Chapter 11: Assessment of Rougheye and Blackspotted Rockfish in the Gulf of Alaska (Executive Summary)

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Introduction

Rockfish are assessed on a biennial stock assessment schedule to coincide with new survey data. We use a separable age-structured model as the primary assessment tool for Gulf of Alaska rougheye and blackspotted rockfish. This consists of an assessment model, which uses survey and fishery data to generate a historical time series of population estimates, and a projection model which uses results from the assessment model to predict future population estimates and recommended harvest levels. For Gulf of Alaska rockfish in alternate (even) years we present an executive summary to recommend harvest levels for the next (odd) year. For this off-cycle year, we only updated the 2007 projection model estimates with revised catch data for 2007 and a new catch estimate for 2008. Please refer to last year's full stock assessment, which is available online, for further information regarding the assessment model (Shotwell et al. 2007, www.afsc.noaa.gov/REFM/docs/2007/GOArougheye.pdf). A full stock assessment document with updated assessment and projection model results will be presented in next year's SAFE report. Orr and Hawkins (2008) formally verified the presence of two species, rougheye rockfish (*Sebastes aleutianus*) and blackspotted rockfish (*S. melanostictus*), in what was once considered a single variable species with light and dark color morphs. Hereafter we refer to these two species together as the rougheye rockfish complex.

Updated ABC, OFL, Catch and Projection

New information for this year's projection is updated 2007 catch at 425 t and the best estimate of the 2008 catch at 370 t. Catch estimates used in last year's model were 397 t and 517 t for 2007 and 2008, respectively. For the 2009 fishery, we recommend the maximum allowable ABC of 1,284 t from the updated projection. This ABC is very similar to last year's ABC of 1,286 t. The corresponding reference values for the rougheye rockfish complex are summarized in the following table, with the recommended ABC and OFL values in bold. The stock is not overfished, nor is it approaching overfishing status.

Summary	2007 projection: Not Updated		2007 projection: Updated catch*	
Projection Year	2008	2009	**2009**	2010
Tier 3a				
Total Biomass (Age 3+)	46,121	46,266	46,385	46,637
Female Spawning Biomass (t)	13,882	13,980	14,055	13,919
$B_{0\%}$ (t, female spawning biomass)	24,839	--	--	--
$B_{40\%}$ (t, female spawning biomass)	9,935	--	--	--
$B_{35\%}$ (t, female spawning biomass)	8,694	--	--	--
M	0.034	0.034	0.034	0.034
F_{ABC} (maximum allowable = $F_{40\%}$)	0.039	0.039	0.039	0.039
F_{OFL}	0.047	0.047	0.047	0.047
ABC (t; maximum allowable)	1,286	1,279	**1,284**	1,297
OFL (t)	1,548	1,540	**1,545**	1,562

*Projected ABCs and OFLs for 2010 are derived using an expected catch value of 368 t for 2009 based on recent ratios of catch to ABC. This calculation is in response to management requests to obtain a more accurate one-year projection.

Area Apportionment

The apportionment percentages are identical to last year, because there is no new survey information. The following table shows the recommended apportionment for 2009.

Area Apportionment	Western 10%	Central 65%	Eastern 25%	Total 100%
Area ABC (t)	**125**	**833**	**326**	**1,284**
OFL (t)				**1,545**

Responses to Council, SSC, and Plan Team Comments

The SSC December 2007 minutes included the following comments concerning all stock assessments:

"The SSC notes that the approach for calculating ABC and other biological reference points is not fully described in the SAFE's. It would be desirable to have a general description in the introduction of the SAFE. In each SAFE chapter, specific details could be provided, if the calculation is done differently. For example, the range of years that is used to calculate average recruitment for converting SPR to B40 should be given."

We continue to assume that the equilibrium level of recruitment is equal to the average of age 3 recruits from 1980-2005 (year classes between 1977 and 2002) for rougheye rockfish as detailed in the *Amendment 56 Reference Points* section of the *Projections and Harvest Alternatives* of last year's full stock assessment.

The SSC December 2007 minutes included the following comments concerning all rockfish:

"For all of the rockfish assessments, the SSC recognizes the efforts of the stock assessment authors to respond fully to the 2006 CIE review comments. The SSC requests that the draft response to the CIE review be finalized and made available."

