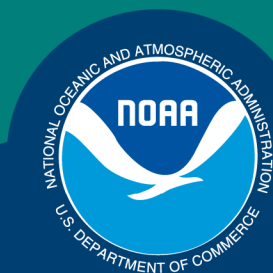


*Science, Service, Stewardship*

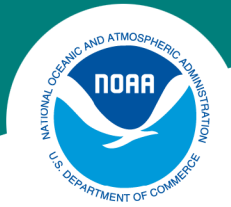


## BSAI Sculpin Complex

Ingrid Spies

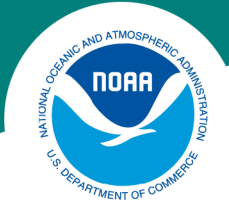
November 17, 2016

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## BSAI Sculpin Reference Points

<b>Quantity</b>	As estimated or <i>specified last year for:</i>		As estimated or <i>recommended this year for:</i>	
	2016	2017	2017	2018
$M$ (natural mortality rate)*	0.29	0.29	0.283	0.283
Tier	5	5	5	5
Biomass (t)	194,783	194,783	199,937	199,937
$F_{OFL}$	0.29	0.29	0.283	0.283
$maxF_{ABC}$	0.22	0.22	0.212	0.212
$F_{ABC}$	0.22	0.22	0.212	0.212
OFL (t)	56,487	56,487	56,582	56,582
maxABC (t)	42,852	42,852	42,387	42,387
ABC (t)	42,852	42,852	42,387	42,387
<b>Status</b>	As determined <i>last year for:</i>		As determined <i>this year for:</i>	
	2014	2015	2015	2016
Overfishing		n/a		n/a



## Six most abundant sculpins in the BSAI

bigmouth (*Hemitripterus bolini*)

great (*Myoxocephalus polyacanthocephalus*)

plain (*Myoxocephalus jaok*)

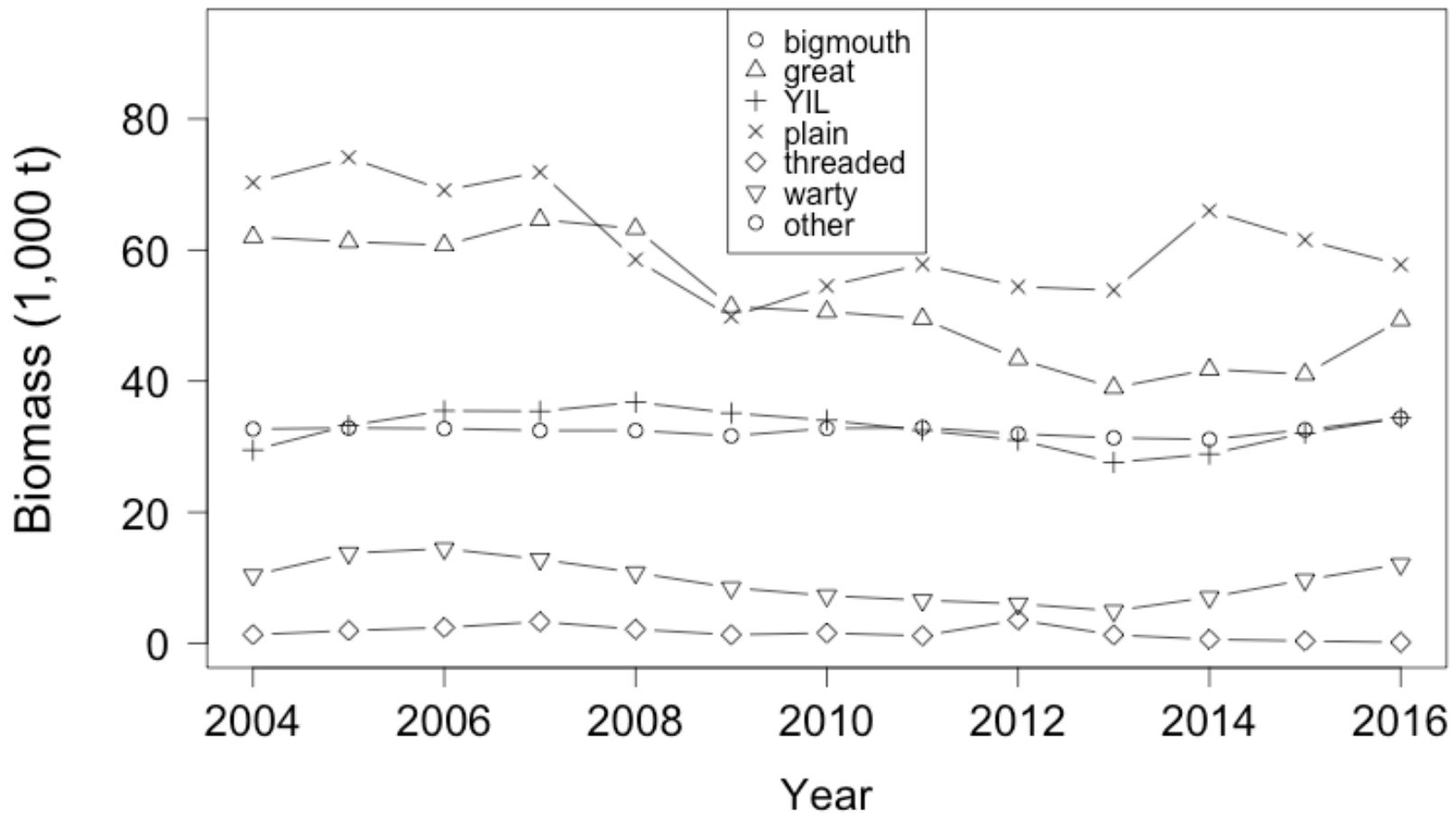
threaded (*Gymnocanthus pistilliger*)

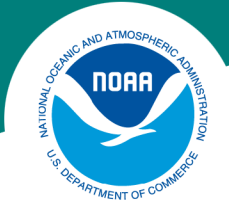
warty (*Myoxocephalus verrucosus/scorpius*)

yellow Irish lord (*Hemilepidotus jordani*)



## Random effect estimates of the six most common sculpin species in the BSAI, in 1,000 t



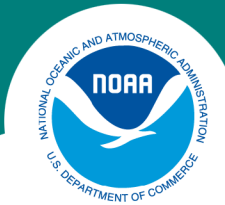


## Plan Team Comments

The BSAI Plan Team recommended using the random effects model to estimate the sculpin biomass for future assessments. The SSC concurred (December 2014).

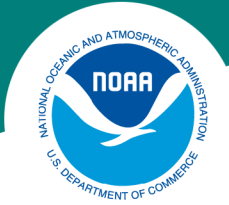
Authors' response: Assessment methodology has changed to using the random effects model for biomass estimates.

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2017-2018 sculpin complex <i>M</i> harvest specification							
2016 random effects model estimate					Relative proportion	<i>M</i>	weighted contribution to mort. est.
species	EBS shelf	EBS slope	AI	<b>BSAI</b>			
bigmouth	32,002	1,889	476	34,367	0.183	0.21	0.038
great	48,329	0	990	49,319	0.262	0.28	0.073
YIL	25,698	75	8,605	34,378	0.183	0.17	0.031
plain	57,753	0	0	57,753	0.307	0.40	0.123
threaded	148	0	0	148	0.001	0.45	0.000
warty	12,066	0	0	12,066	0.064	0.26	0.017
other	4,733	3,206	3,966	11,905		-	
<b>total</b>	<b>180,729</b>	<b>5,170</b>	<b>14,037</b>	<b>199,937</b>			<b>Complex <i>M</i>: 0.283</b>
<b>Total (6 most common species only):</b>				<b>188,033</b>			

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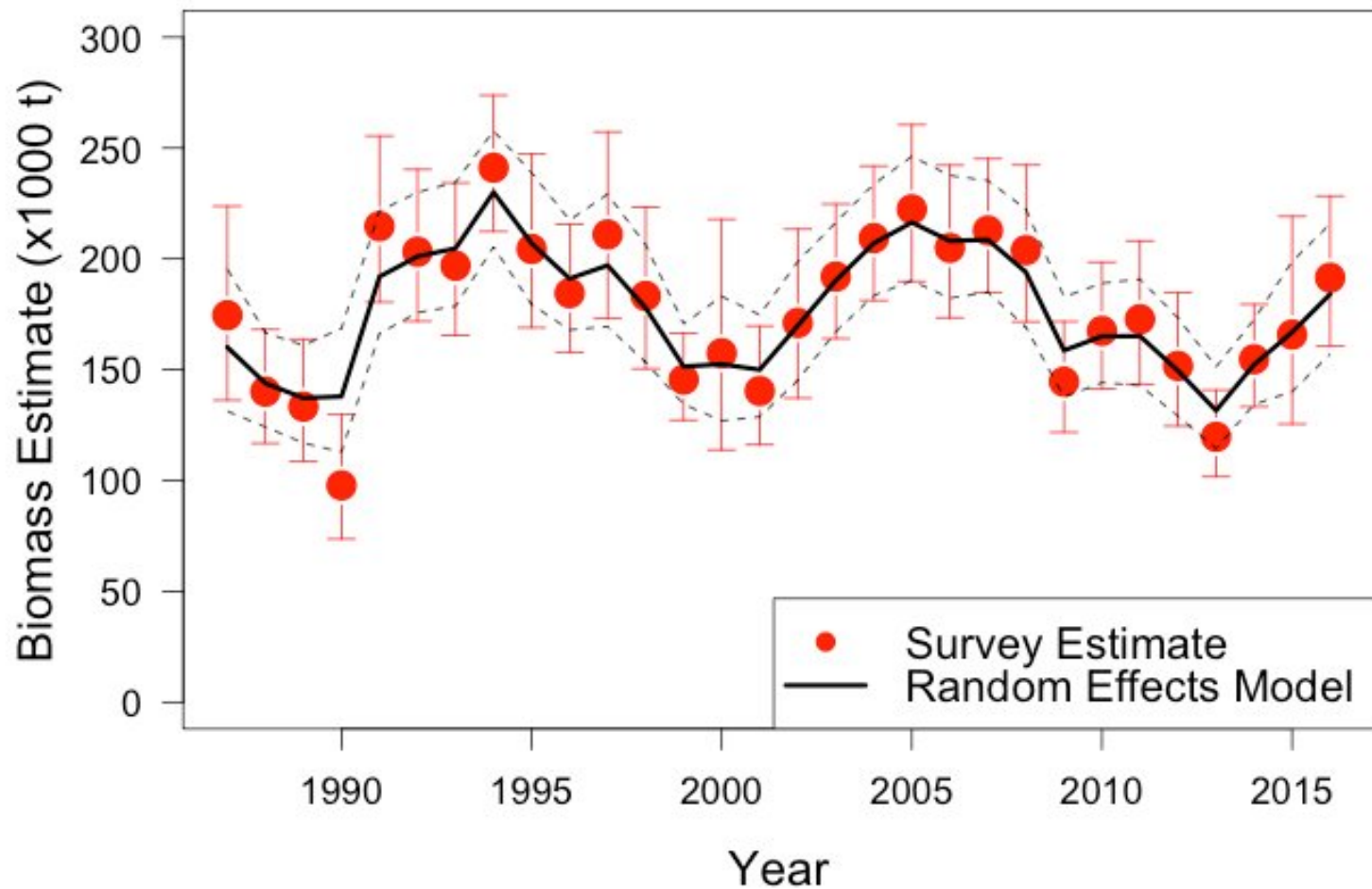
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weighted-average mortality rate	0.283
BSAI sculpin complex biomass estimate (t)	199,937
$F_{OFL}$	0.283
max $F_{ABC}$	0.212
rec. $F_{ABC}$	0.212
OFL (t)	56,582
max. ABC (t)	42,387
rec. ABC (t)	42,387

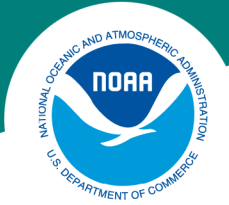
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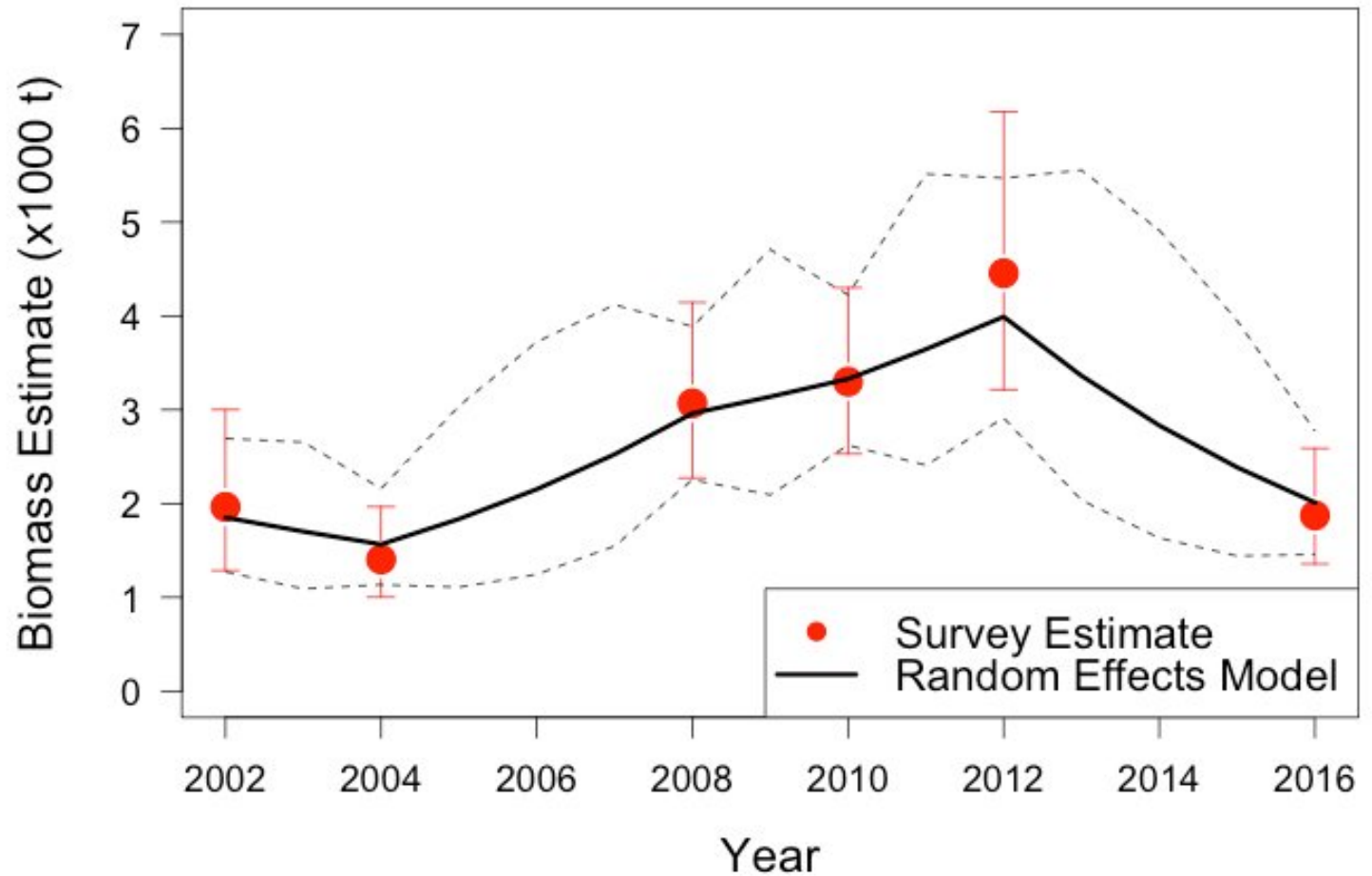
# EBS shelf





