

Update on the Eastern North Pacific Gray Whale (*Eschrichtius robustus*) 2019-2022 Unusual Mortality Event

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ABSTRACT

From 17 December 2018 through 06 April 2022, a total of ~534 stranded Eastern North Pacific gray whales (*Eschrichtius robustus*) were documented along the Pacific coast across three countries (Canada, Mexico, and United States). Two hundred and fourteen whales were reported in 2019, (including two whales from December 2018), 172 in 2020, 114 in 2021, and 32 in 2022 as of 06 April (Table 1, Figures 1, 2). Along the west coast of the United States, the 122 stranded

whales reported in 2019, 79 in 2020, and 54 in 2021 were above the annual mean stranding rate of 29 ± 10 whales calculated between 2001-2018 (Table 2, Figure 3). Strandings occurred along the entire range of the Eastern North Pacific gray whale, including breeding, migratory, and feeding areas (Figure 2, Tables 1, 2), with most U.S. whales documented in spring and early summer when gray whales are near the end of their seasonal fast (Figure 3).

The recent abundance estimate of the Eastern North Pacific gray whale population showed a ~24% decrease between 2016 and 2020, which spans the Unusual Mortality Event (UME; Stewart and Weller 2021a). Total calf production in 2021 was estimated at 380 individuals (95% CI 296 – 493) and is among the lowest calf production estimates on record (Stewart and Weller 2021b). Two of the three recorded periods of low calf production have coincided with UMEs, the 1999-2000 UME and the current event. This suggests that the factors driving or mediating gray whale fecundity and mortality rates may be similar. Photogrammetry of live gray whales in Mexico from 2017 through 2019, demonstrated significantly lower body condition in whales in 2018 and 2019 compared to 2017 (Christiansen *et al.* 2021). Depending upon the age class of the whales, this lower body condition may have led to delayed reproduction and lower calf counts, and/or reduced survival in thin whales.

Preliminary results have not identified a primary cause of the gray whale UME. It is likely that the event may be multifactorial, including some mortality linked to killer whale predation, entanglements and vessel strikes, and to poor body condition possibly associated with ecosystem changes in sub-Arctic and Arctic feeding areas (Moore *et al.* 2022). Partial or complete necropsy examinations conducted in 2019 on a subset of stranded whales found evidence of poor to thin body condition, killer whale predation, and/or human interactions (Raverty *et al.* 2020). Similar findings were documented in 2020 and 2021, with additional analyses of necropsy data in progress. Between 2019 and 2021, tissue samples from 25 whales tested negative by PCR for morbilliviruses, Influenza viruses, and coronaviruses. Samples (*i.e.*, feces, stomach contents, intestinal contents) from 48 whales were tested by ELISA for biotoxins including domoic acid and/or saxitoxin. For domoic acid, 83% of whales (38/46) had detectable concentrations including 7% (3/46) with high (>1000 ng/ml), 2% (1/46) with moderate (164 ng/ml), 74% (34/46) with low (<100 ng/ml) and 17% (8/46) with no detectable concentrations. For saxitoxin, 29% of whales (10/35) had detectable concentrations including 6% (2/35) with moderate (113 & 373 ng/g), 23% (8/35) with low (<100 ng/g) and 71% (25/35) with no detectable concentrations. Currently the toxic thresholds and kinetics of biotoxins are not well known in cetaceans (Lefebvre *et al.* 2016, Danil *et al.* 2021, Fire *et al.* 2021). Due to decomposition, histology of likely target organs (brain, heart) was not available for these animals, although histologic lesions associated with biotoxin exposure in cetaceans are limited (Broadwater *et al.* 2018).

For current data, please refer to: <https://www.fisheries.noaa.gov/national/marine-life-distress/2019-2022-gray-whale-unusual-mortality-event-along-west-coast-and>

Table 1: Eastern North Pacific gray whale strandings by country from December 17, 2018, through April 6, 2022.