The response to the 2006 CIE rockfish review is available online at the following web address: ftp://ftp.afsc.noaa.gov/afsc/public/rockfish/RWG%20response%20to%20CIE%20review.pdf

The GOA Plan Team 2007 minutes included the following comments concerning all rockfish:

"Area apportionments for rockfish ABC are a weighted average of previous years' percent exploitable biomass distributions. The Plan Team discussed the merit of exploring the difference that weighting the apportionments by biomass rather than percentages could have on the resultant apportionments. Assessment authors agreed to compare the approaches under different scenarios of biomass distribution."

Please see Appendix A of the Gulf of Alaska Pacific ocean Perch SAFE for a comparison of the effects of weighting proportion or biomass by survey year for determining area apportionment. Simple scenarios assuming no survey error and how that affects bias between the two methods are first presented. This is followed by simulations exploring varying levels of survey error and results on stability.

The SSC December 2007 minutes included the following comments concerning rougheye rockfish:

"The SSC requests that the assessment authors work to bring forward a rationale for decisions regarding assessment of mixed species groups with attention to the potential for overfishing the weaker stock."

Preliminary analysis of results from the 2005 and 2006 two-day experiment on the longline survey near Yakutat suggests a high proportion of misidentification for blackspotted rockfish. When compared to the genetic samples, at sea scientists only correctly identified blackspotted rockfish 47% of the time. Results from the expert scientist identification on photos of the same samples were improved but only to 63% accuracy. However, identification of rougheye rockfish was nearly 100% accurate in both cases. Upon reevaluation of photos, there were several other features that may be important for correctly identifying blackspotted rockfish (J. Orr, personal communication). We propose that a new at sea field identification pamphlet be prepared and tested with genetic samples to determine whether rapid and accurate identification of the two species can occur.

When observers and survey biologists can reliably identify both species, we can begin to develop a rational for mixed species assessments and the potential implication for overfishing a weaker stock. Please refer to the *Evidence of stock structure* section in the *Introduction* of last year's full stock assessment for further details about the two species and the experimental design. We are also beginning to examine whether differences in life history characteristics (e.g., age and growth) exist for the two species. When combined with accurate species-specific catch and survey data, such information will help determine whether one species is a weaker stock and the potential for overfishing.

The SSC December 2007 minutes included the following comments concerning Pacific ocean perch which we determined also concern rougheye rockfish:

"The SSC requests that the authors include plots of the spatial distribution of the catch in future assessments. The SSC also requests that the tables of commercial catch should include estimates of discard as well as retained catch."

Historical maps of rougheye rockfish observed catch (kg) for all gear types are provided from 1993 through 2007 (Figures 11.1 – 11.5). Data are available online from Fisheries Monitoring and Analysis Division (FMA, Observer program) at www.afsc.noaa.gov/FMA/spatial_data.htm. Catches are aggregated in 10 km x 10 km (100 km^2) cell blocks and cells representing less than three vessels for a given gear type and year are not provided due to confidentiality issues. Description and appropriate usage of data are available on the webpage given above. Spatial distribution of rougheye rockfish catch is generally along the continental shelf break. Large catches are sporadic in the 1990s often occurring in the Yakutat, Seward, and Amatuli gully regions and are rare following 2000.

Gulfwide discard rates (% discarded) are provided in a separate table embedded in the main text of the stock assessment (please see *Discards* of the *Fishery* section in the *Introduction* of last year's full stock assessment, www.afsc.noaa.gov/REFM/docs/2007/GOArougheye.pdf). We intend to also include these estimates of discard rate in the catch table for the full assessment next year.

Research Priorities

It is critically important to rockfish stock assessments that the GOA trawl surveys continue and that they extend into deeper waters (>300m) in order to cover the range of primary habitat for rockfish, especially the rougheye rockfish complex. There is little information on larval, post-larval, or early juvenile stages of rockfish. Habitat requirements for these stages are mostly unknown. Research on early life history parameters and essential habitat for these early life stages is vital to effective management of rockfish.