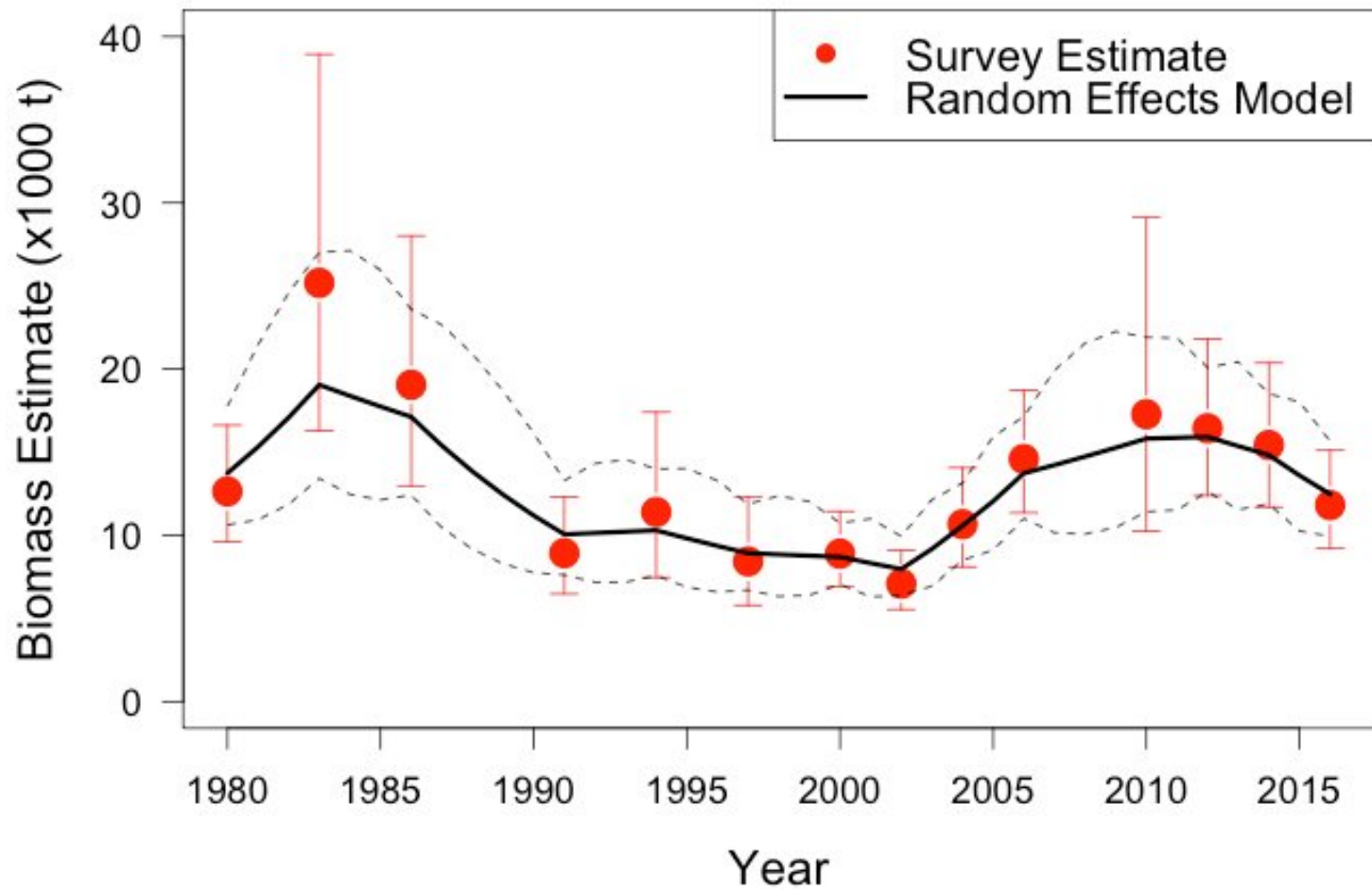


# EBS slope

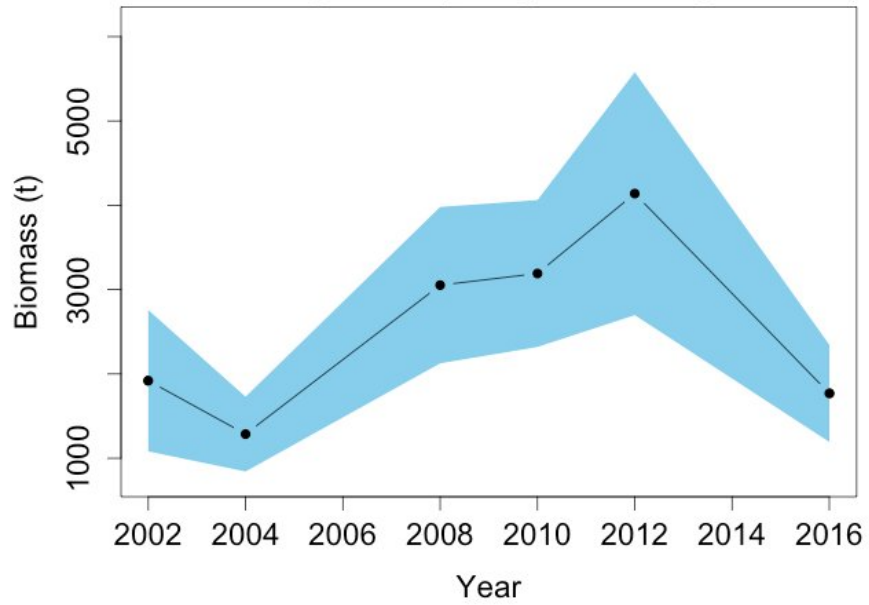




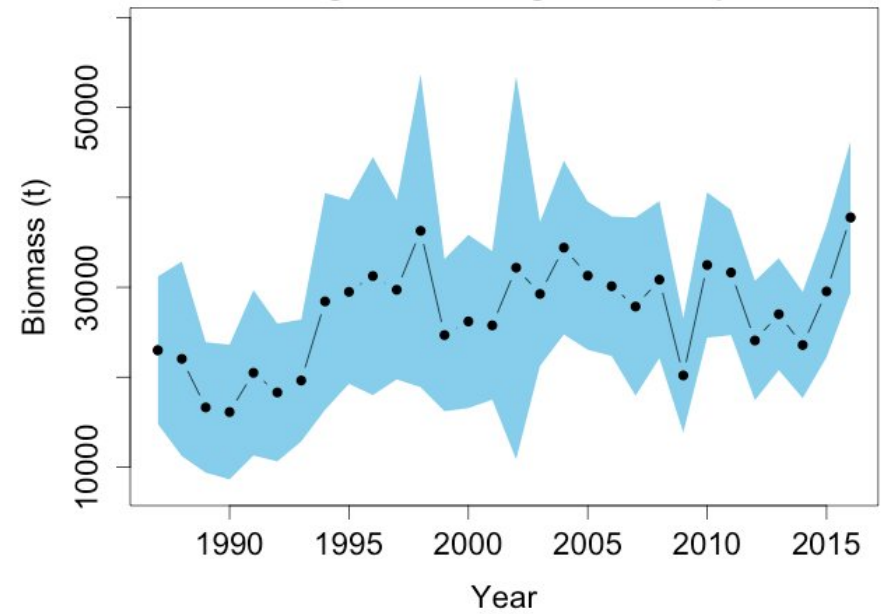
# Aleutian Islands



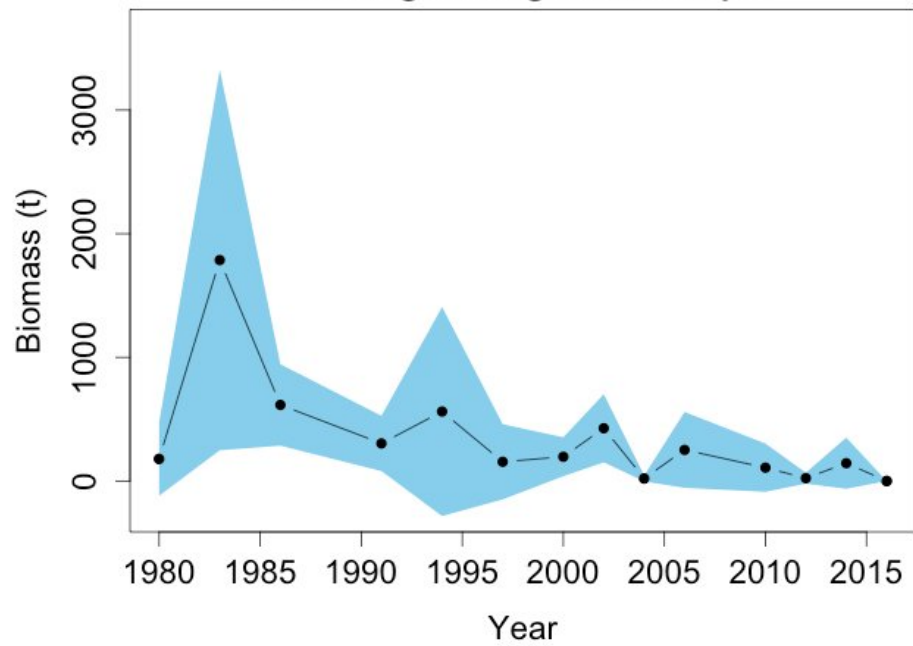
**Bering Sea slope bigmouth sculpin**



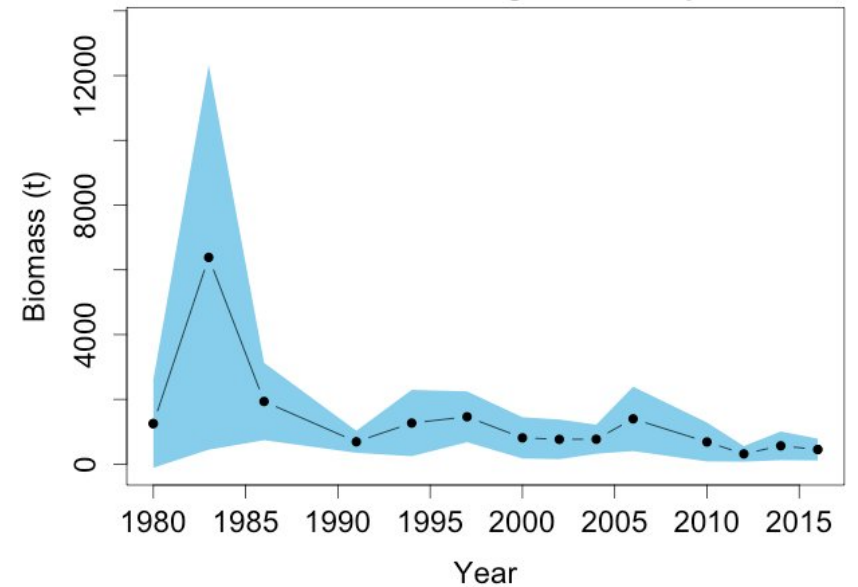
**Bering Sea shelf bigmouth sculpin**



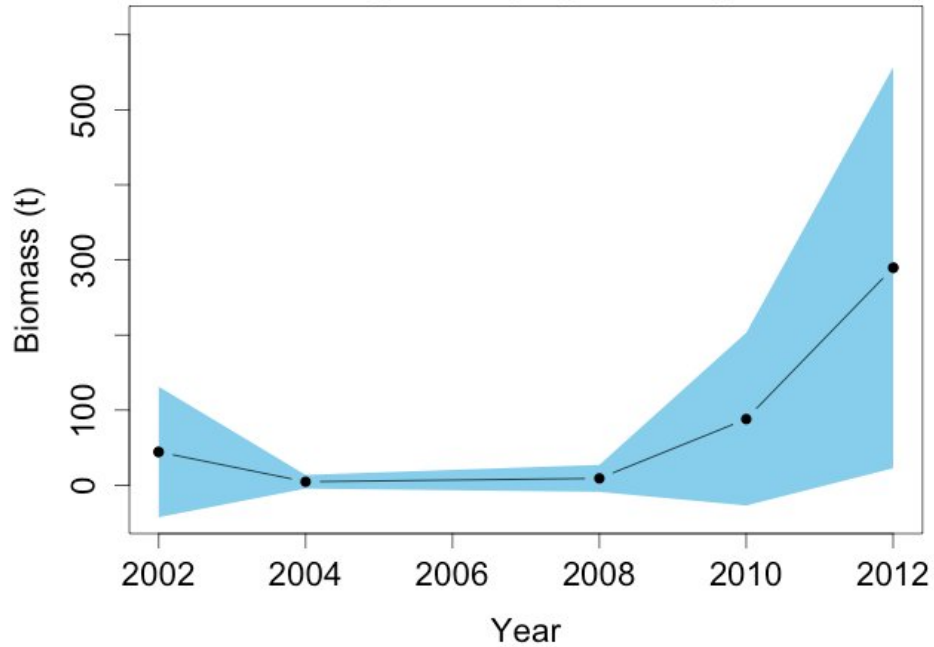
**S. Bering Sea bigmouth sculpin**



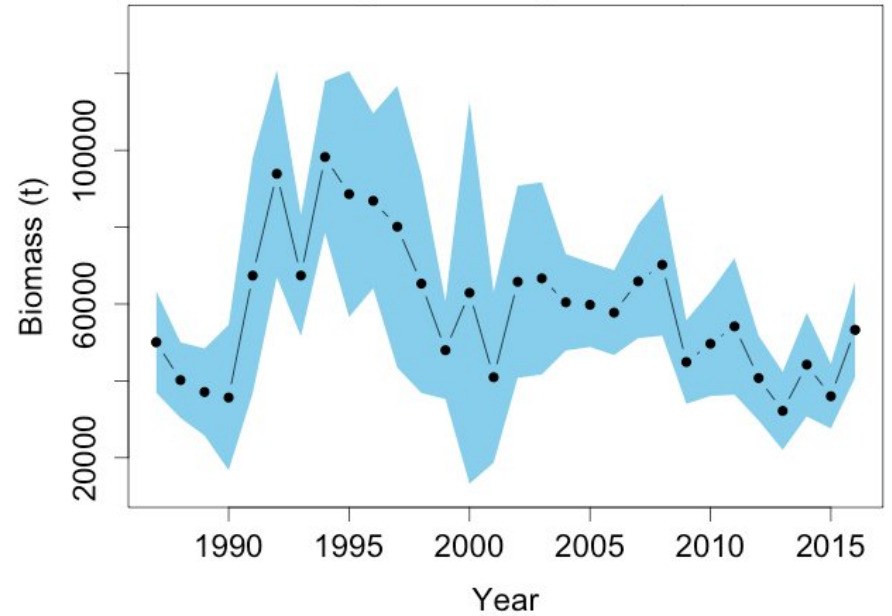
**Aleutian Islands bigmouth sculpin**



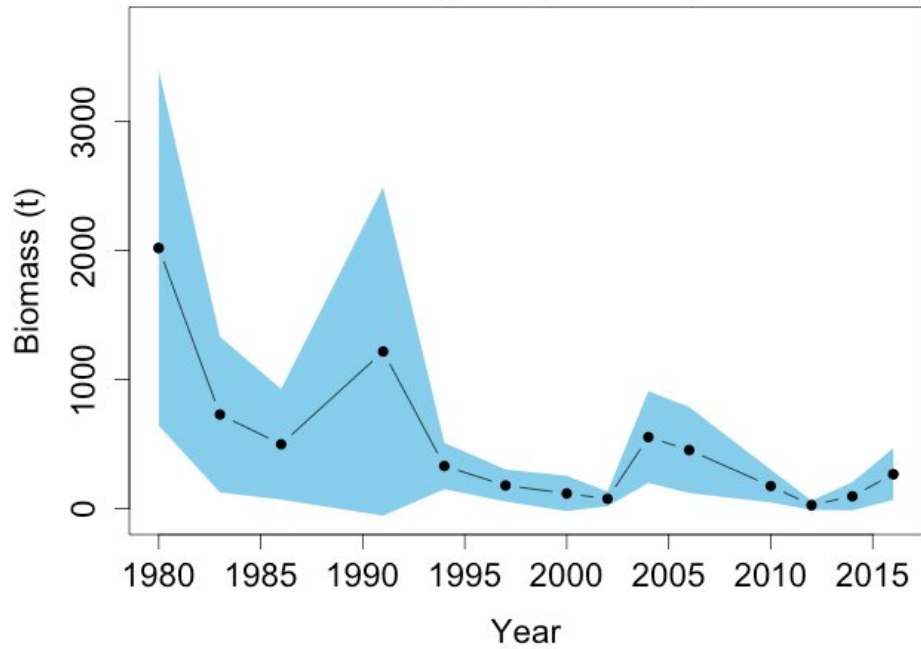
**Bering Sea slope great sculpin**



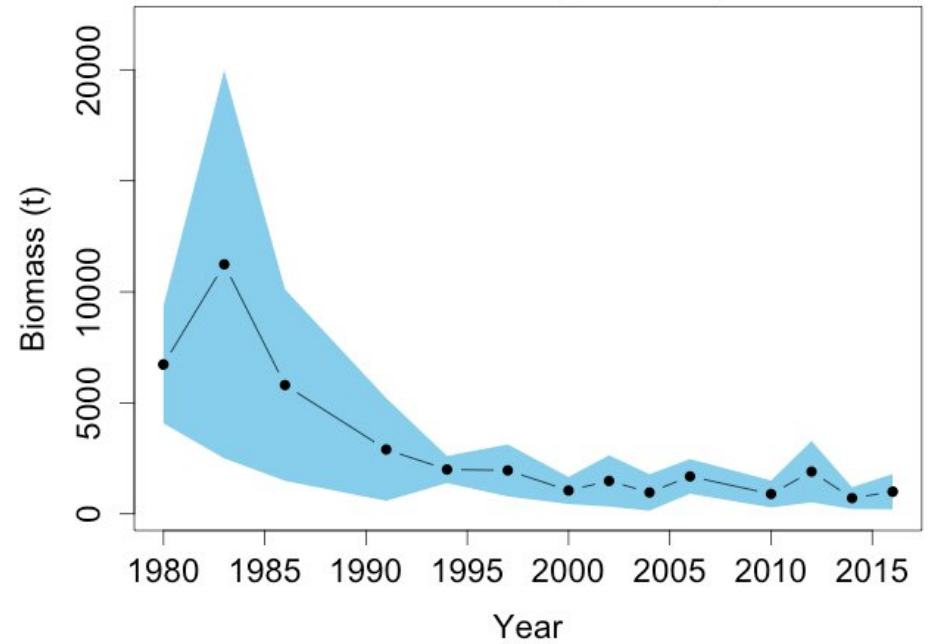
**Bering Sea shelf great sculpin**

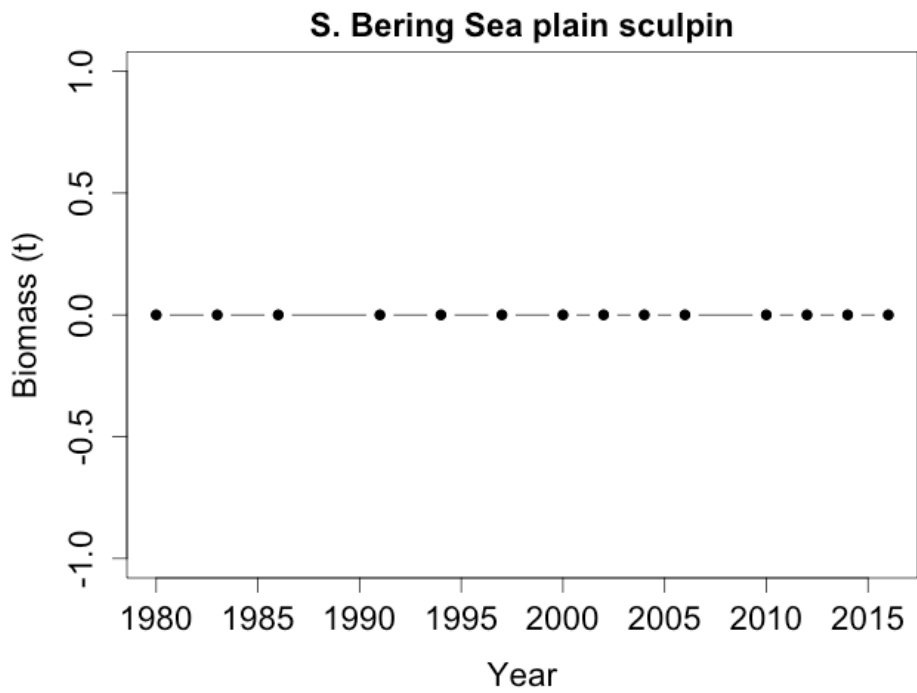
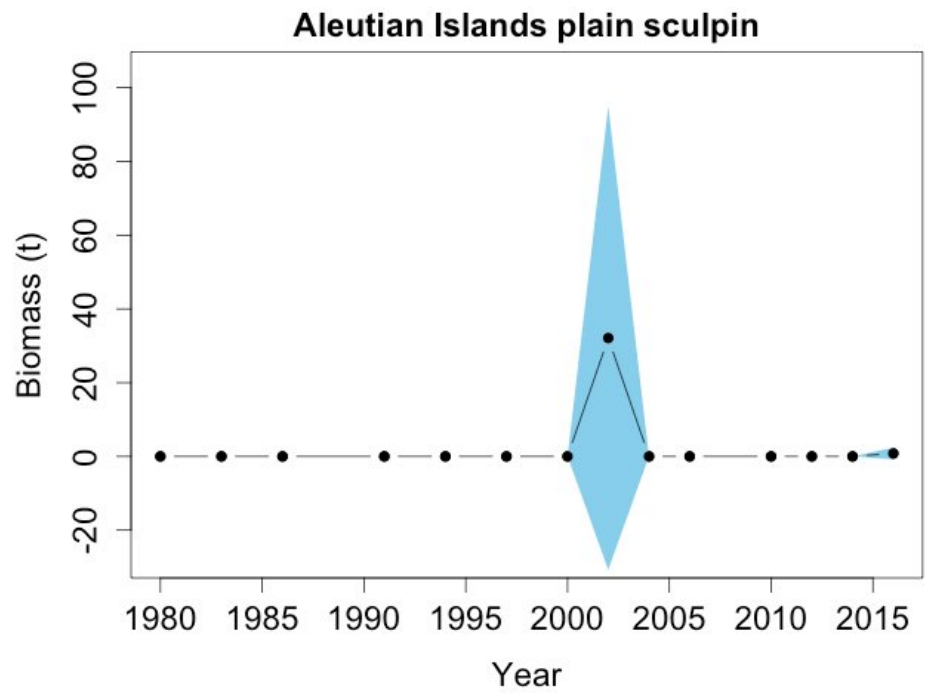
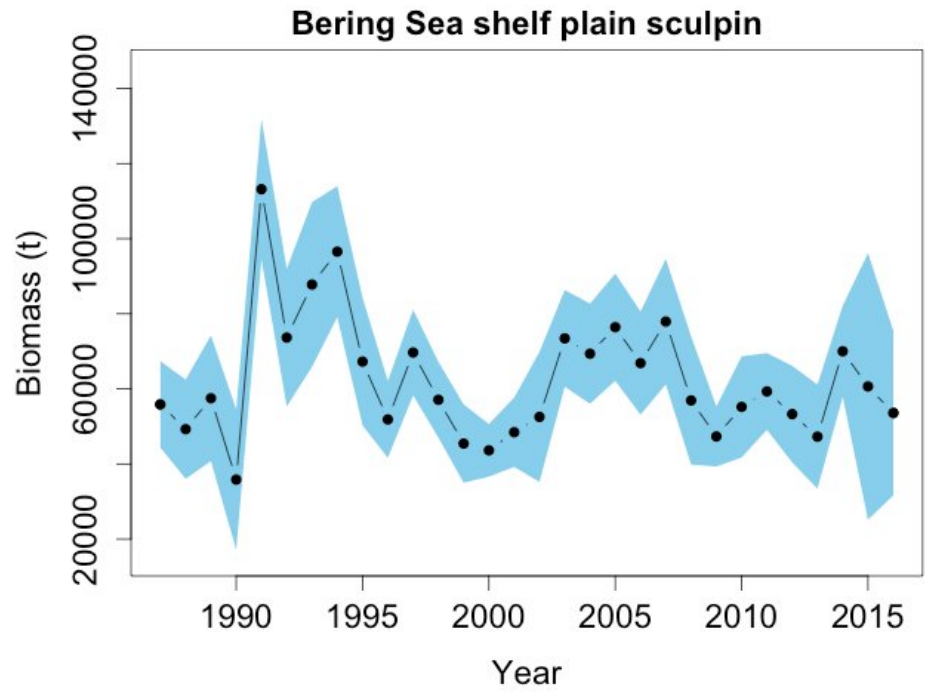


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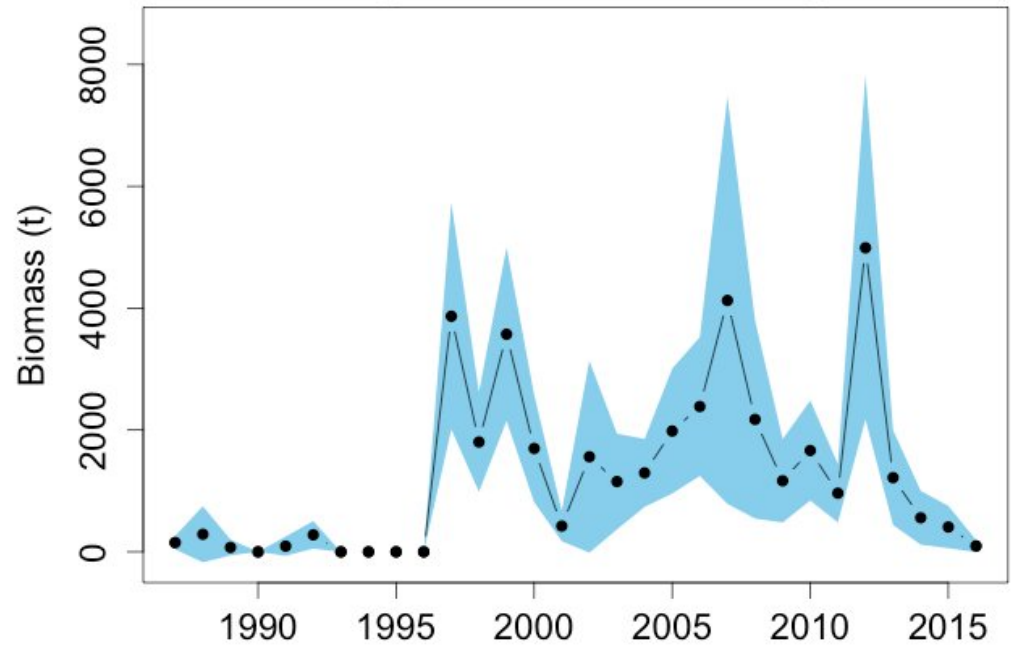


