

PACIFIC SLEEPER SHARK STOCK STRUCTURE AND MODEL UPDATES

CINDY TRIBUZIO, SEPTEMBER GROUND FISH PLAN TEAM 2022



PHOTO: KEITH FULLER, POST-DOC APU, EM LARGE SHARKS PROJECT



OUTLINE

- PT and SSC comments (paraphrased for brevity)
 - *Bring forward a stock structure for Pacific sleeper sharks across both FMPs (GOA PT 2017)*
 - *Explore data-limited models (JGPT Sept 2018, SSC October 2018, PT BSAI November 2018, SSC December 2018)*
- Outline
 - Pacific sleeper shark (PSS) stock structure (PSS SS)
 - Shark model updates
 - Action items

PSS STOCK STRUCTURE

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Lots of information

Many contributions from many folks

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- Small changes to data collections could substantially improve ability to assess the species
- Assessment improvements: catch data, monitoring, document

PSS STOCK STRUCTURE – KEY FINDINGS

Fishing Mortality on Vulnerable Age Classes

- PSS are highly vulnerable to overfishing
- Fishing mortality on immature sharks is associated with the highest risk of overfishing
- The overwhelming majority of PSS caught in Alaskan fisheries are immature.



Photo: Suzanne McDermott, Jerry Hoff and others, RACE AI Survey

PSS STOCK STRUCTURE – KEY FINDINGS

Fishing Mortality on Vulnerable Age Classes

- Fisheries catch the smallest PSS, in large numbers

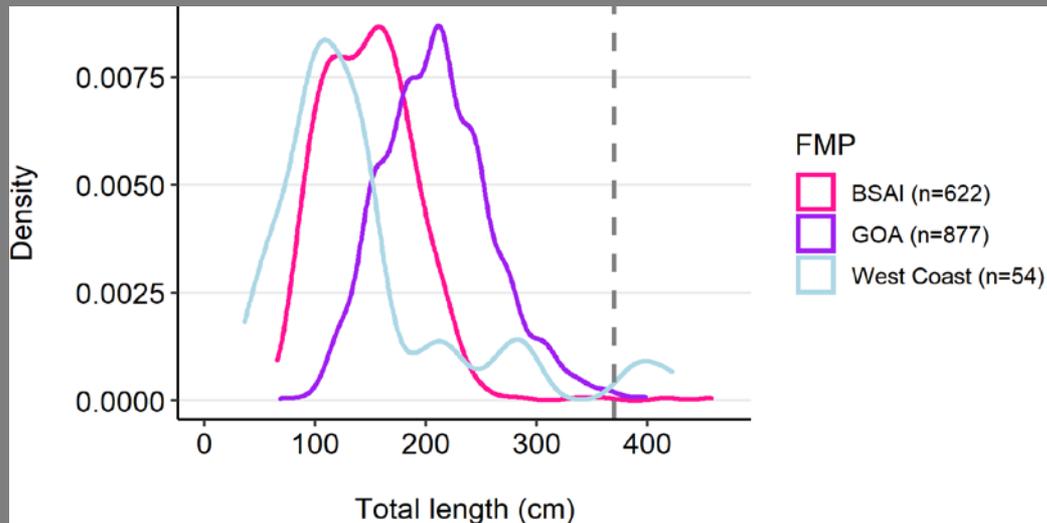


Figure 1

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Fishing Mortality on Vulnerable Age Classes

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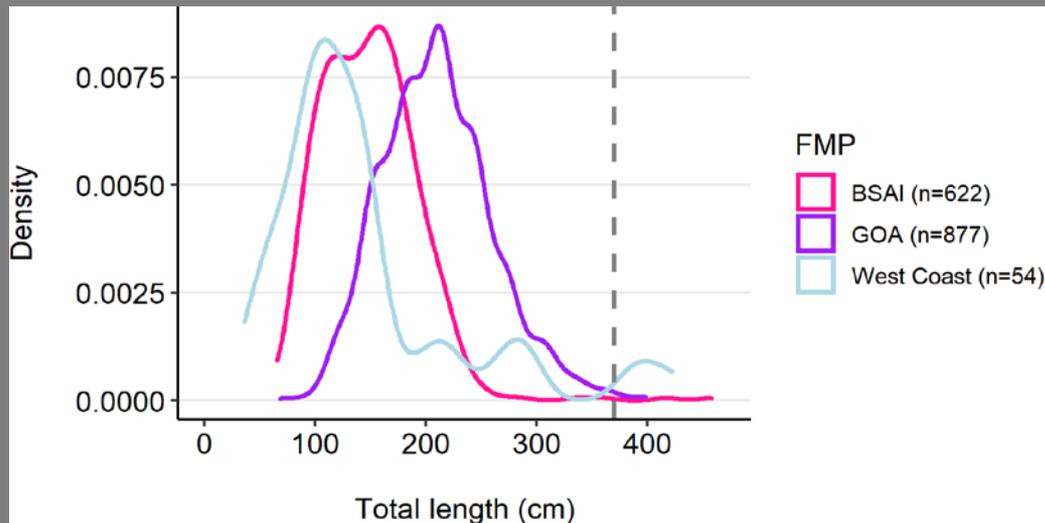


