

# Appendix A: PIBKC Bycatch in the Groundfish Fisheries: 2009/10-2021/22

William Stockhausen

30 August, 2022

## Overview

Bycatch estimates of PIBKC in the groundfish fisheries are based on groundfish observer data sampling, expanded to total catch. Historical estimates beginning in 1996 are available to 2009 from AKFIN using results from the old Catch Accounting System database. More recent estimates, 2009-present, are available from AKFIN serving results from the AKRO's Catch-In-Areas database, which provides standardized spatial resolution using ADFG statistical areas (among other improvements over the older Catch Accounting System). In 2019, the algorithm used by AKFIN to expand observer data was changed from one based on retained groundfish catch weight to the one currently used by AKRO, which is based on total groundfish catch weight. The algorithm was “tweaked” again this year to better account for unspiciated king and *Chionoectes* (Tanner and snow) crab, correct an error in an extrapolation method, and improve the logic used to identify fishing trips. The changes were described on the AKFIN Stock Assessment Portal. These changes have been retroactively applied to data from calendar year 2017 forward, affecting estimates for crab starting in crab year 2016/17.

Here, bycatch in the groundfish fisheries during 2009/10-2021/22 is documented. This data was downloaded from AKFIN on July 23, 2022 for the current assessment. In order to apply gear-specific discard mortality rates to the bycatch data, trawl gear types (pelagic and non-pelagic) have been aggregated as “trawl” gear, while hook-and-line (longline) and pot gear have been aggregated as “fixed” gear. Discard mortality rates of 0.5 and 0.8 have subsequently been applied by gear type (fixed and trawl, respectively) to bycatch biomass to estimate fishing-related mortality for the discarded crab. Since 2009/10, the maximum annual bycatch of PIBKC in the groundfish fisheries was 1.55 t in 2015/16, while the maximum total discard mortality was 1.02 t in 2015/16. In contrast, the average rate of bycatch over the previous 5 years is 0.382 t, while the average discard mortality is 0.273 t.

## Bycatch by gear type

Annual estimates of bycatch abundance, biomass, and discard mortality of PIBKC in the groundfish fisheries aggregated by gear type are presented in Table 1, with time series plots of bycatch biomass and discard mortality shown in Figure 1. In general, trawl gear takes more PIBKC than fixed gear, and with higher mortality, although exceptions are fairly common (e.g., 2011/12, 2013/14, 2015/16).

## **Bycatch by target type**

Annual estimates of bycatch abundance, biomass, and discard mortality of PIBKC in the groundfish fisheries are presented by groundfish target type in Tables 2-4, with time series plots of bycatch biomass and discard mortality shown in Figure 2. Groundfish targets with less than 10 kg bycatch over the 2009-2021 period have been dropped. PIBKC is primarily taken as bycatch in fisheries targeting flathead sole, yellowfin sole, northern rock sole, and Pacific cod. Although the Pacific cod fishery accounted for the highest bycatch of PIBKC (in 2016) across the time series, it generally ranks below the other fisheries because the bycatch occurs primarily with fixed gear.

## **Spatial patterns of bycatch**

Spatial patterns of PIBKC bycatch, by ADFG stat area, in the groundfish fisheries are illustrated by gear type in Figures 3 and 4. All plots are on the same scale. Bycatch taken by fixed gear is typically dispersed along the shelf edge, although it was concentrated within and near the Pribilof Islands Habitat Conservation Zone (Figure 3) in 2015/16. In contrast, bycatch taken with trawl gear (Figure 4) tends to be concentrated along and to the northeast of the eastern boundary of the Habitat Conservation Zone (non-pelagic trawl gear is excluded from the Zone), although 2012 was an exception in which bycatch was concentrated along the western edge of the Zone.

