

# GOA Shark Assessments



Cindy Tribuzio, Pete Hulson, Katy  
Echave, Cara Rodgveller  
Auke Bay Laboratories, AFSC

# Responses to PT/SSC Comments

- Major comments (paraphrased):
  - Bring forward average (w/CI), maximum and median catches of the current time period
    - *Interpreted “current time period” to mean “current time period used for Tier 6 calculations*
    - *Alternatives are presented in Table 20.6*
  - [For spiny dogfish] Bring forward status quo method in addition to  $F_{max}$  and include the demographic methods as appendix
    - *Model 15.1 is status quo, Model 15.3A uses  $F_{max}$*
    - *Demographic methods are included in Appendix 20B*

# Responses to PT/SSC Comments

- Major comments (paraphrased):
  - Recommended continued work on improving biomass estimate
    - *Model 15.3A incorporates catchability and adjust the minimum biomass ( $B_{RFX}$ ) to a total biomass ( $B_q$ )*
  - Work on: PSS stock structure, catch by numbers, genetics, ageing, and asses bias in hook and line catch estimates
    - *Short answer: It's all in process*



# GOA Sharks



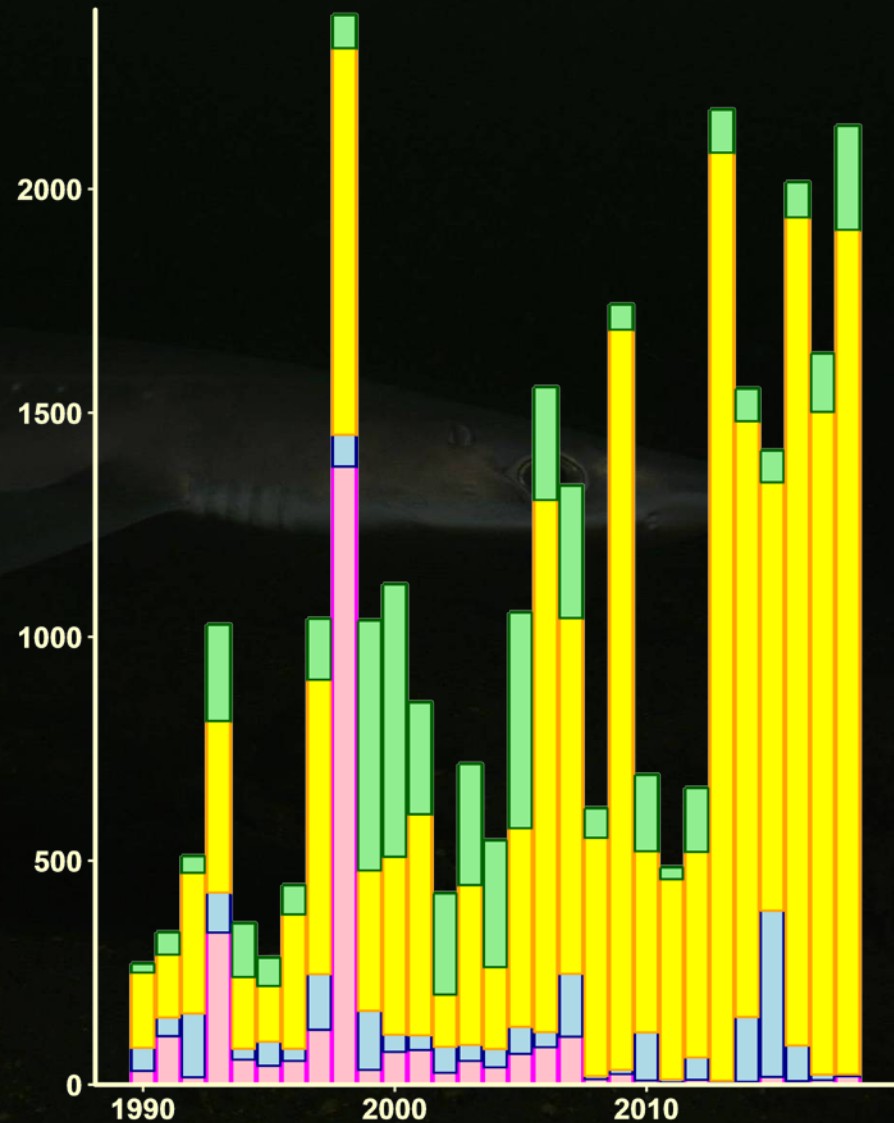
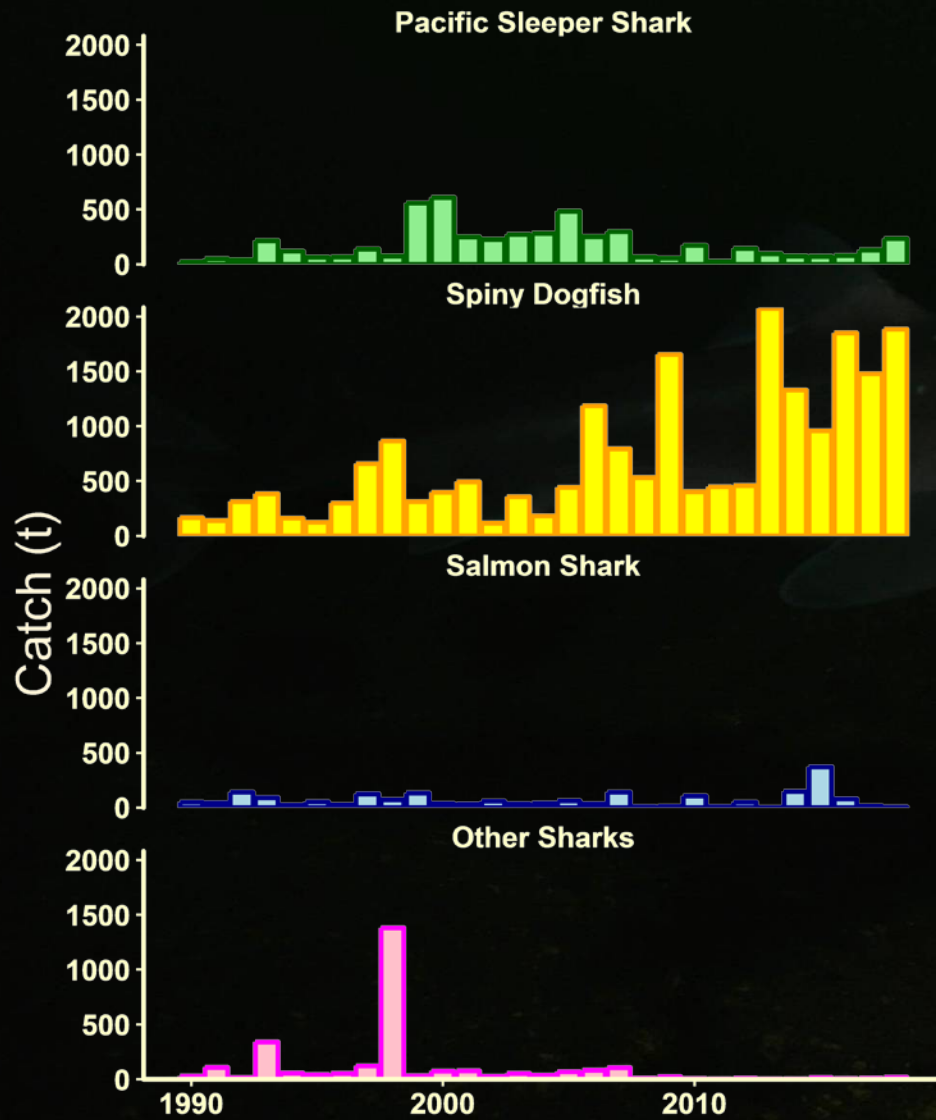
- Changes to input data:
  - Updated catch data through 2018 (as of Oct 9, 2018)
  - Updated data from AFSC trawl, AFSC longline, IPHC longline and ADF&G surveys
  - Updated random effects biomass
  - Estimate of catchability ( $q$ )

# GOA Sharks



- Changes to assessment methodology:
  - Tier 6 species: none
  - Spiny dogfish (Model 15.3A)
    - Minimum biomass ( $B_{RFX}$ ) adjusted by  $q = 0.21$
    - $F_{OFL} = F_{max} = 0.04$
    - Model 15.1 (status quo) assumes  $q = 1$  and  $F_{OFL} = M = 0.097$