Figure 1

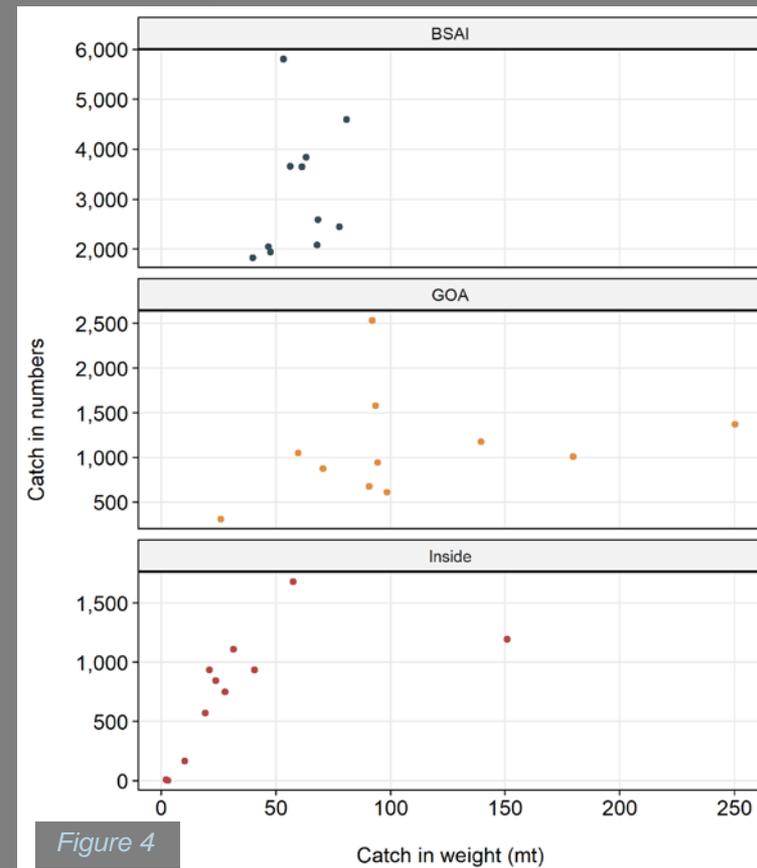


Figure 4

PSS STOCK STRUCTURE – KEY FINDINGS

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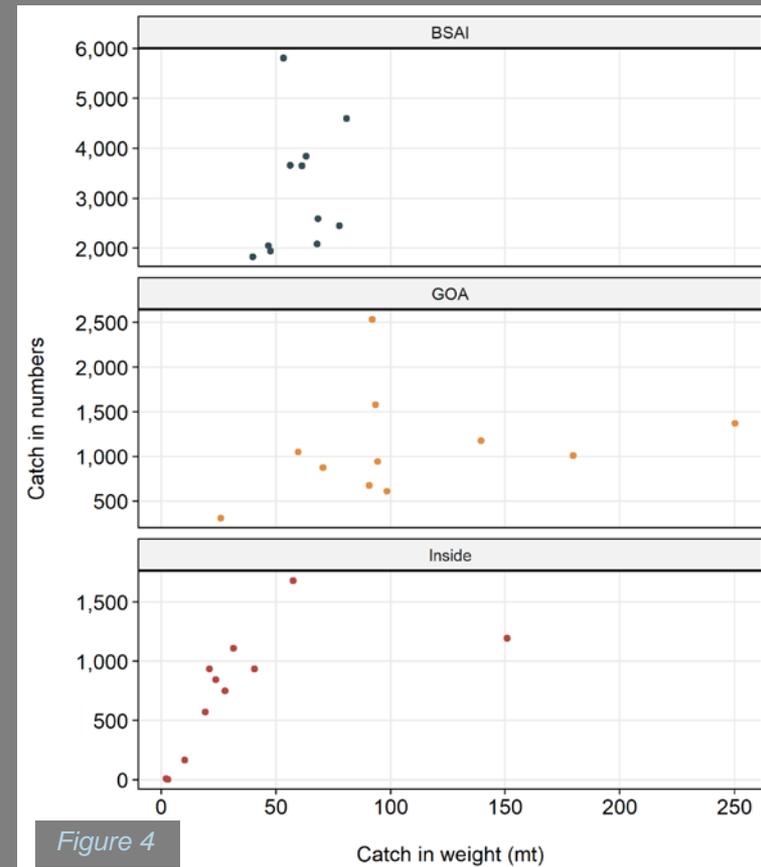
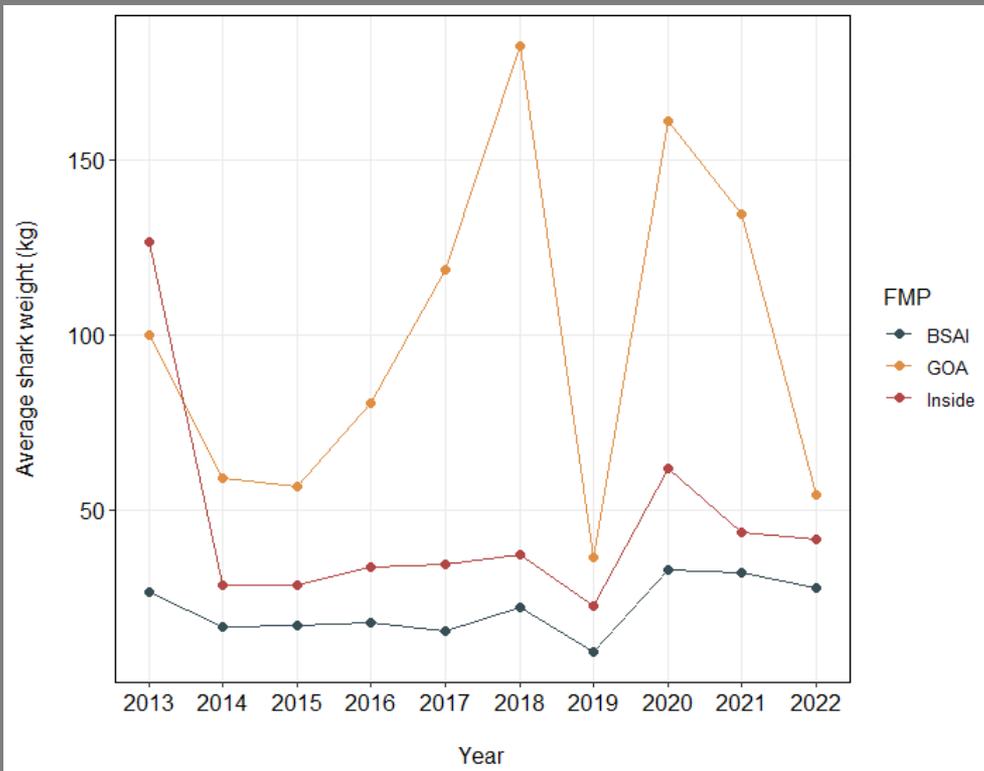


