

## Appendix 2

# EA/RIR for Groundfish Area Closures within the Bristol Bay Red King Crab Stock Assessment Area

January 16, 2024

## PSC Impact Analyses

This appendix provides the full analysis of how the area-closure action alternatives under consideration (Alternatives 2 and 3) could affect prohibited species catch (PSC) of certain non-target species that are encountered by Bering Sea (BS) groundfish fisheries.<sup>1</sup> The main body of the EA/RIR document is directly accessible under Agenda Item C2 on the Council’s February 2024 eAgenda, [here](#). **A synopsis of the information in this appendix is included in the main EA/RIR document in Section 3.3, titled “Historical Analysis of Groundfish Effort Distribution and Bycatch”.** The following analyses were prepared as instructed by the Council in its June 2023 motion on this topic ([link](#)) and by the SSC in its June 2023 final report ([link](#), see pp.21-23).

### A2.1 PSC Rate Approach

In June 2023, the Council requested staff to “Incorporate the Appendix 2 analysis on halibut, salmon, and crab PSC into the EA/RIR; expand the analysis of PSC impacts to include PSC data from the past 10 years; and analyze PSC impacts under Alternative 3 in addition to Alternative 2.” This section details annually and seasonally estimated PSC impacts under Alternatives 2 and 3 between 2013 and 2022.

Similar to the June 2023 Initial Review, the estimated change in PSC by area was calculated by multiplying the historical bycatch rate in the area of interest by the amount of groundfish that would have been displaced from an area, and subtracting the PSC from the displaced area (e.g., RKCSA or Area 512) that would have no longer been caught:

$$\Delta PSC = (GF\ Catch_{old\ area} \times [PSC/GF\ Catch]_{new\ area}) - PSC_{old\ area}$$

Groundfish and PSC catch data were queried from the NMFS Catch Accounting System between 2013 and 2022 for halibut, salmon, and crab based upon the gear type used (PTR, NPT, POT, and HAL). Seasons were determined by catch occurring before (A Season) or after June 10 (B Season) in the calendar year.

The areas to which effort is displaced represent a ‘maximum’ scenario, where statistical areas with the highest average PSC rates were chosen as groupings of equal size to the areas displaced from (e.g., RKCSA, Area 512, or both). A mean of the new high PSC rate areas was then applied to the displaced groundfish catches using the above equation.

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<sup>1</sup> Prepared by Dr. Mason Smith (NMFS HCD/SF); Sam Cunningham (NPFMC)

## Pelagic Trawl

### Chinook salmon

Changes in Chinook PSC occurred primarily in the A Season. Displacement from the RKCSA led to Chinook PSC increases in all years (Table A2-1; Figure A2-1). The highest PSC areas were typically southwest of the RCKSA or northwest near the Pribilof Islands (Figure A2-2). The highest PSC was estimated in 2016 due to the high average PSC rate in the new areas that year (Table A2-1).

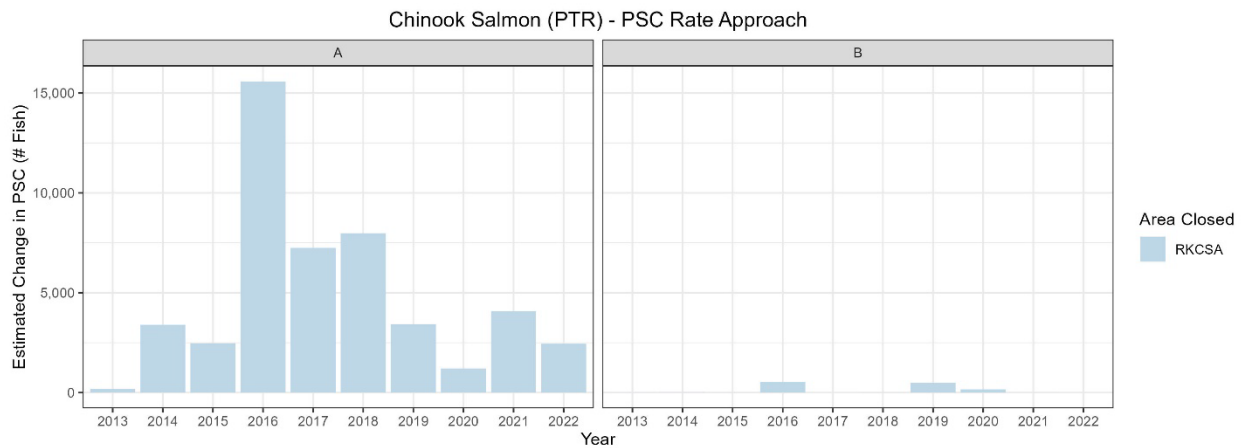
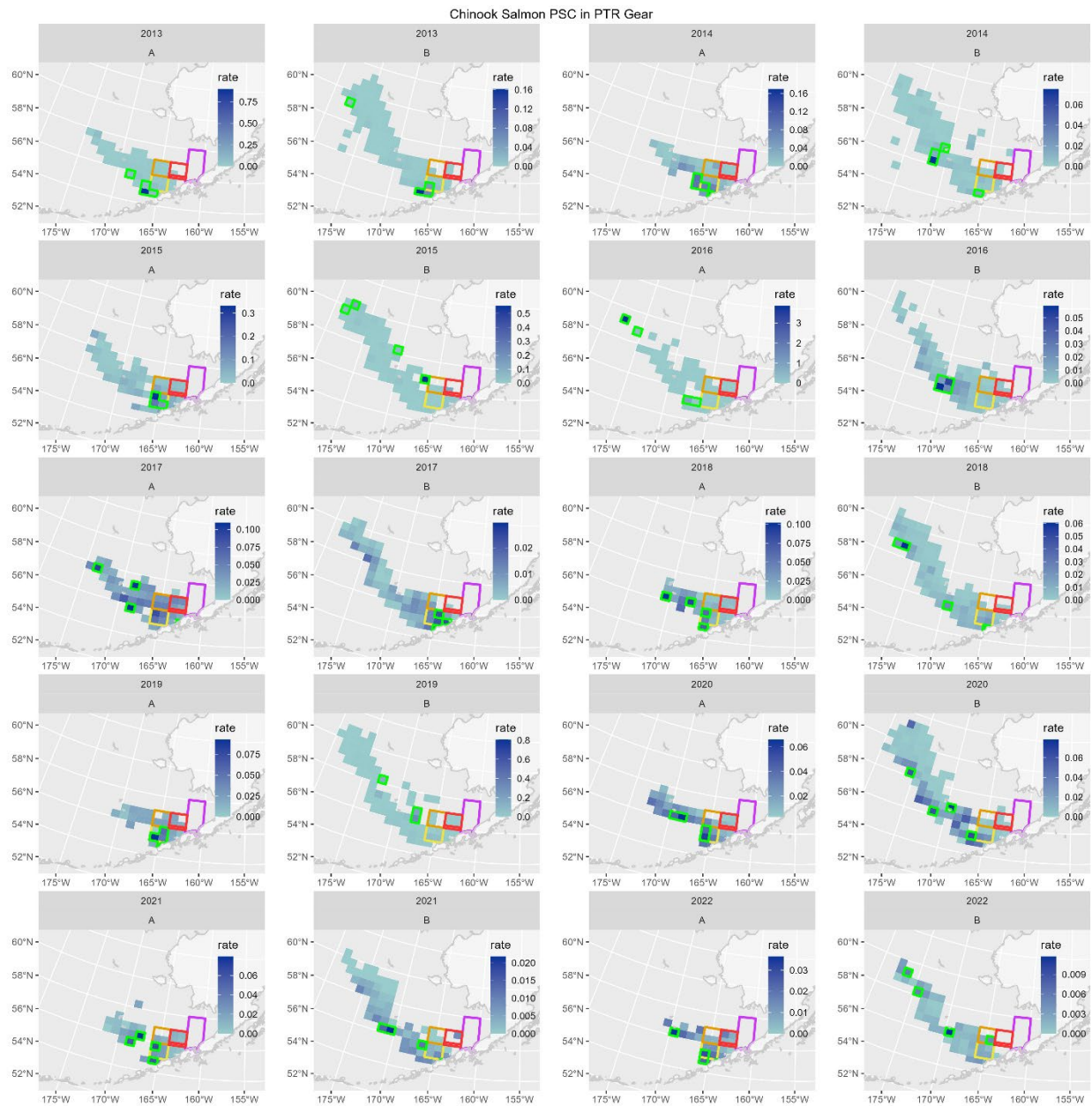


Figure A2-1. Highest change estimated in Chinook PSC from PTR displaced from the RKCSA.

Table A2-1. Highest change estimated in Chinook PSC from PTR displaced from the RKCSA.

YEAR	SEASON	Chinook PSC in RKCSA	GF Catch (mt) in RKCSA	PSC Rate in High Areas	Est. Change in PSC	Total BS PSC	% Change
2013	A	4	1920	0.098	185	8237	2.2%
2014	A	240	41334	0.088	3395	11536	29.4%
2015	A	872	33490	0.100	2470	12298	20.1%
2016	A	534	30427	0.530	15580	16818	92.6%
2017	A	2544	92905	0.105	7245	21602	33.5%
2018	A	847	127505	0.069	7979	8535	93.5%
2019	A	2166	113530	0.049	3428	15738	21.8%
2020	A	172	24792	0.056	1211	18216	6.6%
2021	A	560	74672	0.062	4078	9475	43.0%
2022	A	589	111954	0.027	2450	5185	47.3%
2013	B	0	101	0.057	6	4799	0.1%
2014	B	0	1187	0.017	20	3501	0.6%
2015	B	8	67	0.056	-4	6031	-0.1%
2016	B	44	21049	0.027	526	5108	10.3%
2017	B	0	15	0.024	0	8474	0.0%
2018	B	0	213	0.045	10	5196	0.2%
2019	B	5	2069	0.239	489	9247	5.3%
2020	B	6	2728	0.061	161	13987	1.2%
2021	B	2	241	0.016	2	4309	0.0%
2022	B	0	0	0.006	0	1152	0.0%



**Figure A2-2. PSC rates of Chinook salmon in relation to PTR gear displaced from in the RKCSA (red box) between 2013 and 2022. Blue shading represents the average PSC rates throughout the period by year and season, while the green boxes represent the collection of highest PSC-rate statistical areas. Other areas identified include immediately adjacent to the RKCSA/SS (orange), an area within the SCA (yellow), and Area 512 (purple).**

### Non-Chinook Salmon

Changes in Non-Chinook PSC occurred primarily in the B Season. Displacement from the RKCSA led to only increases in PSC, but not all years had a change in PSC (Table A2-2; Figure A2-3). The highest PSC areas were often southwest of the RCKSA or northwest near the Pribilof Islands, but were farther northwest in some years (Figure A2-4). The highest PSC was estimated in 2016 due to the high groundfish catch within the RKCSA in that year (Table A2-2).

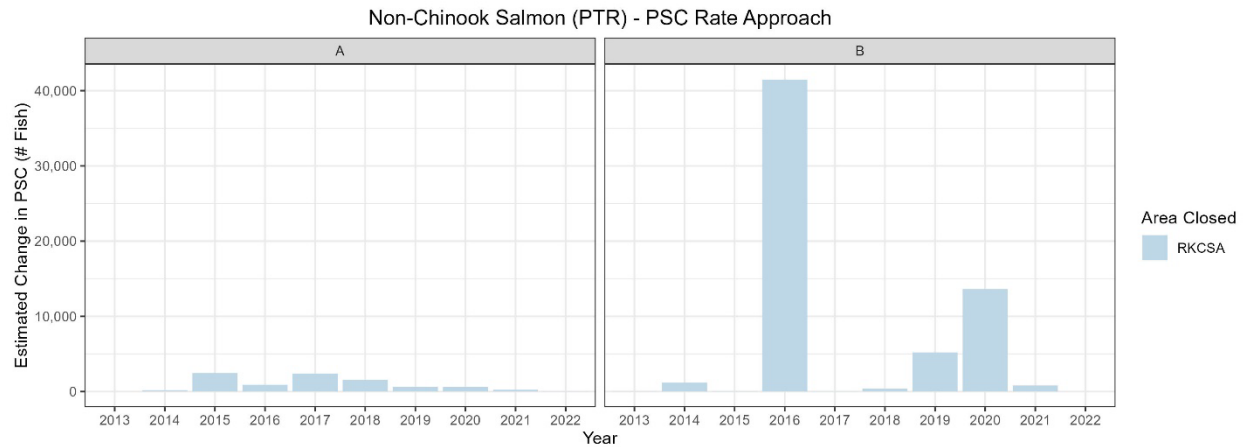
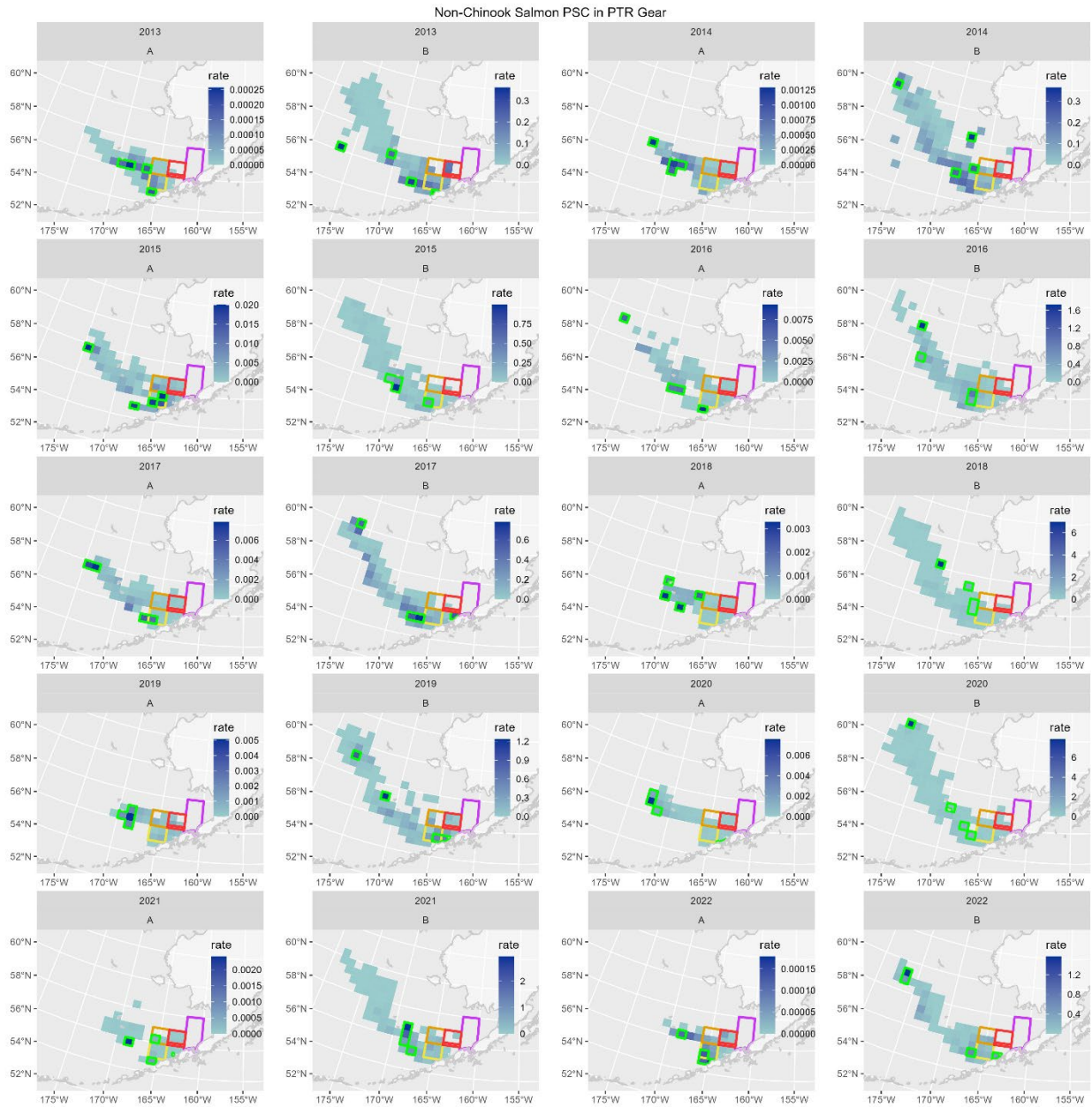


Figure A2-3. Highest change estimated in Non-Chinook PSC from PTR displaced from the RKCSA/SS.

Table A2-2. Highest change estimated in Non-Chinook PSC from PTR displaced from the RKCSA/SS.

YEAR	SEASON	Non-Chinook PSC in RKCSA	GF Catch (mt) in RKCSA	PSC Rate in High Areas	Est. Change in PSC	Total BS PSC	% Change
2013	A	0	7679	0.000	2	202	0.8%
2014	A	2	165260	0.001	180	556	32.3%
2015	A	184	133961	0.020	2461	4667	52.7%
2016	A	9	121708	0.007	895	3765	23.8%
2017	A	58	370790	0.007	2390	1830	130.6%
2018	A	11	510022	0.003	1558	387	402.6%
2019	A	434	453343	0.002	647	1211	53.4%
2020	A	1	99167	0.006	621	531	116.9%
2021	A	11	298265	0.001	239	141	169.3%
2022	A	4	446715	0.000	50	66	76.1%
2013	B	76	402	0.254	26	125114	0.0%
2014	B	24	4748	0.255	1188	218886	0.5%
2015	B	9	267	0.253	58	233085	0.0%
2016	B	743	84196	0.501	41474	339236	12.2%
2017	B	0	62	0.611	38	465848	0.0%
2018	B	1	851	0.478	406	294705	0.1%
2019	B	367	8276	0.674	5209	346812	1.5%
2020	B	368	10912	1.281	13612	343095	4.0%
2021	B	94	964	0.932	805	545901	0.1%
2022	B	0	0	0.647	0	242309	0.0%



**Figure A2-4. PSC rates of non-Chinook salmon in relation to PTR gear displaced from in the RKCSA (red box) between 2013 and 2022. Blue shading represents the average PSC rates throughout the period by year and season, while the green boxes represent the collection of highest PSC-rate statistical areas. Other areas identified include immediately adjacent to the RKCSA/SS (orange), an area within the SCA (yellow), and Area 512 (purple).**

## Pacific Herring

Changes in Pacific herring PSC occurred primarily in the A Season. Displacement from the RKCSA led to only increases in PSC, but not all years had a change (Table A2-3; Figure A2-5). The highest PSC areas were often southwest of the RCKSA or northwest near the Pribilof Islands, but were farther northwest in some years (Figure A2-6). High years of estimated PSC such as in 2017 and 2019 were due in part to the high groundfish catch within the RKCSA during those years (Table A2-3).

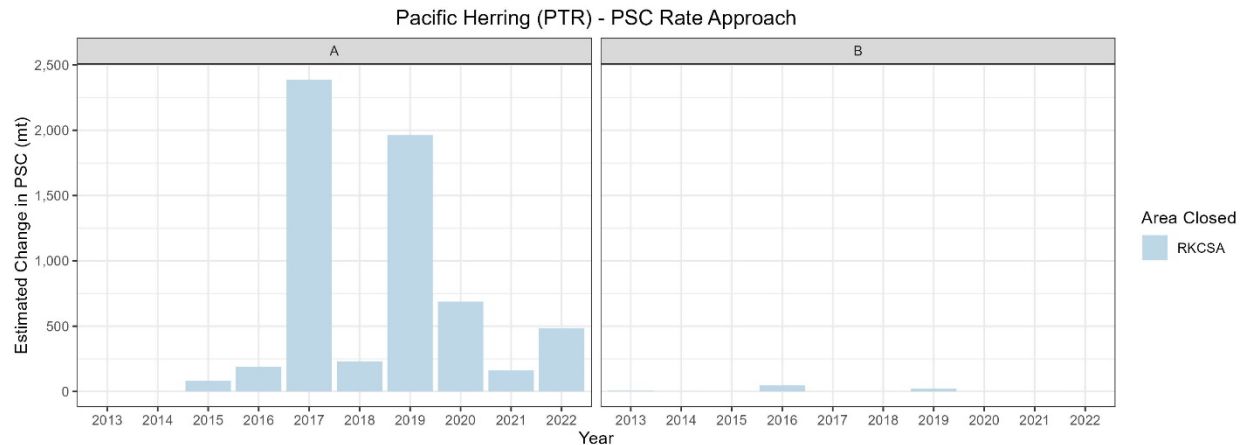
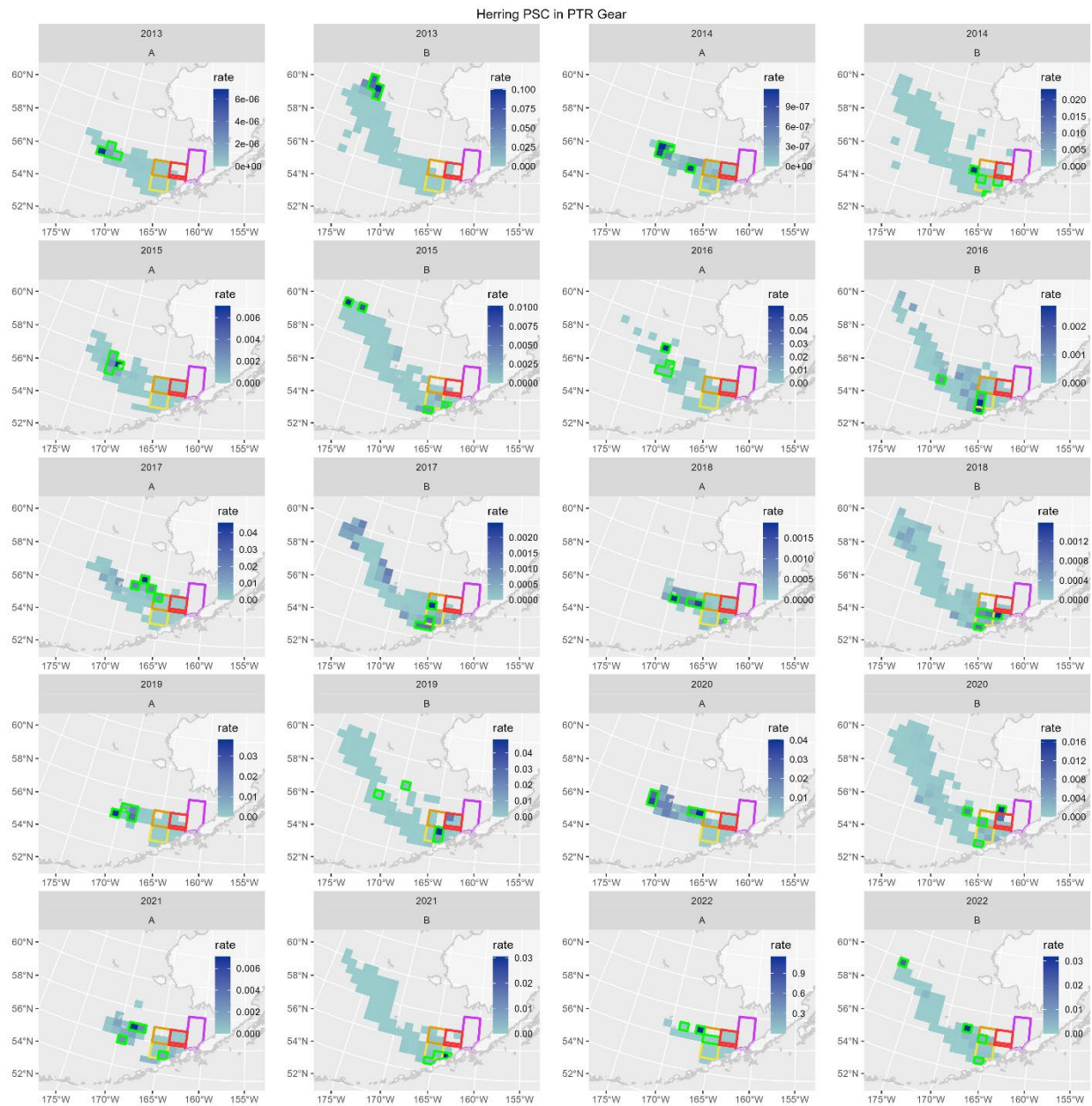


Figure A2-5. Highest change estimated in Pacific herring PSC from PTR displaced from the RKCSA.

Table A2-3. Highest change estimated in Pacific herring PSC from PTR displaced from the RKCSA.

YEAR	SEASON	Herring PSC in RKCSA	GF Catch (mt) in RKCSA	PSC Rate in High Areas	Est. Change in PSC	Total BS PSC	% Change
2013	A	0.000	1920	0.000	0.002	0.1	1.6%
2014	A	0.001	41542	0.000	0.042	0.1	68.5%
2015	A	0.009	33613	0.002	82.891	416.8	19.9%
2016	A	0.020	30427	0.006	188.363	577.5	32.6%
2017	A	0.020	92905	0.026	2387.540	261.5	912.9%
2018	A	0.937	127505	0.002	230.500	65.8	350.1%
2019	A	0.071	113643	0.017	1962.994	209.6	936.6%
2020	A	0.018	24804	0.028	688.533	2898.2	23.8%
2021	A	0.023	72391	0.002	161.591	594.8	27.2%
2022	A	59.501	104993	0.005	483.834	442.6	109.3%
2013	B	0.000	101	0.066	6.587	958.8	0.7%
2014	B	0.025	1187	0.002	2.431	159.3	1.5%
2015	B	0.049	67	0.003	0.183	1069.8	0.0%
2016	B	0.963	21049	0.002	46.953	853.3	5.5%
2017	B	0.000	15	0.001	0.022	701.2	0.0%
2018	B	0.014	213	0.001	0.185	407.5	0.0%
2019	B	4.091	2069	0.013	21.817	890.5	2.5%
2020	B	9.244	2566	0.003	-0.583	962.7	-0.1%
2021	B	0.000	241	0.004	0.883	1112.6	0.1%
2022	B	0.000	0	0.006	0.000	1260.3	0.0%



**Figure A2-6. PSC rates of Pacific herring in relation to PTR gear displaced from in the RKCSA (red box) between 2013 and 2022. Blue shading represents the average PSC rates throughout the period by year and season, while the green boxes represent the collection of highest PSC-rate statistical areas. Other areas identified include immediately adjacent to the RKCSA/SS (orange), an area within the SCA (yellow), and Area 512 (purple).**

## Non-Pelagic Trawl

### Red King Crab

Displacement from the RKCSS led to changes in RKC PSC primarily in the A Season (Table A2-4; Figure A2-7). The highest PSC areas occurred most often adjacent and northwest of the RKCSA (Figure 2). Years of high and low estimated PSC alternated with no apparent pattern (Figure A2-8).

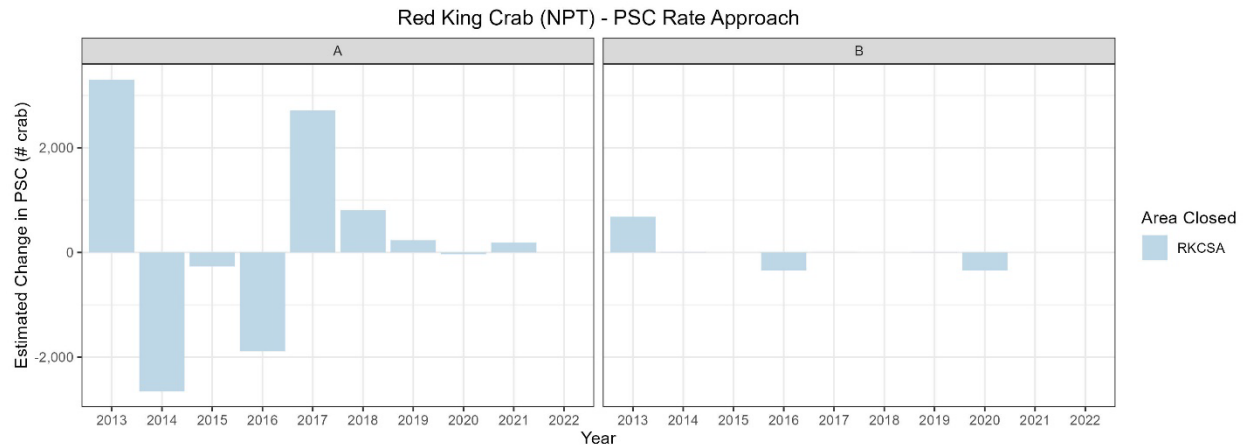
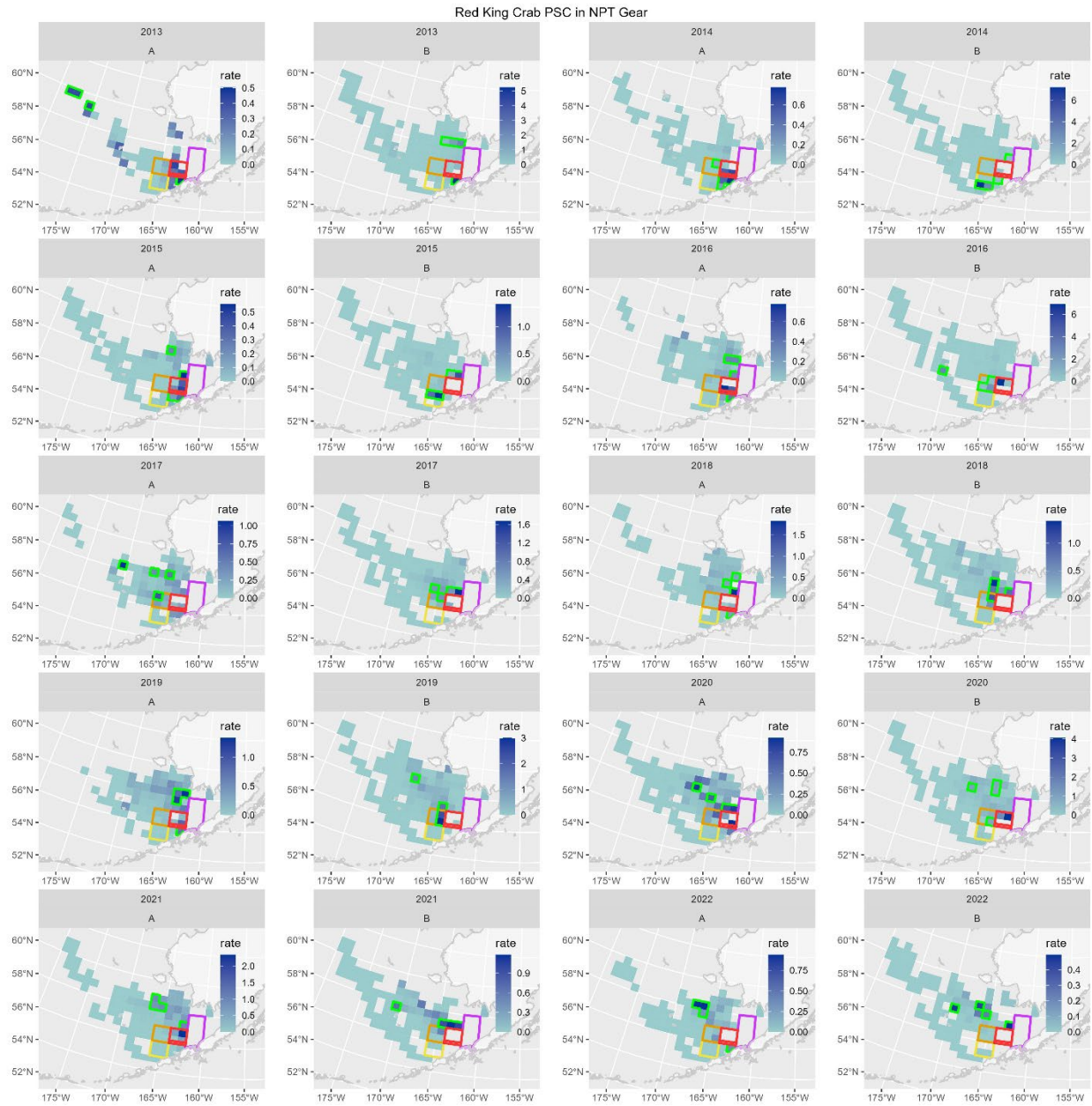


Figure A2-7. Highest estimated change in RKC PSC from NPT displaced from in the RKCSS.

Table A2-4. Highest estimated change in RKC PSC from NPT displaced from the RKCSS.

YEAR	SEASON	GF Catch		PSC Rate in High Areas	Est. Change in PSC	Total BS PSC	% Change
		RKC PSC in RKCSA	(mt) in RKCSA				
2013	A	5446.2	17375	0.50	3303	20559.8	16.1%
2014	A	10353.4	18417	0.42	-2658	26332.09	-10.1%
2015	A	2804.8	8853	0.29	-268	14684.82	-1.8%
2016	A	5212.9	9735	0.34	-1890	27530.63	-6.9%
2017	A	1167.2	4779	0.81	2714	26595.46	10.2%
2018	A	542.9	2087	0.65	813	17357.84	4.7%
2019	A	1164.5	1478	0.95	235	46068.34	0.5%
2020	A	534.7	704	0.71	-33	30175.48	-0.1%
2021	A	372.5	602	0.93	188	24258.15	0.8%
2022	A	0.0	0	0.64	0	4994.371	0.0%
2013	B	145.4	544	1.53	685	10937.08	6.3%
2014	B	25.5	82	0.43	10	5888.923	0.2%
2015	B	0.0	0	0.57	0	5218.353	0.0%
2016	B	382.3	63	0.59	-345	13472.88	-2.6%
2017	B	1.2	4	0.54	1	32931.74	0.0%
2018	B	0.0	0	0.96	0	12750.77	0.0%
2019	B	0.0	4	2.24	9	23528.5	0.0%
2020	B	620.1	262	1.06	-344	34214.74	-1.0%
2021	B	0.0	0	1.04	0	16242.23	0.0%
2022	B	0.0	0	0.35	0	3596.128	0.0%





**Figure A2-8. PSC rates of Red King Crab in relation to NPT gear displaced from in the RKCSS (red box) between 2013 and 2022. Blue shading represents the average PSC rates throughout the period by year and season, while the green boxes represent the collection of highest PSC-rate statistical areas. Other areas identified include immediately adjacent to the RKCSS (orange), an area within the SCA (yellow), and Area 512 (purple).**

### Opilio Crab

Displacement from the RKCSS led to changes in Opilio PSC primarily in the A Season (Table A2-5; Figure A2-9). In the A Season, 2014 stood out as the highest estimated increase in PSC (Figure 1), where a high catch of groundfish within the RKCSS that year was applied to high PSC rates to the south of the RKCSS (Figure A2-10).