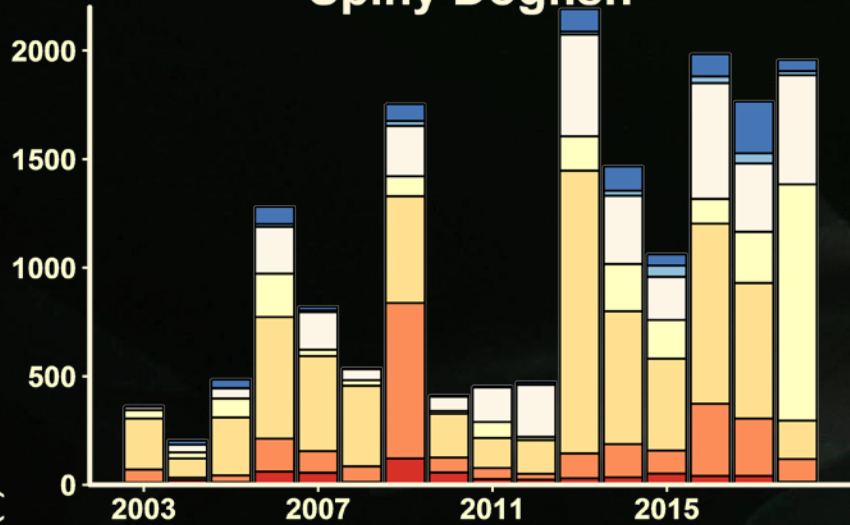
# Species Specific Catch



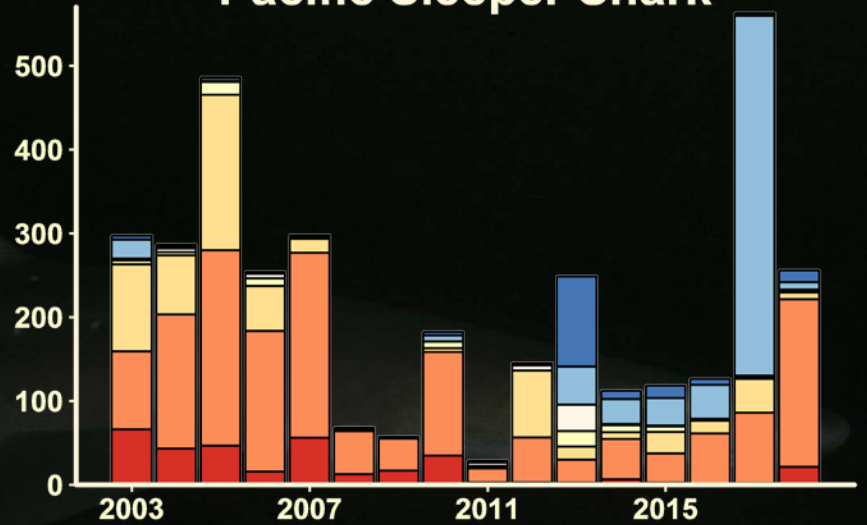
Year

# Catch by Area

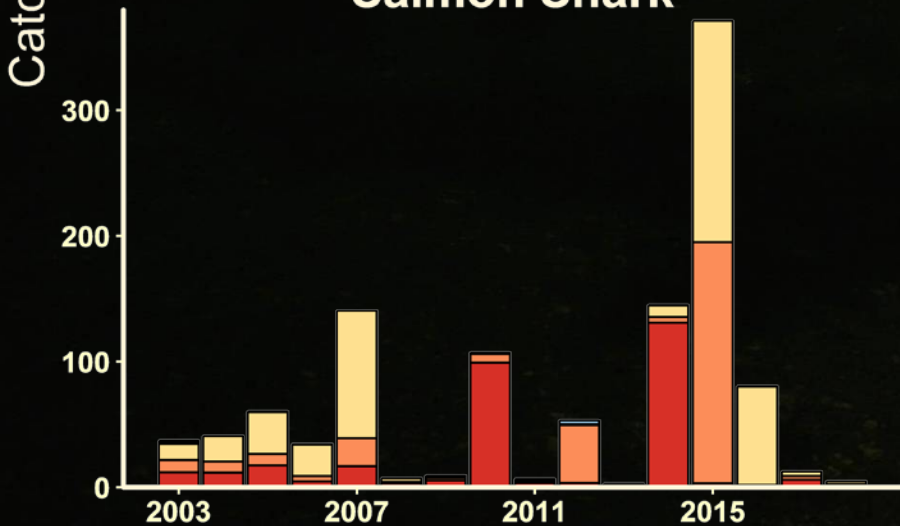
## Spiny Dogfish



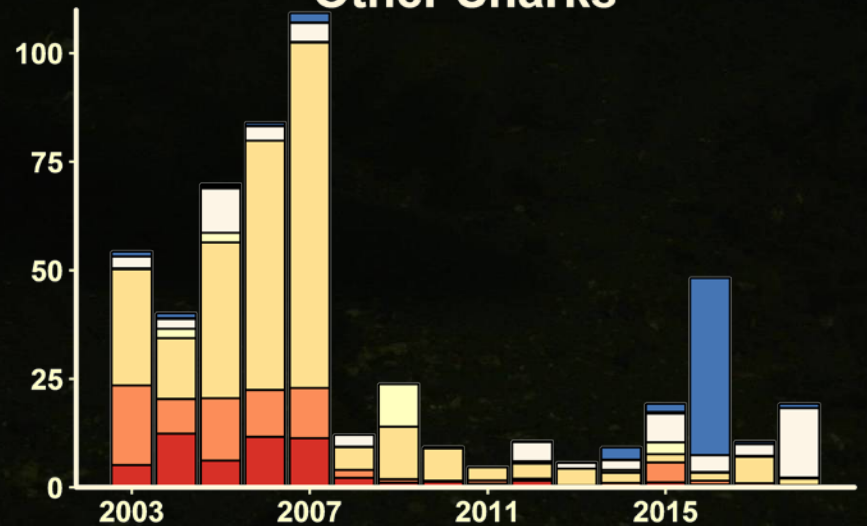
## Pacific Sleeper Shark



## Salmon Shark



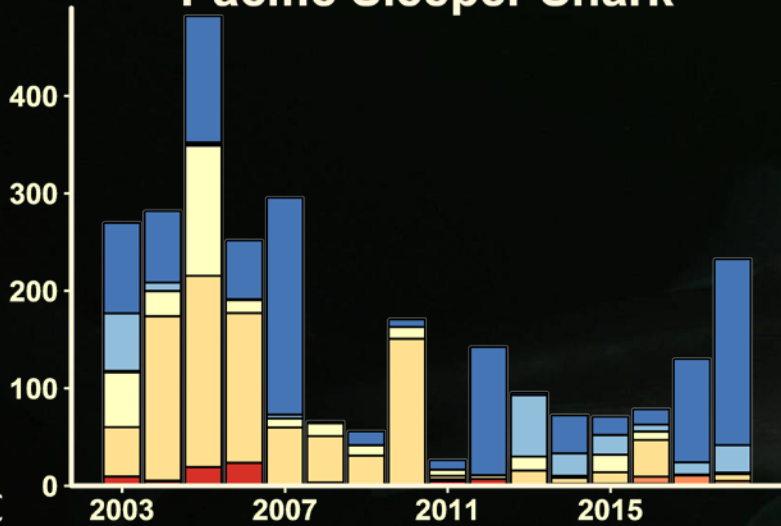
## Other Sharks



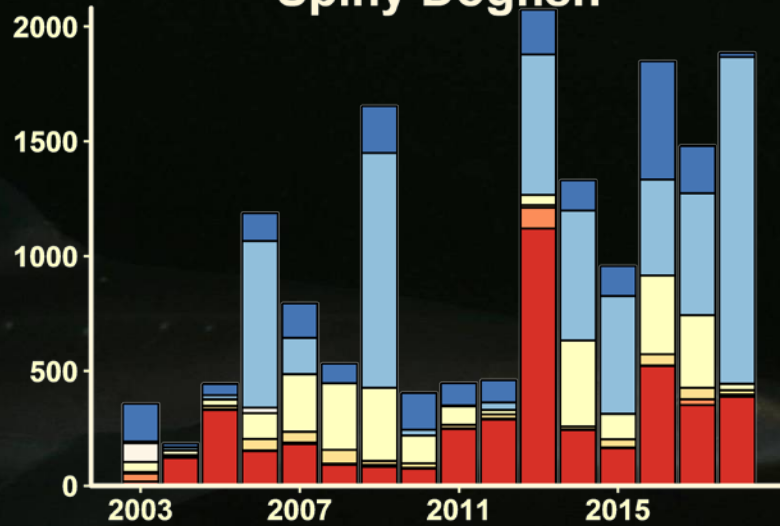
Year

# Catch by Target Group

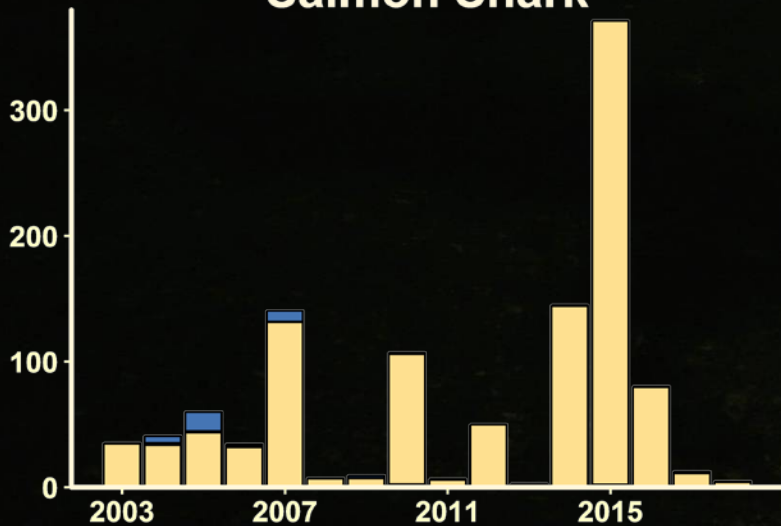
## Pacific Sleeper Shark



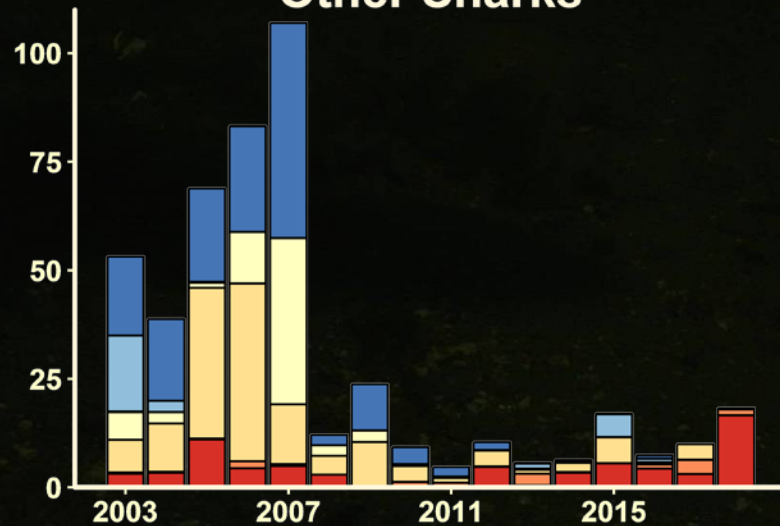
## Spiny Dogfish



## Salmon Shark



## Other Sharks



- Target Fishery
- Sablefish
  - Rockfish
  - Pollock
  - Pacific Cod
  - Other
  - Halibut
  - Flatfish
  - Atka Mackerel