Figure 4

PSS STOCK STRUCTURE – KEY FINDINGS

Decreasing Survey Indices

- IPHC most informative index for PSS due to spatial coverage and selectivity
- CPUE have decreased
- AFSC GOA and slope bottom trawl surveys
- ADFG sablefish survey in Southeast Alaska

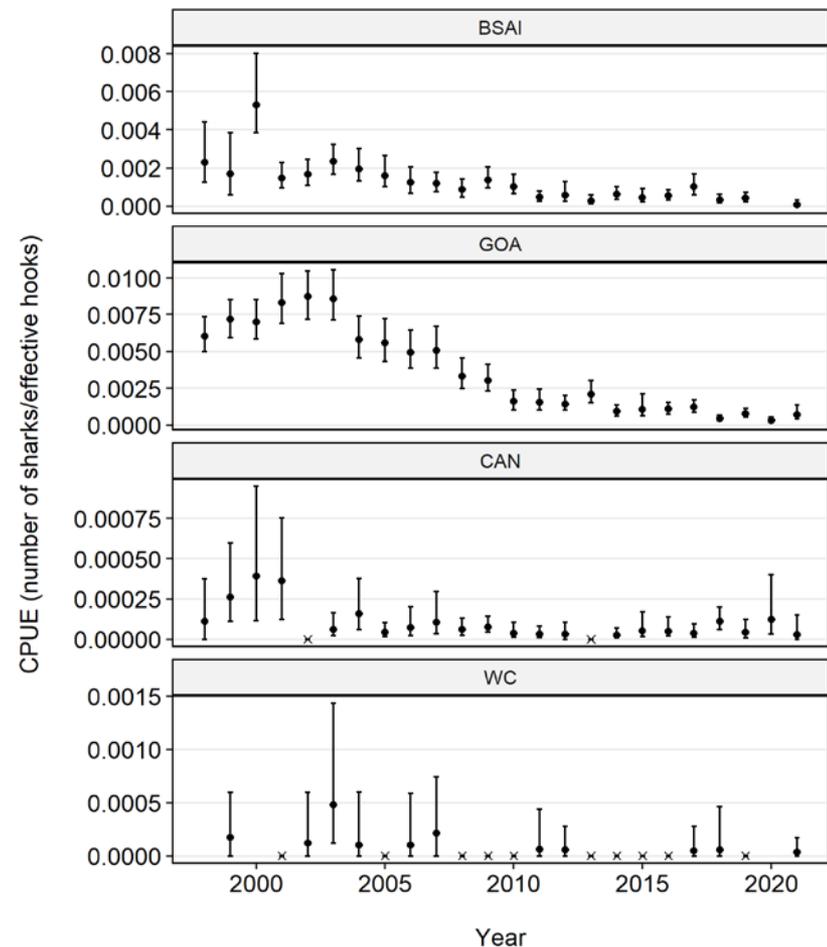


Figure 7

PSS STOCK STRUCTURE – KEY FINDINGS

Contracting Spatial Extent

- Spatial extent of both the fishery

