallow-set longline fishery. U.S. Dept. of Commerce, NOAA Technical Memorandum NOAA-TM-NMFS-PIFSC-95, 183 p. https://www.fisheries.noaa.gov/resource/document/assessing-population-level-impacts-north-pacific-loggerhead-and-western-pacific

Maurer, A.S., J.A. Seminoff, C.A. Layman, S.P. Stapleton, M.H. Godfrey, and M.O. Burford Reiskind. 2021. Population viability of sea turtles in the context of global warming. BioScience 71:790-804. https://doi.org/10.1093/biosci/biab028

National Marine Fisheries Service and U.S. Fish and Wildlife Service. 2020. Endangered Species Act status review of the leatherback turtle (*Dermochelys coriacea*). Report to the National Marine Fisheries Service Office of Protected Resources and U.S. Fish and Wildlife Service. xviii + 378 pp.

Pacific Leatherback Turtle Recovery Team (PLTRT). 2006. Recovery Strategy for Leatherback Turtles (Dermochelys coriacea) in Pacific Canadian Waters. Species at Risk Act Recovery Strategy Series. Fisheries and Oceans Canada, Vancouver, v + 41 pp.

Spaven, L. D., personal communication. 2021. *Email correspondence to* L. Spaven. October 4, 2021. Research Technician, Aquatic Ecosystem and Marine Mammal Section, Fisheries and Oceans Canada, Nanaimo, British Columbia.

Spaven, L.D., J.K.B. Ford, and C. Sbrocchi. 2009. Occurrence of leatherback sea turtles (*Dermochelys coriacea*) off the Pacific coast of Canada, 1931-2009. Canadian Technical Report of Fisheries and Aquatic Sciences 2858:vi + 32 pp.

Tapilatu, R.F., P.H. Dutton, M. Tiwari, T. Wibbels, H.V. Ferdinandus, W.G. Iwanggin, and B.H. Nugroho. 2013. Long-term decline of the western Pacific leatherback, *Dermochelys coriacea*: a globally important sea turtle population. Ecosphere 4(2): 25. https://doi.org/10.1890/ES12-00348.1

Tiwari, M., B.P. Wallace, and M. Girondot. 2013. *Dermochelys coriacea* (West Pacific Ocean subpopulation). The IUCN Red List of Threatened Species 2013: e.T46967817A46967821.

Tucker, A.D. 2010. Nest site fidelity and clutch frequency of loggerhead turtles are better elucidated by satellite telemetry than by nocturnal tagging efforts: Implications for stock estimation. Journal of Experimental Marine Biology and Ecology 383:48-55.

Wallace, B.P., A.D. DiMatteo, A.B. Bolten, M.Y. Chaloupka, B.J. Hutchinson, F.A. Abreu-Grobois, J.A. Mortimer, J.A. Seminoff, D. Amorocho, K.A. Bjorndal, J. Bourjea, B.W. Bowen, R. Briseño-Dueñas, P. Casale, B.C. Choudhury, A. Costa, P.H. Dutton, A. Fallabrino, E.M. Finnkbeiner, A. Girard, M. Girondot, M. Hamann, B.J. Hurley, M. López-Mendilaharsu, M.A. Marcovaldi, J.A. Musick, R. Nel, N.J. Pilcher, S. Troëng, B. Witherington, and R.B. Mast. 2011. Global conservation priorities for marine turtles. PLoS ONE 6(9):e24510. https://doi.org/10.1371/journal.pone.0024510

Wallace, B.P., A.D., DiMatteo, B.J. Hurley, E.M. Finkbeiner, A.B. Bolten, M.Y. Chaloupka, B.J. Hutchinson, F.A. Abreu-Grobois, D. Amorocho, K.A. Bjorndal, J. Bourjea, B.W. Bowen, R. Briseño-Dueñas, P. Casales, B.C. Choudhury, A. Costa, P.H. Dutton, A. Fallabrino, A. Girard, M. Girondot, M.H. Godfrey, M. Hamann, M. López-Mendilaharsu, M.A. Marcovaldi, J.A. Mortimer, J.A. Musick, R. Nel, N.J. Pilcher, J.A. Seminoff, S. Troëng, B. Witherington, and R.B. Mast. 2010. Regional management units for marine turtles: A novel framework for prioritizing conservation and research across multiple scales. PLoS ONE 5(12): e15465. https://doi.org/10.1371/journal.pone.0015465

Wallace, B.P., and T.T. Jones. 2015. Leatherback turtle physiological ecology. J.R. Spotila and M.S. Tomillo, Eds. The leatherback turtle: biology and conservation. Baltimore, Maryland: Johns Hopkins Press. pp. 149-161.

Wallace, B.P., and V.S. Saba. 2009. Environmental and anthropogenic impacts on intra-specific variation in leatherback turtles: opportunities for targeted research and conservation. Endangered Species Research 7:11-21. https://doi.org/10.3354/esr00177

Weber, N., S.B. Weber, B.J. Godley, J. Ellick, M. Witt, and A.C. Broderick. 2013. Telemetry as a tool for improving estimates of marine turtle abundance. Biological Conservation 167:90-96.