**Aleutian Islands great sculpin**

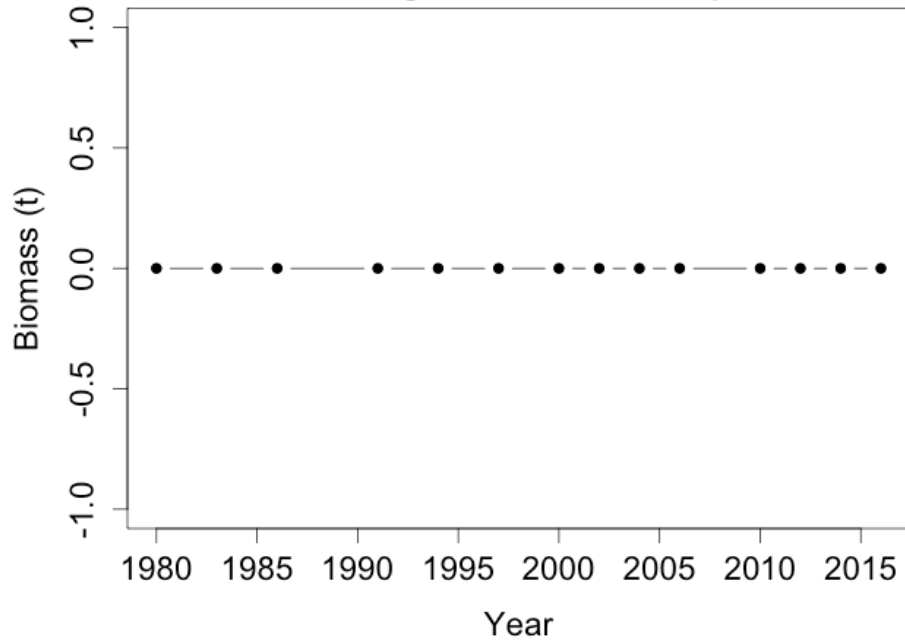




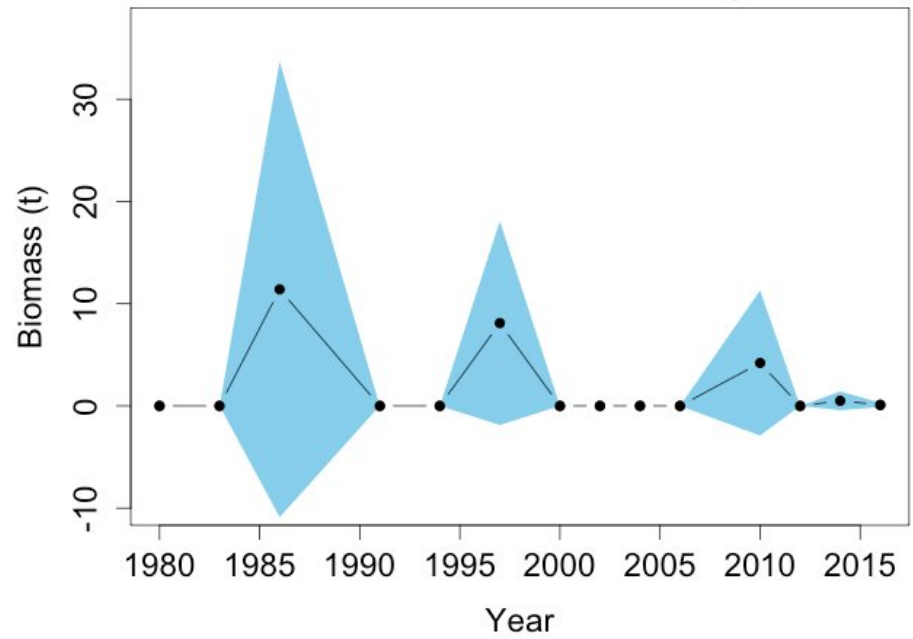
**Bering Sea shelf threaded sculpin**



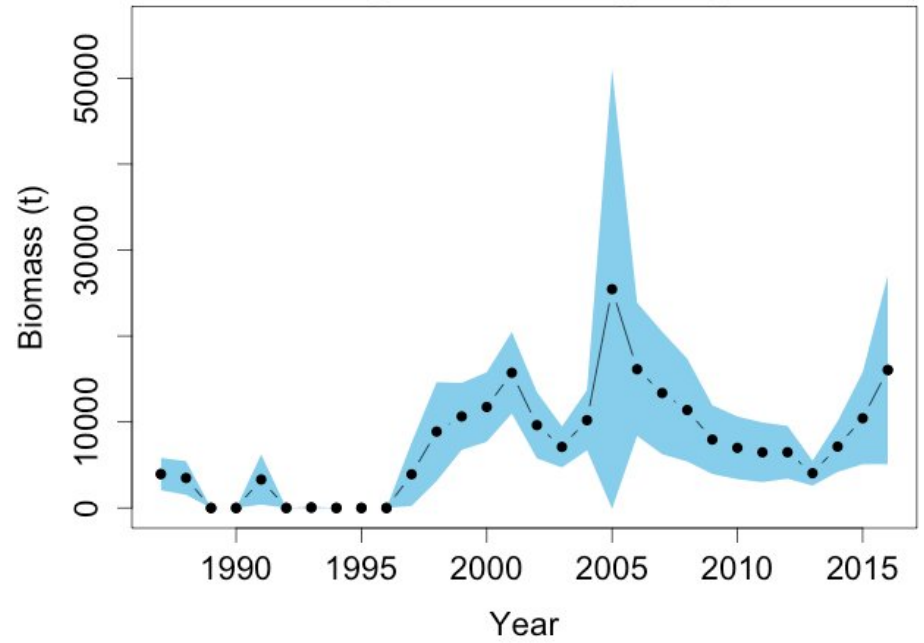
**S. Bering Sea threaded sculpin**



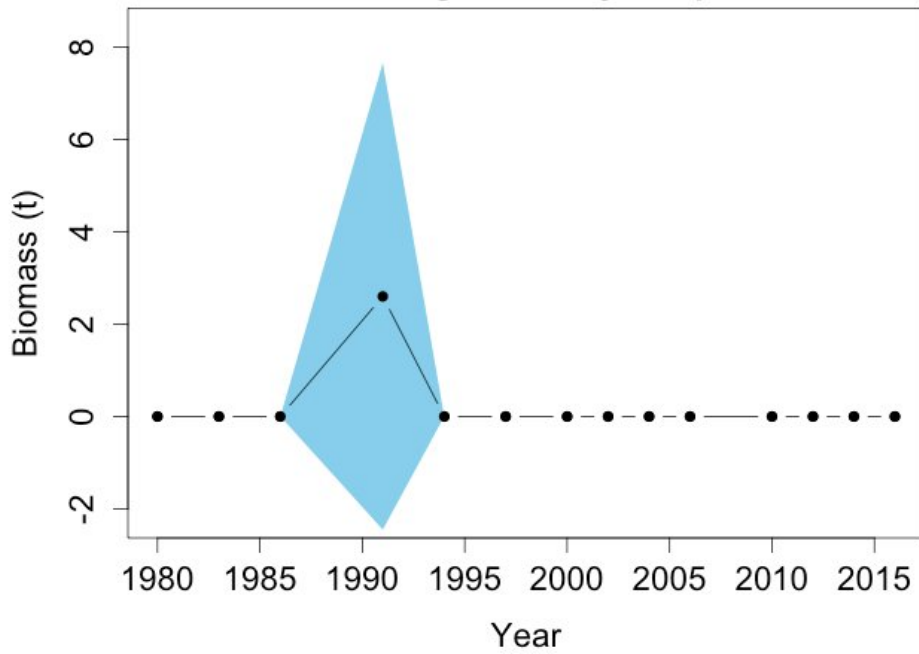
**Aleutian Islands threaded sculpin**



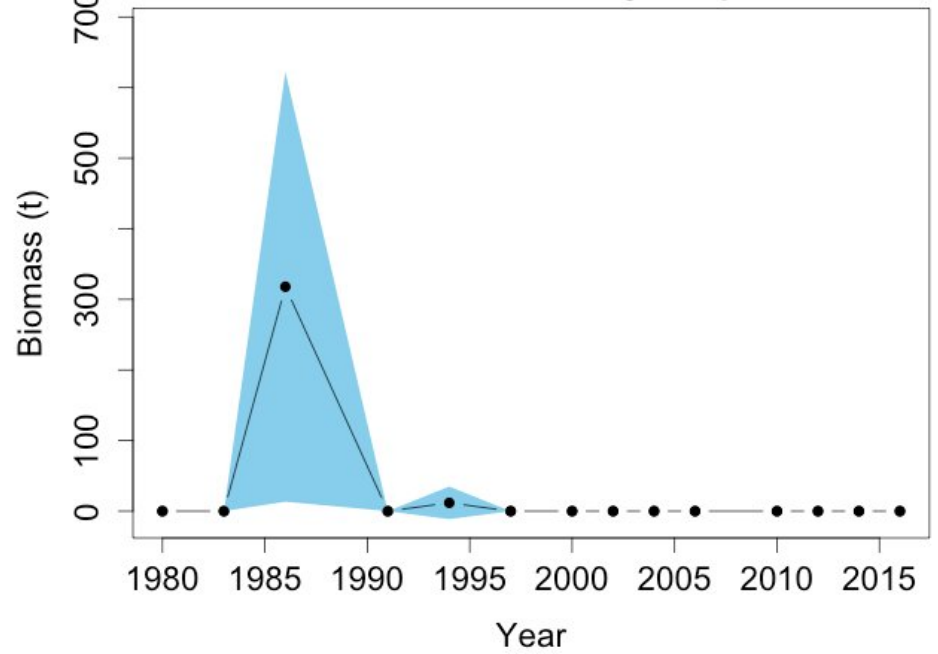
**Bering Sea shelf warty sculpin**



**S. Bering Sea warty sculpin**

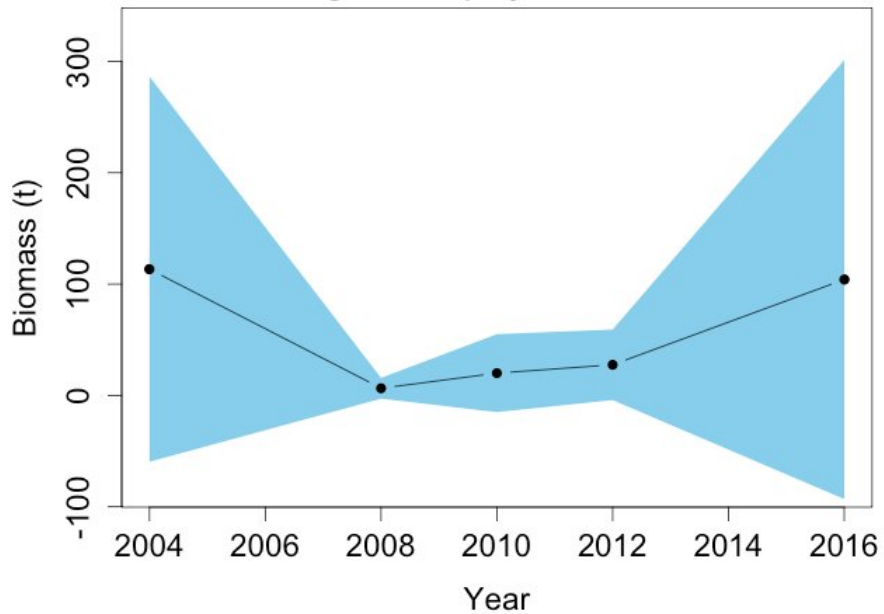


**Aleutian Islands warty sculpin**

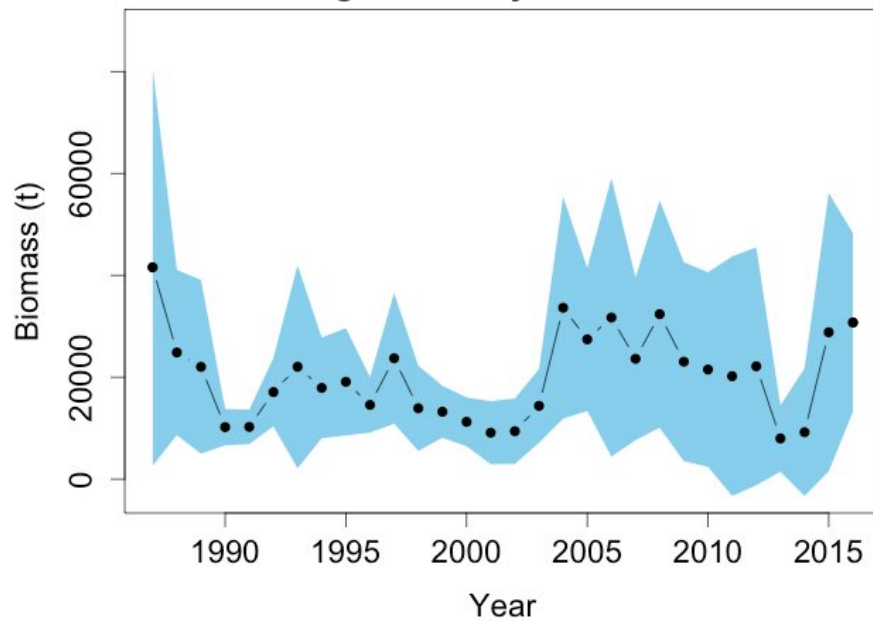




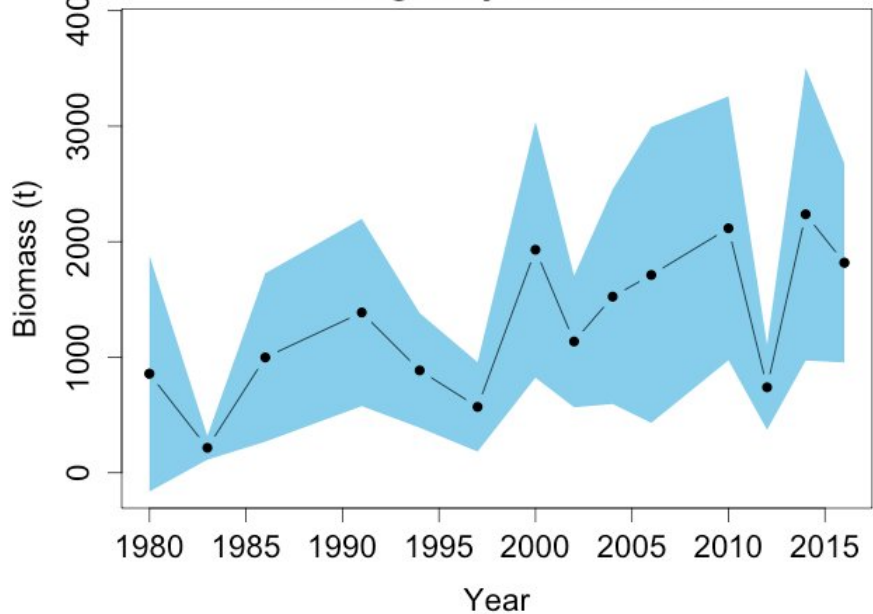
**Bering Sea slope yellow Irish lord**



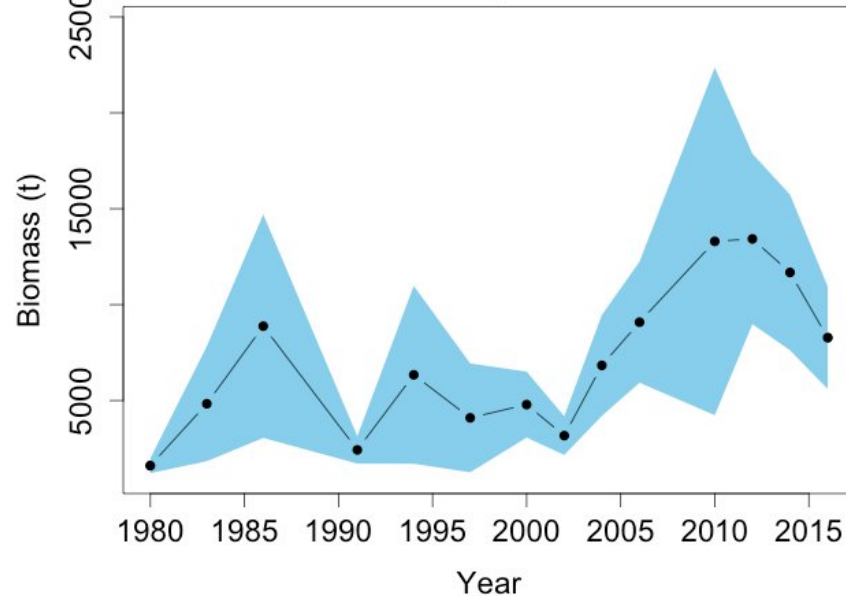
**Bering Sea shelf yellow Irish lord**



**S. Bering Sea yellow Irish lord**

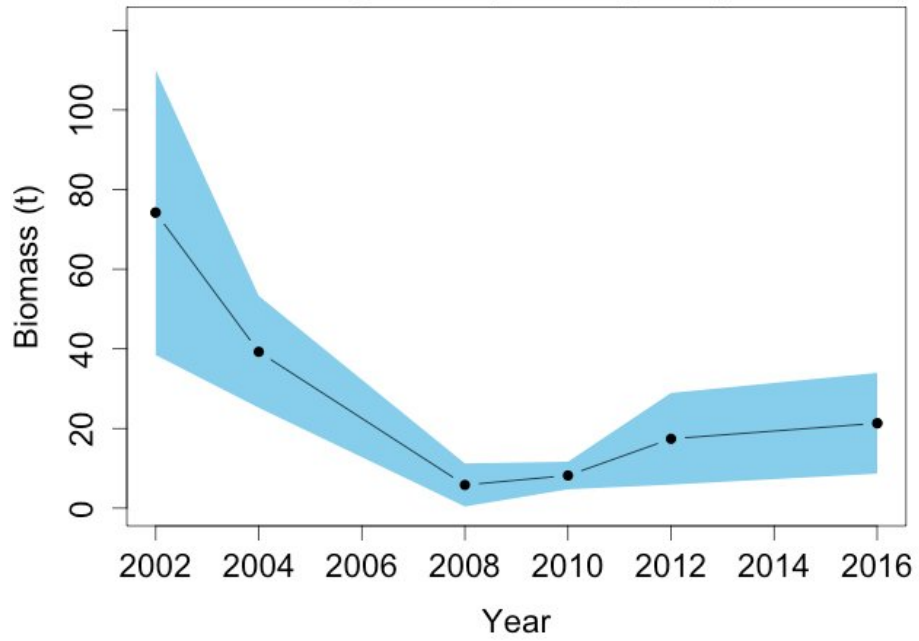


**Aleutian Islands yellow Irish lord**

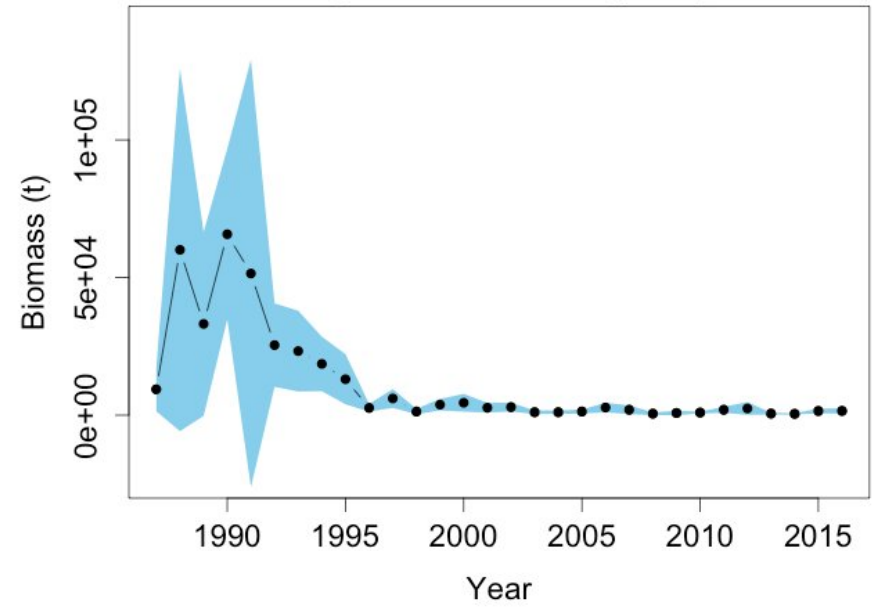




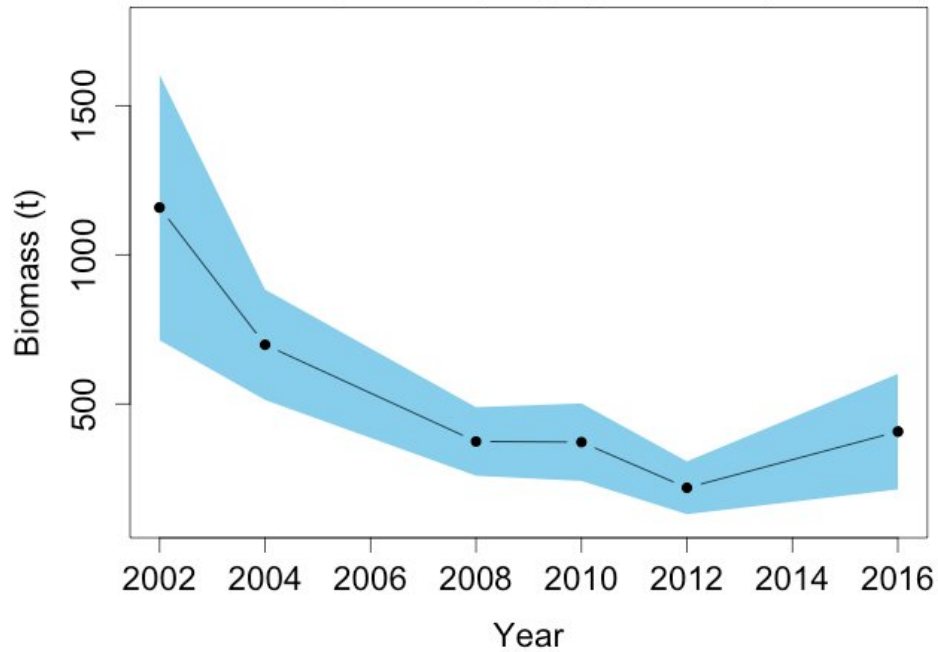
**Bering Sea slope thorny sculpin**

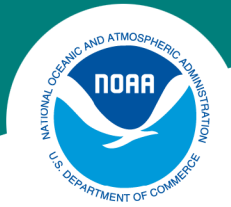


**Bering Sea shelf butterfly sculpin**



**Bering Sea slope spinyhead sculpin**

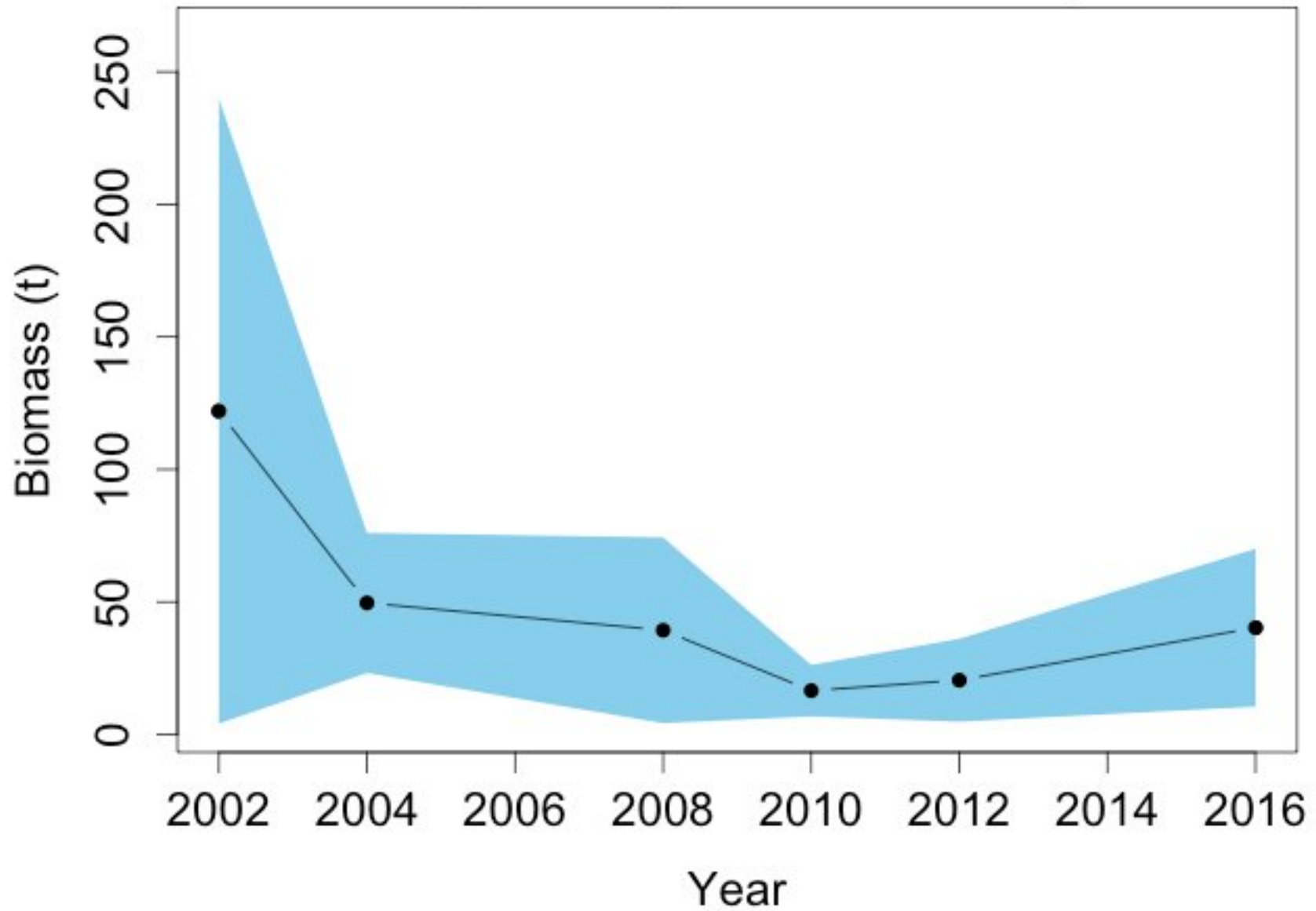




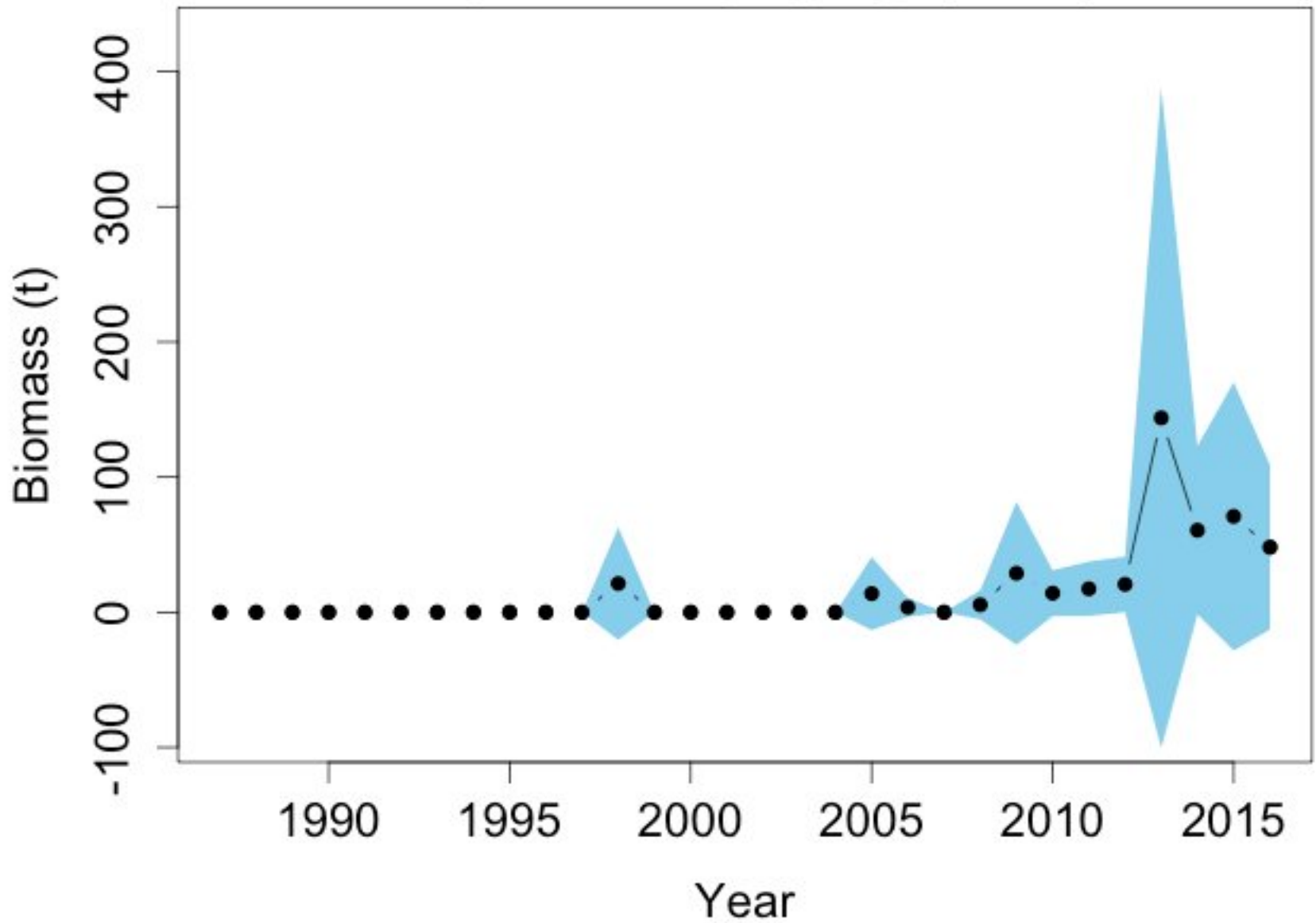
## BSAI Sculpin Complex

<b>Quantity</b>	As estimated or <i>specified last year for:</i>		As estimated or <i>recommended this year for:</i>	
	2016	2017	2017	2018
$M$ (natural mortality rate)*	0.29	0.29	0.283	0.283
Tier	5	5	5	5
Biomass (t)	194,783	194,783	199,937	199,937
$F_{OFL}$	0.29	0.29	0.283	0.283
$maxF_{ABC}$	0.22	0.22	0.212	0.212
$F_{ABC}$	0.22	0.22	0.212	0.212
OFL (t)	56,487	56,487	56,582	56,582
maxABC (t)	42,852	42,852	42,387	42,387
ABC (t)	42,852	42,852	42,387	42,387
<b>Status</b>	As determined <i>last year for:</i>		As determined <i>this year for:</i>	
	2014	2015	2015	2016
Overfishing		n/a		n/a

