

Online Resource 2 – Contains figures and tables showing the number of bowhead whale (*Balaena mysticetus*) carcasses, number of carcasses categorized as probable killer whale (*Orcinus orca*) predation, annual survey effort (per 1000-km), and sighting rates (carcasses/1000-km of survey effort) for carcasses documented in the eastern Chukchi and western Beaufort study areas from 2009 to 2019.

Bowhead whale (Balaena mysticetus) carcasses documented during the 2019 aerial surveys in the eastern Chukchi and western Beaufort seas: A follow up to evidence of bowhead whale and killer whale (Orcinus orca) co-occurrence during 2009–2018

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Table 2.1 All bowhead whale (*Balaena mysticetus*) carcasses (2009–2019) detected during aerial line-transect surveys in the eastern Chukchi Sea (EC) study area (2009–2013: 68°–72° N, 157°–169° W; 2014–2019: 67°–72° N, 157°–169° W), western Beaufort Sea (WB) study area (south of 71.2°N, 140°–146° W; south of 71.3° N, 146°–150° W; and south of 72° N, 150°–157° W), and both study areas combined (EC+WB), tallied by year. The number of bowhead whales with cause of death categorized as probable killer whale (*Orcinus orca*) predation are provided inside brackets

	July		August		September		October		Annual
	EC	WB	EC	WB	EC	WB	EC	WB	EC+WB
2009	0	0	1	0	0	0	0	0	1
2010	1[1]	0	0	0	1	0	0	0	2[1]
2011	0	0	0	0	0	0	0	0	0
2012^a	0	0	0	0	1[1]	0	1[1]	0	2[2]
2013[†]	0	0	0	0	5[3]	1	0	0	6[3]
2014	0	0	0	0	0	0	0	0	0
2015^{††}	0	0	1	0	2[1]	1	4[1]	2[1]	10[3]
2016^b	1[1]	0	0	1	2[2]	1[1]	0	0	5[4]
2017^c	0	0	0	0	1[1]	0	0	0	1[1]
2018^d	1[1]	1	1	0	2[2]	1[1]	0	0	6[4]
2019^e	1	0	1[1]	5[3]	1[1]	3[2]	0	0	11[7]
Total	4[3]	1	4[1]	6[3]	15[11]	7[4]	5[2]	2[1]	44[25]

^a In 2012, killer whales were seen on one day each in August (one sighting of 13 whales) and September (one sighting of five whales)

^b In 2016, killer whales were seen on three days in September (five sightings totaling 30 whales)

^c In 2017, killer whales were seen on one day in September (one sighting of two whales)

^d In 2018, killer whales were seen on one day each in August (one sightings of four whales) and September (one sighting of 12 whales)

^e In 2019, killer whales were seen on one day in August (one sighting of two whales) and September (three sightings totaling 13 whales)

[†]In 2013 and 2018, one carcass each year was attributed to aboriginal subsistence hunting activities

^{††}In 2015, two carcasses were attributed to aboriginal subsistence hunting activities