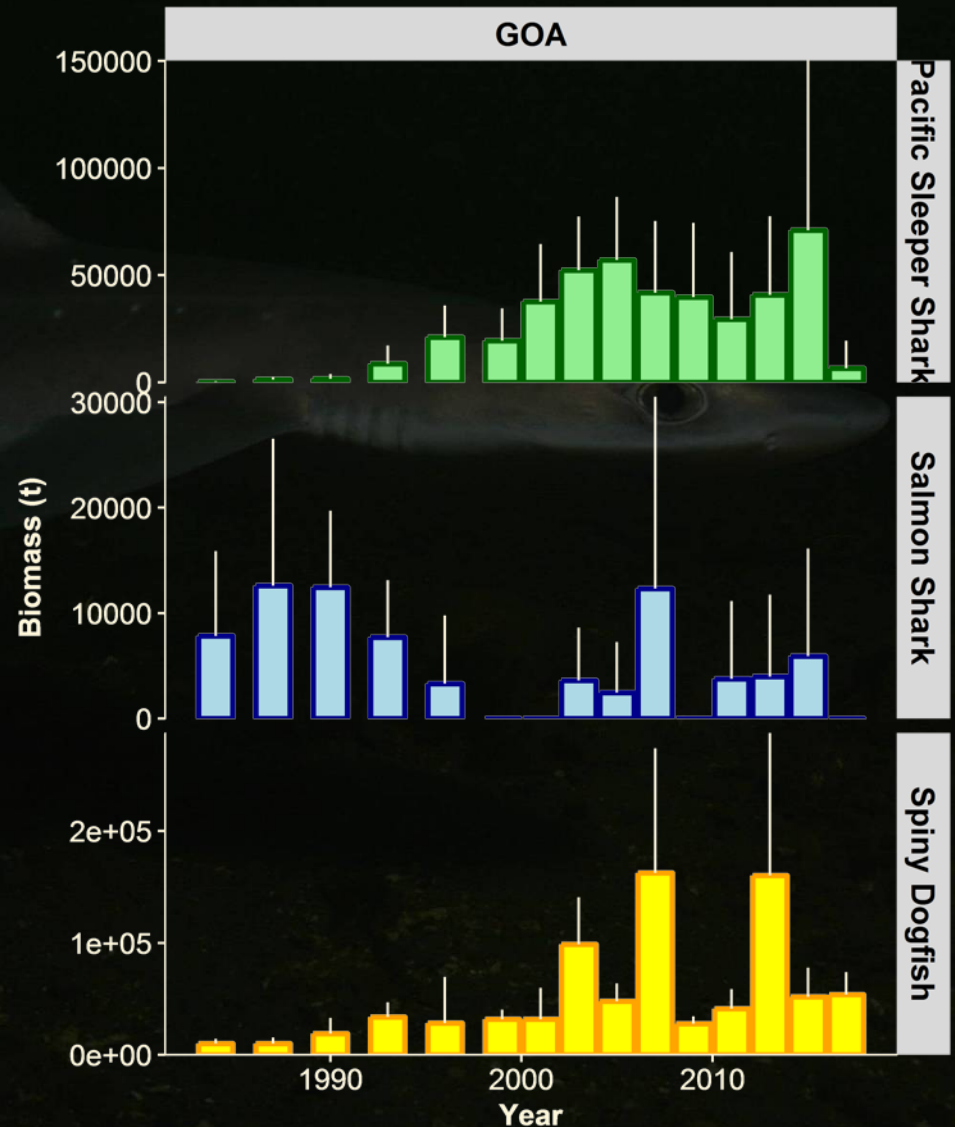
Catch (t)

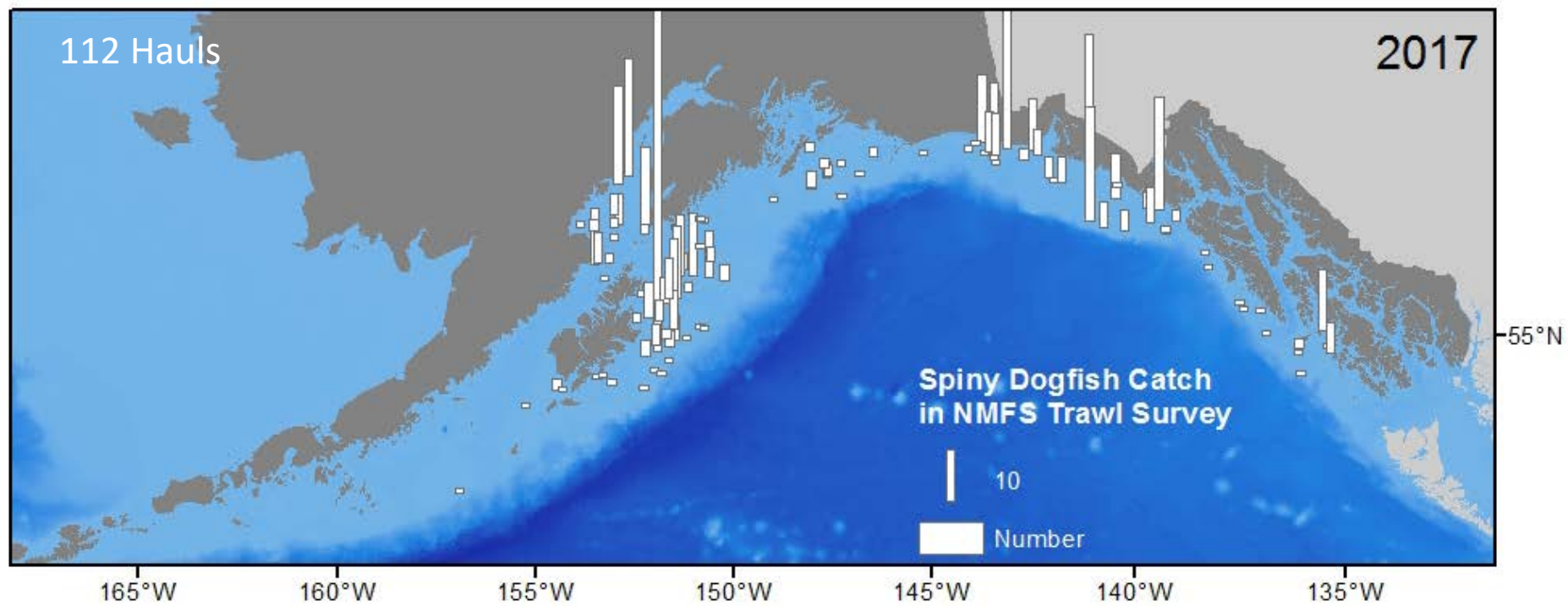
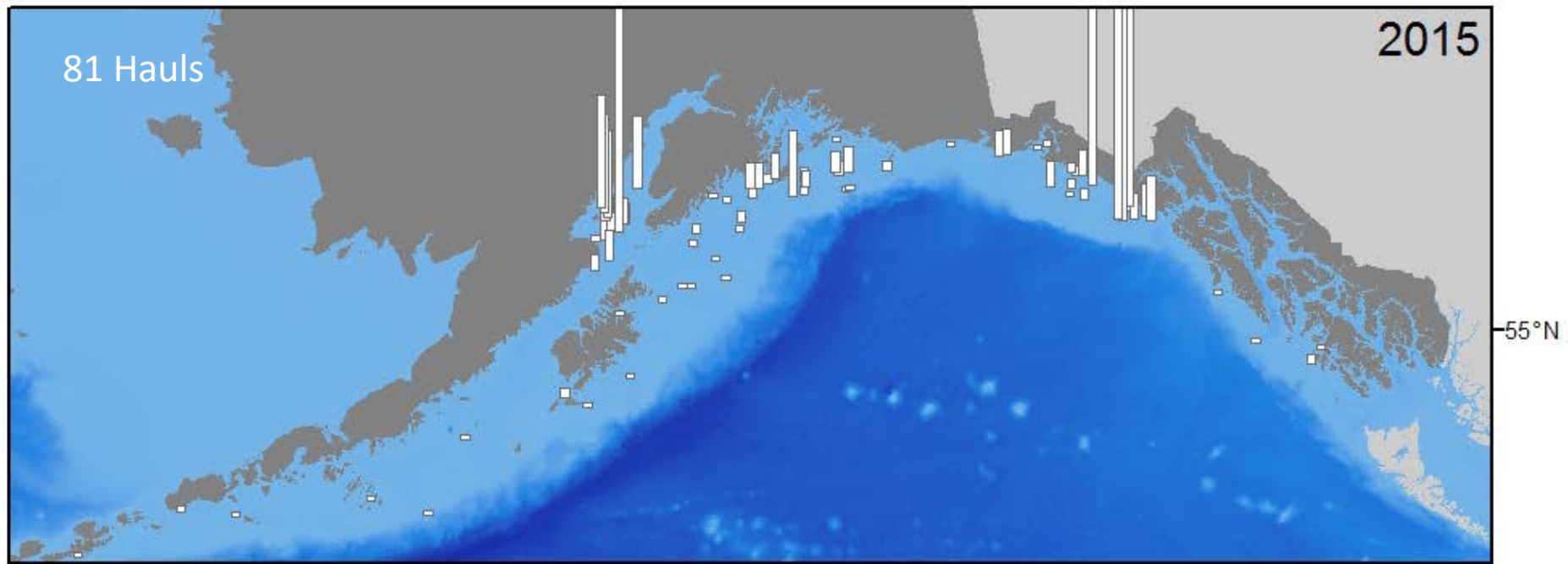
Year