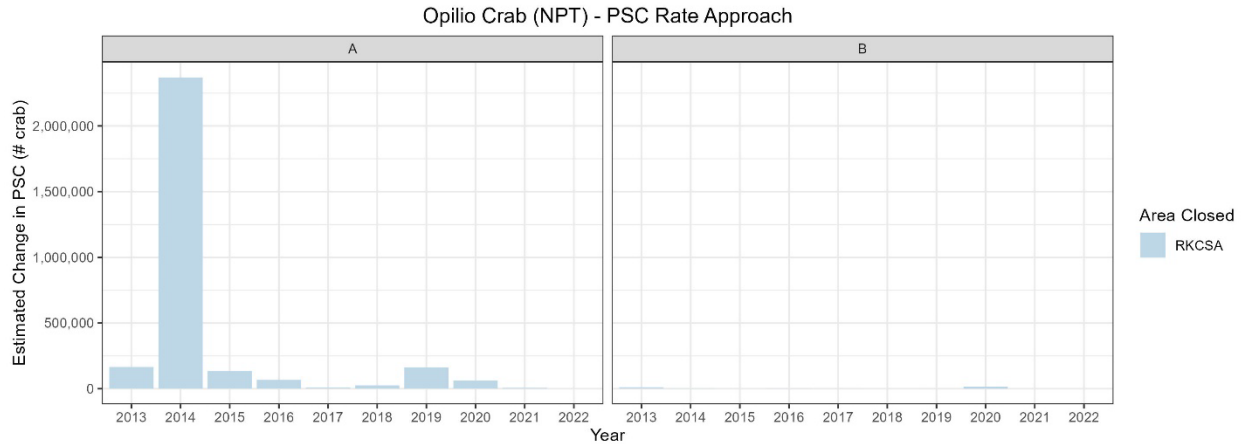
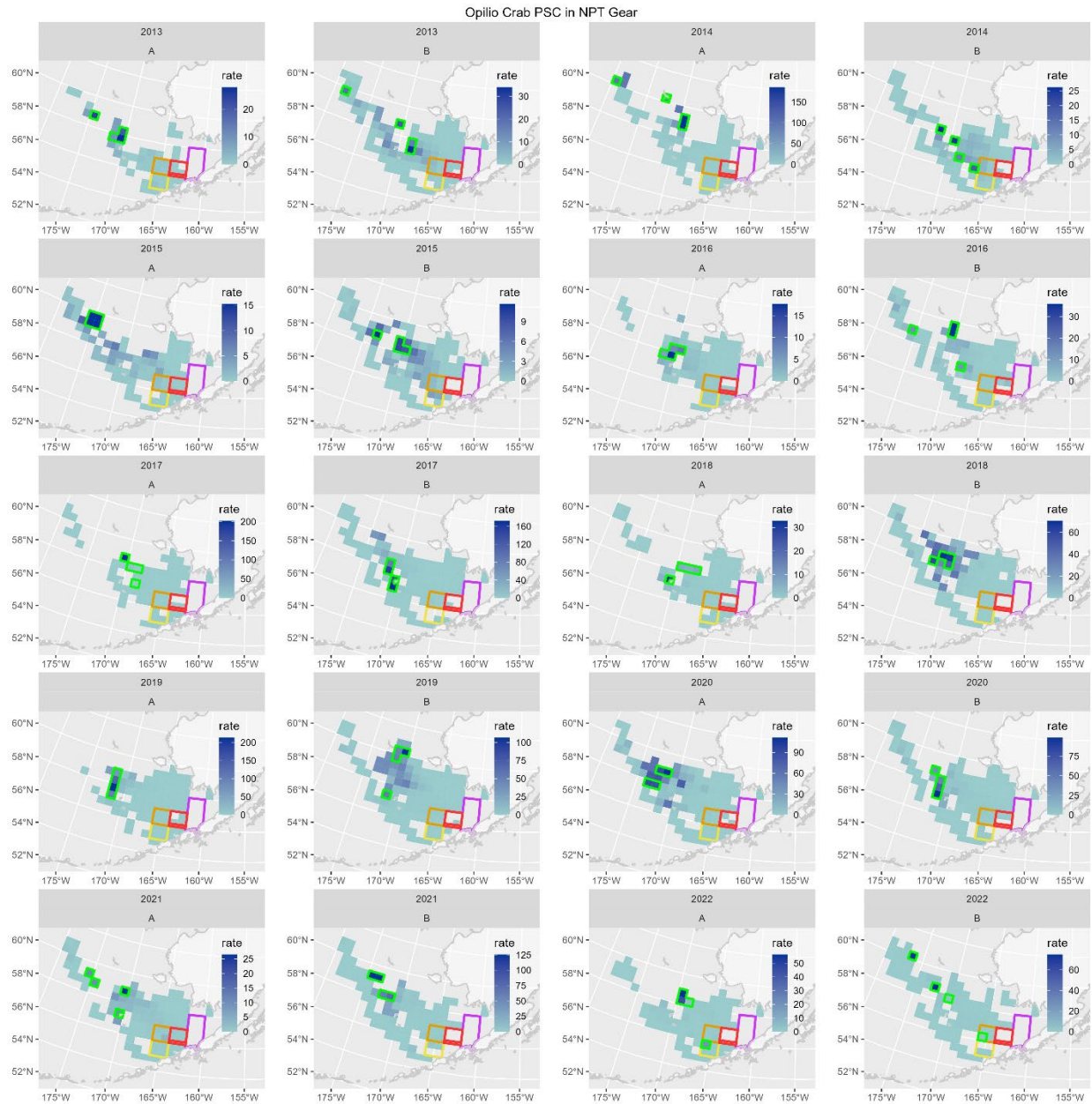


Figure A2-9. Highest estimated change in Opilio PSC from NPT displaced from in the RKCSS.

Table A2-5. Highest change estimated in Opilio PSC from NPT displaced from the RKCSS.

YEAR	SEASON	Opilio PSC in RKCSA	GF Catch		Est. Change in PSC	Total BS PSC	% Change
			(mt) in RKCSA	PSC Rate in High Areas			
2013	A	474.6	17375	9.54	165284.9	484779.5	34.1%
2014	A	953.4	18417	128.69	2369144.9	129586.5	1828.2%
2015	A	551.8	8853	15.27	134664.7	104201.2	129.2%
2016	A	15.5	9735	6.83	66519.2	12473.18	533.3%
2017	A	0.0	4779	1.77	8447.6	37717	22.4%
2018	A	0.0	2087	12.08	25214.1	28936.02	87.1%
2019	A	0.0	1478	109.56	161979.0	120551.9	134.4%
2020	A	59.9	704	88.79	62490.4	485738.4	12.9%
2021	A	22.1	602	11.39	6831.9	99194.87	6.9%
2022	A	0.0	0	19.65	0.0	118706.2	0.0%
2013	B	45.9	544	20.77	11250.5	204255.1	5.5%
2014	B	0.0	82	25.29	2076.6	351506.4	0.6%
2015	B	0.0	0	8.64	0.0	384425.2	0.0%
2016	B	23.1	63	12.28	753.8	153616.6	0.5%
2017	B	0.0	4	142.95	521.4	121626.5	0.4%
2018	B	0.0	0	57.65	0.0	1553213	0.0%
2019	B	0.0	4	64.61	249.7	820590	0.0%
2020	B	14.4	262	60.27	15755.5	293115.3	5.4%
2021	B	0.0	0	83.86	0.0	147499.1	0.0%
2022	B	0.0	0	4.50	0.0	85631.13	0.0%



**Figure A2-10. PSC rates of Opilio crab in relation to NPT gear displaced from in the RKCSS (red box) between 2013 and 2022. Blue shading represents the average PSC rates throughout the period by year and season, while the green boxes represent the collection of highest PSC-rate statistical areas. Other areas identified include immediately adjacent to the RKCSA/SS (orange), an area within the SCA (yellow), and Area 512 (purple).**

### Bairdi Crab

Displacement from the RKCSS led to changes in Bairdi PSC primarily in the A Season, and all changes led to an increase in PSC (Table A2-6; Figure A2-11). High PSC rates of Bairdi crab were often near or northwest of the Pribilof Islands, but were sometimes adjacent or south/southwest of the RKCSS (Figure 2). In the A Season, some high years (2013, 2014) appeared largely due to high groundfish catches being displaced, while other years (2016) were the result of the new areas having a high average PSC rate (Table A2-12).

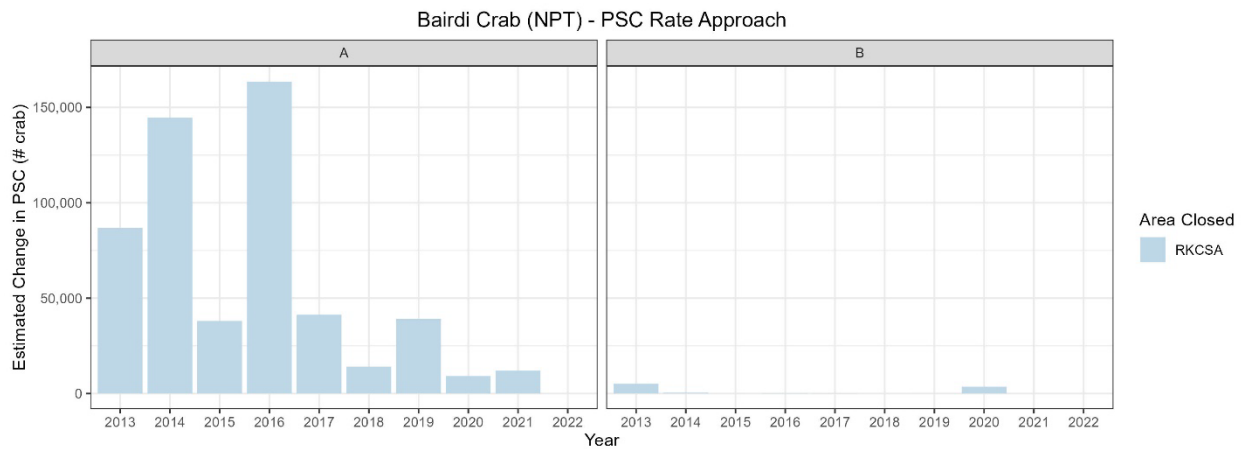
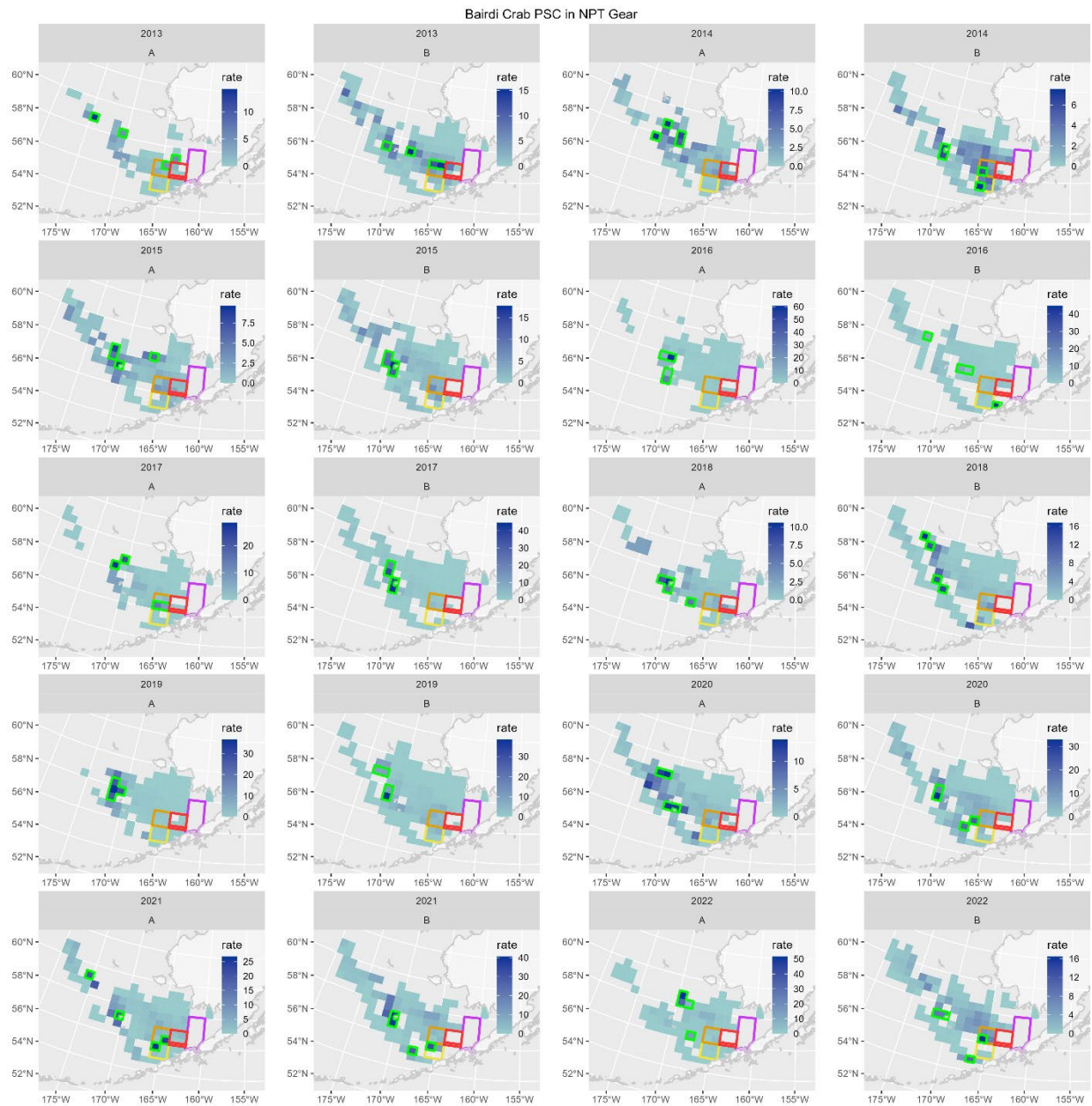


Figure A2-11. Highest estimated change in Bairdi PSC from NPT gear if displaced from in the RKCSS.

Table A2-6. Highest change estimated in Bairdi PSC from NPT displaced from the RKCSS.

YEAR	SEASON	GF Catch		PSC Rate in High Areas	Est. Change in PSC	Total BS PSC	% Change
		Bairdi PSC in RKCSA	(mt) in RKCSA				
2013	A	5104.5	17375	5.29	86876.3	267151	32.5%
2014	A	36646.5	18417	9.84	144609.0	259870.7	55.6%
2015	A	12442.6	8853	5.71	38081.5	207971.8	18.3%
2016	A	4155.7	9735	17.23	163540.3	61970.87	263.9%
2017	A	1363.8	4779	8.93	41321.2	283716.4	14.6%
2018	A	852.2	2087	7.18	14134.1	76556.89	18.5%
2019	A	619.9	1478	26.92	39174.5	124119.8	31.6%
2020	A	168.0	704	13.23	9155.2	255756.4	3.6%
2021	A	551.3	602	20.93	12037.1	234843.6	5.1%
2022	A	0.0	0	16.08	0.0	188820.9	0.0%
2013	B	2037.1	544	13.18	5129.3	447953.4	1.1%
2014	B	0.0	82	5.97	490.1	363062.6	0.1%
2015	B	0.0	0	11.48	0.0	214288.9	0.0%
2016	B	161.6	63	6.21	231.2	158677.7	0.1%
2017	B	2.5	4	35.48	127.0	68865.58	0.2%
2018	B	0.0	0	13.33	0.0	106333.9	0.0%
2019	B	0.0	4	9.88	38.2	219453.7	0.0%
2020	B	72.2	262	14.01	3595.0	340788.1	1.1%
2021	B	0.0	0	31.08	0.0	353032.4	0.0%
2022	B	0.0	0	10.72	0.0	247142.6	0.0%



**Figure A2-12. PSC rates of Bairdi crab in relation to NPT gear displaced from in the RKCSS (red box) between 2013 and 2022. Blue shading represents the average PSC rates throughout the period by year and season, while the green boxes represent the collection of highest PSC-rate statistical areas. Other areas identified include immediately adjacent to the RKCSA/SS (orange), an area within the SCA (yellow), and Area 512 (purple).**

## Halibut

Displacement from the RKCSS led to changes in Halibut PSC primarily in the A Season, and all changes led to an increase in PSC (Table A2-7; Figure A2-13). High Halibut PSC rates often occurred southwest of the RKCSA or along the western limits of the NPT footprint (Figure A2-14). The 2014 A Season stood out as the highest estimated increase in PSC, where a large amount of groundfish catch was applied to a high average PSC rate south of the Pribilof Islands (Table A2-7).

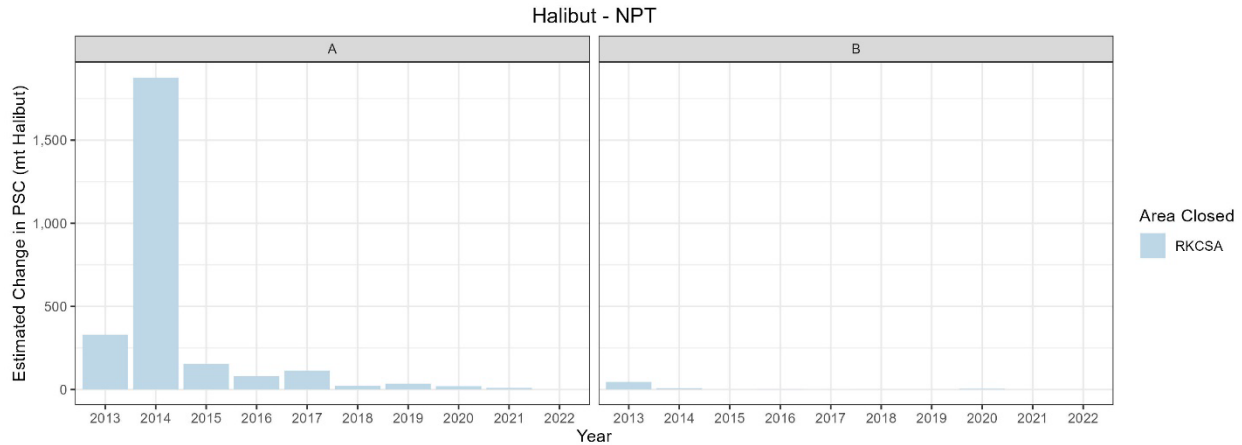
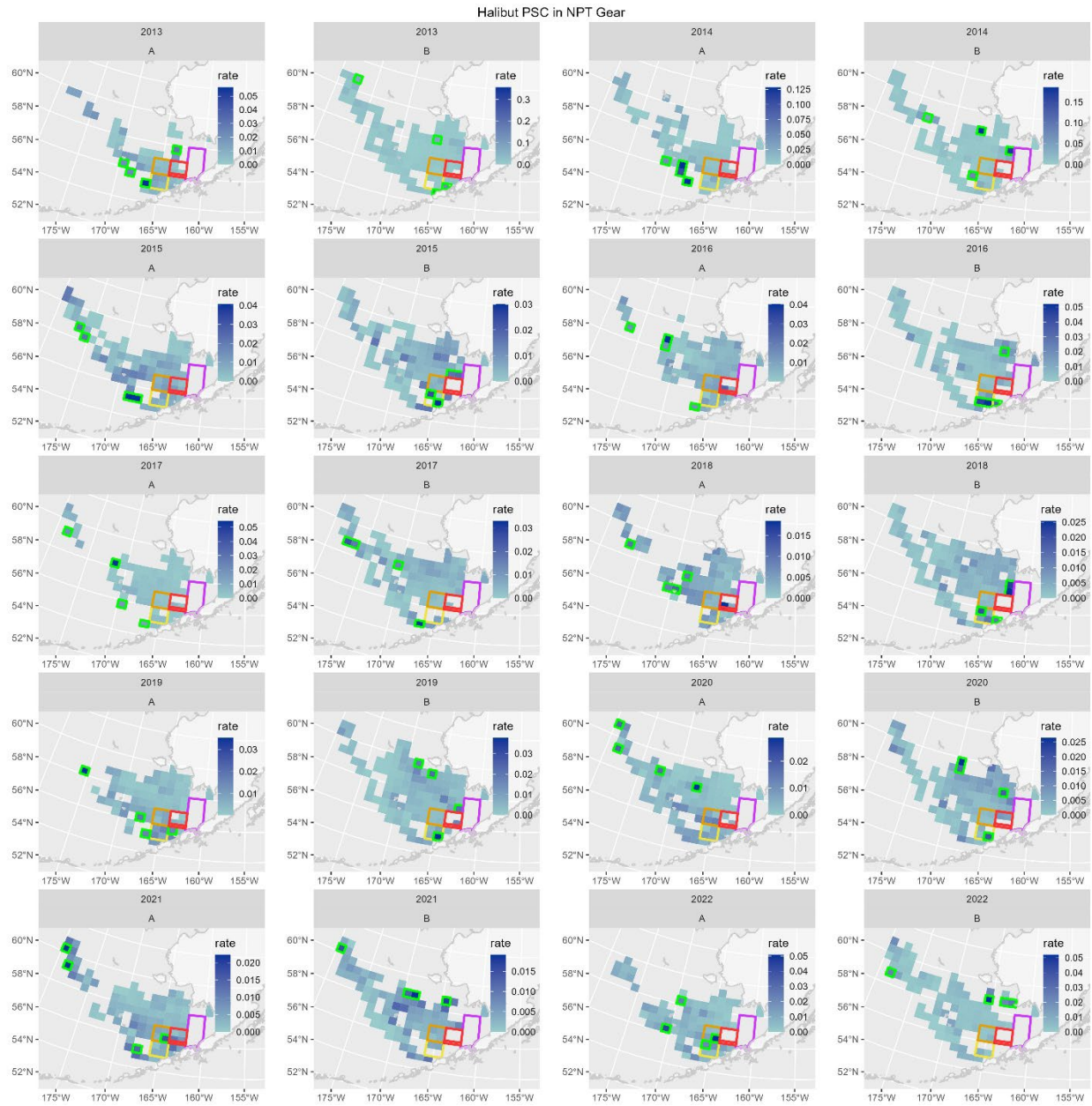


Figure A2-13. Estimated change in Halibut PSC from NPT displaced from in the RKCSS.

Table A2-7. Highest change estimated in Halibut PSC from NPT displaced from the RKCSS.

YEAR	SEASON	Halibut PSC in RKCSA	GF Catch		Est. Change in PSC	Total BS PSC	% Change
			(mt) in RKCSA	PSC Rate in High Areas			
2013	A	68.0	17375	0.023	330.0	1162.885	28.4%
2014	A	142.7	18417	0.110	1876.4	1526.244	122.9%
2015	A	80.4	8853	0.026	154.0	1115.452	13.8%
2016	A	69.5	9735	0.015	81.3	1145.713	7.1%
2017	A	12.7	7785	0.016	114.6	853.1116	13.4%
2018	A	14.8	4087	0.009	22.5	1038.517	2.2%
2019	A	11.4	2811	0.017	35.4	1271.919	2.8%
2020	A	4.5	1279	0.019	20.2	802.8805	2.5%
2021	A	6.3	993	0.017	10.2	633.7593	1.6%
2022	A	0.0	0	0.049	0.0	1152.267	0.0%
2013	B	5.0	544	0.095	46.4	1459.741	3.2%
2014	B	0.4	82	0.104	8.2	1139.794	0.7%
2015	B	0.0	0	0.018	0.0	598.097	0.0%
2016	B	0.7	63	0.028	1.1	750.9296	0.1%
2017	B	0.0	7	0.019	0.1	682.3762	0.0%
2018	B	0.0	0	0.024	0.0	714.7367	0.0%
2019	B	0.1	8	0.027	0.1	780.5862	0.0%
2020	B	3.2	419	0.020	5.2	600.6232	0.9%
2021	B	0.0	0	0.013	0.0	572.116	0.0%
2022	B	0.0	0	0.026	0.0	647.1394	0.0%

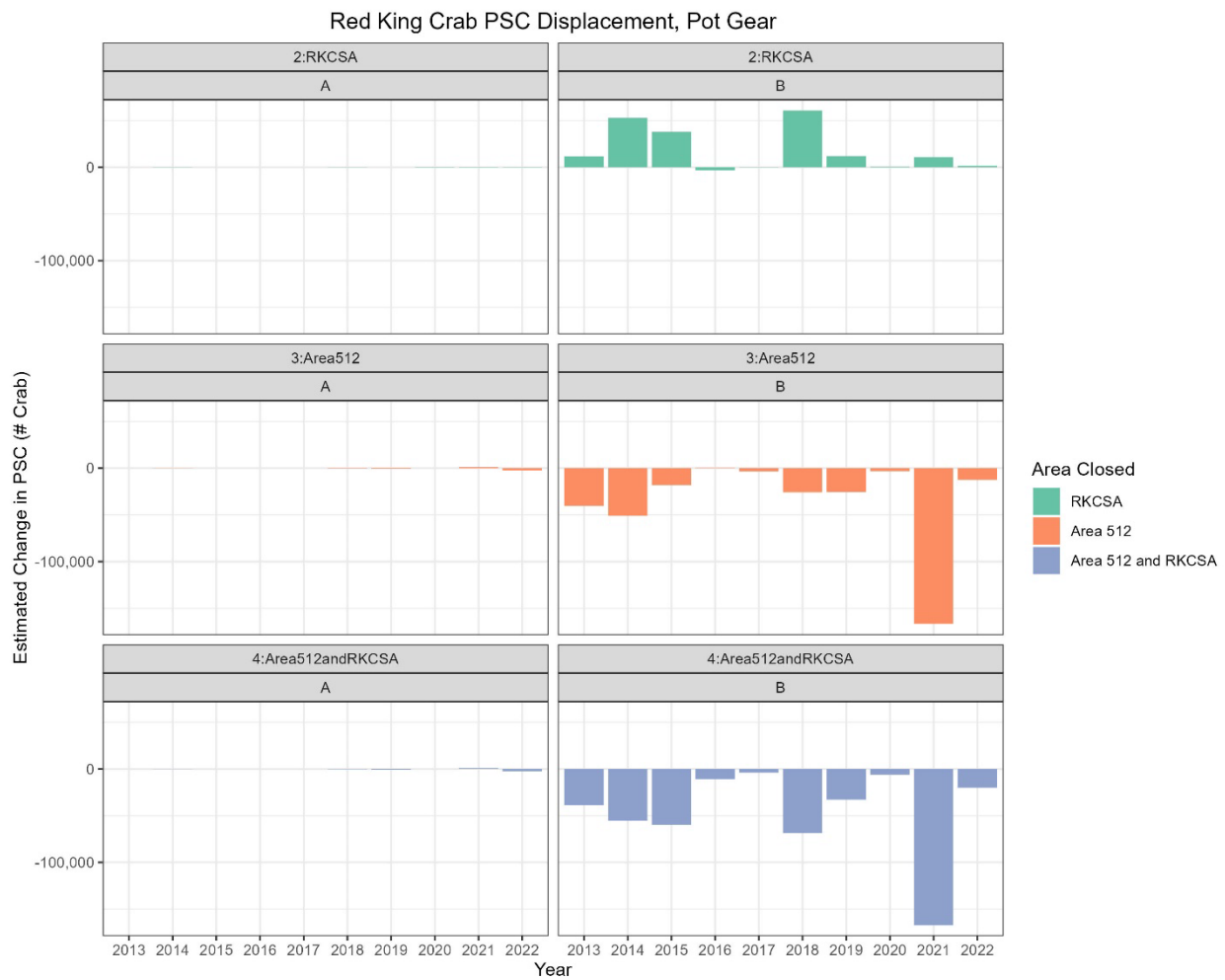


**Figure A2-14. PSC rates of Halibut in relation to NPT gear displaced from in the RKCSS (red box) between 2013 and 2022. Blue shading represents the average PSC rates throughout the period by year and season, while the green boxes represent the collection of highest PSC-rate statistical areas. Other areas identified include immediately adjacent to the RKCSA/SS (orange), an area within the SCA (yellow), and Area 512 (purple).**

## Pot Gear

### Red King Crab

The estimated changes in RKC PSC under the three scenarios of displacement (RKCSA/SS, Area 512, or both) are displayed in Table A2-8 and Figure A2-15. The estimates are derived using the highest PSC boxes represented in Figures A2-16, 17, and 18. Changes occurred primarily in the B Season, where the displacement of POT gear from the RKCSA led to PSC increases in some years, while the displacement from Area 512 or both RKCSA and Area 512 often led to estimated decreases (Figure A2-15). These trends appear to be due to the highest B Season RKC PSC rates often occurring within Area 512 (Figures A2-16, 17, and 18).