## **References**

none

## List of Tables

1	Bycatch of PIBKC in the groundfish fisheries, by gear type. Biomass and (discard) mortality are in kilograms. Discard mortality rates of 0.5 and 0.8 for fixed and trawl gear, respectively, were applied to obtain discard mortalities. . . . .	4
2	Bycatch in numbers of PIBKC in the groundfish fisheries, by target type. . . . .	4
3	Bycatch in biomass (kg) of PIBKC in the groundfish fisheries, by target type. . . . .	4
4	Discard mortality, in kg, of PIBKC in the groundfish fisheries, by target type. Discard mortality rates of 0.5 and 0.8 for fixed and trawl gear, respectively, were applied to obtain discard mortalities. . . . .	5

## List of Figures

1	Upper plot: Bycatch (kg) of PIBKC in the groundfish fisheries since 2009 by gear type (no mortality applied). Lower plot: Discard mortality (kg) of PIBKC in the groundfish fisheries since 2009 by gear type. Gear-specific discard mortality rates of 0.5 and 0.8 were applied to bycatch from fixed and trawl gear, respectively . . . . .	6
2	Upper plot: Bycatch (kg) of PIBKC in the groundfish fisheries, by target type since 2009. Lower plot: Discard mortality (kg) of PIBKC in the groundfish fisheries, by target type since 2009. Gear-specific discard mortality rates of 0.5 and 0.8 were applied to bycatch from fixed and trawl gear, respectively . . . . .	7
3	Estimated bycatch (in kg) of PIBKC, by ADFG stat area and crab year, in the fixed gear groundfish fisheries, expanded from groundfish observer reports for the last 12 years. Grey shading: Pribilof Islands; blue lines: bathymetry (50, 100, 200, 250m); grey lines: ADFG statistical areas; orange polygon: Pribilof Islands Habitat Conservation Zone. . . . .	8
4	Estimated bycatch (in kg) of PIBKC, by ADFG stat area and crab year, in the trawl gear groundfish fisheries, expanded from groundfish observer reports for the last 12 years. Grey shading: Pribilof Islands; blue lines: bathymetry (50, 100, 200, 250m); grey lines: ADFG statistical areas; orange polygon: Pribilof Islands Habitat Conservation Zone. . . . .	9

## Tables

Table 1: Bycatch of PIBKC in the groundfish fisheries, by gear type. Biomass and (discard) mortality are in kilograms. Discard mortality rates of 0.5 and 0.8 for fixed and trawl gear, respectively, were applied to obtain discard mortalities.

year	fixed			trawl		
	number	biomass	mortality	number	biomass	mortality
2009/10	87	216	108	193	207	165
2010/11	16	44	22	35	56	45
2011/12	54	112	56	8	7	6
2012/13	72	170	85	340	669	535
2013/14	41	65	32	0	0	0
2014/15	65	144	72	0	0	0
2015/16	352	744	372	257	808	646
2016/17	63	93	46	524	455	364
2017/18	2	4	2	265	378	303
2018/19	24	38	19	398	466	373
2019/20	10	18	9	226	522	418
2020/21	5	7	3	0	0	0
2021/22	22	30	15	46	109	87

Table 2: Bycatch in numbers of PIBKC in the groundfish fisheries, by target type.

year	Flathead Sole	Pacific Cod	Rock Sole - BSAI	Yellowfin Sole - BSAI
	number	number	number	number
2009/10	54	87	0	119
2010/11	35	14	0	0
2011/12	0	62	0	0
2012/13	12	72	0	328
2013/14	0	41	0	0
2014/15	0	64	0	0
2015/16	58	351	0	199
2016/17	0	63	432	92
2017/18	95	2	0	170
2018/19	0	24	0	300
2019/20	0	10	55	170
2020/21	0	5	0	0
2021/22	0	22	0	46

Table 3: Bycatch in biomass (kg) of PIBKC in the groundfish fisheries, by target type.

year	Flathead Sole	Pacific Cod	Rock Sole - BSAI	Yellowfin Sole - BSAI
	biomass	biomass	biomass	biomass
2009/10	71	216	0	129
2010/11	56	42	0	0
2011/12	0	119	0	0

2012/13	24	170	0	645
2013/14	0	64	0	0
2014/15	0	143	0	0
2015/16	147	742	0	661
2016/17	0	91	368	87
2017/18	227	4	0	151
2018/19	0	38	0	442
2019/20	0	18	189	332
2020/21	0	7	0	0
2021/22	0	30	0	109

Table 4: Discard mortality, in kg, of PIBKC in the groundfish fisheries, by target type. Discard mortality rates of 0.5 and 0.8 for fixed and trawl gear, respectively, were applied to obtain discard mortalities.

year	Flathead Sole mortality	Pacific Cod mortality	Rock Sole - BSAI mortality	Yellowfin Sole - BSAI mortality
2009/10	57	108	0	103
2010/11	45	21	0	0
2011/12	0	61	0	0
2012/13	19	85	0	516
2013/14	0	32	0	0
2014/15	0	72	0	0
2015/16	117	371	0	529
2016/17	0	46	294	70
2017/18	182	2	0	121
2018/19	0	19	0	354
2019/20	0	9	151	265
2020/21	0	3	0	0
2021/22	0	15	0	87