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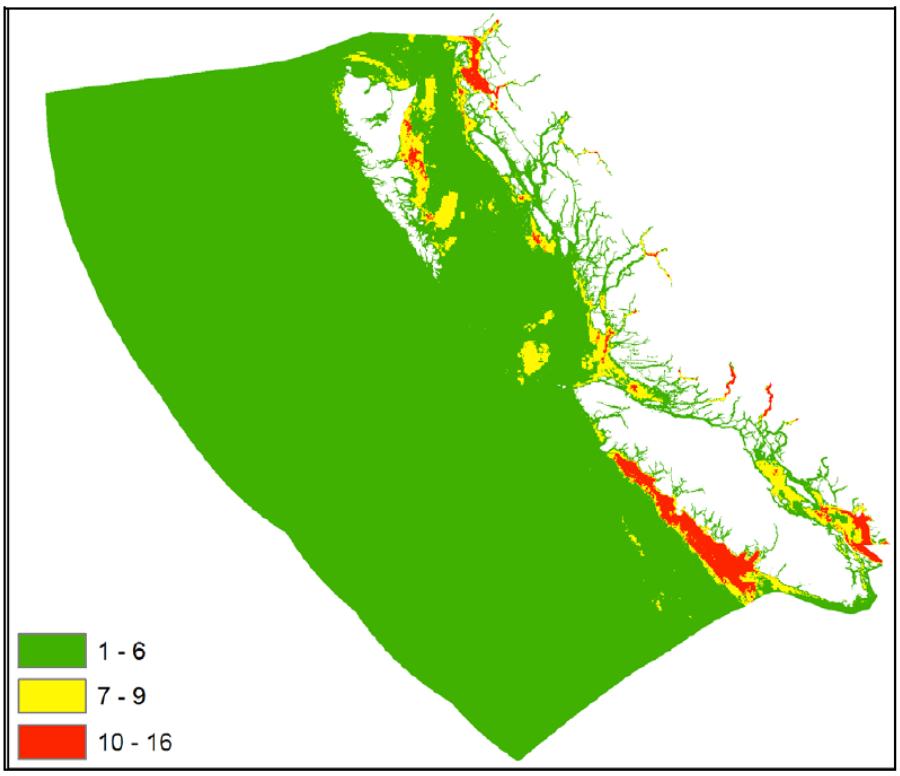

Figure 1. Modelled areas of suitable foraging habitat for Leatherback Sea Turtles, shown as low (green), medium (yellow) and high (red) suitability (Figure from DFO 2014).

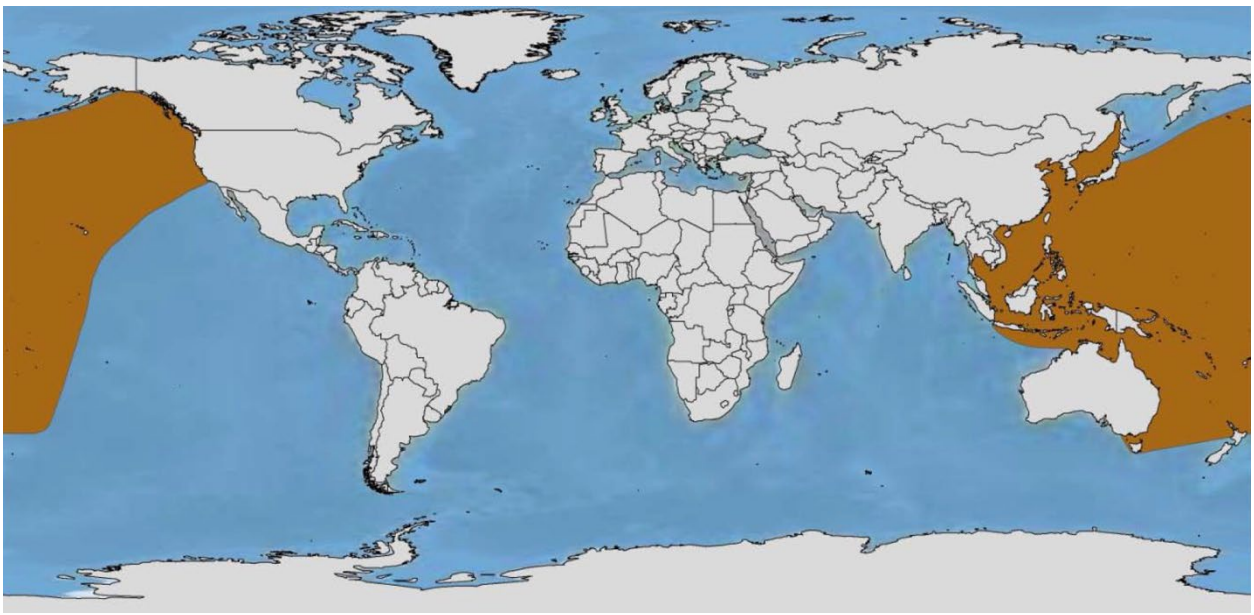

Figure 2. Distribution of Western Pacific Ocean Leatherback Sea Turtle Regional Management Unit (shaded brown). (Figure from Tiwari *et al.* 2013).