Country	2019*	2020	2021	2022	Total
Canada	11	5	5	0	21
US	122	79	54	7	262
Mexico	83	88	55	25	251
Total	216	172	114	32	534

*includes 2 whales that stranded in Mexico in December 2018

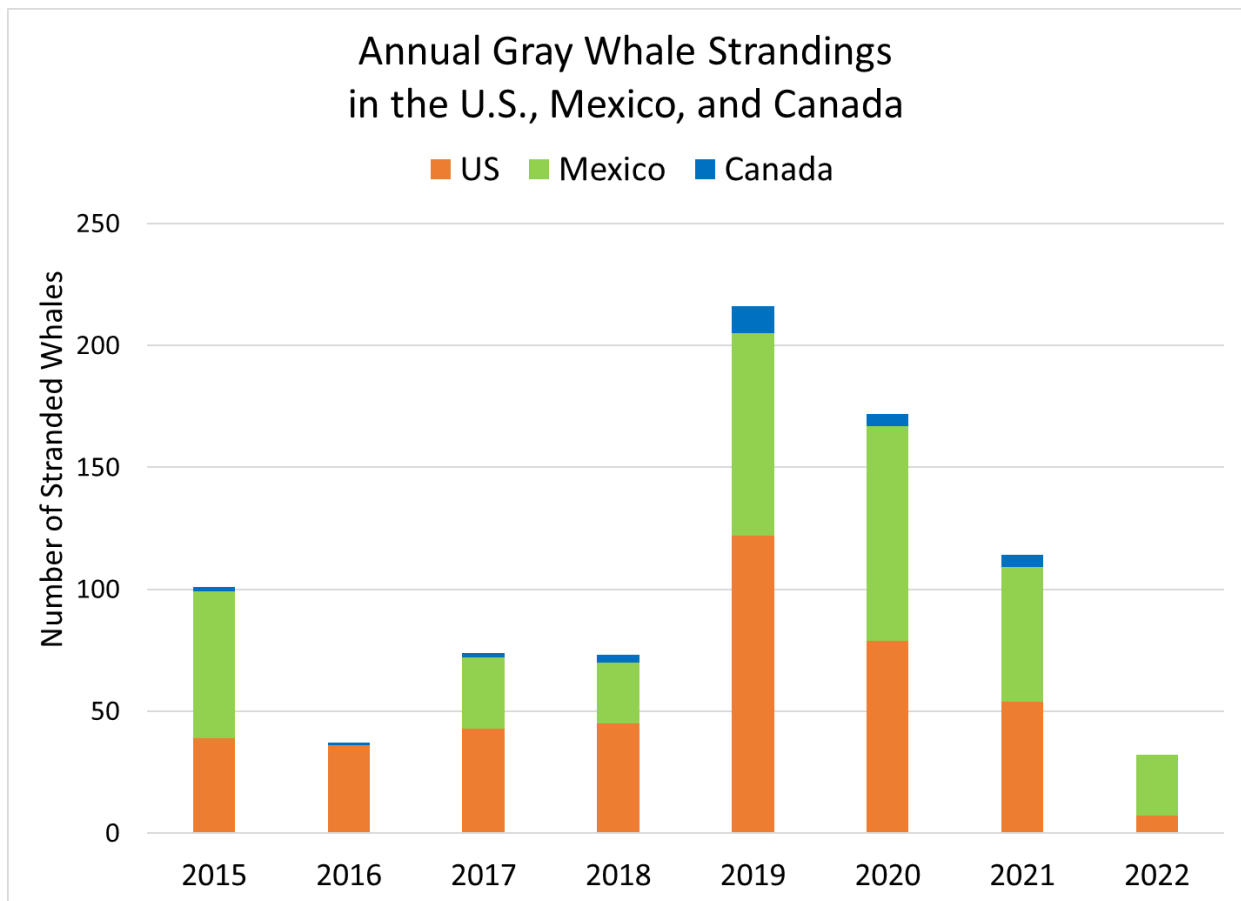


Figure 1: Overall Eastern North Pacific gray whale annual strandings, 2015 to 2022 (as of April 6, 2022) in the U.S., Mexico, and Canada