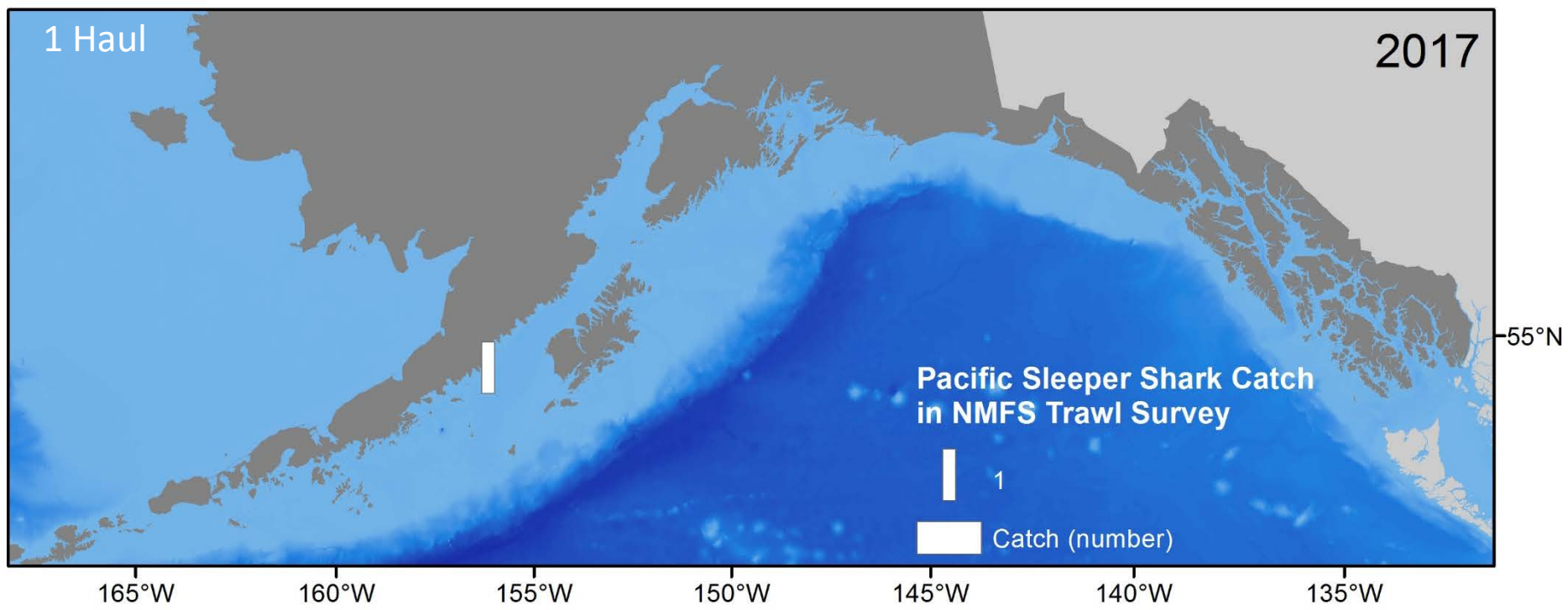
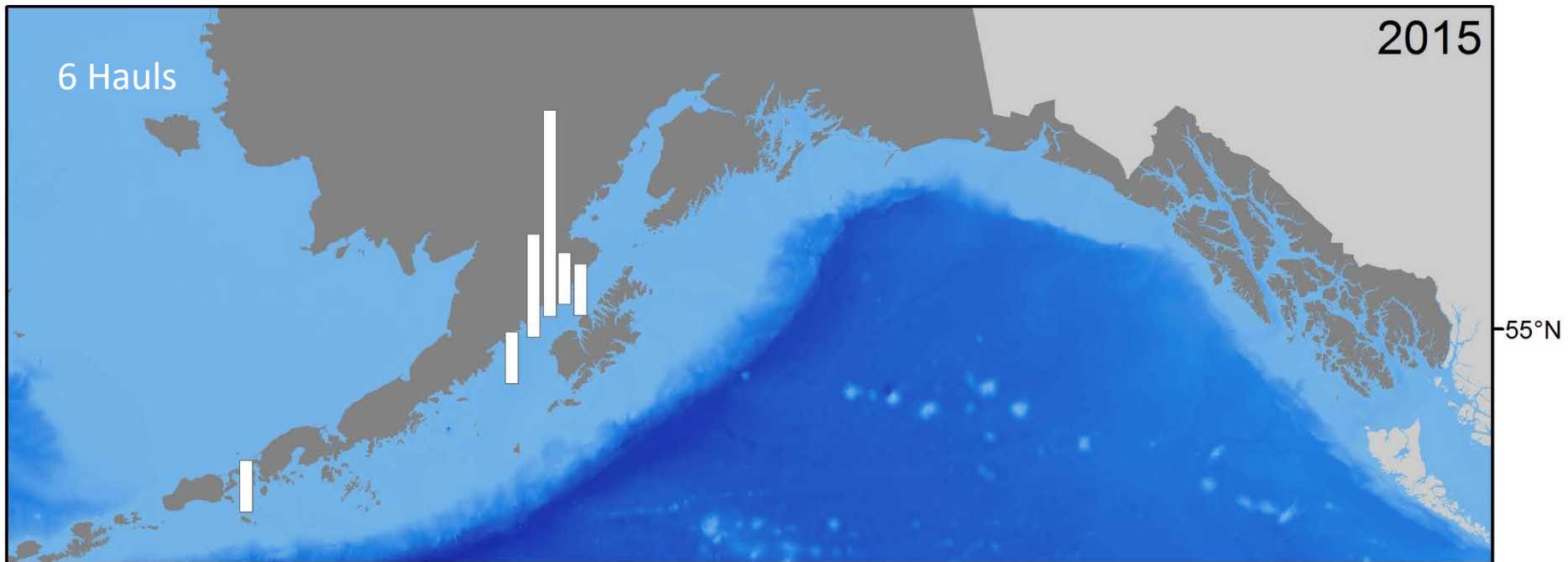


# AFSC Trawl Survey

- Pacific Sleeper shark one of lowest of time series
- Spiny dogfish flat
- Only used for spiny dogfish