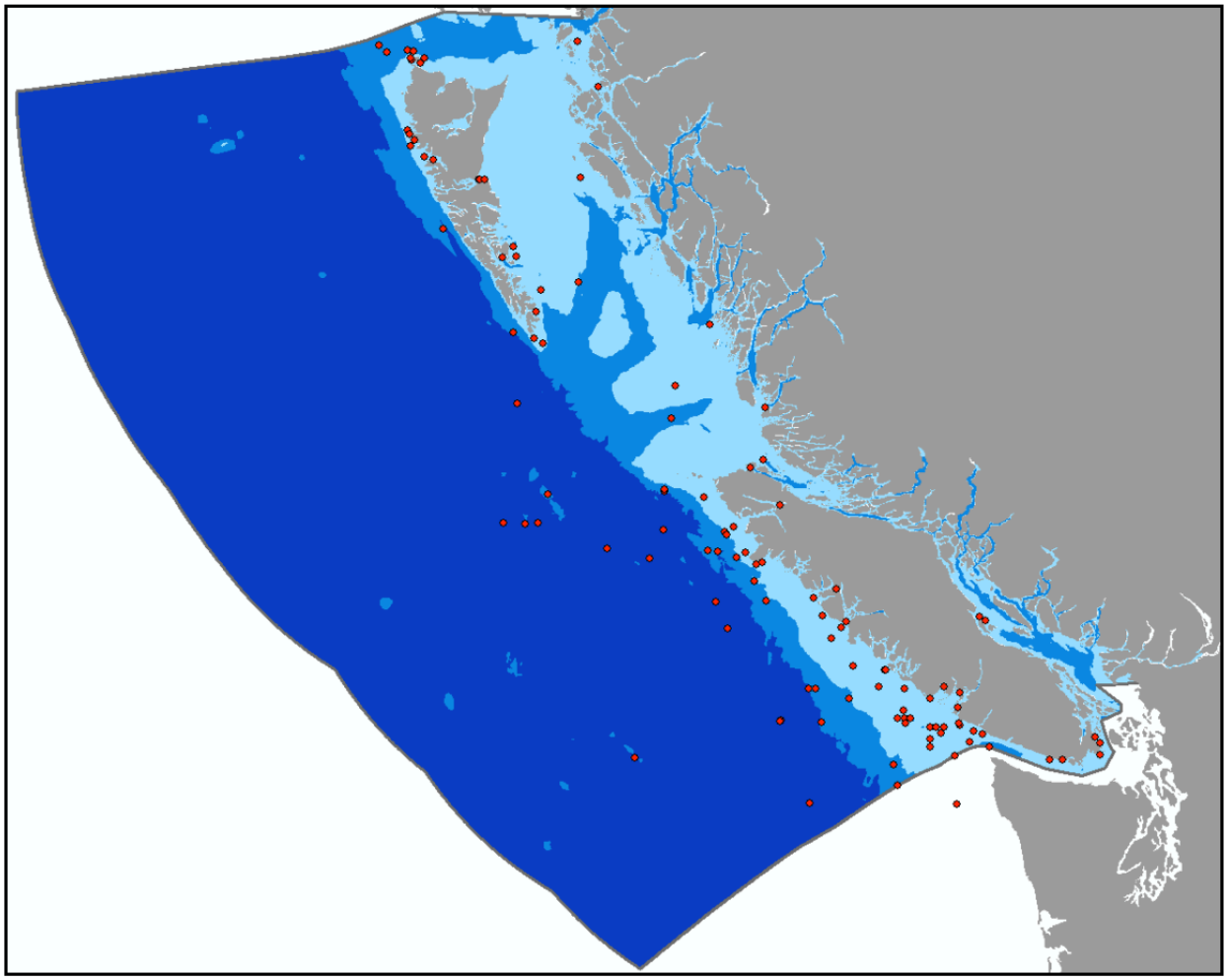

Figure 3. Live Leatherback Sea Turtle sightings (n=122) in the Canadian Pacific exclusive economic zone (1931–2009). Depth categories are continental shelf to 200 m (light blue); 1,500 m (moderate blue); and offshore waters (dark blue) (Figure from DFO 2014).