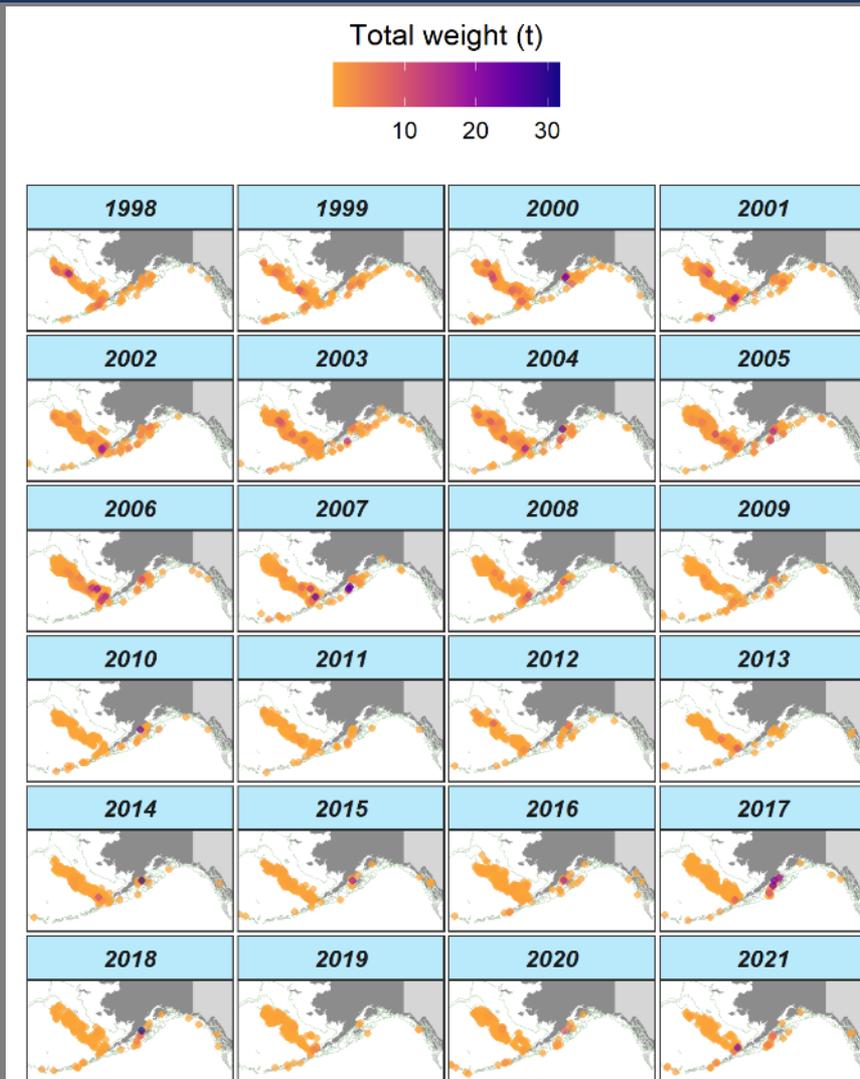


Figure 6

PSS STOCK STRUCTURE – KEY FINDINGS

Contracting Spatial Extent

- Spatial extent of both the fishery and IPHC survey have contracted

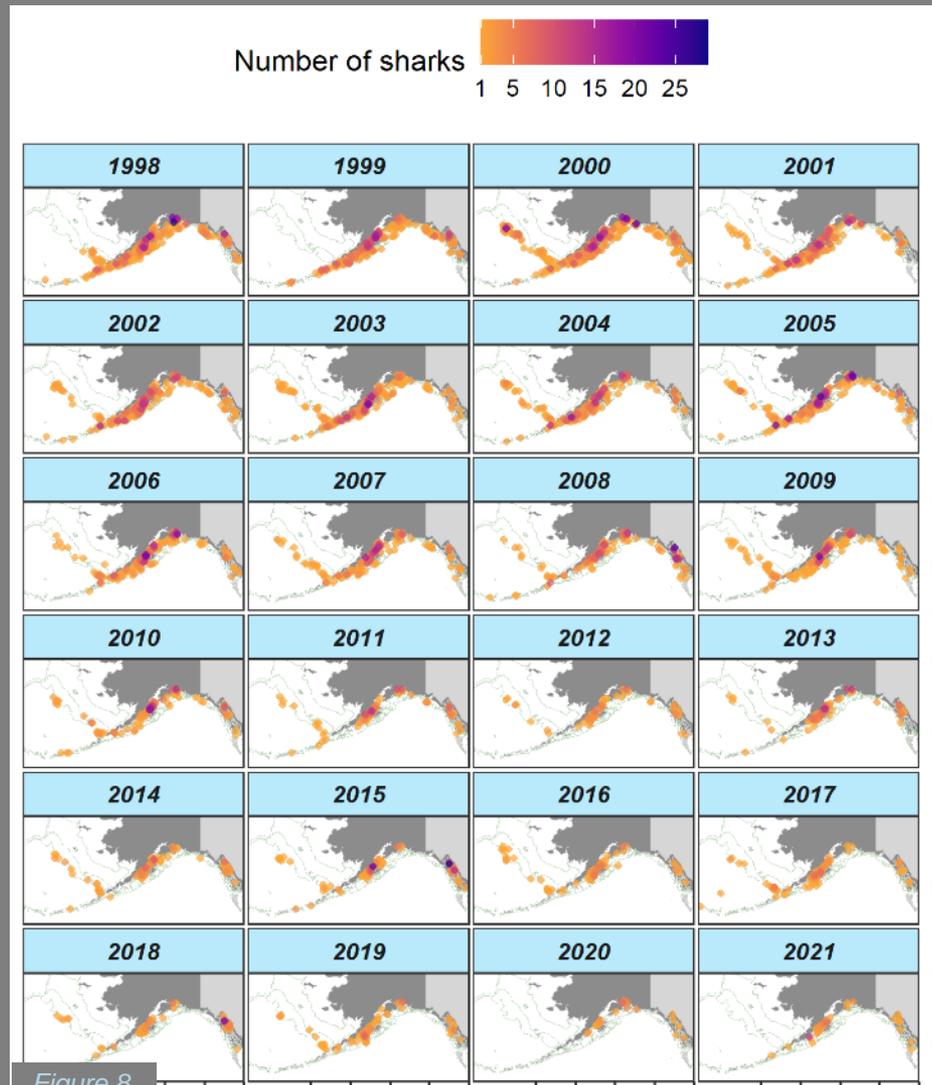


Figure 8

PSS STOCK STRUCTURE – KEY FINDINGS

Contracting Spatial Extent

- Spatial extent of both the fishery and IPHC survey have contracted
- Despite increased coverage on smaller and IFQ vessels