Literature Cited

Orr, J.W. and S. Hawkins. 2008. Species of the rougheye rockfish complex: resurrection of Sebastes melanostictus (Matsubara, 1934) and a redescription of Sebastes aleutianus (Jordan and Evermann, 1898) (Teleostei: Scorpaeniformes). Fisheries Bulletin. 106: 111-134.

Summaries for Plan Team

Species	Year	Biomass[1]	OFL	ABC	TAC	Catch[2]
Rougheye rockfish complex	2007	39,506	1,148	988	988	425
	2008	46,121	1,548	1,286	1,286	370
	2009	46,385	1,545	1,284		
	2010	46,637	1,562	1,297		

[1]Total biomass from the age-structured model

Stock/ Assemblage	Area	2008 OFL	ABC	TAC	Catch[2]	2009 OFL	ABC	2010 OFL	ABC
Rougheye rockfish complex	W		125	125	76		125		126
	C		834	834	177		833		842
	E		327	327	117		326		329
	Total	1,548	1,286	1,286	370	1,545	1,284	1,562	1,297

[2]Current as of October 14, 2008 (http://www.fakr.noaa.gov)

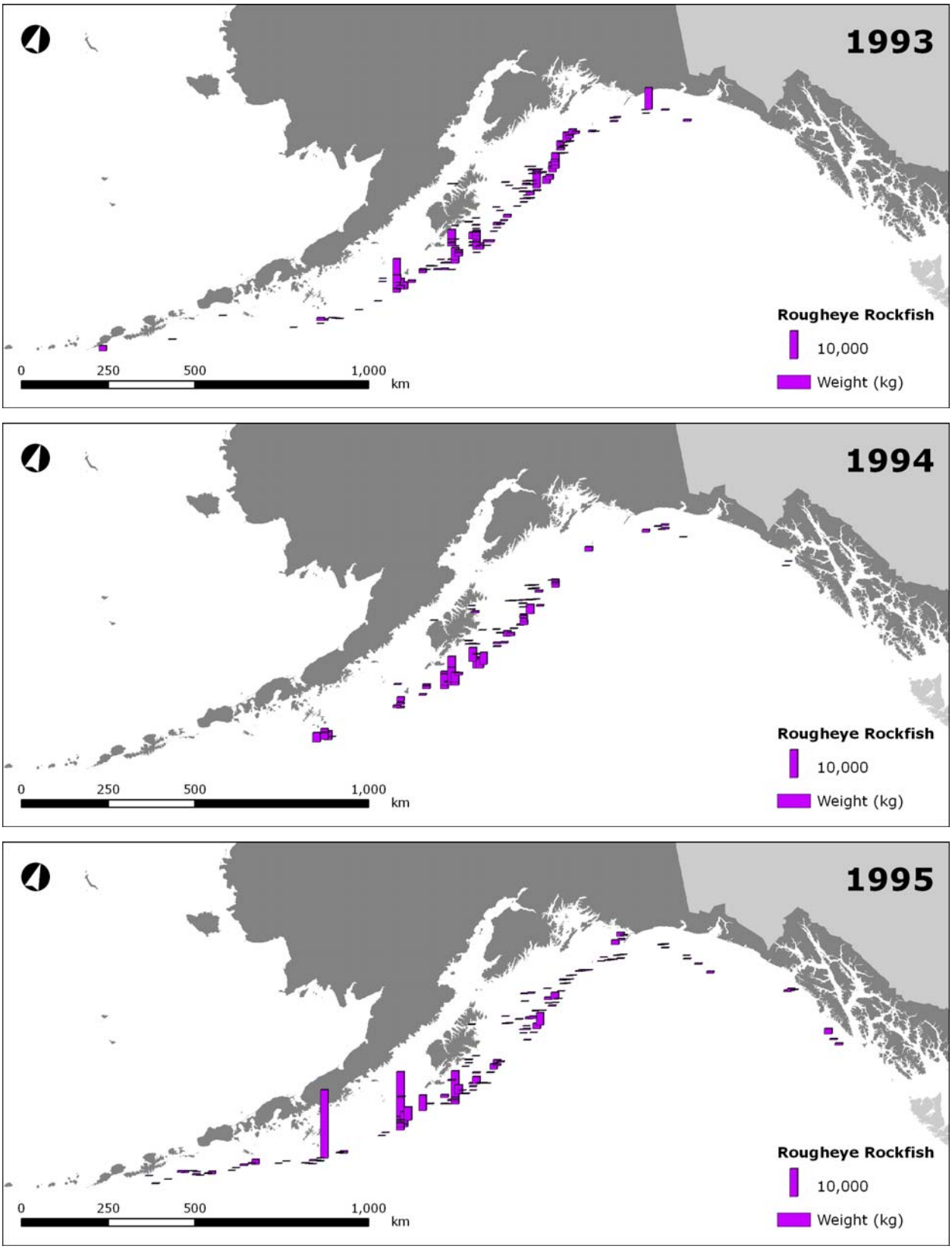

Figure 11.1: Maps of fishery catch based on observer data by 100 km^2 blocks for the rougheye rockfish complex from 1993-1995.

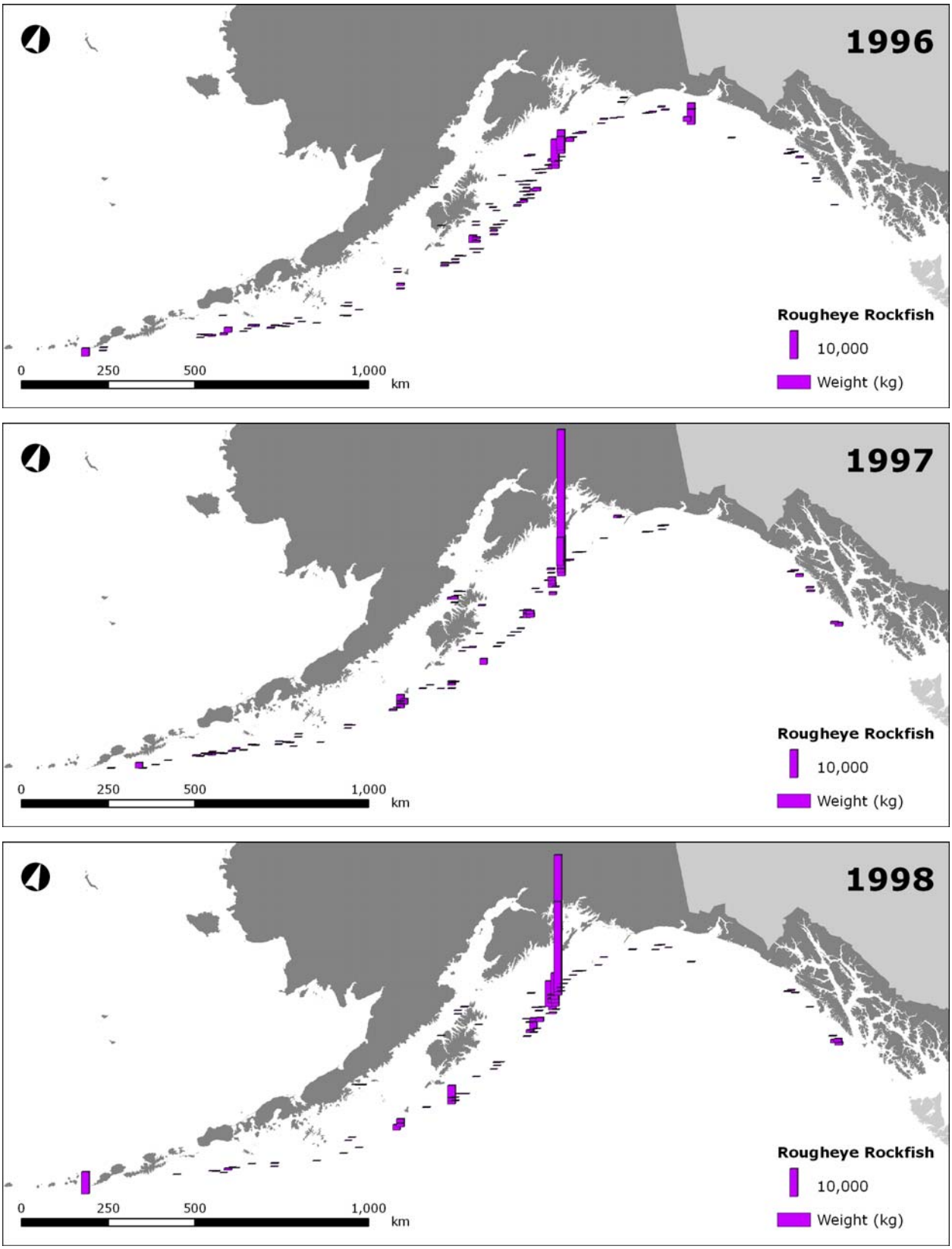

Figure 11.2: Maps of fishery catch based on observer data by 100 km^2 blocks for the rougheye rockfish complex from 1996-1998.