## Figures

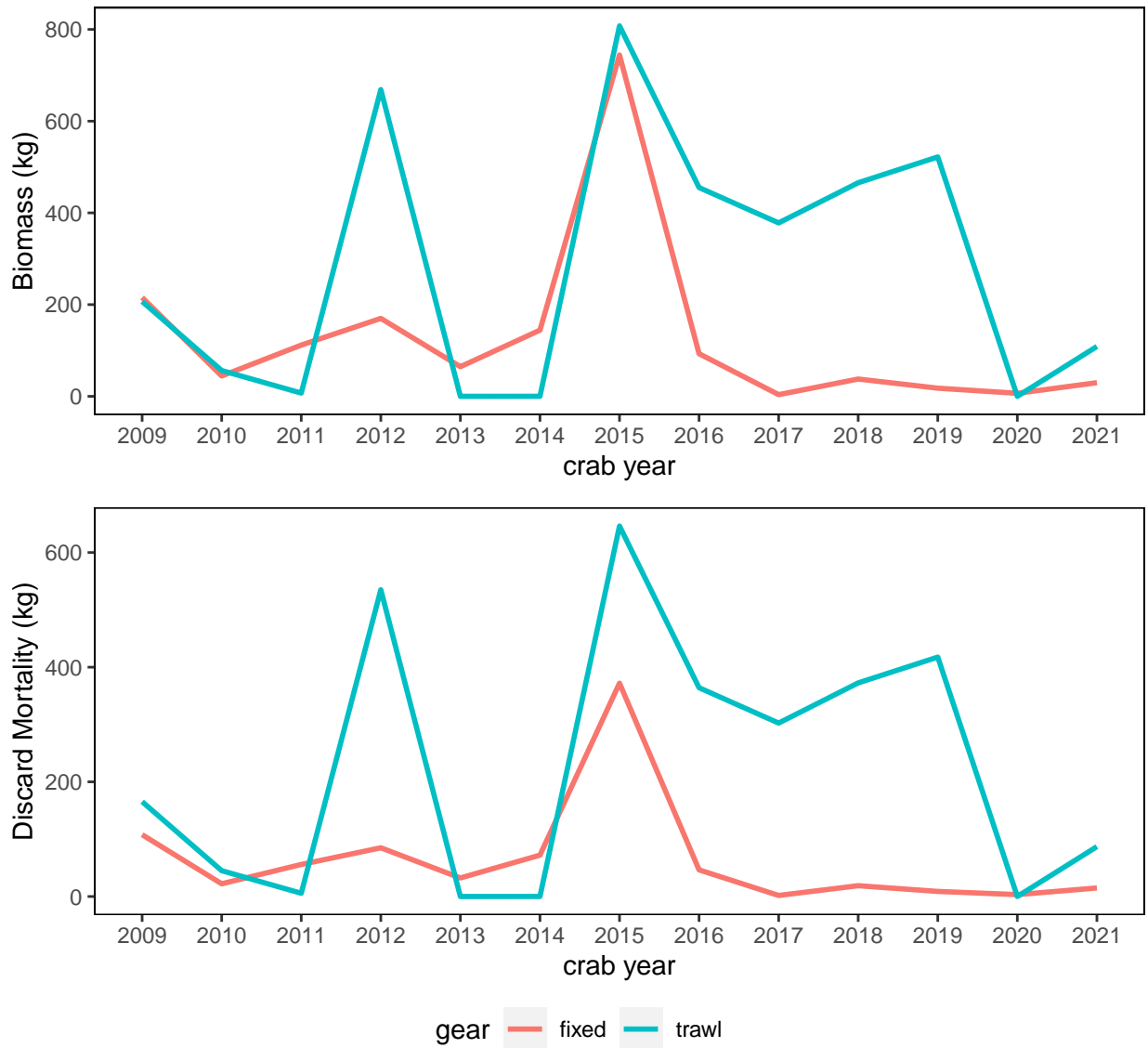


Figure 1: Upper plot: Bycatch (kg) of PIBKC in the groundfish fisheries since 2009 by gear type (no mortality applied). Lower plot: Discard mortality (kg) of PIBKC in the groundfish fisheries since 2009 by gear type. Gear-specific discard mortality rates of 0.5 and 0.8 were applied to bycatch from fixed and trawl gear, respectively