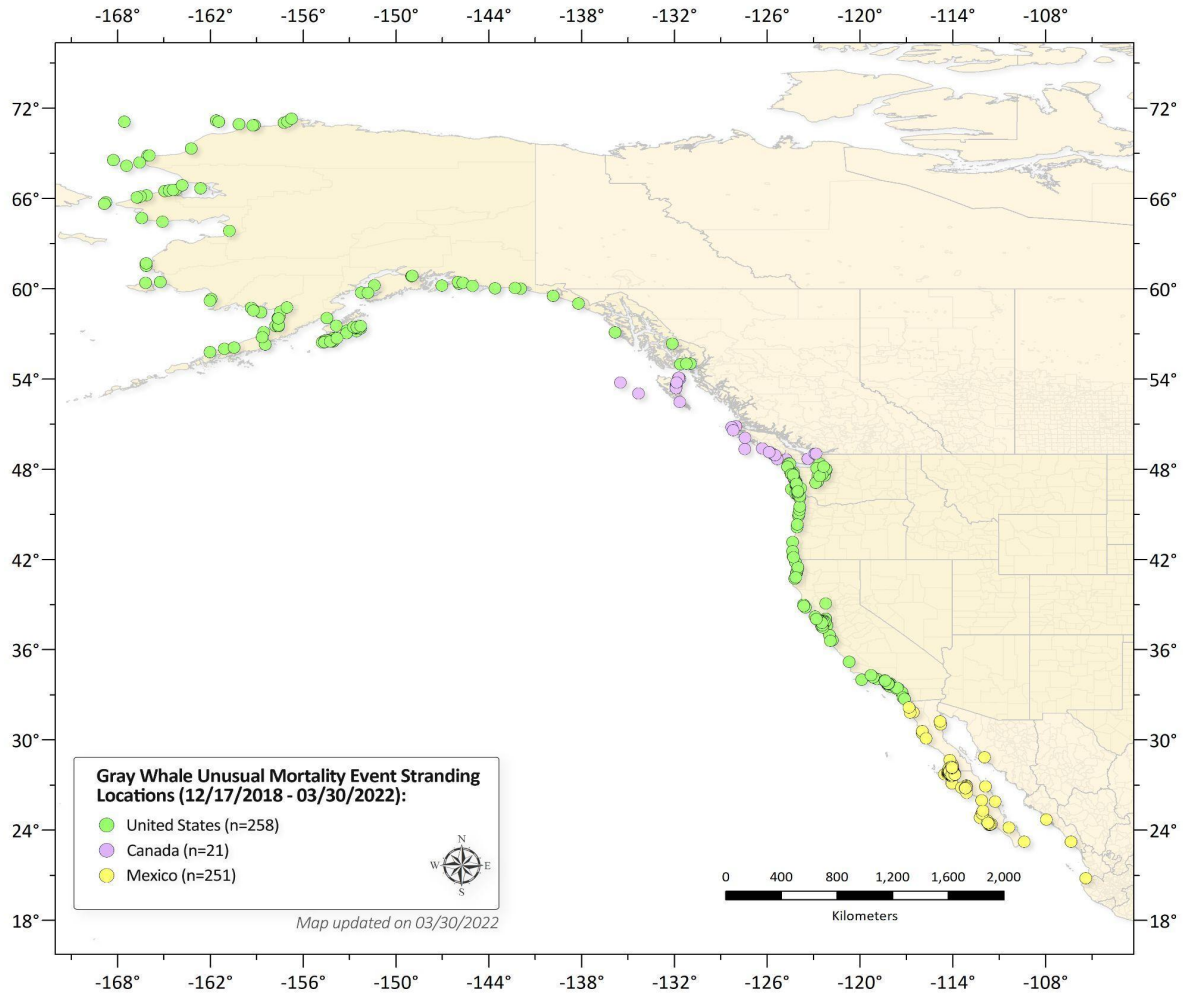


Figure 2: Locations of stranded Eastern North Pacific gray whales from December 17, 2018, through March 30, 2022