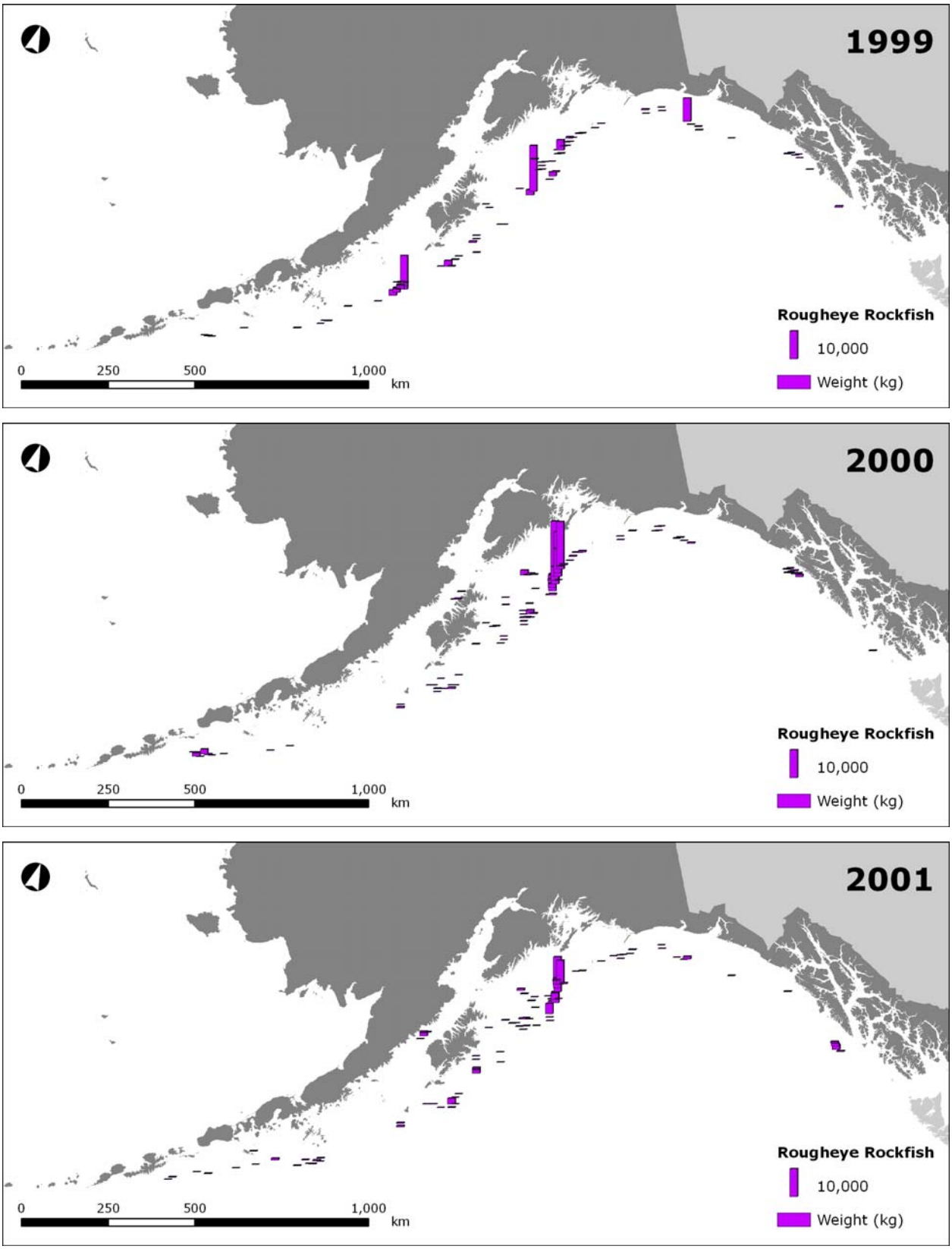

Figure 11.3: Maps of fishery catch based on observer data by 100 km^2 blocks for the rougheye rockfish complex from 1999-2001.