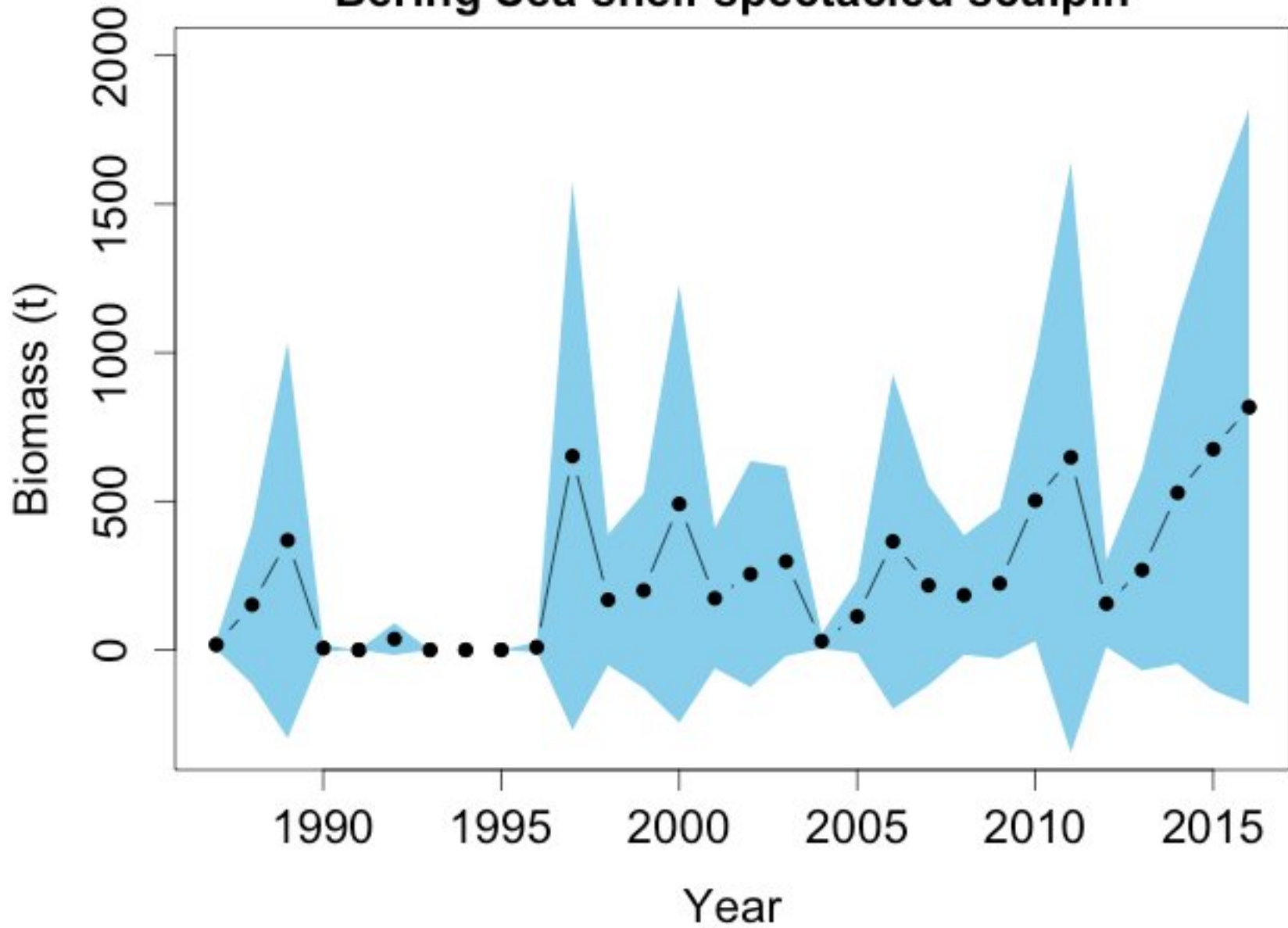
### Bering Sea slope blacknose sculpin



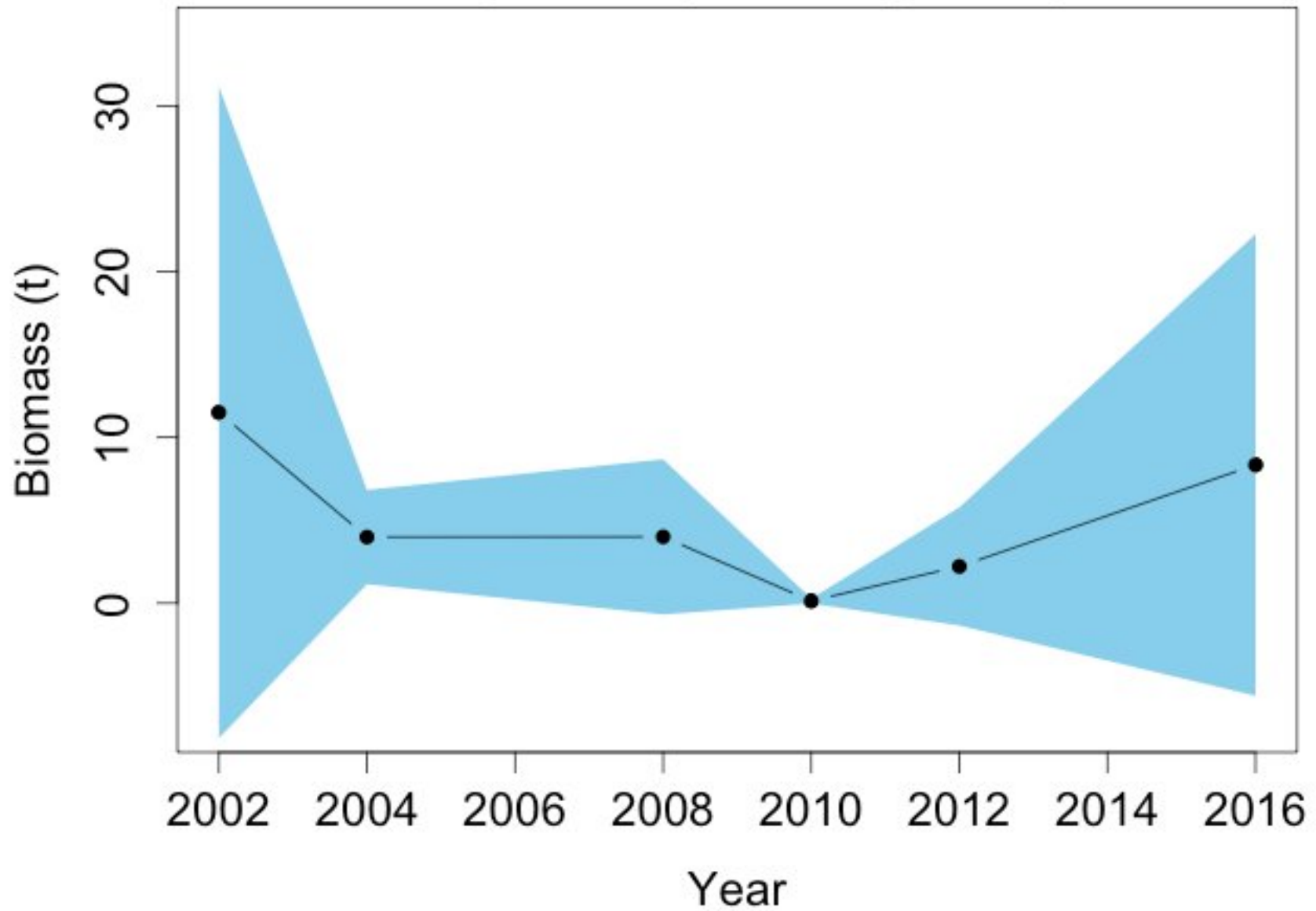
### Bering Sea shelf purplegray sculpin



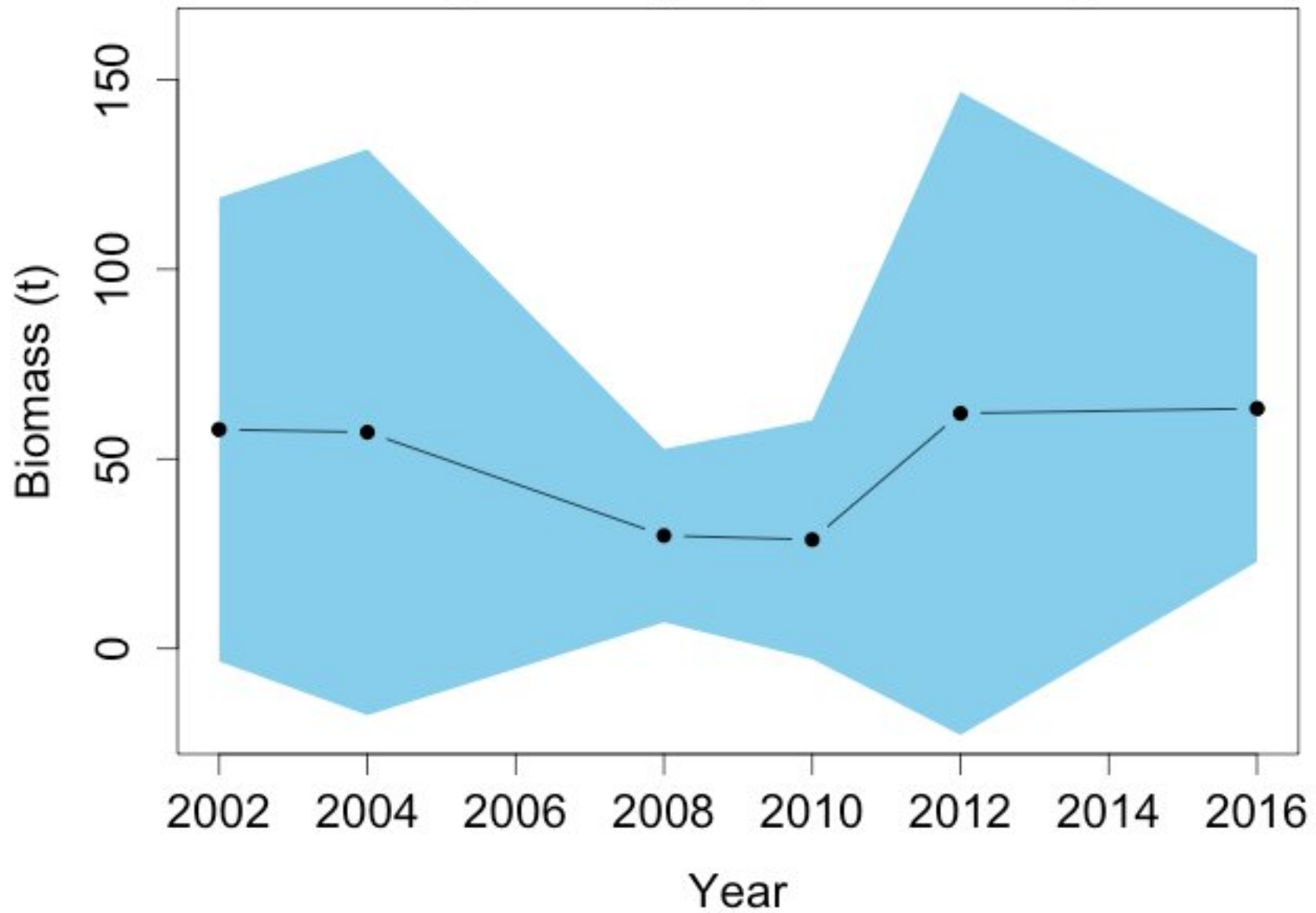
### Bering Sea shelf spectacled sculpin



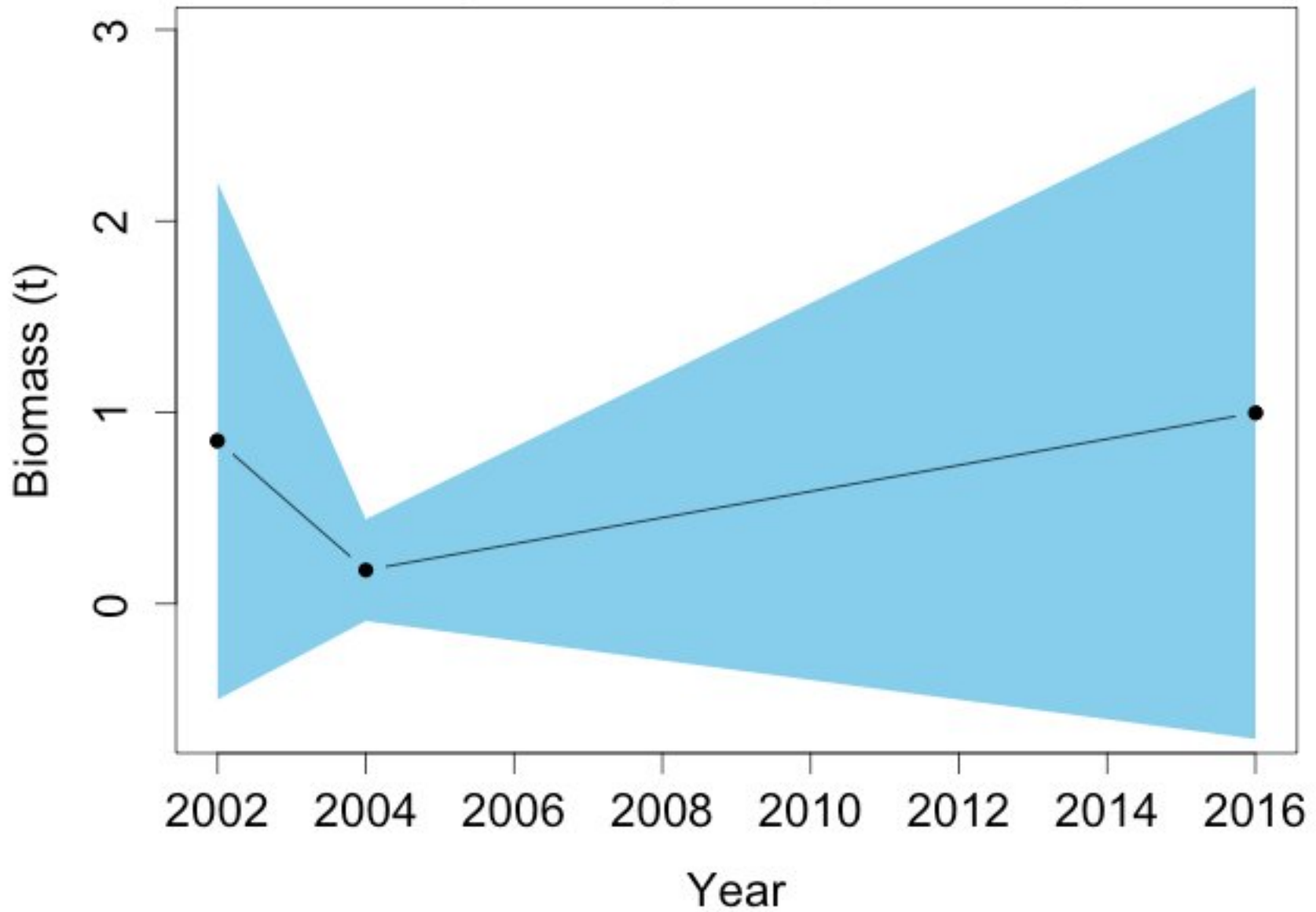
### Bering Sea slope wide-eye sculpin



## Bering Sea slope spectacled sculpin

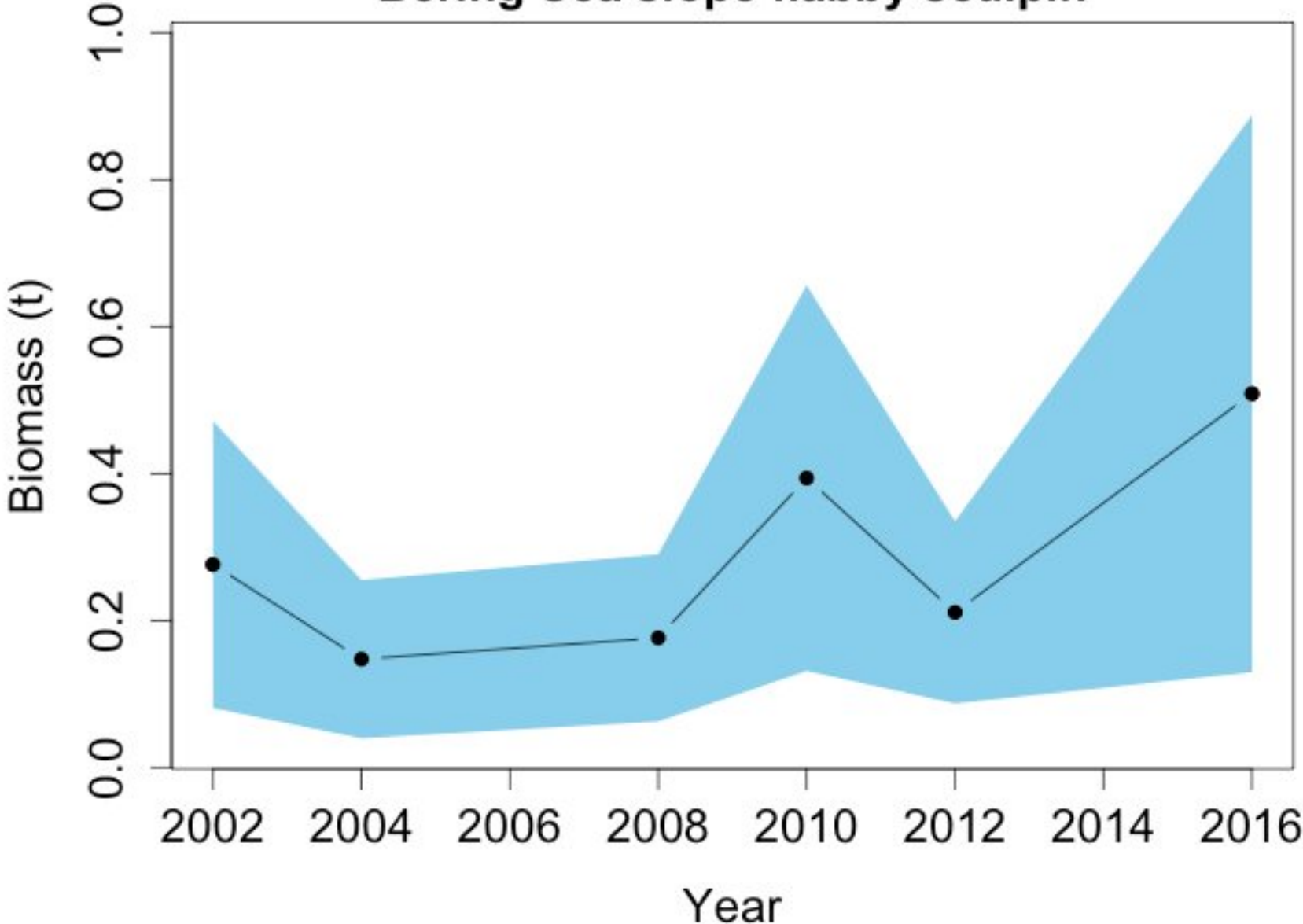


### Bering Sea slope roughskin sculpin

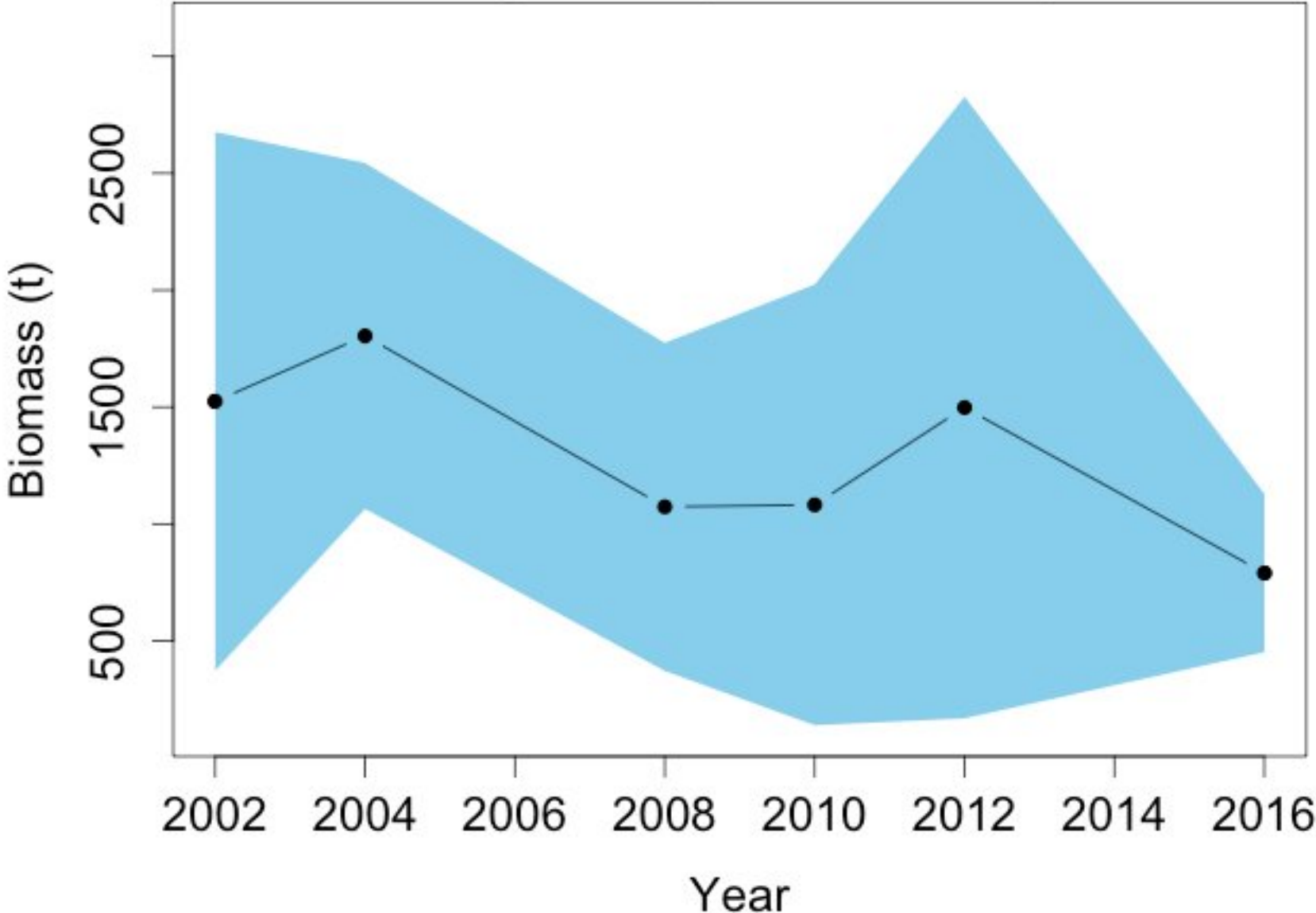




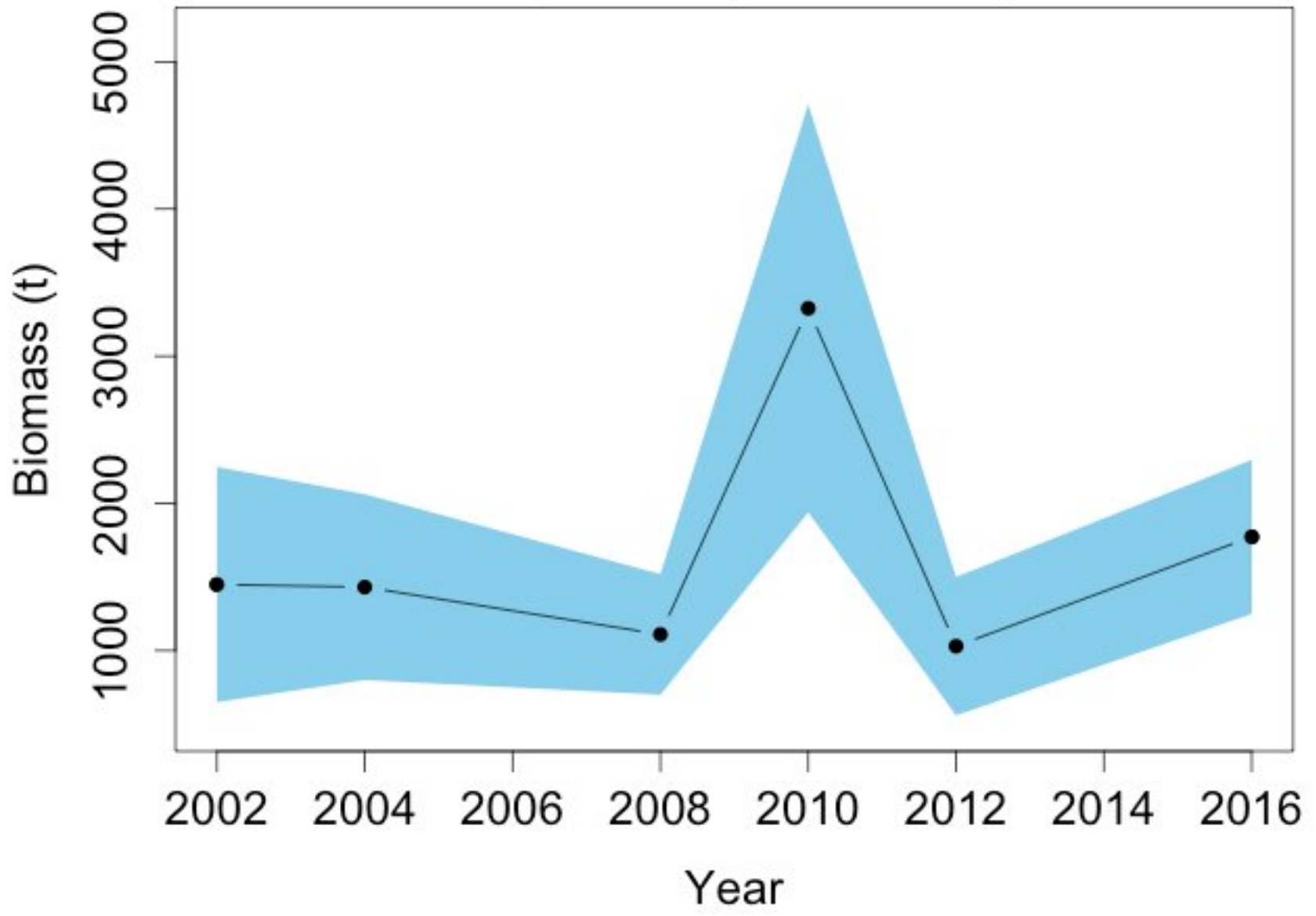
### Bering Sea slope flabby sculpin



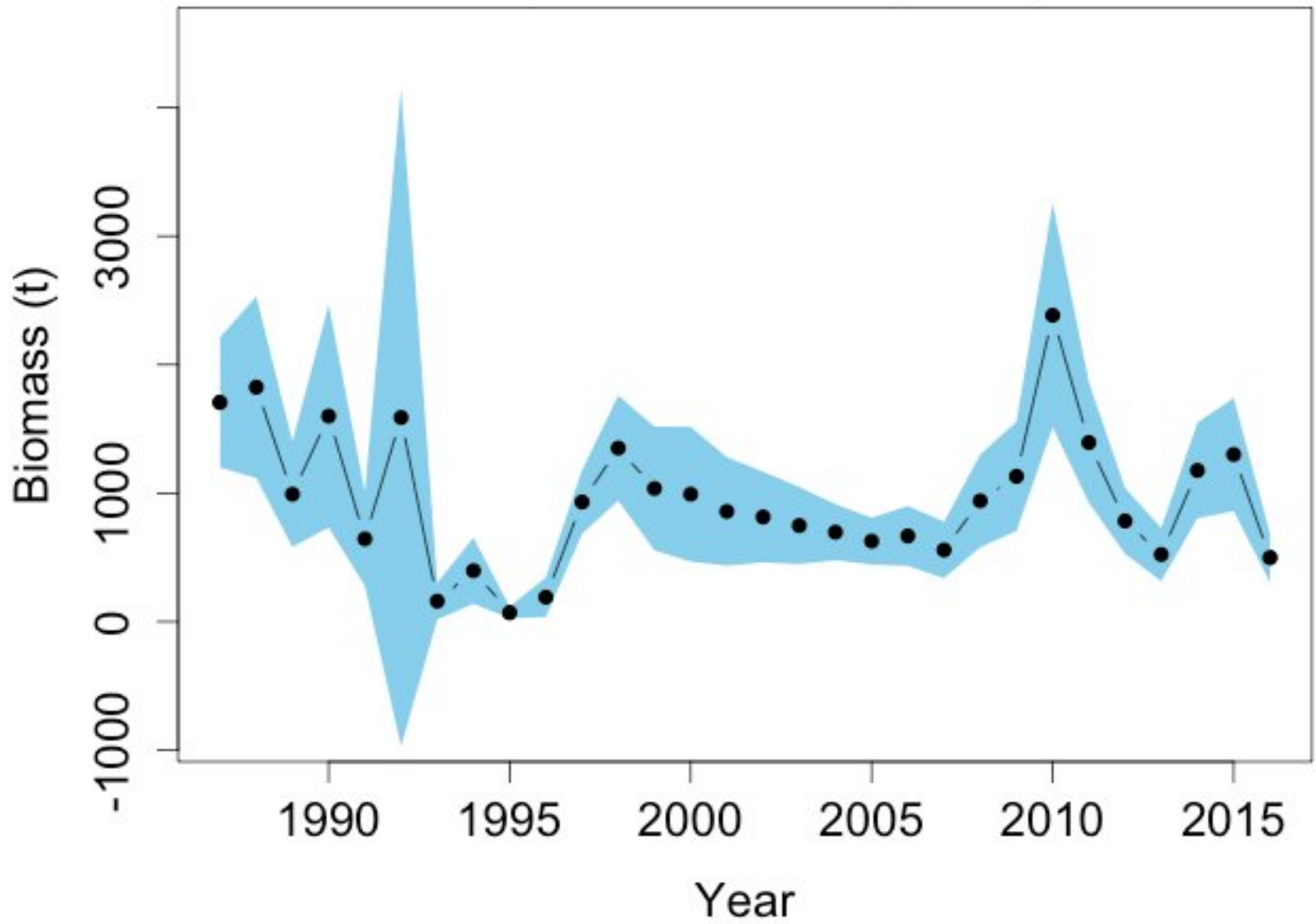