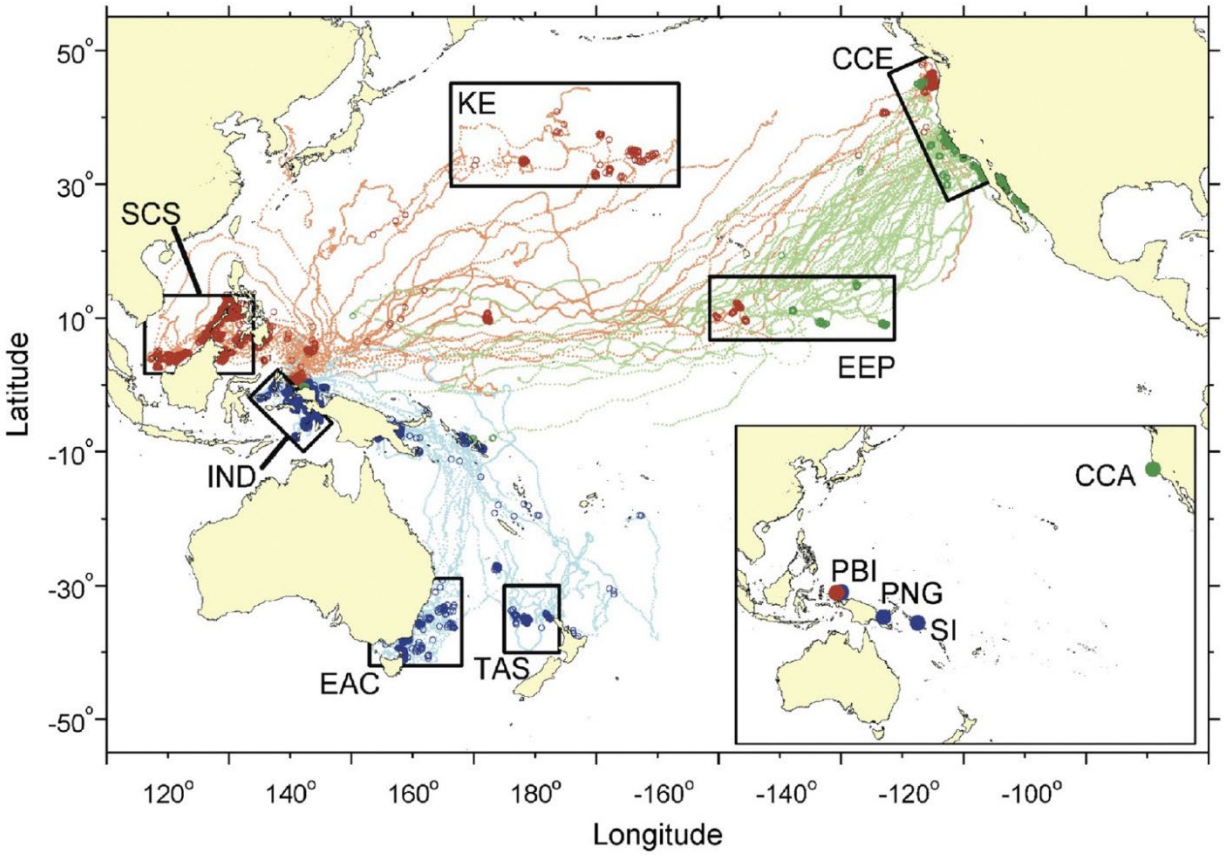

Figure 4. Satellite tracks of 126 deployments on WPO RMU Leatherback Sea Turtles from 2000 to 2007, presented as probability of transit. Large, darker circles indicate Area Restricted Search behaviour; small, lighter dots indicate transiting behaviour. Colour of track indicates deployment season: red = summer nesters, blue = winter nesters, green = deployments at central California foraging grounds. Inset shows deployment locations: PBI = Papua Barat, Indonesia, PNG = Papua New Guinea, SI = Solomon Islands; CCA = central California. Black boxes represent ecoregions for which habitat associations were quantitatively examined: SCS = South China, Sulu, and Sulawesi Seas, IND = Indonesian Seas, EAC = East Australia Current Extension, TAS = Tasman Front, KE = Kuroshio Extension, EEP = eastern equatorial Pacific, and CCE = California Current Ecosystem. (Figure from Benson *et al.* 2011)

Table 1. Threats to WPO subpopulation, adapted from National Marine Fisheries Service and U.S. Fish and Wildlife Service (2020). Exposure refers to the individuals affected by the threat. Impact refers to how the threat affects demographic factors. Primary threats are identified with asterisks.

Threat	Exposure	Impact
Fisheries bycatch*	Adults off nesting beaches; foraging juveniles and adults	Loss of individuals (abundance), including loss of nesting females (productivity)
Overutilization*	Eggs and nesting females; turtles at sea	Loss of nesting females (abundance) and reproductive potential (productivity)
Destruction or modification of habitat	Eggs and hatchlings	Reduction of hatching success and hatchling survival (productivity)
Inadequate national and international regulatory mechanisms; inconsistent or non-existent regulatory enforcement	Eggs and turtles of all life stages	Reduction of hatchling success and hatchling survival (productivity); loss of individuals (abundance), including loss of nesting females (productivity)
Pollution (e.g., contaminants, marine debris, ghost fishing gear, artificial lighting)	Turtles of all life stages	Lethal (abundance) and sublethal (productivity) effects
Natural disasters (e.g., hurricanes, increased biomass of *Sargassum*)	Some eggs and hatchlings	Reduction of hatching success and hatchling survival (productivity)
Climate change	Eggs and turtles at all life stages	Reduction of nesting and hatching success (productivity)
Predation (feral dogs, pigs)	Eggs and hatchlings	Reduction of hatching success and hatchling survival (productivity)

Appendix 1. British Columbia sightings of Leatherback Turtle 2000–2022 (Data provided by L. Spaven, DFO).

Data Sources	Animal Condition	YR	# turtles	latitude	longitude	Region	Sighting Location
BCCSN/DFO outreach or hotline	Alive	2000.06.27	1	49.133	-126.083	Vancouver Island, West	Clayquot Sound - 3 NM off Vargas Island
2003 DFO/BCCSN questionnaire	Alive	2000.08.?	1	51.883	-130.867	Haida Gwaii, West	Haida Gwaii - off W Cape St James
2003 DFO/BCCSN questionnaire	Alive	2000.08.?	1	49.533	-128.217	Vancouver Island, West	Top Knot Point - 60 NM S of
McAlpine *et al.* 2004	Alive	2000.09.06	1	48.720	-127.433	Vancouver Island, West	Estevan Point - 55 NM WSW of
BCCSN/DFO outreach or hotline	Alive	2001.04.?	1	49.583	-126.600	Vancouver Island, West	Friendly Cove, Nootka Sound
2003 DFO/BCCSN questionnaire	Dead	2001.07.?	1	49.116	-125.895	Vancouver Island, West	Tonquin Beach - off
McAlpine *et al.* 2004	Alive	2001.08.04	1	54.300	-133.167	Haida Gwaii, North	Langara Island - off
2003 DFO/BCCSN questionnaire	Dead	2001.08.12	1	52.650	-131.667	Haida Gwaii, East	Darwin Sound - near Shuttle Island
BCCSN/DFO outreach or hotline	Alive	2001.09.08	1	50.578	-127.508	Vancouver Island, West	Quatsino Sound - Rupert Inlet, in small bay between camp and log sort
2014 DFO/BCCSN questionnaire	Alive	2001.09.?	1	50.933	-130.500	Vancouver Island, West	Dellwood Knoll - 75 NM W of Cape Scott
2003 DFO/BCCSN questionnaire	Alive	2002.06.?	1	49.250	-127.083	Vancouver Island, West	Nootka Island - 35 NM off
BCCSN/DFO outreach or hotline	Alive	2003.07.29	1	52.700	-131.383	Haida Gwaii, East	Laskeek Bay - 10 NM S of Reef Island
BCCSN/DFO outreach or hotline	Alive	2003.08.06	1	52.337	-130.954	Haida Gwaii, East	Haida Gwaii - SE of
BCCSN/DFO outreach or hotline	Alive	2003.08.08	1	49.617	-124.833	Vancouver Island, East	Denman Island - off Sandy Island
BCCSN/DFO outreach or hotline	Alive	2003.08.11	1	52.617	-131.333	Haida Gwaii, East	Juan Perez Sound - 3 NM off the NE corner of Murchison Island
2003 DFO/BCCSN questionnaire	Alive	2003.08.?	1	48.167	-125.917	Vancouver Island, West	Cape Beale - 45 NM SW of
2003 DFO/BCCSN questionnaire	Alive	2003.08.?	1	unknown	unknown	Vancouver Island, West	Vancouver Island - W of
BCCSN/DFO outreach or hotline	Alive	2004.05.30	1	48.363	-123.792	Vancouver Island, SW	Sooke Harbour - towards Otter Point