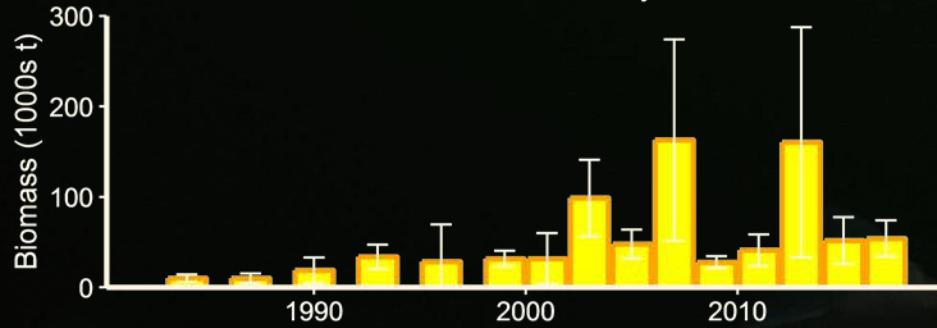




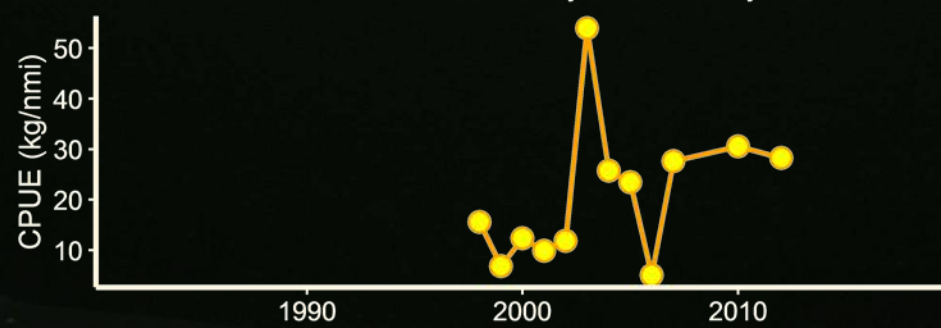


# Survey Indices – Spiny Dogfish

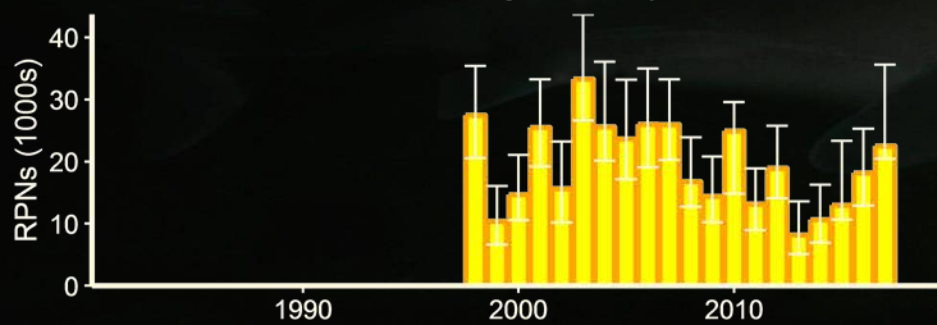
AFSC Trawl Survey



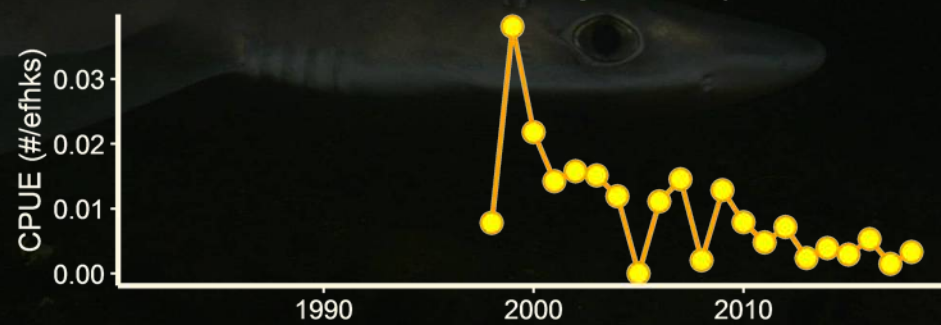
ADF&G Kamishak Bay Trawl Survey



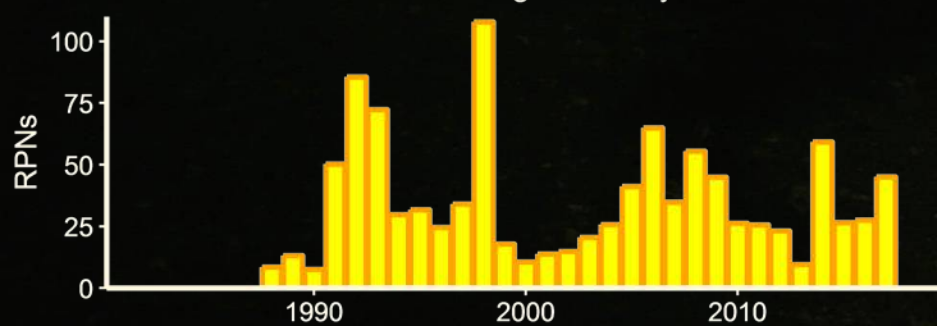
IPHC Longline Survey



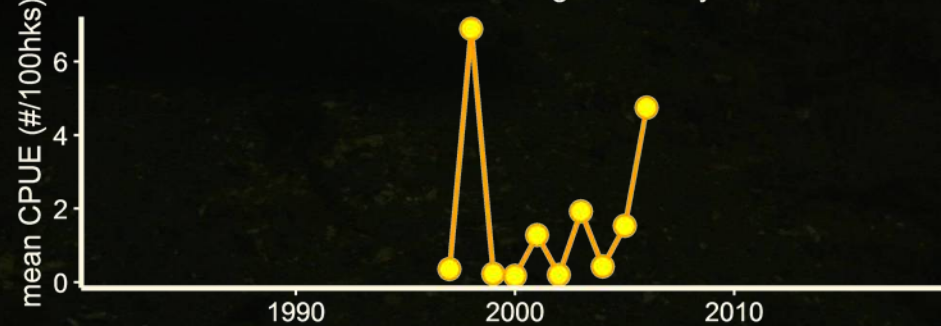
ADF&G SEAK Longline Survey



AFSC Longline Survey

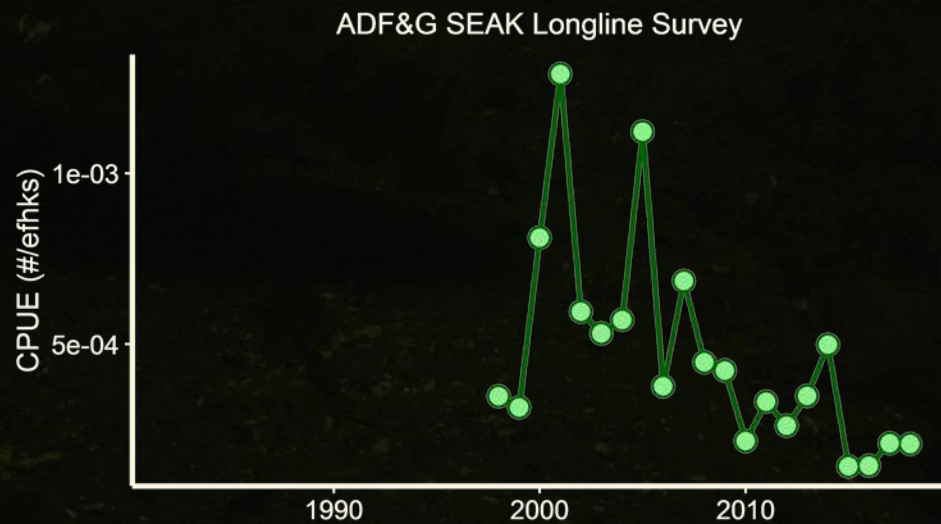
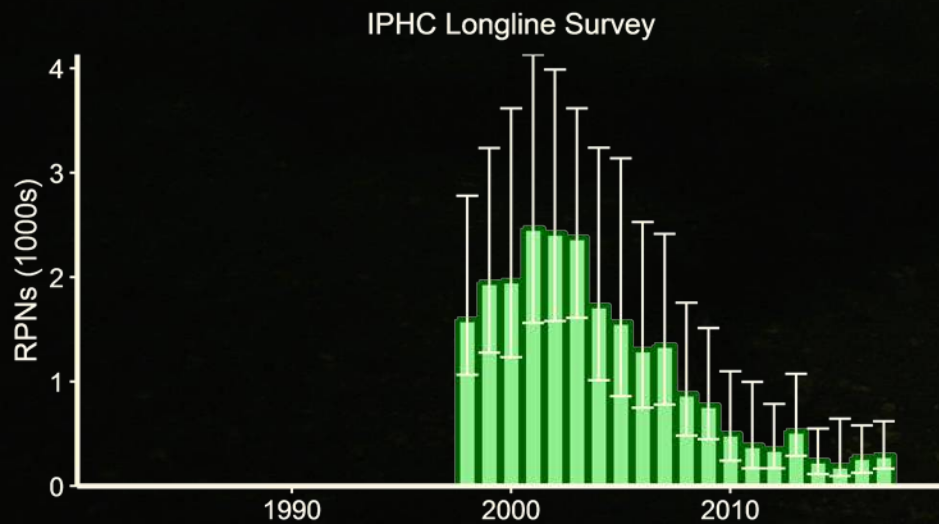
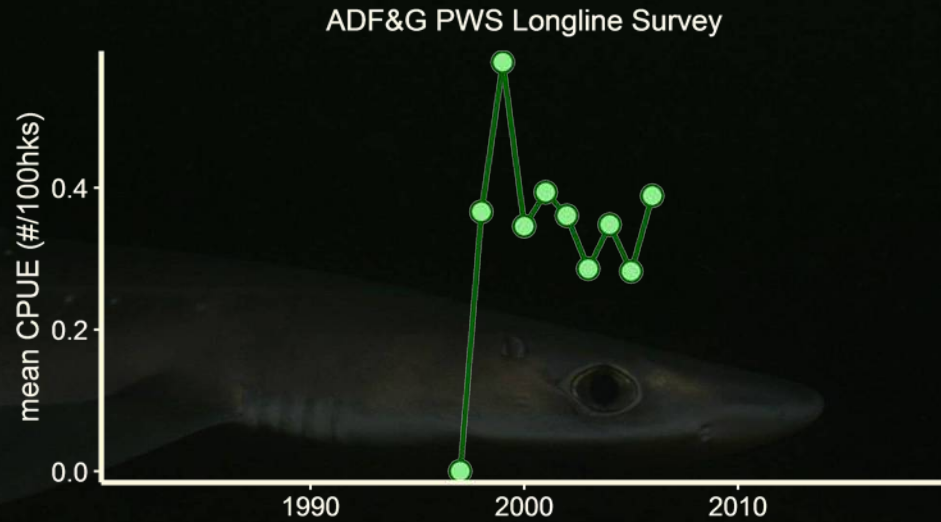
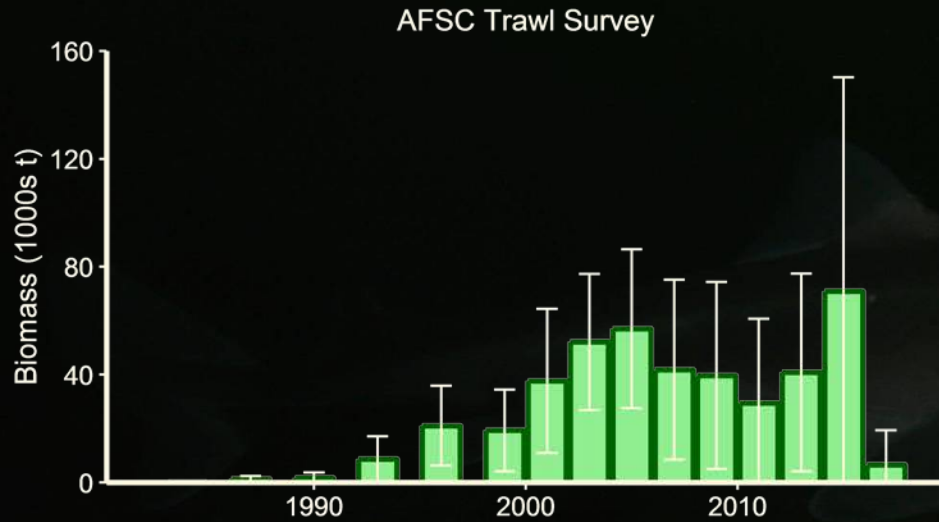


ADF&G PWS Longline Survey





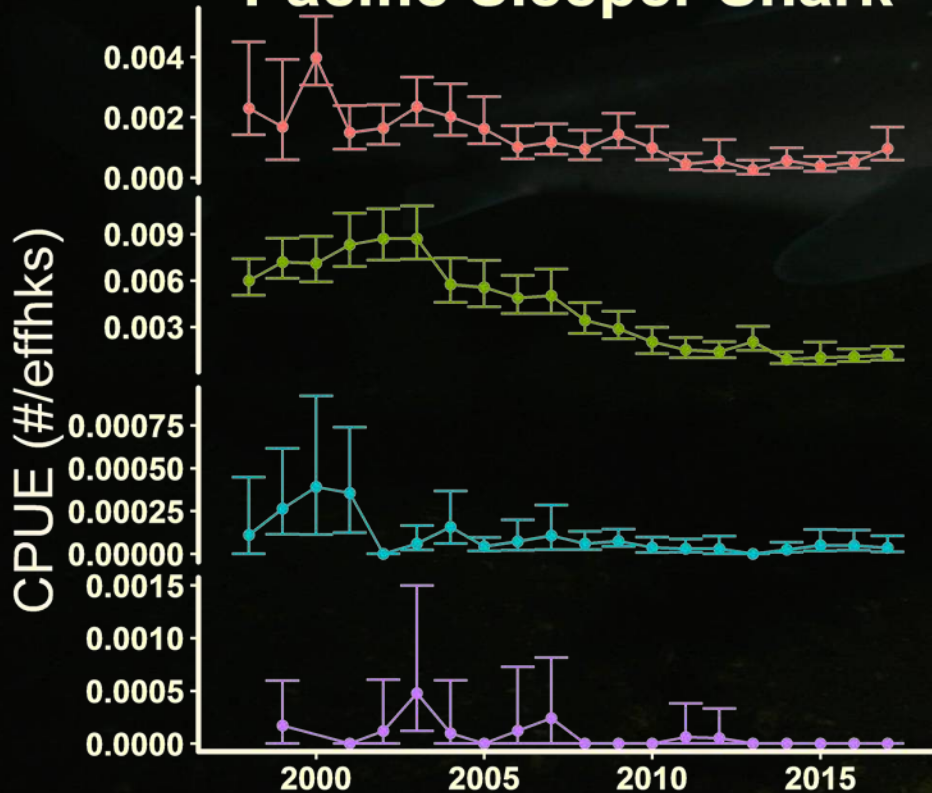
# Survey Indices – Pacific Sleeper Shark



