Temporal shifts in seabird populations and spatial coherence with prey in the southeastern Bering Sea

Robert M. Suryan*, Kathy J. Kuletz, Sandra L. Parker-Stetter, Patrick H. Ressler, Martin Renner, John K. Horne, Edward V. Farley, Elizabeth A. Labunski

*Corresponding author: rob.suryan@oregonstate.edu

Table S1. Sampling effort during summer (02 June - 31 July) and fall (18 August – 05 October) within the southeastern Bering Sea study area, 2008-2010. Sample sizes include the number of 3-km transect segments surveyed within each 37 km x 37 km cell that was sampled (S/C; mean, range), the number of individual grid cells (C) sampled each season, and the combined distance of all transects (km). A transect segment is every 3-km for strip transect bird surveys, 0.9 km for summer and fall hydroacoustic prey surveys. Not all of the same grid cells were sampled during summer and fall each year, therefore, the number of grid cells sampled each year during both summer and fall were 26 cells in 2008, 51 cells in 2009, and 56 cells in 2010.

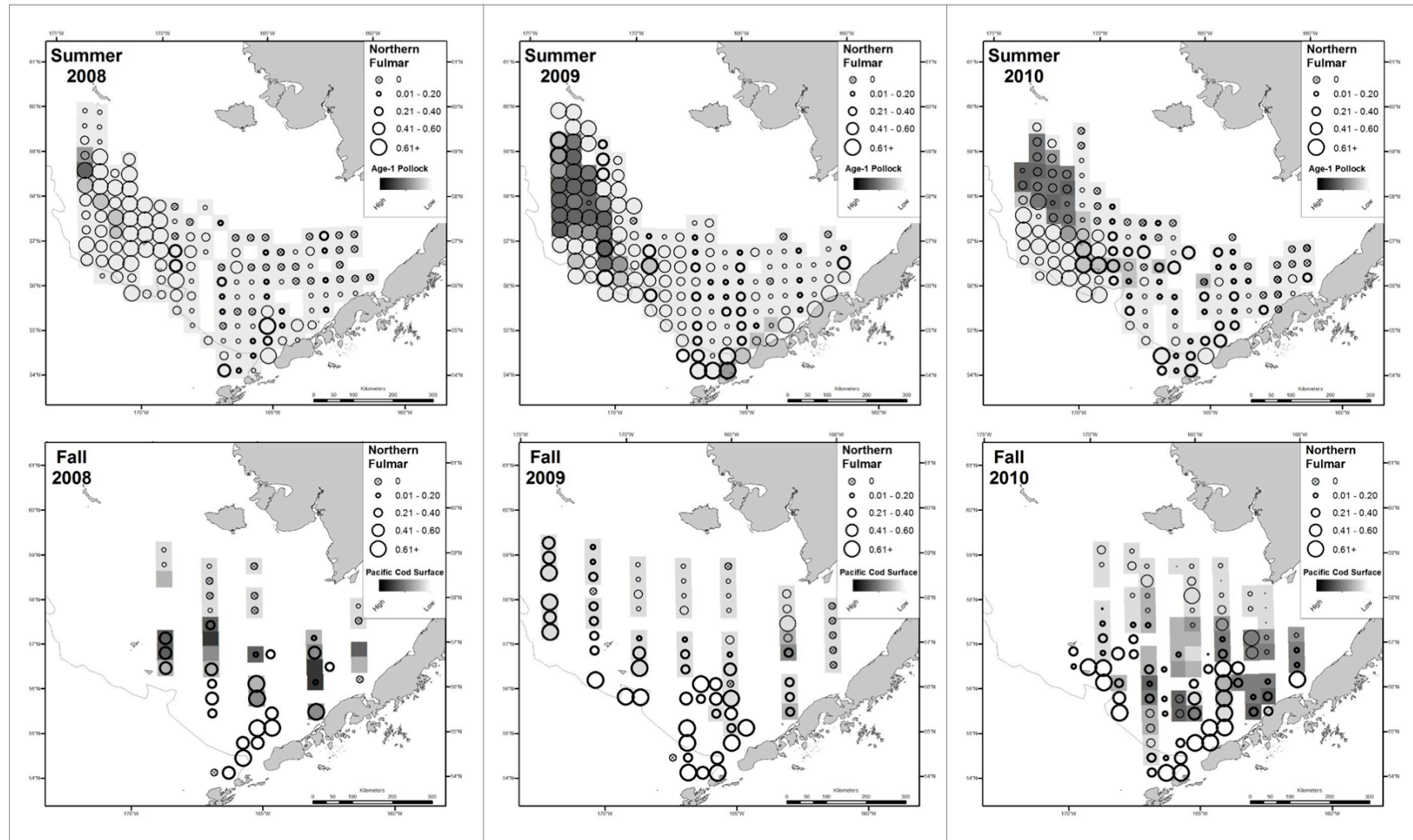|	2008						2009						2010					
	Summer			Fall			Summer			Fall			Summer			Fall		
Survey	S/C	C	km	S/C	C	km	S/C	C	km	S/C	C	km	S/C	C	km	S/C	C	km
Seabird	12.4 (1-33)	147	5,239	8.0 (1-27)	46	954	13.6 (1-33)	159	6,032	10.1 (1-26)	79	2,207	11.0 (1-33)	139	4,702	11.8 (1-47)	107	3,510
Prey	35.3 (3-42)	176	3,104	36.2 (2-44)	42	1,409	35.5 (1-44)	172	3,053	34.6 (1-46)	74	2,401	35.6 (2-42)	177	3,151	35.5 (1-60)	116	3,816

Figure S1. Distribution of northern fulmars and prey species that ranked highest in predator-prey models during summer vs. fall, 2008-2010. Median bird density is plotted as open circles for each 37 X 37 km grid cell sampled in a given season and year. Open circles with thicker lines indicate grid cells sampled during both summer and fall within a year. The number of grid cells sampled during both seasons varied each year (see Table S1).
