SEDAR 74 Gulf of Mexico Red Snapper Research Track Stock Assessment: Review Workshop Day 1

NOAA FISHERIES
SEFSC
Miami, FL

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Review Workshop TOR Review

1. Evaluate the data used in the assessment, including discussion of the strengths and weaknesses of data sources and decisions. Consider the following:

- Are data decisions made by the Data and Assessment processes justified?
- Are data uncertainties acknowledged, reported, and within normal or expected levels?
- Is the appropriate model applied properly to the available data?
- Are input data series sufficient to support the assessment approach?

2. Evaluate and discuss the strengths and weaknesses of the methods used to assess the stock, taking into account the available data. Consider the following:

- Are methods scientifically sound and robust?
- Are priority modeling issues clearly stated and addressed?
- Are the methods appropriate for the available data?
- Are assessment models configured properly and used in a manner consistent with standard practices?

3. Consider how uncertainties in the assessment, and their potential consequences, are addressed.

- Comment on the degree to which methods used to evaluate uncertainty reflect and capture the significant sources of uncertainty in the population, data sources, and assessment methods.
- Comment on the likely relationship of this variability with possible ecosystem or climate factors and possible mechanisms for encompassing this into management reference points.

4. Provide, or comment on, recommendations to improve the assessment.

- Consider the research recommendations provided by the Data and Assessment processes in the context of overall improvement to the assessment, and make any additional research recommendations warranted.
- If applicable, provide recommendations for improvement or for addressing any inadequacies identified in the data or assessment modeling. These recommendations should be described in sufficient detail for application, and should be practical for short term implementation (e.g., achievable within ~6 months). Longer-term recommendations should instead be listed as research recommendations above.

5. Provide recommendations on possible ways to improve the Research Track Assessment process.

Outline

- Data Review
  - Stock Definition
  - Life History
  - Data
    - Removals
    - Indices
    - Compositions
- Statistical Catch-at-age Model
  - Base Model Setup
  - Model Fits
  - Sensitivities

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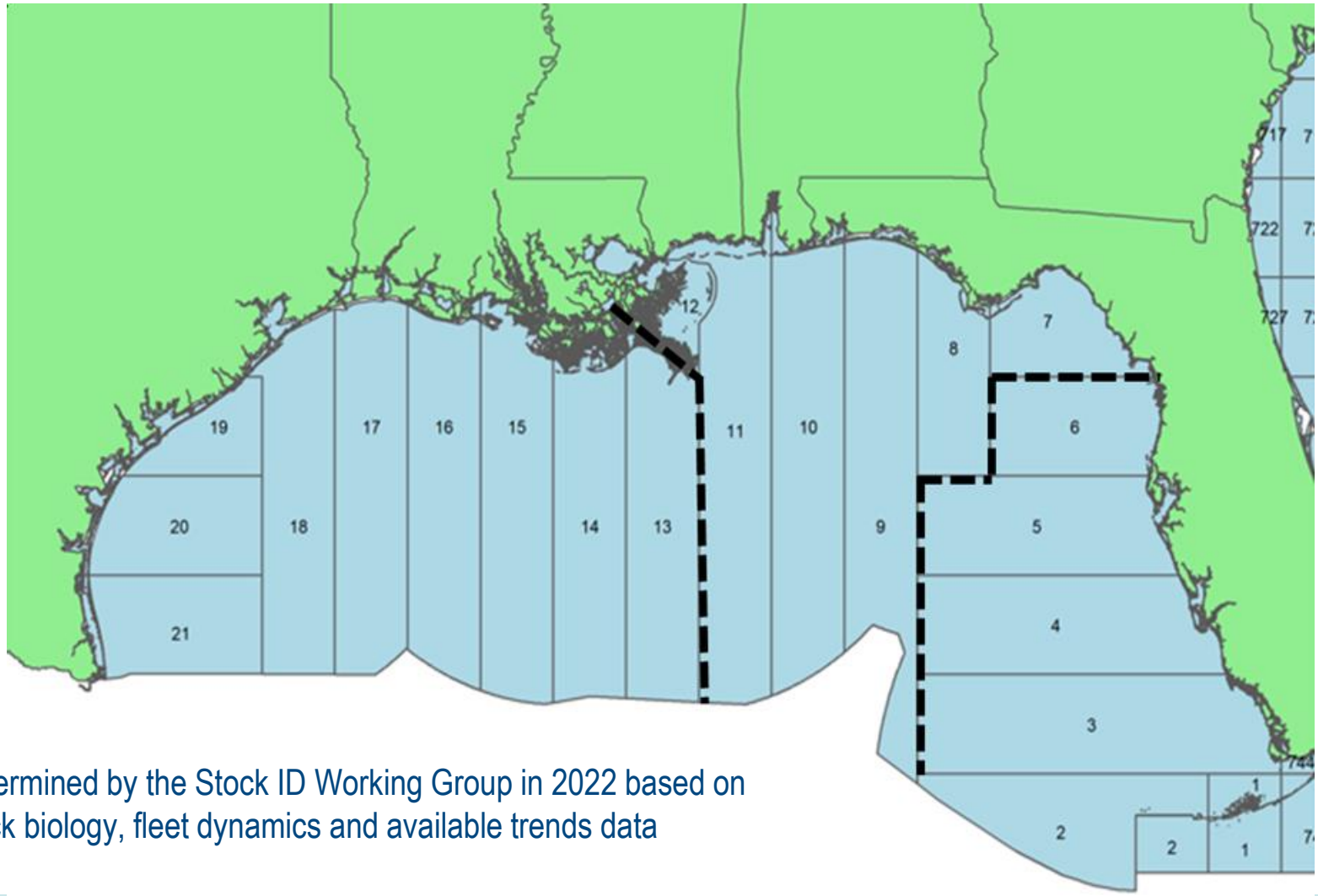
New Gulf of Mexico RS Stock Definition
West (13-21), Central (7-12), Eastern (1-6)



Determined by the Stock ID Working Group in 2022 based on stock biology, fleet dynamics and available trends data

Management History

Year	Comm. Event	Rec. Event	Summary
1985	12" min	12" min	First minimum size established.
1990	13" min	7 fish bag 13" min	7 fish recreational bag and 13" minimum size established.
1993	trip limit initiated	–	Commercial 2000/200lbs. trip limit begins for endorsed/unendorsed vessels.
1994	trip limit modified	14" min	Commercial vessels restricted to one trip limit per day. Recreational minimum size limit increased to 14"
1995	15" min	5 fish bag 15" min	Recreational bag reduced to 5 and size lmit increased to 15" for all fisheries
1999	–	4 fish bag 18" min ER	Recreational bag reduced to 4 and size lmit increased mid season to 18" under emergency rule
2000	–	16" min	Recreational minimum size increased to 16"
2007	IFQ circle hooks	2 fish bag circle hooks	Circle hooks mandated for all fisheries. IFQ established in the commercial sector. Recreational bag limit reduced to 2
2008	13" min	–	Commercial minimum size limit reduced to 13"
2015	–	Sector separation	Separate quota established for the for-hire recreational sector
2018	–	EFP	Exempted fishing permits issued to test State management of private recreational component

Management History cont'd

Recreational Season Lengths

- Federally controlled until 2014
  - Gradually decreased from 365 days to 9 days in 2014
- Private and For-hire season lengths began to differ in 2015
- Private season length began to differ by state in 2018

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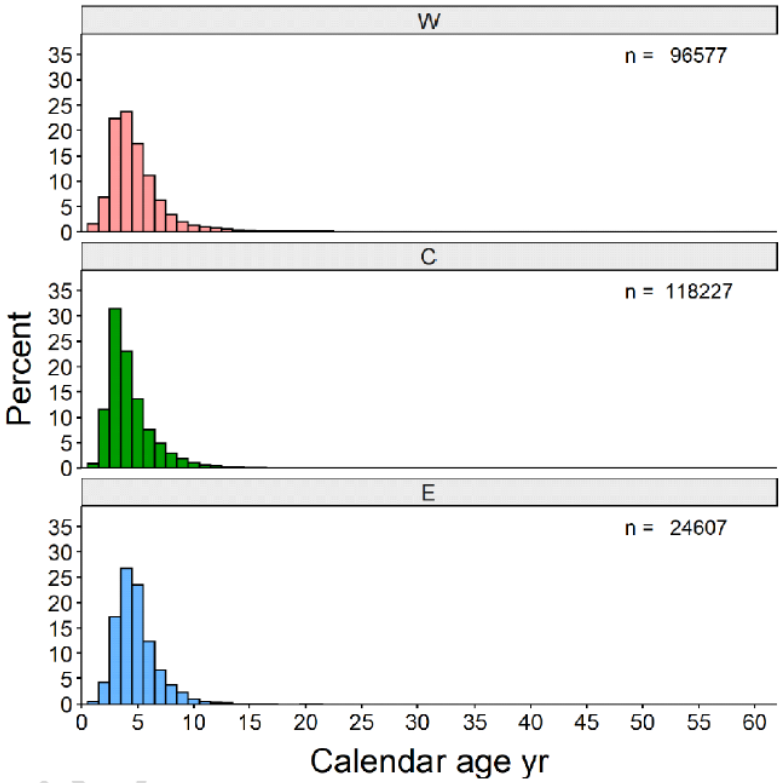
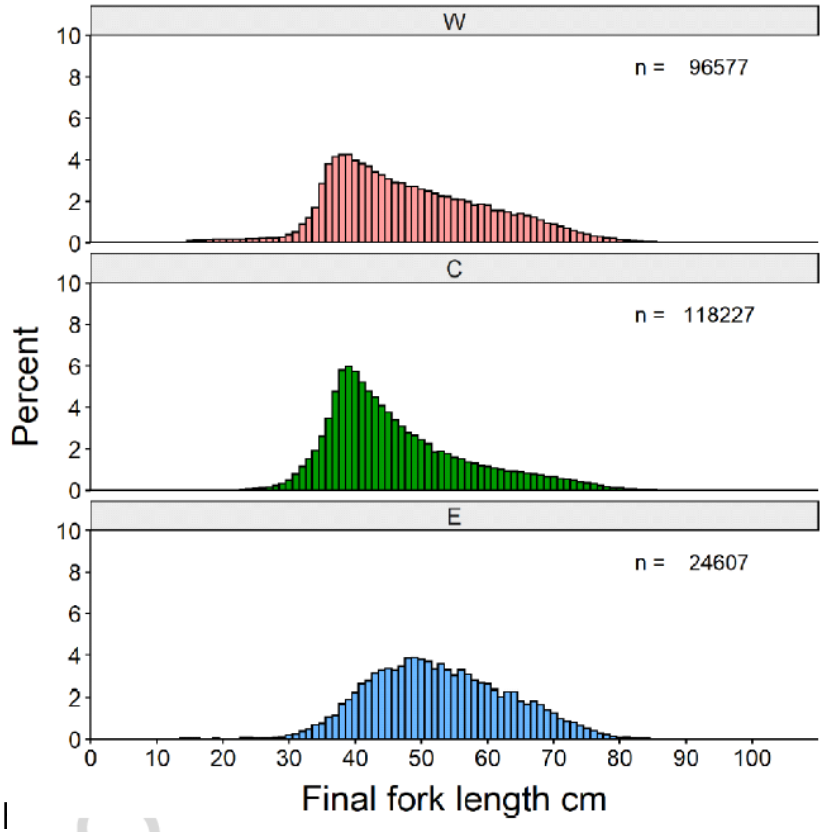
Life History