### Bering Sea slope darkfin sculpin



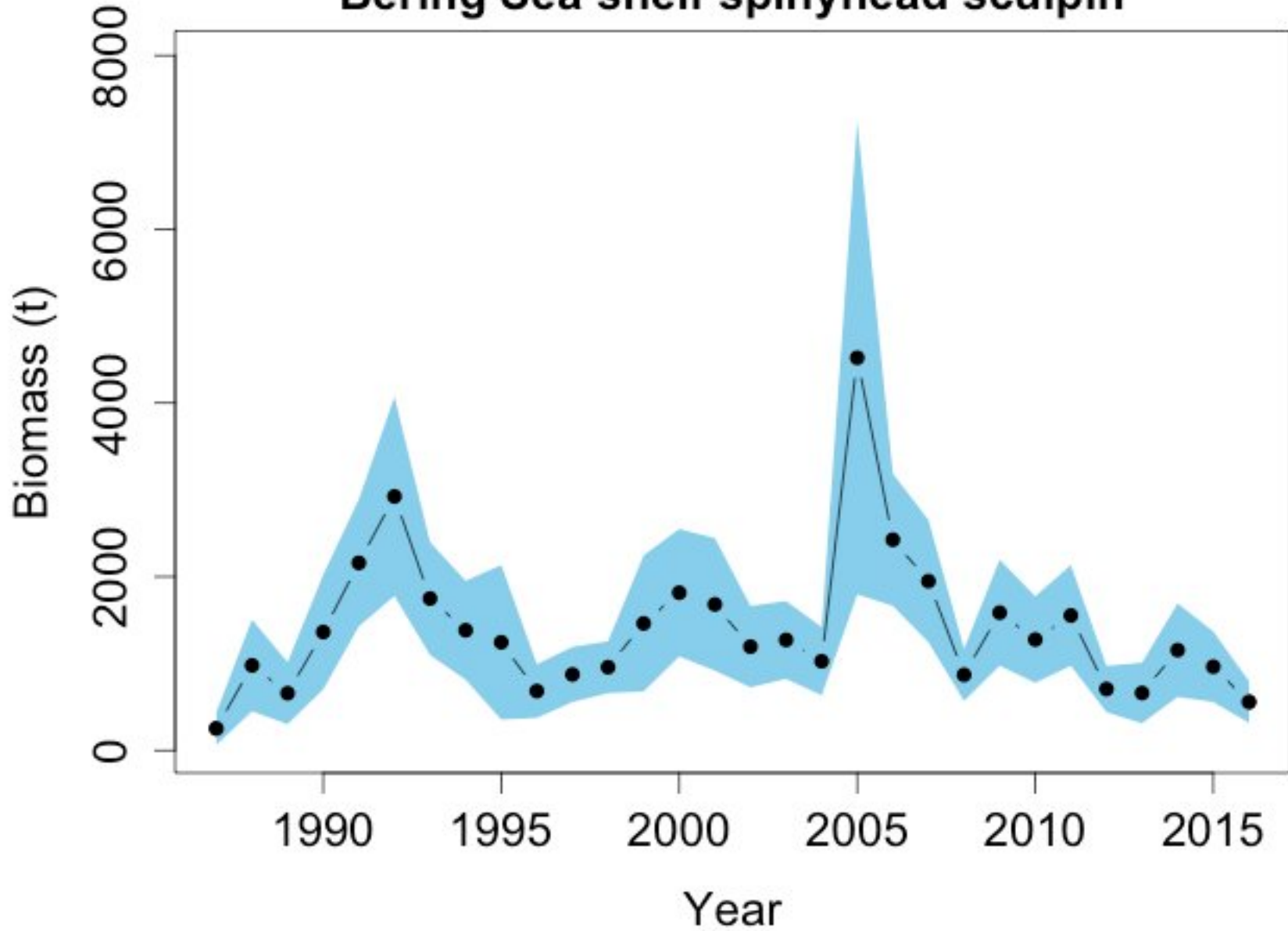
### Bering Sea slope blob sculpin



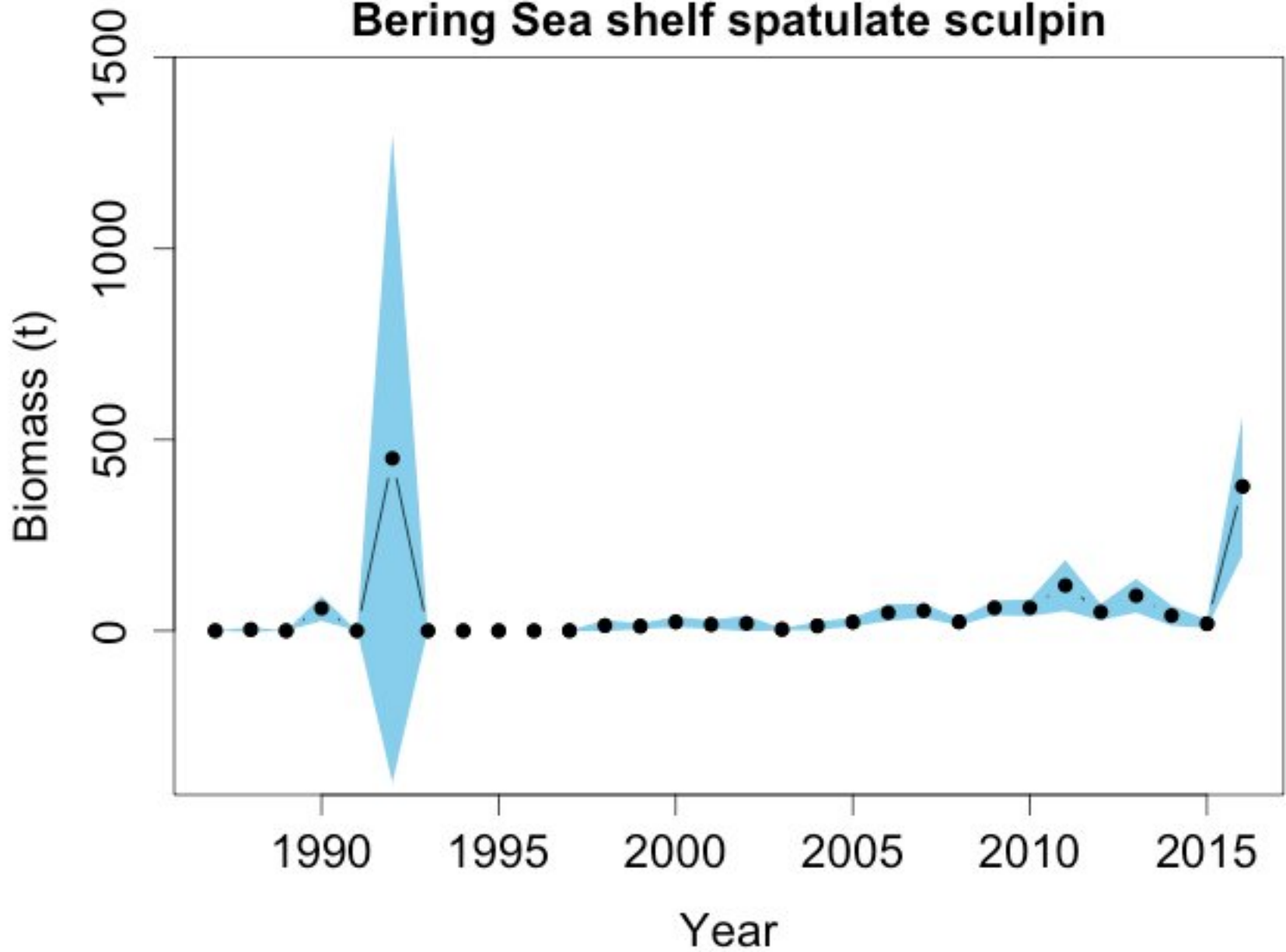
### Bering Sea shelf thorny sculpin



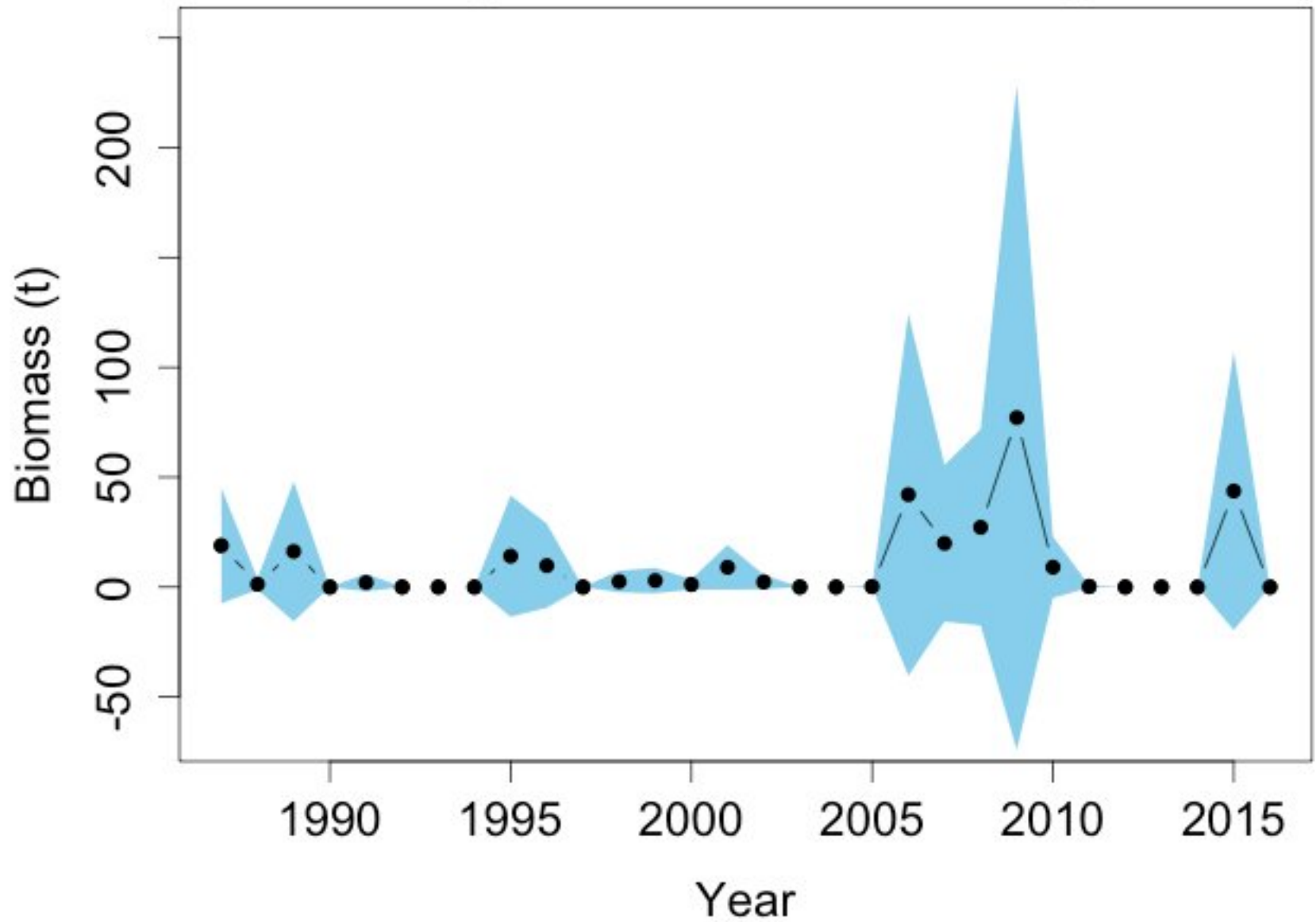
### Bering Sea shelf spinyhead sculpin



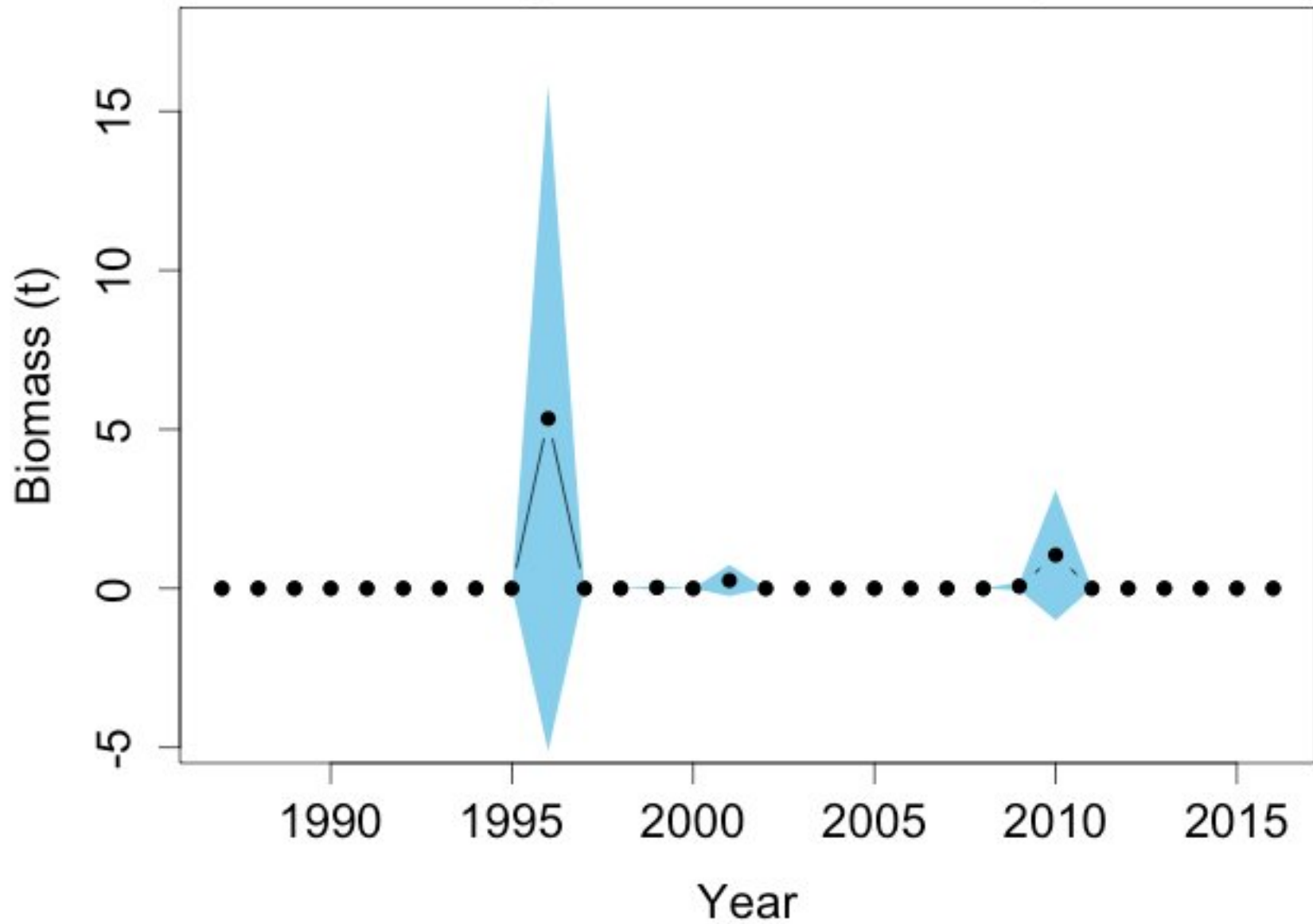
### Bering Sea shelf spatulate sculpin



### Bering Sea shelf scissortail sculpin

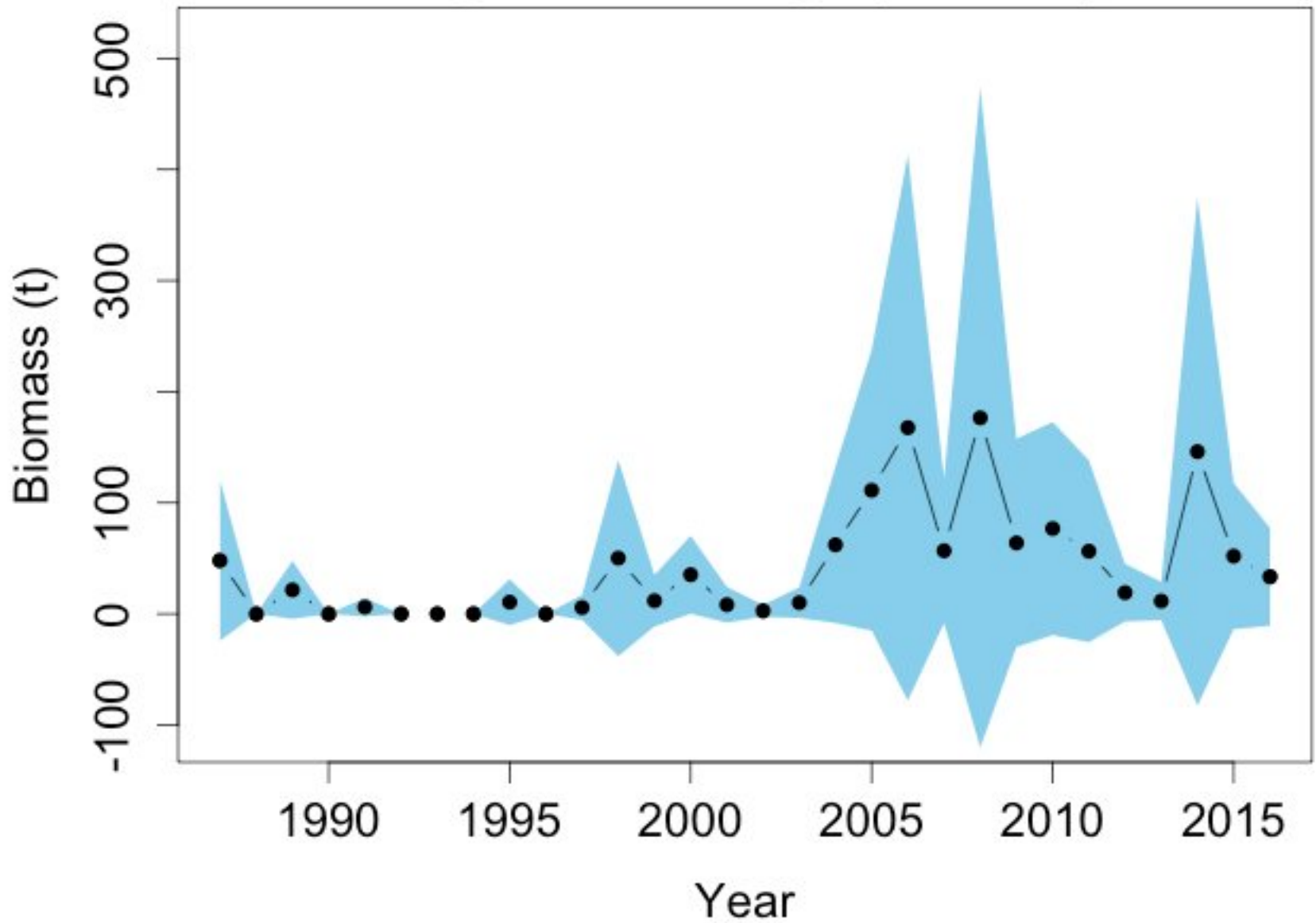


### Bering Sea shelf sailfin sculpin

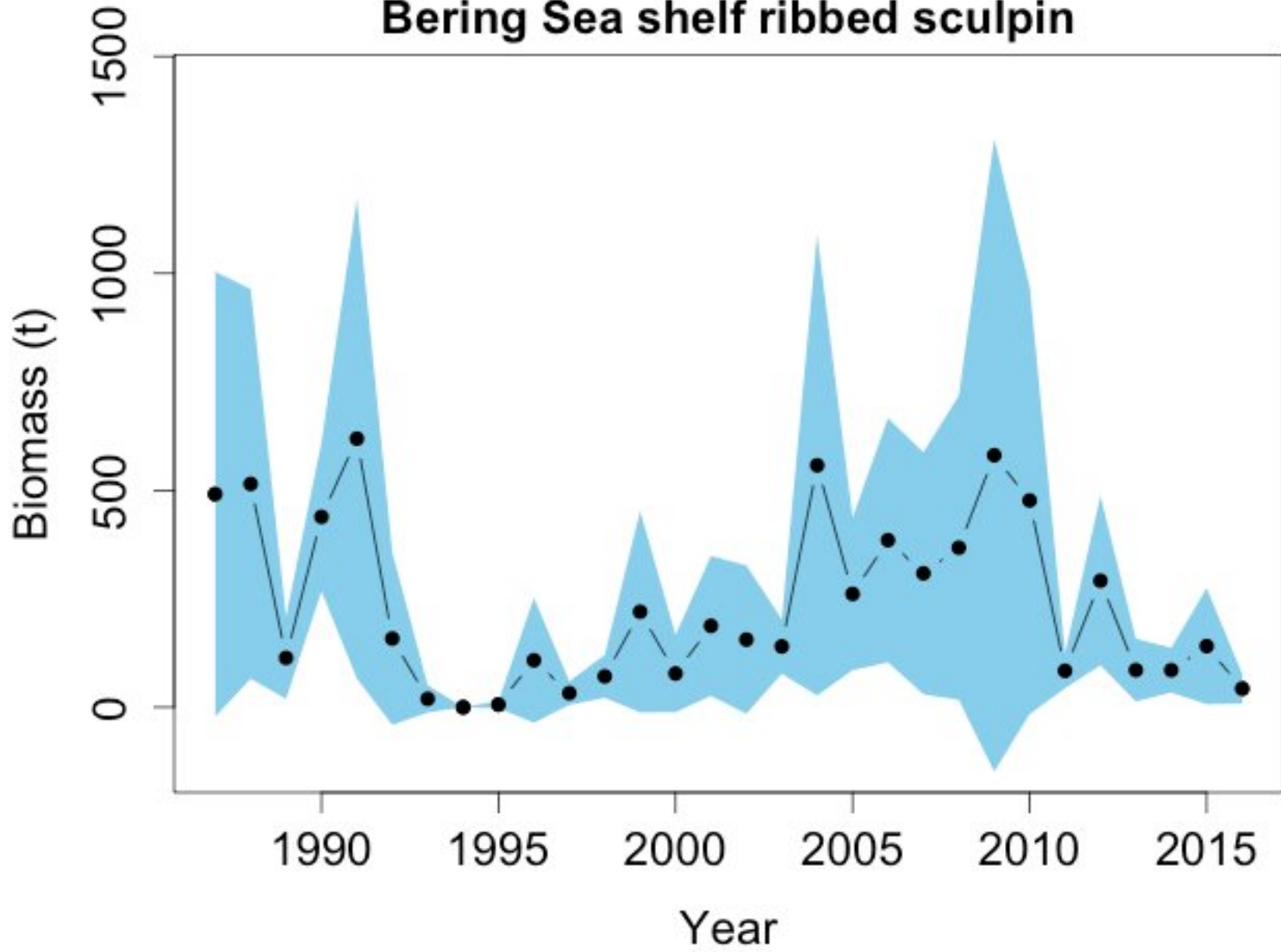




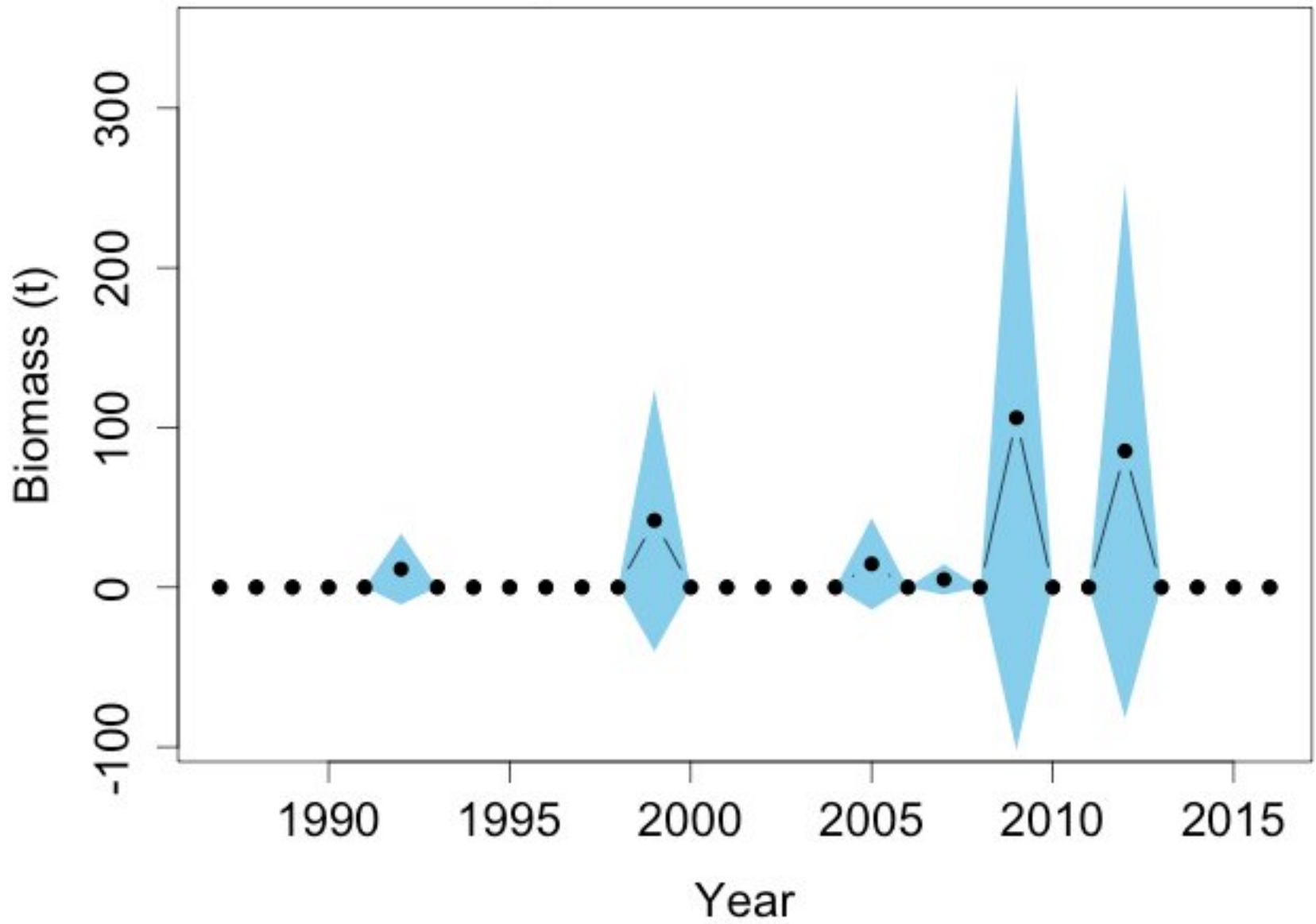
### Bering Sea shelf roughspine sculpin



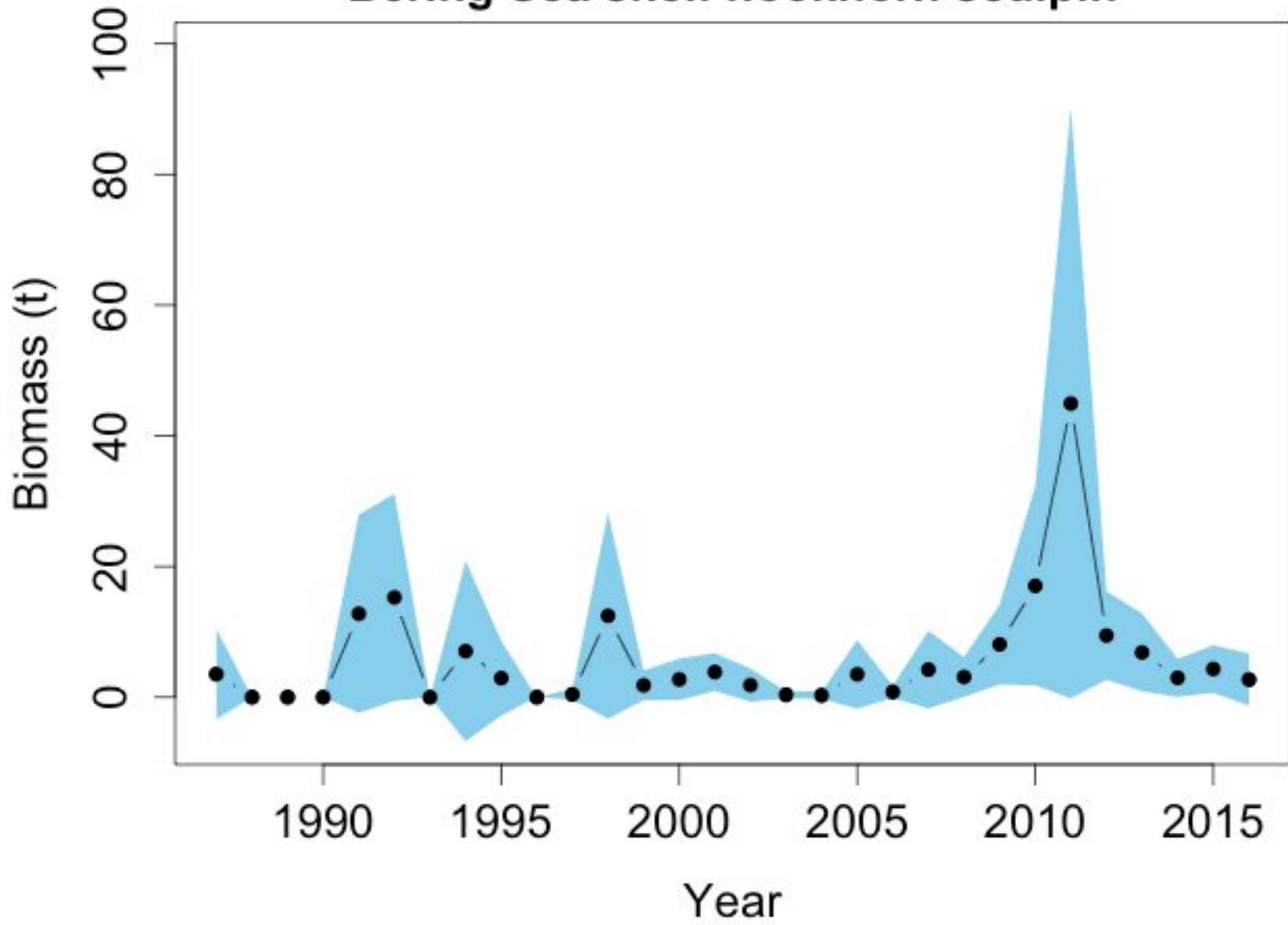
### Bering Sea shelf ribbed sculpin



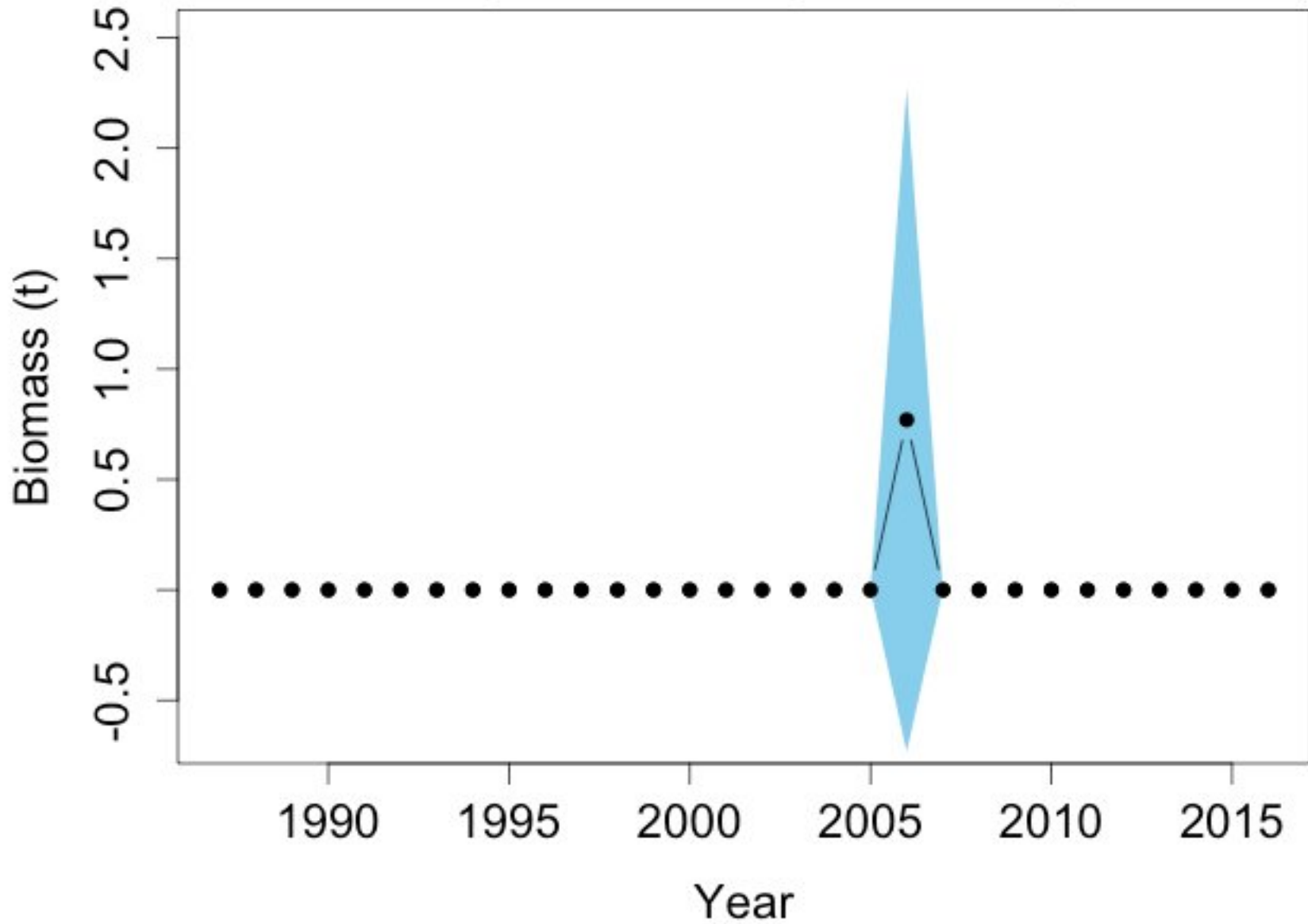