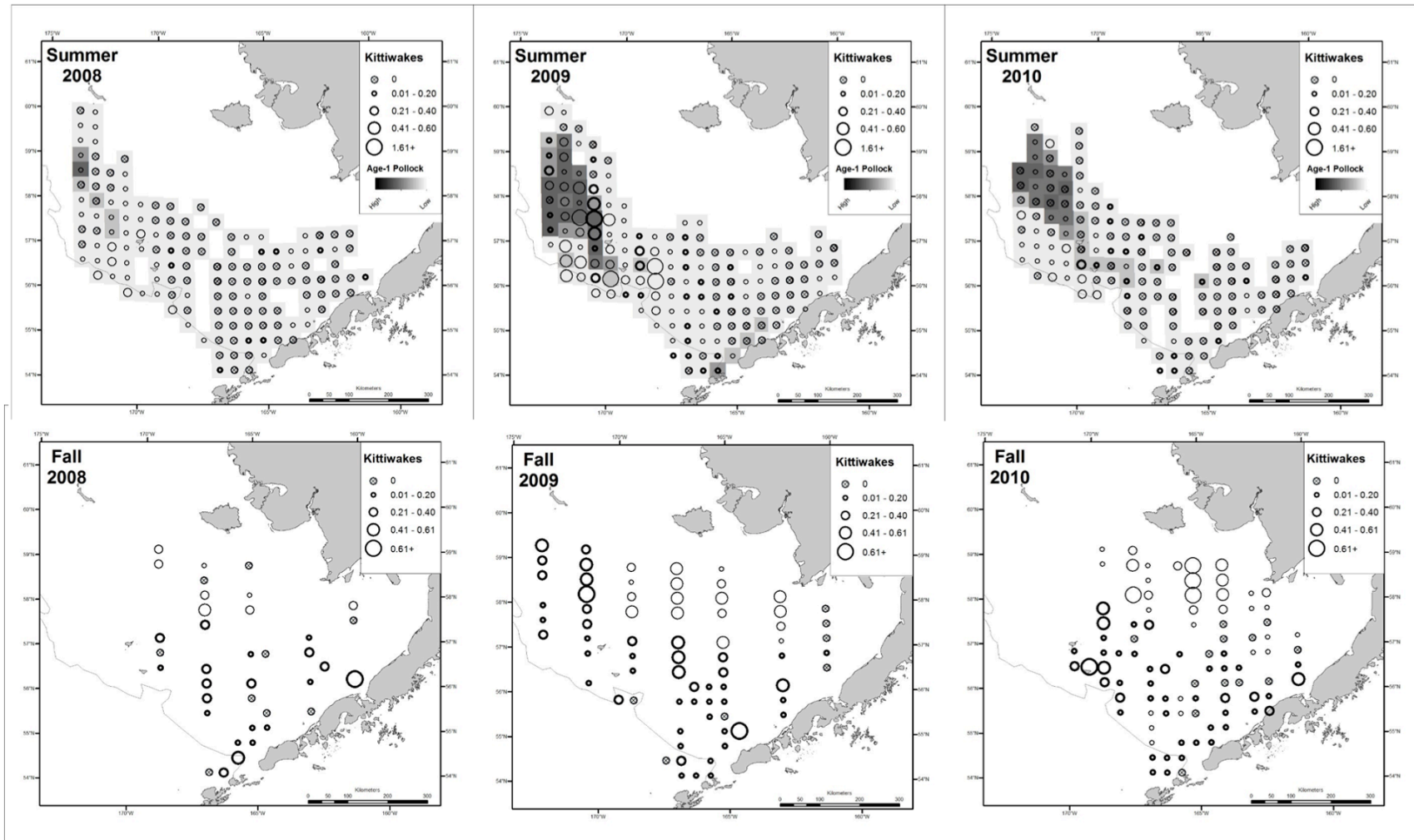
Figure S2. Distribution of kittiwakes (black-legged [primarily], red-legged, and unidentified kittiwakes) and prey species that ranked highest in predator-prey models during summer vs. fall, 2008-2010. Median bird density is plotted as open circles for each 37 X 37 km grid cell sampled in a given season and year. Open circles with thicker lines indicate grid cells sampled during both summer and fall within a year. The number of grid cells sampled during both seasons varied each year (see Table S1).