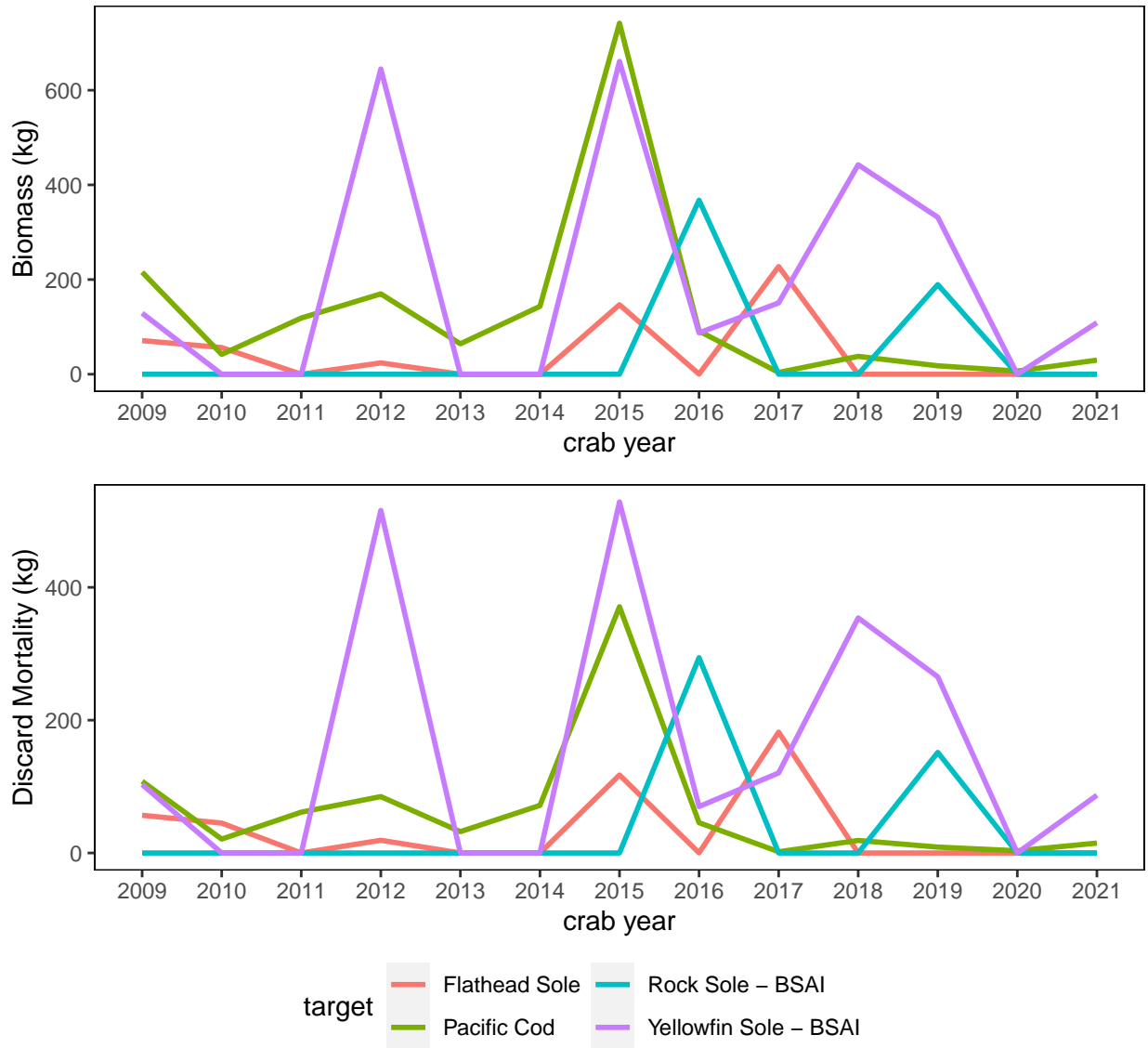


Figure 2: Upper plot: Bycatch (kg) of PIBKC in the groundfish fisheries, by target type since 2009. Lower plot: Discard mortality (kg) of PIBKC in the groundfish fisheries, by target type since 2009. Gear-specific discard mortality rates of 0.5 and 0.8 were applied to bycatch from fixed and trawl gear, respectively