- Age and Growth
- Natural Mortality
- Discard Mortality
- Maturity & Fecundity

Life History - Age and Growth

- Population max age 57
- Mean age only differed by 0.6 yrs among areas
- Different size distributions across areas





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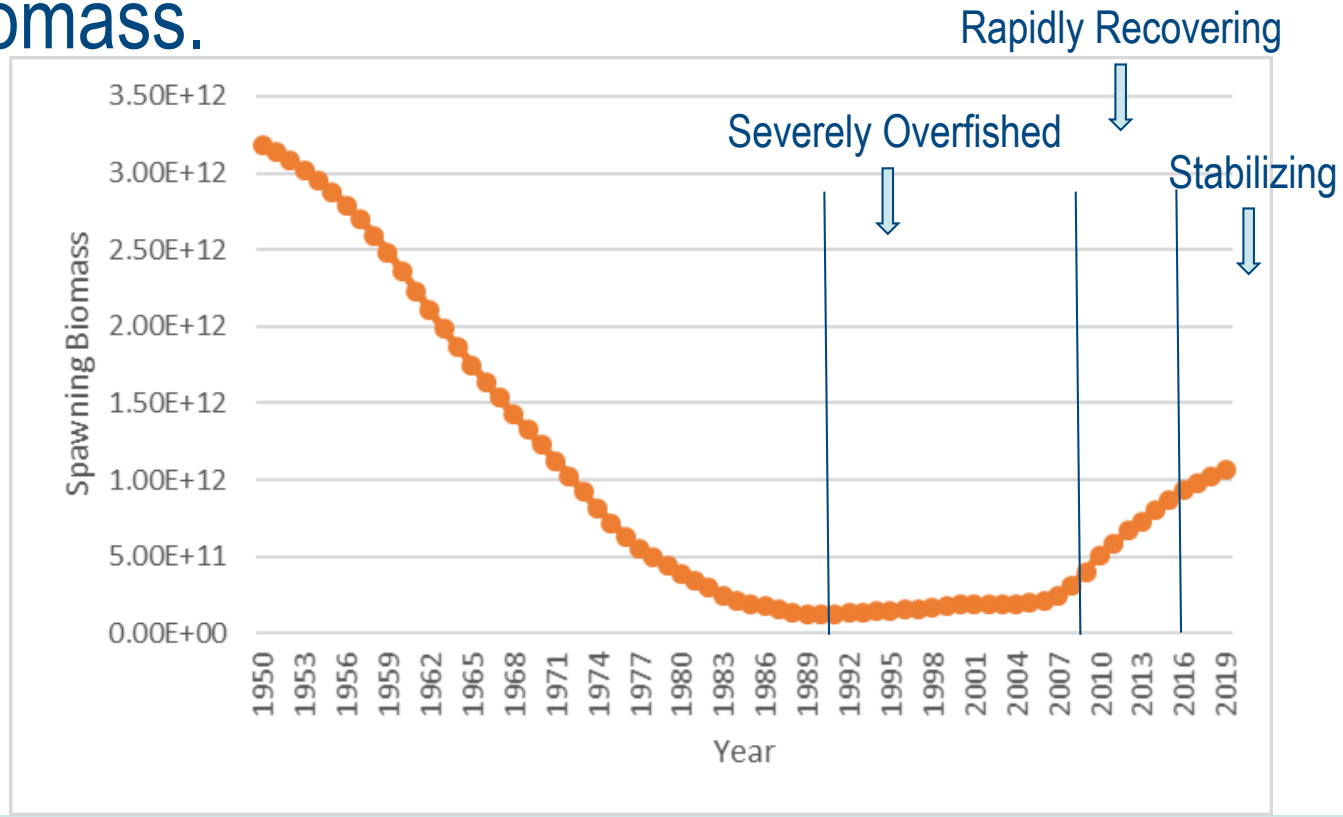
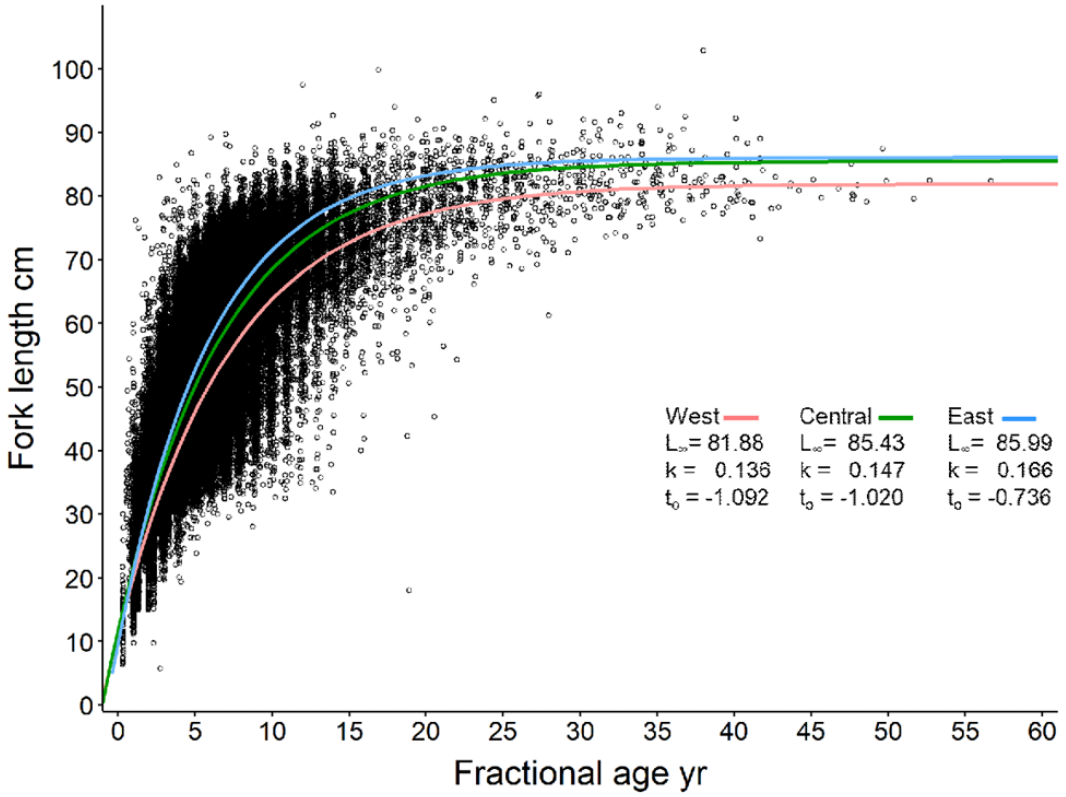
Life History - Changes Over Time

- LHWG DW: Trends in life history parameters may be tied to periods of change in RS spawning biomass.



Life History - Age and Growth

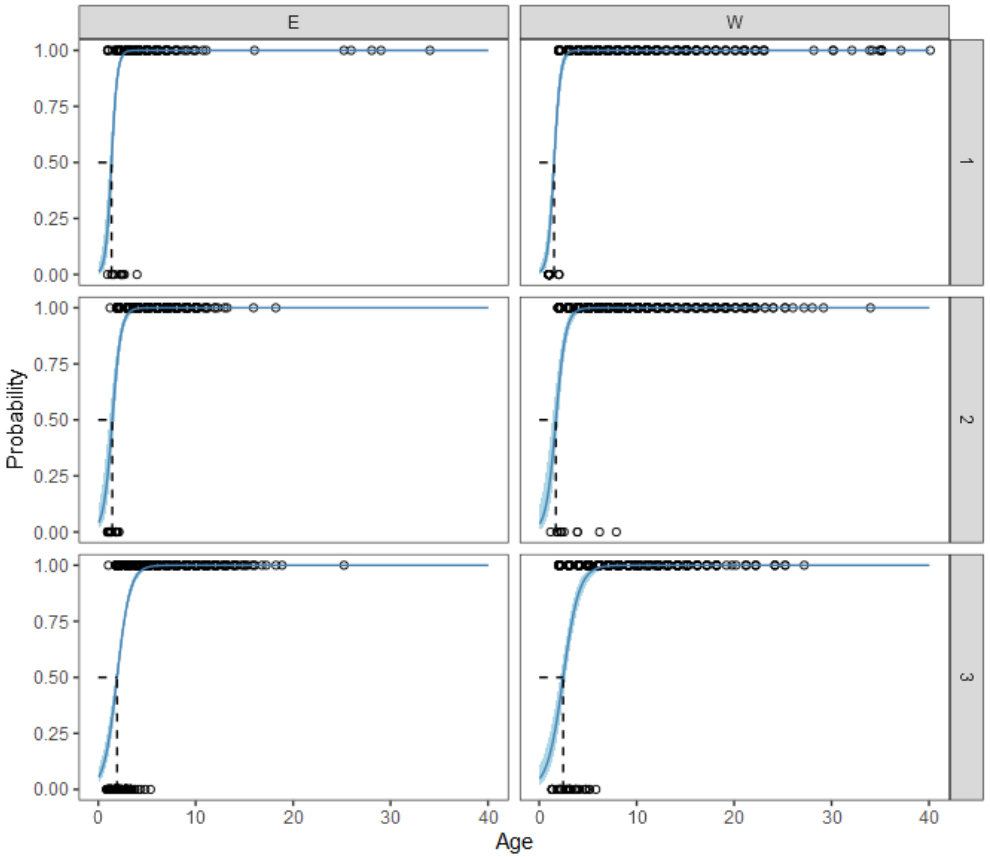
- von Bertalanffy growth params estimated externally using paired length and age data
- Estimated by Stock ID area (3) and time-stanza (1991-2008,2009-2015, and 2016-2019)
- Lack of samples in latest time period resulted in insignificant temporal differences.
- LHWG Recommendation: use area estimates with all years combined