Data Sources	Animal Condition	YR	# turtles	latitude	longitude	Region	Sighting Location
BCCSN/DFO outreach or hotline	Alive	2004.06.21	1	53.383	-132.633	Haida Gwaii, West	Gospel Island, Rennel Sound - 1 NM W of
BCCSN/DFO outreach or hotline	Alive	2004.07.06	1	50.967	-127.750	Vancouver Island, East	Pine Island - 1 NM W of
BCCSN/DFO outreach or hotline	Alive	2004.07.09	1	52.800	-131.400	Haida Gwaii, East	Lost Island - 1 NM E of
BCCSN/DFO outreach or hotline	Alive	2004.07.20	1	53.617	-133.050	Haida Gwaii, West	Port Louis - towards Hippa Island
BCCSN/DFO outreach or hotline	Alive	2004.07.28	1	48.713	-126.908	Vancouver Island, West	Pachena Point - 70 NM W of
BCCSN/DFO outreach or hotline	Alive	2004.08.09	1	54.233	-133.117	Haida Gwaii, North	Langara Island - 1 NM W of
BCCSN/DFO outreach or hotline	Alive	2004.08.16	1	49.733	-128.333	Vancouver Island, West	Esperanza Inlet - 50 NM W of
BCCSN/DFO outreach or hotline	Alive	2004.09.07	1	48.367	-123.950	Vancouver Island, SW	French Beach - near
BCCSN/DFO outreach or hotline	Dead	2004.09.25	1	48.752	-125.520	Vancouver Island, West	Amphitrite Point - 10 NM S of
vessel survey	Alive	2005.08.26	1	51.962	-131.303	Haida Gwaii, East	Houston Stewart Channel - W of
BCCSN/DFO outreach or hotline	Alive	2005.09.11	1	54.250	-132.917	Haida Gwaii, North	Langara Island - E of
BCCSN/DFO outreach or hotline	Alive	2005.09.15	1	50.320	-130.942	Vancouver Island, West	Dellwood Seamount - 100 NM W of Triangle Island
BCCSN/DFO outreach or hotline	Alive	2005.09.16	2	50.583	-130.667	Vancouver Island, West	Dellwood Knolls - W of
BCCSN/DFO outreach or hotline	Alive	2005.09.16	1	50.312	-131.235	Vancouver Island, West	Dellwood Seamount - 100 NM W of Triangle Island
BCCSN/DFO outreach or hotline	Alive	2005.09.17	1	50.331	-130.772	Vancouver Island, West	Dellwood Seamount - 100 NM W of Triangle Island
vessel survey	Alive	2007.08.11	1	51.350	-131.167	Central Coast	Queen Charlotte Sound
BCCSN/DFO outreach or hotline	Alive	2007.10.?	1	49.550	-124.667	Vancouver Island, East	Galleon Beach, Hornby Island
2014 DFO/BCCSN questionnaire	Alive	2008.07.15	1	53.930	-133.217	Haida Gwaii, West	Frederick Island - near
BCCSN/DFO outreach or hotline	Alive	2008.08.07	1	48.003	-127.050	Vancouver Island, West	Cape Beale - 80 NM SW of
BCCSN/DFO outreach or hotline	Alive	2008.08.27	1	49.017	-126.167	Vancouver Island, West	La Perouse Bank - 11 NM off Lennard Island Lightstation
BCCSN/DFO outreach or hotline	Alive	2008.09.04	1	48.704	-125.824	Vancouver Island, West	La Perouse Bank - 20 NM W of Barkley Sound
BCCSN/DFO outreach or hotline	Alive	2008.09.25	1	49.006	-125.824	Vancouver Island, West	Wickaninnish Bay - off Portland Point