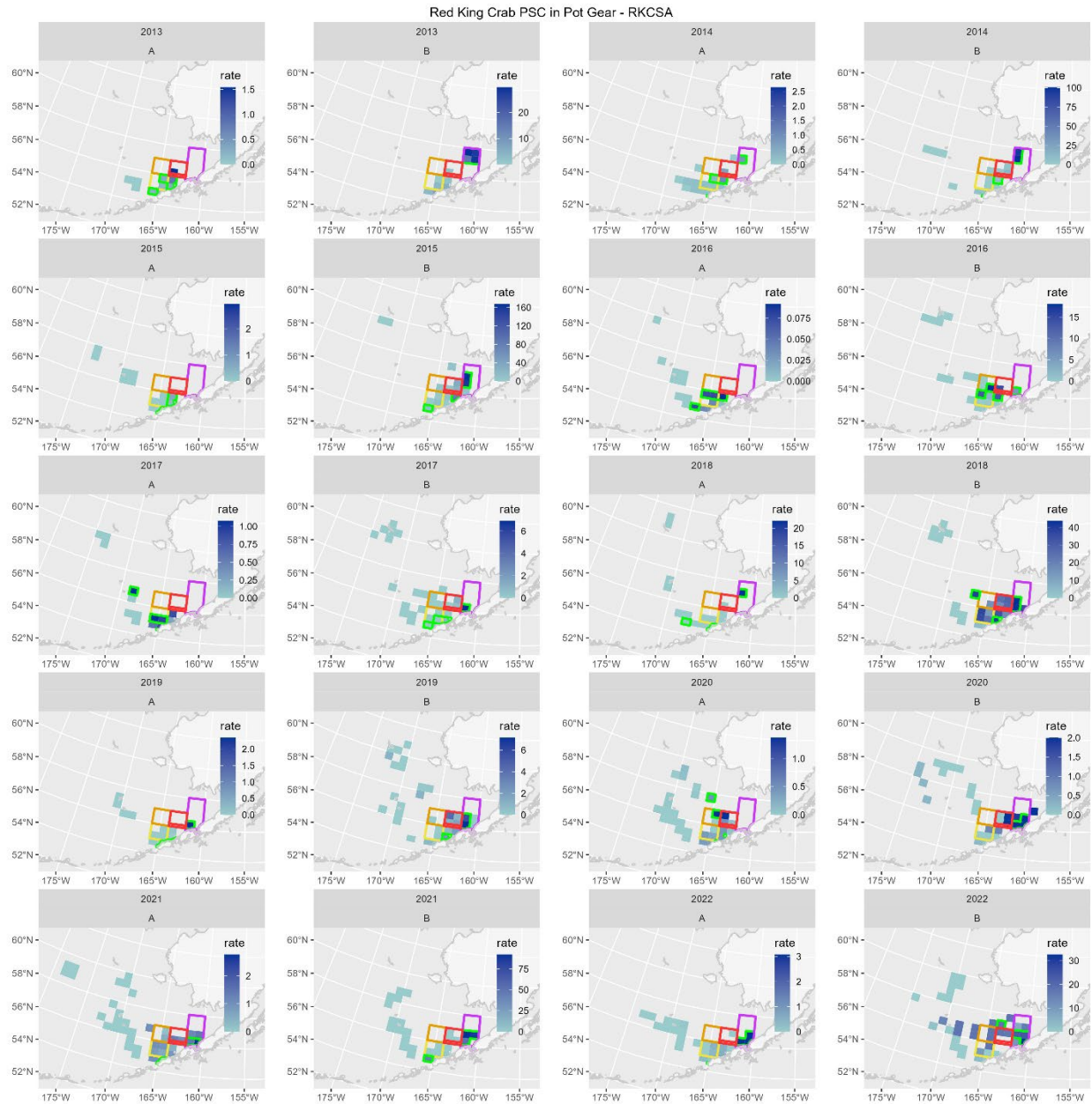


**Figure A2-15. Estimated change in Red King Crab PSC rates in POT gear if displaced from in the RKCSA/SS (top), Area 512 (middle), or both (bottom) between 2013 and 2022 under the highest PSC scenario.**

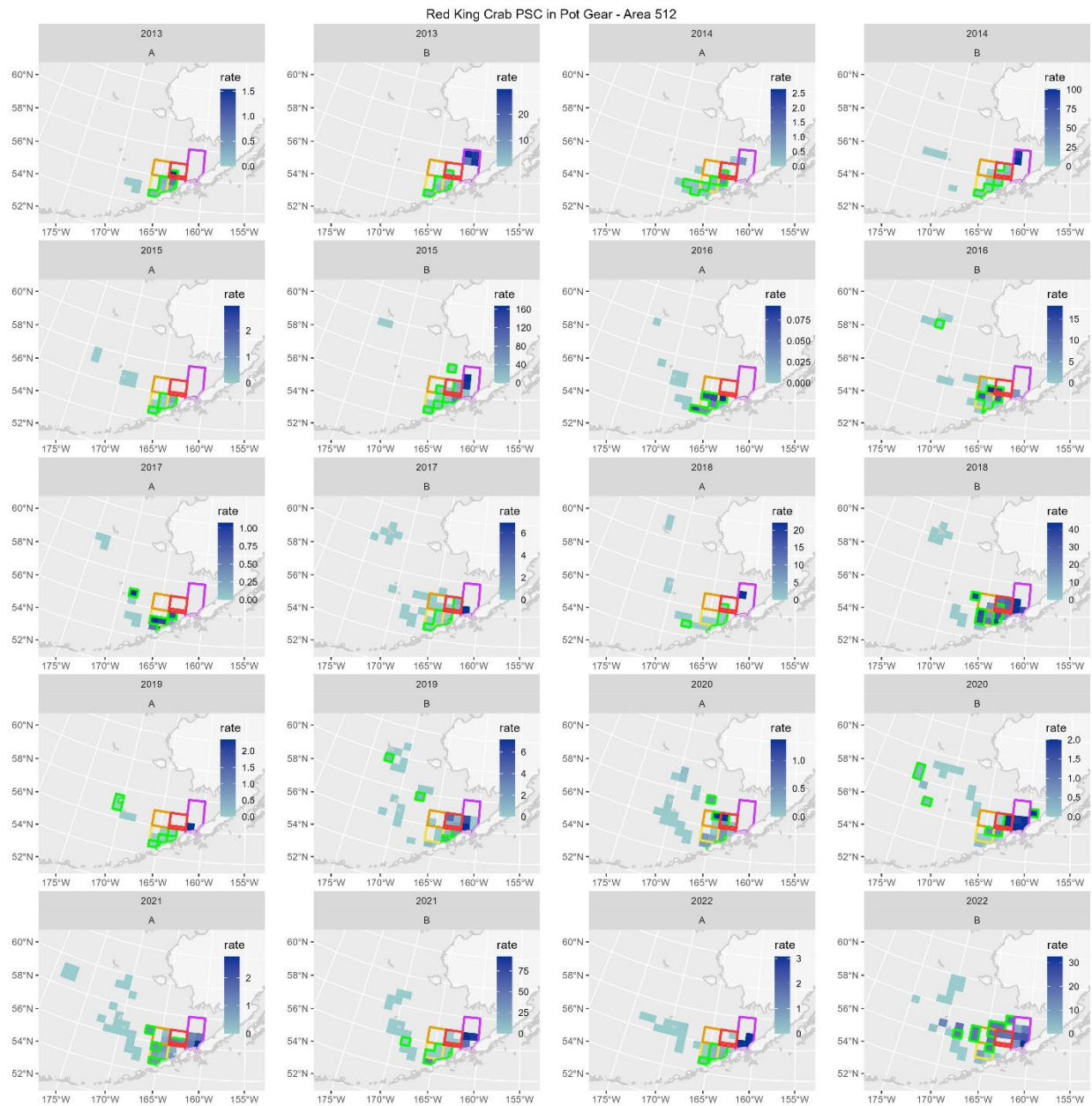


**Table A2-8. Highest change estimated in RKC PSC from POT displaced from the RKCSA, Area 512, or both.**

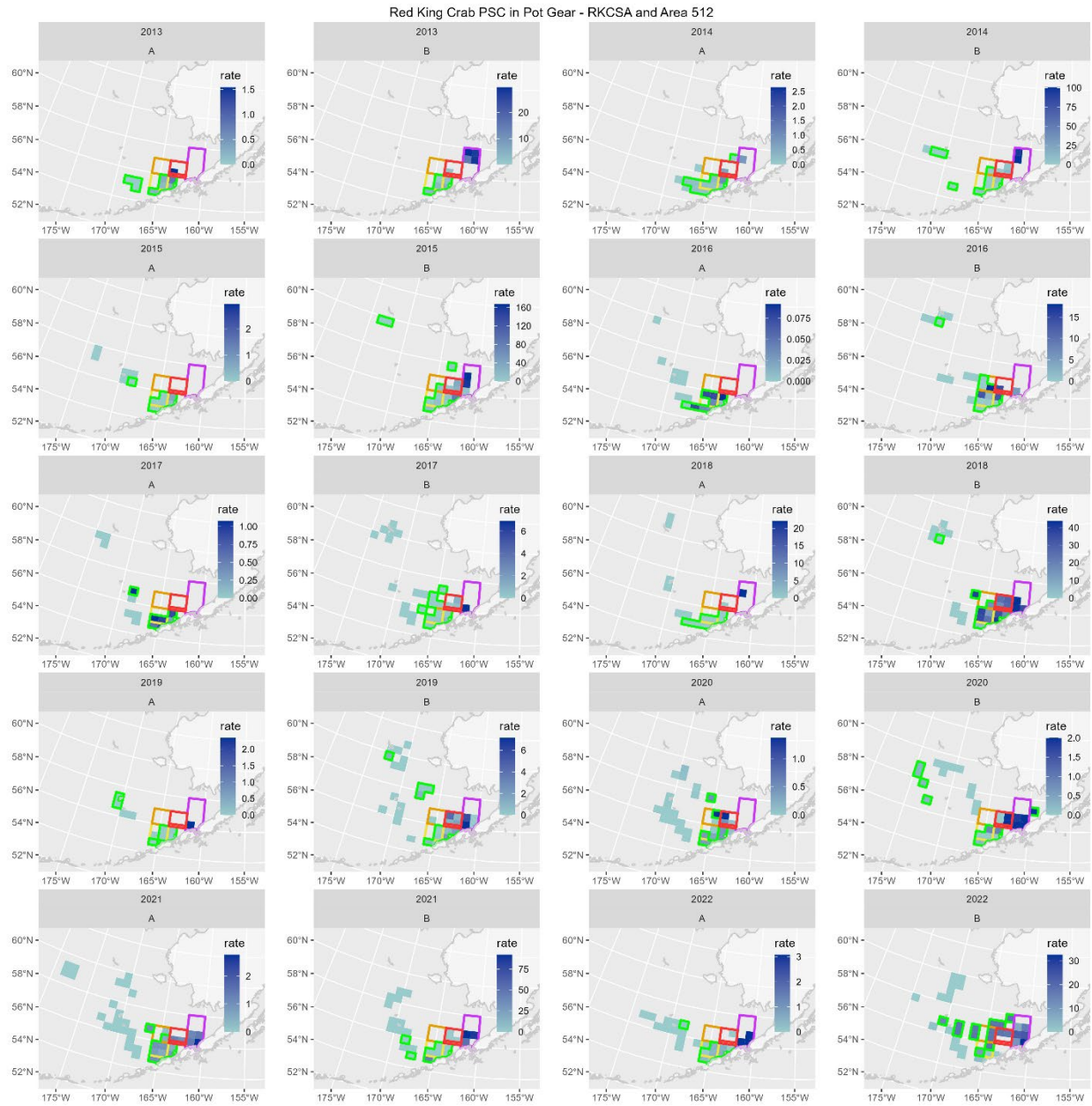
YEAR	SEASON	DISPLACEMENT	RKC PSC in AREA	GF Catch (mt) in Area	PSC Rate in High Areas	Est. Change in PSC	Total BS PSC	% Change
2013	A	RKCSA	7	4	0.38	-5	11866.53	0.0%
2014	A	RKCSA	164	248	1.50	208	23688.42	0.9%
2015	A	RKCSA	0	0	0.86	0	15554.89	0.0%
2016	A	RKCSA	0	0	0.09	0	921.3838	0.0%
2017	A	RKCSA	0	0	0.91	0	26064.5	0.0%
2018	A	RKCSA	0	291	0.62	182	7872.16	2.3%
2019	A	RKCSA	0	0	0.30	0	3951.452	0.0%
2020	A	RKCSA	727	1837	0.58	345	9396.237	3.7%
2021	A	RKCSA	303	296	2.15	333	31237.61	1.1%
2022	A	RKCSA	0	221	1.26	279	20596.02	1.4%
2013	B	RKCSA	1119	613	20.98	11743	81271.13	14.4%
2014	B	RKCSA	10893	1867	34.09	52769	112978.2	46.7%
2015	B	RKCSA	56558	2563	36.89	37987	162166.7	23.4%
2016	B	RKCSA	9508	652	9.64	-3222	21505.5	-15.0%
2017	B	RKCSA	366	561	1.10	250	3988.272	6.3%
2018	B	RKCSA	97208	3703	42.68	60834	283311.5	21.5%
2019	B	RKCSA	3769	2445	6.45	11994	42150.9	28.5%
2020	B	RKCSA	257	483	1.99	704	11396.49	6.2%
2021	B	RKCSA	0	147	74.56	10930	250665.5	4.4%
2022	B	RKCSA	4280	249	23.48	1567	126162.8	1.2%
2013	A	Area512	0	0	0.27	0	11866.53	0.0%
2014	A	Area512	215	255	1.35	130	23688.42	0.5%
2015	A	Area512	0	0	0.34	0	15554.89	0.0%
2016	A	Area512	0	0	0.03	0	921.3838	0.0%
2017	A	Area512	0	0	0.83	0	26064.5	0.0%
2018	A	Area512	341	15	0.45	-334	7872.16	-4.2%
2019	A	Area512	794	338	0.12	-753	3951.452	-19.0%
2020	A	Area512	0	0	0.48	0	9396.237	0.0%
2021	A	Area512	2213	1727	1.93	1111	31237.61	3.6%
2022	A	Area512	2900	944	0.53	-2399	20596.02	-11.6%
2013	B	Area512	48338	2304	3.45	-40391	81271.13	-49.7%
2014	B	Area512	53773	538	5.14	-51006	112978.2	-45.1%
2015	B	Area512	29463	578	19.33	-18298	162166.7	-11.3%
2016	B	Area512	3813	710	6.27	638	21505.5	3.0%
2017	B	Area512	3587	519	0.19	-3491	3988.272	-87.5%
2018	B	Area512	96365	2371	29.71	-25916	283311.5	-9.1%
2019	B	Area512	34182	5512	1.57	-25519	42150.9	-60.5%
2020	B	Area512	8168	4259	1.16	-3217	11396.49	-28.2%
2021	B	Area512	215888	2661	18.54	-166550	250665.5	-66.4%
2022	B	Area512	84865	4073	17.77	-12466	126162.8	-9.9%
2013	A	RCKSAand512	7	4	0.27	-5	11866.53	0.0%
2014	A	RCKSAand512	379	503	0.44	-157	23688.42	-0.7%
2015	A	RCKSAand512	0	0	0.27	0	15554.89	0.0%
2016	A	RCKSAand512	0	0	0.03	0	921.3838	0.0%
2017	A	RCKSAand512	0	0	0.73	0	26064.5	0.0%
2018	A	RCKSAand512	341	307	0.24	-266	7872.16	-3.4%
2019	A	RCKSAand512	794	338	0.11	-758	3951.452	-19.2%
2020	A	RCKSAand512	727	1837	0.42	37	9396.237	0.4%
2021	A	RCKSAand512	2516	2023	1.75	1024	31237.61	3.3%
2022	A	RCKSAand512	2900	1164	0.46	-2363	20596.02	-11.5%
2013	B	RCKSAand512	49457	2916	3.66	-38794	81271.13	-47.7%
2014	B	RCKSAand512	64666	2406	3.96	-55149	112978.2	-48.8%
2015	B	RCKSAand512	86021	3140	8.37	-59723	162166.7	-36.8%
2016	B	RCKSAand512	13320	1362	1.88	-10762	21505.5	-50.0%
2017	B	RCKSAand512	3953	1080	0.12	-3826	3988.272	-95.9%
2018	B	RCKSAand512	193573	6075	20.58	-68539	283311.5	-24.2%
2019	B	RCKSAand512	37951	7957	0.65	-32774	42150.9	-77.8%
2020	B	RCKSAand512	8425	4742	0.49	-6080	11396.49	-53.3%
2021	B	RCKSAand512	215888	2808	17.29	-167336	250665.5	-66.8%
2022	B	RCKSAand512	89145	4322	16.02	-19910	126162.8	-15.8%



**Figure A2-16. PSC rates of Red King Crab in POT gear displaced from in the RKCSA (red box) between 2013 and 2022. Blue shading represents the average PSC rates throughout the period by year and season, while the green boxes represent the collection of highest PSC-rate statistical areas. Other areas identified include immediately adjacent to the RKCSA/SS (orange), an area within the SCA (yellow), and Area 512 (purple).**



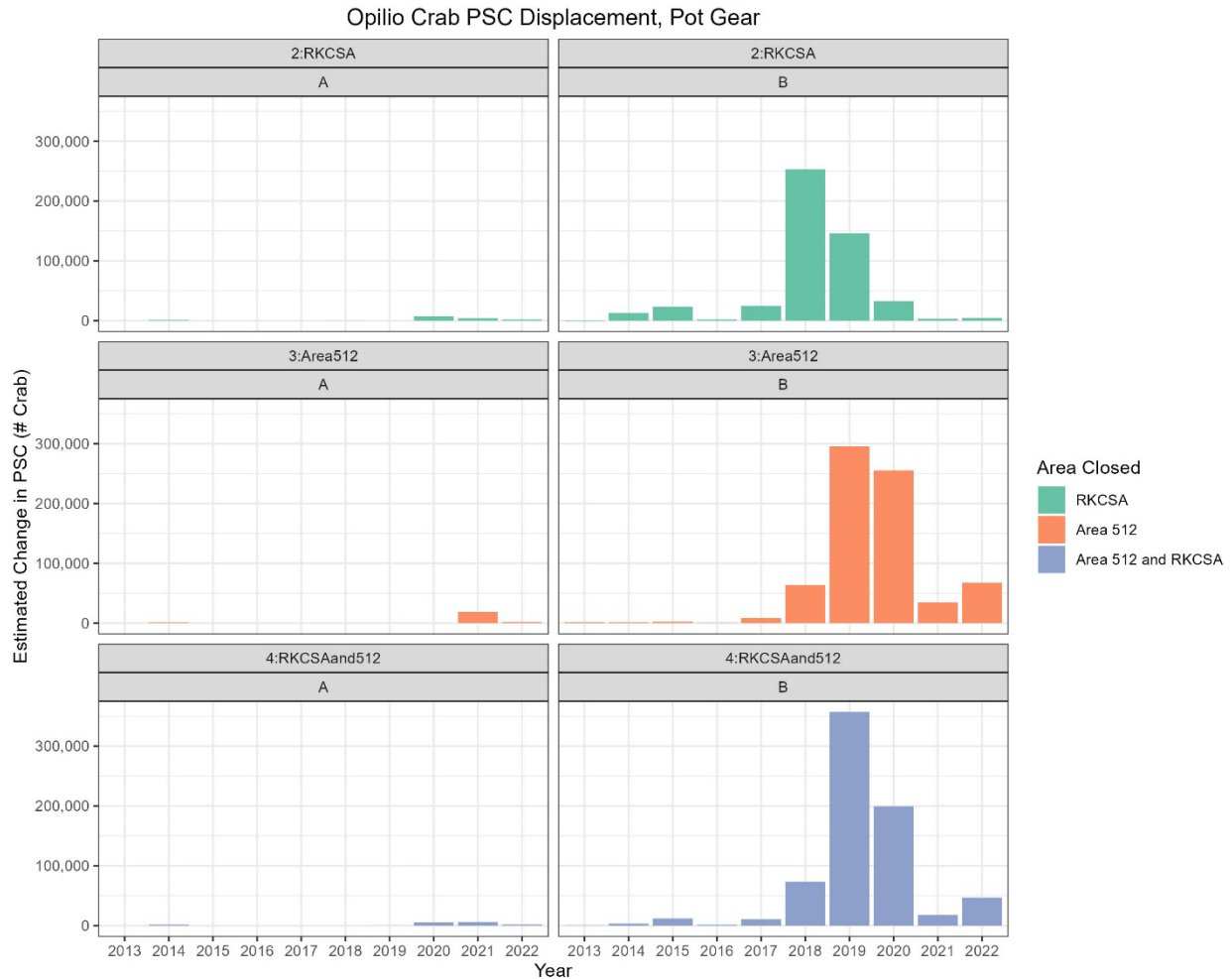
**Figure A2-17. PSC rates of Red King Crab in POT gear displaced from Area 512 (purple box) between 2013 and 2022. Blue shading represents the average PSC rates throughout the period by year and season, while the green boxes represent the collection of highest PSC-rate statistical areas. Other areas identified include immediately adjacent to the RKCSA/SS (orange), an area within the SCA (yellow), and the RKCSA (red).**



**Figure A2-18. PSC rates of Red King Crab in POT gear displaced from both the RKCSA (red) and Area 512 (purple) between 2013 and 2022. Blue shading represents the average PSC rates throughout the period by year and season, while the green boxes represent the collection of highest PSC-rate statistical areas. Other areas identified include immediately adjacent to the RKCSA/SS (orange), an area within the SCA (yellow).**

### Opilio Crab

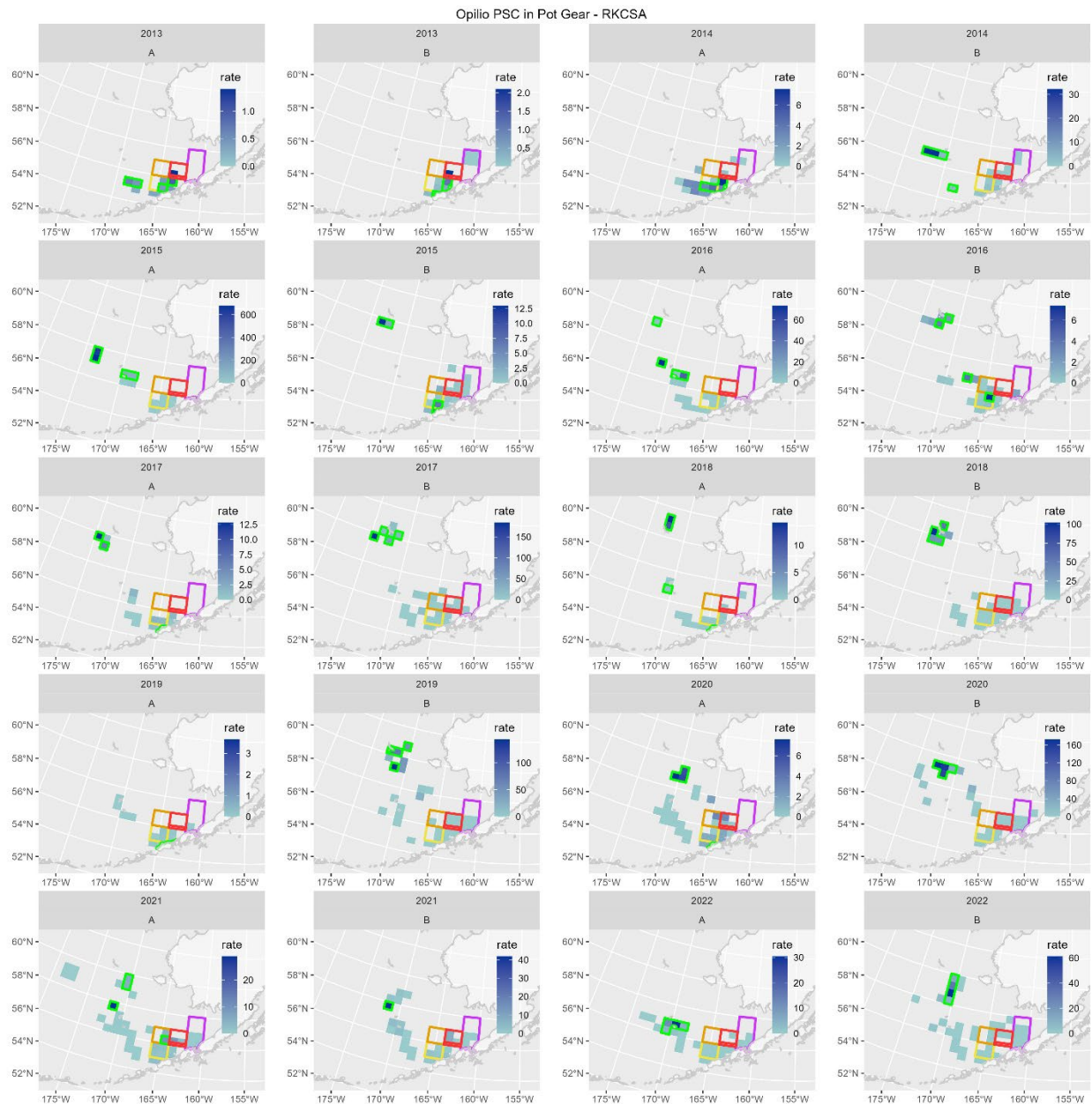
The estimated changes in Opilio PSC under the three scenarios of displacement (RKCSA/SS, Area 512, or both) are displayed in Table A2-9 and Figure A2-19. These estimates are derived using the highest PSC boxes represented in Figures A2-20, A2-21, and A2-22. In all cases where changes were estimated, the displacements led to an estimated increase in PSC. During the A Season, the estimated changes in PSC were negligible in most years, ticking up slightly since 2020. In the B Season, large increases in PSC were estimated between 2018 and 2020, due in part to the higher average PSC rates in the new areas during those years (Table A2-9).



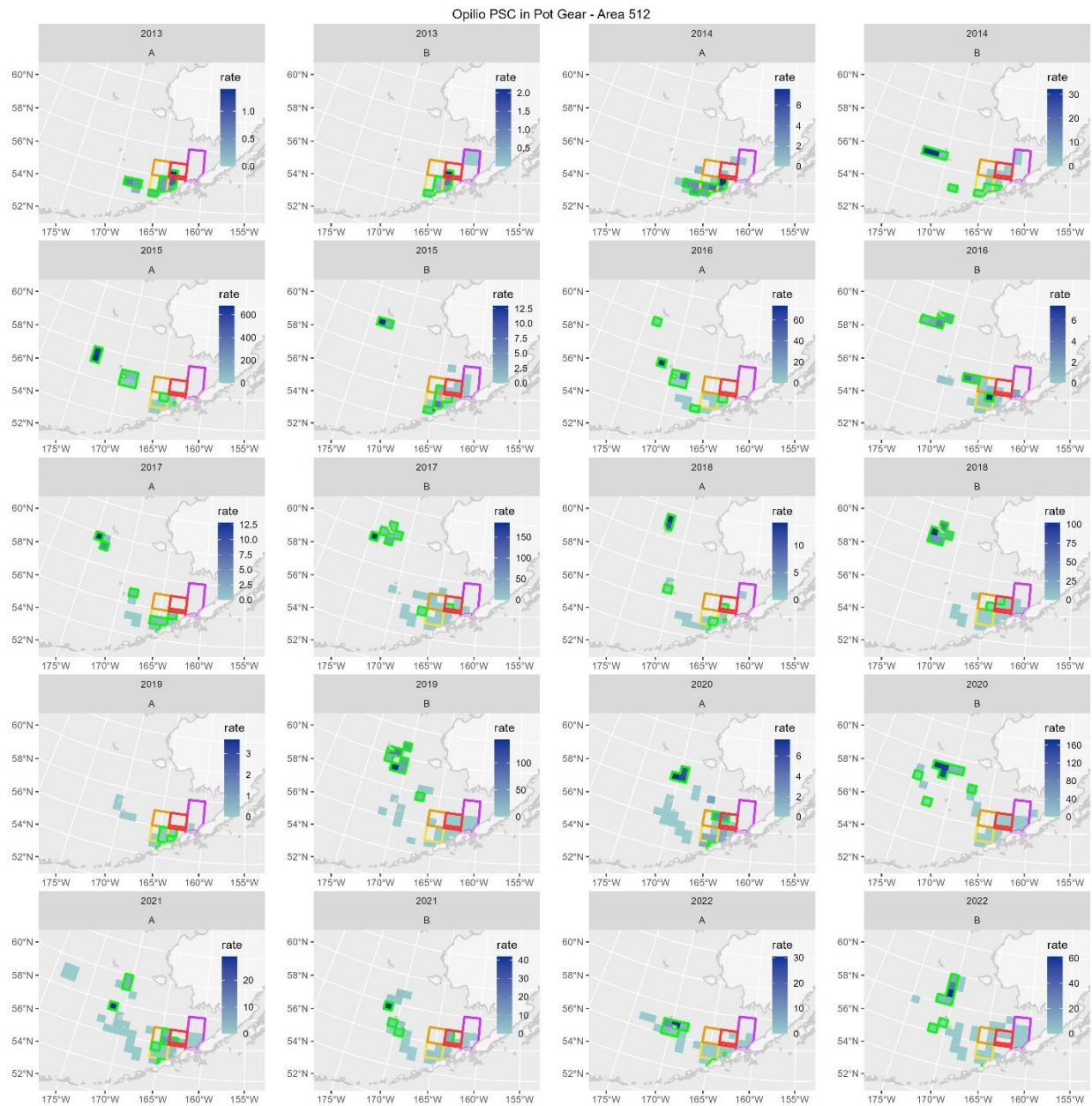
**Figure A2-19. Estimated change in Opilio Crab PSC rates in POT gear if displaced from in the RKCSA/SS (top), Area 512 (middle), or both (bottom) between 2013 and 2022 under the highest PSC scenario.**

**Table A2-9. Highest change estimated in Opilio PSC from POT displaced from the RKCSA, Area 512, or both.**

YEAR	SEASON	DISPLACEMENT	Opilio PSC in AREA	GF Catch (mt) in Area	PSC Rate in High Areas	Est. Change in PSC	Total BS PSC	% Change
2013	A	RKCSA	6	4	0.62	-3	8785.146	0.0%
2014	A	RKCSA	130	248	5.28	1180	75614.08	1.6%
2015	A	RKCSA	0	0	153.84	0	105869.3	0.0%
2016	A	RKCSA	0	0	10.92	0	10321.65	0.0%
2017	A	RKCSA	0	0	2.76	0	72058.52	0.0%
2018	A	RKCSA	140	291	0.81	97	12646.52	0.8%
2019	A	RKCSA	0	0	0.58	0	10046.13	0.0%
2020	A	RKCSA	1153	1837	4.53	7173	70527.51	10.2%
2021	A	RKCSA	794	296	16.44	4074	48336.55	8.4%
2022	A	RKCSA	21	221	9.58	2093	29566.5	7.1%
2013	B	RKCSA	1289	613	0.79	-802	4797.952	-16.7%
2014	B	RKCSA	261	1867	7.04	12883	8247.883	156.2%
2015	B	RKCSA	670	2563	9.43	23495	15691.11	149.7%
2016	B	RKCSA	96	652	3.37	2102	9715.488	21.6%
2017	B	RKCSA	1430	561	47.10	24976	58774.23	42.5%
2018	B	RKCSA	398	3703	68.47	253162	33630.17	752.8%
2019	B	RKCSA	533	2445	59.96	146092	58685.75	248.9%
2020	B	RKCSA	0	483	67.97	32801	50526.55	64.9%
2021	B	RKCSA	421	147	25.53	3320	4926.424	67.4%
2022	B	RKCSA	3	249	18.31	4558	14324.73	31.8%
2013	A	Area512	0	0	0.48	0	8785.146	0.0%
2014	A	Area512	0	255	4.26	1088	75614.08	1.4%
2015	A	Area512	0	0	79.64	0	105869.3	0.0%
2016	A	Area512	0	0	5.75	0	10321.65	0.0%
2017	A	Area512	0	0	2.31	0	72058.52	0.0%
2018	A	Area512	0	15	0.61	9	12646.52	0.1%
2019	A	Area512	0	338	0.44	149	10046.13	1.5%
2020	A	Area512	0	0	3.92	0	70527.51	0.0%
2021	A	Area512	86	1727	11.08	19048	48336.55	39.4%
2022	A	Area512	17	944	2.09	1953	29566.5	6.6%
2013	B	Area512	18	2304	0.72	1648	4797.952	34.4%
2014	B	Area512	33	538	2.44	1281	8247.883	15.5%
2015	B	Area512	61	578	4.08	2298	15691.11	14.6%
2016	B	Area512	1233	710	2.59	603	9715.488	6.2%
2017	B	Area512	15	519	16.71	8666	58774.23	14.7%
2018	B	Area512	88	2371	26.72	63267	33630.17	188.1%
2019	B	Area512	302	5512	53.65	295401	58685.75	503.4%
2020	B	Area512	1359	4259	60.28	255368	50526.55	505.4%
2021	B	Area512	0	2661	13.07	34779	4926.424	706.0%
2022	B	Area512	1	4073	16.56	67470	14324.73	471.0%
2013	A	RCKSAand512	6	4	0.42	-4	8785.146	0.0%
2014	A	RCKSAand512	130	503	3.54	1654	75614.08	2.2%
2015	A	RCKSAand512	0	0	5.08	0	105869.3	0.0%
2016	A	RCKSAand512	0	0	0.97	0	10321.65	0.0%
2017	A	RCKSAand512	0	0	1.94	0	72058.52	0.0%
2018	A	RCKSAand512	140	307	0.47	6	12646.52	0.0%
2019	A	RCKSAand512	0	338	0.33	111	10046.13	1.1%
2020	A	RCKSAand512	1153	1837	3.55	5360	70527.51	7.6%
2021	A	RCKSAand512	881	2023	3.34	5881	48336.55	12.2%
2022	A	RCKSAand512	38	1164	1.54	1753	29566.5	5.9%
2013	B	RCKSAand512	1307	2916	0.55	291	4797.952	6.1%
2014	B	RCKSAand512	294	2406	1.45	3203	8247.883	38.8%
2015	B	RCKSAand512	731	3140	4.04	11957	15691.11	76.2%
2016	B	RCKSAand512	1329	1362	2.12	1558	9715.488	16.0%
2017	B	RCKSAand512	1445	1080	11.16	10609	58774.23	18.0%
2018	B	RCKSAand512	486	6075	12.11	73052	33630.17	217.2%
2019	B	RCKSAand512	835	7957	45.00	357216	58685.75	608.7%
2020	B	RCKSAand512	1359	4742	42.30	199220	50526.55	394.3%
2021	B	RCKSAand512	421	2808	6.48	17774	4926.424	360.8%
2022	B	RCKSAand512	4	4322	10.79	46615	14324.73	325.4%

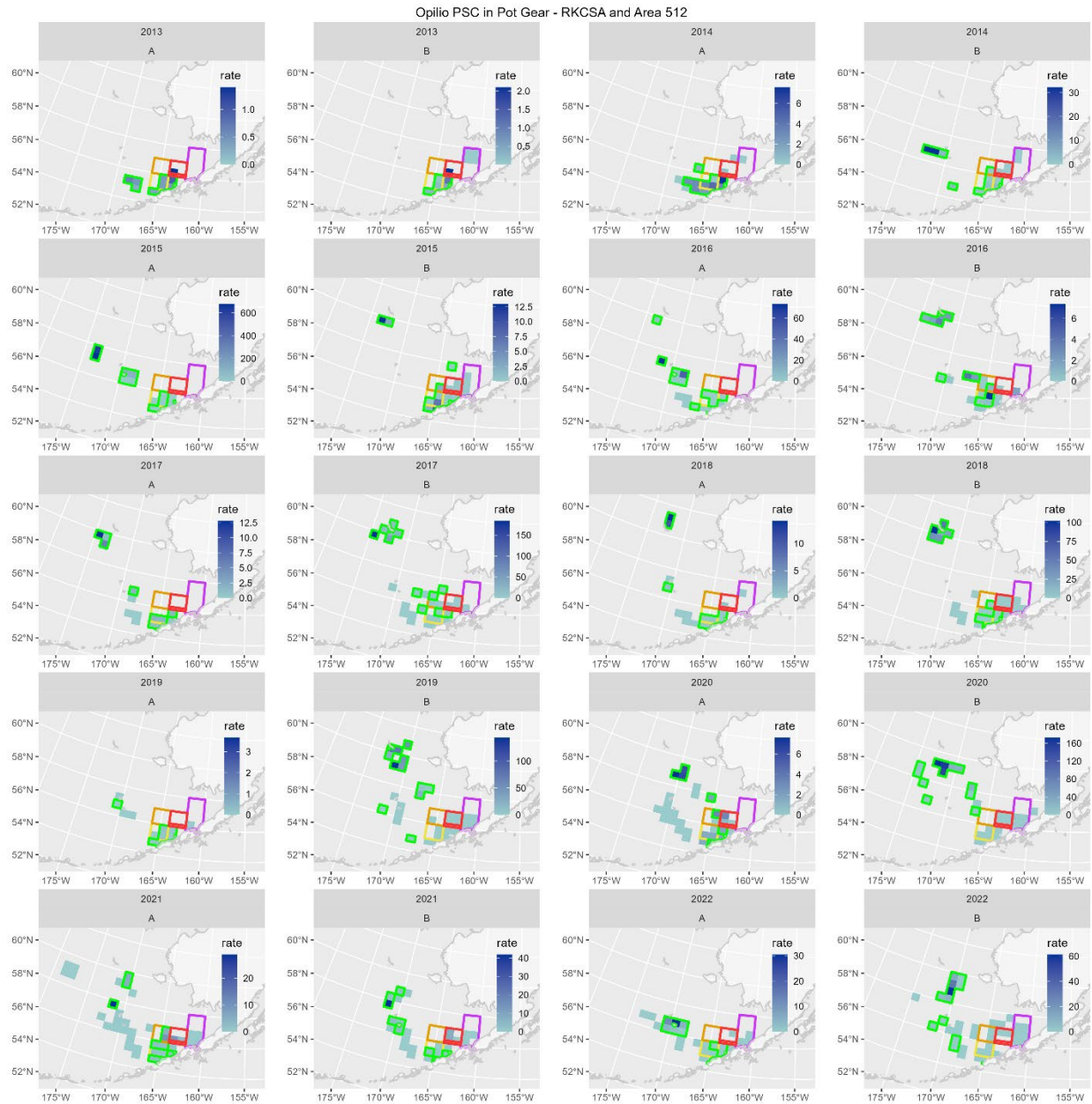


**Figure A2-20. PSC rates of *Opilio* in POT gear displaced from in the RKCSA (red box) between 2013 and 2022. Blue shading represents the average PSC rates throughout the period by year and season, while the green boxes represent the collection of highest PSC-rate statistical areas. Other areas identified include immediately adjacent to the RKCSA/SS (orange), an area within the SCA (yellow), and Area 512 (purple).**