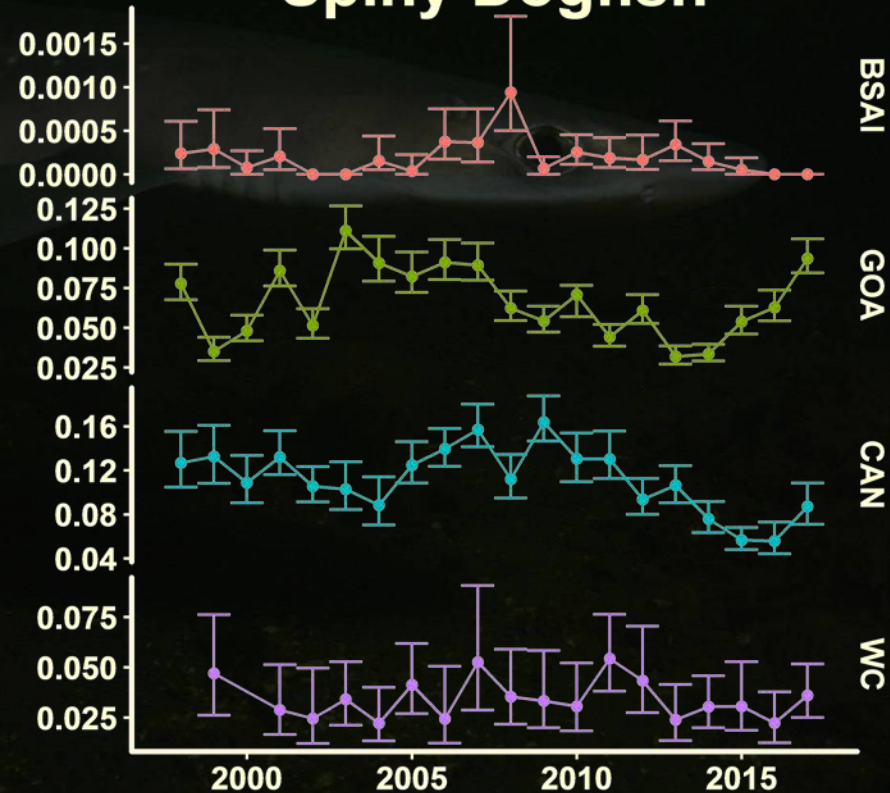
# IPHC Survey – Coastwide

- CPUE only
- Bootstrapped 95% CI

## Pacific Sleeper Shark



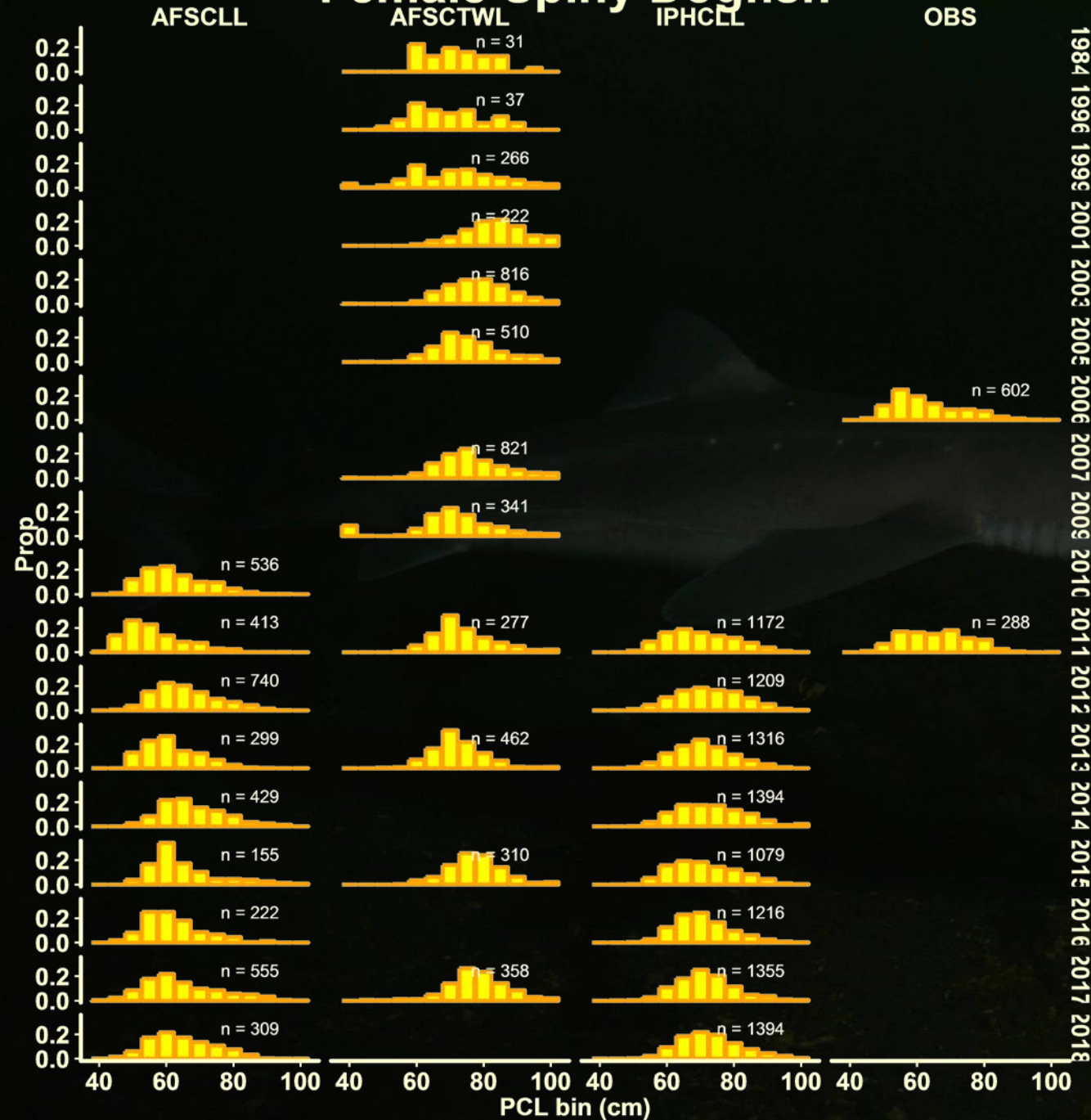
## Spiny Dogfish



Year

# Female Spiny Dogfish

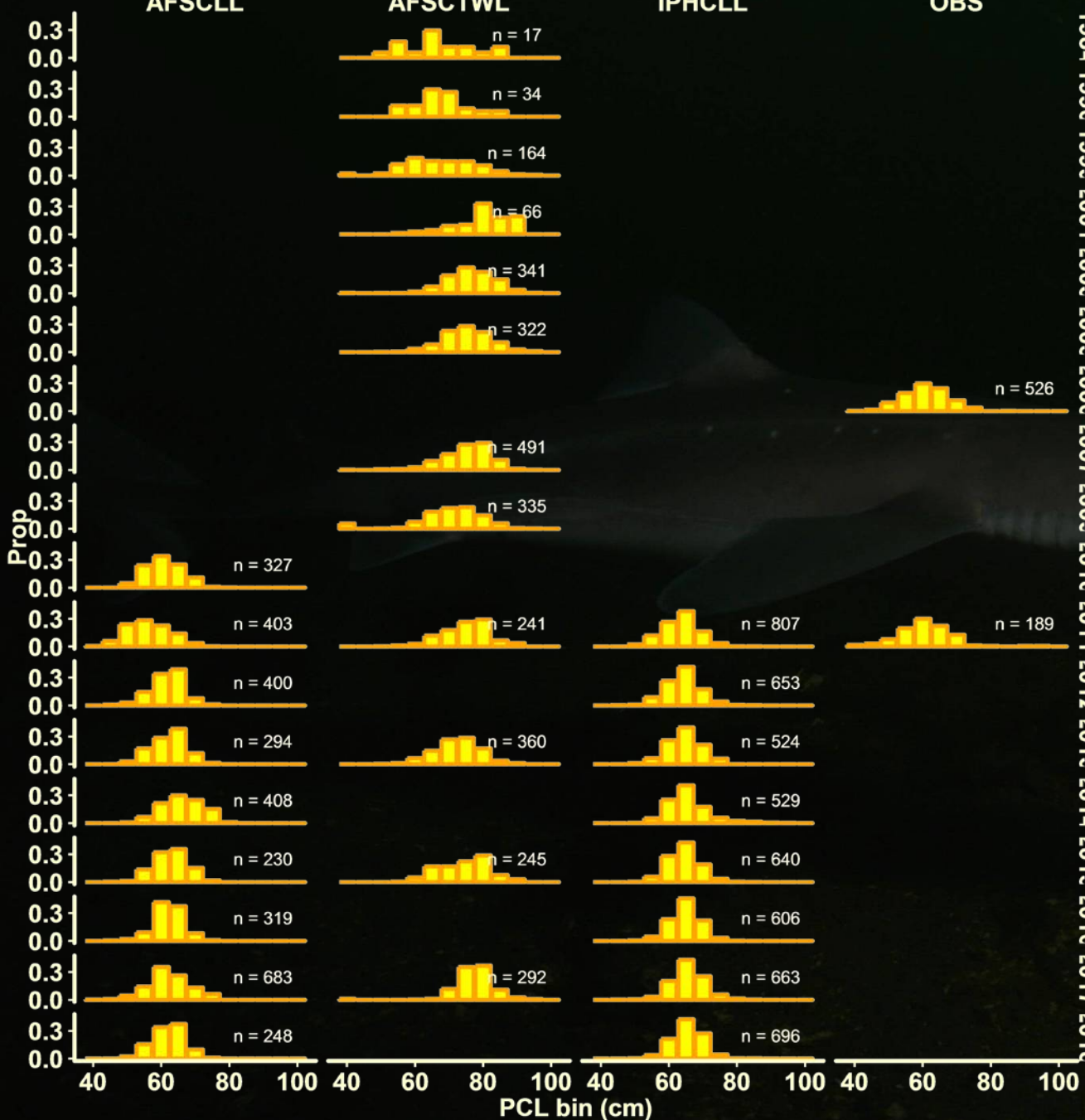
# Length Frequency Data



1984 1996 1999 2001 2003 2005 2006 2007 2009 2010 2011 2012 2013 2014 2015 2016 2017 2018