### Bering Sea shelf red Irish lord



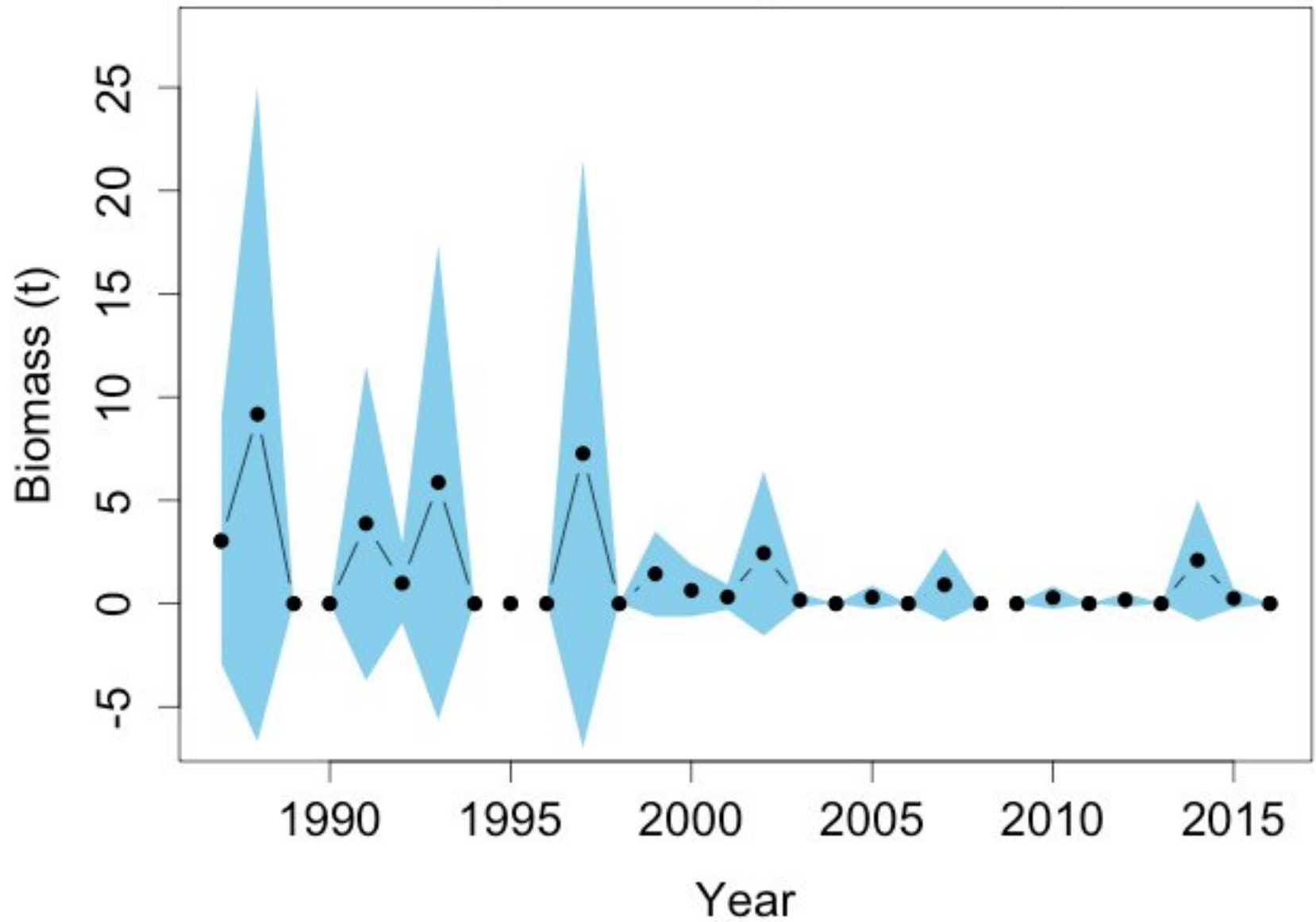
### Bering Sea shelf hookhorn sculpin



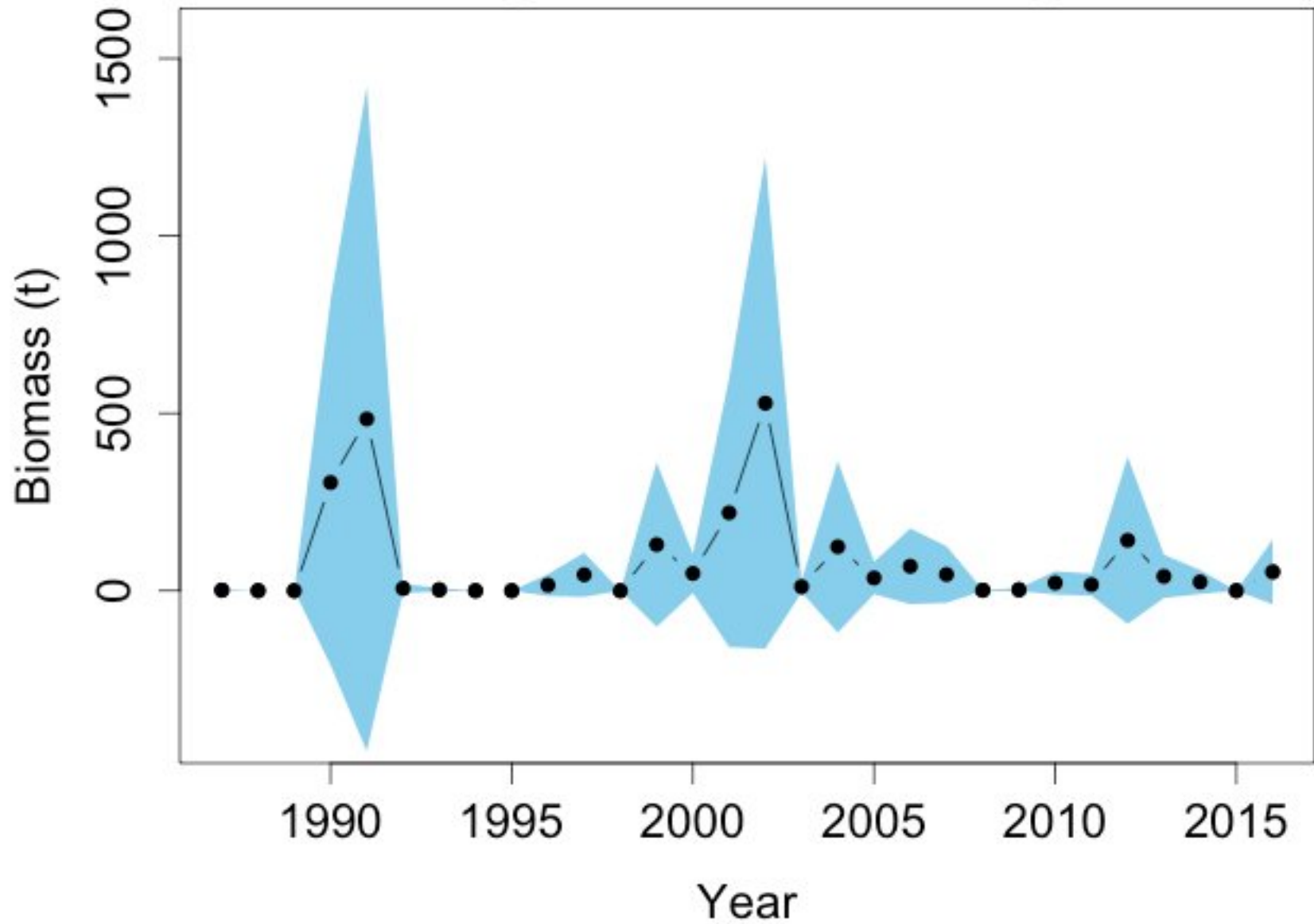
### Bering Sea shelf highbrow sculpin



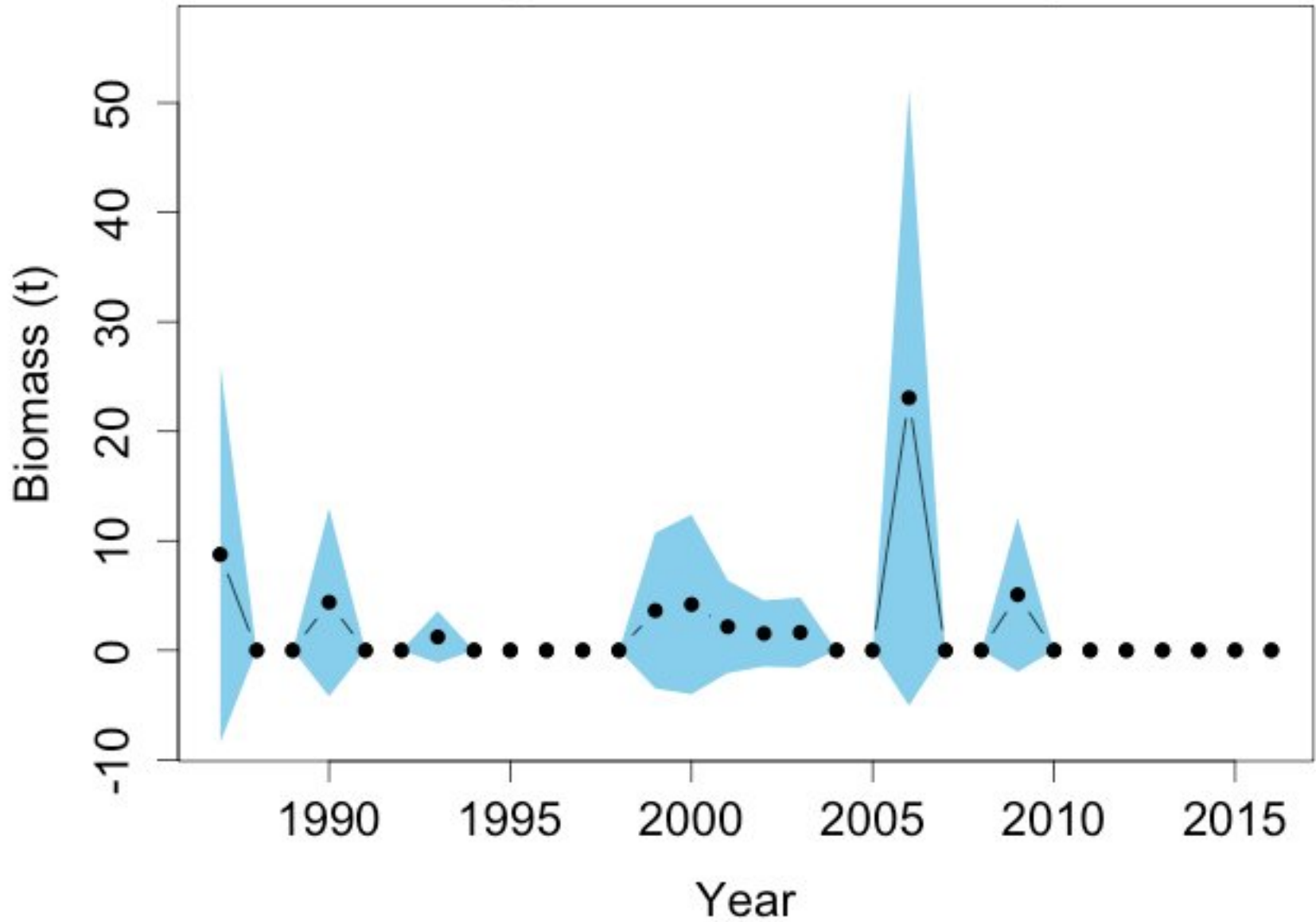
### Bering Sea shelf eyeshade sculpin



### Bering Sea shelf darkfin sculpin

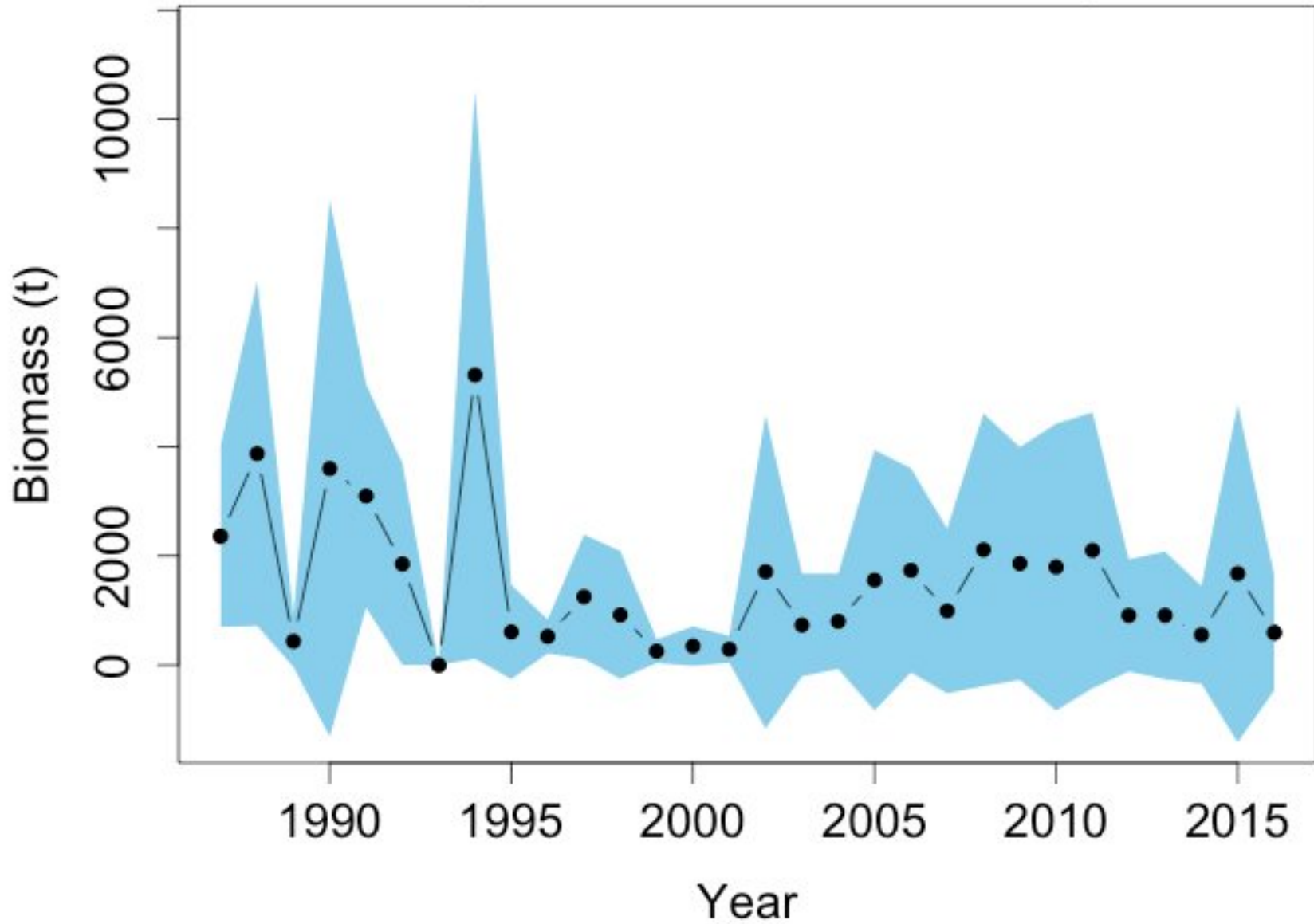


### Bering Sea shelf crested sculpin

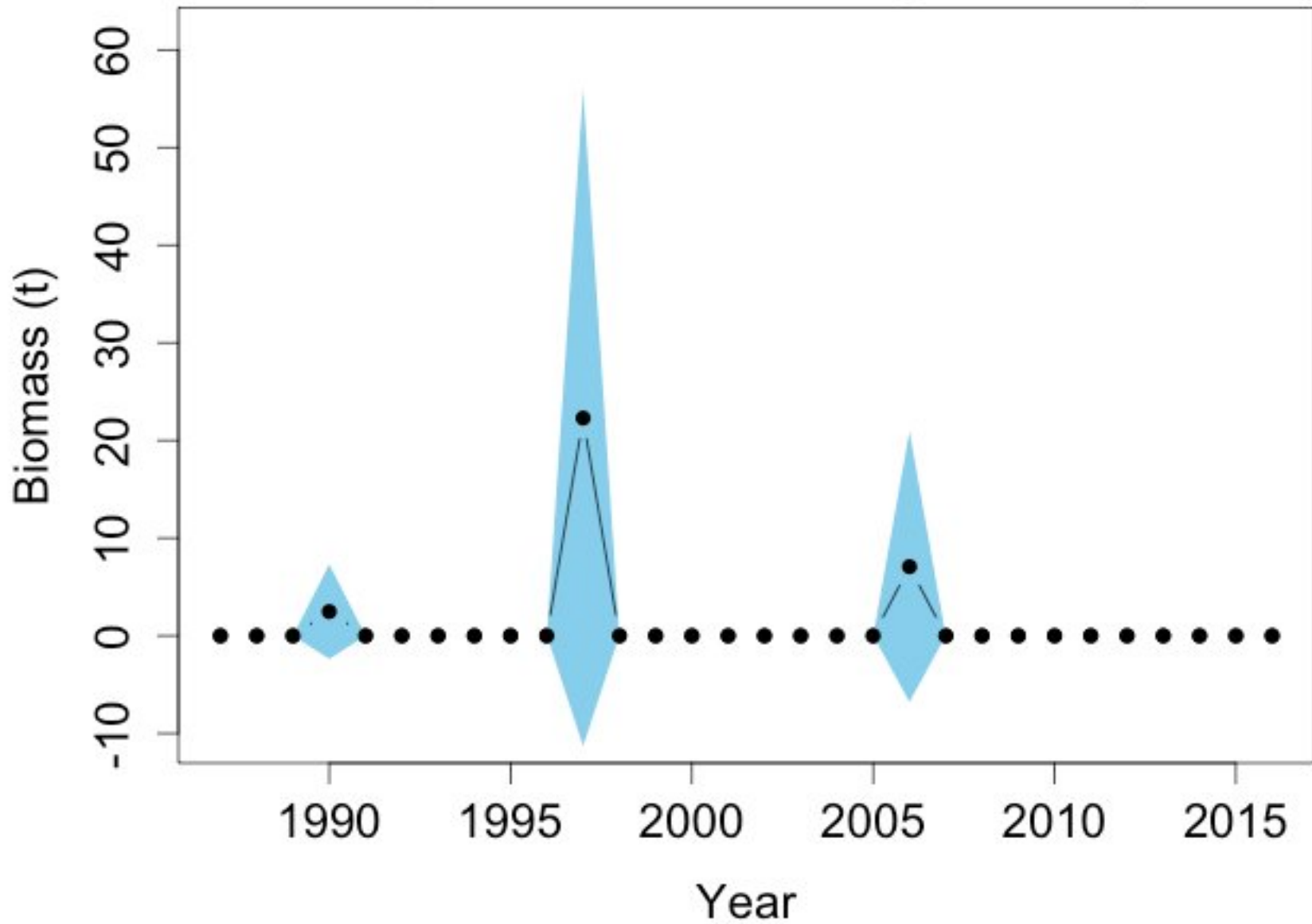




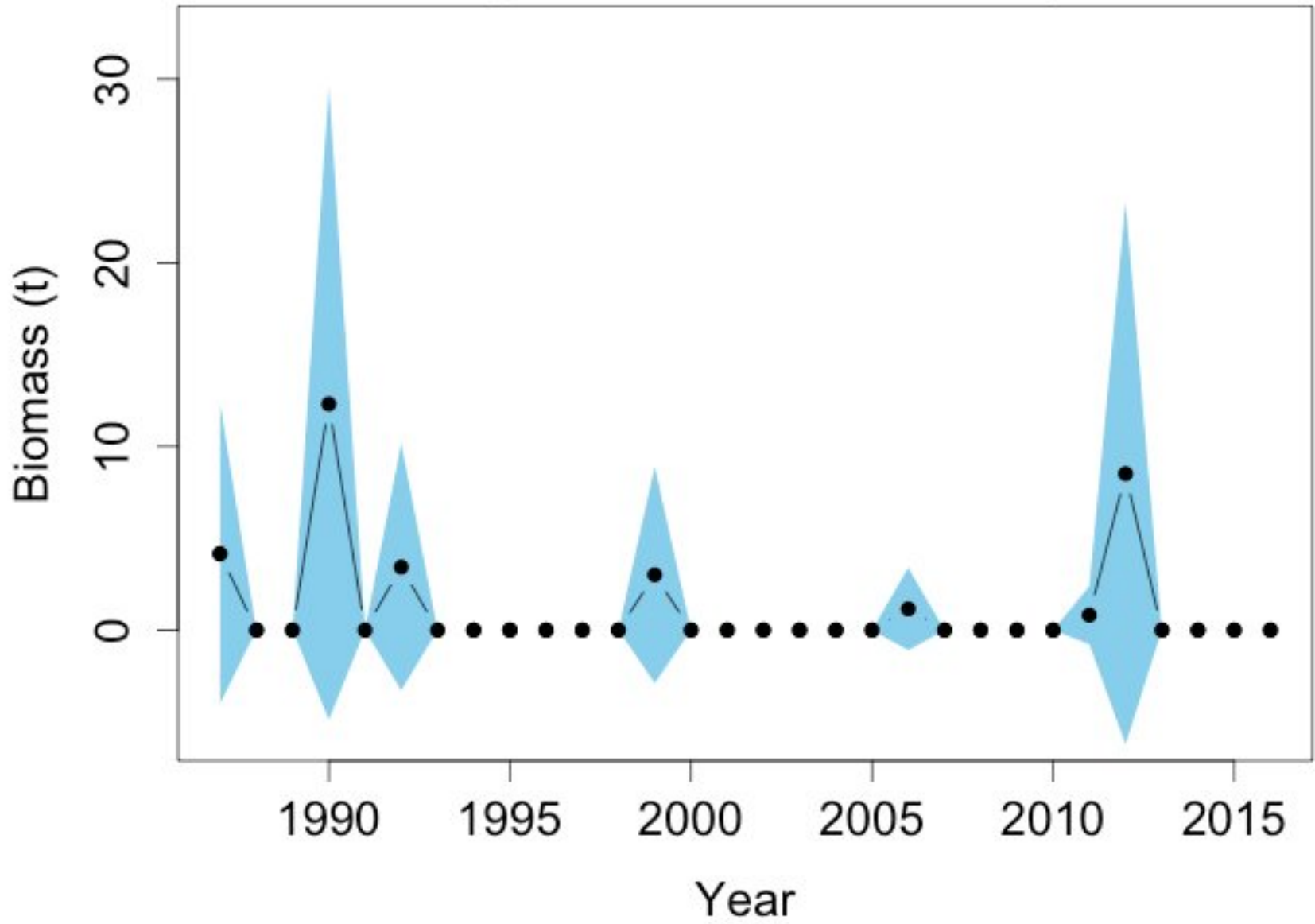
### Bering Sea shelf armorhead sculpin



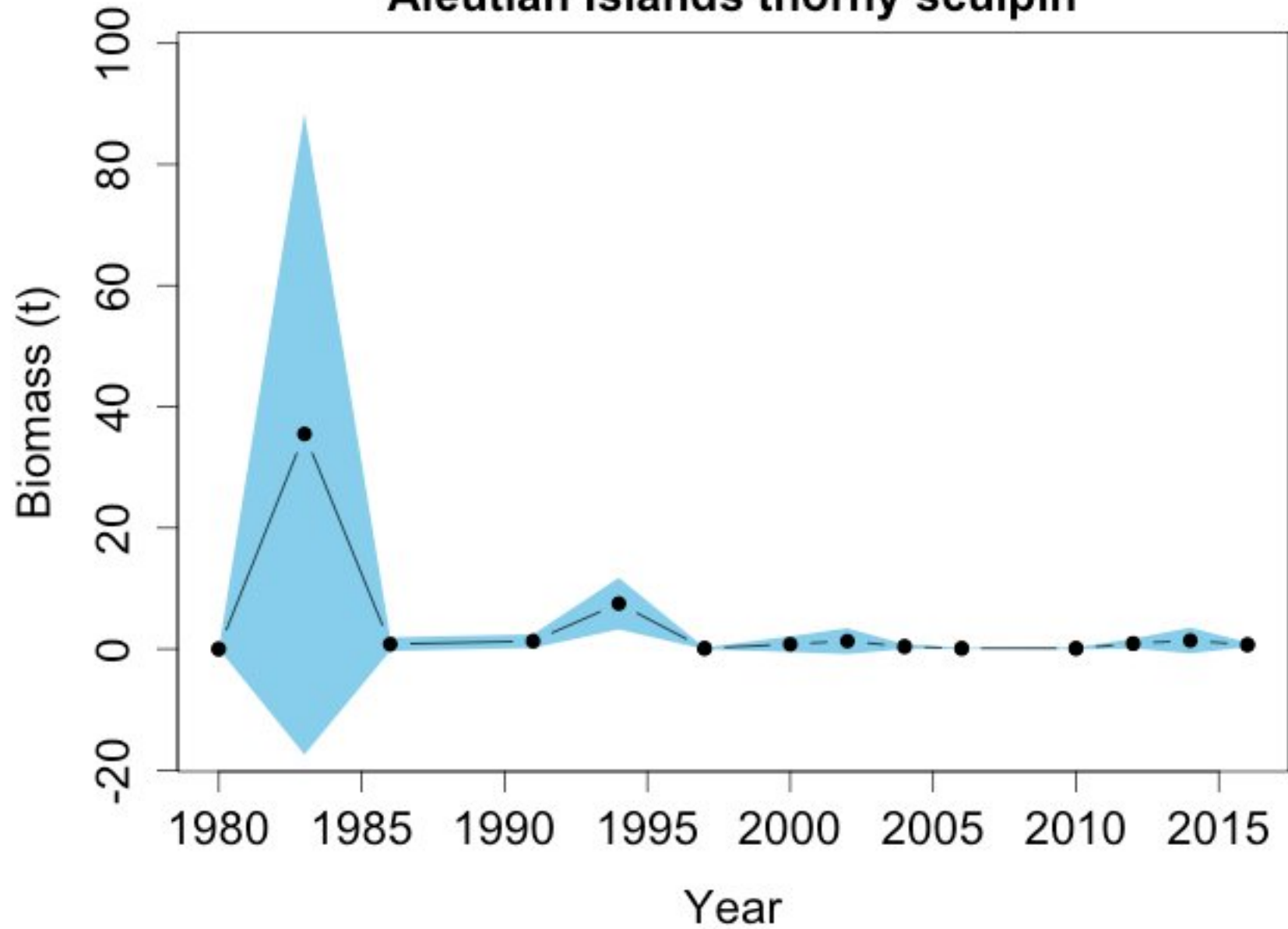
### Bering Sea shelf Arctic staghorn sculpin