**Figure A2-21. PSC rates of Opilio in POT gear displaced from Area 512 (purple box) between 2013 and 2022. Blue shading represents the average PSC rates throughout the period by year and season, while the green boxes represent the collection of highest PSC-rate statistical areas. Other areas identified include immediately adjacent to the RKCSA/SS (orange), an area within the SCA (yellow), and the RKCSA (red).**





**Figure A2-22. PSC rates of Opilio in POT gear displaced from both the RKCSA (red) and Area 512 (purple) between 2013 and 2022. Blue shading represents the average PSC rates throughout the period by year and season, while the green boxes represent the collection of highest PSC-rate statistical areas. Other areas identified include immediately adjacent to the RKCSA/SS (orange), an area within the SCA (yellow).**

### Bairdi Crab

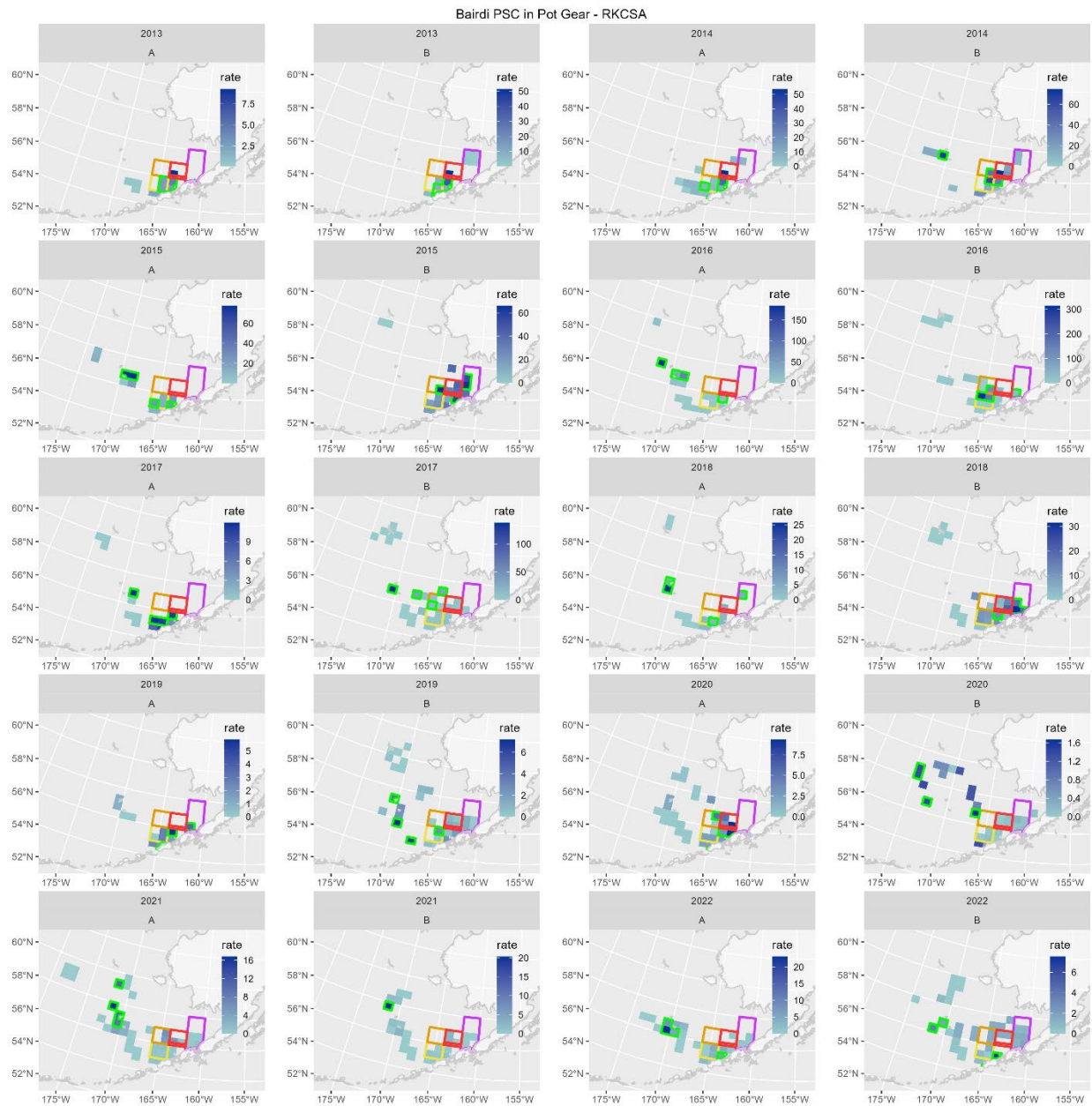
The estimated changes in Bairdi PSC under the three scenarios of displacement (RKCSA/SS, Area 512, or both) are displayed in Table A2-10 and Figure A2-23. These estimates are derived using the highest PSC boxes represented in Figure A2-24, 25, and 26. During the A Season, the estimated changes were negligible in many years, and have showed a mixed response in recent years since 2020. In the B Season, most years showed small increases in PSC estimated, but showed larger isolated increases estimated from the displacement of Area 512 (2013) or the RKCSA (2015) in some years (Figure A2-23). Some years also stood out as decreases in PSC estimated under the displacement from both the RCKSA and Area 512 (2015, 2018) when high PSC rates occurred within the RKCSA and Area 512 (Figure A2-23).



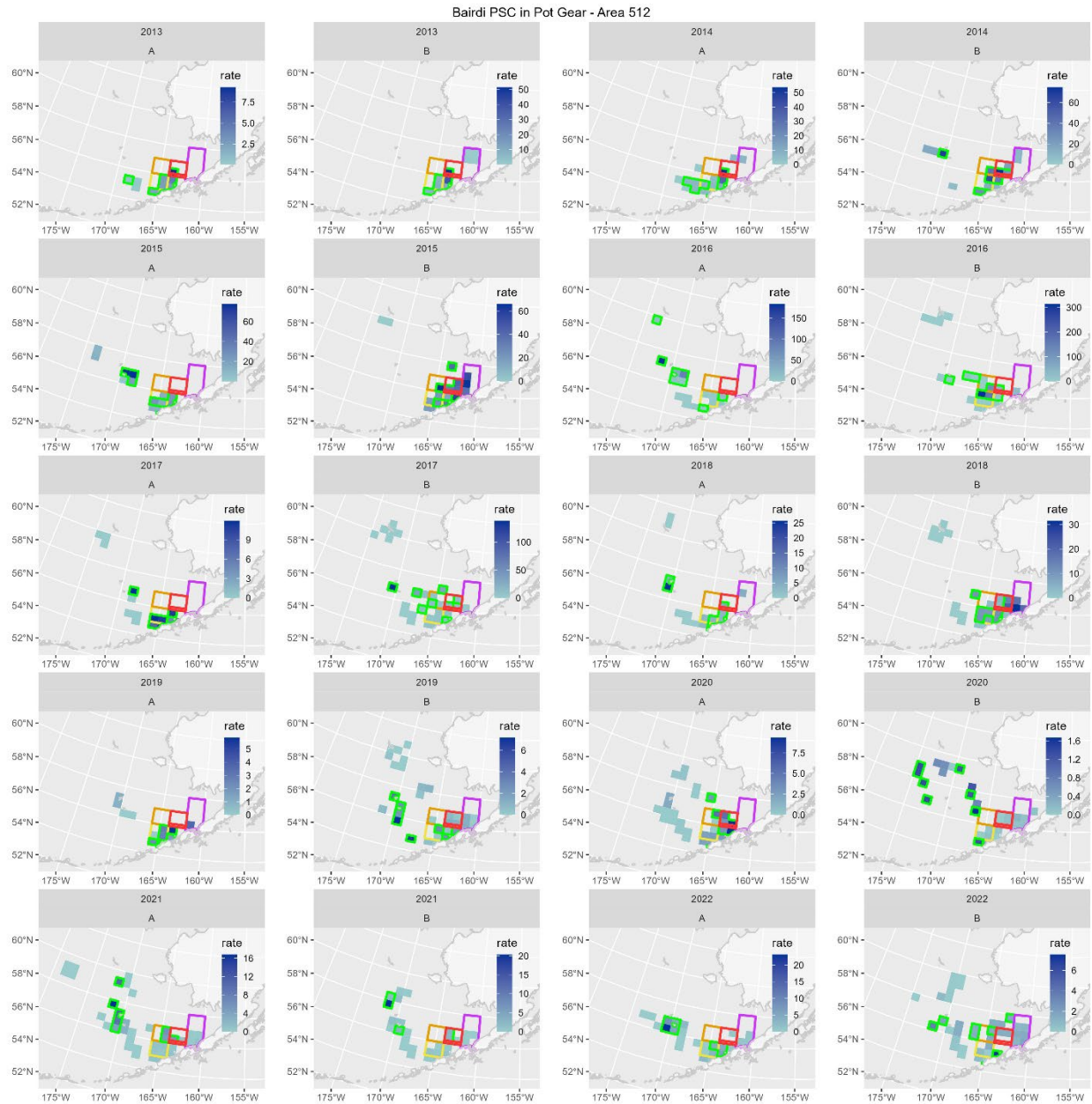
**Figure A2-23. Estimated change in Bairdi Crab PSC rates in POT gear if displaced from in the RKCSA/SS (top), Area 512 (middle), or both (bottom) between 2013 and 2022 under the highest PSC scenario.**

**Table A10. Highest change estimated in Bairdi PSC from POT displaced from the RKCSA, Area 512, or both.**

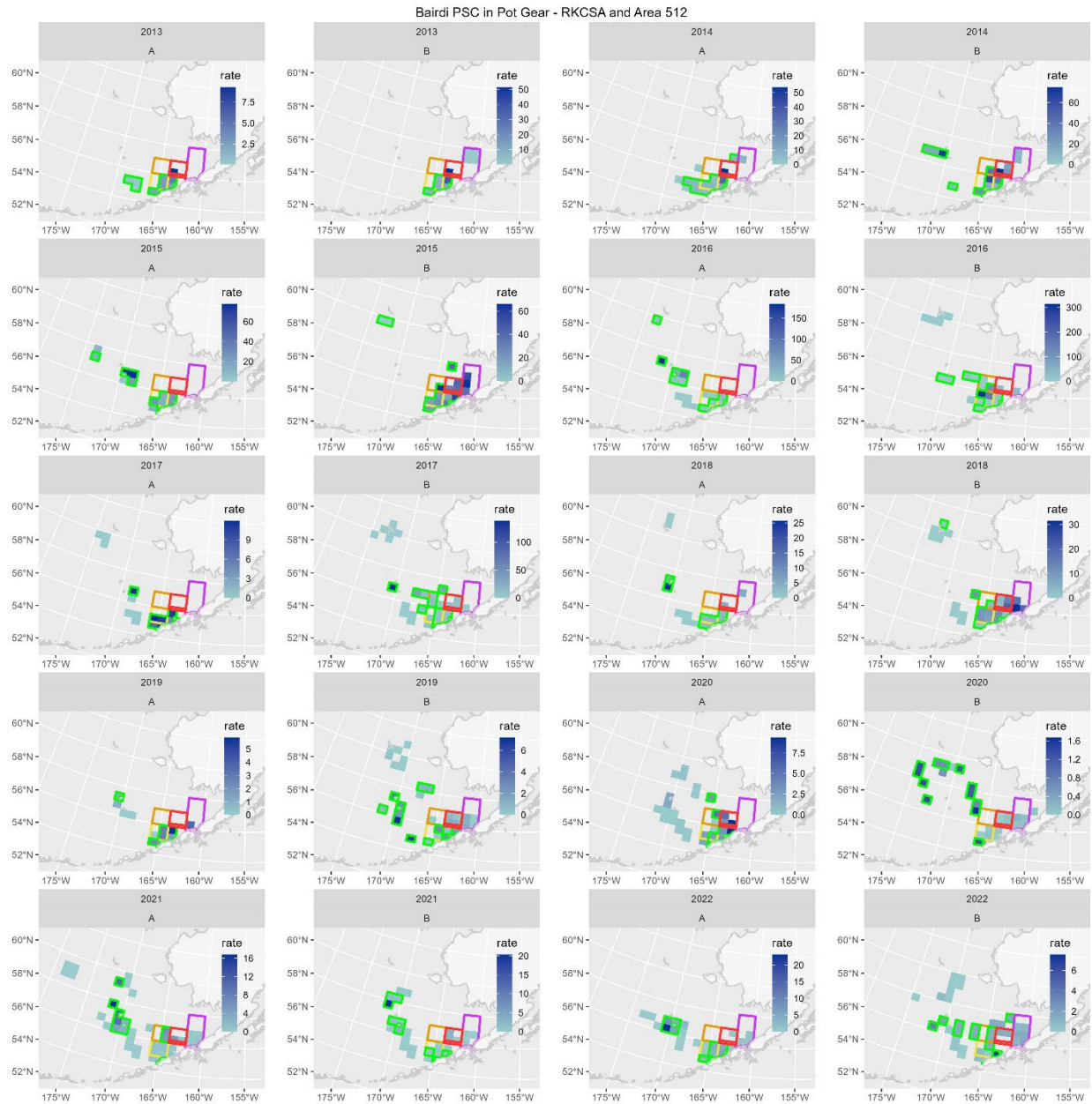
YEAR	SEASON	DISPLACEMENT	Bairdi PSC in AREA	GF Catch (mt) in Area	PSC Rate in High Areas	Est. Change in PSC	Total BS PSC	% Change
2013	A	RKCSA	39	4	3.29	-25	67854.42	0.0%
2014	A	RKCSA	13351	248	21.77	-7949	280274.8	-2.8%
2015	A	RKCSA	0	0	61.47	0	352457	0.0%
2016	A	RKCSA	0	0	31.70	0	209737.2	0.0%
2017	A	RKCSA	0	0	10.95	0	268970.7	0.0%
2018	A	RKCSA	1351	291	6.07	417	98037.48	0.4%
2019	A	RKCSA	0	0	4.76	0	98913.97	0.0%
2020	A	RKCSA	8504	1837	3.19	-2638	70293.89	-3.8%
2021	A	RKCSA	360	296	14.65	3978	28201.86	14.1%
2022	A	RKCSA	125	221	9.39	1945	92697.42	2.1%
2013	B	RKCSA	31586	613	24.63	-16486	146012.5	-11.3%
2014	B	RKCSA	65075	1867	42.38	14064	285664	4.9%
2015	B	RKCSA	97152	2563	64.95	69301	258117.8	26.8%
2016	B	RKCSA	21334	652	52.20	12712	86621.55	14.7%
2017	B	RKCSA	5659	561	22.58	7000	56628.64	12.4%
2018	B	RKCSA	66255	3703	18.62	2714	142822.3	1.9%
2019	B	RKCSA	2525	2445	3.03	4886	12453.14	39.2%
2020	B	RKCSA	13	483	1.66	789	1657.937	47.6%
2021	B	RKCSA	150	147	14.91	2035	3127.925	65.1%
2022	B	RKCSA	335	249	7.09	1431	9559.21	15.0%
2013	A	Area512	0	0	2.57	0	67854.42	0.0%
2014	A	Area512	1801	255	22.69	3988	280274.8	1.4%
2015	A	Area512	0	0	17.32	0	352457	0.0%
2016	A	Area512	0	0	8.22	0	209737.2	0.0%
2017	A	Area512	0	0	9.58	0	268970.7	0.0%
2018	A	Area512	72	15	4.44	-4	98037.48	0.0%
2019	A	Area512	1252	338	3.94	81	98913.97	0.1%
2020	A	Area512	0	0	3.61	0	70293.89	0.0%
2021	A	Area512	400	1727	11.57	19573	28201.86	69.4%
2022	A	Area512	791	944	6.38	5227	92697.42	5.6%
2013	B	Area512	1212	2304	22.56	50757	146012.5	34.8%
2014	B	Area512	4944	538	40.40	16806	285664	5.9%
2015	B	Area512	25835	578	39.62	-2954	258117.8	-1.1%
2016	B	Area512	20152	710	42.84	10256	86621.55	11.8%
2017	B	Area512	653	519	14.43	6841	56628.64	12.1%
2018	B	Area512	49828	2371	17.14	-9171	142822.3	-6.4%
2019	B	Area512	6273	5512	2.62	8165	12453.14	65.6%
2020	B	Area512	722	4259	1.43	5366	1657.937	323.6%
2021	B	Area512	0	2661	6.61	17602	3127.925	562.7%
2022	B	Area512	5323	4073	5.55	17300	9559.21	181.0%
2013	A	RCKSAand512	39	4	2.55	-28	67854.42	0.0%
2014	A	RCKSAand512	15152	503	10.12	-10057	280274.8	-3.6%
2015	A	RCKSAand512	0	0	15.83	0	352457	0.0%
2016	A	RCKSAand512	0	0	6.32	0	209737.2	0.0%
2017	A	RCKSAand512	0	0	7.52	0	268970.7	0.0%
2018	A	RCKSAand512	1424	307	3.64	-306	98037.48	-0.3%
2019	A	RCKSAand512	1252	338	3.62	-28	98913.97	0.0%
2020	A	RCKSAand512	8504	1837	2.94	-3094	70293.89	-4.4%
2021	A	RCKSAand512	761	2023	2.23	3753	28201.86	13.3%
2022	A	RCKSAand512	916	1164	3.99	3726	92697.42	4.0%
2013	B	RCKSAand512	32798	2916	18.88	22264	146012.5	15.2%
2014	B	RCKSAand512	70019	2406	34.38	12686	285664	4.4%
2015	B	RCKSAand512	122987	3140	23.73	-48460	258117.8	-18.8%
2016	B	RCKSAand512	41485	1362	12.17	-24905	86621.55	-28.8%
2017	B	RCKSAand512	6313	1080	7.81	2127	56628.64	3.8%
2018	B	RCKSAand512	116083	6075	6.64	-75742	142822.3	-53.0%
2019	B	RCKSAand512	8798	7957	0.84	-2154	12453.14	-17.3%
2020	B	RCKSAand512	735	4742	1.19	4914	1657.937	296.4%
2021	B	RCKSAand512	150	2808	3.88	10738	3127.925	343.3%
2022	B	RCKSAand512	5658	4322	4.86	15332	9559.21	160.4%



**Figure A2-24. PSC rates of Bairdi in POT gear displaced from in the RKCSA (red box) between 2013 and 2022. Blue shading represents the average PSC rates throughout the period by year and season, while the green boxes represent the collection of highest PSC-rate statistical areas. Other areas identified include immediately adjacent to the RKCSA/SS (orange), an area within the SCA (yellow), and Area 512 (purple).**



**Figure A2-25. PSC rates of Bairdi in POT gear displaced from Area 512 (purple box) between 2013 and 2022. Blue shading represents the average PSC rates throughout the period by year and season, while the green boxes represent the collection of highest PSC-rate statistical areas. Other areas identified include immediately adjacent to the RKCSA/SS (orange), an area within the SCA (yellow), and the RKCSA (red).**



**Figure A2-26. PSC rates of Bairdi in POT gear displaced from both the RKCSA (red) and Area 512 (purple) between 2013 and 2022. Blue shading represents the average PSC rates throughout the period by year and season, while the green boxes represent the collection of highest PSC-rate statistical areas. Other areas identified include immediately adjacent to the RKCSA/SS (orange), an area within the SCA (yellow).**

## Hook and Line

### Halibut

Changes in Halibut PSC occurred in both A and B seasons. All changes in PSC were positive (increases), however the majority of these changes were small (under 15mt) (Table A2-11; Figure A2-27). There were no apparent spatial patterns in PSC rates (Figure A2-28), and the years with highest PSC (2013 A Season; 2018 B Season) appeared mostly due to the larger catch within the RKCSA in those years/seasons (Table A2-11).

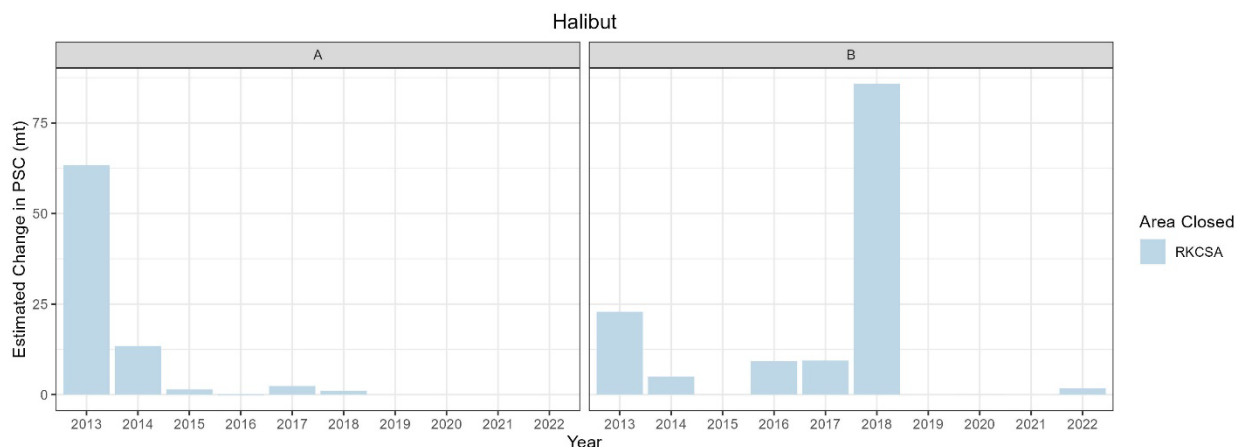
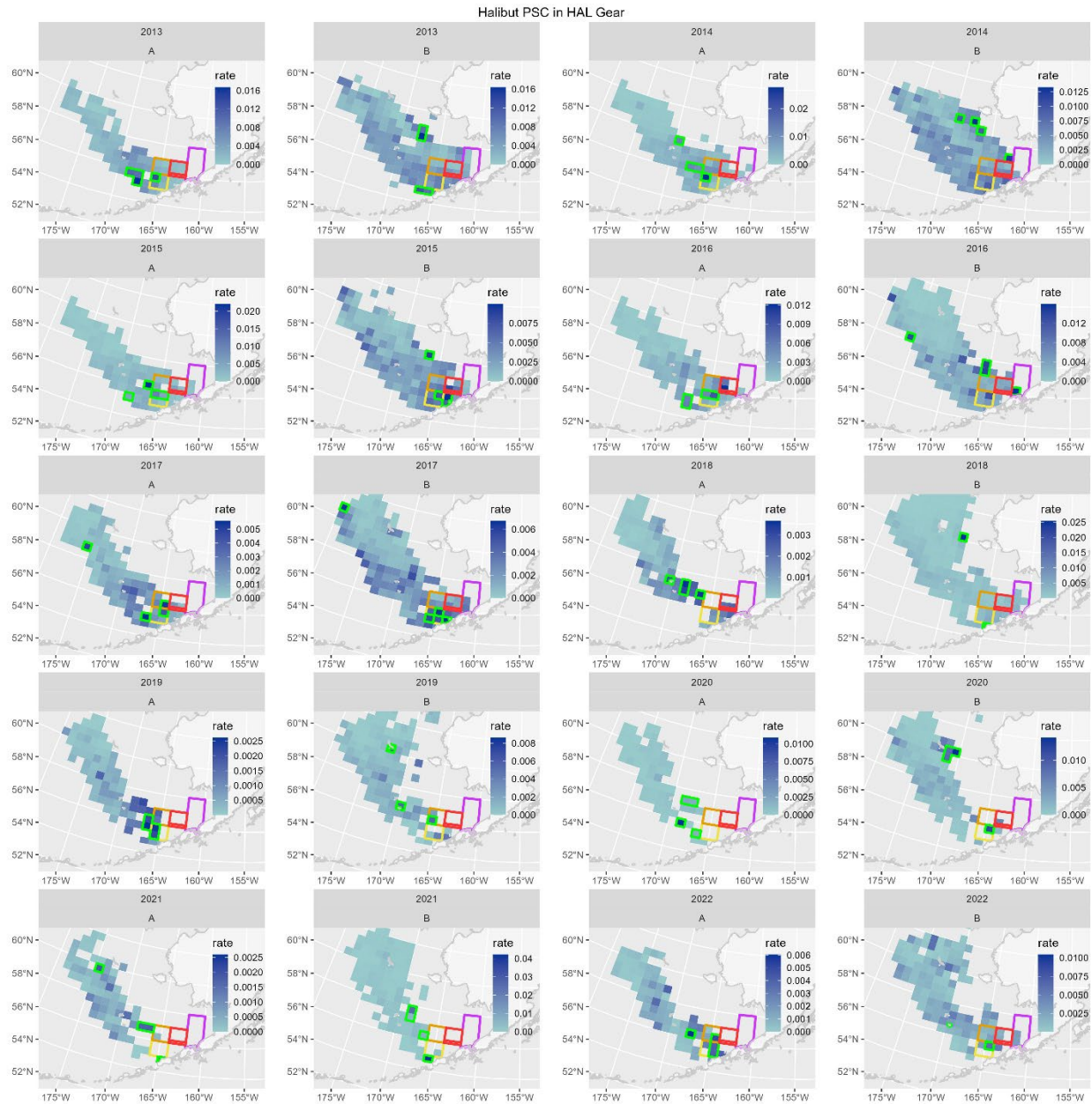


Figure A2-27. Highest estimated change in Halibut PSC from HAL displaced from in the RKCSA.

Table A2-11. Highest estimated change in Halibut PSC from HAL displaced from in the RKCSA.

YEAR	SEASON	Halibut PSC (mt) in RKCSA	GF Catch (mt) in RKCSA	PSC Rate in High Areas	Est. Change in PSC	Total BS PSC	% Change
2013	A	7.06	5552	0.013	63.3	183.4323	34.5%
2014	A	1.80	1433	0.011	13.4	185.3458	7.2%
2015	A	0.90	393	0.006	1.4	115.3389	1.2%
2016	A	0.80	69	0.008	-0.3	102.7631	-0.3%
2017	A	0.37	624	0.004	2.4	85.51991	2.8%
2018	A	1.73	815	0.003	1.1	58.96518	1.8%
2019	A	0.00	0	0.002	0.0	37.09739	0.0%
2020	A	0.00	0	0.003	0.0	19.59467	0.0%
2021	A	0.00	0	0.002	0.0	18.29191	0.0%
2022	A	0.00	0	0.005	0.0	46.65681	0.0%
2013	B	4.83	2637	0.011	22.9	346.2267	6.6%
2014	B	2.57	805	0.009	5.0	264.0385	1.9%
2015	B	0.29	44	0.007	0.0	195.0401	0.0%
2016	B	2.94	860	0.014	9.2	115.3751	8.0%
2017	B	3.79	2002	0.007	9.4	96.99858	9.7%
2018	B	4.49	4752	0.019	85.9	65.63439	130.8%
2019	B	0.00	0	0.007	0.0	39.58363	0.0%
2020	B	0.11	16	0.009	0.0	60.65788	0.1%
2021	B	0.00	0	0.007	0.0	48.37846	0.0%
2022	B	0.91	426	0.006	1.7	100.7262	1.7%



**Figure A2-28. PSC rates of Halibut in HAL gear displaced from in the RKCSA (red box) between 2013 and 2022. Blue shading represents the average PSC rates throughout the period by year and season, while the green boxes represent the collection of highest PSC-rate statistical areas. Other areas identified include immediately adjacent to the RKCSA/SS (orange), an area within the SCA (yellow), and Area 512 (purple).**



## A2.2 CPUE-Based Approach

In June 2023, the Council requested staff to “Incorporate SSC recommendations as practicable for additional steps to more accurately portray the likely range and certainty of costs and benefits of the proposed alternatives.” This section details an alternative method of estimating PSC change using following equation adapted from the June 2023 SSC Report:

$$\Delta PSC = (Displaced\ Effort_{old\ area} \times PSC\ CPUE_{new\ area}) - PSC_{old\ area}$$

In effect, the displaced effort from a given area is distributed to new areas having the highest groundfish catch per unit effort (CPUE), under the assumption that high catch rates would attract the displaced effort, and the PSC from the old area is subtracted to result in the net change of PSC. The estimates are reported for halibut, salmon, and crab based upon the gear type used (PTR, NPT, POT, and HAL).

### Catch and Effort

Estimates of groundfish catch and effort to develop spatial CPUEs were obtained from the National Marine Fisheries Service’s Catch-in-Areas (CIA) by gear type. For all fleets, catch represents the retained groundfish weight of a haul in tons. Effort was presented in time (minutes) for the PTR and NPT gears, and as the number of pots or hooks for POT and HAL gears. Effort was limited to trips occurring in the Bering Sea during the time series and consisted of trip targets of Pollock (PTR) and Pacific cod (HAL, POT). For NPT, all trips targeting either rock sole or Pacific cod were included, as industry representatives noted that some vessels target species on a haul-by-haul basis. However, since the CIA only reports the target at the trip level, these two species were grouped to capture the most likely effort in the RKCSS as suggested by industry experts.

The CIA relies on vessel monitoring system (VMS) tracks at the haul level, filtering outliers based on probable vessel speeds. For this analysis, only hauls with a performance rating showing no issue were utilized. Additionally, because we were only interested in rates, only observed hauls were utilized. For the trawl fisheries, to remove any hauls that were immediately retrieved and not representative of fishing, a final step removed a number of hauls with an effort of fewer than 10 minutes. This was determined to be the minimum time needed to consider all components of the net in the water following the beginning of the deployment time (i.e. time the codend first enters the water).

This analysis is presented over the past 10 years (2013-2022), by season. Seasons were determined by catch occurring before (A Season) or after June 10 (B Season) in the calendar year. Catcher processors (CPs) and catcher vessels (CVs) are aggregated in this analysis, as CVs have had low effort in this area during the time series (as with NPT, POT, and HAL), or did not differ in spatial catch (as with PTR).

### Effort Displaced

The efforts displaced were based on the options in the June Council motion. For PTR, NPT, and HAL, effort was displaced from the RKCSA only. For pot gear, the effort is displaced by three options representing the Council motion – displacement from the RKCSA, displacement from Area 512, and displacement from *both* the RKCSA and Area 512. Displaced effort was distributed evenly to the new grid cells. For example, 100 minutes of effort distributed to four new grid cells would result in each of the four new areas receiving 25 minutes of effort.

### Areas to which Effort is Displaced

The displaced efforts were distributed to a selection of grid cells having the highest groundfish CPUE under the assumption that high catch rates would attract the displaced effort. For all gears displaced from the RKCSA, the selected high CPUE areas consisted of the highest four CPUE grids (roughly equal to the area of the RKCSA), while the Pot gear was displaced to eight new grids (roughly the area of Area 512), or 12 new grids (roughly the area of both the RKCSA and Area 512).

Areas of high catch rates were determined through a selection of weighted mean groundfish CPUEs, which were developed as a product of mean CPUE and the total area covered per statistical area. An example is represented for PTR in Figure A2-29. In this way, we minimized the chance that small area (sometimes a single pixel) of high CPUE resulted in the selection of a statistical area that may not be able to absorb the displaced effort. Annual mean values per season in the time series (2013-2022) represent the full spatial scale of the fisheries.

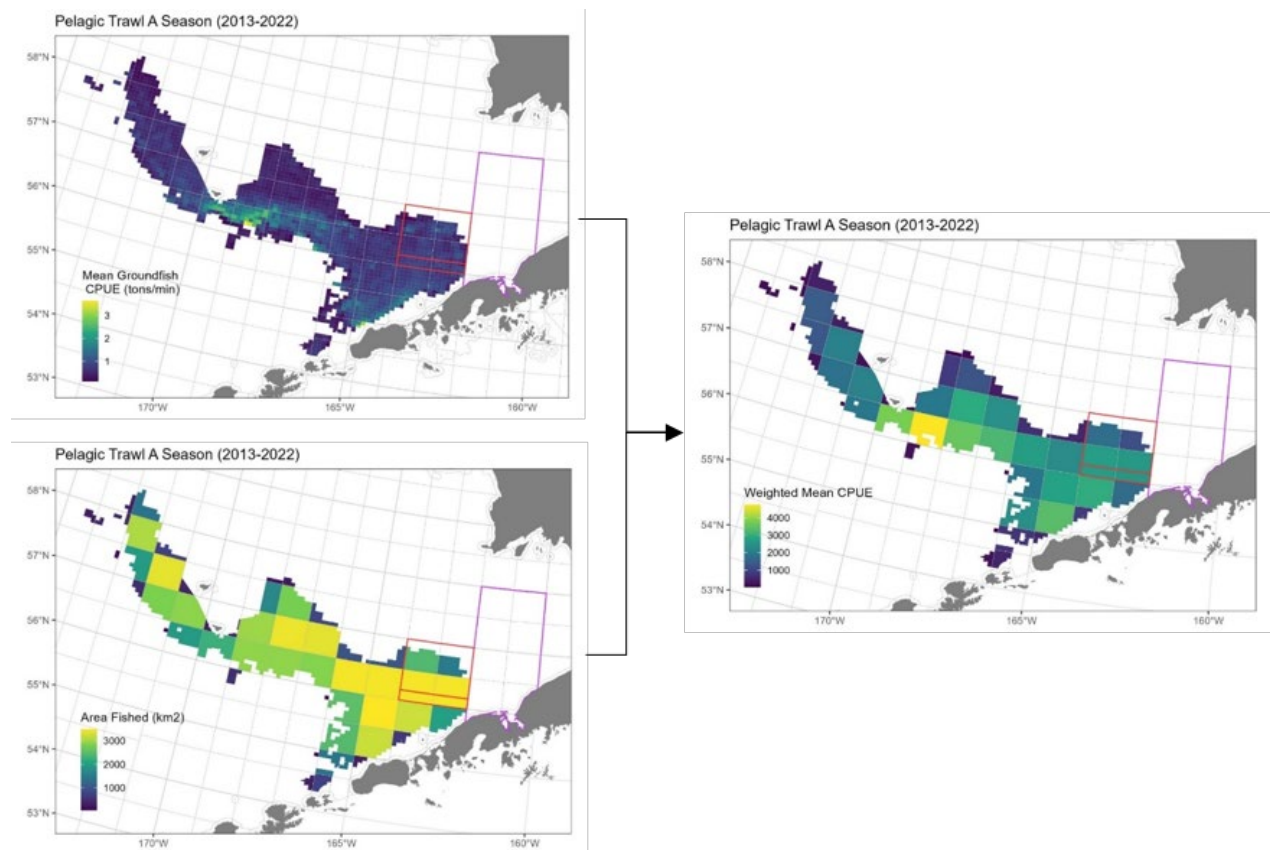


Figure A2-29. Example process of estimating weighted mean CPUE (right) by multiplying mean spatial CPUE (top left) and the area fished (bottom right) of each statistical area.