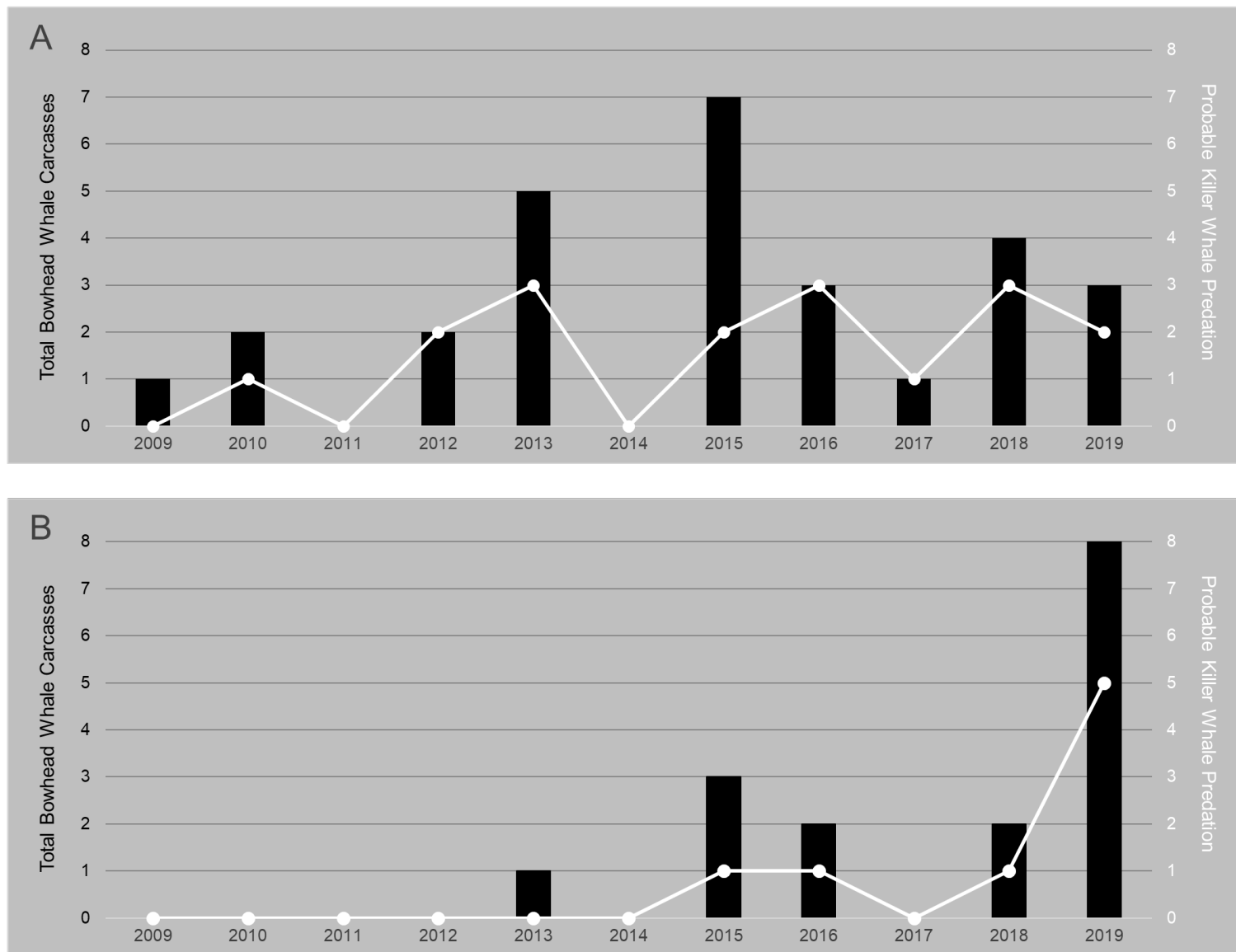


Fig. 2.1 Total number of bowhead whale (*Balaena mysticetus*) carcasses from 2009 to 2019 (left y-axis). The white line with markers depicts the number of bowhead whale carcasses categorized as probable killer whale (*Orcinus orca*) predation from 2009 to 2019 (right y-axis). A: Eastern Chukchi (EC) study area (2009–2013: 68°–72° N, 157°–169° W; 2014–2019: 67°–72° N, 157°–169° W). B: Western Beaufort (WB) study area (south of 71.2° N, 140°–146° W; south of 71.3° N, 146°–150° W; and south of 72° N, 150°–157° W). Note that WB surveys in 2009–2011 did not begin until September. Surveys in the EC study area were limited in October 2013 due to U.S. government furlough and in August 2019 while abundance surveys were conducted in the Beaufort Sea