Source: Life History Working Group S74 Data Workshop Report Figure 12

Life History - Maturity

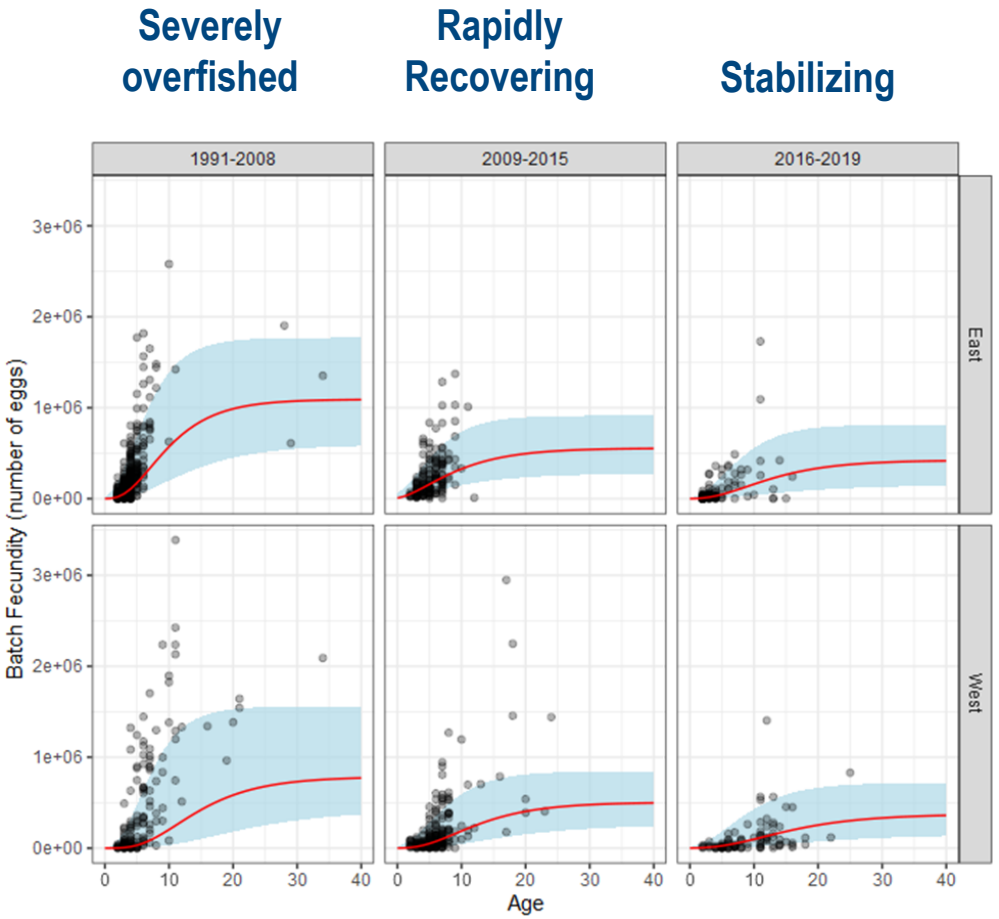
- 1:1 sex ratio
- LHWG established area and time-varying maturity relationships
  - 1– overfished (1991-2008);
  - 2– rapidly recovering (2009-2016);
  - 3–stabilizing (2017-2019)
- Insufficient data to separate East from Central



Source: Life History Working Group S74 Data Workshop Report Figure 18

Life History - Fecundity

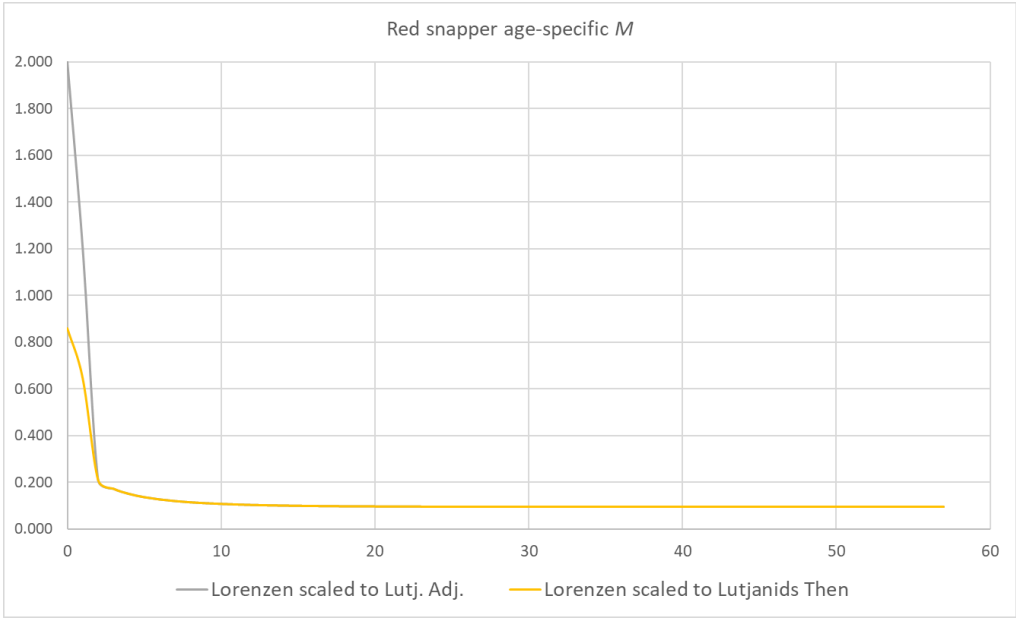
- Attempted fecundity-at -age vector recreation
  - Low sample size for fish age 10 or older
  - Uncertainty in fecundity-at-age vectors given different time periods and regions
- LHWG: Use SSB related reference points instead of Total Egg Production



Source: Figure 21 Life History DW report

Life History - Natural Mortality

- Max age 57 from 48
  - multiple reader verification
- Average M estimation uses Then et al. (2015) - Lutjanid-specific (0.1040 yr^{-1})
- M for age 0 and 1 remain fixed at higher rates to account for Shrimp Trawl mortality (Gazey et. al 2008)
- M for 2+ scaled by age using Lorenzen (1996) function



Life History - Recreational Discard Mortality

- Uses direct measurements from peer reviewed publications, where possible
- Also uses meta-analysis approach (Campbell et al. 2014) using median fishing depth
  - considers delayed mortality
- Different discard mortality rates for open and closed season only estimable in the west area due to sample size limitations.

Table 2. Discard mortality recommendations for SEDAR74, expressed as percentages with +/- standard error, for the recreational directed fleets.

	Western Gulf		*Central Gulf*		*Eastern Gulf*	
Fleet	Open	Closed	Open	Closed	Open	Closed
Private boat	35.5 +/- 10	21.1 +/- 7	29.7 +/- 10	29.7 +/- 10	31.5 +/- 10	31.5 +/- 10
Charter	41.2 +/- 16	26.2 +/- 8	16.9 +/- 9	16.9 +/- 9	26.8 +/- 5	26.8 +/- 5
Headboat	40.6 +/- 6	24.6 +/- 5	24.4 +/- 5	24.4 +/- 5	27.9 +/- 5	27.9 +/- 5

Source: SEDAR74- AP-02

Life History - Commercial Discard Mortality

- Uses data from Commercial Logbook Program and Reef Fish Observer Program
- Estimated as the midpoint between % discarded dead and % discarded dead+discarded w/ barotrauma
- Insufficient sample sizes to determine open/closed season rates

	East	Central	West
Commercial Handline	24.7	19.2	21.2
Commercial Longline	26.4	40.7	22.1

Questions about Life History?

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Data Overview - Fleet Structure

Commercial:

- Handline (also referred to as vertical line)
- Longline

Bycatch:

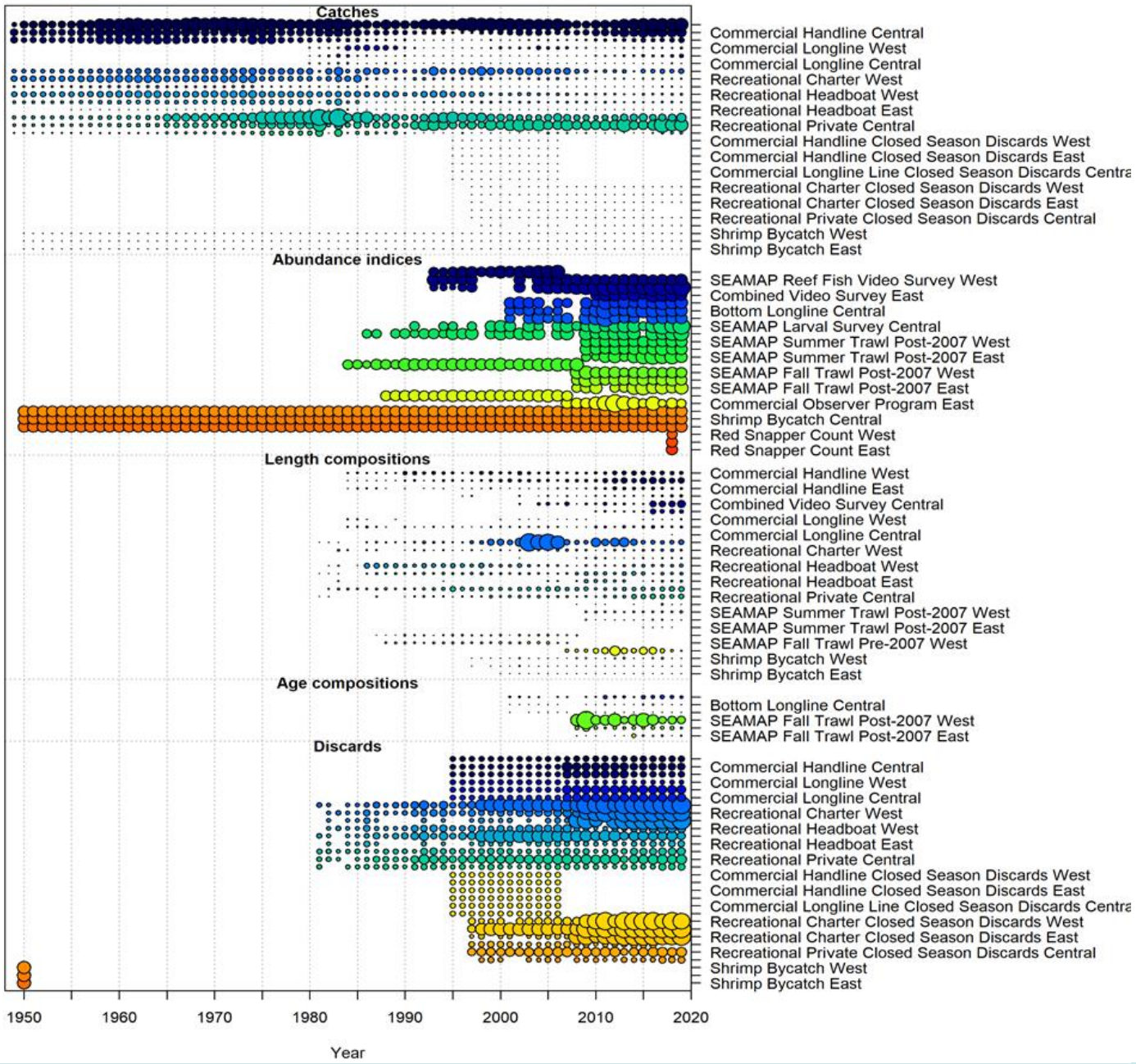
- Shrimp fishery bycatch

Recreational:

- For-Hire
  - Charter
  - Headboat
- Private

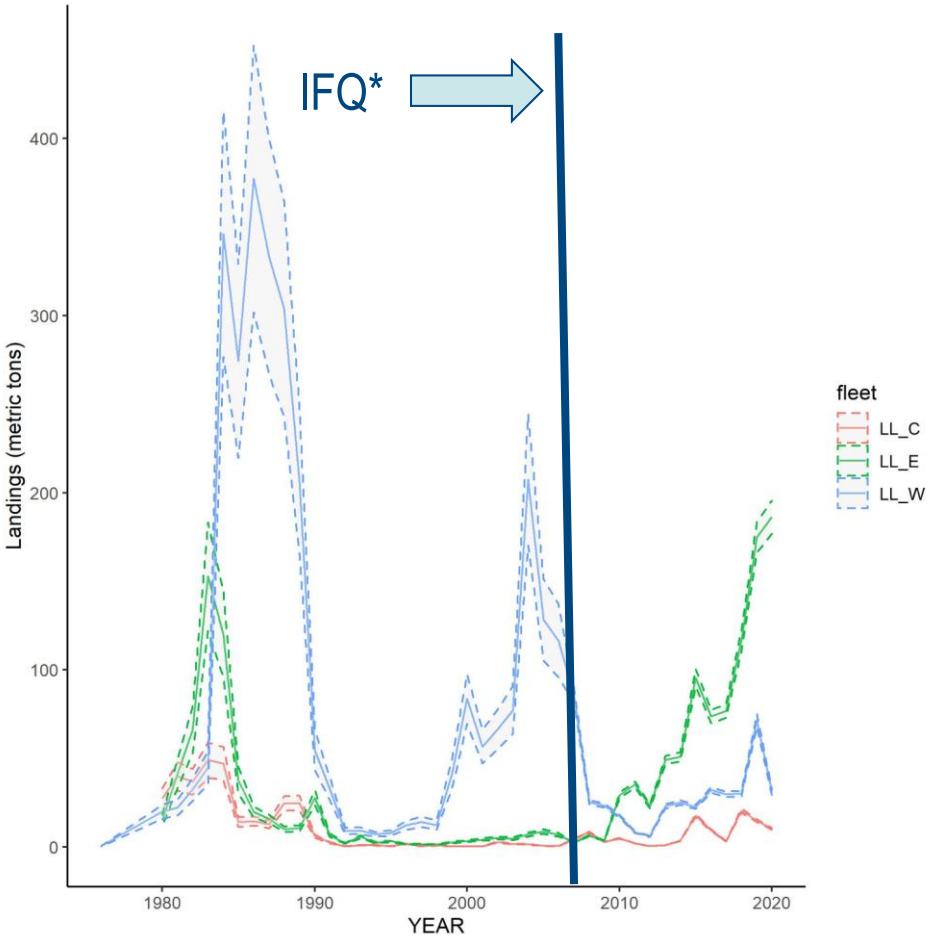
Data Overview

- Detailed descriptions of all data are provided in the Data Workshop Report

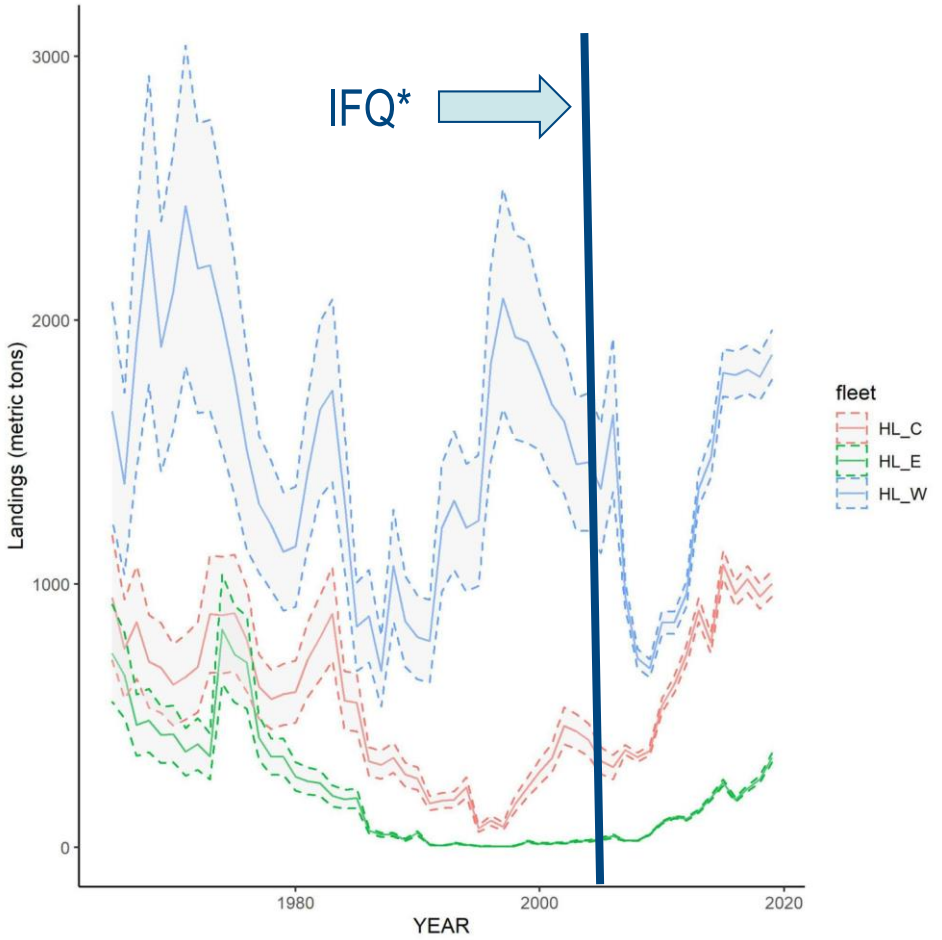


Commercial Landings and Discards

Commercial Landings in Weight



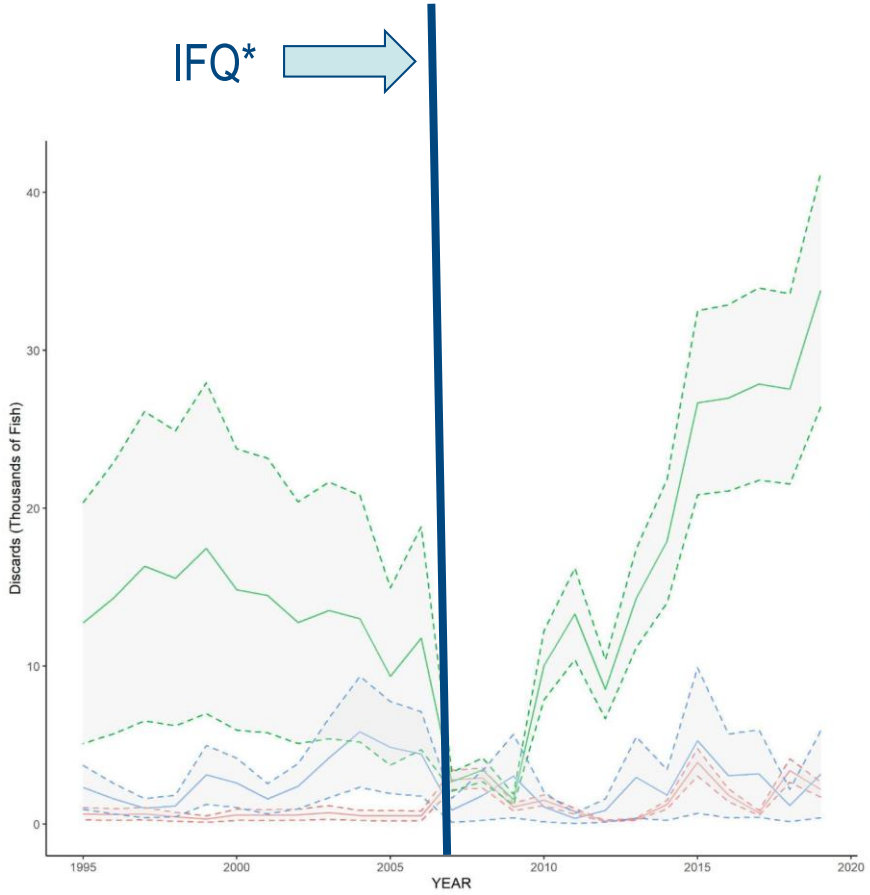
Longline



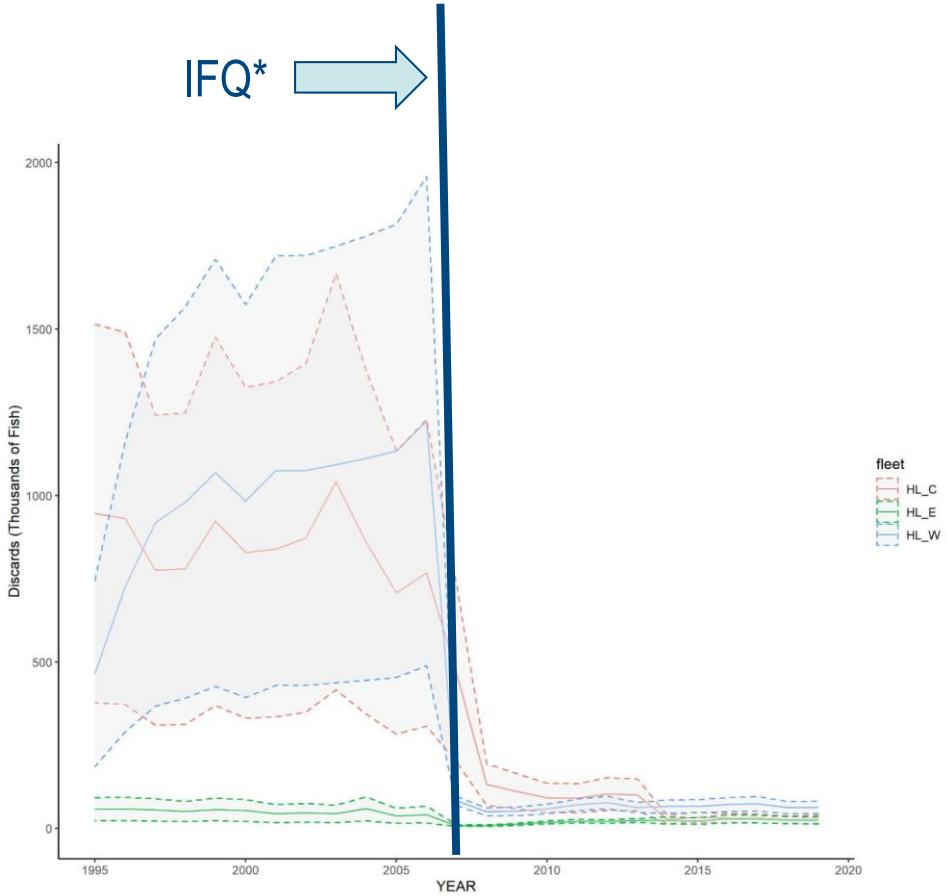
Handline

*IFQ=Individual Fishing Quota (2007)