## Pelagic Trawl

### Effort

The PTR fleet has primarily fished inside the RKCSA during the A Season, although in some years (e.g. 2016, 2019, and 2020) there has been some effort within the area during the B Season (Figures A2-30 and A2-31). According to PTR representatives, the primary importance of the RKCSA for the fleet during the A Season is the low Chinook salmon bycatch found there. PTR industry representatives also noted that during the A Season, the RKCSA is most important during the months of January through mid-March/early April when the Pollock move out, after which the fleet will move west toward the Pribilof Islands.

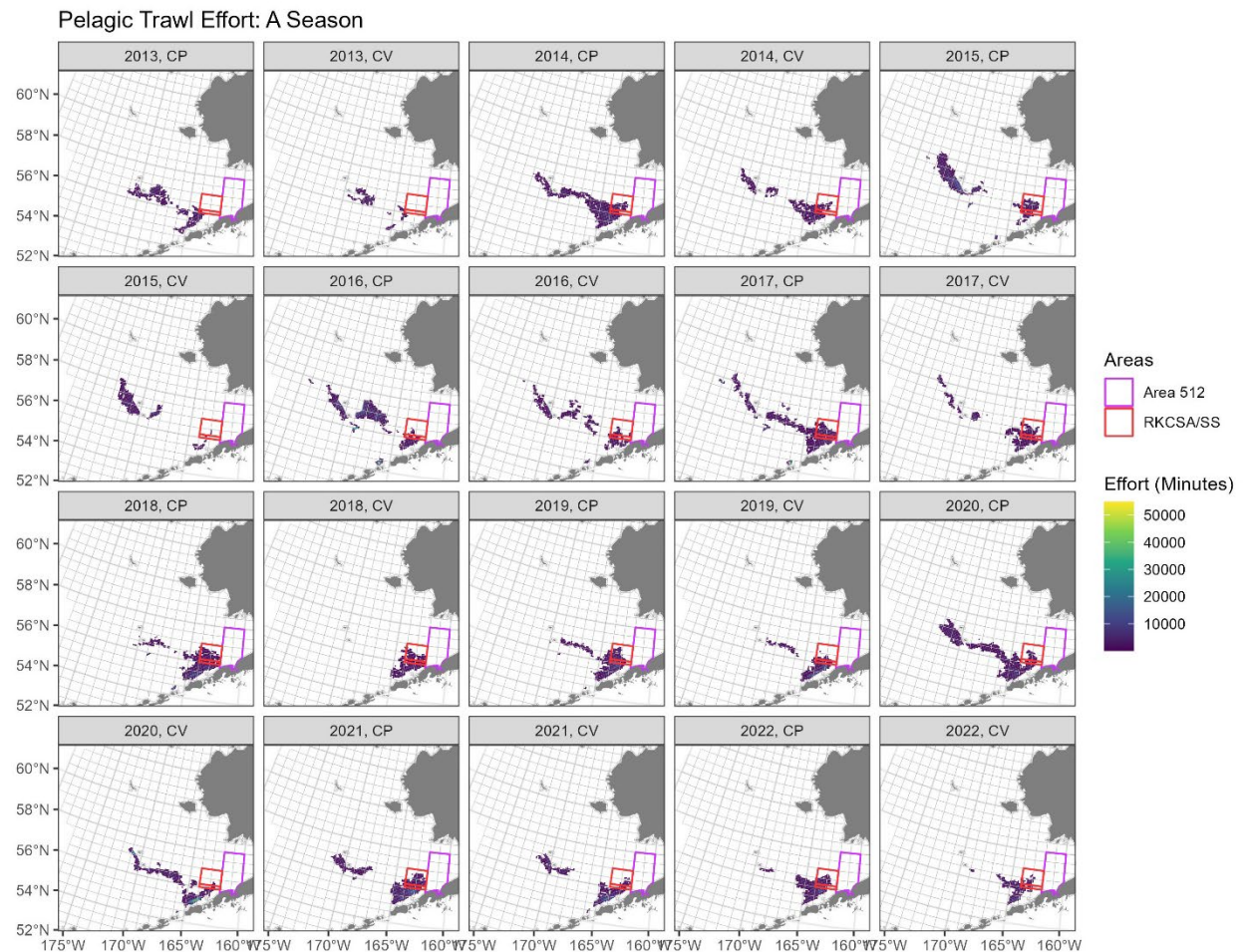


Figure A2-30. Distribution of A season PTR effort (minutes) between 2013 and 2022.

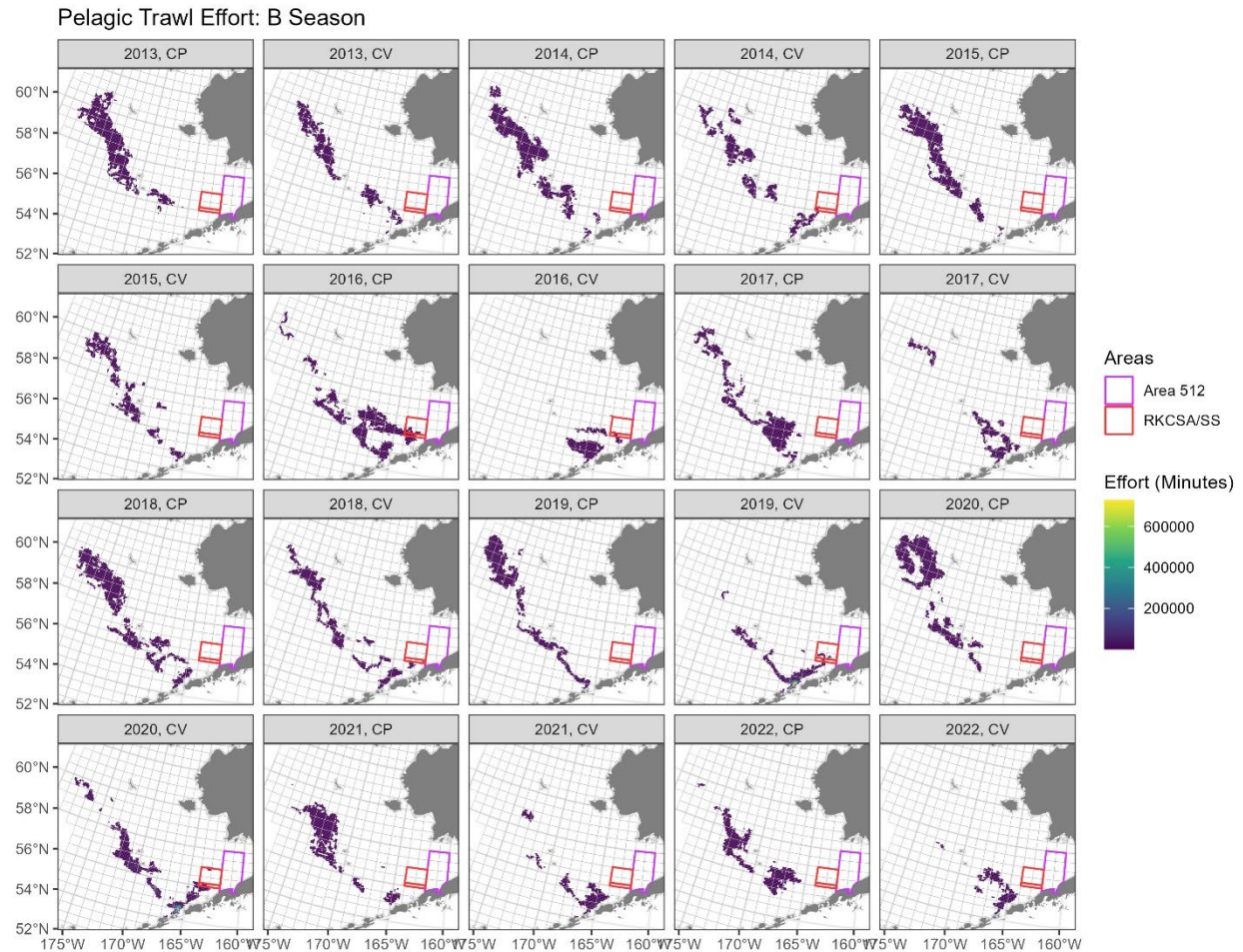
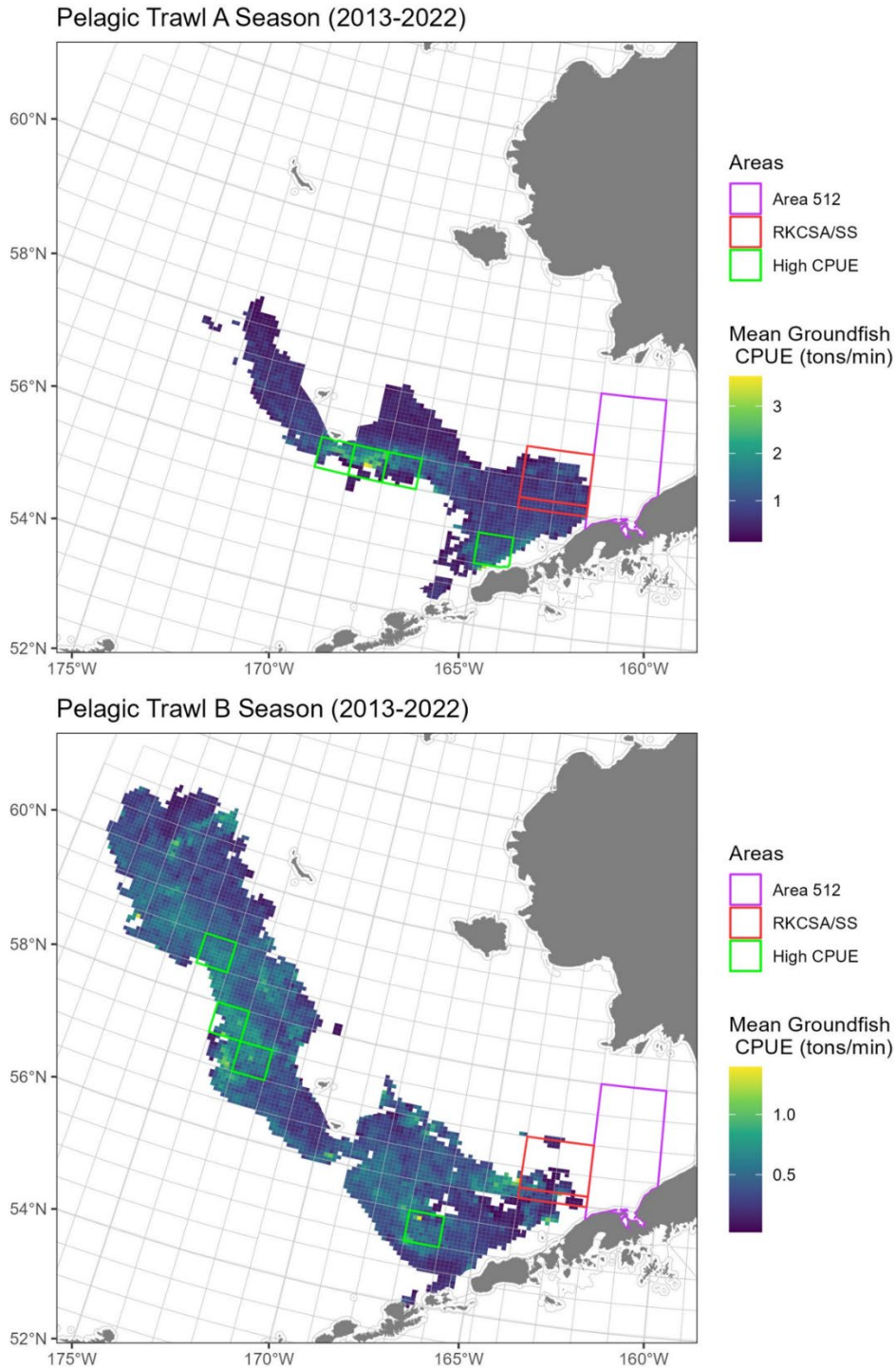


Figure A2-31. Distribution of B season PTR effort (minutes) between 2013 and 2022.

### Groundfish CPUE

During the A Season, the mean groundfish CPUE of PTR (i.e. Pollock) has been highest south of the Pribilof Islands, as well as an area just north of the island of Unimak. Mean CPUEs during the B Season were more uniformly distributed, with the highest areas of CPUE occurring northwest of the Pribilof Islands, or northwest of Unimak Island (Figure A2-32).

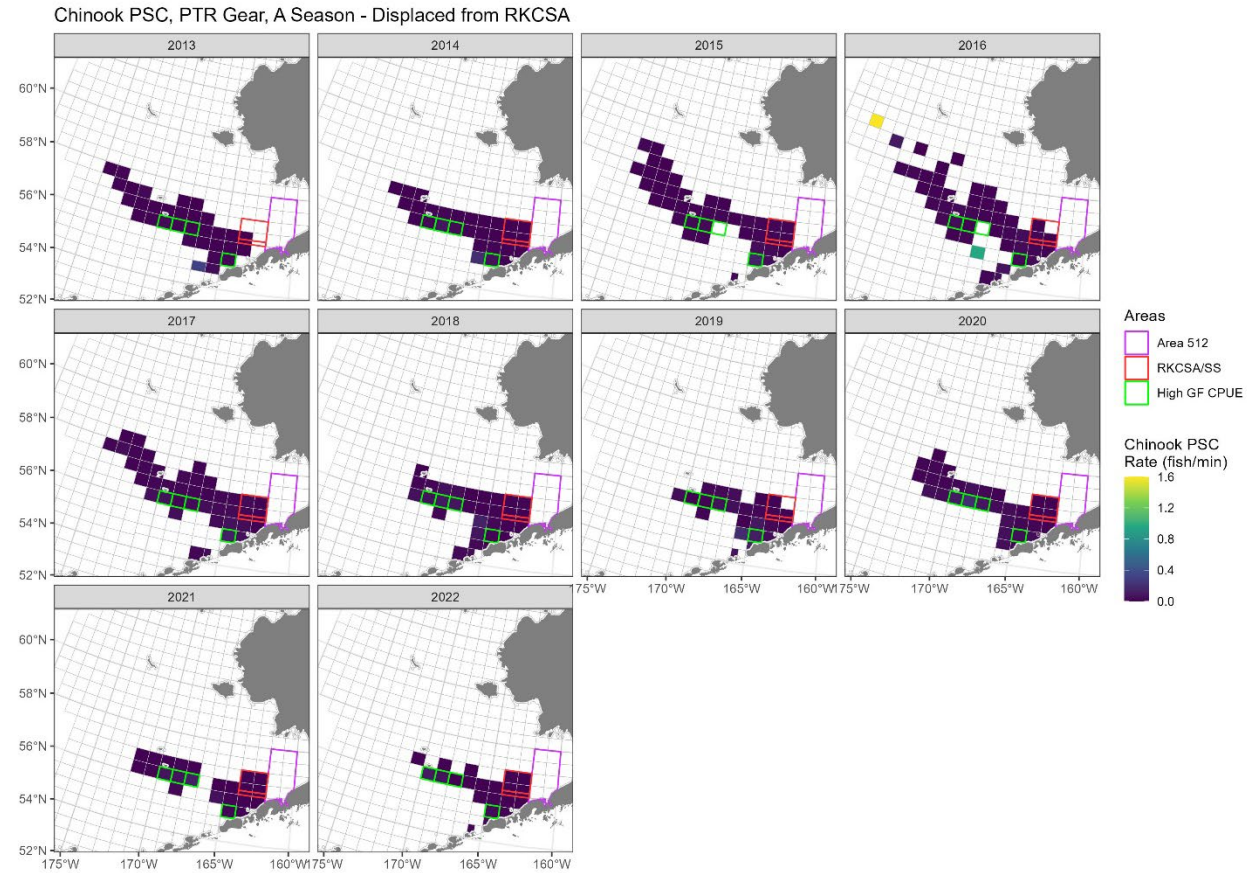
In general, PTR representatives agreed with the general areas identified as having high CPUE where the fleet may go. However, concerning the A Season, PTR representatives noted that the three boxes near the Pribilof Islands have higher Chinook bycatch, which would influence future fleet decisions in real time. Additionally, the fleet is reluctant to go too east of St. George due to high herring bycatch in that area, but herring avoidance is possible when fishing on the edges. Concerning the boxes near Unimak Island, PTR representatives noted this area as productive, but having a potential for high Chinook bycatch at deeper depths.



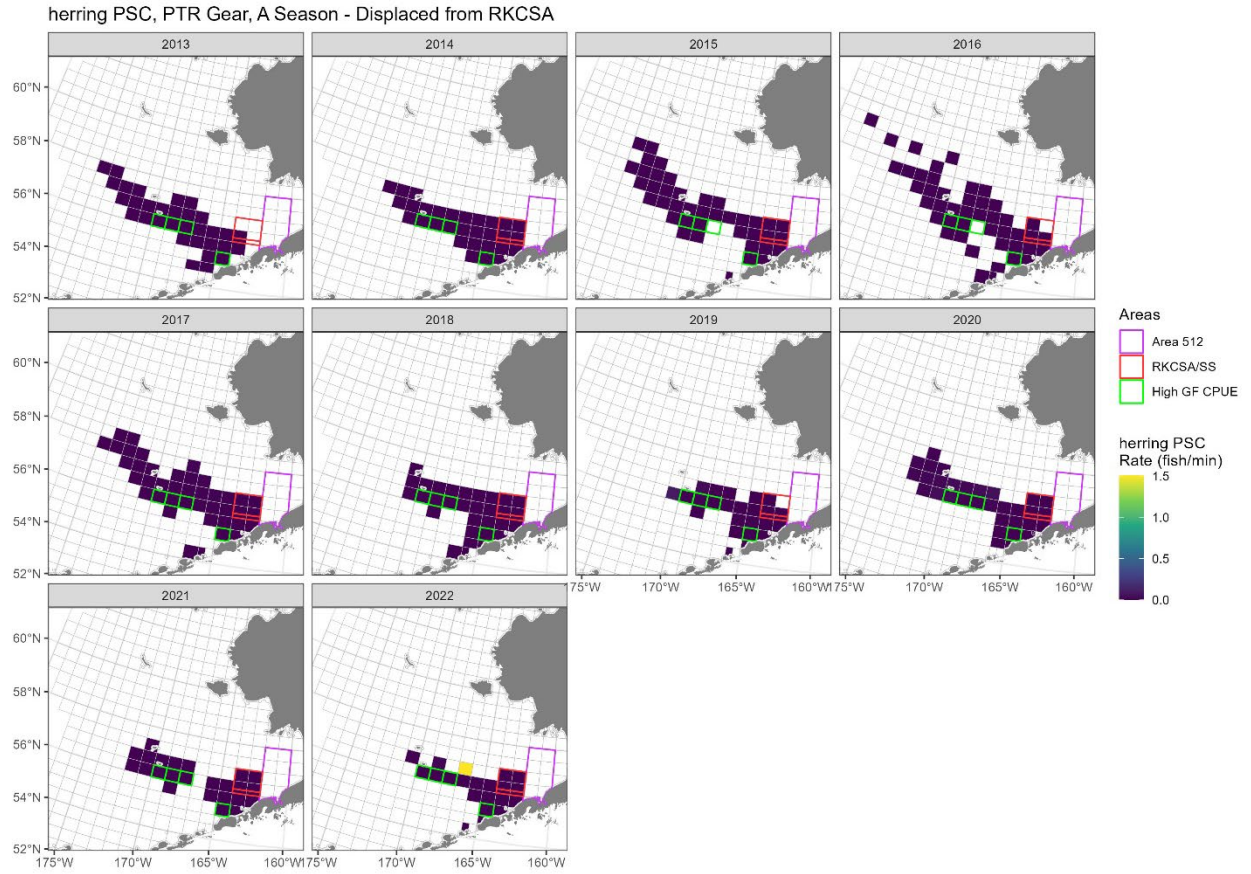
**Figure A2-32. Mean groundfish CPUE (tons/minute) in the PTR fleet. Boxes highlighted in green represent the four highest CPUE statistical areas as determined by mean CPUEs weighted by area fished.**

**PSC CPUE**

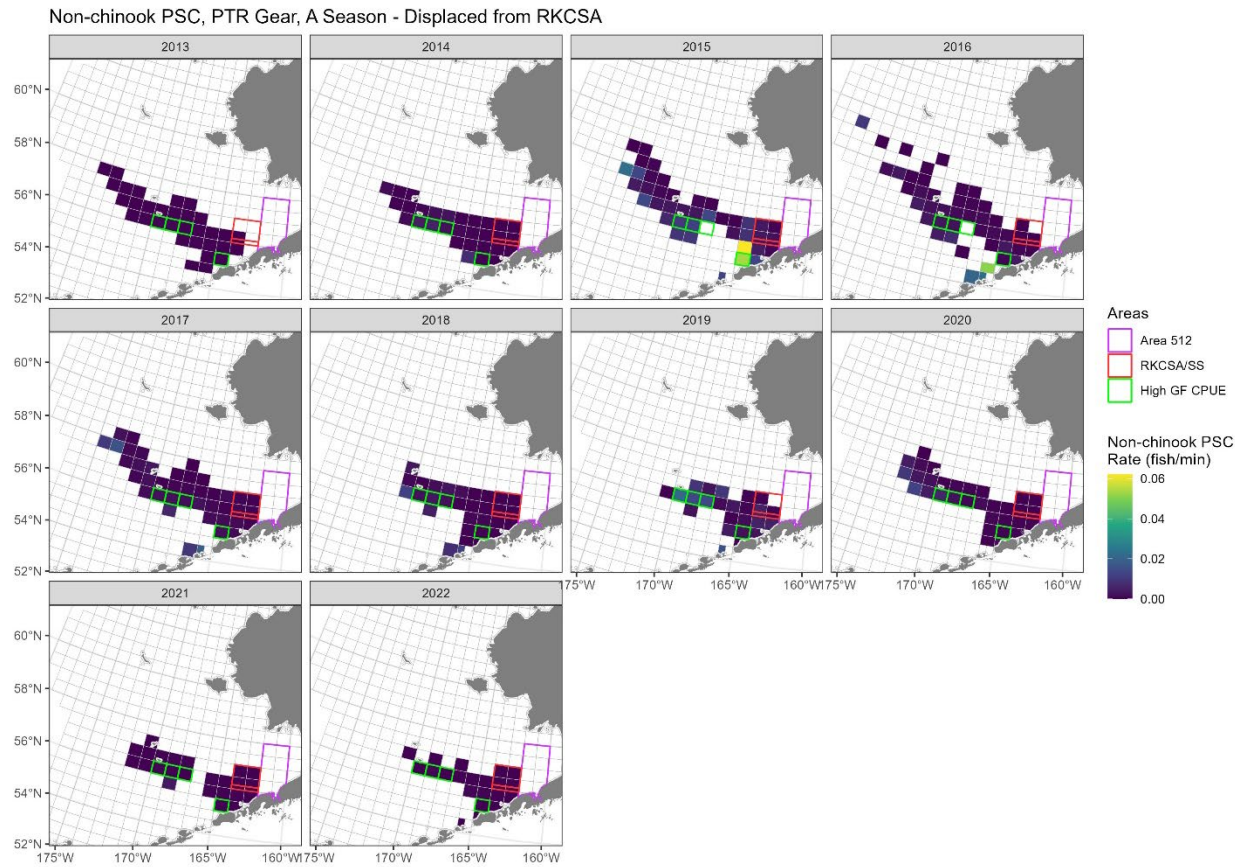
The A season PSC CPUEs for Chinook salmon, non-Chinook salmon, and Pacific herring from the PTR fleet are shown below in Figures A2-33, A2-34, and A2-35, respectively.



**Figure A2-33. A season Chinook salmon PSC CPUEs between 2013 and 2022, with the high groundfish CPUE areas overlaid to show the locations where the efforts were displaced.**



**Figure A2-34. A season non-Chinook salmon PSC CPUEs between 2013 and 2022, with the high groundfish CPUE areas overlaid to show the locations where the efforts were displaced.**



**Figure A2-35. A season Pacific herring PSC CPUEs between 2013 and 2022, with the high groundfish CPUE areas overlaid to show the locations where the efforts were displaced.**



## **Estimated Change in PSC**

### *Chinook salmon*

When displaced from the RKCSA, an increase in Chinook salmon PSC was estimated to occur in most years of the A season (Table A2-12; Figure A2-36). These increases ranged from 87 fish in 2013 (a 1% increase over that year's PSC) to 8,548 fish in 2021 (a 90% increase).

### *Non-Chinook salmon*

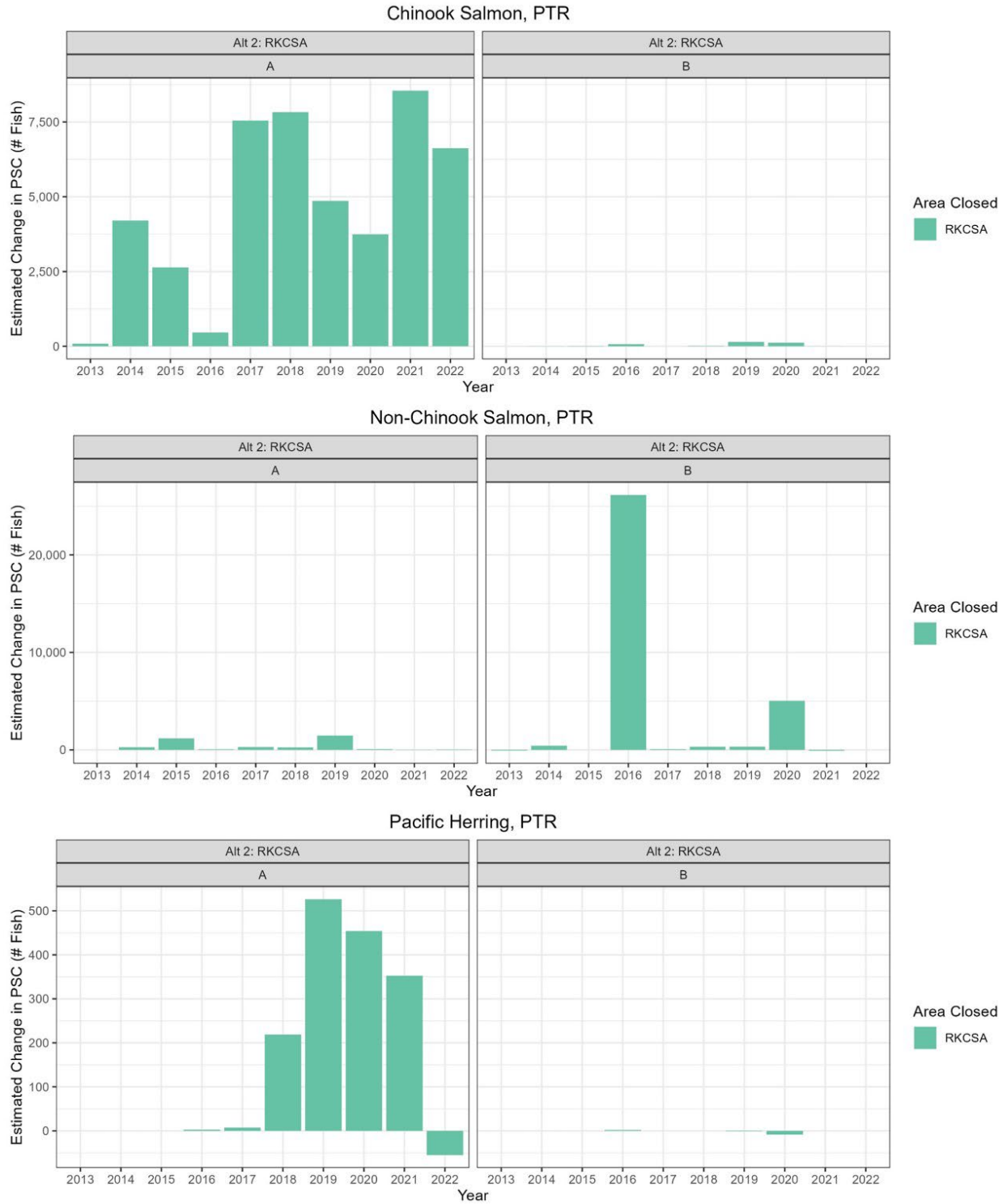
For non-Chinook salmon, modest increases in PSC were estimated to occur in both season, with the largest peaks occurring during the B season (Table A2-12; Figure A2-36). Changes ranged from a reduction of 94 fish in the 2021 B season (a 0% change) to 26,153 fish in the 2016 B season (a 7.7% increase).

### *Herring*

For herring, the largest changes occurred primarily in the A season (Table A2-12; Figure A2-36). These changes ranged from a reduction of 55mt in 2022 (a 12.4% reduction) to an increase of 526 fish in 2019 (a 251% increase).