Table 2: Eastern North Pacific gray whale strandings by U.S. state from January 1, 2019, through April 6, 2022

U.S. State	2019	2020	2021	2022
Alaska	48	45	23	0
Washington	34	13	9	4
Oregon	6	3	3	0
California	34	18	19	3
Total	122	79	54	7

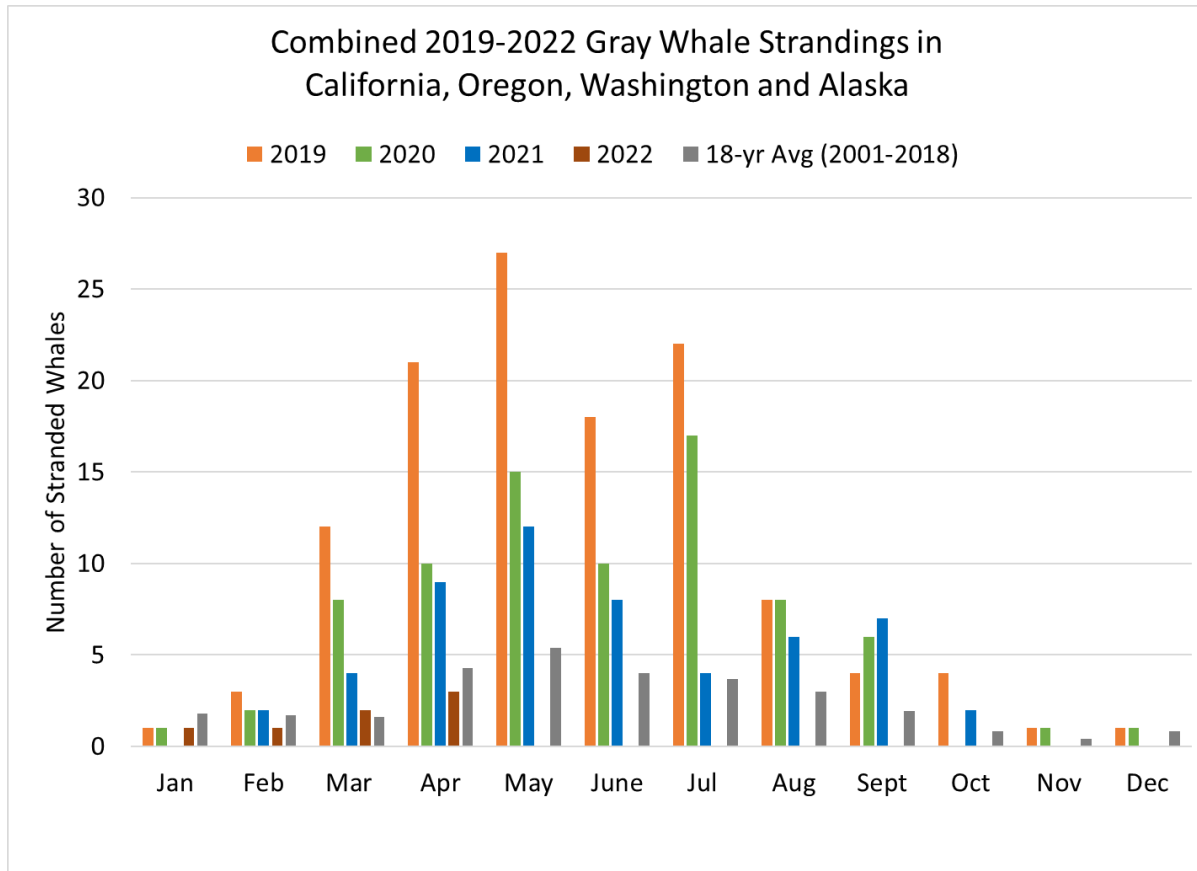


Figure 3: Annual U.S. Eastern North Pacific gray whale strandings from January 1, 2019, through April 6, 2022, compared to 18-year average (2001-2018).

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