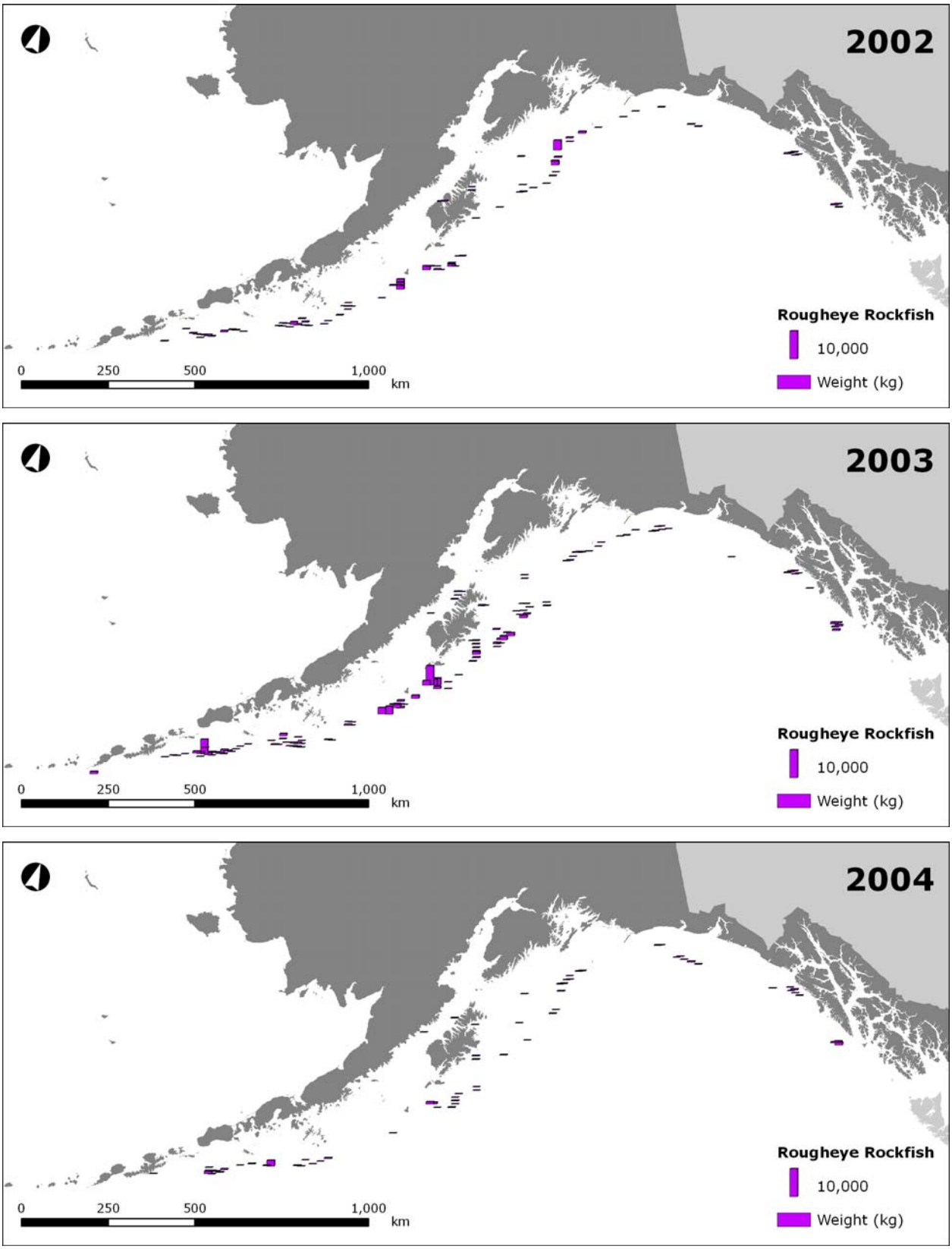

Figure 11.4: Maps of fishery catch based on observer data by 100 km^2 blocks for the rougheye rockfish complex from 2002-2004.