**Table A2-12. Estimated change in Chinook, non-Chinook, and Pacific herring PSC in PTR gear by year and season if displaced from the RKCSA. Total BS PSC = the actual PSCs caught by the fleet in that year and season. PSC represents numbers of fish for Chinook and non-Chinook salmon, and metric tons for Pacific herring. All effort is in minutes.**

		Chinook Salmon						Non-Chinook Salmon					Pacific Herring				
Year	Season	PTR Effort RKCSA	PSC	PSC	Est. Change	Total BS PSC	% Change	PSC	PSC	Est. Change	Total BS PSC	% Change	PSC	PSC	Est. Change	Total BS PSC	% Change
			Catch RKCSA	CPUE High Areas				Catch RKCSA	CPUE High Areas				Catch RKCSA	CPUE High Areas			
2013	A	5775	4	0.01569	86.61	8237	1.1%	0	0.0005	2.68	202	1.3%	0.000	0.0000001	0.00	0.10	0.5%
2014	A	94331	240	0.04712	4204.82	11536	36.4%	2	0.0029	271.81	556	48.9%	0.001	0.0000004	0.04	0.06	63.4%
2015	A	72628	872	0.04829	2635.43	12298	21.4%	184	0.0189	1185.70	4667	25.4%	0.009	0.0000004	0.02	416.81	0.0%
2016	A	53095	534	0.01872	459.98	16818	2.7%	9	0.0014	64.60	3765	1.7%	0.020	0.0000464	2.44	577.53	0.4%
2017	A	180354	2544	0.05594	7545.41	21602	34.9%	58	0.0019	287.29	1830	15.7%	0.020	0.0000415	7.47	261.52	2.9%
2018	A	138778	847	0.06252	7828.88	8535	91.7%	11	0.0019	259.07	387	66.9%	0.937	0.0015847	218.98	65.83	332.6%
2019	A	152570	2163	0.04605	4862.72	15738	30.9%	434	0.0125	1473.91	1211	121.7%	0.071	0.0034502	526.33	209.58	251.1%
2020	A	37072	171	0.10557	3742.72	18216	20.5%	1	0.0023	82.80	531	15.6%	0.018	0.0122453	453.94	2898.20	15.7%
2021	A	136531	560	0.06671	8548.05	9475	90.2%	11	0.0002	22.22	141	15.8%	0.023	0.0025808	352.33	594.83	59.2%
2022	A	144668	591	0.04985	6620.43	5185	127.7%	4	0.0003	37.27	66	56.5%	59.501	0.0000306	-55.07	442.65	-12.4%
2013	B	95	0	0.00046	0.04	4799	0.0%	76	0.0044	-75.58	125114	-0.1%	0.000	0.0000017	0.00	958.82	0.0%
2014	B	4120	0	0.00072	2.98	3501	0.1%	24	0.1100	429.26	218886	0.2%	0.025	0.0000008	-0.02	159.30	0.0%
2015	B	205	8	0.00234	-7.52	6031	-0.1%	9	0.0531	1.89	233085	0.0%	0.049	0.0000098	-0.05	1069.77	0.0%
2016	B	40336	44	0.00283	70.30	5108	1.4%	743	0.6668	26152.65	339236	7.7%	0.963	0.0000738	2.02	853.35	0.2%
2017	B	98	0	0.00265	0.26	8474	0.0%	0	0.8229	80.63	465848	0.0%	0.000	0.0000903	0.01	701.24	0.0%
2018	B	3281	0	0.00348	11.42	5196	0.2%	1	0.0973	318.10	294705	0.1%	0.014	0.0000092	0.02	407.53	0.0%
2019	B	20992	5	0.00722	146.57	9247	1.6%	367	0.0330	325.54	346812	0.1%	4.091	0.0001393	-1.17	890.48	-0.1%
2020	B	25989	6	0.00476	117.60	13987	0.8%	368	0.2079	5036.06	343095	1.5%	9.244	0.0000328	-8.39	962.67	-0.9%
2021	B	0	2	0.00158	-2.00	4309	0.0%	94	0.3102	-94.00	545901	0.0%	0.000	0.0000824	0.00	1112.63	0.0%
2022	B	0	0	0.00107	0.00	1152	0.0%	0	0.5457	0.00	242309	0.0%	0.000	0.0001110	0.00	1260.32	0.0%

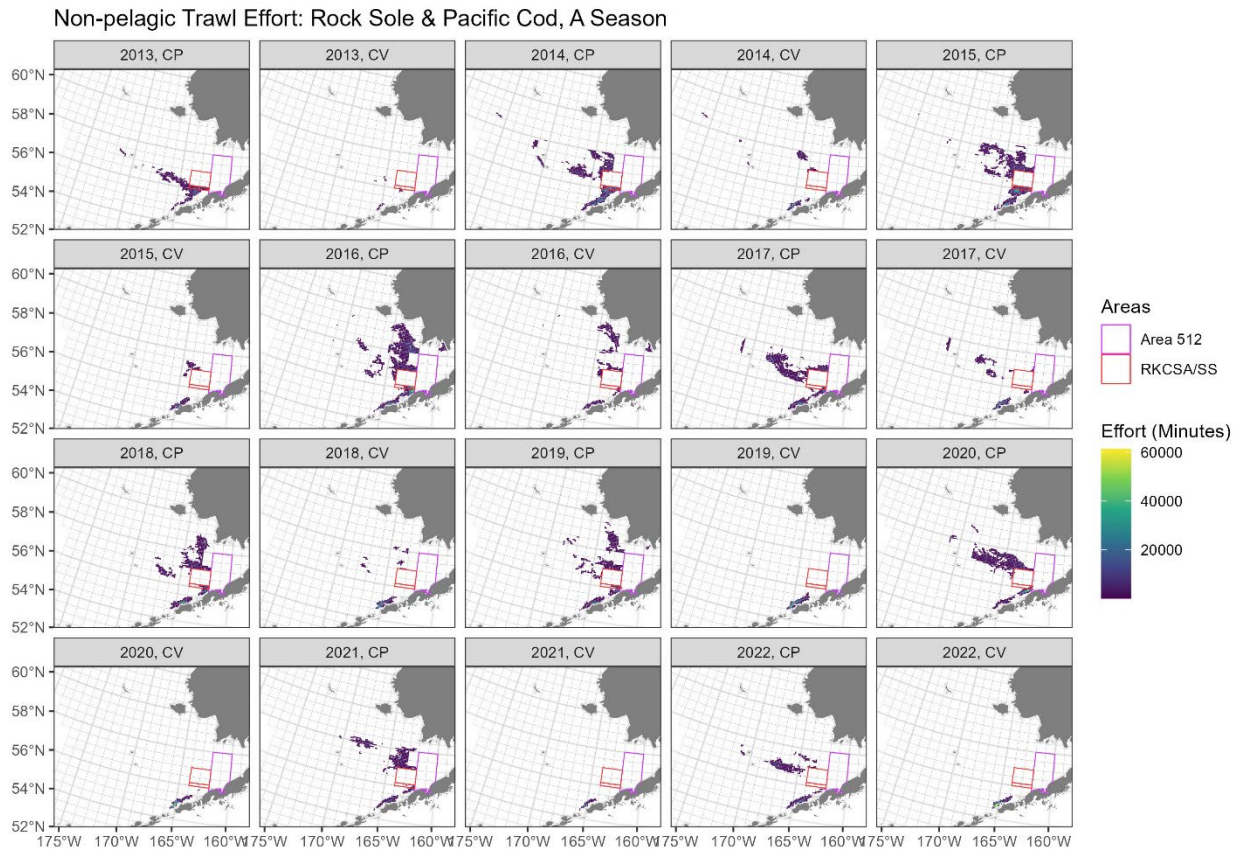


**Figure A2-36. Estimated change in Chinook salmon, non-Chinook salmon, and Pacific herring PSC in PTR gear by year and season if displaced from the RKCSA.**

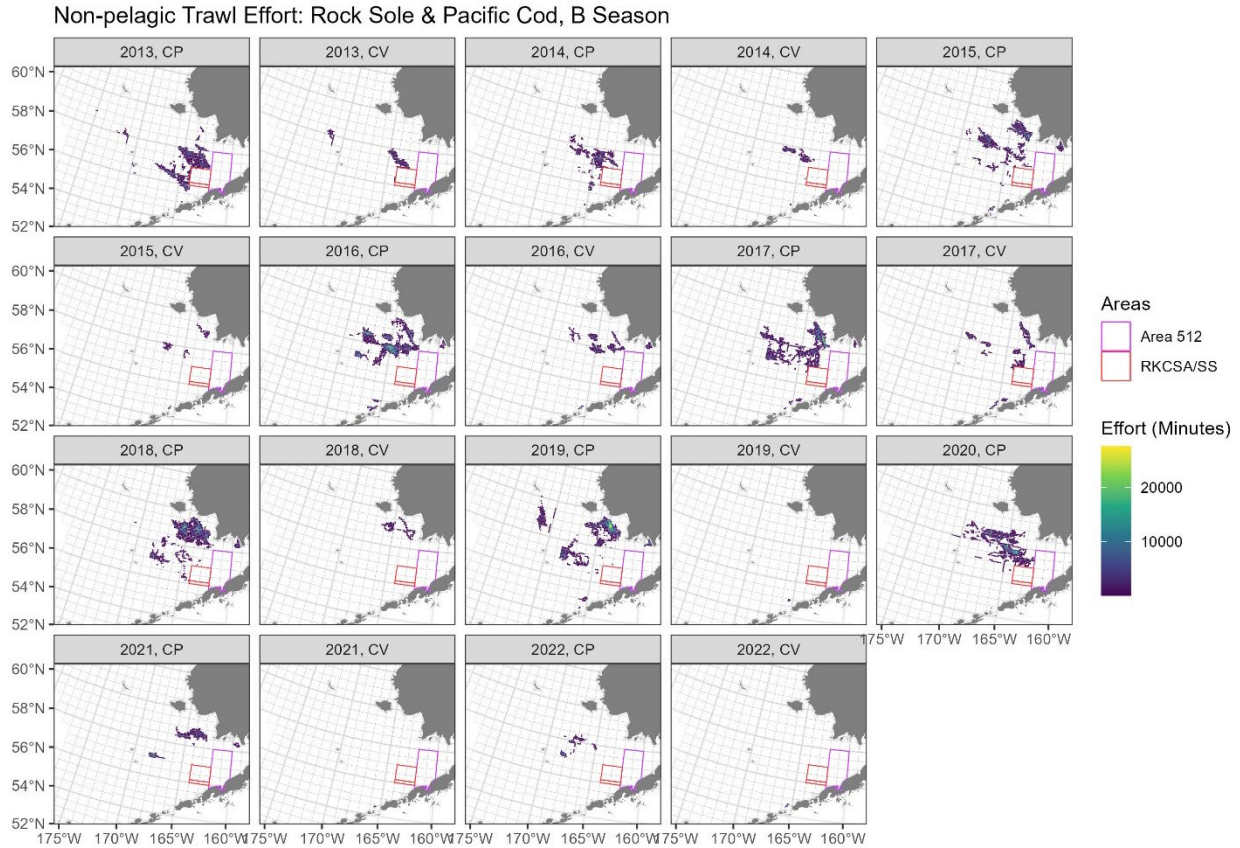
## Non-Pelagic Trawl

### Effort

The NPT fleet has fished inside the RKCSS nearly exclusively during the A Season (Figures A2-37 and A2-38). Industry representatives noted that effort inside the RKCSS has been low in recent years due to low Pacific cod allocations, locations of the target fish, and RKC avoidance. As mentioned above, the NPT effort includes those trips targeting rock sole and/or Pacific cod.



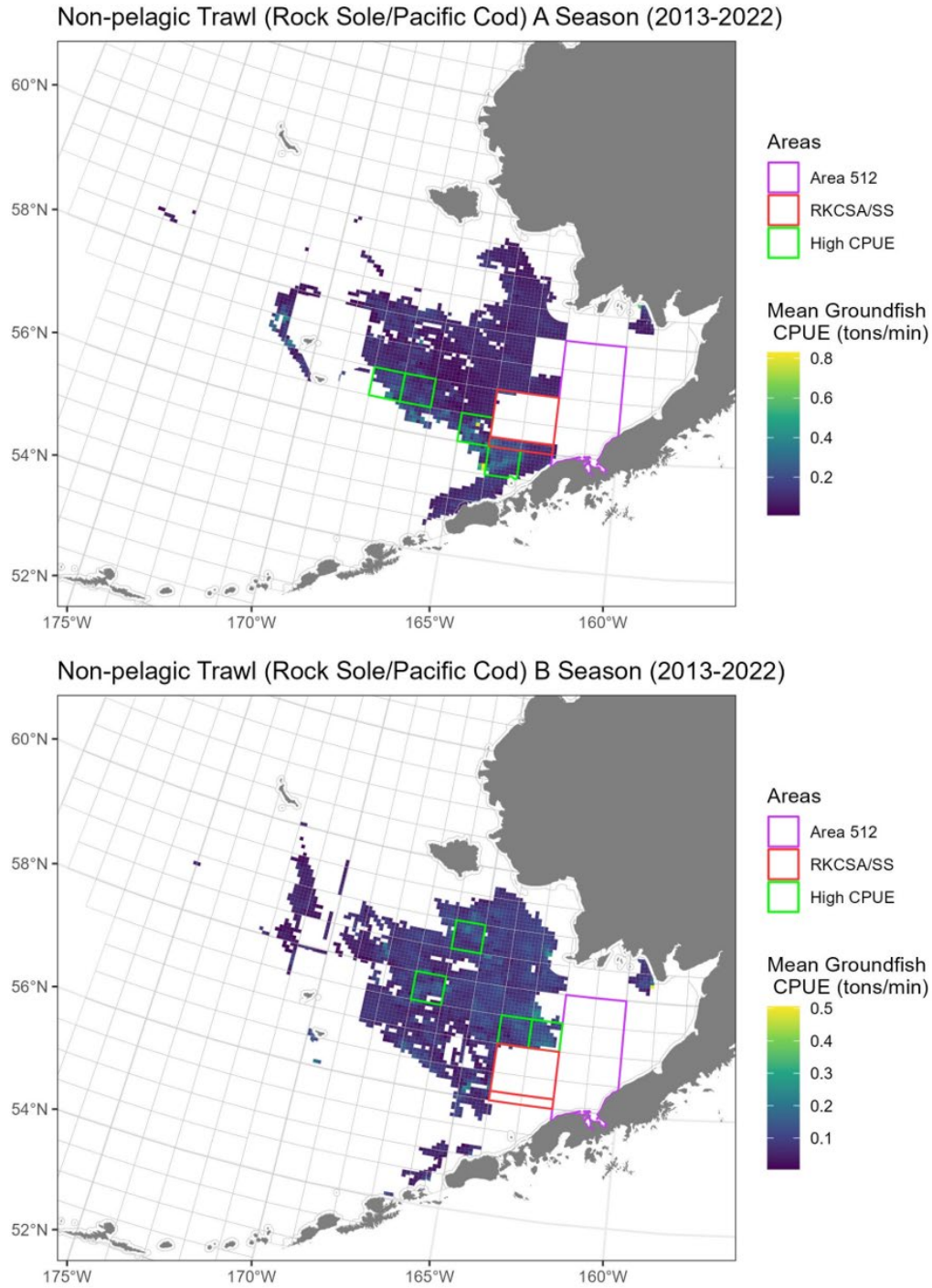
**Figure A2-37. Distribution of A season NPT effort (minutes targeting rock sole and/or Pacific cod) between 2013 and 2022.**



**Figure A2-38. Distribution of B season NPT effort (minutes targeting rock sole and/or Pacific cod) between 2013 and 2022.**

**Groundfish CPUE**

During the A season, mean groundfish (rock sole/Pacific cod) CPUEs were highest adjacent to the south and west of the RKCSS, as well as an area between the RKCSA and St. George (Figure A2-39). In the B season, the highest mean CPUE areas shifted north directly adjacent to the RKCSA and to the northwest (Figure A2-39).



**Figure A2-39. Mean groundfish CPUE (tons/minute) in the NPT fleet. Boxes highlighted in green represent the four highest CPUE statistical areas as determined by mean CPUEs weighted by area fished.**

### PSC CPUE

The A season PSC CPUEs for halibut, red king crab, Opilio crab, and Bairdi crab from the NPT fleet are shown below in Figures A2-40, A2-41, A2-42, and A2-43, respectively.

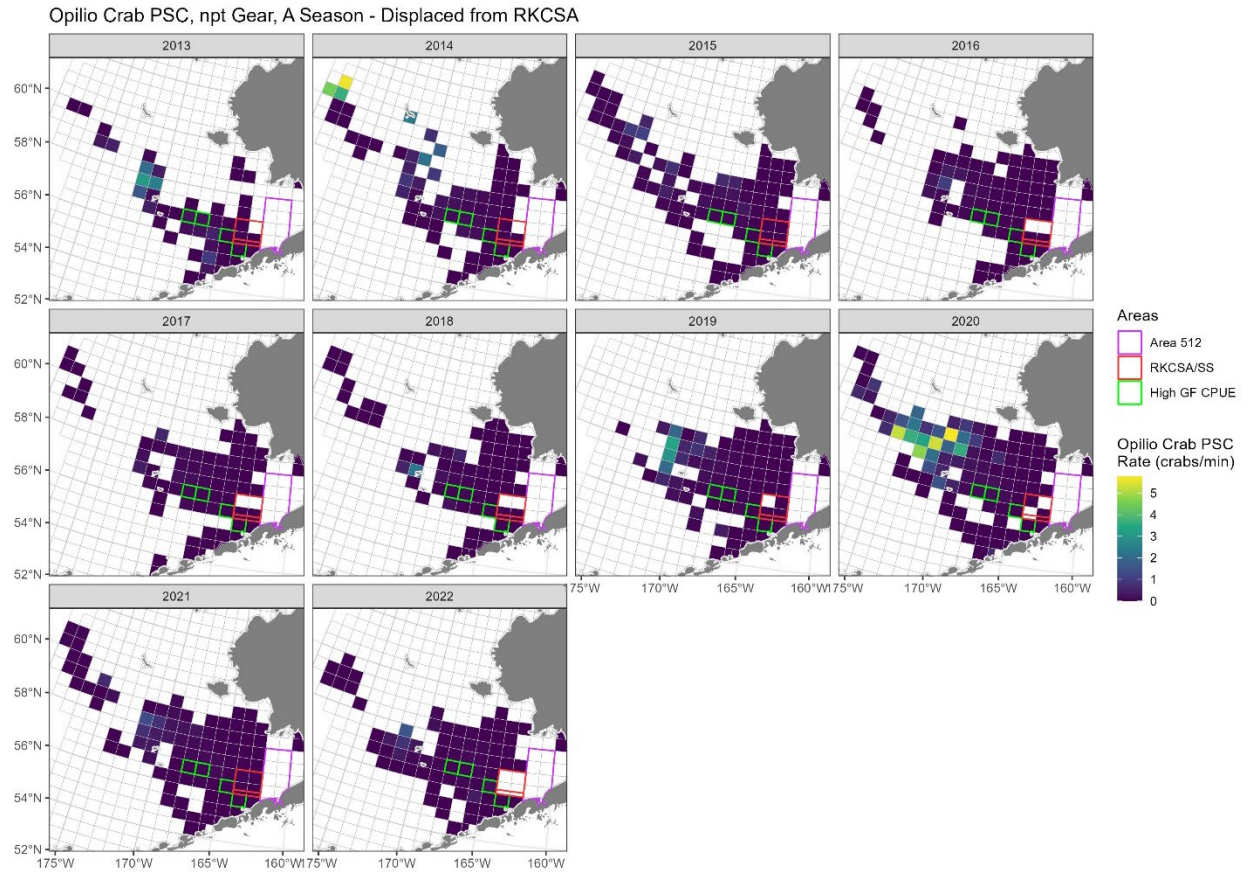


Figure A2-40. A season halibut PSC CPUEs from NPT between 2013 and 2022, with the high groundfish CPUE areas overlaid to show the locations where the efforts were displaced.

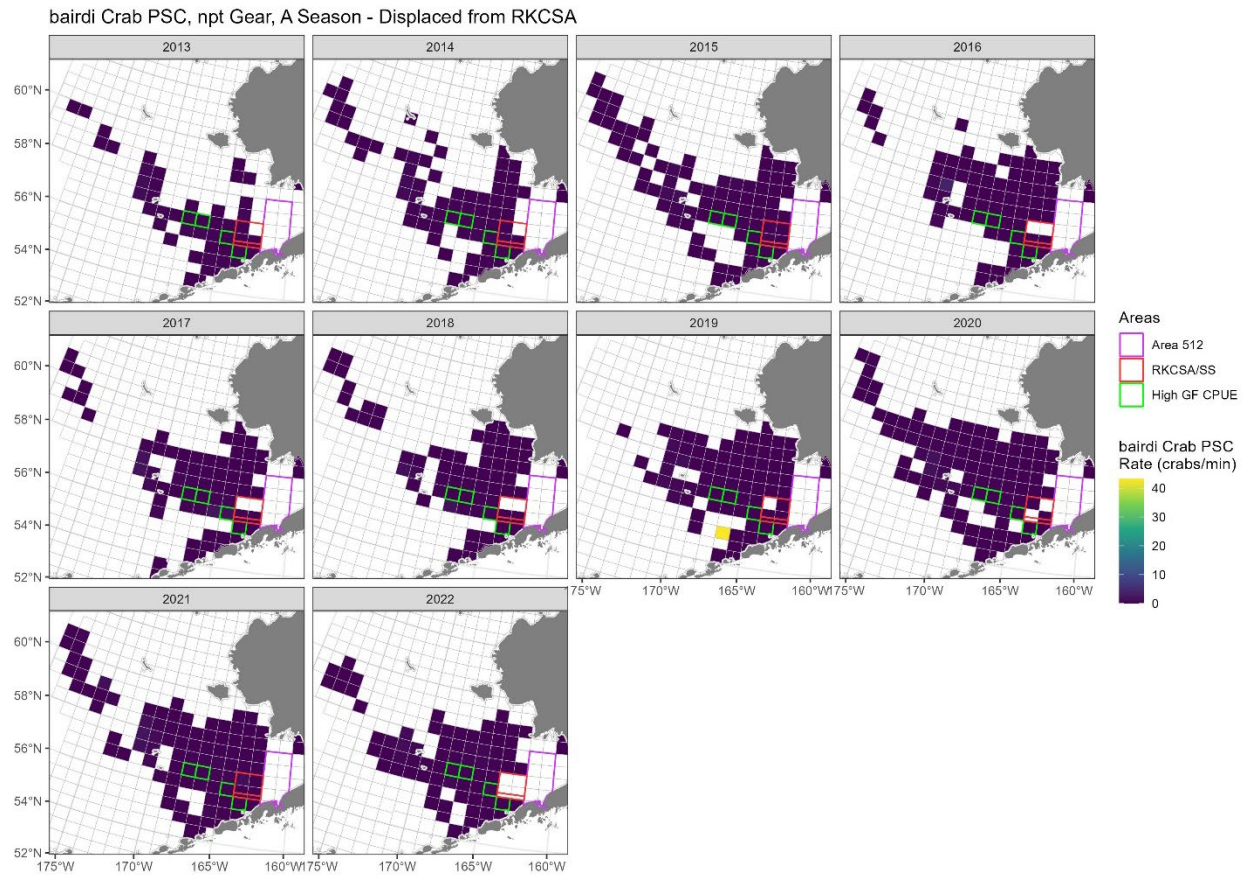


**Figure A2-41. A season red king crab PSC CPUEs from NPT between 2013 and 2022, with the high groundfish CPUE areas overlaid to show the locations where the efforts were displaced.**





**Figure A2-42. A season Opilio PSC CPUEs from NPT between 2013 and 2022, with the high groundfish CPUE areas overlaid to show the locations where the efforts were displaced.**



**Figure A2-43. A season Bairdi PSC CPUEs from NPT between 2013 and 2022, with the high groundfish CPUE areas overlaid to show the locations where the efforts were displaced.**

## **Estimated Change in PSC**

### *Red King Crab*

In the A Season, the displacement of NPT from the RKCSA generally led to decreased RKC PSC (Table A2-13; Figure A2-44). Many of these changes become less pronounced after 2016 or 2017, correlating with the decline in NPT effort in the area in recent years. For RKC, estimated declines in A Season PSC ranged from 209 crabs in 2017 (a 0.8% decrease) to 7,874 crabs in 2014 (a 30% decrease over that year's PSC).

### *Bairdi Tanner Crab*

The displacement of NPT from the RKCSS generally led to estimated increases in Bairdi PSC (Table A2-13; Figure A2-44). The estimated increases ranged 198 crabs in 2021 (a 0.1% increase) to an increase of 11,350 crabs in 2017 (a 4% increase).

### *Opilio Tanner Crab*

Similar to Bairdi, displacement of NPT from the RKCSS largely led to increases in Opilio PSC (Table A2-13; Figure A2-44). Estimated increases ranged from 137 crabs in 2021 (a 0.1% increase) to 9,678 crabs in 2014 (a 7.5% increase).

### *Halibut*

Displacement from the RKCSS also led to increases in halibut PSC, primarily between 2013 and 2016 (Table A2-13; Figure A2-44). Estimated increases ranged from a reduction of 3.5mt in 2021 (a 0.5% decrease) to an increase of 175mt in 2014 (an 11.5% increase).

**Table A2-13. Estimated change in red king crab, Bairdi crab, Opilio crab, and Pacific halibut PSC in NPT gear by year and season if displaced from the RKCSS. Total BS PSC = the actual PSCs caught by the fleet in that year and season. PSC represents numbers for crab, and metric tons for Pacific halibut. All effort is in minutes.**

Year	Season	NPT Effort RKCSA	Red King Crab					Bairdi Crab				
			PSC Catch RKCSA	PSC CPUE High Areas	Est. Change	Total BS PSC	% Change	PSC Catch RKCSA	PSC CPUE High Areas	Est. Change	Total BS PSC	% Change
2013	A	52382.67	5446.17	0.0214	-4322.97	20560	-21.0%	5104.54	0.2276	6817.78	267151	2.6%
2014	A	145359.20	10353.40	0.0171	-7873.58	26332	-29.9%	36646.51	0.2922	5824.40	259871	2.2%
2015	A	84029.44	2804.77	0.0043	-2445.94	14685	-16.7%	12442.61	0.1669	1584.97	207972	0.8%
2016	A	114079.93	5212.94	0.0026	-4910.96	27531	-17.8%	4155.67	0.1022	7505.56	61971	12.1%
2017	A	27387.17	1167.22	0.0350	-208.86	26595	-0.8%	1363.78	0.4642	11349.88	283716	4.0%
2018	A	28404.16	542.91	0.0015	-500.50	17358	-2.9%	852.19	0.1405	3137.72	76557	4.1%
2019	A	19993.84	1164.51	0.0025	-1113.54	46068	-2.4%	619.94	0.1011	1402.37	124120	1.1%
2020	A	7210.37	534.66	0.0054	-495.41	30175	-1.6%	168.05	0.1260	740.16	255756	0.3%
2021	A	5122.05	372.46	0.0000	-372.46	24258	-1.5%	551.28	0.1463	197.94	234844	0.1%
2022	A	0.00	0.00	0.0089	0.00	4994	0.0%	0.00	0.2752	0.00	188821	0.0%
2013	B	71.76	145.35	0.0097	-144.66	10937	-1.3%	2037.08	0.0526	-2033.30	447953	-0.5%
2014	B	0.00	25.48	0.0245	-25.48	5889	-0.4%	0.00	0.1920	0.00	363063	0.0%
2015	B	0.00	0.00	0.0435	0.00	5218	0.0%	0.00	0.0532	0.00	214289	0.0%
2016	B	0.00	382.34	0.0077	-382.34	13473	-2.8%	161.58	0.0326	-161.58	158678	-0.1%
2017	B	0.00	1.16	0.0369	-1.16	32932	0.0%	2.46	0.0135	-2.46	68866	0.0%
2018	B	0.02	0.00	0.0154	0.00	12751	0.0%	0.00	0.0251	0.00	106334	0.0%
2019	B	52.00	0.00	0.0086	0.45	23528	0.0%	0.00	0.0274	1.43	219454	0.0%
2020	B	0.00	620.14	0.0293	-620.14	34215	-1.8%	72.20	0.1459	-72.20	340788	0.0%
2021	B	0.00	0.00	0.0489	0.00	16242	0.0%	0.00	0.2351	0.00	353032	0.0%
2022	B	0.00	0.00	0.0269	0.00	3596	0.0%	0.00	0.1591	0.00	247143	0.0%

**Table A2-13.** Continued

			Opilio Crab					Halibut				
Year	Season	NPT Effort RKCSA	PSC	PSC CPUE	Total BS	% Change	PSC	PSC CPUE	Est. Change	Total BS	% Change	
			Catch RKCSA	High Areas			Est. Change	Catch RKCSA				High Areas
2013	A	52382.67	474.59	0.1276	6207.84	484780	1.3%	67.97	0.0021	43.89	1163	3.8%
2014	A	145359.20	953.43	0.0731	9678.19	129587	7.5%	142.74	0.0022	175.20	1526	11.5%
2015	A	84029.44	551.78	0.0353	2411.63	104201	2.3%	80.37	0.0016	53.49	1115	4.8%
2016	A	114079.93	15.47	0.0428	4867.02	12473	39.0%	69.47	0.0009	35.27	1146	3.1%
2017	A	27387.17	0.00	0.0338	925.46	37717	2.5%	12.73	0.0005	2.16	853	0.3%
2018	A	28404.16	0.00	0.0286	811.42	28936	2.8%	14.81	0.0006	2.81	1039	0.3%
2019	A	19993.84	0.00	0.0359	717.62	120552	0.6%	11.43	0.0009	6.61	1272	0.5%
2020	A	7210.37	59.92	0.0683	432.75	485738	0.1%	4.51	0.0006	-0.47	803	-0.1%
2021	A	5122.05	22.08	0.0310	136.54	99195	0.1%	6.29	0.0005	-3.48	634	-0.5%
2022	A	0.00	0.00	0.0780	0.00	118706	0.0%	0.00	0.0028	0.00	1152	0.0%
2013	B	71.76	45.89	0.0724	-40.69	204255	0.0%	5.04	0.0007	-4.99	1460	-0.3%
2014	B	0.00	0.00	0.0854	0.00	351506	0.0%	0.40	0.0013	-0.40	1140	0.0%
2015	B	0.00	0.00	0.0374	0.00	384425	0.0%	0.00	0.0008	0.00	598	0.0%
2016	B	0.00	23.08	0.0073	-23.08	153617	0.0%	0.66	0.0003	-0.66	751	-0.1%
2017	B	0.00	0.00	0.0051	0.00	121627	0.0%	0.03	0.0002	-0.03	682	0.0%
2018	B	0.02	0.00	0.0089	0.00	1553213	0.0%	0.00	0.0004	0.00	715	0.0%
2019	B	52.00	0.00	0.0164	0.85	820590	0.0%	0.13	0.0003	-0.11	781	0.0%
2020	B	0.00	14.37	0.0371	-14.37	293115	0.0%	3.15	0.0004	-3.15	601	-0.5%
2021	B	0.00	0.00	0.0227	0.00	147499	0.0%	0.00	0.0003	0.00	572	0.0%
2022	B	0.00	0.00	0.0091	0.00	85631	0.0%	0.00	0.0005	0.00	647	0.0%



**Figure A2-44. Estimated change in red king crab, Bairdi crab, Opilio crab, and Pacific halibut PSC in NPT gear by year and season if displaced from the RKCSS.**

## Pot Gear

### Effort

The POT fleet has historically fished within the RKCSA primarily during the B Season, although in some years have entered into the southern end of the area in the A Season (Figures A2-45 and A2-46). As noted in testimony to the Council throughout 2022, at least some of the O60 cod CVs voluntarily avoided fishing in the RKCSA during recent A seasons, as well as the 2022 B season. As a limitation for this gear, roughly 39% of the BS POT effort in the time series was unobserved, resulting in a limitation on the amount of effort able to be applied to the new areas of high groundfish CPUE.

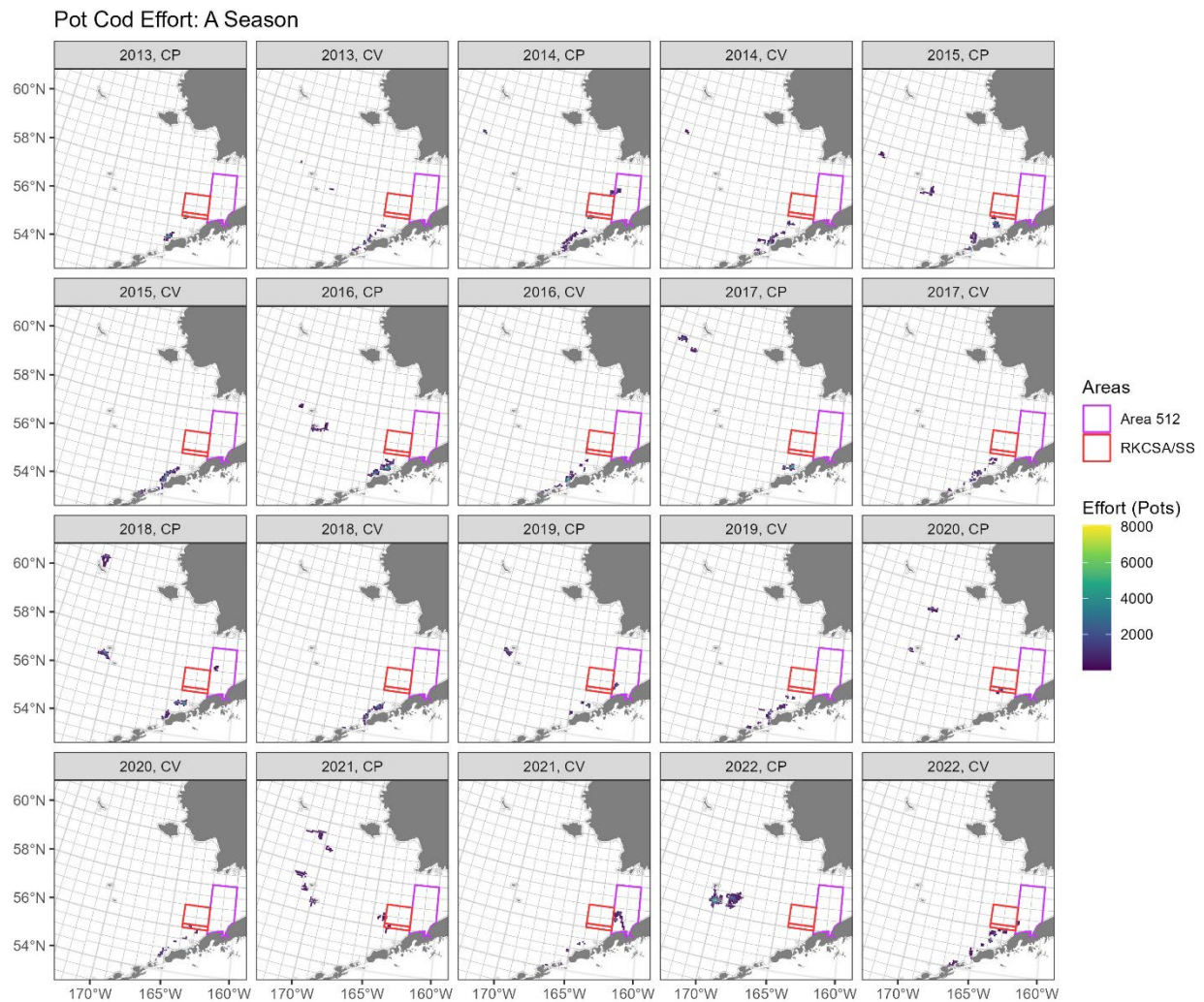
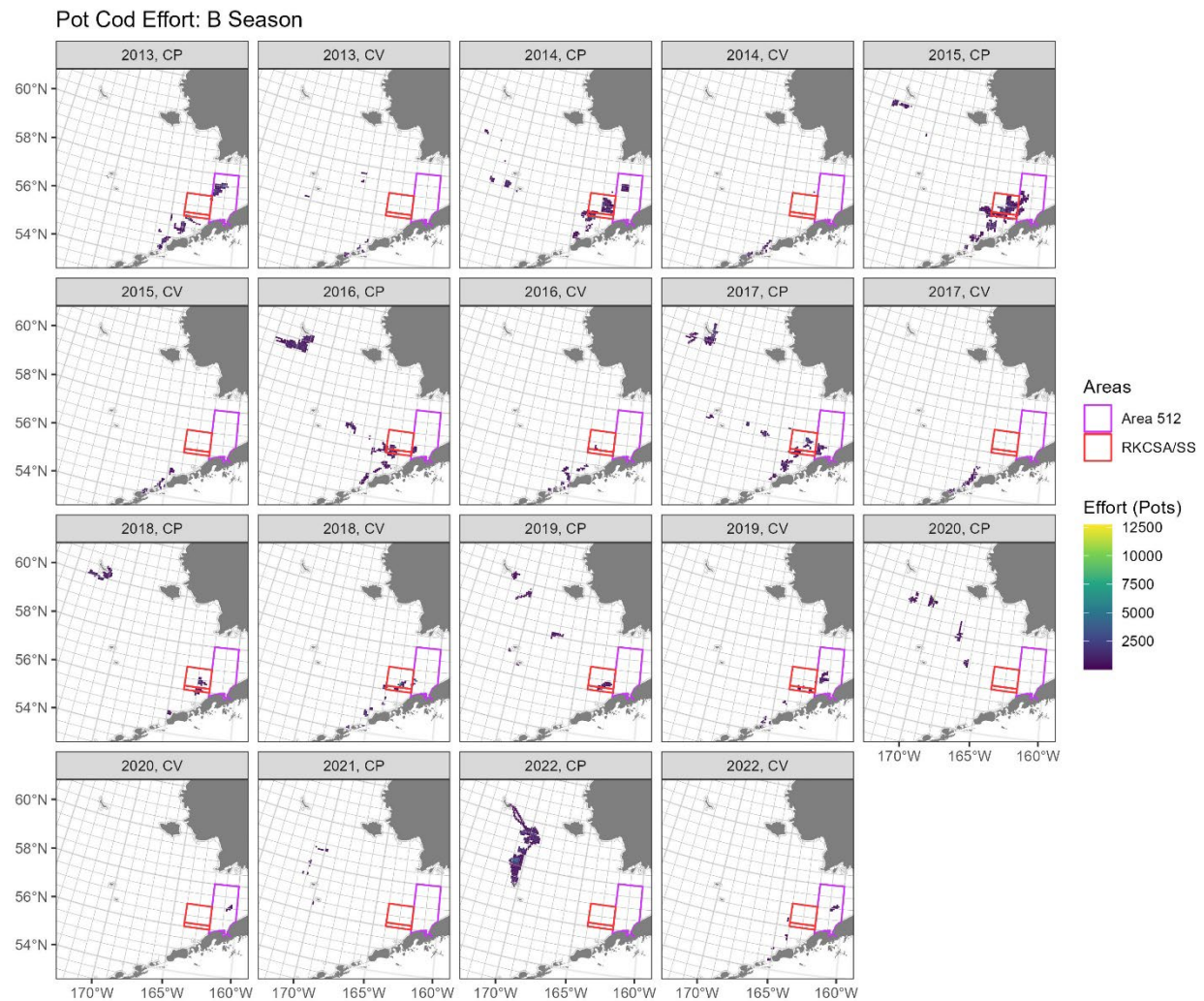


Figure A2-45. Distribution of A season POT effort (number of pots) between 2013 and 2022.