Table 2.2 Sighting rates (SR) of bowhead whale (*Balaena mysticetus*) carcasses in the eastern Chukchi (EC) Sea study area (2009–2013: 68°–72° N, 157°–169° W; 2014–2019: 67°–72° N, 157°–169° W) and western Beaufort (WB) Sea study area (south of 71.2° N, 140°–146° W; south of 71.3° N, 146°–150° W; and south of 72° N, 150°–157° W), by month and year. SR: Number of bowhead whale carcasses (*n*) per 1000-km of survey effort (km). Note that WB surveys in 2009–2011 did not begin until September. Surveys in the EC study area were limited in October 2013 due to U.S. government furlough and in August 2019 while abundance surveys were conducted in the Beaufort Sea

EC	July			August			September			October			Annual		
	km	<i>n</i>	SR	km	<i>n</i>	SR	km	<i>n</i>	SR	km	<i>n</i>	SR	km	<i>n</i>	SR
2009	8.7	0	0.0000	6.7	1	0.1495	10.2	0	0.0000	5.5	0	0.0000	31.1	1	0.0321
2010	9.3	1	0.1080	5.3	0	0.0000	6.9	1	0.1452	4.3	0	0.0000	25.8	2	0.0775
2011	6.7	0	0.0000	8.1	0	0.0000	10.5	0	0.0000	3.6	0	0.0000	28.8	0	0.0000
2012	10.2	0	0.0000	6.2	0	0.0000	9.2	1	0.1089	8.1	1	0.1235	33.7	2	0.0594
2013	6.5	0	0.0000	9.8	0	0.0000	9.5	5	0.5251	1.0	0	0.0000	26.8	5	0.1865
2014	8.6	0	0.0000	7.2	0	0.0000	7.8	0	0.0000	5.8	0	0.0000	29.3	0	0.0000
2015	6.4	0	0.0000	9.1	1	0.1102	10.0	2	0.1991	7.2	4	0.5586	32.7	7	0.2143
2016	8.3	1	0.1210	9.5	0	0.0000	10.1	2	0.1987	6.1	0	0.0000	33.9	3	0.0885
2017	8.7	0	0.0000	7.5	0	0.0000	10.9	1	0.0914	4.8	0	0.0000	31.9	1	0.0314
2018	6.1	1	0.1631	5.1	1	0.1971	8.7	2	0.2290	4.0	0	0.0000	23.9	4	0.1672
2019	5.3	1	0.1893	3.0	1	0.3344	8.3	1	0.1205	6.1	0	0.0000	22.7	3	0.1324

WB	July			August			September			October			Annual		
	km	<i>n</i>	SR	km	<i>n</i>	SR	km	<i>n</i>	SR	km	<i>n</i>	SR	km	<i>n</i>	SR
2009	0.3	0	0.0000	0.8	0	0.0000	6.4	0	0.0000	6.2	0	0.0000	13.6	0	0.0000
2010	0.4	0	0.0000	0.1	0	0.0000	8.2	0	0.0000	5.0	0	0.0000	13.8	0	0.0000
2011	0.8	0	0.0000	3.3	0	0.0000	12.0	0	0.0000	2.2	0	0.0000	18.4	0	0.0000
2012	5.2	0	0.0000	11.3	0	0.0000	7.6	0	0.0000	6.6	0	0.0000	30.7	0	0.0000
2013	4.9	0	0.0000	7.9	0	0.0000	6.9	1	0.1449	2.7	0	0.0000	22.3	1	0.0448
2014	4.1	0	0.0000	9.0	0	0.0000	8.5	0	0.0000	5.7	0	0.0000	27.3	0	0.0000
2015	4.4	0	0.0000	9.1	0	0.0000	14.5	1	0.0691	5.6	2	0.3556	33.6	3	0.0894
2016	6.8	0	0.0000	11.2	1	0.0894	11.8	1	0.0846	6.5	0	0.0000	36.4	2	0.0550
2017	7.8	0	0.0000	11.5	0	0.0000	9.9	0	0.0000	6.5	0	0.0000	35.8	0	0.0000
2018	8.6	1	0.1161	9.0	0	0.0000	11.6	1	0.0863	5.0	0	0.0000	34.2	2	0.0584
2019	7.4	0	0.0000	7.5	5	0.6660	12.7	3	0.2370	9.3	0	0.0000	36.9	8	0.2166