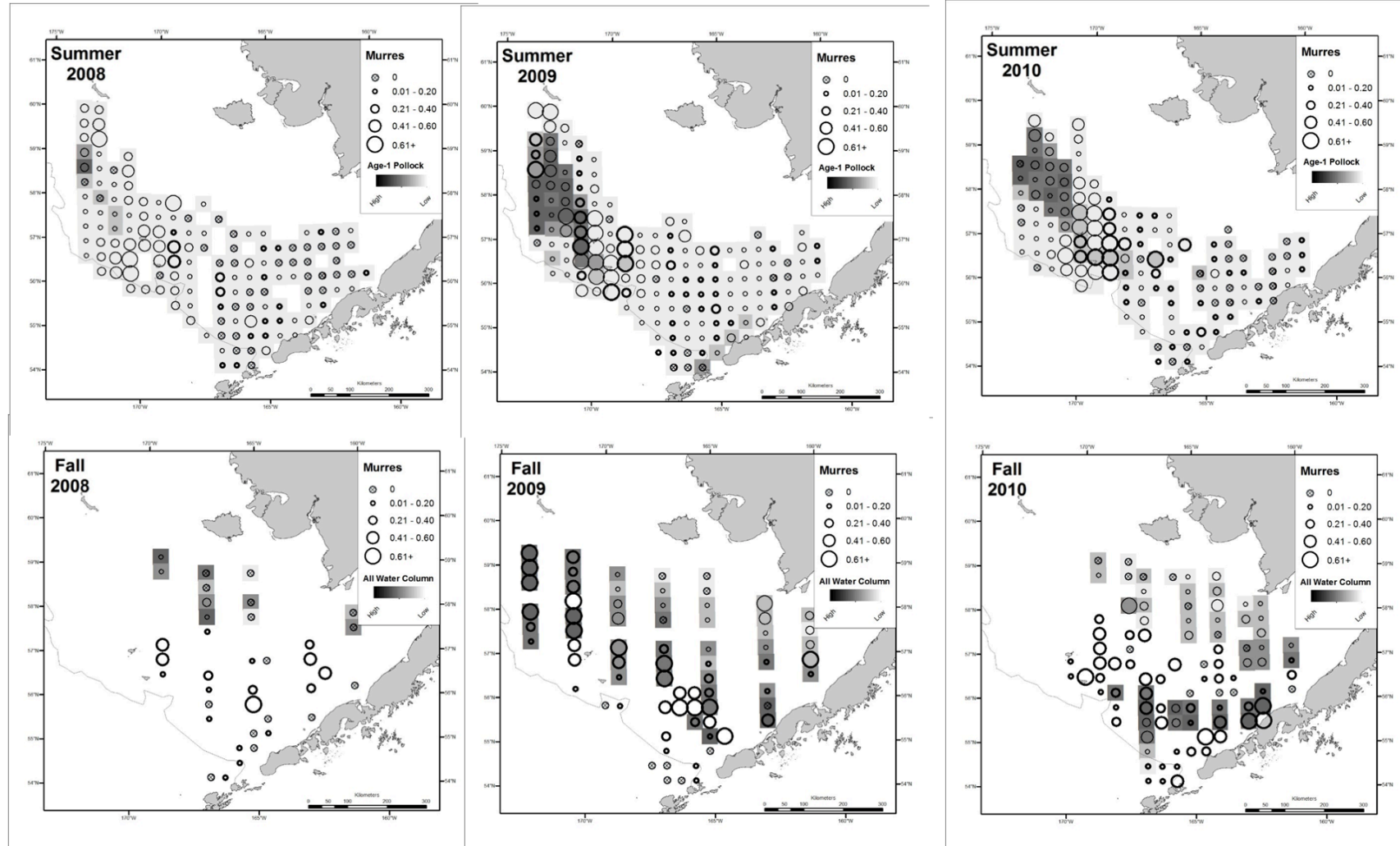
Figure S3. Distribution of murres (thick-billed [primarily], common, and unidentified murres) and prey species that ranked highest in predator-prey models during summer vs. fall, 2008-2010. Median bird density is plotted as open circles for each 37 X 37 km grid cell sampled in a given season and year. Open circles with thicker lines indicate grid cells sampled during both summer and fall within a year. The number of grid cells sampled during both seasons varied each year (see Table S1).