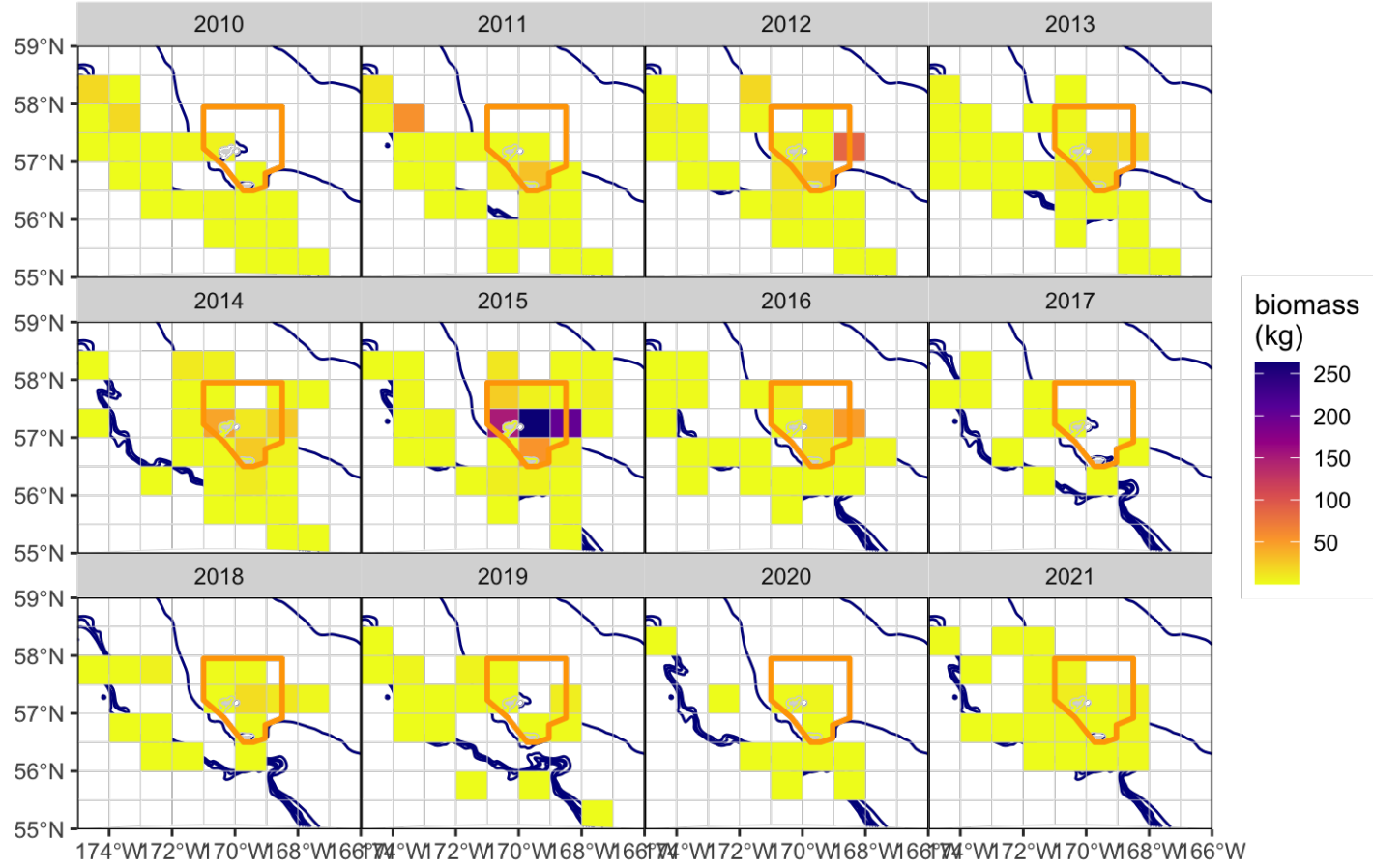


Figure 3: Estimated bycatch (in kg) of PIBKC, by ADFG stat area and crab year, in the fixed gear groundfish fisheries, expanded from groundfish observer reports for the last 12 years. Grey shading: Pribilof Islands; blue lines: bathymetry (50, 100, 200, 250m); grey lines: ADFG statistical areas; orange polygon: Pribilof Islands Habitat Conservation Zone.