Commercial Discards in Numbers of Fish



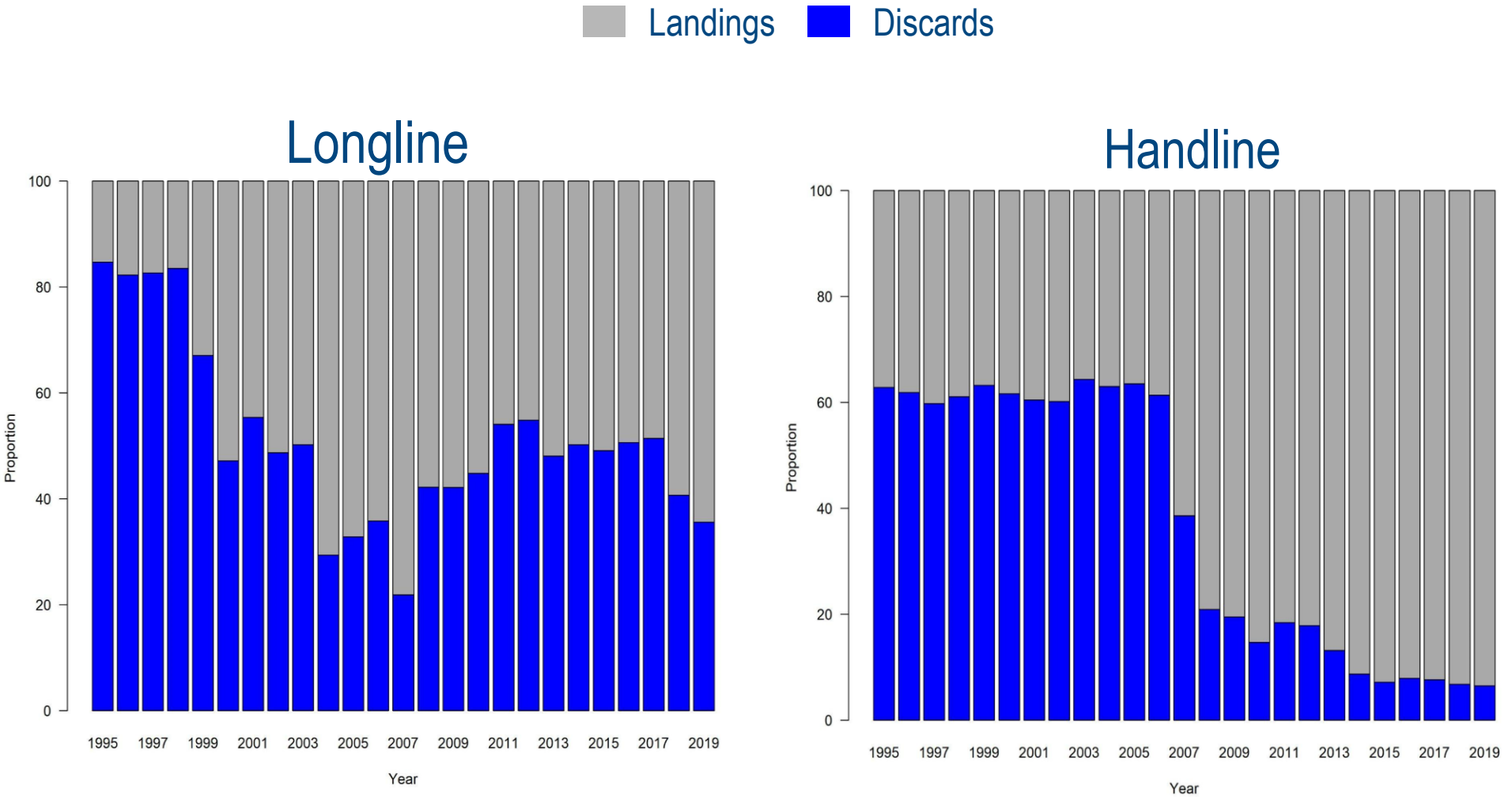
Longline



Handline

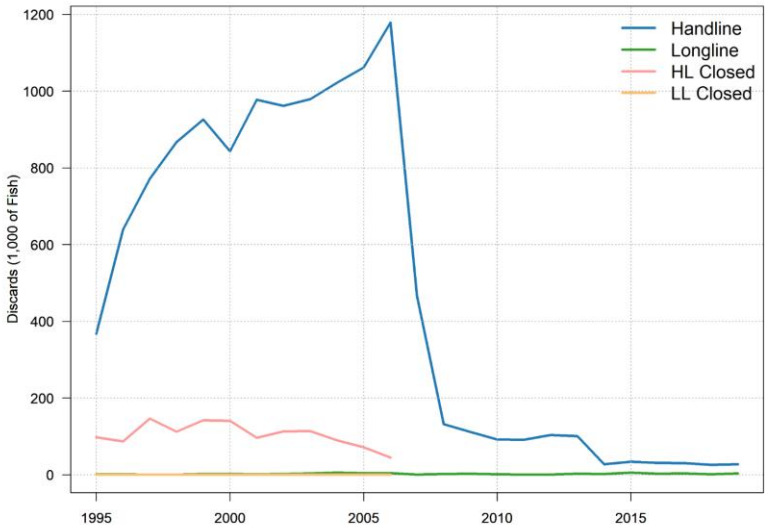
*IFQ=Individual Fishing Quota (2007)