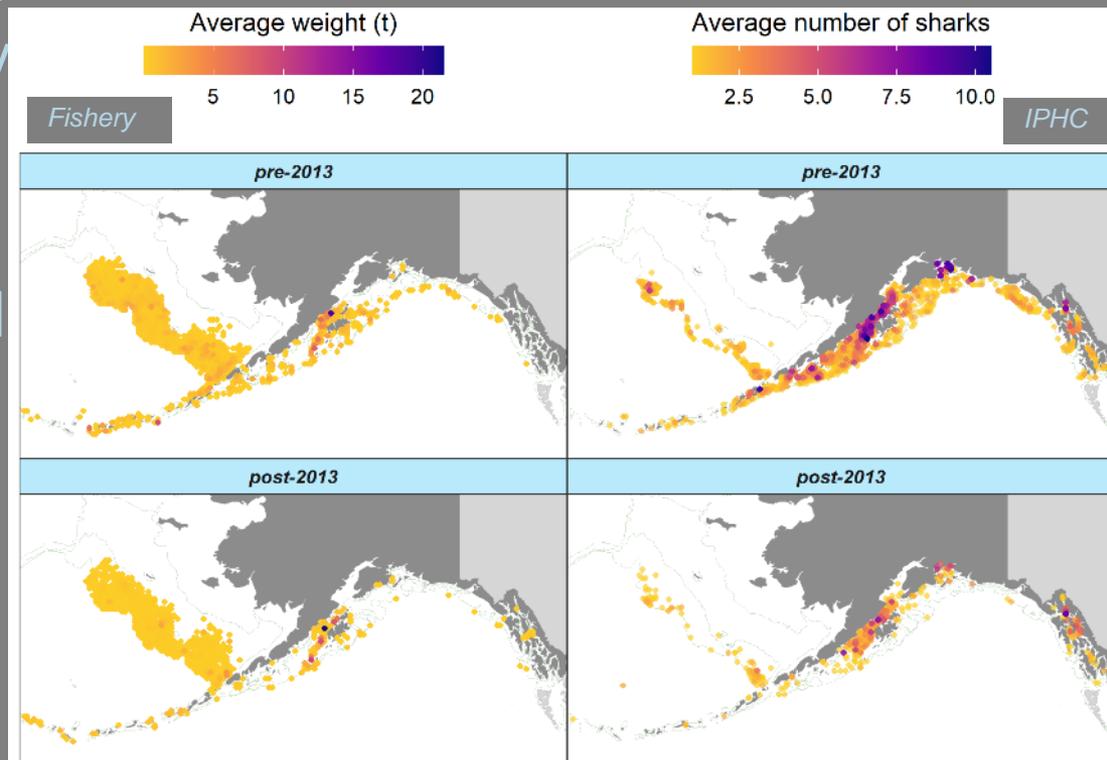


Figure 11

PSS STOCK STRUCTURE – KEY FINDINGS

Genetics

- No significant genetics stock structure between FMPs and beyond



Figure 1 – Timm et al. in review

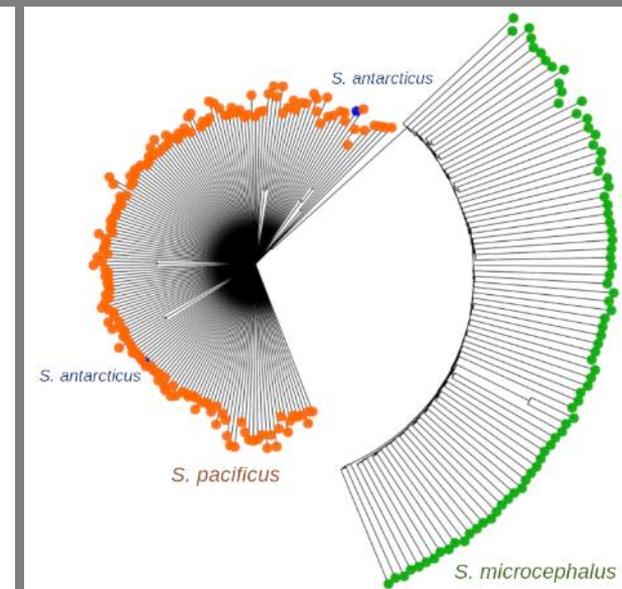


Figure 2 – Timm et al. in review

PSS STOCK STRUCTURE – KEY FINDINGS

Genetics

- No significant genetics stock structure between FMPs and beyond
- Sibling pair found in EBS
- F_{IS} value could be consistent with high survival, family clustering or sampling occurring in nursery habitat
- N_e is below but near the threshold for declining populations
- ***Taken together, genetic results suggest continued monitoring of the population stock status and N_e is warranted***