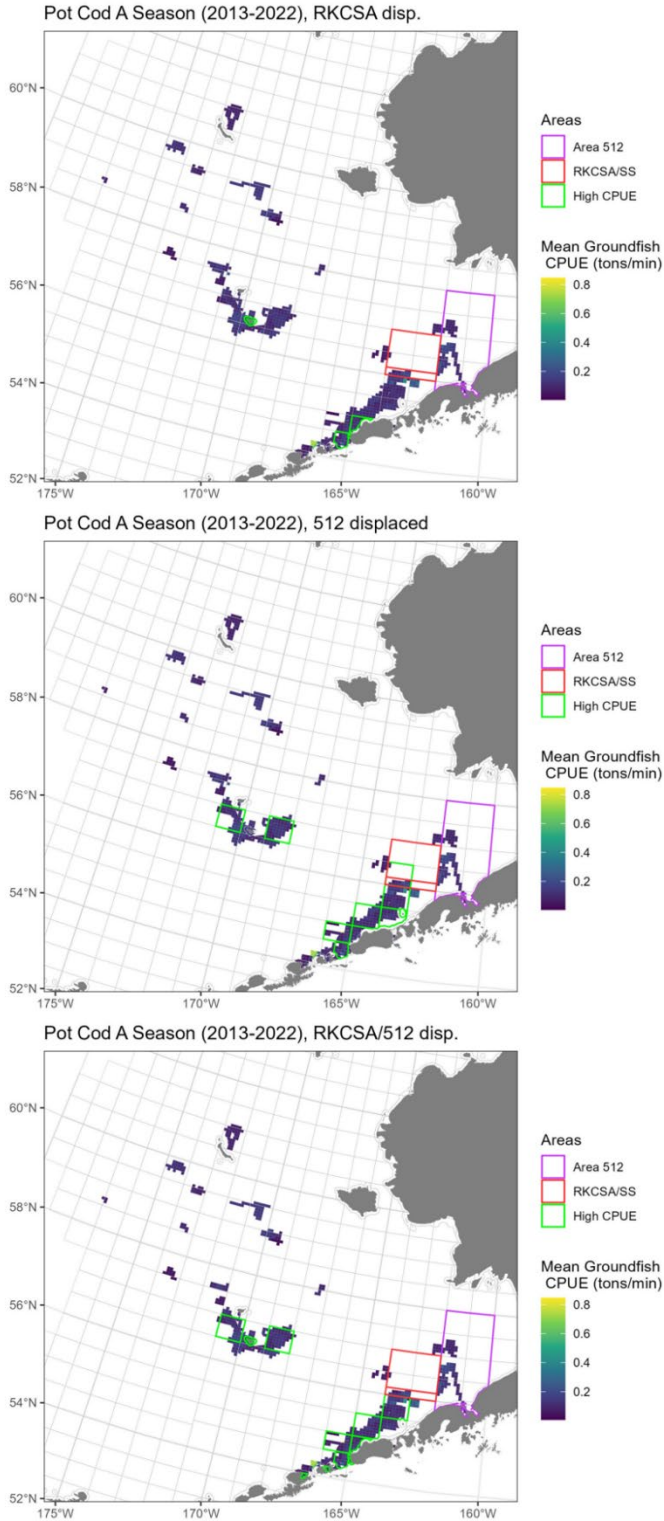


**Figure A2-46. Distribution of B season POT effort (number of pots) between 2013 and 2022.**

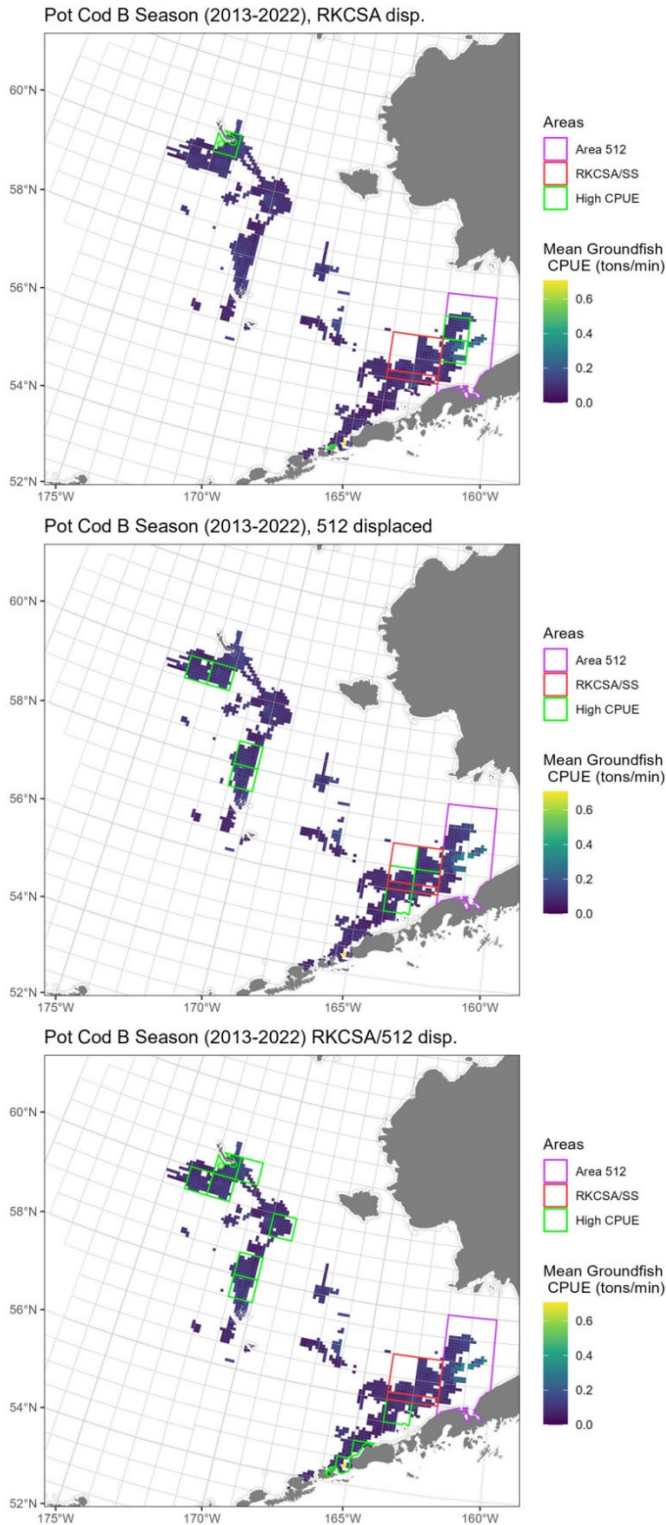
### Groundfish CPUE

In the A Season, the highest mean groundfish (Pacific cod) CPUE (tons/pot) areas commonly occurred near the Pribilof Islands or just north of Unimak Island under all displacement scenarios (Figure A2-47). When displaced from Area 512 only, one of the high groundfish CPUE areas occurred within the RKCSA (Figure A2-47). The groundfish CPUEs were more dispersed in the B Season. When displaced from the RKCSA only, the highest groundfish CPUEs occurred within Area 512 or a much further location north of the Pribilof Islands and west of Nunivak Island (Figure A2-48). When displaced from Area 512 only, the highest CPUEs were instead largely inside or just south of the RKCSA, or north of the Pribilof Islands (Figure A2-48). When displaced from both the RKCSA and Area 512, the highest groundfish CPUEs remained south of the RKCSA, as well as near Unimak Island, and a variety of locations north of the Pribilof Islands (Figure A2-48).





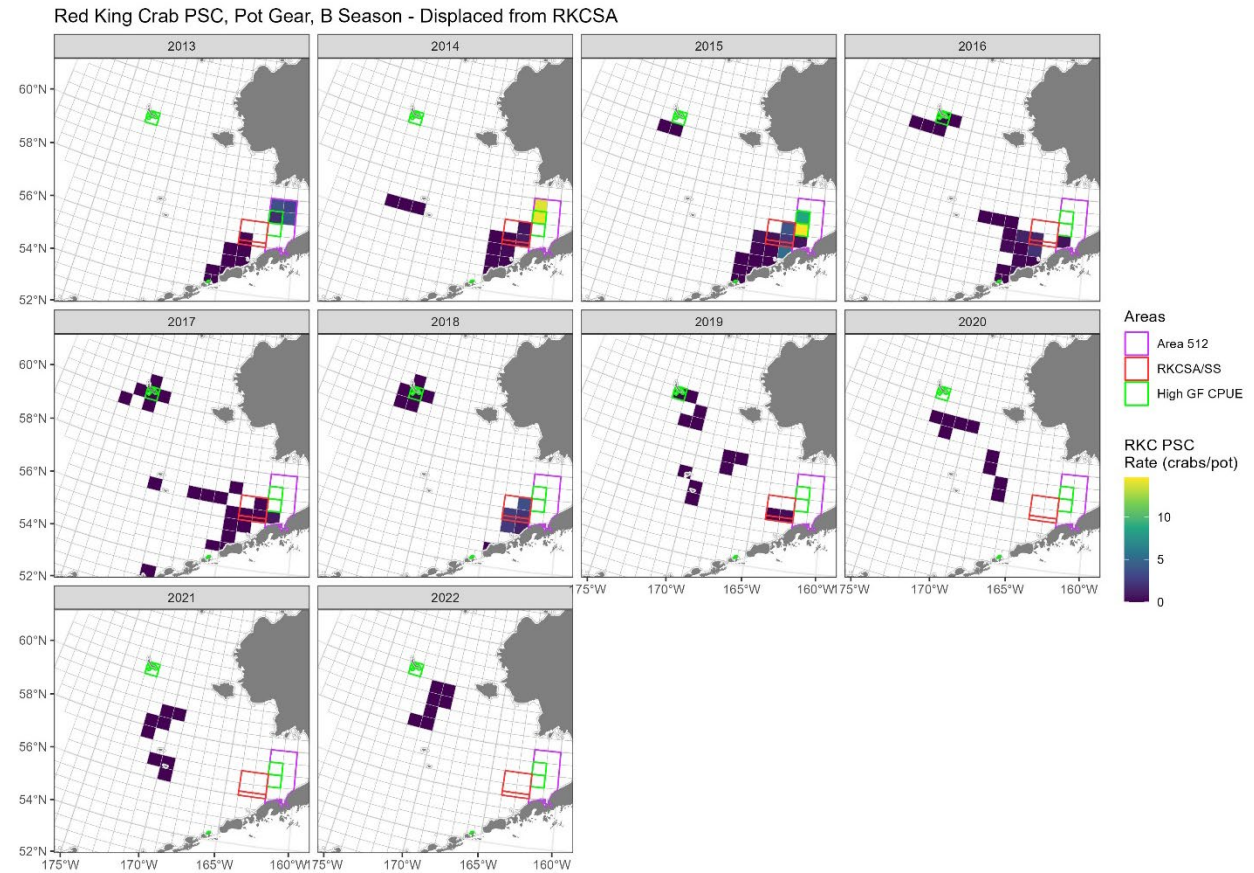
**Figure A2-47. Mean CPUE (tons/pot) of retained groundfish (Pacific cod) in the POT fleet between 2013 and 2022 if displaced from the RKCSA (top), Area 512 (middle), or both (bottom) during the A Season. Boxes highlighted in green represent the four highest CPUE statistical areas as determined by mean CPUEs weighted by area fished.**



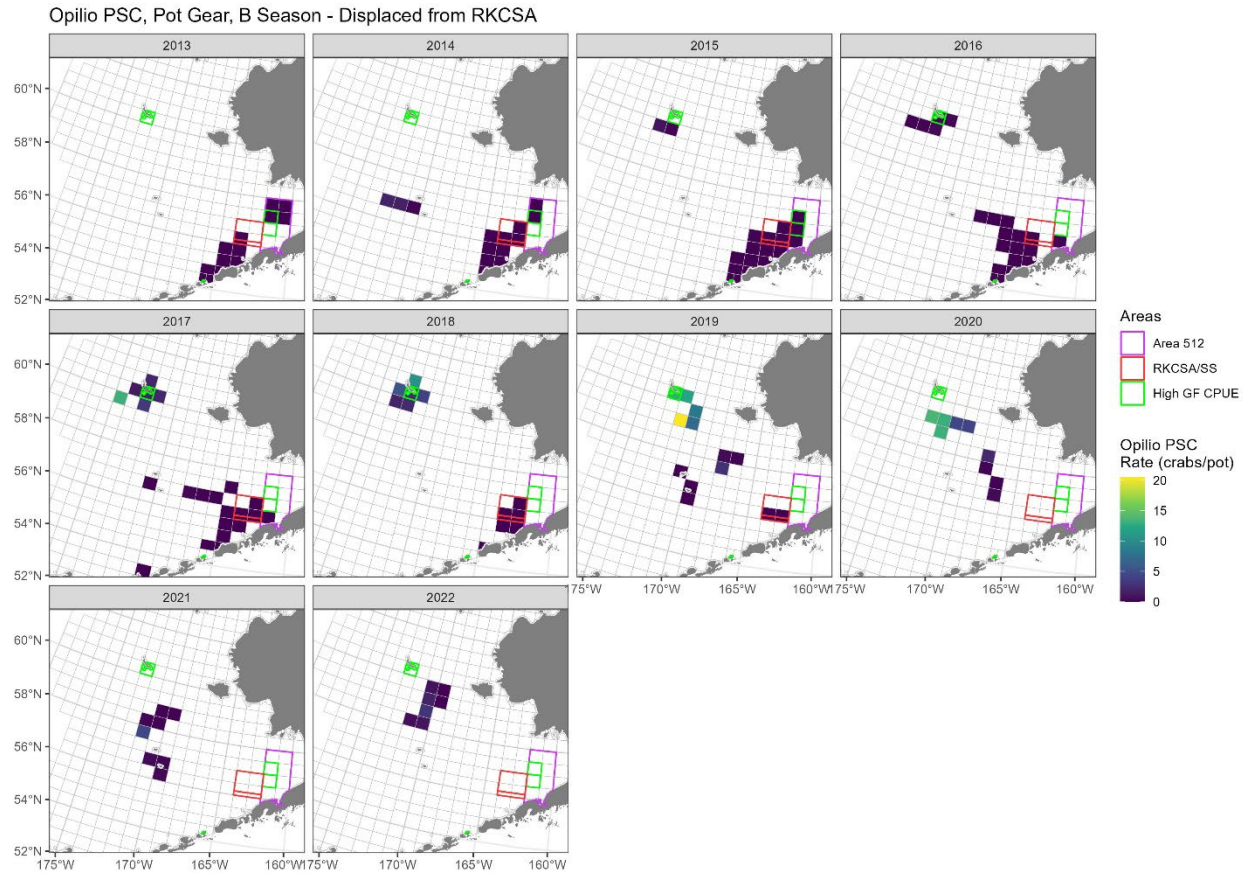
**Figure A2-48. Mean CPUE (tons/pot) of retained groundfish (Pacific cod) in the POT fleet between 2013 and 2022 if displaced from the RKCSA (top), Area 512 (middle), or both (bottom) during the B Season. Boxes highlighted in green represent the four highest CPUE statistical areas as determined by mean CPUEs weighted by area fished.**

**PSC CPUE**

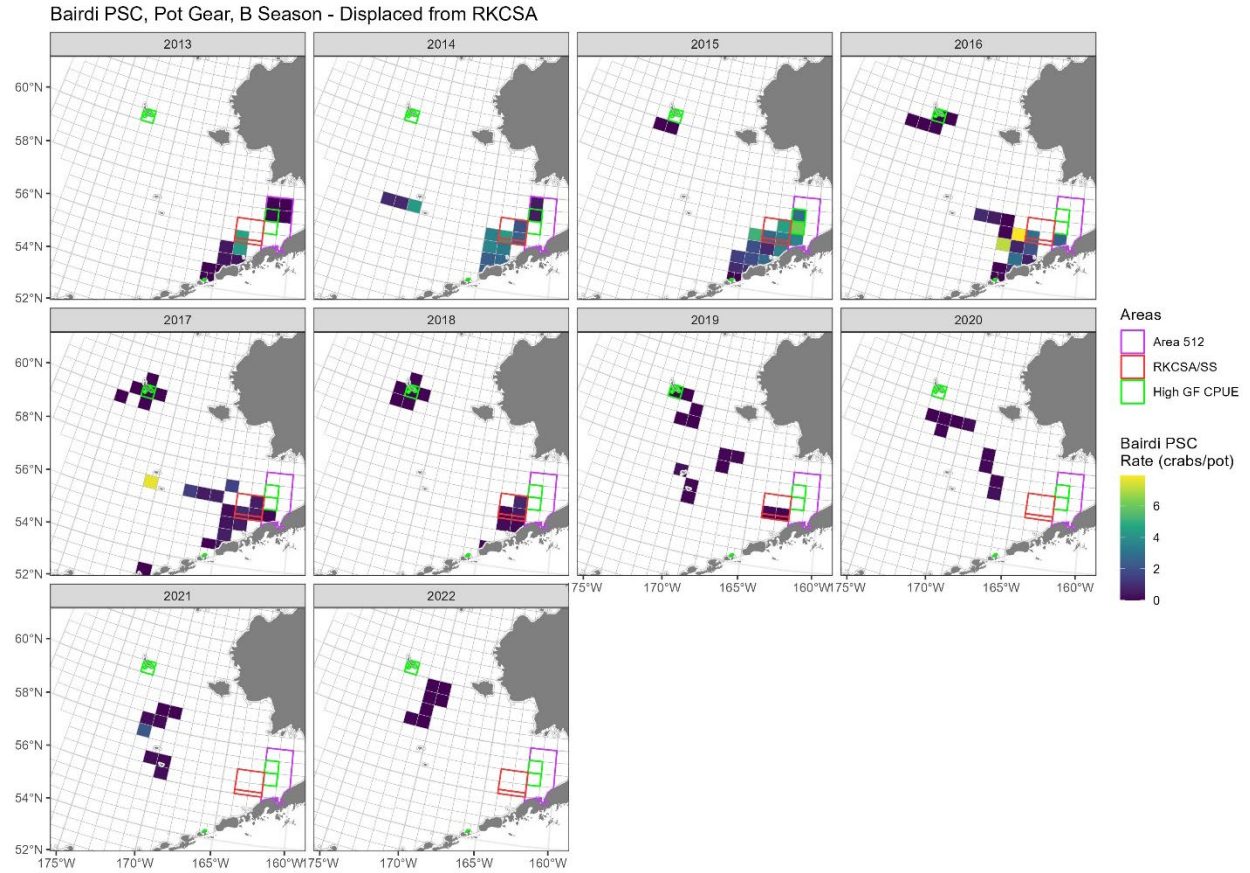
The B season PSC CPUEs for red king crab, *Opilio* crab, and Bairdi crab from the POT fleet are shown below in Figures A2-49, A2-50, and A2-51, respectively. For simplicity, only the RKCSA displacement in shown, as the PSC CPUE among years and seasons remains constant throughout the three displacement scenarios.



**Figure A2-49. B season red king crab PSC CPUEs from NPT between 2013 and 2022, with the high groundfish CPUE areas overlaid to show the locations where the RKCSA efforts were displaced.**



**Figure A2-50. B season Opilio PSC CPUEs from NPT between 2013 and 2022, with the high groundfish CPUE areas overlaid to show the locations where the RKCSA efforts were displaced.**



**Figure A2-51. B season Bairdi PSC CPUEs from NPT between 2013 and 2022, with the high groundfish CPUE areas overlaid to show the locations where the RKCSA efforts were displaced.**

## **Estimated Change in PSC**

### *Red king crab*

Changes in RKC occurred primarily during the B season (Figure A2-52). These changes were estimated to either increase or slightly decrease when displaced from the RKCSA, but decrease in most years when displaced from Area 512 (Figure A2-52). Calculations for each displacement scenario are shown in Tables A2-14, A2-15, and A2-16. When displaced from the RKCSA, estimated B season changes in RKC PSC ranged from a reduction of 97,193 crabs in 2018 (a 34.3% decrease in that year's BS PSC) to an increase of 372,619 crabs in 2015 (a 230% increase). Displacement from Area 512 largely resulted in reduced PSC, with B season reduction estimates ranging from 760 crabs in 2016 (a 3.5% decrease) to 215,888 crabs in 2021 (an 86% decrease). When displaced from both areas, the trends in reductions mirrored that of the Area 512 displacement, with B season reduction estimates ranging from 3,947 crabs in 2017 (a 99% decrease) to 215,888 crabs in 2021 (an 86% decrease).

### *Bairdi Tanner Crab*

Similar to RKC, changes in Bairdi PSC occurred primarily during the B season (Figure A2-53). When displaced from the RKCSA, estimated B season changes were largely reductions, with a peak reduction of 66,180 in 2018 (a 46% decrease), and an exception of 2015 which saw an increase of 67,458 crabs (a 26% increase). Displacement from Area 512 largely resulted in reduced PSC, with a peak reduction in 2018 at 46,316 crabs (a 32% decrease), and a large exception in 2013 that saw an increase of 65,908 crabs (a 45% decrease). When displaced from both areas, all major changes were reductions, ranging from 679 crabs in 2020 (a 50% decrease) to 114,678 crabs in 2018 (an 80.3% decrease).

### *Opilio Tanner Crab*

Changes in Opilio PSC occurred primarily during the B season, and mostly resulted in increases (Figure A2-54). When displaced from the RKCSA, changes ranged from a decrease of 1,287 crabs in 2013 (a 27% decrease) to an increase of 42,663 crabs in 2019 (a 73% increase). Displacement from Area 512 resulted in B season estimates ranging from a reduction of 1,359 crabs in 2020 (a 2.7% decrease) to an increase of 8,699 crabs in 2018 (a 26% increase). When displaced from both areas, the changes largely mirrored that of the RKCSA displacement, with B season estimates ranging from a reduction of 575 crabs in 2013 (a 12% decrease) to an increase of 47,141 crabs in 2018 (a 140% increase).

**Table A2-14. Estimated change in red king crab, Bairdi crab, and Opilio crab PSC in POT gear by year and season if displaced from the RKCSA. Total BS PSC column = the actual crab PSC caught by the fleet in that year and season. PSC represents numbers for crab, and metric tons for Pacific halibut. All effort is in number of pots.**

Year	Season	POT Effort RKCSA	Red King Crab					Bairdi Crab					Opilio Crab				
			PSC Catch RKCSA	PSC CPUE High Areas	Est. Increase	Total BS PSC	% Change	PSC Catch RKCSA	PSC CPUE High Areas	Est. Increase	Total BS PSC	% Change	PSC Catch RKCSA	PSC CPUE High Areas	Est. Increase	Total BS PSC	% Change
2013	A	6064	6.5	0.000	-6.5	11867	-0.1%	39.0	0.050	262.3	67854	0.4%	5.9	0.013	71.6	8785	0.8%
2014	A	1598	163.9	0.000	-163.9	23688	-0.7%	13351.2	0.010	-13335.5	280275	-4.8%	130.1	0.221	223.1	75614	0.3%
2015	A	30	0.0	0.000	0.0	15555	0.0%	0.0	0.354	10.6	352457	0.0%	0.0	0.006	0.2	105869	0.0%
2016	A	0	0.0	0.000	0.0	921	0.0%	0.0	0.033	0.0	209737	0.0%	0.0	0.000	0.0	10322	0.0%
2017	A	0	0.0	0.000	0.0	26064	0.0%	0.0	0.000	0.0	268971	0.0%	0.0	0.000	0.0	72059	0.0%
2018	A	0	0.0	0.000	0.0	7872	0.0%	1351.4	0.135	-1351.4	98037	-1.4%	139.6	0.002	-139.6	12647	-1.1%
2019	A	0	0.0	0.000	0.0	3951	0.0%	0.0	0.027	0.0	98914	0.0%	0.0	0.000	0.0	10046	0.0%
2020	A	11561	726.8	0.000	-726.8	9396	-7.7%	8504.4	0.000	-8504.4	70294	-12.1%	1153.3	0.000	-1153.3	70528	-1.6%
2021	A	1529	302.7	0.000	-302.7	31238	-1.0%	510.0	0.040	-449.0	28202	-1.6%	1215.9	0.004	-1210.0	48337	-2.5%
2022	A	0	0.0	0.000	0.0	20596	0.0%	131.8	0.000	-131.8	92697	-0.1%	20.8	0.000	-20.8	29566	-0.1%
2013	B	11227	1119.3	0.427	3674.9	81271	4.5%	31586.1	0.021	-31345.3	146013	-21.5%	1289.1	0.000	-1286.7	4798	-26.8%
2014	B	52980	10893.1	3.568	178146.4	112978	157.7%	65074.5	0.125	-58443.6	285664	-20.5%	260.5	0.002	-165.3	8248	-2.0%
2015	B	73417	56558.1	5.846	372619.0	162167	229.8%	97152.0	2.242	67458.2	258118	26.1%	670.3	0.001	-631.7	15691	-4.0%
2016	B	25056	9507.5	0.000	-9507.5	21505	-44.2%	21333.7	0.000	-21333.7	86622	-24.6%	95.8	0.068	1616.7	9715	16.6%
2017	B	22562	365.6	0.000	-365.6	3988	-9.2%	5659.4	0.003	-5584.4	56629	-9.9%	1430.4	0.429	8255.8	58774	14.0%
2018	B	38598	97207.8	0.000	-97192.6	283312	-34.3%	66254.7	0.002	-66179.8	142822	-46.3%	397.9	0.567	21471.3	33630	63.8%
2019	B	13544	3768.5	0.000	-3768.5	42151	-8.9%	2525.3	0.000	-2525.3	12453	-20.3%	532.9	3.189	42663.3	58686	72.7%
2020	B	0	256.9	0.000	-256.9	11396	-2.3%	13.2	0.000	-13.2	1658	-0.8%	0.0	0.000	0.0	50527	0.0%
2021	B	0	0.0	0.000	0.0	250665	0.0%	0.0	0.000	0.0	3128	0.0%	0.0	0.000	0.0	4926	0.0%
2022	B	0	4279.6	0.000	-4279.6	126163	-3.4%	328.3	0.000	-328.3	9559	-3.4%	2.7	0.000	-2.7	14325	0.0%

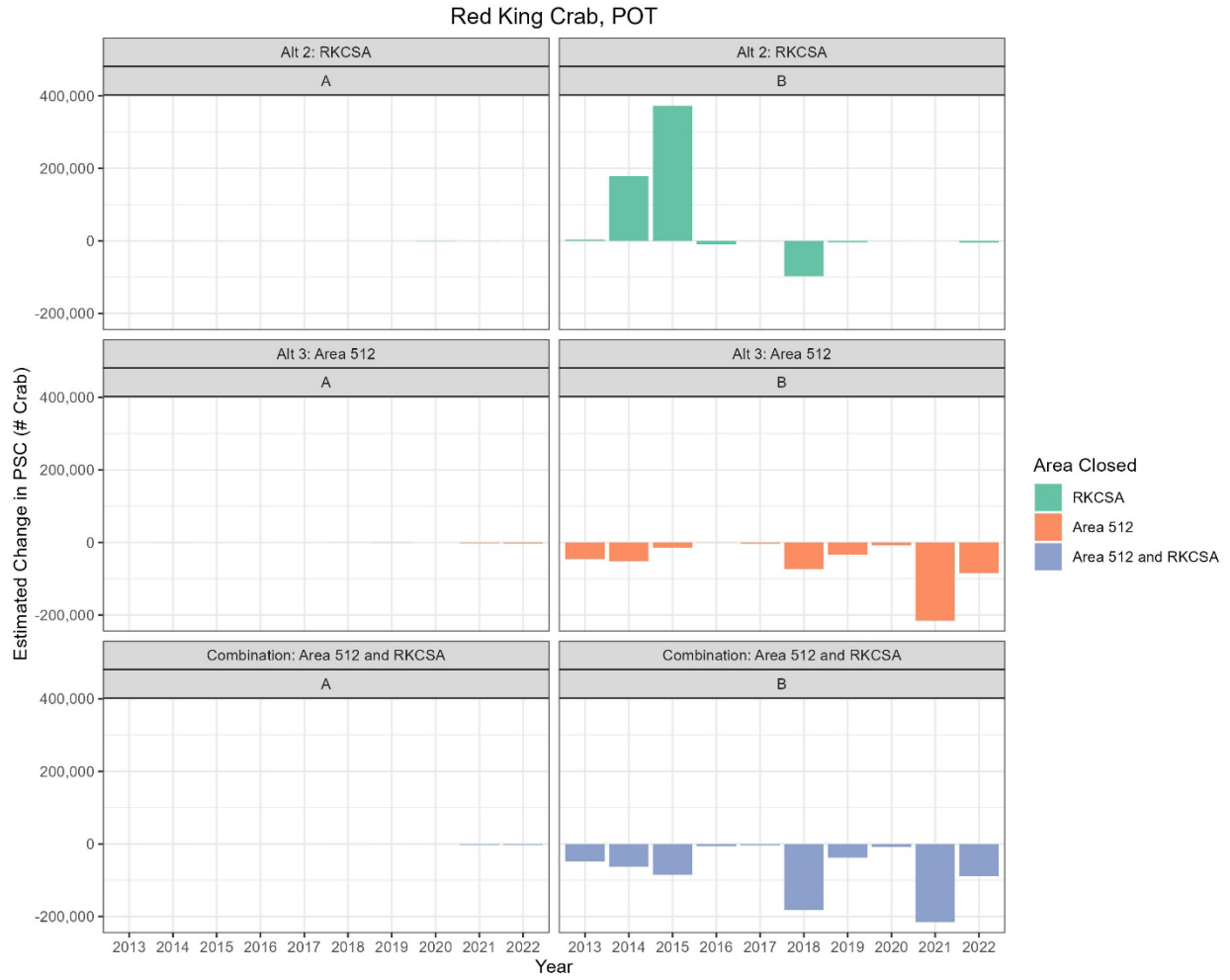
**Table A2-15. Estimated change in red king crab, Bairdi crab, and Opilio crab PSC in POT gear by year and season if displaced from Area 512. Total BS PSC column = the actual crab PSC caught by the fleet in that year and season. PSC represents numbers for crab, and metric tons for Pacific halibut. All effort is in number of pots.**