Commercial Landings vs Discards in Numbers

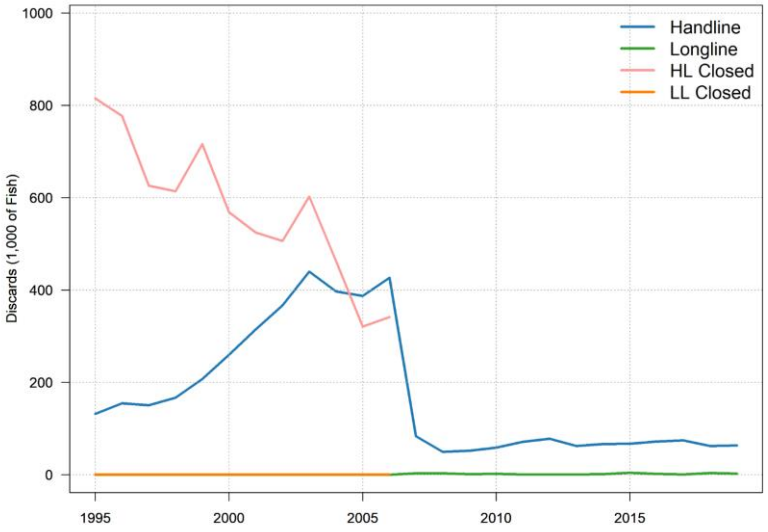


Commercial Discards Open and Closed Season

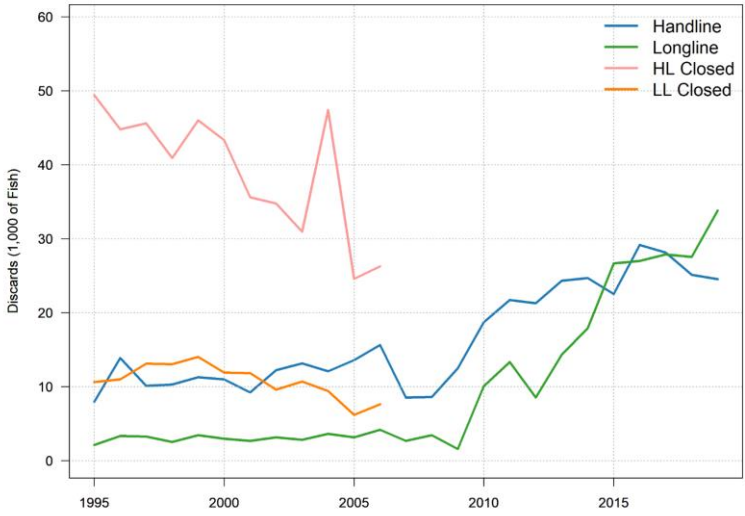
West



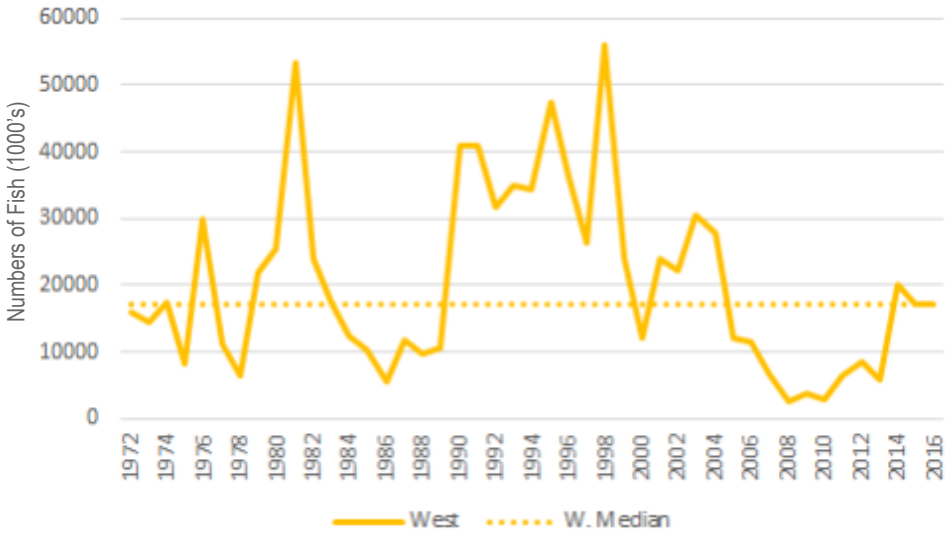
Central

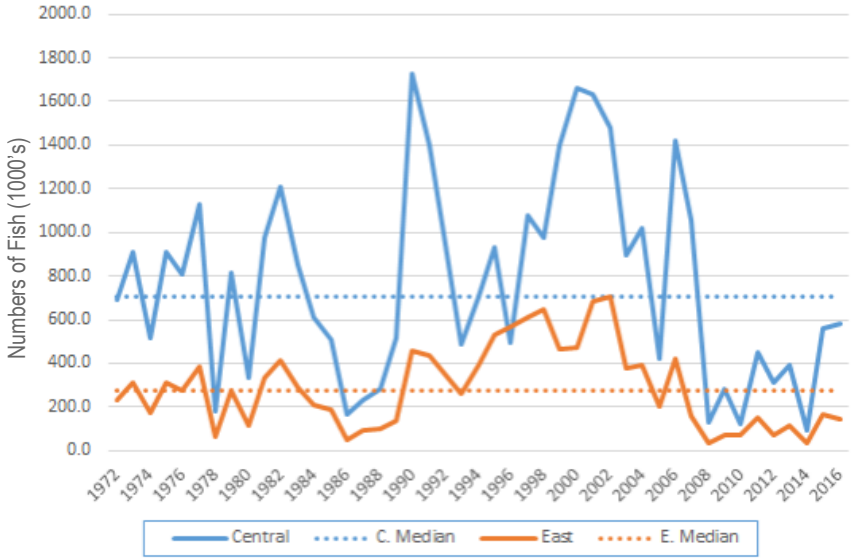


East



Shrimp Trawl Bycatch

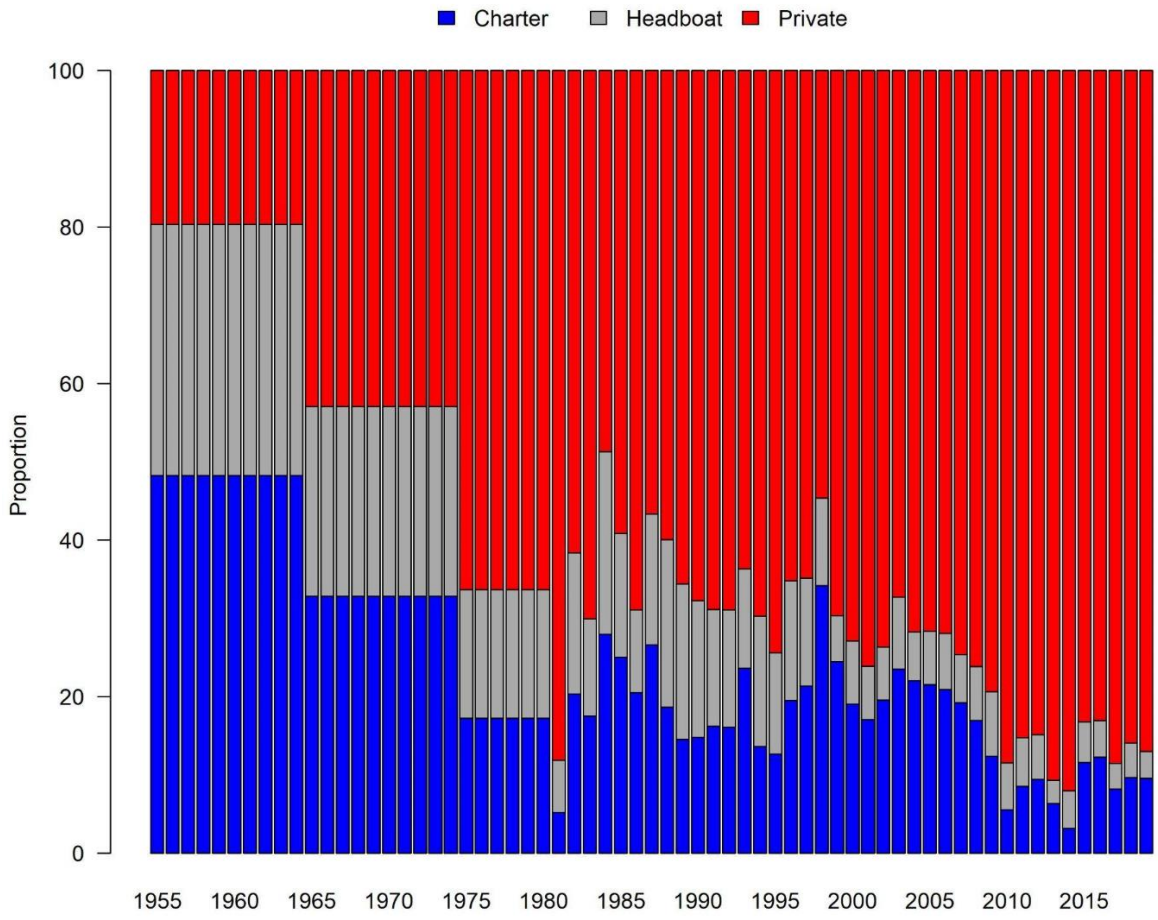




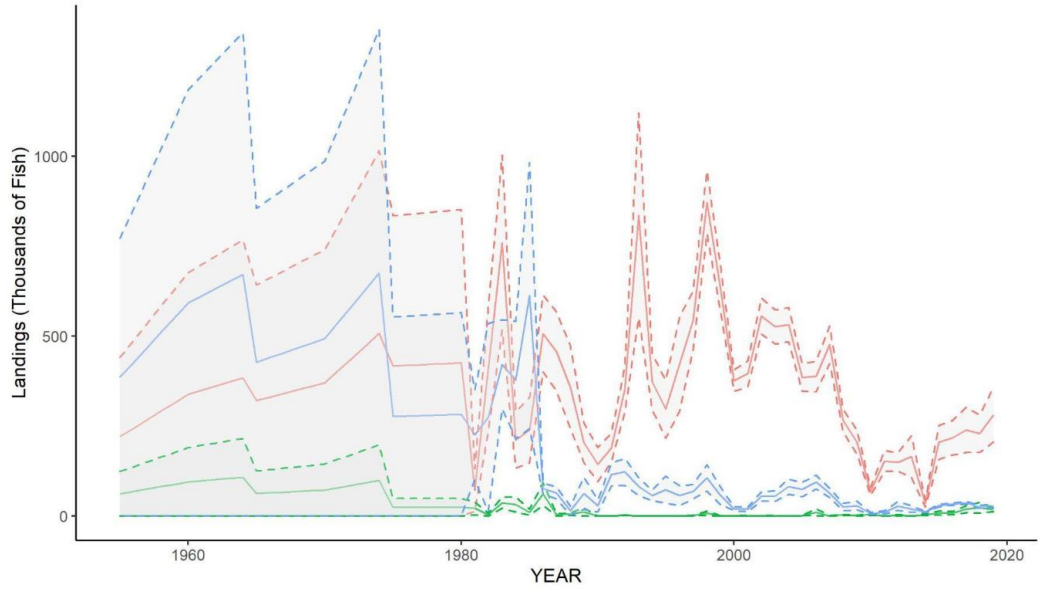
Placeholder data set, as the SEFSC is updating the estimation methodology

Recreational Landings and Discards

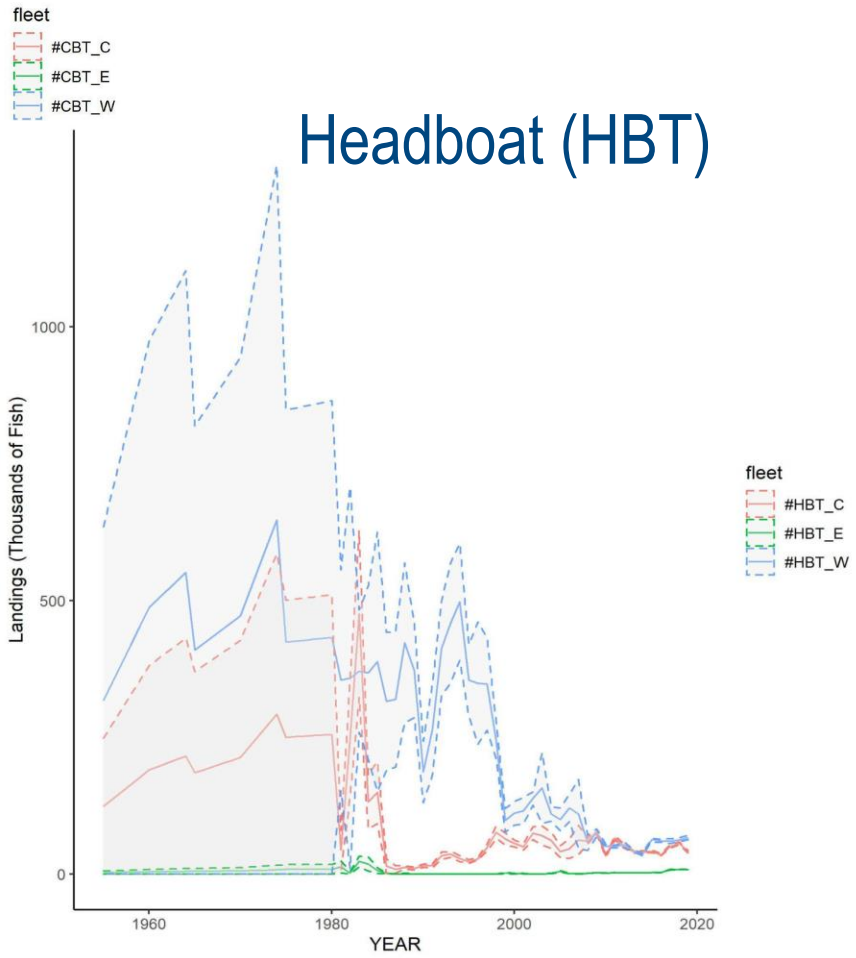
Gulf Wide Recreational Landings Comparison