PSS STOCK STRUCTURE – KEY FINDINGS

Stock Assessment and Monitoring

- Assessment does not account for biology of species
- Catch uncertainty
- Surveys can not provide regular biological data collections
- Inseason monitoring, especially in the GOA, does not allow for managing catch of less productive species within the complex
- Due to size, numbers management should to be considered

PSS STOCK STRUCTURE – KEY FINDINGS

Fishery Dependent Data Collections

- Biological data not collected for sharks
 - Special projects only, which are “as time allows” and may not be representative
- Observers often take lengths of PSS to convert to weight, but do not record that length
- Fishery length data would allow for expanded DLMs
 - Length data not available from the IPHC survey
- Limited species codes

PSS STOCK STRUCTURE – KEY FINDINGS

Complex Management

- GOA Shark Stock Complex dominated by Tier 5 spiny dogfish
- Pacific sleeper shark is majority (64%) of Tier 6 catch
- Catch trends for Tier 6 species are muted by spiny dogfish, monitoring or managing for lower productivity or vulnerable species is not possible
- PSS are likely a “single stock” in Alaskan waters
- Both FMPs have similar assessment documents, creating inefficiencies in the production of the assessments and the review process.

PSS S S - RECOMMENDATIONS

- Expanded monitoring
 1. Retain observer at-sea length measurements
 2. Expand list of shark species codes available for observers
 3. Separate Pacific spiny dogfish ABC from that of the other shark species in the GOA.
- Improve stock assessment
 1. Develop indices to more accurately track catch and abundance of Pacific sleeper sharks and improve the stock assessment.
 2. explore numbers as an alternative to weight for management.
 3. Develop a combined shark stock assessment document.
- Support research efforts to generate or improve monitoring of species and critical parameters for stock assessment

ACTION ITEMS – PSS S S

Recommendations distilled down

- Changes to observer protocol to expand shark species codes and retain length data
- Separate ABCs for GOA spiny dogfish and Tier 6 species
- Investigate IPHC survey index for informing DLMs
- Continue explorations of numbers based DLMs
- Develop of more efficient combined stock assessment document

DISCUSSION BREAK

UP NEXT: SHARK MODEL UPDATES

THANK-YOU!!!!!!

ALL THE FOLKS HELPING TO COLLECT DATA:

- SURVEY CREWS
- INDUSTRY
- OBSERVERS



ALTERNATIVE SHARK MODELS

Responding to PSS SS recommendations and SSC comments:

- DLMs: prioritized for PSS this cycle
 - Alternative PSS models using two catch only methods
- Provide example apportioned ABCs for GOA based on stock structure recommendations

Housekeeping

- Propose alternate models for BSAI/GOA other/unidentified sharks and BSAI spiny dogfish to reduce influence of extreme or unlikely catch values

SHARK MODELS - STATUS QUO

GOA Tier 6 Model 11.0

- Does not include Tier 5 spiny dogfish
- Species specific OFL/ABCs = mean historical catch
- Complex OFL/ABCs = sum of species

BSAI Tier 6 Model 16.0

- All species are Tier 6
- Complex OFL/ABCs = maximum catch of total complex

SHARKS MODELS – STATUS QUO

Assumptions:

- Fishery behavior 20+ years ago represents behavior today
- Times series represents stable abundance (Fig 1)
- Catch trends represent abundance trends
- Catch is known without error
- Nothing better since Restrepo (1998)

PSS MODELS

Refined ORCS PSS22.0

- Allows for qualitative information
- Determines stock status by mean attribute score (Table 1)
- Catch statistic based on stock status (Table 2)
- OFL scaled by risk tolerance

CC PSS22.1-22.5

- Provides stability to OFL while accounting for recent catch trends
- Catch statistic is mean of recent 5 yr catch
- OFL scaled by risk tolerance