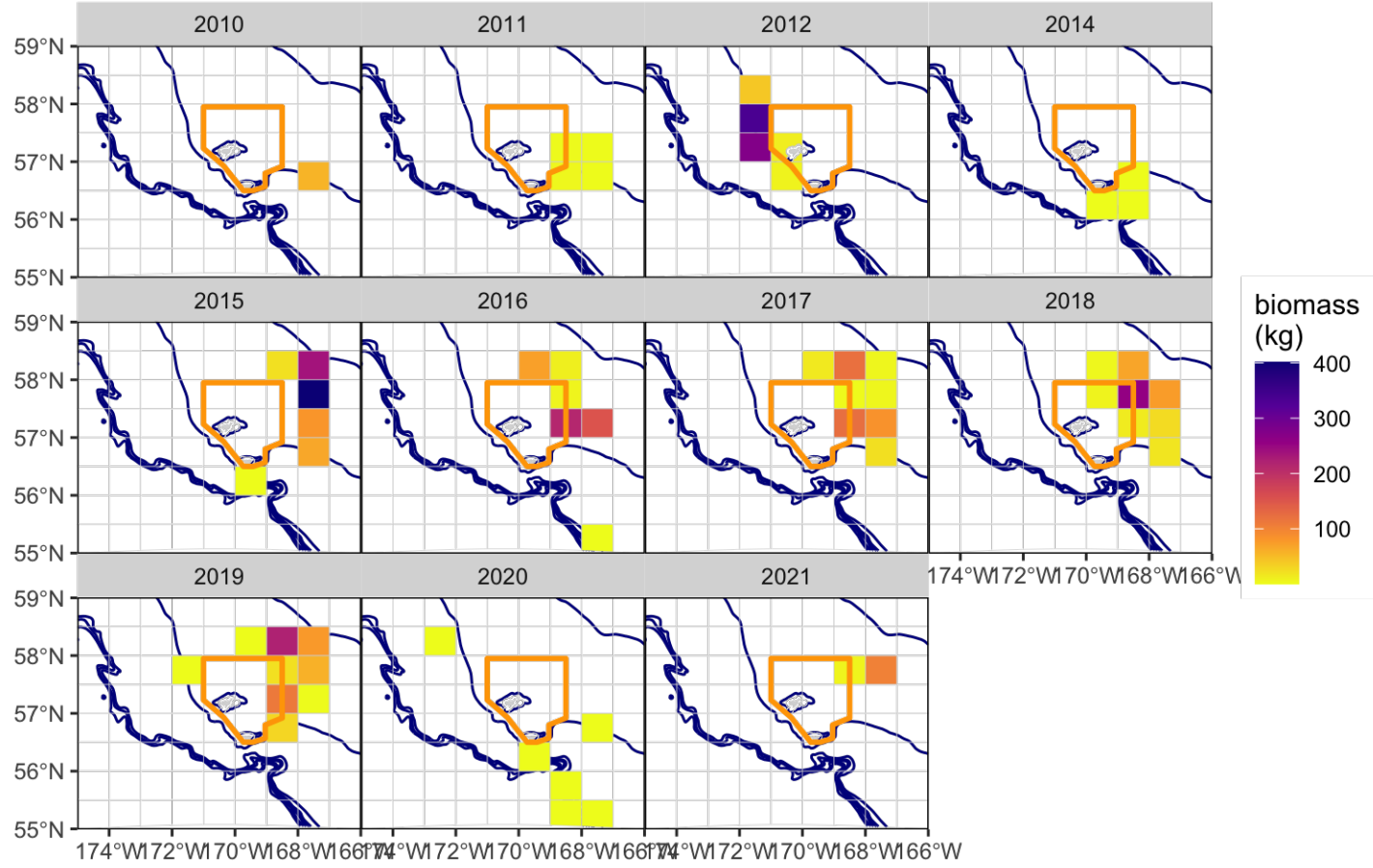


Figure 4: Estimated bycatch (in kg) of PIBKC, by ADFG stat area and crab year, in the trawl gear groundfish fisheries, expanded from groundfish observer reports for the last 12 years. Grey shading: Pribilof Islands; blue lines: bathymetry (50, 100, 200, 250m); grey lines: ADFG statistical areas; orange polygon: Pribilof Islands Habitat Conservation Zone.