For-Hire Landings in Numbers

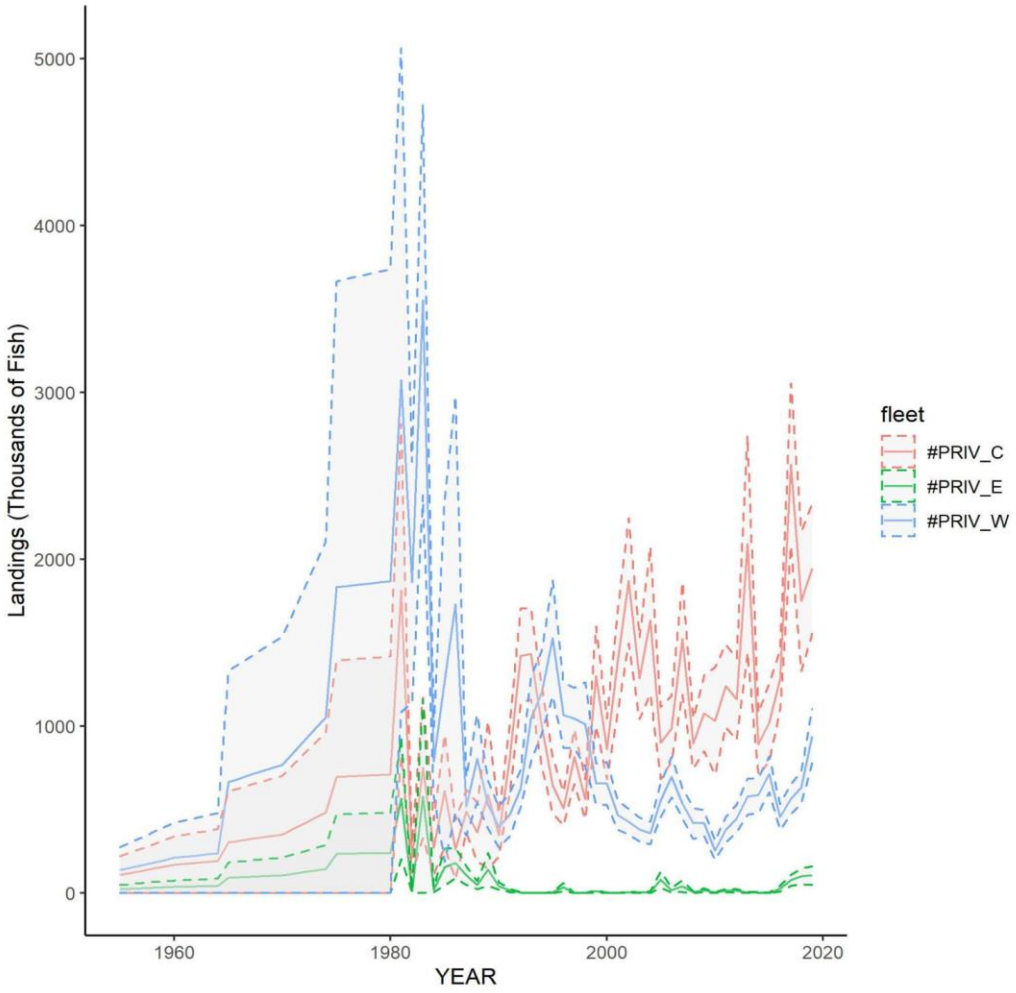


Charter boat (CBT)

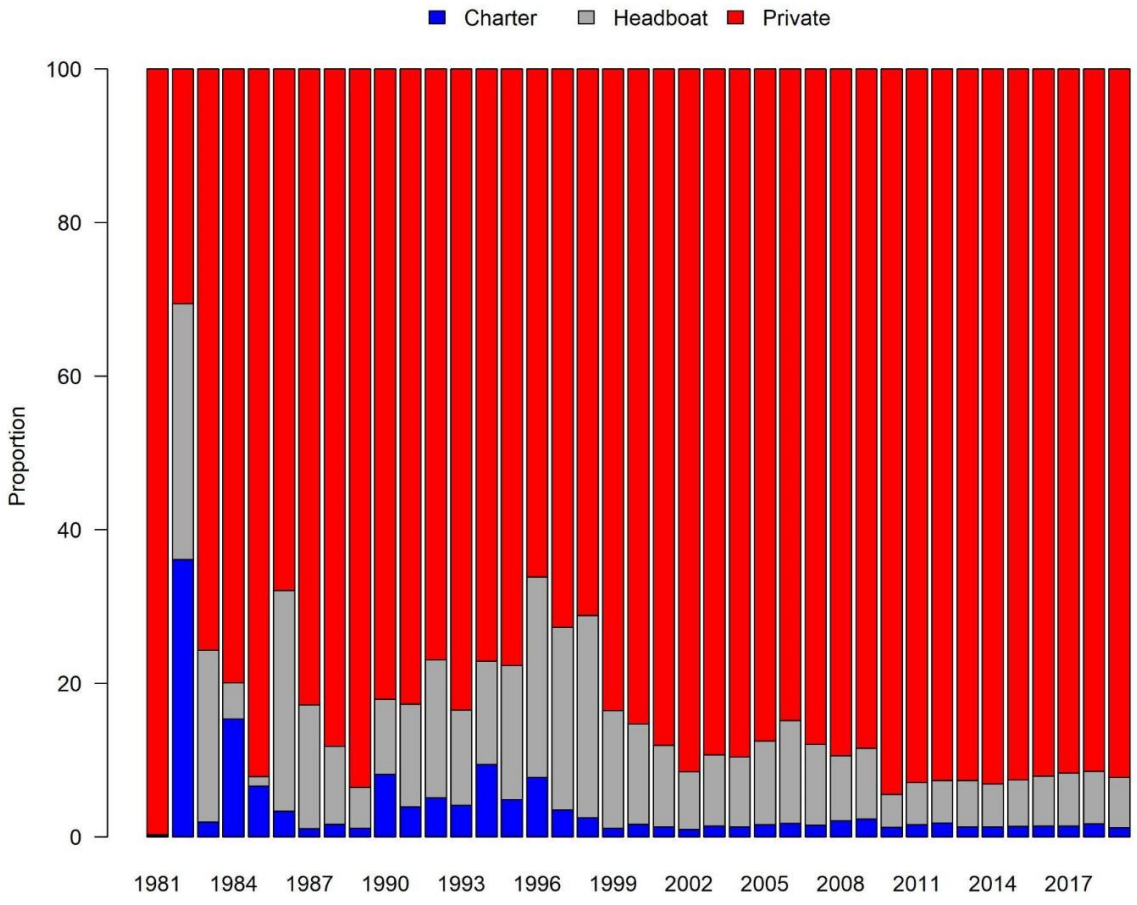


Headboat (HBT)