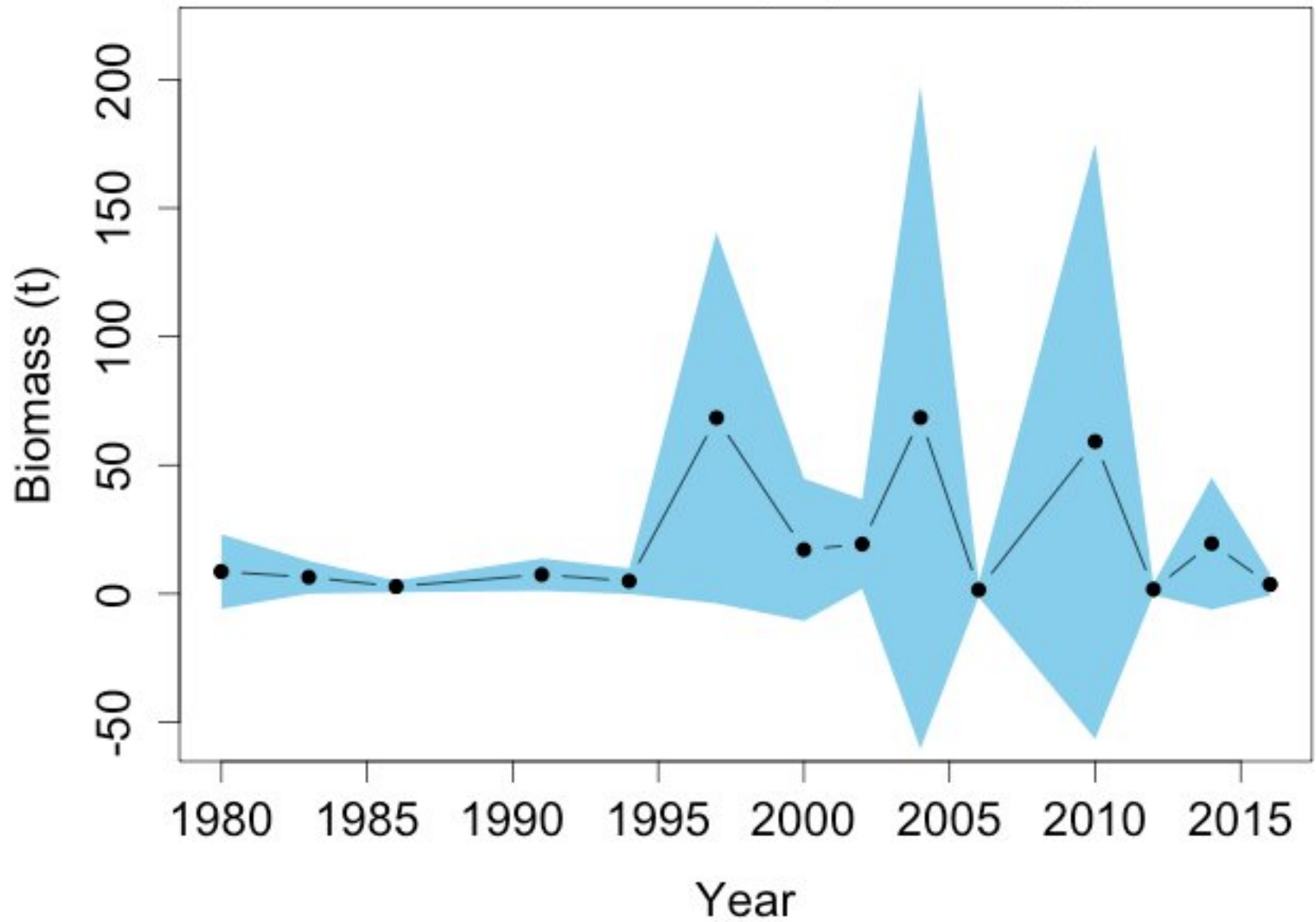
### Bering Sea shelf antlered sculpin



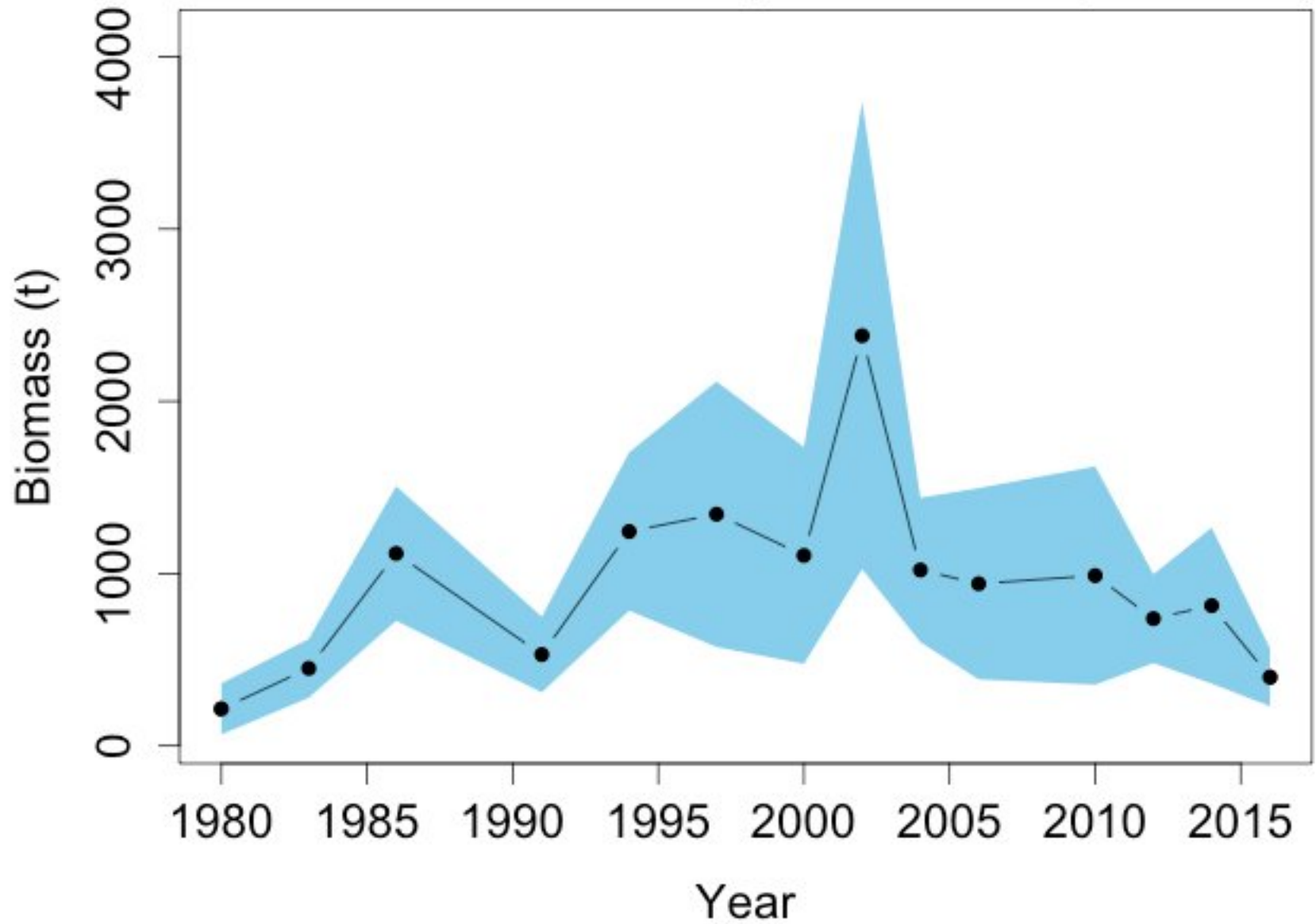
## Aleutian Islands thorny sculpin



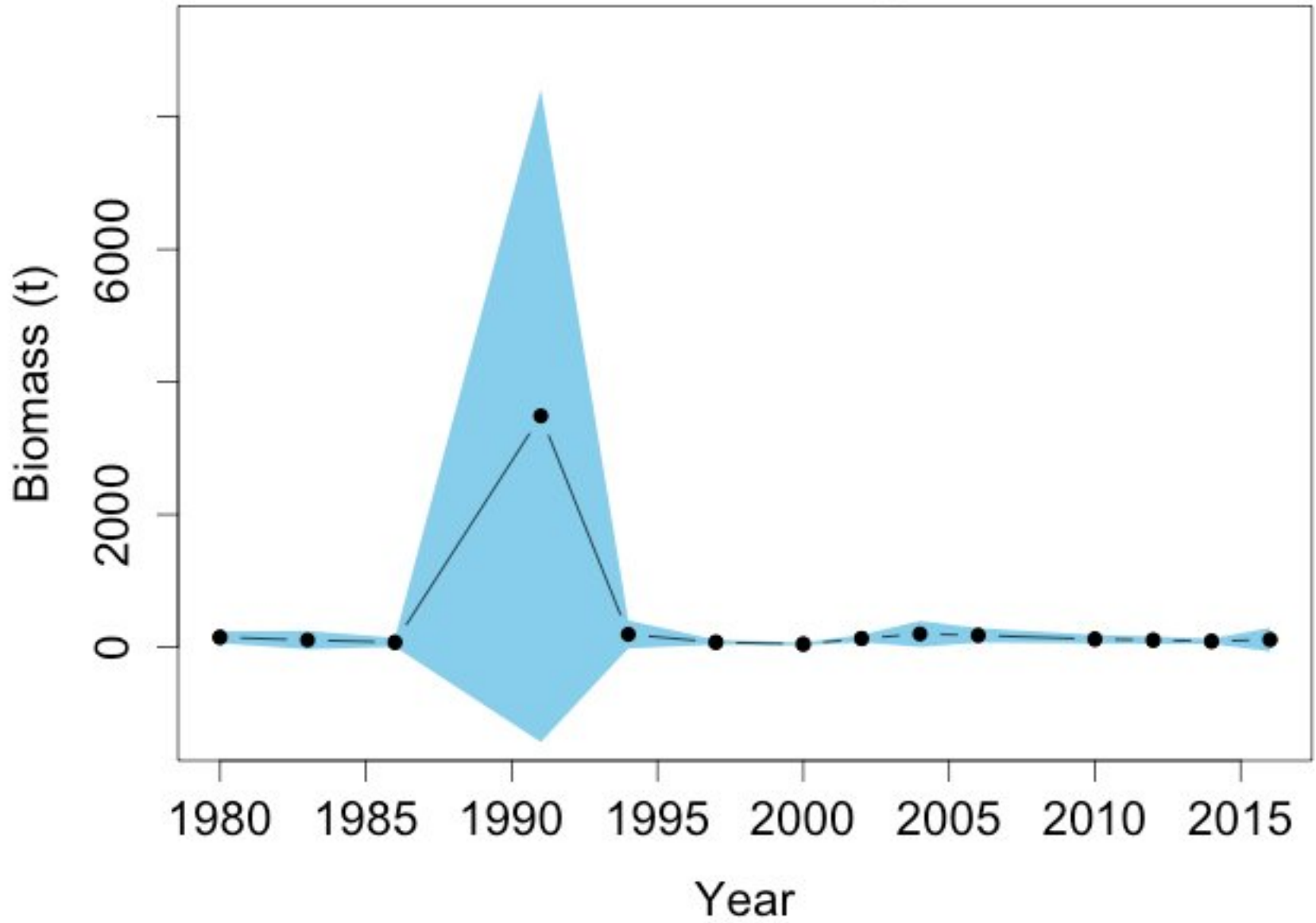
### Aleutian Islands spinyhead sculpin



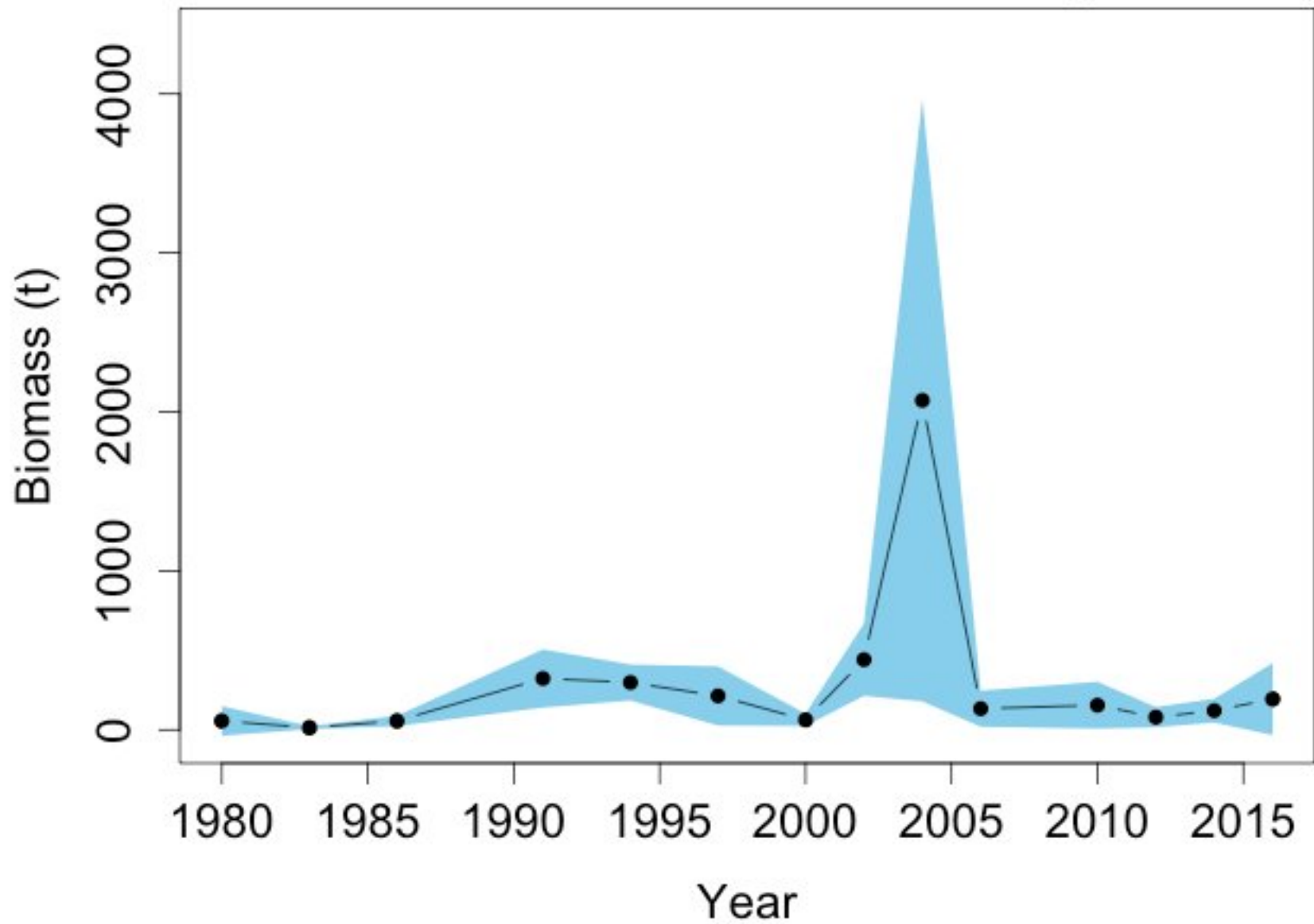
### Aleutian Islands spectacled sculpin



### Aleutian Islands sculpin unid.

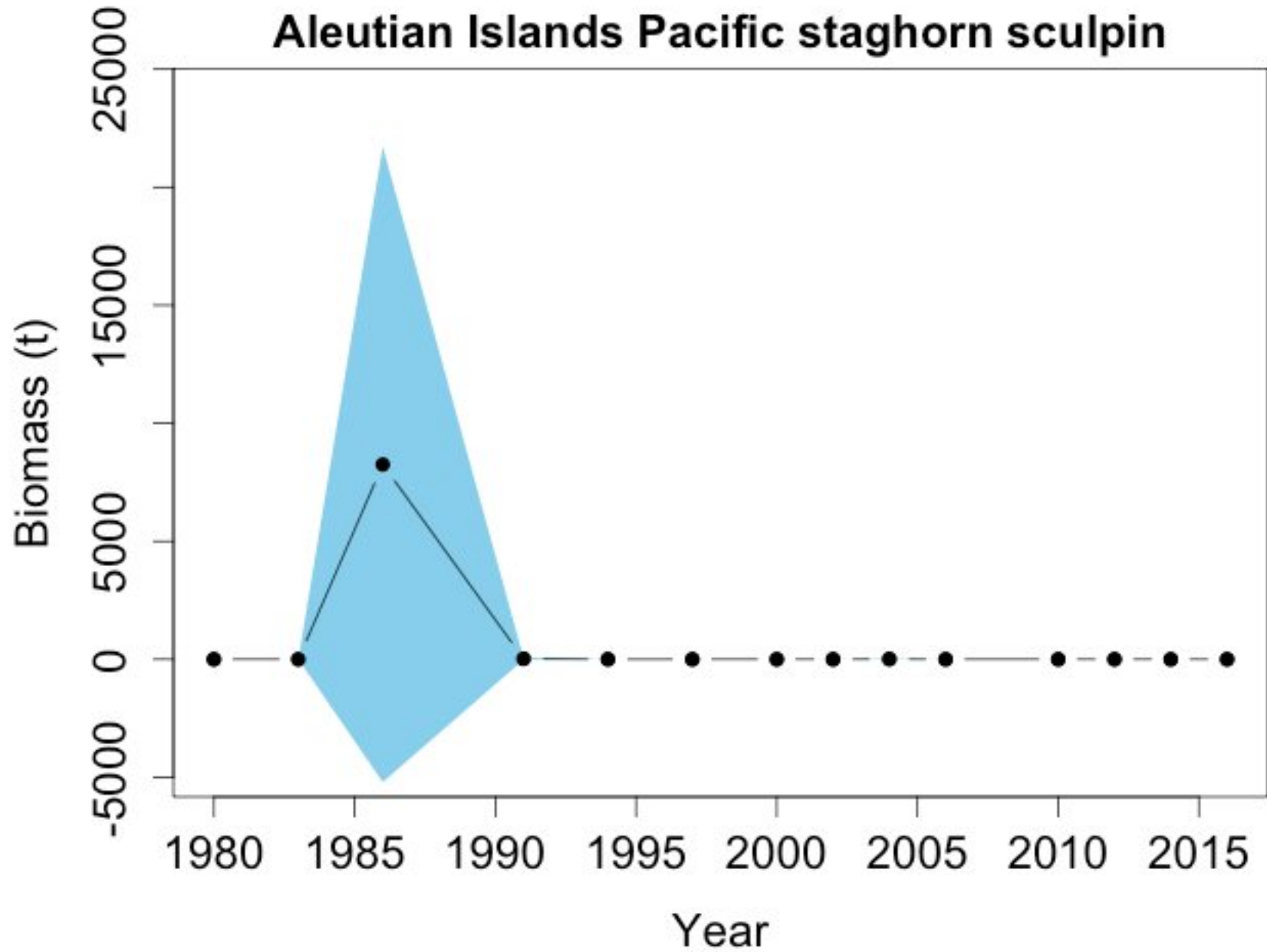


## Aleutian Islands scissortail sculpin

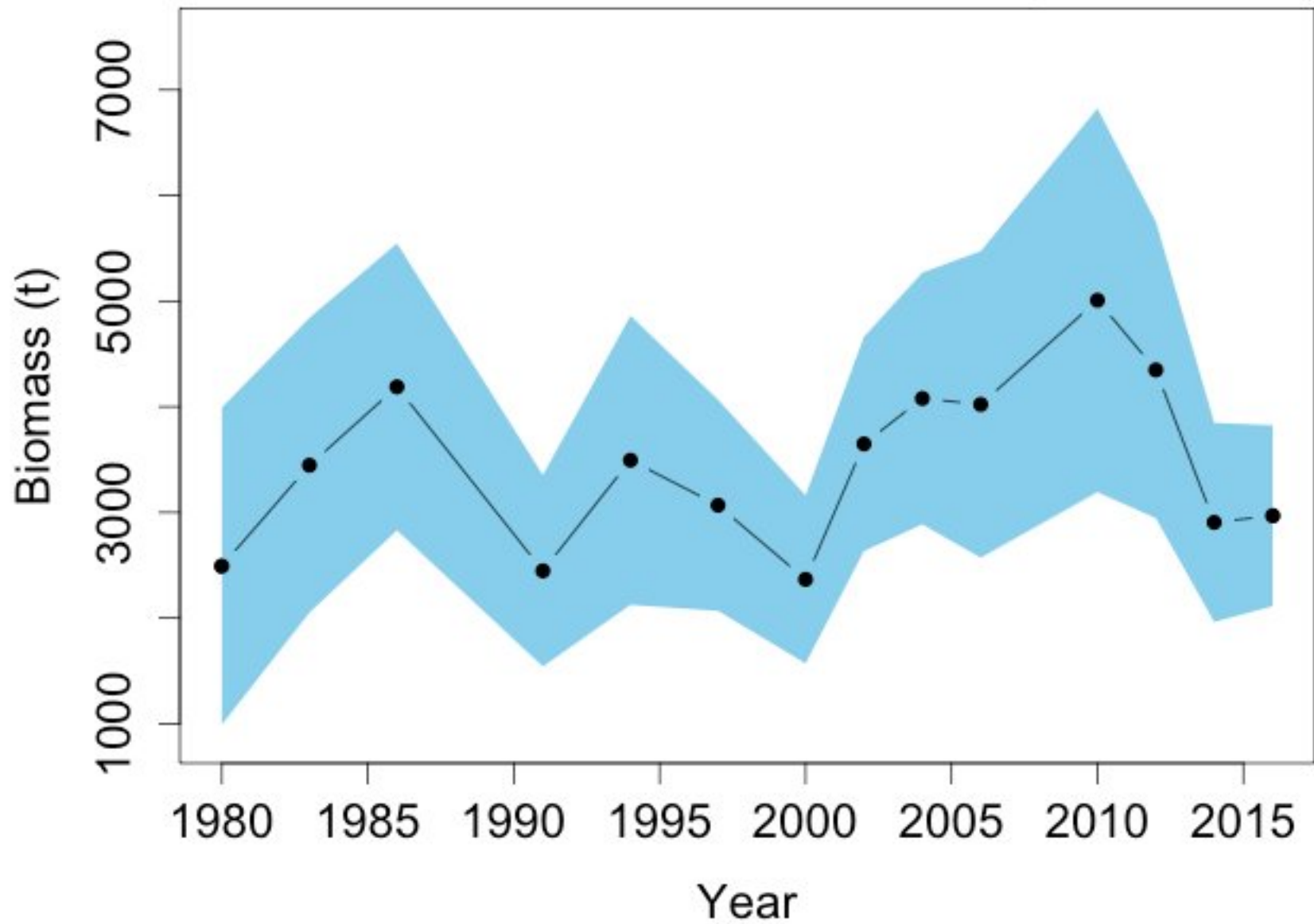




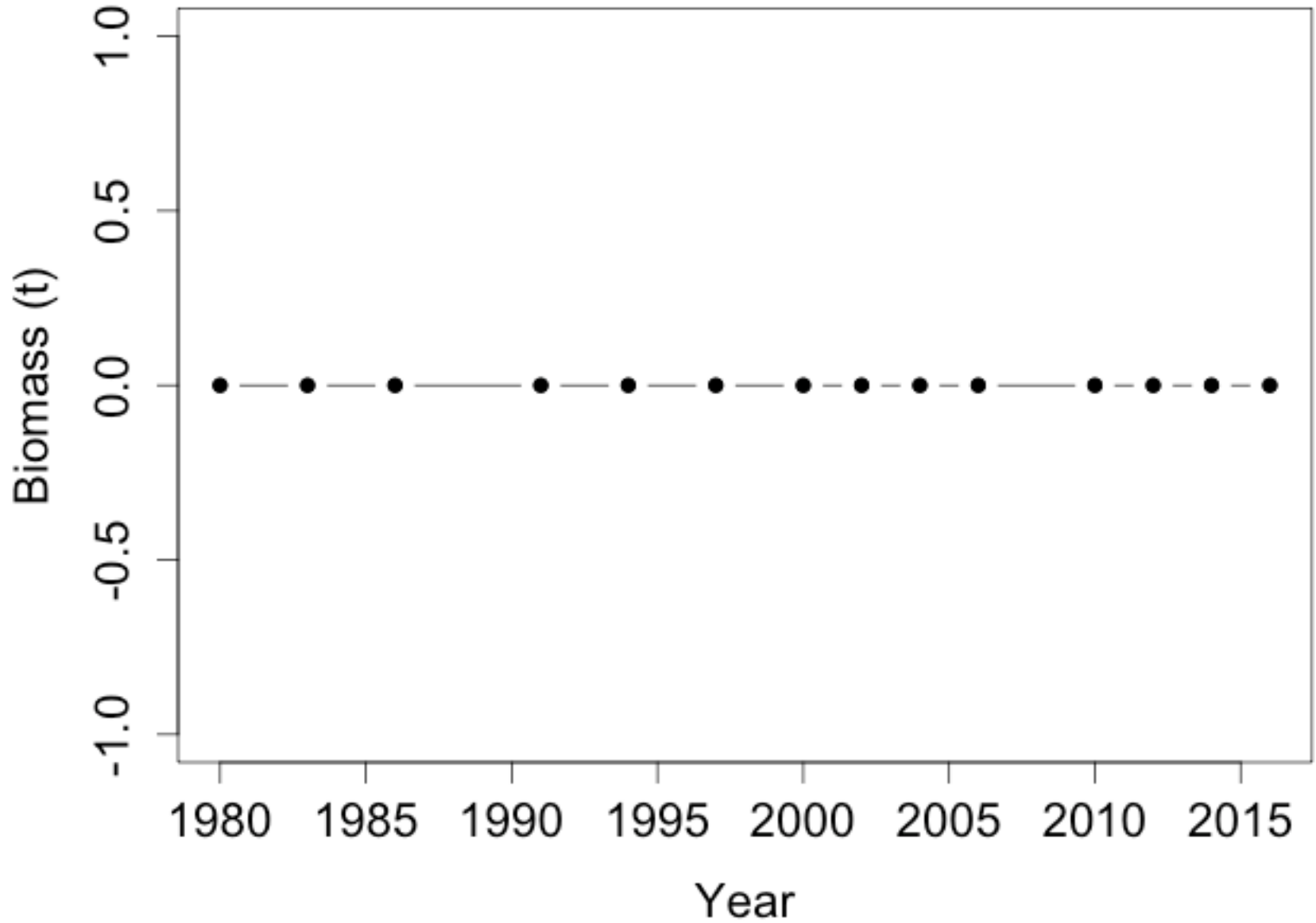
### Aleutian Islands Pacific staghorn sculpin