Table 2.3 Annual sighting rates (SR) of bowhead whale (*Balaena mysticetus*) carcasses in the eastern Chukchi (EC) study area (2009–2013: 68°–72° N, 157°–169° W; 2014–2019: 67°–72° N, 157°–169° W) and western Beaufort (WB) study area (south of 71.2° N, 140°–146° W; south of 71.3° N, 146°–150° W; and south of 72° N, 150°–157° W), combined (EC+WB). SR: Number of bowhead whale carcasses (*n*) per 1000-km of survey effort (km). Note that WB surveys in 2009–2011 did not begin until September. Surveys in the EC study area were limited in October 2013 due to U.S. government furlough and in August 2019 while abundance surveys were conducted in the Beaufort Sea

EC + WB	Annual		
	km	<i>n</i>	SR
2009	44.8	1	0.0223
2010	39.6	2	0.0505
2011	47.2	0	0.0000
2012	64.4	2	0.0311
2013	49.1	6	0.1222
2014	56.6	0	0.0000
2015	66.2	10	0.1510
2016	70.3	5	0.0712
2017	67.7	1	0.0148
2018	58.2	6	0.1031
2019	59.6	11	0.1846

Table 2.4 Annual sighting rates (SR) of bowhead whale (*Balaena mysticetus*) carcasses categorized as probable killer whale (*Orcinus orca*) predation, in the eastern Chukchi (EC) study area (2009–2013: 68°–72° N, 157°–169° W; 2014–2019: 67°–72° N, 157°–169° W), the western Beaufort (WB) study area (south of 71.2° N, 140°–146° W; south of 71.3° N, 146°–150° W; and south of 72° N, 150°–157° W), and the two areas combined (EC+WB). SR: Number of bowhead whale carcasses categorized as probable killer whale predation (*kwp*) per 1000-km of survey effort (km). Note that WB surveys in 2009–2011 did not begin until September. Surveys in the EC study area were limited in October 2013 due to U.S. government furlough and in August 2019 while abundance surveys were conducted in the Beaufort Sea

	EC			WB			EC+WB		
	km	<i>kwp</i>	SR	km	<i>kwp</i>	SR	km	<i>kwp</i>	SR
2009	31.1	0	0.0000	13.6	0	0.0000	44.8	0	0.0000
2010	25.8	1	0.0388	13.8	0	0.0000	39.6	1	0.0253
2011	28.8	0	0.0000	18.4	0	0.0000	47.2	0	0.0000
2012	33.7	2	0.0594	30.7	0	0.0000	64.4	2	0.0311
2013	26.8	3	0.1119	22.3	0	0.0000	49.1	3	0.0611
2014	29.3	0	0.0000	27.3	0	0.0000	56.6	0	0.0000
2015	32.7	2	0.0612	33.6	1	0.0298	66.2	3	0.0453
2016	33.9	3	0.0885	36.4	1	0.0275	70.3	4	0.0569
2017	31.9	1	0.0314	35.8	0	0.0000	67.7	1	0.0148
2018	23.9	3	0.1254	34.2	1	0.0292	58.2	4	0.0688
2019	22.7	2	0.0883	36.9	5	0.1354	59.6	7	0.1175
Total		17			8			25	