# Male Spiny Dogfish

# Length Frequency Data

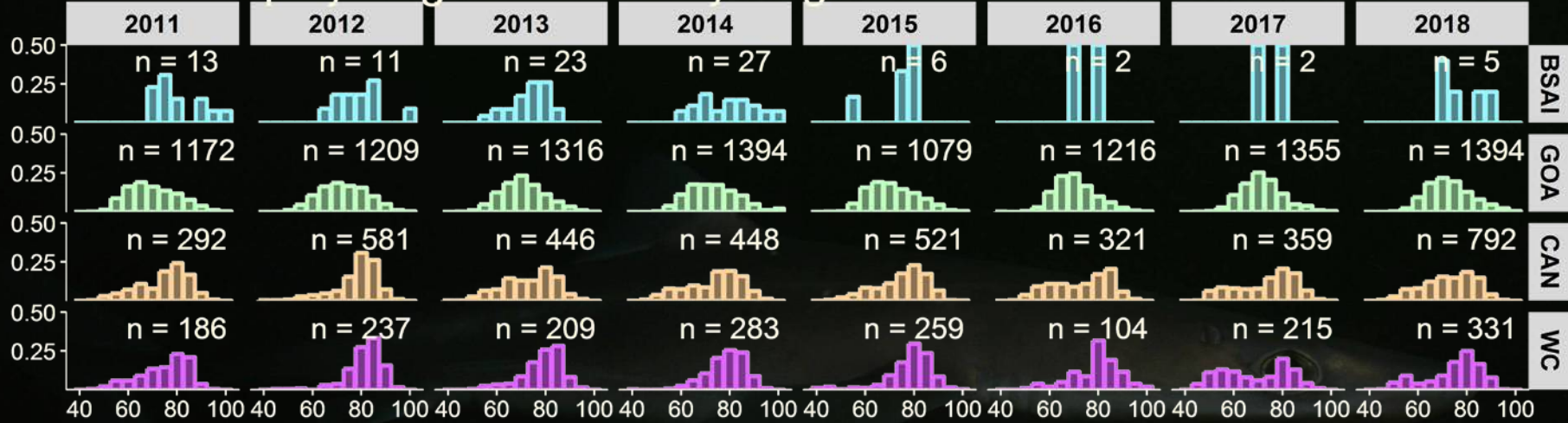


1984 1996 1996 2001 2003 2005 2006 2006 2007 2009 2010 2011 2012 2013 2014 2015 2016 2017 2018

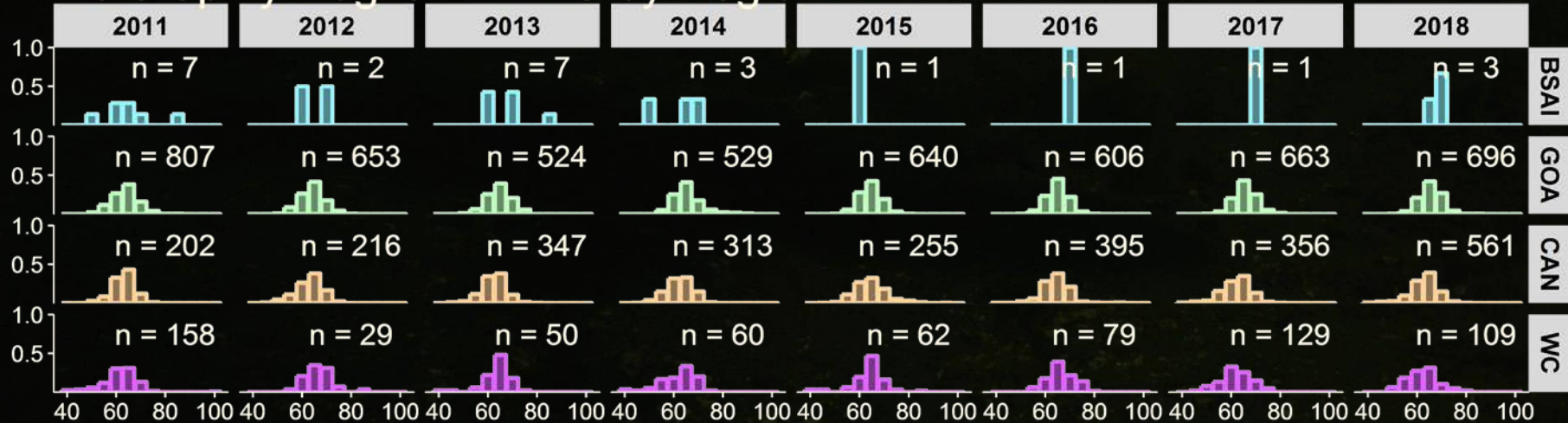


# Length Frequency Data

## Female Spiny Dogfish - IPHC by Region

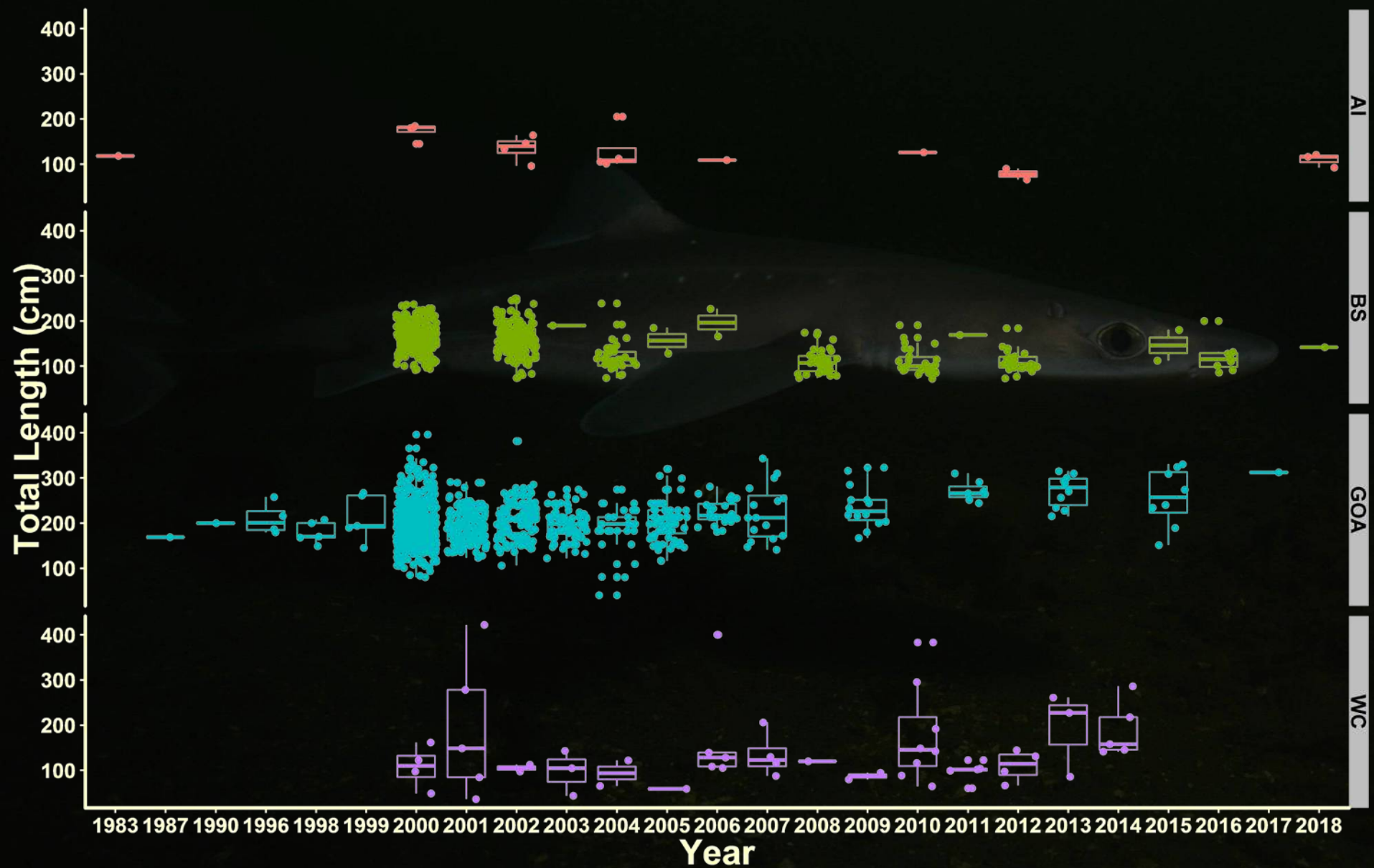


## Male Spiny Dogfish - IPHC by Region



PCL bin (cm)