Year	Season	POT Effort 512	Red King Crab					Bairdi Crab					Opilio Crab				
			PSC Catch 512	PSC CPUE High Areas	Est. Increase	Total BS PSC	% Change	PSC Catch 512	PSC CPUE High Areas	Est. Increase	Total BS PSC	% Change	PSC Catch 512	PSC CPUE High Areas	Est. Increase	Total BS PSC	% Change
2013	A	0	0.0	0.051	0.0	11867	0.0%	0.0	0.325	0.0	67854	0.0%	0.0	0.060	0.0	8785	0.0%
2014	A	6084	215.3	0.045	56.7	23688	0.2%	1800.6	2.050	10670.0	280275	3.8%	0.0	0.530	3227.3	75614	4.3%
2015	A	0	0.0	0.021	0.0	15555	0.0%	0.0	1.822	0.0	352457	0.0%	0.0	1.115	0.0	105869	0.0%
2016	A	0	0.0	0.001	0.0	921	0.0%	0.0	1.156	0.0	209737	0.0%	0.0	0.478	0.0	10322	0.0%
2017	A	0	0.0	0.000	0.0	26064	0.0%	0.0	0.065	0.0	268971	0.0%	0.0	0.006	0.0	72059	0.0%
2018	A	480	341.1	0.000	-341.1	7872	-4.3%	72.3	0.501	168.0	98037	0.2%	0.0	0.030	14.5	12647	0.1%
2019	A	5992	794.4	0.000	-793.7	3951	-20.1%	1252.0	0.110	-591.5	98914	-0.6%	0.0	0.005	30.9	10046	0.3%
2020	A	0	0.0	0.008	0.0	9396	0.0%	0.0	0.144	0.0	70294	0.0%	0.0	0.004	0.0	70528	0.0%
2021	A	11335	2213.0	0.020	-1981.4	31238	-6.3%	400.3	0.214	2028.8	28202	7.2%	86.4	0.202	2200.1	48337	4.6%
2022	A	7062	2900.3	0.001	-2895.3	20596	-14.1%	790.6	0.191	554.9	92697	0.6%	17.3	0.317	2222.2	29566	7.5%
2013	B	59184	48337.7	0.035	-46237.9	81271	-56.9%	1212.4	1.134	65907.6	146013	45.1%	17.6	0.038	2228.2	4798	46.4%
2014	B	7664	53772.7	0.232	-51992.8	112978	-46.0%	4944.4	1.531	6786.4	285664	2.4%	33.3	0.006	10.4	8248	0.1%
2015	B	16655	29462.6	0.856	-15203.4	162167	-9.4%	25835.0	1.448	-1722.2	258118	-0.7%	61.2	0.148	2399.4	15691	15.3%
2016	B	7033	3812.6	0.434	-759.5	21505	-3.5%	20151.7	0.632	-15708.2	86622	-18.1%	1233.3	0.074	-710.7	9715	-7.3%
2017	B	14719	3587.4	0.015	-3371.8	3988	-84.5%	653.2	0.324	4110.7	56629	7.3%	14.6	0.430	6315.0	58774	10.7%
2018	B	17054	96364.8	1.345	-73420.7	283312	-25.9%	49828.2	0.206	-46315.6	142822	-32.4%	88.4	0.515	8699.0	33630	25.9%
2019	B	8262	34182.4	0.051	-33759.6	42151	-80.1%	6273.1	0.020	-6104.4	12453	-49.0%	302.2	0.008	-234.5	58686	-0.4%
2020	B	3512	8168.0	0.000	-8168.0	11396	-71.7%	721.9	0.000	-721.9	1658	-43.5%	1358.6	0.000	-1358.6	50527	-2.7%
2021	B	0	215887.9	0.000	-215887.9	250665	-86.1%	0.0	0.021	0.0	3128	0.0%	0.0	0.021	0.0	4926	0.0%
2022	B	6420	84865.3	0.000	-84865.3	126163	-67.3%	5323.4	0.002	-5312.3	9559	-55.6%	1.1	0.110	702.0	14325	4.9%

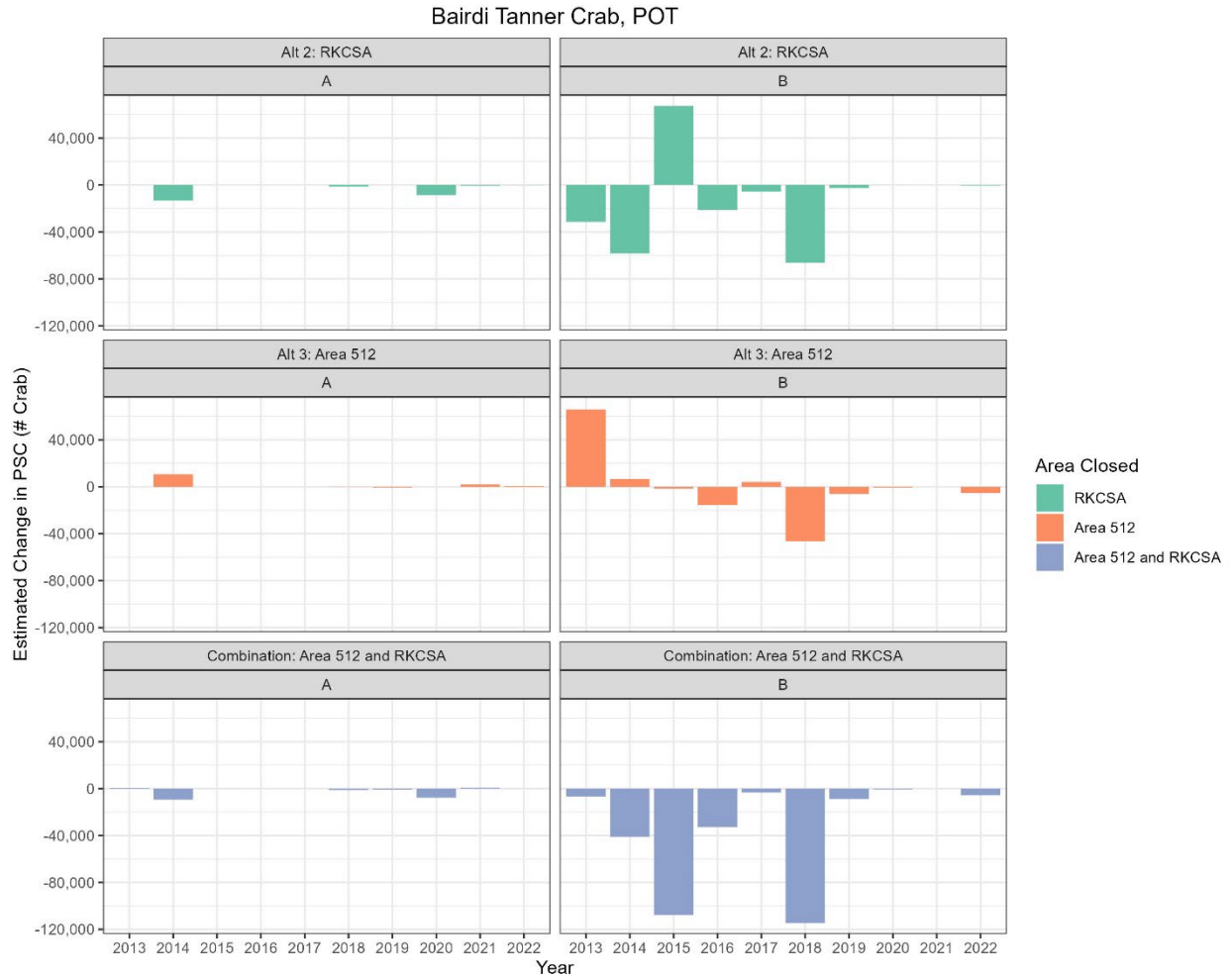


**Table A2-16. Estimated change in red king crab, Bairdi crab, and Opilio crab PSC in POT gear by year and season if displaced from both the RKCSA and Area 512. Total BS PSC column = the actual crab PSC caught by the fleet in that year and season. PSC represents numbers for crab, and metric tons for Pacific halibut. All effort is in number of pots.**

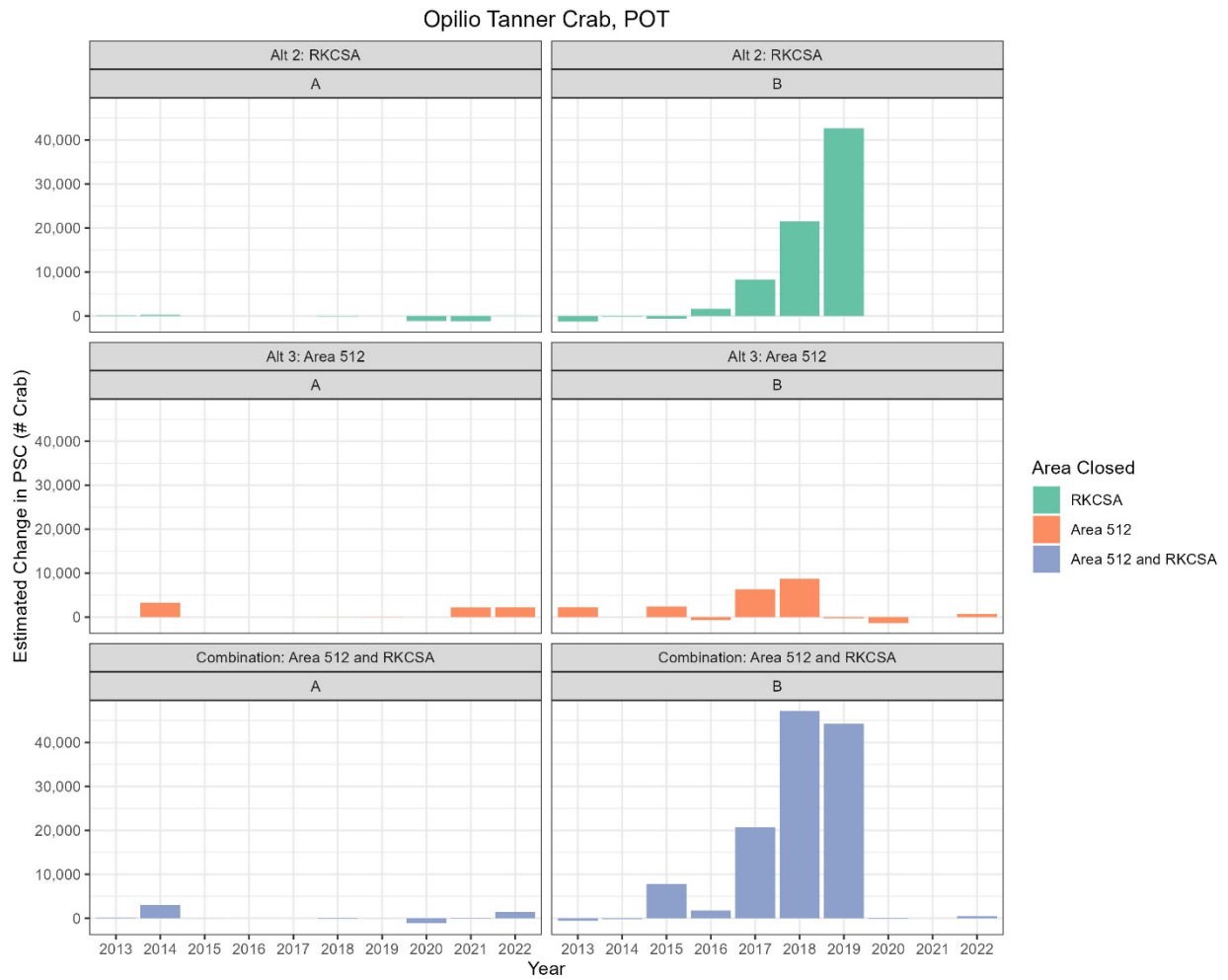
Year	Season	POT Effort RKCSA & 512	Red King Crab					Bairdi Crab					Opilio Crab				
			PSC Catch RKCSA & 512	PSC CPUE High Areas	Est. Increase	Total BS PSC	% Change	PSC Catch RKCSA & 512	PSC CPUE High Areas	Est. Increase	Total BS PSC	% Change	PSC Catch RKCSA & 512	PSC CPUE High Areas	Est. Increase	Total BS PSC	% Change
2013	A	6064	6.5	0.012	66.5	11867	0.6%	39.0	0.103	587.1	67854	0.9%	5.9	0.024	142.4	8785	1.6%
2014	A	7682	379.2	0.022	-211.3	23688	-0.9%	15151.8	0.745	-9429.9	280275	-3.4%	130.1	0.414	3052.2	75614	4.0%
2015	A	30	0.0	0.005	0.2	15555	0.0%	0.0	1.245	37.3	352457	0.0%	0.0	0.745	22.4	105869	0.0%
2016	A	0	0.0	0.001	0.0	921	0.0%	0.0	0.729	0.0	209737	0.0%	0.0	0.318	0.0	10322	0.0%
2017	A	0	0.0	0.000	0.0	26064	0.0%	0.0	0.027	0.0	268971	0.0%	0.0	0.004	0.0	72059	0.0%
2018	A	480	341.1	0.000	-341.1	7872	-4.3%	1423.6	0.353	-1254.3	98037	-1.3%	139.6	0.021	-129.8	12647	-1.0%
2019	A	5992	794.4	0.000	-794.0	3951	-20.1%	1252.0	0.072	-817.8	98914	-0.8%	0.0	0.003	16.4	10046	0.2%
2020	A	11561	726.8	0.002	-707.3	9396	-7.5%	8504.4	0.056	-7858.8	70294	-11.2%	1153.3	0.002	-1134.2	70528	-1.6%
2021	A	12864	2515.7	0.008	-2407.3	31238	-7.7%	910.2	0.131	777.3	28202	2.8%	1302.3	0.094	-99.2	48337	-0.2%
2022	A	7062	2900.3	0.000	-2897.0	20596	-14.1%	922.3	0.127	-25.4	92697	0.0%	38.2	0.211	1454.9	29566	4.9%
2013	B	70411	49457.0	0.009	-48840.2	81271	-60.1%	32798.5	0.369	-6784.4	146013	-4.6%	1306.6	0.010	-575.4	4798	-12.0%
2014	B	60644	64665.8	0.027	-63044.7	112978	-55.8%	70018.9	0.477	-41094.1	285664	-14.4%	293.8	0.001	-207.8	8248	-2.5%
2015	B	90072	86020.7	0.008	-85303.1	162167	-52.6%	122987.0	0.170	-107646.1	258118	-41.7%	731.5	0.095	7802.5	15691	49.7%
2016	B	32089	13320.1	0.218	-6324.9	21505	-29.4%	41485.4	0.268	-32893.7	86622	-38.0%	1329.2	0.096	1762.7	9715	18.1%
2017	B	37281	3953.0	0.000	-3947.4	3988	-99.0%	6312.6	0.078	-3404.6	56629	-6.0%	1444.9	0.593	20664.8	58774	35.2%
2018	B	55652	193572.6	0.200	-182415.2	283312	-64.4%	116083.0	0.025	-114678.1	142822	-80.3%	486.3	0.856	47141.2	33630	140.2%
2019	B	21806	37950.9	0.000	-37950.9	42151	-90.0%	8798.4	0.000	-8798.4	12453	-70.7%	835.1	2.065	44199.6	58686	75.3%
2020	B	3512	8424.9	0.000	-8424.9	11396	-73.9%	735.1	0.016	-678.6	1658	-40.9%	1358.6	0.348	-136.4	50527	-0.3%
2021	B	0	215887.9	0.000	-215887.9	250665	-86.1%	0.0	0.014	0.0	3128	0.0%	0.0	0.014	0.0	4926	0.0%
2022	B	6420	89145.0	0.000	-89144.1	126163	-70.7%	5651.7	0.001	-5644.3	9559	-59.0%	3.8	0.077	492.6	14325	3.4%



**Figure A2-52. Estimated change in red king crab PSC in POT gear by year and season if displaced from the RKCSA (top), Area 512 (middle), or both (bottom) between 2013 and 2022.**



**Figure A2-53. Estimated change in Bairdi PSC in POT gear by year and season if displaced from the RKCSA (top), Area 512 (middle), or both (bottom) between 2013 and 2022.**



**Figure A2-54. Estimated change in Opilio PSC in POT gear by year and season if displaced from the RKCSA (top), Area 512 (middle), or both (bottom) between 2013 and 2022.**

## Hook and Line

### Effort

The HAL fleet has historically fished within the RKCSA in both the A and B seasons, but has had less effort since around 2019 (Figures A2-55 and A2-56). HAL Industry representatives noted the lack of effort in recent years was due to the Pacific cod fishery tracking north in warmer years, but would return in colder years. According to the representatives, the fleet's current behavior is geared toward catching higher quality fish over the catch rates (i.e. CPUEs) alone.

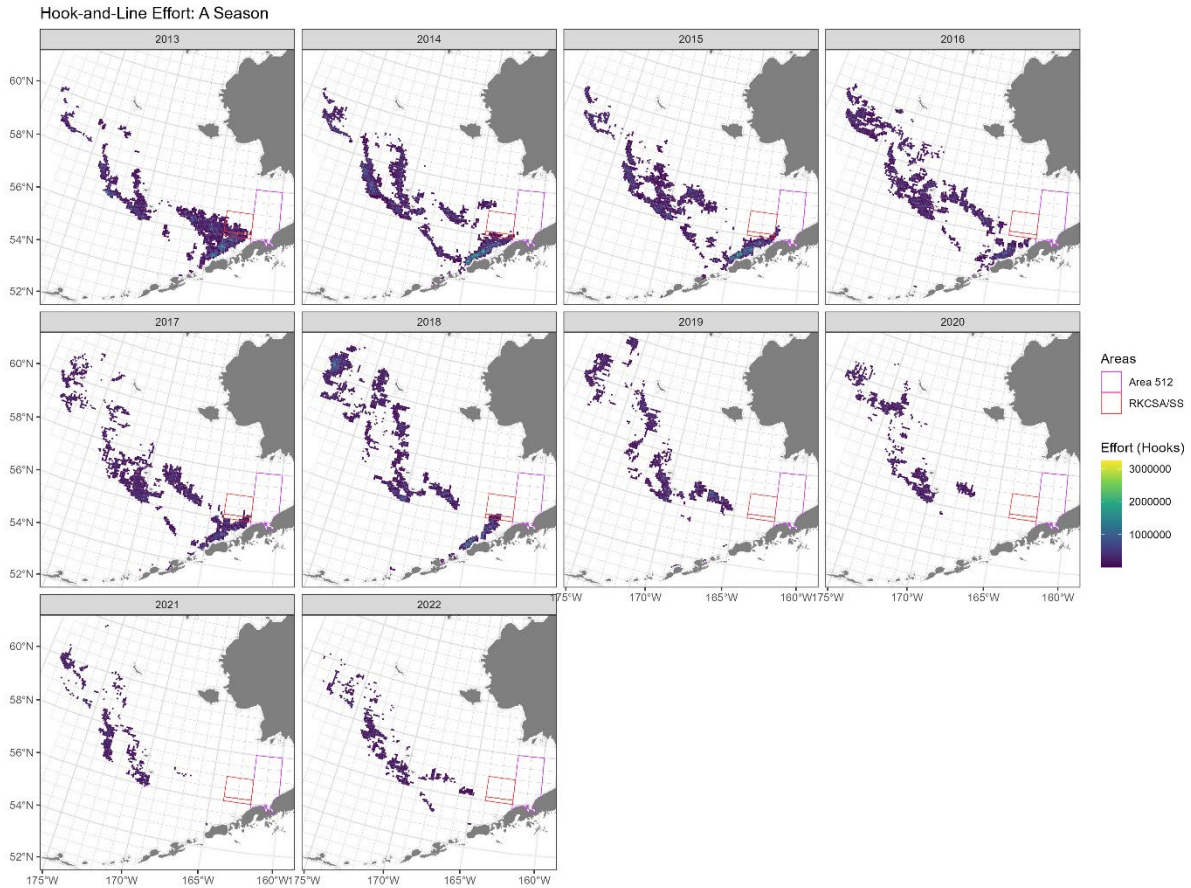
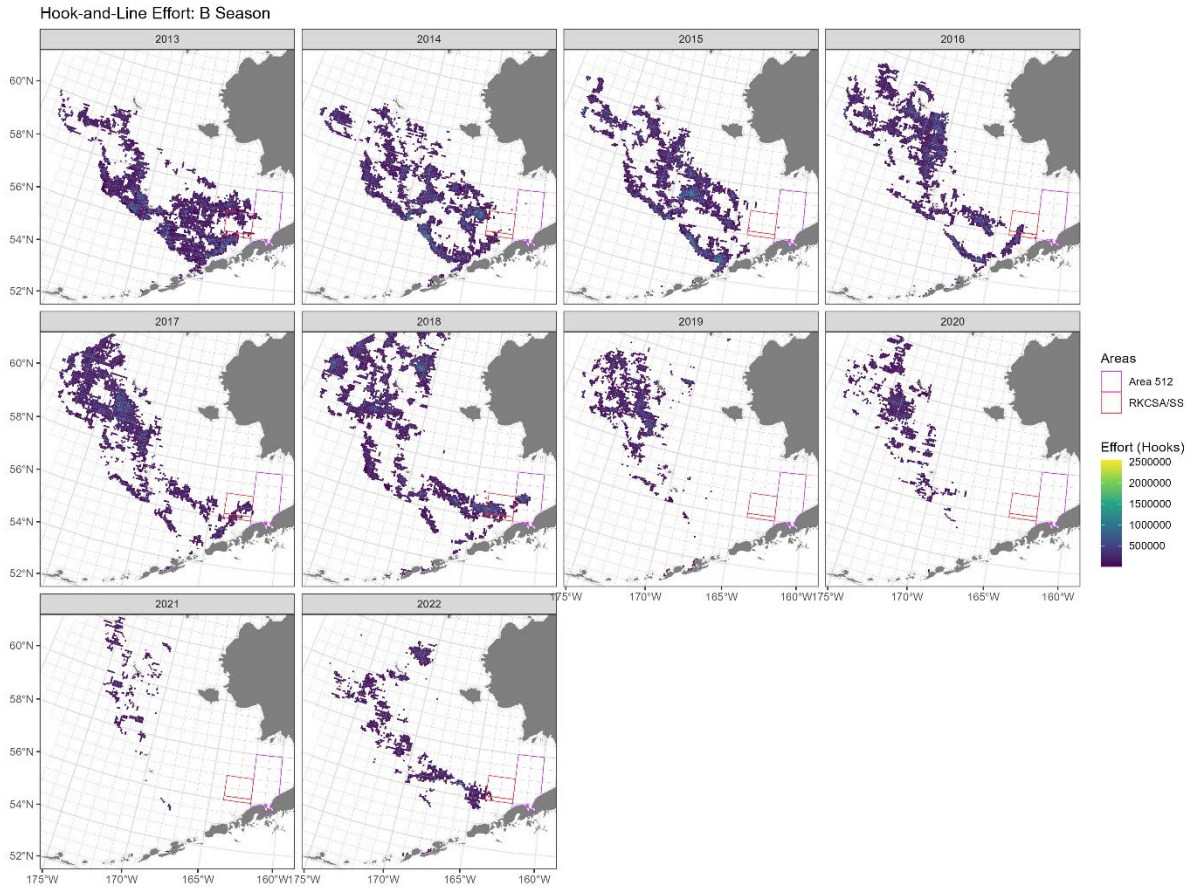


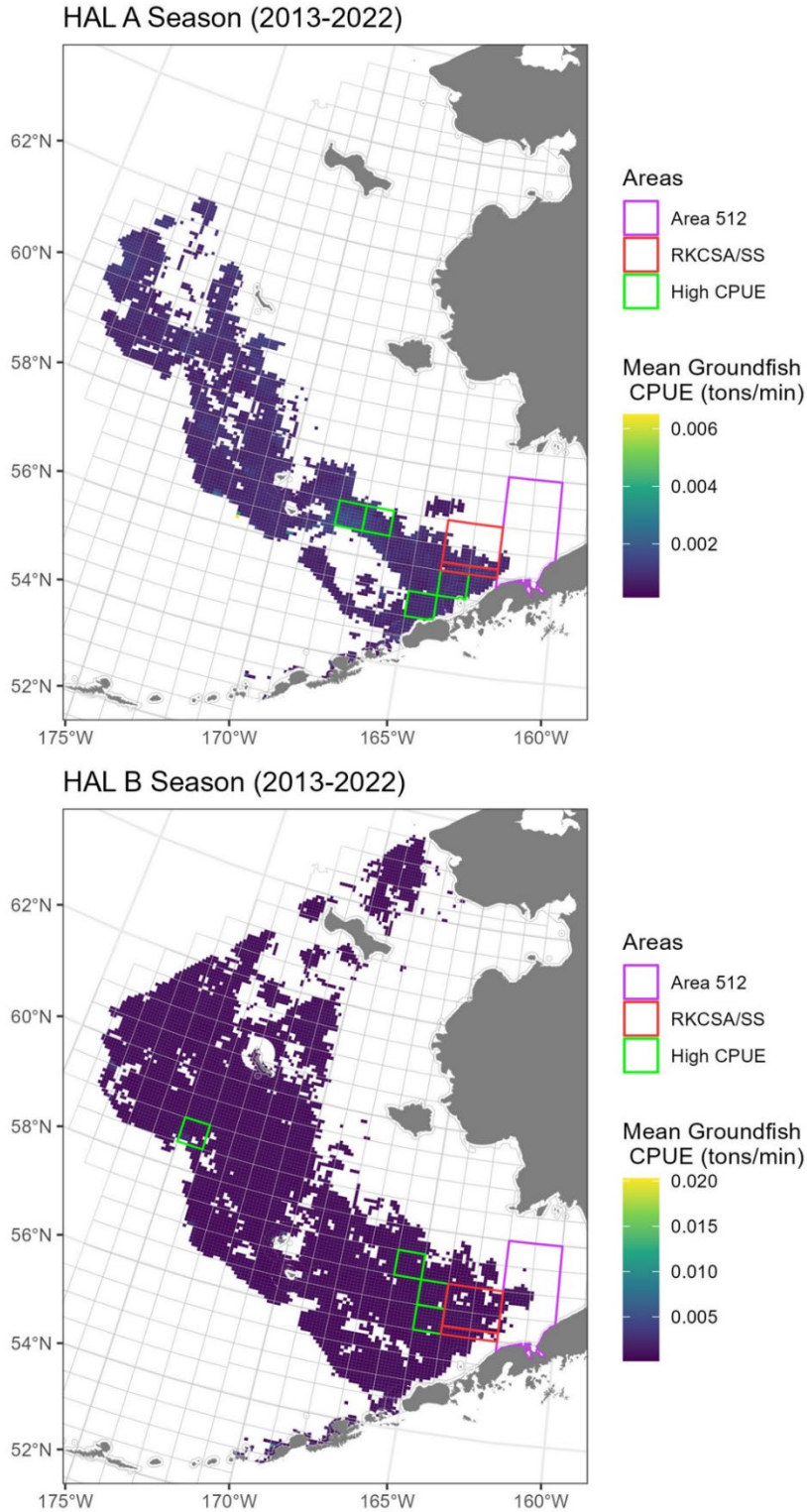
Figure A2-55. Distribution of A season HAL effort (number of hooks) between 2013 and 2022.



**Figure A2-56. Distribution of B season HAL effort (number of hooks) between 2013 and 2022.**

### Groundfish CPUE

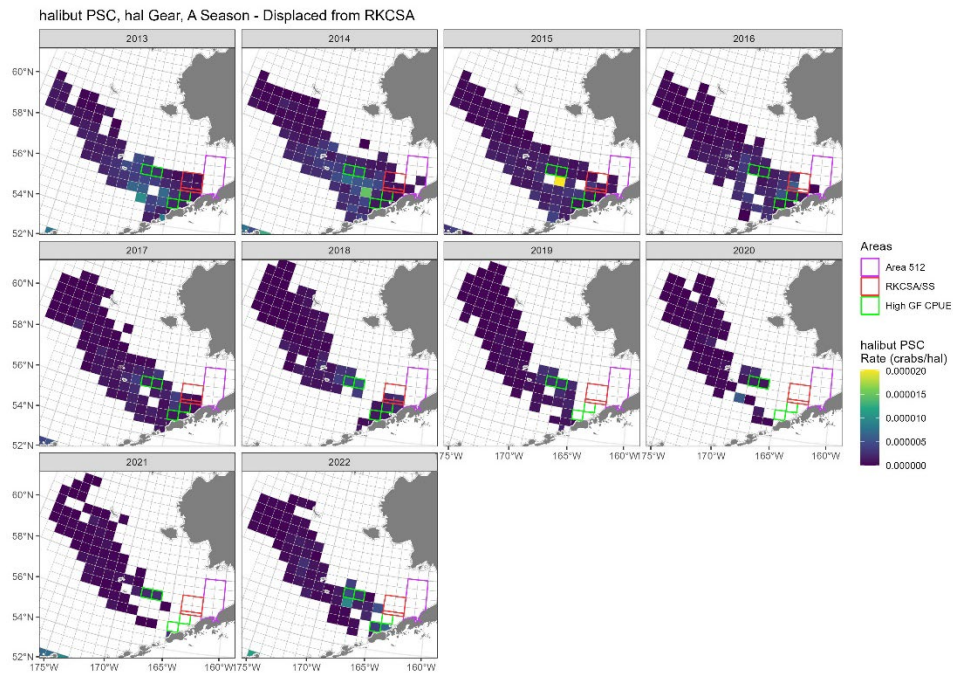
In the A season, the highest groundfish CPUEs occurred just south of the RKCSA and toward Unimak Island, as well as an area between the RKCSA and St. George, and in the B season primarily just west of the RKCSA, aside from an area due far west of Nunivak Island (Figure A2-57). Due to the large geographical footprint of the fleet, combined with the fleet’s target of quality fish over CPUE alone, HAL industry representatives have noted that the high CPUE boxes may not be representative of where they would go if displaced from the RKCSA.



**Figure A2-57. Mean CPUE (tons/hook) of retained groundfish (Pacific cod) in the HAL fleet between 2013 and 2022 during the A and B seasons. Boxes highlighted in green represent the four highest CPUE statistical areas as determined by mean CPUEs weighted by area fished.**

### PSC CPUE

The A and B season halibut PSC CPUEs from HAL are shown in Figures A2-58 and A2-59, respectively.



**Figure A2-58. A season halibut PSC CPUEs from HAL between 2013 and 2022, with the high groundfish CPUE areas overlaid to show the locations where the efforts were displaced.**



**Figure A2-59. A season halibut PSC CPUEs from HAL between 2013 and 2022, with the high groundfish CPUE areas overlaid to show the locations where the efforts were displaced.**

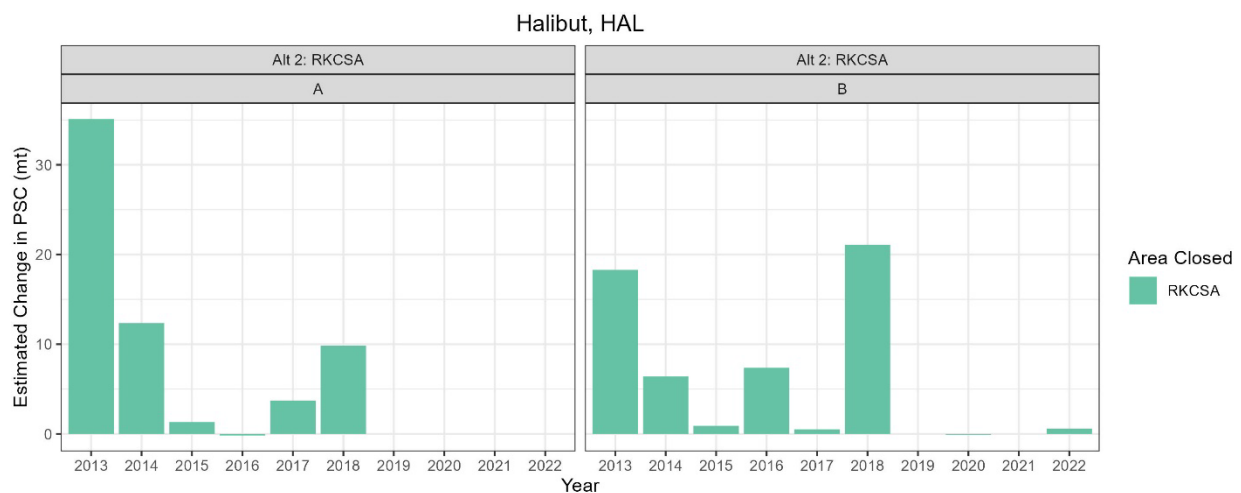


### Estimated Change in PSC

Changes in halibut PSC were largely positive and were estimated to occur in both A and B seasons (Table A2-17; Figure A2-60). These changes ranged from 0mt in multiple years to an increase of 35mt in the 2013 A season (a 19% increase).

**Table A2-17. Estimated change in halibut PSC (mt) in HAL gear by year and season if displaced from the RKCSA. Total BS PSC = the halibut PSC caught by the HAL fleet across the BS in that year and season. Effort = number of hooks.**

Year	Season	HAL Effort RKCSA	PSC Catch RKCSA	PSC CPUE High Areas	Change in PSC	Total BS PSC	% Change
2013	A	20096621	7.06	0.000021	35.10	183.43	19.1%
2014	A	6502252	1.80	0.000022	12.36	185.35	6.7%
2015	A	1642214	0.90	0.000014	1.32	115.34	1.1%
2016	A	484836	0.80	0.000013	-0.17	102.76	-0.2%
2017	A	3161533	0.37	0.000013	3.72	85.52	4.3%
2018	A	3906553	1.73	0.000030	9.85	58.97	16.7%
2019	A	0	0.00	0.000013	0.00	37.10	0.0%
2020	A	0	0.00	0.000006	0.00	19.59	0.0%
2021	A	0	0.00	0.000011	0.00	18.29	0.0%
2022	A	0	0.00	0.000027	0.00	46.66	0.0%
2013	B	17819148	4.83	0.000013	18.29	346.23	5.3%
2014	B	5269256	2.57	0.000017	6.42	264.04	2.4%
2015	B	602432	0.29	0.000020	0.91	195.04	0.5%
2016	B	6775703	2.94	0.000015	7.38	115.38	6.4%
2017	B	11809153	3.79	0.000004	0.51	97.00	0.5%
2018	B	33142945	4.49	0.000008	21.08	65.63	32.1%
2019	B	0	0.00	0.000001	0.00	39.58	0.0%
2020	B	51440	0.11	0.000002	-0.10	60.66	-0.2%
2021	B	0	0.00	0.000002	0.00	48.38	0.0%
2022	B	1349873	0.91	0.000011	0.60	100.73	0.6%



**Figure A2-60. Estimated change in Pacific halibut PSC in HAL gear by year and season if displaced from the RKCSA between 2013 and 2022.**