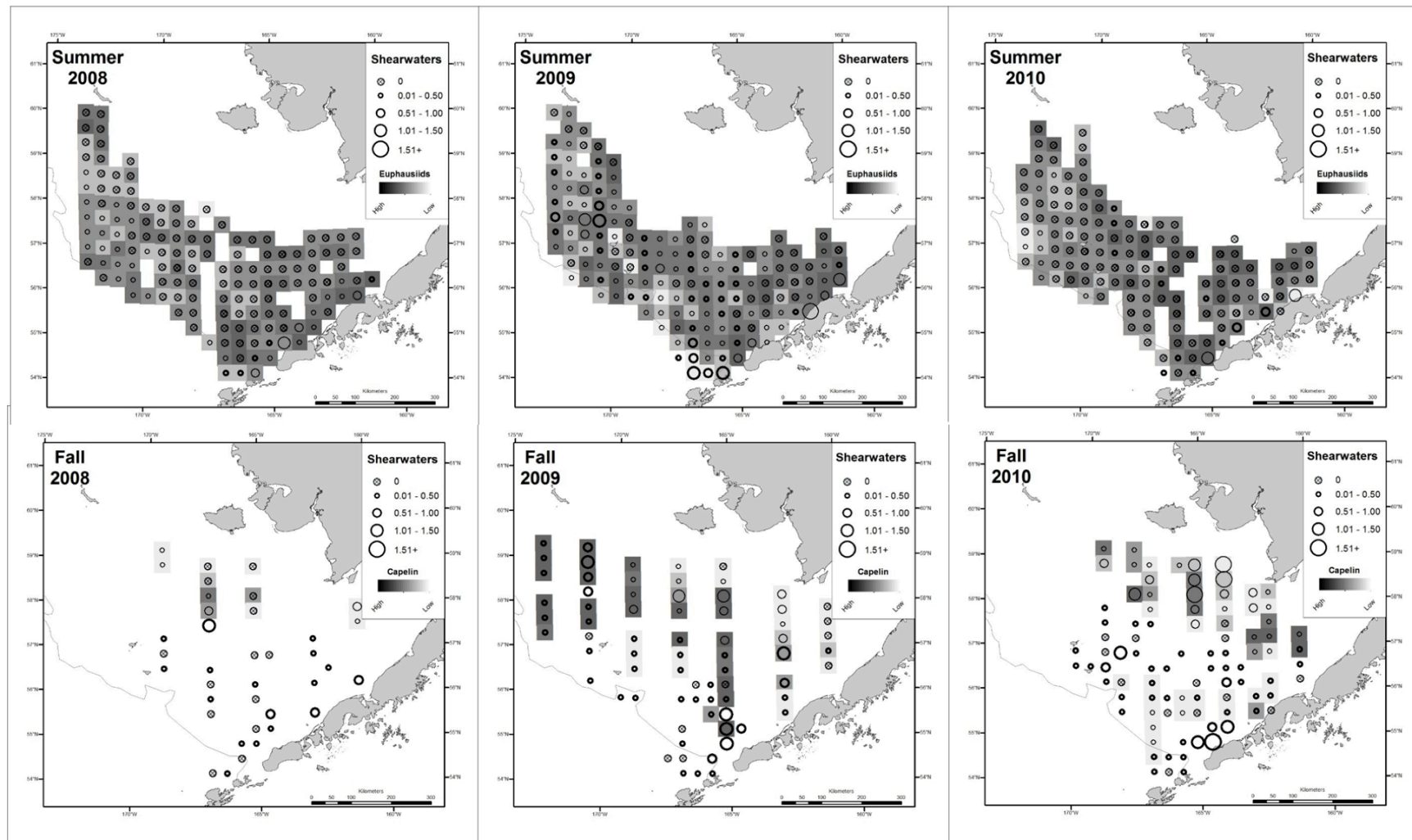
Figure S4. Distribution of shearwaters (short-tailed [primarily] and sooty shearwaters) and prey species during summer vs. fall, 2008-2010. Median bird density is plotted as open circles for each 37 X 37 km grid cell sampled in a given season and year. Open circles with thicker lines indicate grid cells sampled during both summer and fall within a year. Two prey species were significant in each final model for shearwaters, therefore we plotted the prey species that had not been displayed in previous figures. The number of grid cells sampled during both seasons varied each year (see Table S1)