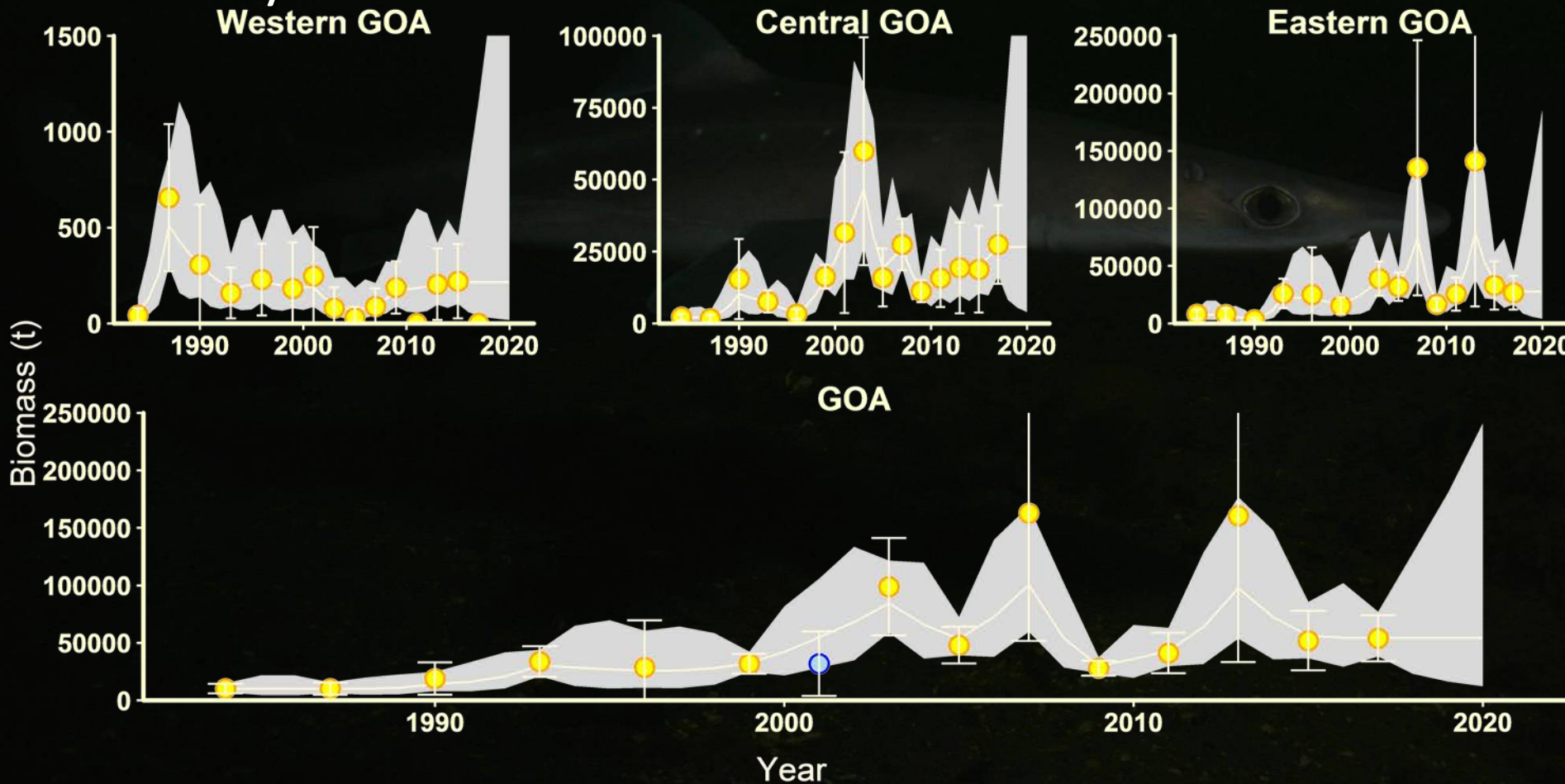
# Length Frequency Data - PSS



# Random Effects Biomass

- Spiny dogfish only

- Fit separately to each area, to account for missing 2001 survey in EGOA survey in EGOA





# Assessment Methods

## Spiny Dogfish

- Model 15.1 (Status quo)
  - Tier 6\*
  - $OFL = F_{OFL} * B_{RFX}$ , where  $F_{OFL} = M = 0.097$
- Model 15.3A
  - Tier 5
  - $OFL = F_{OFL} * B_a$
  - $F_{OFL} = F_{max} = 0.04$  (demographic)
  - $B_a = B_{RFX}/q$
  - $q = 0.21$

Reminder:

$ABC = 0.75OFL$





# Assessment Methods

## Everything Else

- Model 11.0 (Status quo)
  - Tier 6
  - $OFL = \bar{C}_{1997-2007}$



# ABC, OFL and Tier



- ABC/OFL set for complex as a whole as sum of the individual species

# Harvest Recommendations

## Tier 6 Species

- Pacific sleeper shark
- Salmon shark
- Other/unidentified sharks

Species	ABC (t)	OFL (t)
Pacific Sleeper Shark	234	312
Salmon Shark	52	70
Other Sharks	141	188
Total Tier 6	427	570



# Harvest Recommendations

## Spiny Dogfish

Spiny Dogfish only

Model	$F_{OFL}$	$q$	$B_{RFX}$ (95% CI)	Ba (95% CI)
15.1	0.097	1	54,301 (22,941–128,532)	NA
15.3A	0.04	0.21	54,301 (22,941–128,532)	258,577 (109,242–612,057)

Model	OFL (95% CI)	ABC (95% CI)
15.1	5,267 (2,225–12,468)	3,950 (1,669–9,351)
15.3A	10,343 (4,370–24,482)	7,757 (3,277–18,362)



# Harvest Recommendations

## Full Complex

Alternative 1 (Status Quo)		OFL	ABC
Spiny Dogfish	Model 15.1	5,267	3,950
Pacific Sleeper Shark	Model 11.0	312	234
Salmon Shark	Model 11.0	70	52
Other Sharks	Model 11.0	188	141
Shark Complex Total		5,837	4,377

Alternative 2			
Spiny Dogfish	Model 15.3A	10,343	7,757
Pacific Sleeper Shark	Model 11.0	312	234
Salmon Shark	Model 11.0	70	52
Other Sharks	Model 11.0	188	141
<b>Shark Complex Total</b>		<b>10,912</b>	<b>8,184</b>

Spiny Dogfish Quantity	As estimated or specified last year for:		As estimated or recommended this year for:	
	2018	2019	2019	2020
M (natural mortality rate)	0.097	0.097	0.097	0.097
Tier	6*	6*	5	5
Biomass (t)	56,181	56,181	54,301	54,301
F <sub>OFL</sub>	0.097	0.097	0.04	0.04
maxF <sub>ABC</sub>	0.073	0.073	0.03	0.03
F <sub>ABC</sub>	0.073	0.073	0.03	0.03
OFL (t)	5,450	5,450	<b>10,343</b>	10,343
maxABC (t)	4,087	4,087	7,757	7,757
ABC (t)	4,087	4,087	<b>7,757</b>	7,757

Pacific sleeper, salmon and other sharks				
Tier	6	6	6	6
OFL (t)	570	570	<b>570</b>	570
maxABC (t)	427	427	427	427
ABC (t)	427	427	<b>427</b>	427

<b>Total Complex</b>				
<b>OFL (t)</b>	<b>6,020</b>	<b>6,020</b>	<b>10,912</b>	<b>10,912</b>
<b>ABC (t)</b>	<b>4,514</b>	<b>4,514</b>	<b>8,184</b>	<b>8,184</b>



Questions so far???



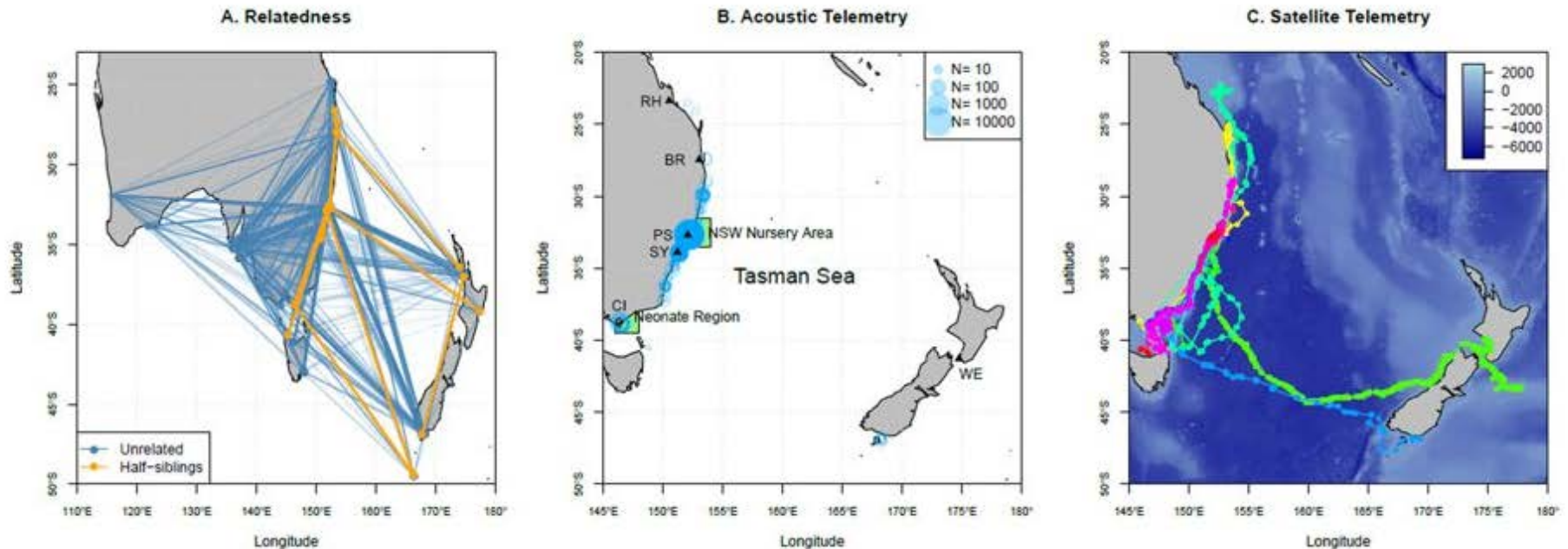
Photo: RACE Survey Team



# Outstanding Issues

- Genetic stock structure, close kin mark-recapture
  - Samples have been/are being run in new MiSeq
  - Planning for a PSS stock structure document Sept 2019

Hillary et al. 2018





# Outstanding Issues

- Ageing
  - Pilot study underway
    - Samples prepped and ready to send, just waiting PO
  - Reaching out to find faculty with right expertise (bio-chem) to collaborate with
  - Drafting proposals for MS student



# Outstanding Issues

- Discard mortality
  - Collaboration with UAF, ASLC and (hopefully) industry (I need to talk to you folks!)
  - Drafting co-op research proposal
  - MS student at UAF

<https://60nscience.alaskasealife.org>



# Outstanding Issues

- Catch by numbers
  - Working with the AKRO staff to get numbers back to 2003
  - Should be available for next full assessment!!!
- Data-limited methods
  - Should be available for next full assessment



# Outstanding Issues

- Unobserved catch in state fisheries
  - Can be a significant source our removals





# Outstanding Issues

- How do we deal with catch in 649/659?
  - Catches occur in both federal and state fisheries, but only federal fisheries accounted for
  - Sharks are highly migratory
  - SSC has requested developing means to extend biomass estimates into state waters
  - Biomass estimates do extend into CI and Yakutat Bay, need to figure out PWS and SEAK
  - May use IPHC or SEAK longline surveys to provide RPNs?

# Questions