Data Sources	Animal Condition	YR	# turtles	latitude	longitude	Region	Sighting Location
2014 DFO/BCCSN questionnaire	Alive	2008.09.?	1	49.500	-129.000	Vancouver Island, West	Nootka Sound - 85 NM off
2014 DFO/BCCSN questionnaire	Alive	2008.?.?	1	unknown	unknown	Vancouver Island, SW	Vancouver Island - S
BCCSN/DFO outreach or hotline	Alive	2009.09.11	1	48.356	-129.317	Vancouver Island, West	Tofino - 70 NM SW of
BCCSN/DFO outreach or hotline	Alive	2010.07.06	1	48.495	-124.918	Vancouver Island, SW	Swiftsure Bank, 10-14 NM from shore, just inside J buoy
2014 DFO/BCCSN questionnaire	Alive	2010.08.10	1	53.527	-133.002	Haida Gwaii, West	Hippa Island - near
BCCSN/DFO outreach or hotline	Alive	2010.09.09	1	50.308	-128.222	Vancouver Island, West	Quatsino Sound - near Kains Island
BCCSN/DFO outreach or hotline	Alive	2011.05.17	1	48.836	-125.136	Vancouver Island, West	Bamfield Inlet - in front of the Bamfield Marine Science Center
BCCSN/DFO outreach or hotline	Alive	2011.08.01	1	48.920	-126.555	Vancouver Island, West	Clayoquot Canyon - 25 NM offshore at the mouth of
BCCSN/DFO outreach or hotline	Alive	2011.08.20	1	48.815	-125.847	Vancouver Island, West	LaPerouse Bank
BCCSN/DFO outreach or hotline	Alive	2012.06.21	1	49.899	-125.127	Vancouver Island, East	Georgia Strait - N of Salmon Point
BCCSN/DFO outreach or hotline	Alive	2012.08.18	1	48.399	-126.492	Vancouver Island, West	Cape Flaherty - 70 NM W along CAN/US border
BCCSN/DFO outreach or hotline	Dead	2012.08.21	1	51.895	-131.003	Haida Gwaii, West	Queen Charlotte Sound - 2 NM S of Cape St James
BCCSN/DFO outreach or hotline	Alive	2013.08.05	1	50.462	-128.130	Vancouver Island, West	Quatsino Sound - 1 NM off Lippy Point
BCCSN/DFO outreach or hotline	Alive	2013.08.08	1	50.449	-128.148	Vancouver Island, West	Quatsino Sound - 2-3 NM off Lippy Point
2014 DFO/BCCSN questionnaire	Alive	2013.09.11	1	48.825	-127.437	Vancouver Island, West	Barkley Sound - 80 NM W of
BCCSN/DFO outreach or hotline	Alive	2013.09.14	1	50.078	-128.639	Vancouver Island, West	Kains Island, Quatsino Sound - 32 NM off
2014 DFO/BCCSN questionnaire	Alive	2013.09.15	1	48.170	-127.760	Vancouver Island, west	Cape Alava, Washington - 100 NM W of (in BC waters)
BCCSN/DFO outreach or hotline	Alive	2014.08.20	1	49.137	-125.977	Vancouver Island, West	Tofino - near La Croix Group Islands
2014 DFO/BCCSN questionnaire	Alive	2014.08.?	1	50.566	-128.478	Vancouver Island, West	Cape Cook - towards Cape Scott

Data Sources	Animal Condition	YR	# turtles	latitude	longitude	Region	Sighting Location
vessel survey	Alive	2016.07.25	1	49.567	-129.604	Vancouver Island, west	Brooks Peninsula - 72.5 NM SW of
BCCSN/DFO outreach or hotline	Alive	2017.07.21	1	50.138	-127.933	Vancouver Island, west	Brooks Peninsula - 1 NM NW of
BCCSN/DFO outreach or hotline	Alive	2017.08.21	1	49.986	-127.330	Vancouver Island, west	Kyuquot Sound
BCCSN/DFO outreach or hotline	Alive	2018.08.06	1	48.682	-126.302	Vancouver Island, West	Lowden Canyon
BCCSN/DFO outreach or hotline	Alive	2019.09.04	1	52.638	-128.318	North Coast	Finlayson Channel meets Tolmie Channel, at the tip of Sarah Island
	alive	2020.04.13	1	50.767	-127.335	Vancouver Island, NE	Port McNeill
Whale Report App	Alive	2020.09.10	1	49.626	-128.099	Vancouver Island, NW	Southwest of Brooks Peninsula
Whale Report App	Alive	2022.08.19	1	48.442	-126.158	Vancouver Island, SW	Swiftsure Bank

TECHNICAL SUMMARY

Dermochelys coriacea

Leatherback Sea Turtle, Pacific population

Tortue luth, population du Pacifique

Range of occurrence in Canada (province/territory/ocean): British Columbia, Pacific Ocean

[NOTE: As specific Canadian information is not available, data used here are based on the West Pacific Ocean Regional Management Unit, which includes all of the Canadian population in the Pacific.]

Demographic Information

Generation time (usually average age of parents in the population; indicate if another method of estimating generation time indicated in the IUCN guidelines (2011) is being used) Generation time used here follows that used by the IUCN (2013) and is consistent with the generation time for the Northwest Atlantic Leatherback Sea Turtle RMU. However, there is significant uncertainty in age at sexual maturity and age at first reproduction (Caillouet *et al.* 2011; Bjorndal *et al.* 2013, 2014; Avens *et al.* 2020; NMFS and USFWS 2020); age and growth data on Leatherback Sea Turtles are sparse and estimates vary widely (Avens *et al.* 2009; Wallace and Jones 2015).	~30 years
Is there an [observed, inferred, or projected] continuing decline in number of mature individuals? See SAS 11-16 and 19.	Yes, estimated, inferred, and projected
Estimated percent of continuing decline in total number of mature individuals within [5 years or 2 generations, whichever is longer up to a maximum of 100 years] Based on Tiwari *et al.* (2013) using numbers of nesting females only. See notes at SAS 11, 12 and 15 regarding caveats to nesting numbers.	Projected -96% decline of mature nesting females by 2040 (less than one generation)

