

Supplemental methods for Shifts in Southern Resident Killer Whale Phenology in the Salish Sea

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Supplemental Methods

Expected phenological change due to change in effort alone (simulations)

Supplemental Results

Expected phenological change due to change in effort alone (simulations)- do this for the recent time span as well?

Time series of peak prob. occurrence for K and L pods

Time series for first- and last- dates when occurrence probability is greater than 0.5 for J,K,L pods

Supplemental Tables

Table comparing estimates of shifts

Supplemental Figures

Table 1: **Estimated linear trends in peak-, start-of-, and end-of-season SRKW phenology** in Puget Sound proper and the central Salish Sea, from occupancy model estimates of presence probabilities. ‘Peak’ is the day of year with the maximum probability of presence (or the mean across day of year, if there are multiple days with the peak probability of presence). To estimate the start of the season, we identified the earliest day of year with an estimated presence probability greater than 0.5. To estimate the end of the season, we identified the latest day of year with an estimated presence probability greater than 0.5.

Pod	Region	Season	Phase	1978-2017 trend	2002-2017 trend
J	Puget Sound	Fall	peak	1.17 (0.7 - 1.62)	0.31 (-1.87 - 2.59)
J	Puget Sound	Fall	first	0.58 (-0.3 - 1.41)	2.63 (0.48 - 4.82)
J	Puget Sound	Fall	last	0.94 (0.13 - 1.75)	-1.41 (-3.29 - 0.36)
J	Central Salish Sea	Summer	peak	1.1 (0.3 - 1.85)	6.15 (0.69 - 10.65)
J	Central Salish Sea	Summer	first	-0.77 (-1.05 - -0.51)	1.11 (0.76 - 1.61)
J	Central Salish Sea	Summer	last	1.12 (0.82 - 1.44)	0.24 (-0.1 - 0.56)
J	Puget Sound	Full Year	peak	2.17 (0.95 - 3.39)	1.59 (-4.2 - 8.59)
J	Puget Sound	Full Year	first	1.9 (-0.42 - 4.29)	-3.57 (-10.1 - 2.91)
J	Puget Sound	Full Year	last	1.24 (-0.54 - 3.14)	-3.7 (-7.39 - 0.43)
J	Central Salish Sea	Full Year	peak	0.28 (-1.17 - 1.64)	3.56 (-3.11 - 8.81)
J	Central Salish Sea	Full Year	first	-2.25 (-2.94 - -1.56)	-2.05 (-2.94 - -1.15)
J	Central Salish Sea	Full Year	last	2.29 (1.72 - 2.84)	2.16 (1.2 - 3.1)
K	Puget Sound	Fall	peak	1.82 (1.29 - 2.34)	1.67 (-0.18 - 3.8)
K	Puget Sound	Fall	first	1.63 (0.51 - 2.59)	1.58 (-0.96 - 4.22)
K	Puget Sound	Fall	last	2.69 (1.72 - 3.67)	1.32 (0.4 - 2.51)
K	Central Salish Sea	Summer	peak	0.81 (0.22 - 1.37)	0.08 (-1.88 - 1.86)
K	Central Salish Sea	Summer	first	-0.33 (-0.85 - 0.19)	0.63 (-0.87 - 1.89)
K	Central Salish Sea	Summer	last	0.66 (0.26 - 1.11)	-1.26 (-2.2 - 0.73)
L	Puget Sound	Fall	peak	0.9 (0.47 - 1.31)	0.05 (-0.98 - 1.13)
L	Puget Sound	Fall	first	1.72 (0.48 - 2.94)	1.43 (-0.74 - 4.08)
L	Puget Sound	Fall	last	0.79 (-0.75 - 2.27)	-0.67 (-1.93 - 0.49)
L	Central Salish Sea	Summer	peak	0.22 (-0.26 - 0.71)	-1.61 (-3.66 - 0.52)
L	Central Salish Sea	Summer	first	-1.77 (-2.3 - -1.23)	0.8 (0.05 - 1.58)
L	Central Salish Sea	Summer	last	1.1 (0.69 - 1.52)	-0.23 (-0.7 - 0.22)