PSS MODELS

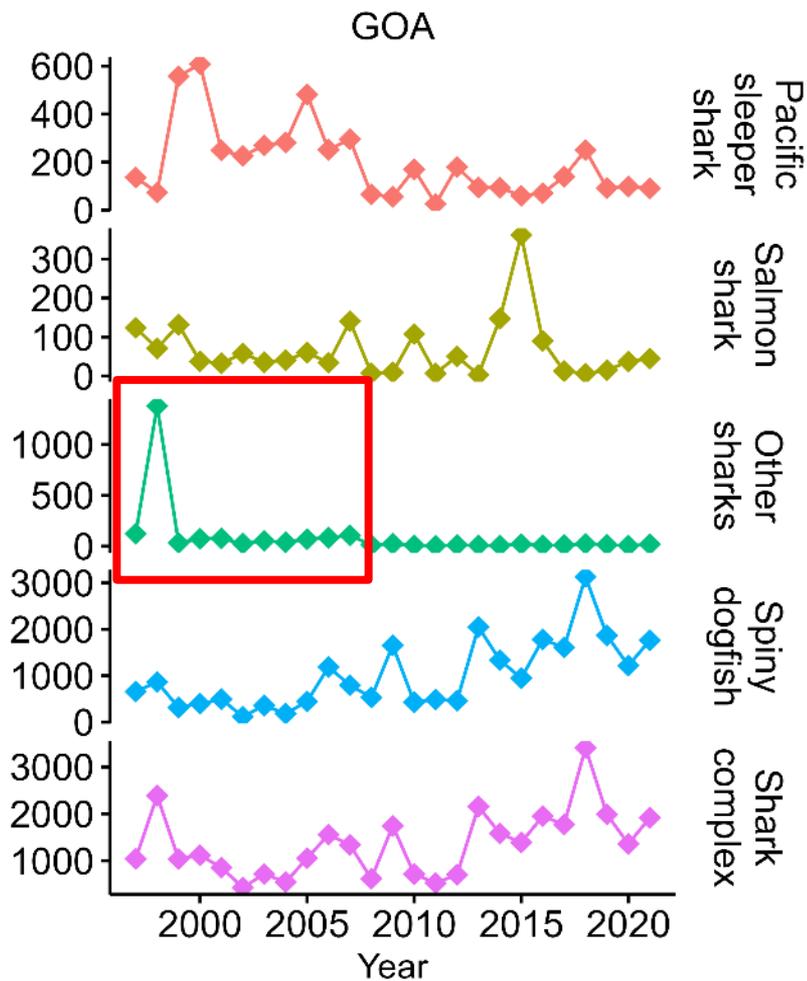
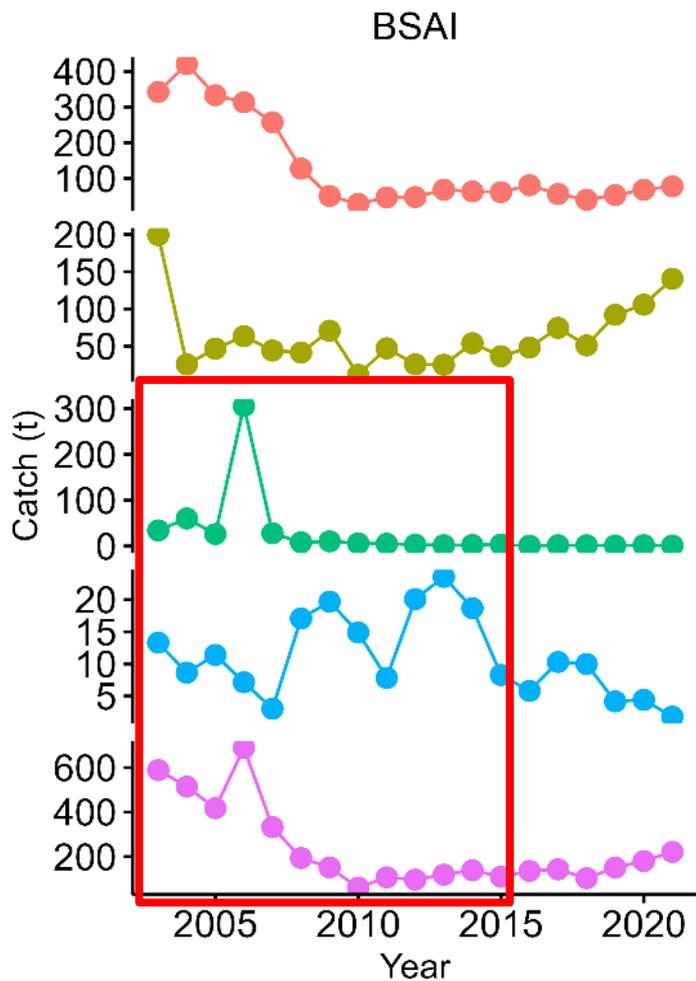
BSAI	OFL	ABC	GOA	OFL	ABC
16.0	689	517	11.0	570	427
PSS22.0	117	88	PSS22.0	197	48
PSS22.1	59	44	PSS22.1	134	100
PSS22.2	53	40	PSS22.2	121	91
PSS22.3	47	35	PSS22.3	107	80
PSS22.4	41	31	PSS22.4	94	70
PSS22.5	35	26	PSS22.5	80	60

PSS MODELS

Models to bring forward in November

BSAI	OFL	ABC	GOA	OFL	ABC
16.0	689	517	11.0	570	427
PSS22.0	117	88	PSS22.0	197	48
PSS22.1	59	44	PSS22.1	134	100
PSS22.2	53	40	PSS22.2	121	91
PSS22.3	47	35	PSS22.3	107	80
PSS22.4	41	31	PSS22.4	94	70
PSS22.5	35	26	PSS22.5	80	60

OTHER SHARKS AND SPINY DOGFISH



OTHER SHARKS AND SPINY DOGFISH

BSAI – OS and SD

GOA - OS

Status quo = OFL = max complex catch

Status quo = OFL = summed species means

FMP	Model	OFL	ABC
BSAI	16.0	NA	NA
GOA	11.0 (Other)	188	141

Alt = OFL = 90th p of species

FMP	Model	OFL	ABC
BSAI	BSAI22.0 (Other)	55	41
	BSAI22.0 (Spiny)	20	15
GOA	GOA22.0 (Other)	123	92