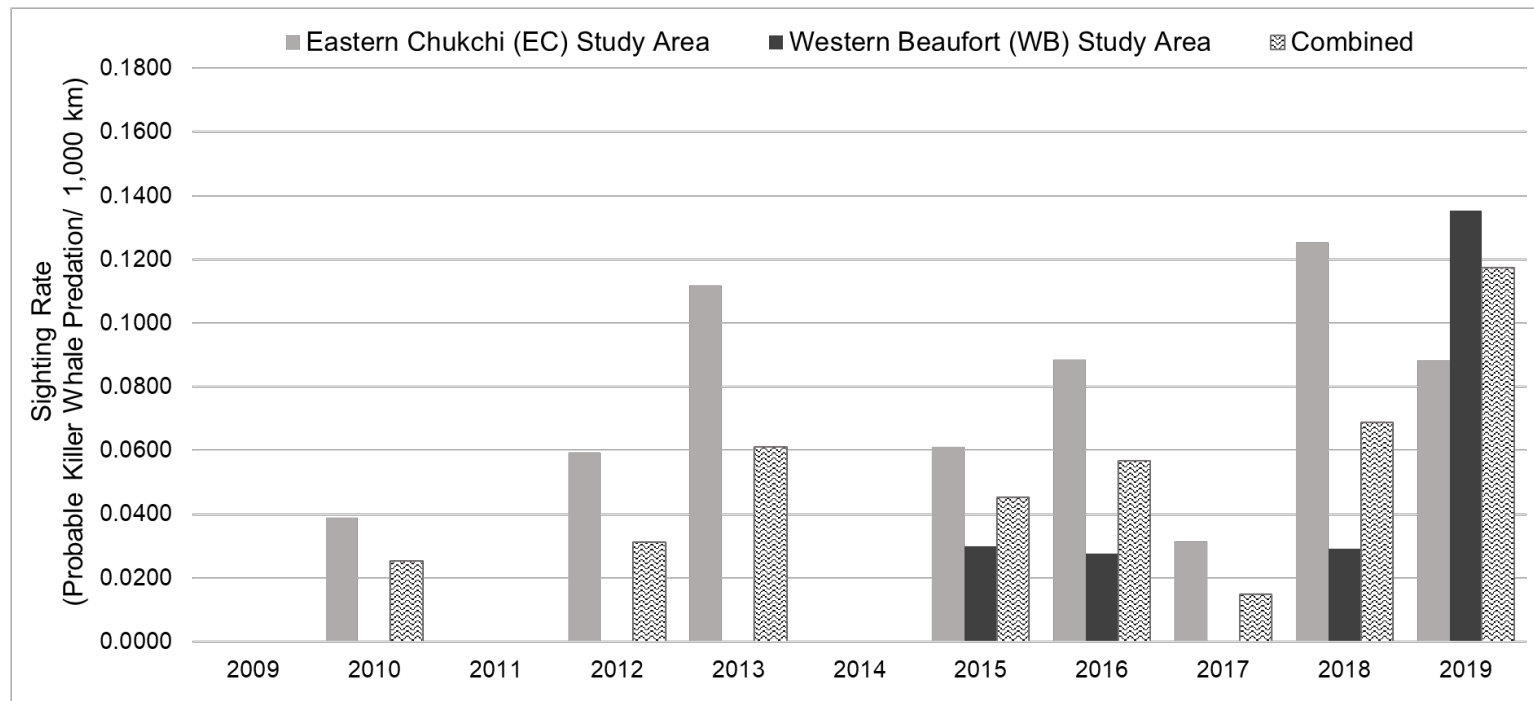


Fig. 2.2 Annual sighting rates of bowhead whale (*Balaena mysticetus*) carcasses categorized as probable killer whale (*Orcinus orca*) predation, in the eastern Chukchi (EC) study area (2009–2013: 68°–72° N, 157°–169° W; 2014–2019: 67°–72° N, 157°–169° W), the western Beaufort (WB) study area (south of 71.2° N, 140°–146° W; south of 71.3° N, 146°–150° W; and south of 72° N, 150°–157° W), and the two areas combined. Sighting Rate: Number of bowhead whale carcasses categorized as probable killer whale predation per 1000-km of survey effort. Note that WB surveys in 2009–2011 did not begin until September. Surveys in the EC study area were limited in October 2013 due to U.S. government furlough and in August 2019 while abundance surveys were conducted in the Beaufort Sea