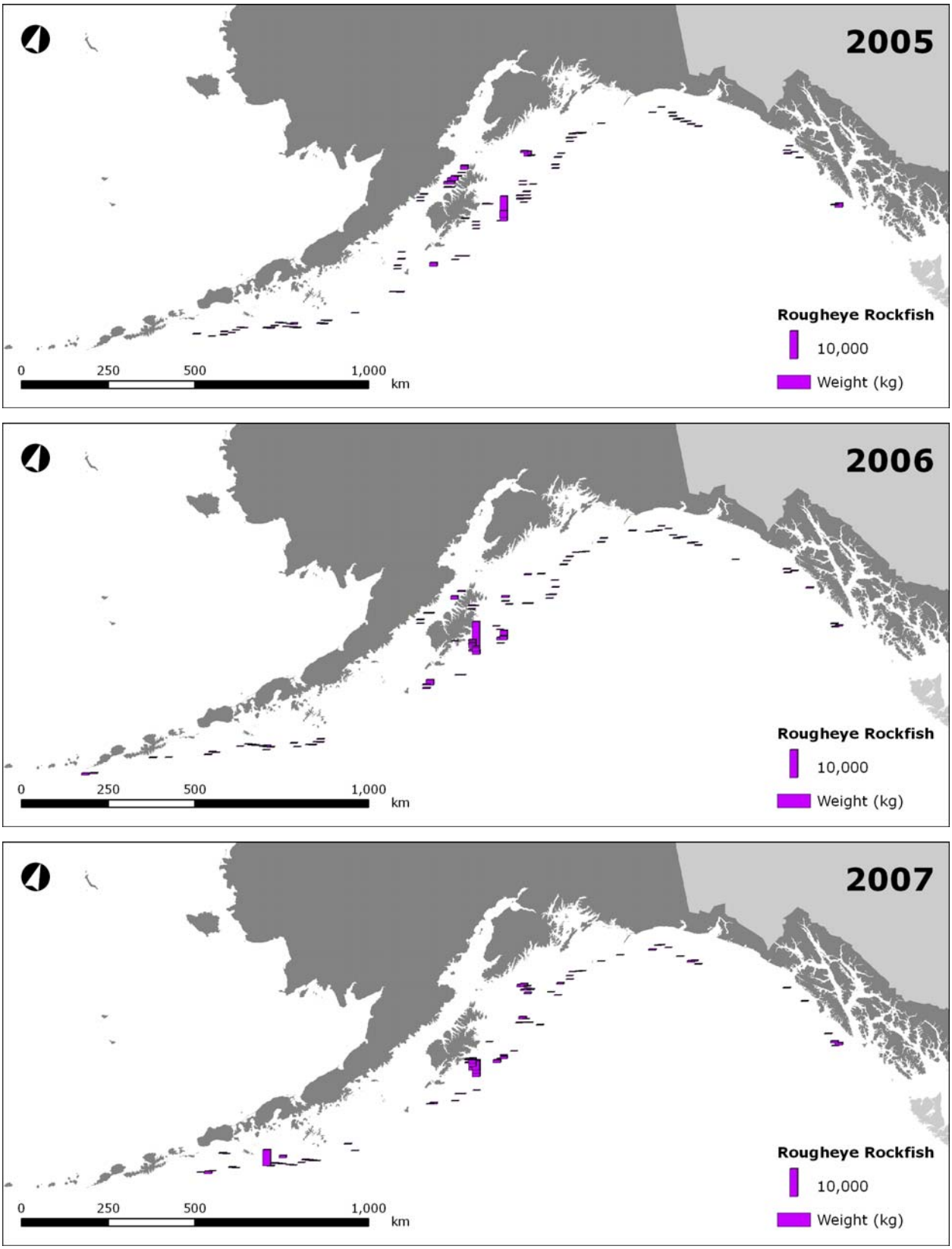

Figure 11.5: Maps of fishery catch based on observer data by 100 km^2 blocks for the rougheye rockfish complex from 2005-2007.

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