[Observed, estimated, inferred, or suspected] percent [reduction or increase] in total number of mature individuals over the last [10 years, or 3 generations, whichever is longer up to a maximum of 100 years]. This rate is taken from Tiwari *et al.* (2013). Most trend work in the literature refers only to annual rates of decline and does not calculate generation-length decline (e.g., Tapilatu *et al.* 2013; Benson *et al.* 2020; Martin *et al.* 2020; NMFS and USFWS 2020). See SAS 11, 12 and 15 for further information. Abundance data for leatherback turtles ~100 years ago do not exist. Tiwari *et al.* (2013) assumed that population abundance three generations ago was similar to the first observed abundance rather than assuming that the WPO had always been declining/increasing at the same rate as in the current generation.	Estimated and inferred -83% reduction over past 3 generations (~100 years)
[Projected or suspected] percent [reduction or increase] in total number of mature individuals over the next [10 years, or 3 generations, whichever is longer up to a maximum of 100 years]. This number is based on Tiwari *et al.* (2013) using numbers of nesting females only. See notes at SAS 11, 12 and 15.	Projected -96% reduction in abundance of mature nesting females by 2040 (less than one generation). Decline at similar high rate into the future is suspected.
[Observed, estimated, inferred, or suspected] percent [reduction or increase] in total number of mature individuals over any period [10 years, or 3 generations, whichever is longer up to a maximum of 100 years], including both the past and the future. Most trend work in the literature refers only to annual rates of decline and does not calculate generation-length decline (e.g., Tapilatu *et al.* 2013; Benson *et al.* 2020; Martin *et al.* 2020; NMFS and USFWS 2020). This rate is taken from Tiwari *et al.* (2013). They assumed that earliest available historical abundance (see #4 above) was equivalent to the WPO RMU for past generations and estimated future population abundance in 2020, 2030 and 2040 (within one generation). This future projection assumes that the derived population trend will continue without deviation during the next generation. Also see notes at SAS 11, 12 and 15.	Estimated/projected -96% reduction in abundance of mature nesting females by 2040 (less than one generation)
Are the causes of the decline a. clearly reversible and b. understood and c. ceased? See SAS 16.	a) partially reversible, b) partially understood, and c) not ceased
Are there extreme fluctuations in number of mature individuals?	No

Extent and Occupancy Information

Estimated extent of occurrence (EOO) As determined for Western Pacific Ocean subpopulation of leatherback turtles throughout their range by Tiwari *et al.* (2013) for the IUCN Assessment. See also SAS 7 and 8.	134,405,260 km² (global range including Canadian)
Index of area of occupancy (IAO) (Always report 2x2 grid value). See SAS 7 and 8.	In excess of 2,000 km² (based on nesting sites)
Is the population "severely fragmented" i.e., is >50% of its total area of occupancy in habitat patches that are (a) smaller than would be required to support a viable population, and (b) separated from other habitat patches by a distance larger than the species can be expected to disperse?	a. No b. No
Number of "locations"∗ (use plausible range to reflect uncertainty if appropriate)	1-10 (based on international bycatch)
Is there an [observed, inferred, or projected] decline in extent of occurrence?	No
Is there an [observed, inferred, or projected] decline in index of area of occupancy? The population of the WPO RMU Leatherback Sea Turtles that occurred in Malaysia is considered functionally extinct (Chan and Liew 1996). Declines have been inferred from recent nesting counts and anecdotal reports from the community at other WPO RMU nesting beaches (Hitipeuw *et al.* 2007, Benson *et al.* 2011, Tiwari *et al.* 2013).	Yes, inferred and projected
Is there an [observed, inferred, or projected] decline in number of subpopulations?	Not applicable
Is there an [observed, inferred, or projected] decline in number of "locations"*?	No
Is there an [observed, inferred, or projected] decline in [area, extent and/or quality] of habitat? See SAS 14 and 16.	Yes, observed, inferred and projected decline in area and quality of habitat
Are there extreme fluctuations in number of subpopulations?	No
Are there extreme fluctuations in number of "locations"*?	No
Are there extreme fluctuations in extent of occurrence?	No
Are there extreme fluctuations in index of area of occupancy?	No

∗ See Definitions and Abbreviations on COSEWIC website for more information on this term.

Number of Mature Individuals (in each subpopulation)

Subpopulations (give plausible ranges)	N Mature Individuals
One subpopulation in Pacific Canadian waters consisting of individuals from several nesting locations (PLTRT 2006; COSEWIC 2012). See SAS 11 and 12 for Pacific Canadian abundance and for rationale for numbers associated with the entire WPO RMU. Numbers listed here combine results from NMFS and USFWS (2020) and Martin *et al.* (2020). Data on number of adult male Leatherback Sea Turtles are not available.	515 - ~1,277 nesting females in Western Pacific Ocean RMU. Numbers in Canadian waters unknown.
Total	515 - ~1,277 nesting females

Quantitative Analysis

Is the probability of extinction in the wild at least [20% within 20 years or 5 generations whichever is longer up to a maximum of 100 years, or 10% within 100 years]? Tiwari *et al.* (2013) projects -96% decline of mature nesting females by 2040 (less than one generation), but probability of extinction not calculated. See details on their analysis included with #4 above.	Analysis not conducted

Threats (direct, from highest impact to least, as per IUCN Threats Calculator)

Was a threats calculator completed for this species?

See SAS 16. No independent threats calculator was completed. Two recent comprehensive threats assessments are available for the WPO RMU (Tiwari *et al.* 2013; NMFS and USFWS 2020), which identified primary threats to WPO population including:

i. Fisheries bycatch – considered High across entire range)
ii. Overexploitation (egg collection and harvesting of females)
iii. Low hatching success due to high sand temperatures, erosion, feral pig and dog predation

What additional limiting factors are relevant?

Late maturation and long generation time limit resilience to population perturbations, and long-distance migrations increase exposure to fisheries bycatch risk and pollution.