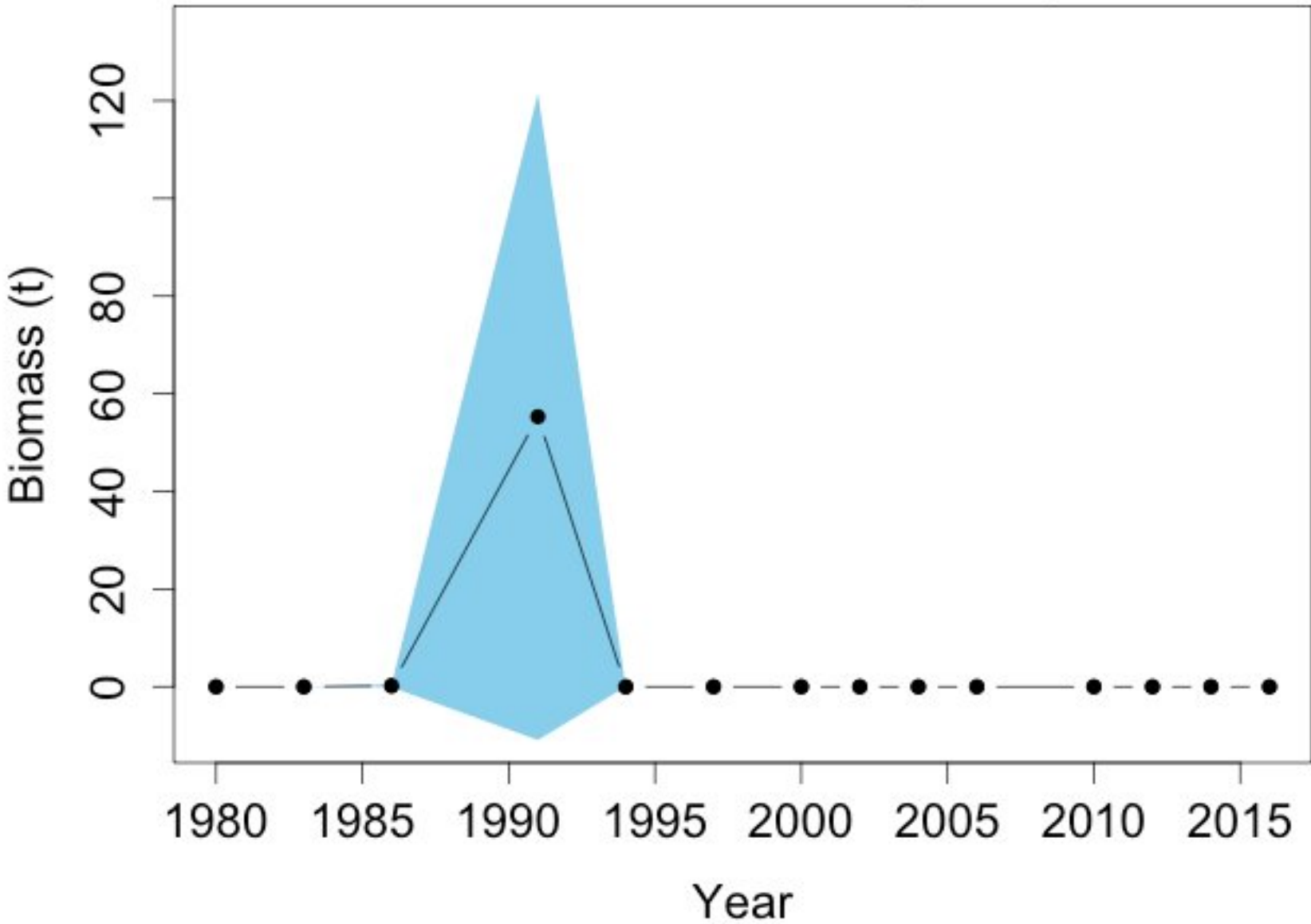
## Aleutian Islands darkfin sculpin



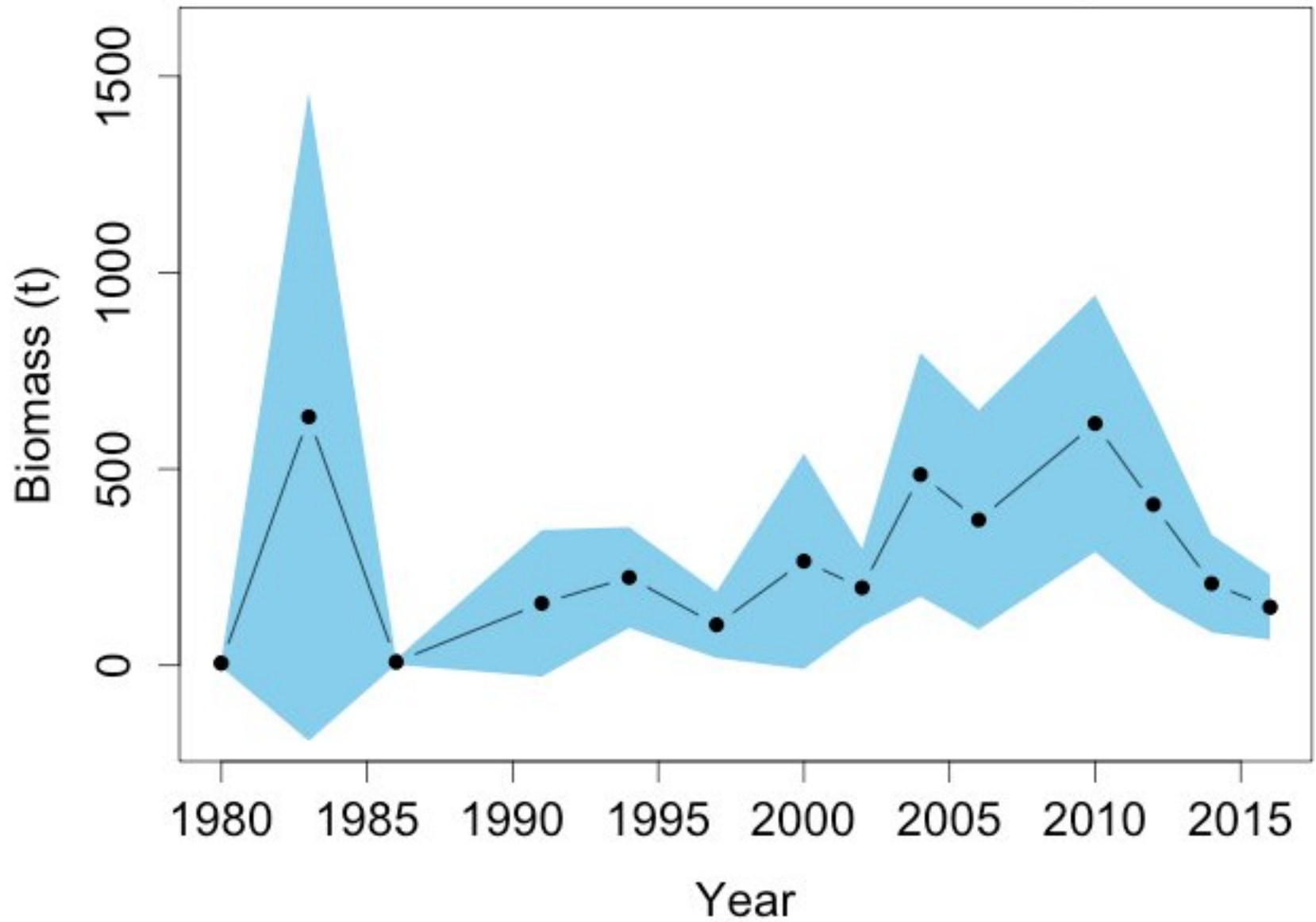
### Aleutian Islands crested sculpin



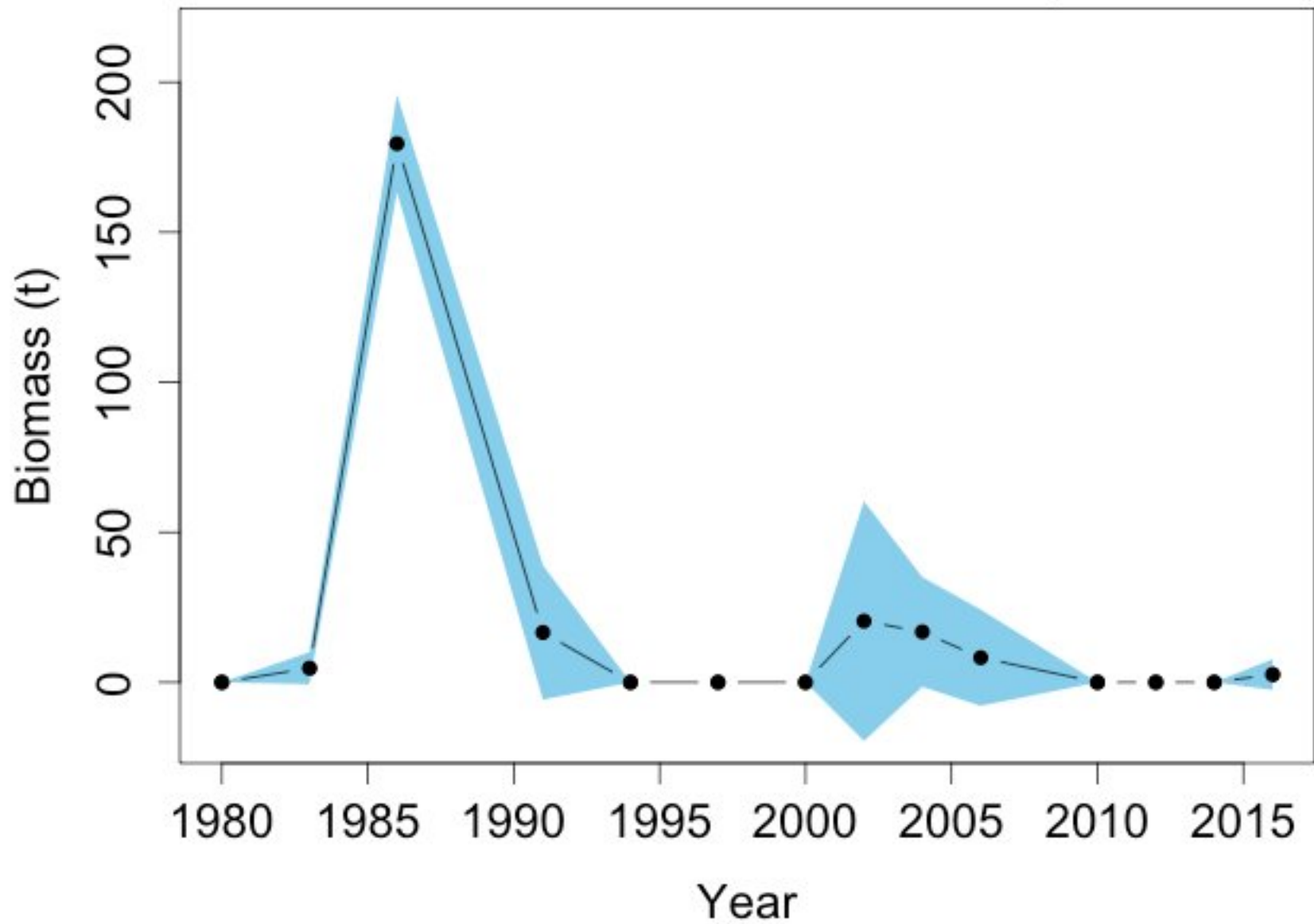
### Aleutian Islands butterfly sculpin



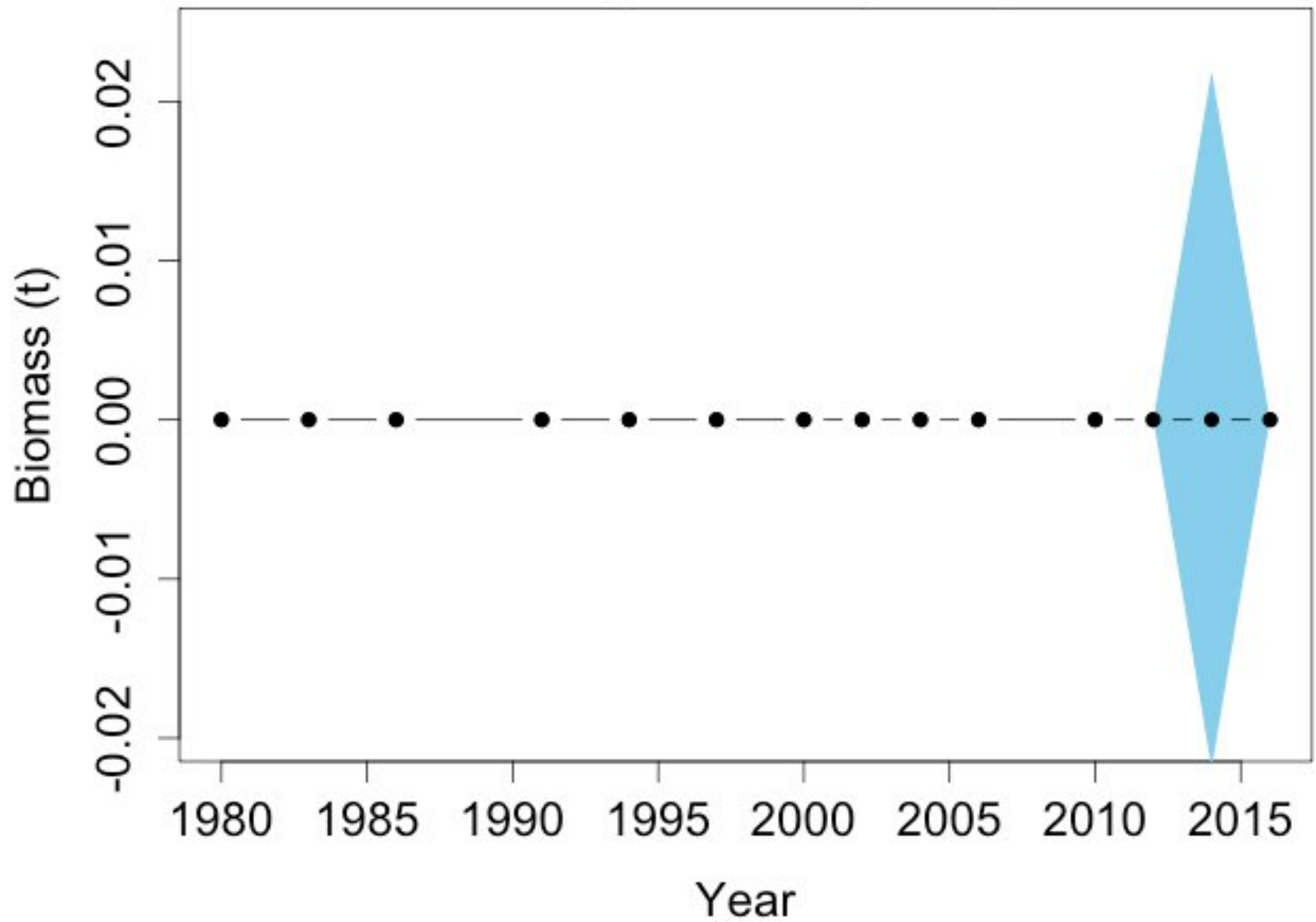
### Aleutian Islands armorhead sculpin



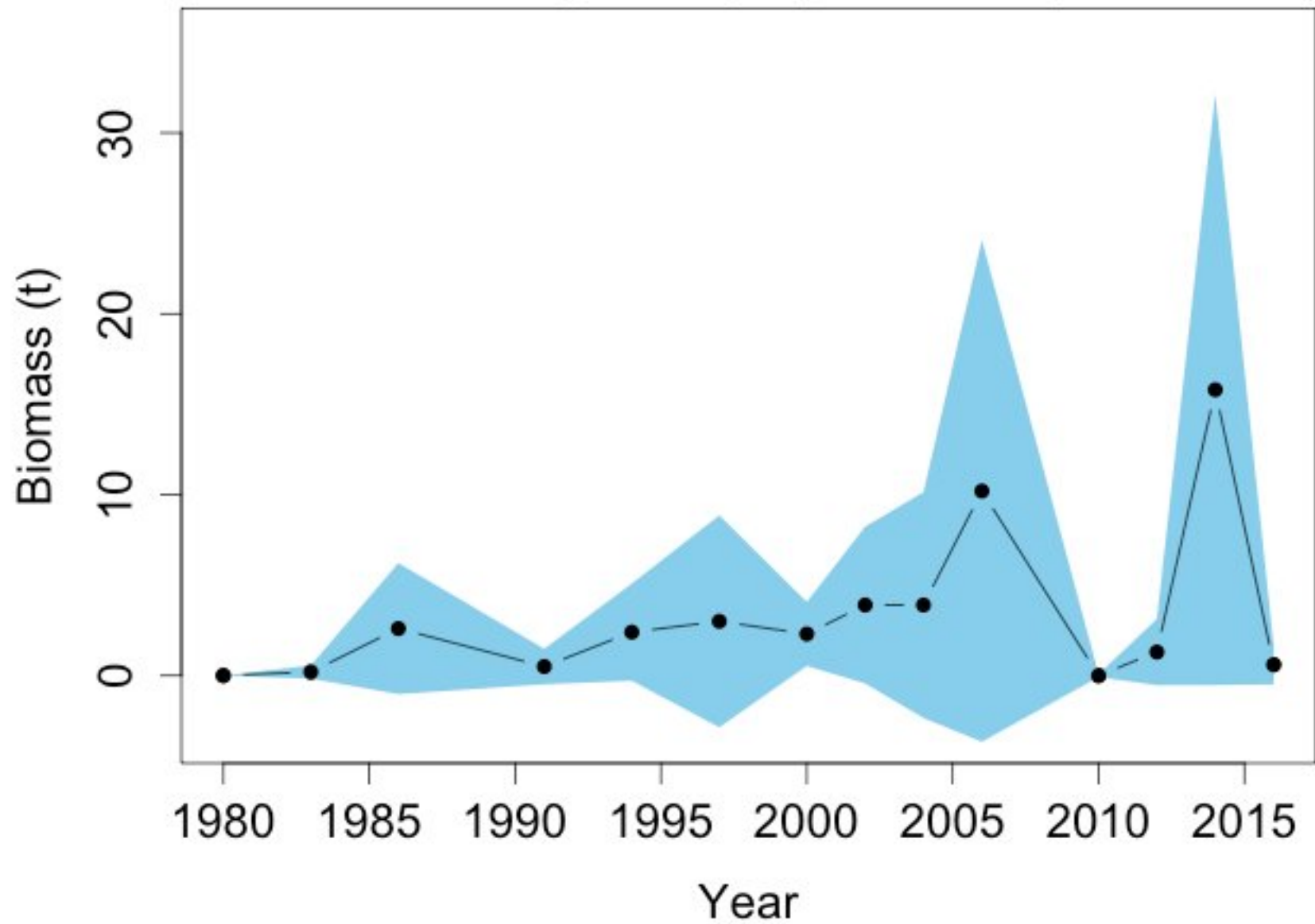
## Aleutian Islands antlered sculpin



### S. Bering Sea thorny sculpin

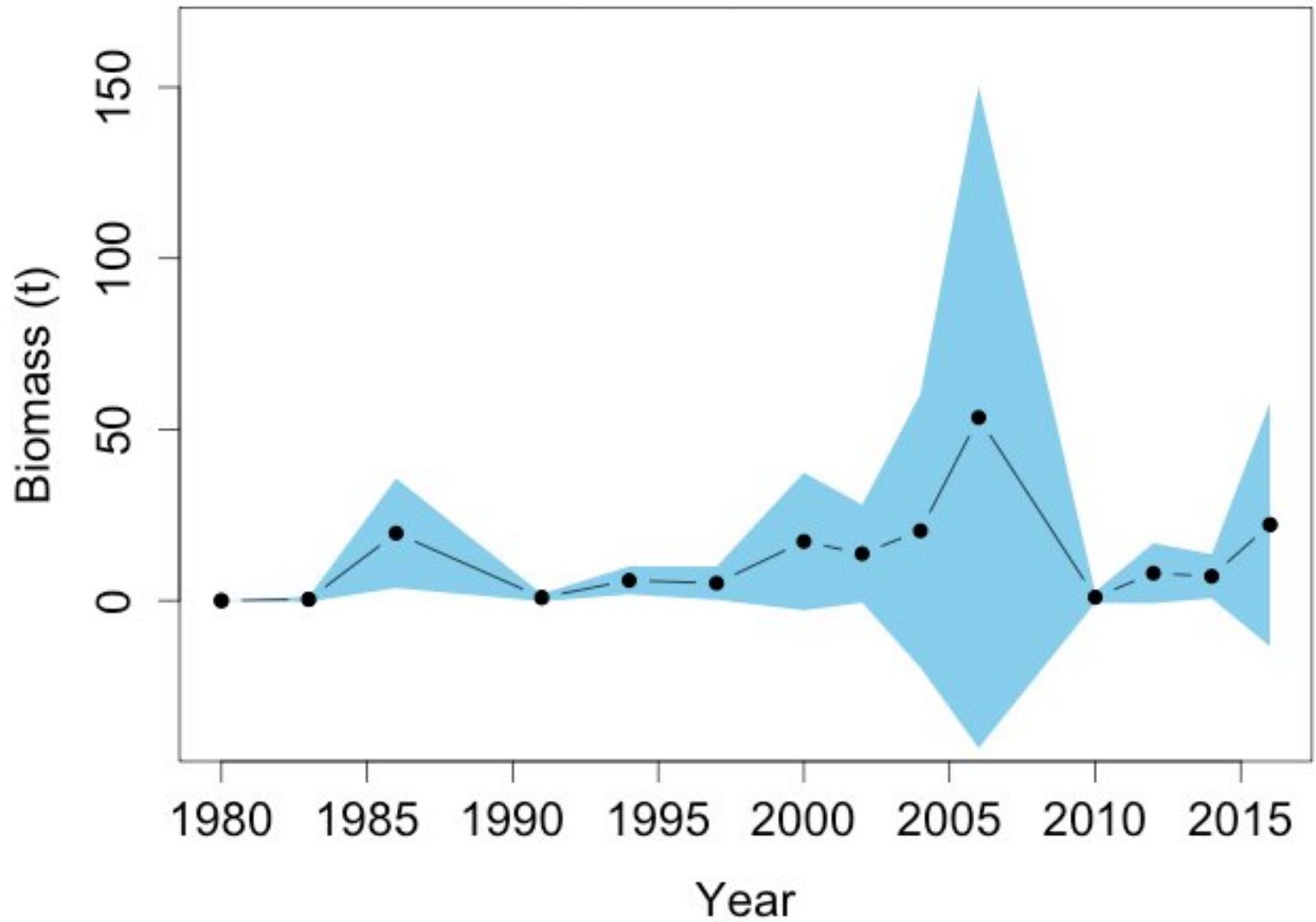


## S. Bering Sea spinyhead sculpin

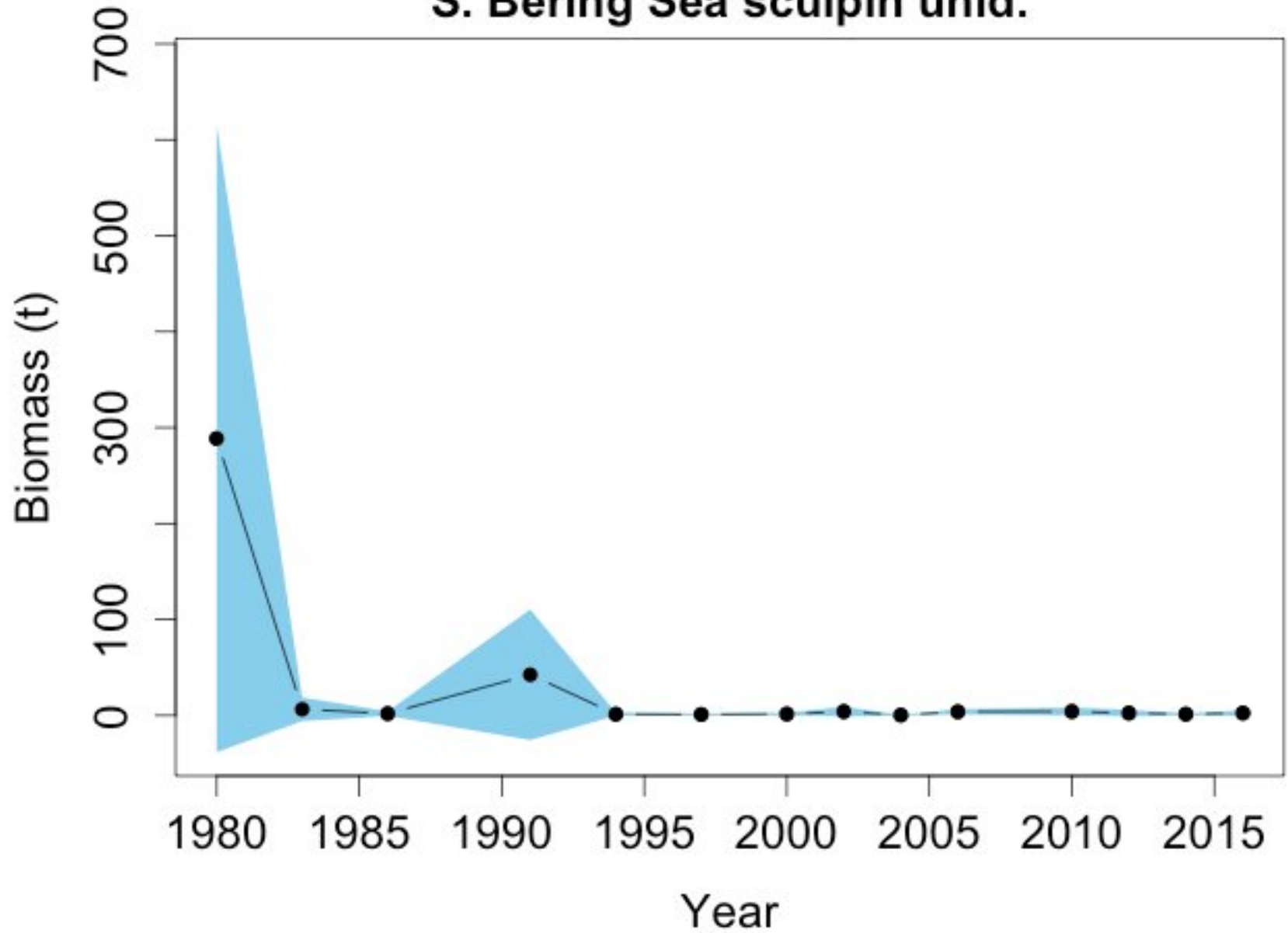




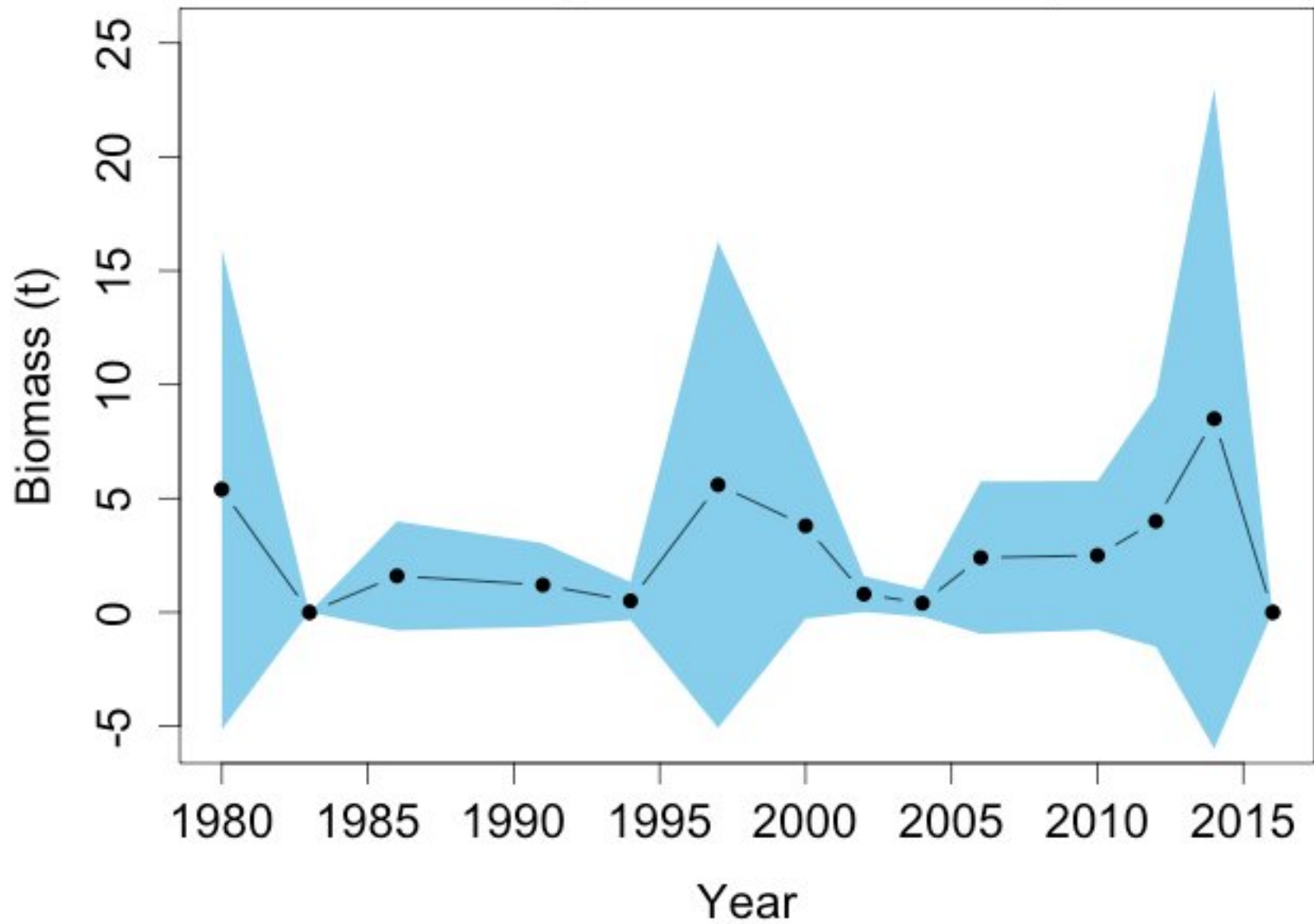
### S. Bering Sea spectacled sculpin



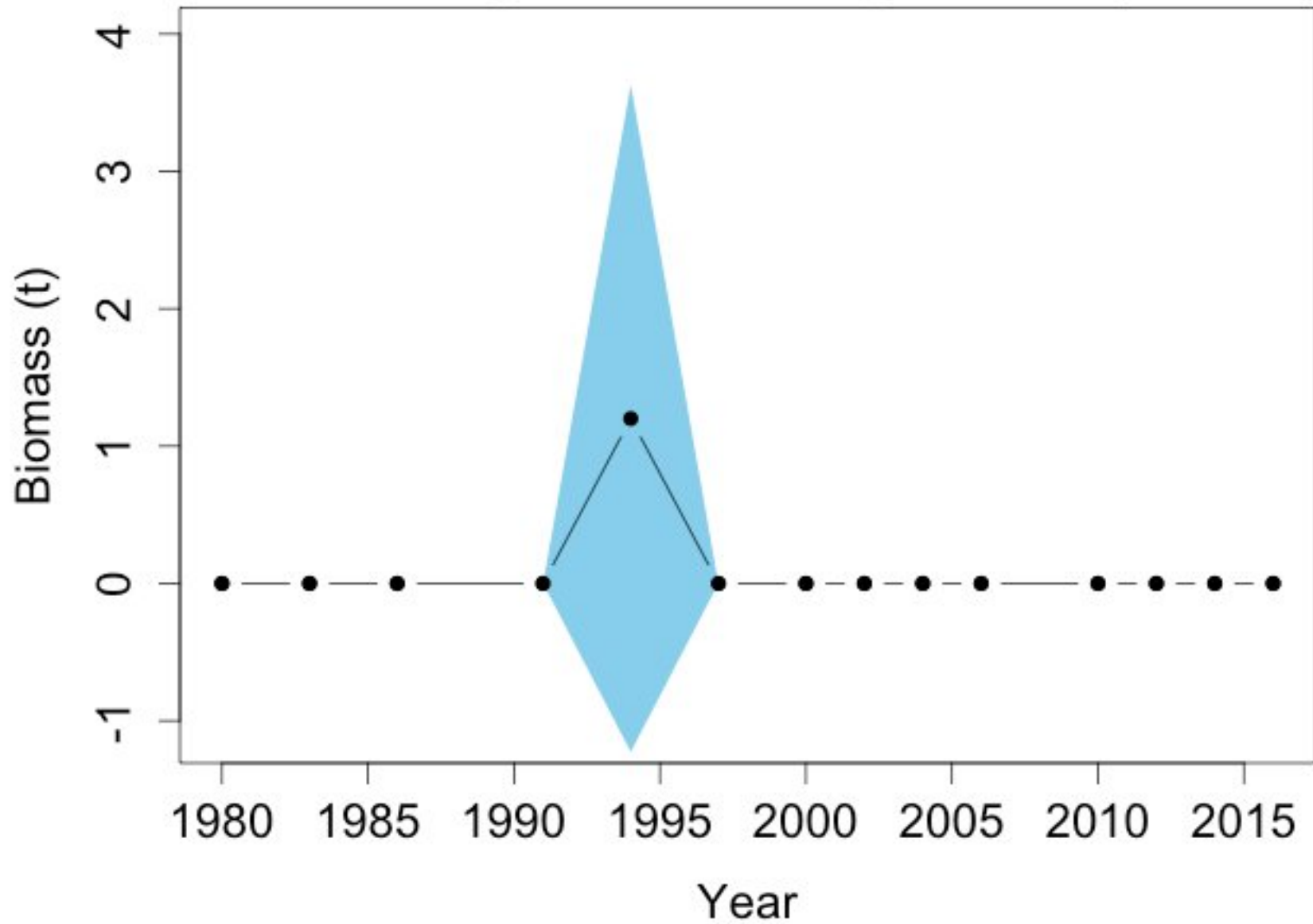
### S. Bering Sea sculpin unid.



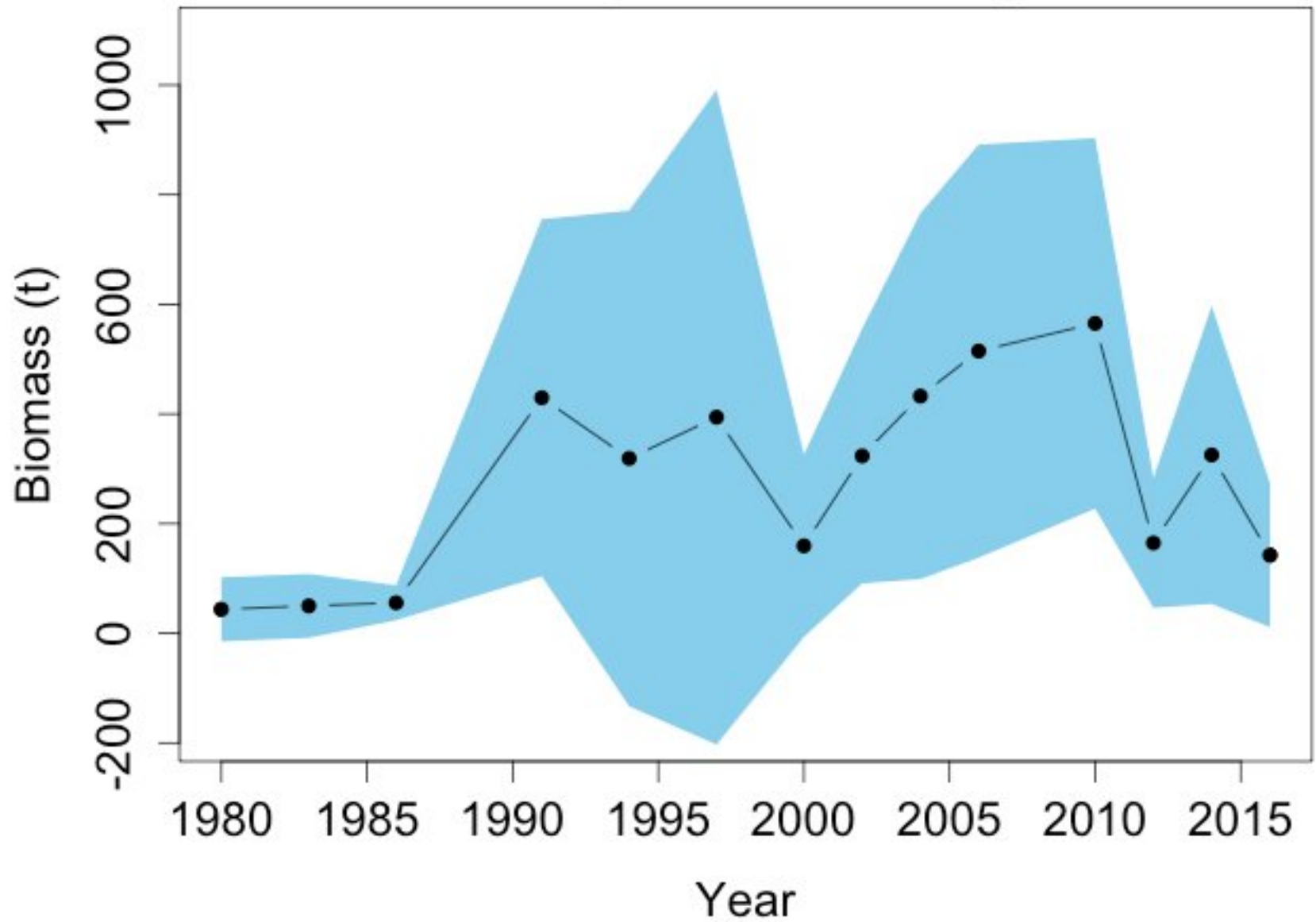
## S. Bering Sea scissortail sculpin



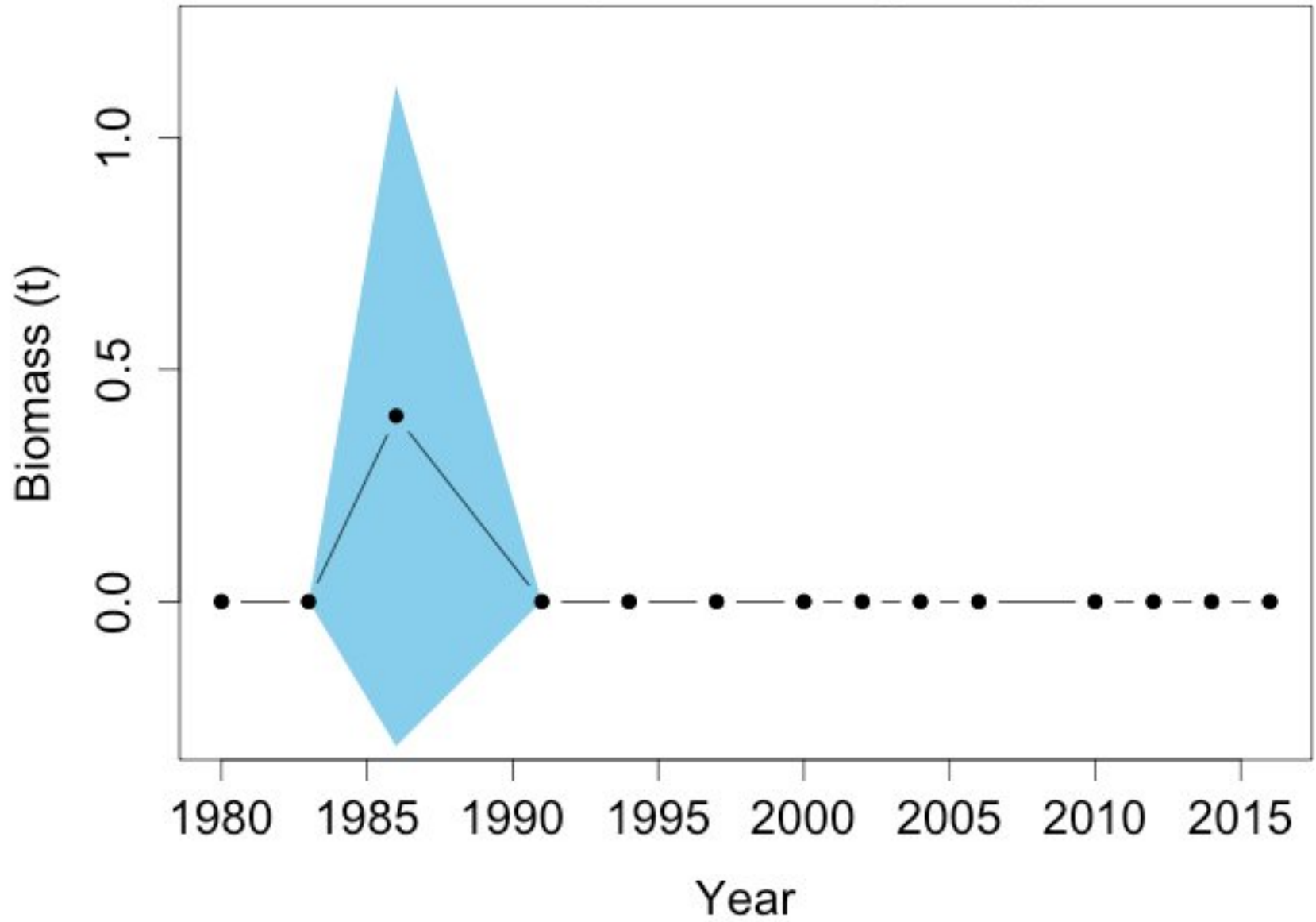
### S. Bering Sea Pacific staghorn sculpin



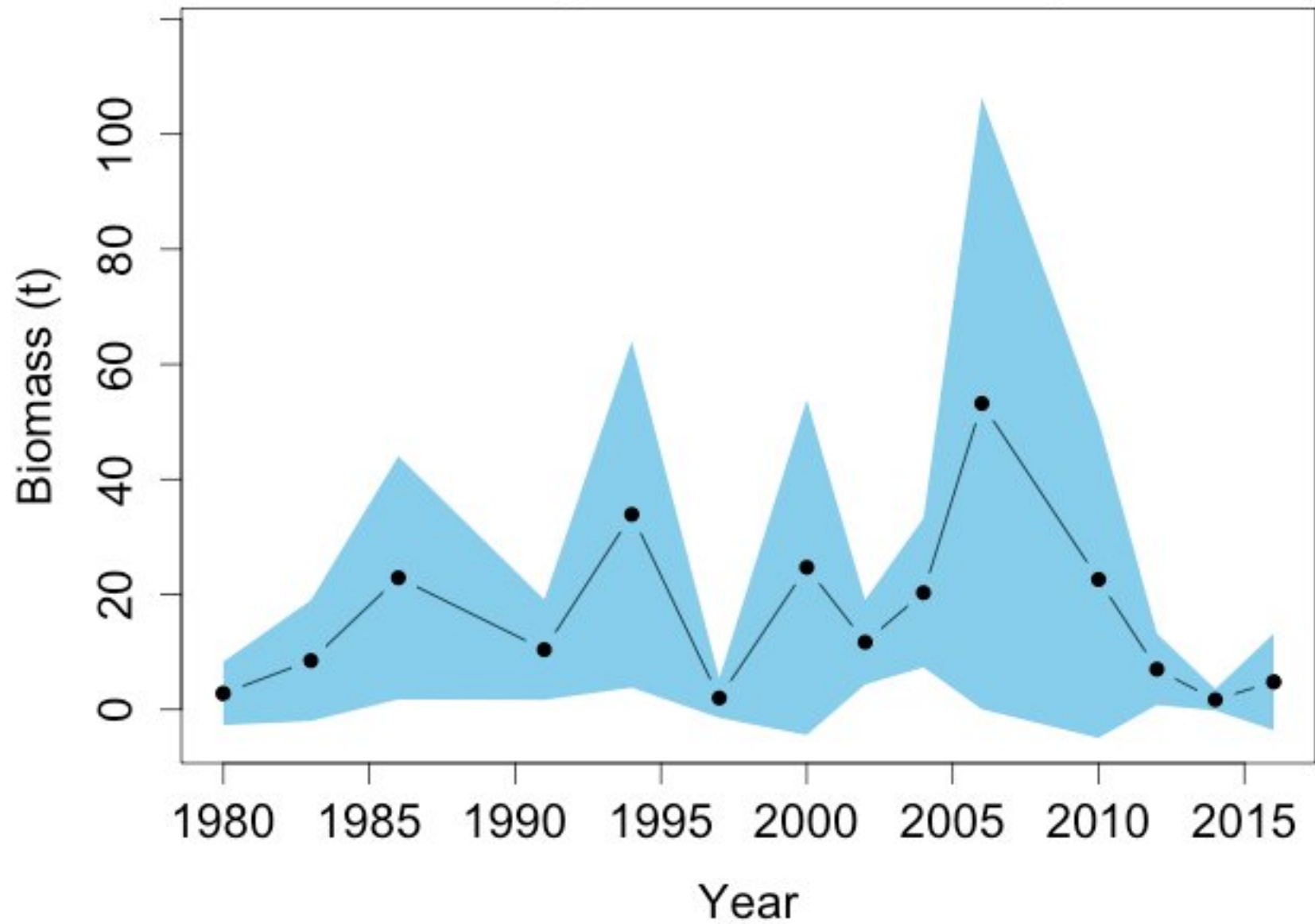
### S. Bering Sea darkfin sculpin



### S. Bering Sea butterfly sculpin



## S. Bering Sea armorhead sculpin



**Biomass for all sculpins combined (solid lines)  
and six most common (dotted lines)**