GOA ALTERNATIVE ABCS

SQ models, SQ app

GOA	Total Complex
Tier	5/6
OFL	5,006
ABC	3,755

SQ models, Alt app

GOA	SD	T6	Comp
OFL			5,006
ABC	3,327	428	3,755

Alt models, SQ app

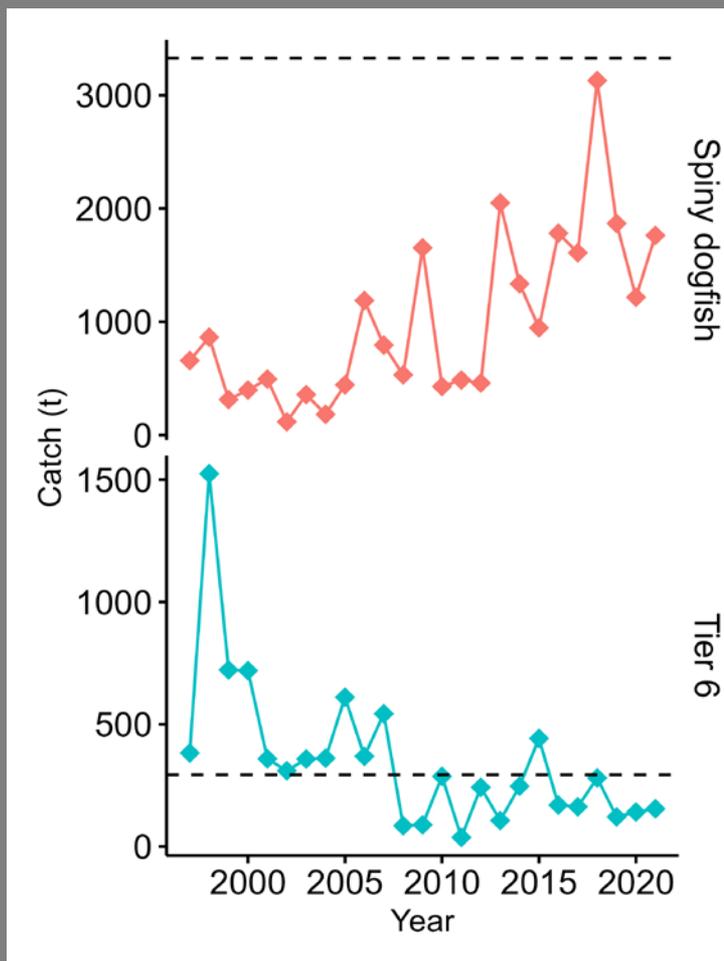
GOA	Total Complex
Tier	5/6
OFL	4,826
ABC	3,620

Alt models, Alt app

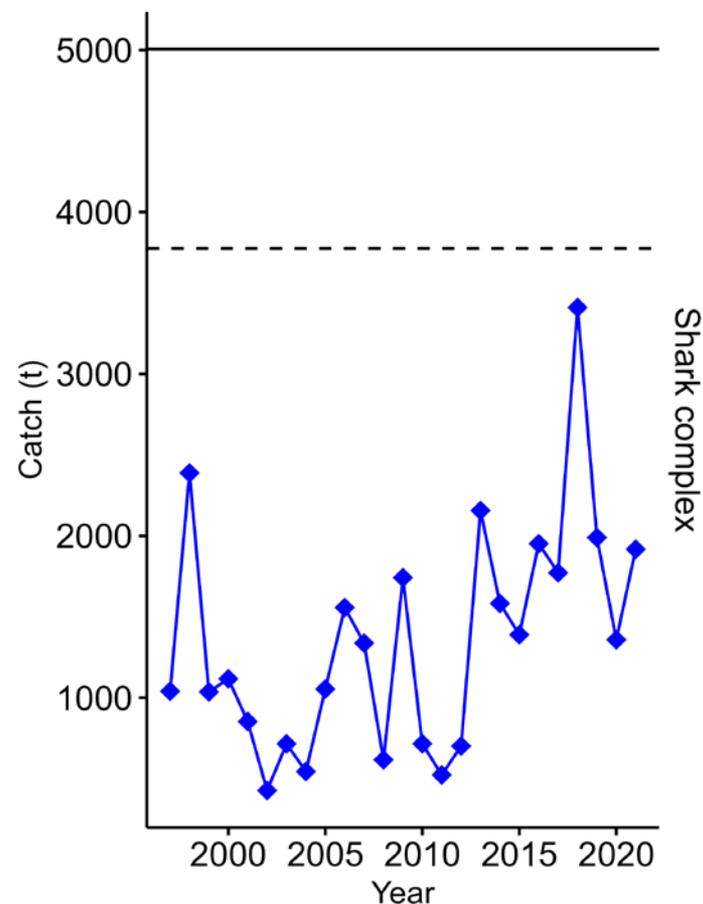
GOA	SD	T6	Comp
OFL			4,826
ABC	3,327	293	3,620

GOA ALTERNATIVE ABCS

Alt models, Alt app



Alt models, SQ app



ACTION ITEMS – SHARK MODELS

Recommendations

- PSS: Include Model PSS22.0 for Nov
- OS/SD: Include both BSAI22.0 and GOA22.0 for Nov
- Bring forward alternative GOA species apportionment for Nov

PSS MODELS

Refined ORCS PSS22.0

Attribute Description	BSAI	GOA
Status of assessed stocks in fishery	3	3
Behavior affecting capture	2	2
Discard rate	3	3
Targeting intensity	1	1
M compared to dominant species	3	3
Occurrence in catch	3	3
Value	1	1
Recent trend in catch	2	3
Habitat loss	2	2
Recent trend in effort	3	3
Recent trend in abundance index	2	2
Proportion of population protected	3	3
Mean Score	2.33	2.42
Stock Status	Full Exp	Full Exp
Catch Statistic	53.99	91.02
Scalar	2.16	2.16
OFL	117	197
ABC	88	148

CC PSS22.1-22.5

	BSAI	OFL	ABC
PSS22.1	59	44	
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