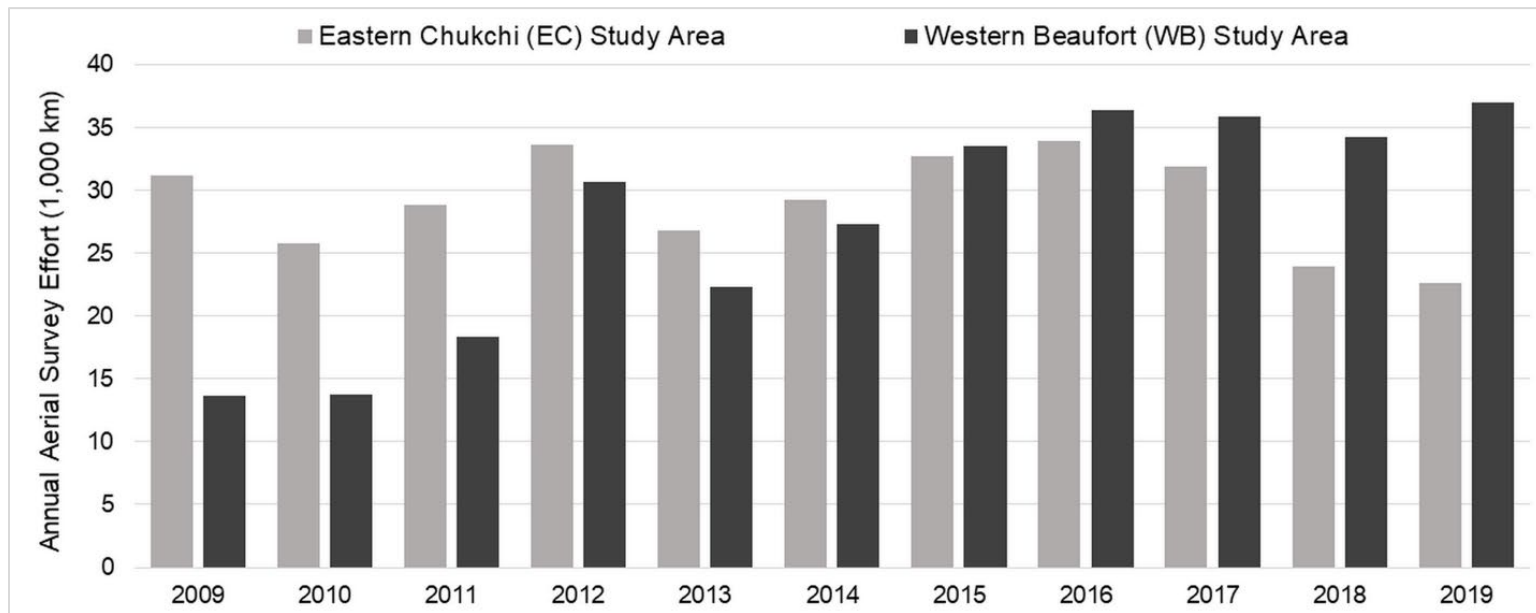


Fig. 2.3 Annual aerial survey effort, by study area, 2009–2019. Study Areas: eastern Chukchi (EC: 2009–2013: 68°–72° N, 157°–169° W; 2014–2019: 67°–72° N, 157°–169° W) and western Beaufort (WB: south of 71.2° N, 140°–146° W; south of 71.3° N, 146°–150° W; and south of 72° N, 150°–157° W). Note that WB surveys in 2009–2011 did not begin until September. Surveys in the EC study area were limited in October 2013 due to U.S. government furlough and in August 2019 while abundance surveys were conducted in the Beaufort Sea