Rescue Effect (immigration from outside Canada)

Status of outside population(s) most likely to provide immigrants to Canada. See SAS 7, 8, 12 and 14. Canadian turtles are part of the wider ranging West Pacific population. The East Pacific population is the only likely source of immigrants.	Endangered
Is immigration known or possible?	possible
Would immigrants be adapted to survive in Canada?	Yes

Is there sufficient habitat for immigrants in Canada?	Yes
Are conditions deteriorating in Canada?[+]	Unknown in Canadian waters, but deteriorating on nesting beaches and migration routes
Are conditions for the source (i.e., outside) population deteriorating?[+] See SAS 11-17 and 19.	Yes
Is the Canadian population considered to be a sink?[+]	No
Is rescue from outside populations likely? See SAS 11-15. Although turtles from WPO RMU nesting and US foraging assemblages could come to Canadian waters, these groups are in steep decline and are part of the same population as the Leatherback Sea Turtles found in Pacific Canadian waters.	No

Data Sensitive Species

Is this a data sensitive species?	No

Status History

COSEWIC Status History:
The species was considered a single unit and designated Endangered in April 1981. Status re-examined and confirmed in May 2001. Split into two populations in May 2012. The Pacific population was designated Endangered in May 2012. Status re-examined and confirmed in December 2022.

Status and Reasons for Designation:

Status:	**Alpha-numeric codes:**
Endangered	A2bcde+3bcde+4bcde

Reasons for designation:
The Pacific population of this large, long-lived marine turtle has collapsed by over 80% since the mid-1980s and is projected to decline by 96% by 2040. Adult turtles nest on beaches in Indonesia, Papua New Guinea, Solomon Islands and Vanuatu, but migrate in summer to the Northeast Pacific to forage on jellyfish, with small numbers reaching the marine waters of Pacific Canada. This species continues to be threatened by bycatch and entanglement in fishing gear, marine pollution, coastal and offshore resource development, climate change, poaching of eggs, and nesting habitat decline.

Applicability of Criteria

Criterion A (Decline in Total Number of Mature Individuals): Meets Endangered, A2bcde+3bcde+4bcde. Estimated and inferred decline in number of mature individuals of approximately 83% over past 3 generations; projected approximate 96% reduction in abundance of mature nesting females by 2040 (less than one generation).
Criterion B (Small Distribution Range and Decline or Fluctuation): Not applicable. EOO and IAO exceed thresholds for Threatened, population may occur at < or =10 locations but is not severely fragmented and does not experience extreme fluctuations.

[+] See Definitions and Abbreviations on COSEWIC website for more information on this term.

Criterion C (Small and Declining Number of Mature Individuals): May meet C1; a continuing decline greatly exceeding 20% within two generations, but there is uncertainty about total number of mature individuals <2,500.
Criterion D (Very Small or Restricted Population): Not applicable. The population is neither very small nor restricted.
Criterion E (Quantitative Analysis): Not applicable. Analysis not conducted.

COSEWIC HISTORY

The Committee on the Status of Endangered Wildlife in Canada (COSEWIC) was created in 1977 as a result of a recommendation at the Federal-Provincial Wildlife Conference held in 1976. It arose from the need for a single, official, scientifically sound, national listing of wildlife species at risk. In 1978, COSEWIC designated its first species and produced its first list of Canadian species at risk. Species designated at meetings of the full committee are added to the list. On June 5, 2003, the *Species at Risk Act* (SARA) was proclaimed. SARA establishes COSEWIC as an advisory body ensuring that species will continue to be assessed under a rigorous and independent scientific process.

COSEWIC MANDATE

The Committee on the Status of Endangered Wildlife in Canada (COSEWIC) assesses the national status of wild species, subspecies, varieties, or other designatable units that are considered to be at risk in Canada. Designations are made on native species for the following taxonomic groups: mammals, birds, reptiles, amphibians, fishes, arthropods, molluscs, vascular plants, mosses, and lichens.

COSEWIC MEMBERSHIP

COSEWIC comprises members from each provincial and territorial government wildlife agency, four federal entities (Canadian Wildlife Service, Parks Canada Agency, Department of Fisheries and Oceans, and the Federal Biodiversity Information Partnership, chaired by the Canadian Museum of Nature), three non-government science members and the co-chairs of the species specialist subcommittees and the Aboriginal Traditional Knowledge subcommittee. The Committee meets to consider status reports on candidate species.

DEFINITIONS (2022)

Wildlife Species	A species, subspecies, variety, or geographically or genetically distinct population of animal, plant or other organism, other than a bacterium or virus, that is wild by nature and is either native to Canada or has extended its range into Canada without human intervention and has been present in Canada for at least 50 years.
Extinct (X)	A wildlife species that no longer exists.
Extirpated (XT)	A wildlife species no longer existing in the wild in Canada, but occurring elsewhere.
Endangered (E)	A wildlife species facing imminent extirpation or extinction.
Threatened (T)	A wildlife species likely to become endangered if limiting factors are not reversed.
Special Concern (SC)*	A wildlife species that may become a threatened or an endangered species because of a combination of biological characteristics and identified threats.
Not at Risk (NAR)**	A wildlife species that has been evaluated and found to be not at risk of extinction given the current circumstances.
Data Deficient (DD)***	A category that applies when the available information is insufficient (a) to resolve a species' eligibility for assessment or (b) to permit an assessment of the species' risk of extinction.

* Formerly described as "Vulnerable" from 1990 to 1999, or "Rare" prior to 1990.

** Formerly described as "Not In Any Category", or "No Designation Required."

*** Formerly described as "Indeterminate" from 1994 to 1999 or "ISIBD" (insufficient scientific information on which to base a designation) prior to 1994. Definition of the (DD) category revised in 2006.

Environment and Climate Change Canada
Canadian Wildlife Service
Environnement et Changement climatique Canada
Service canadien de la faune
Canada

The Canadian Wildlife Service, Environment and Climate Change Canada, provides full administrative and financial support to the COSEWIC Secretariat.