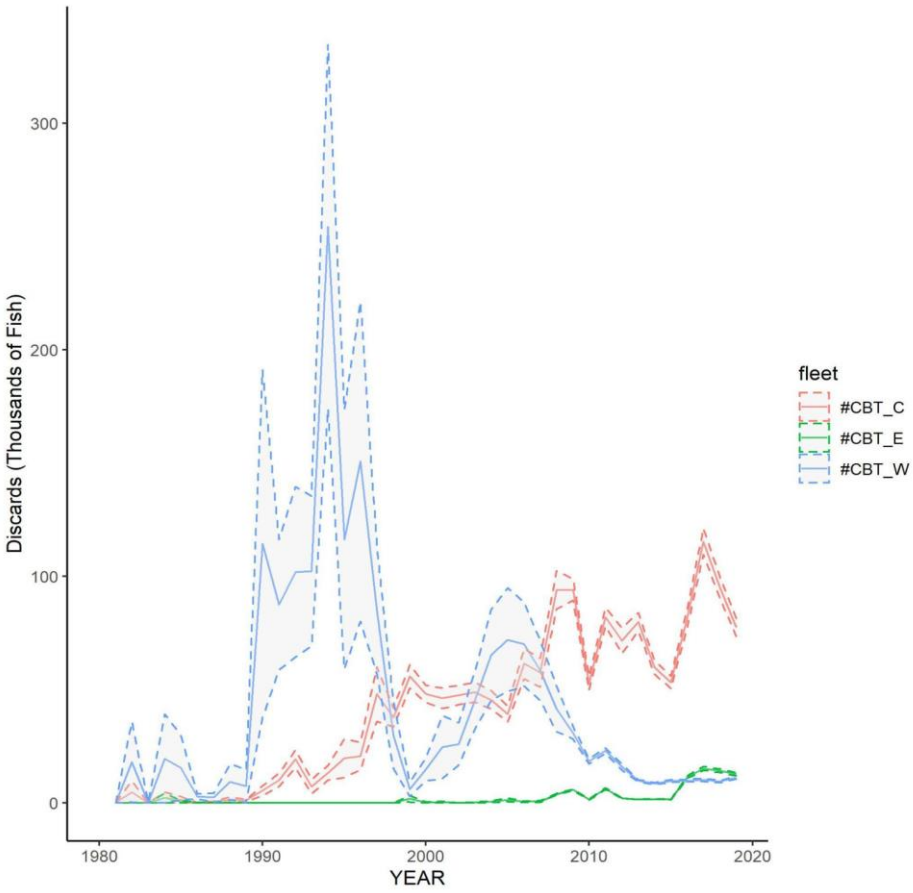
Private Landings in Numbers



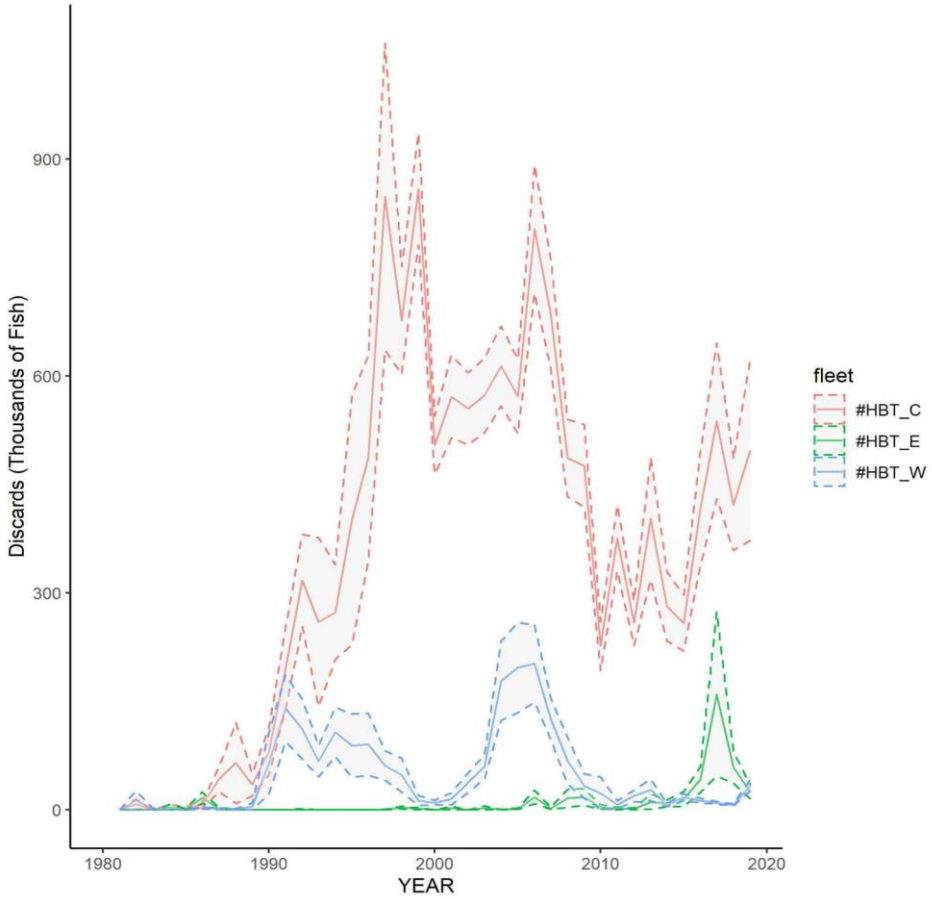
Gulf Wide Rec Discards By Mode



For-Hire Discards

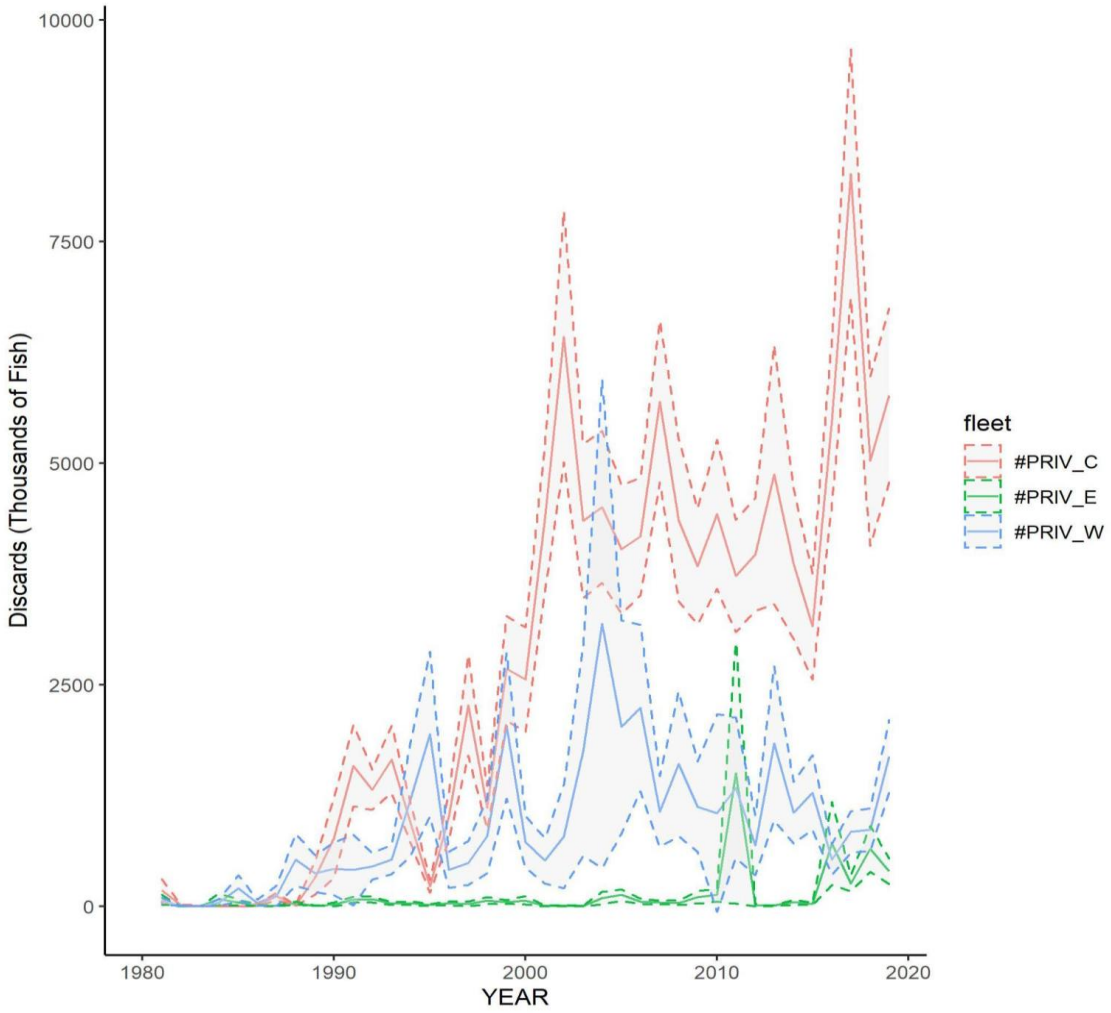


Charter boat (CBT)



Headboat (HBT)

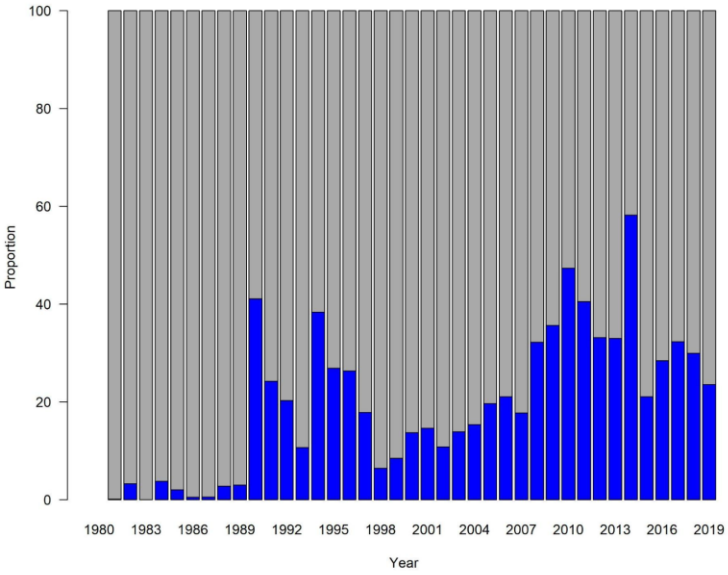
Private Discards



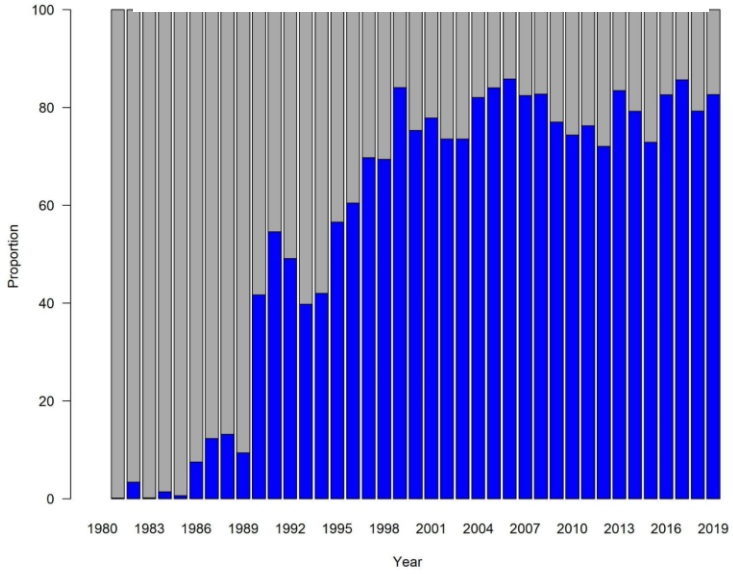
Landings vs Discards By Mode

Landings Discards

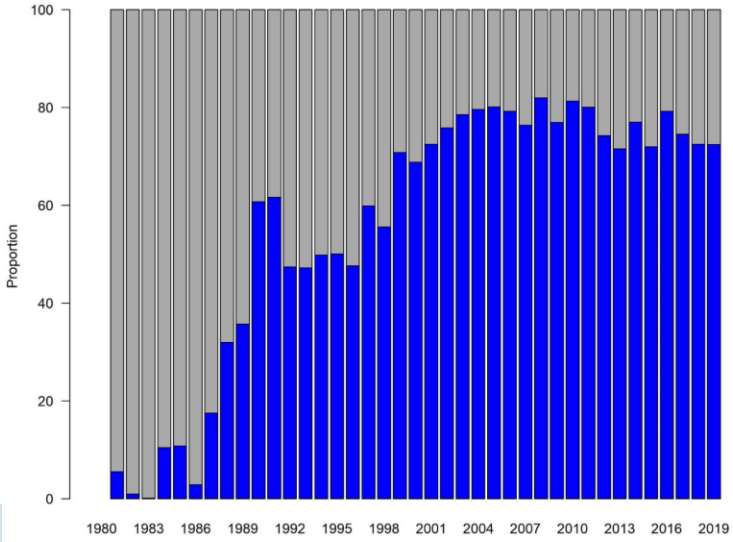
Charter



Headboat

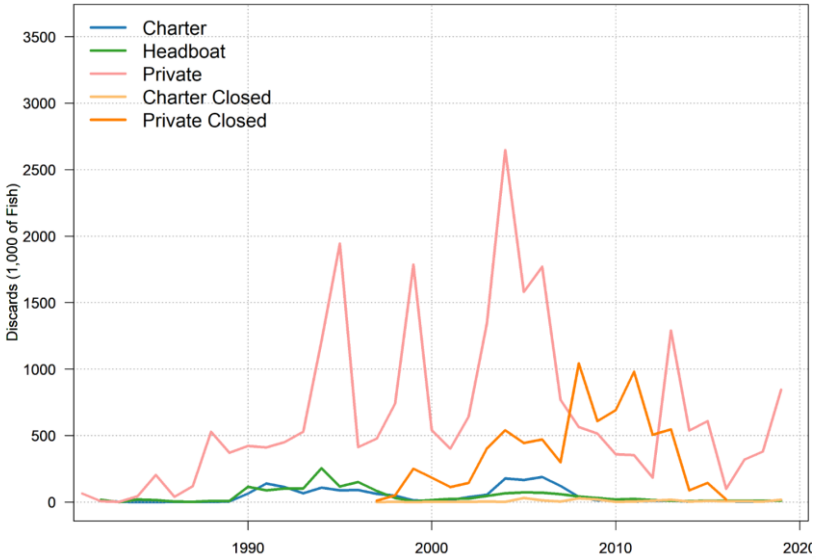


Private

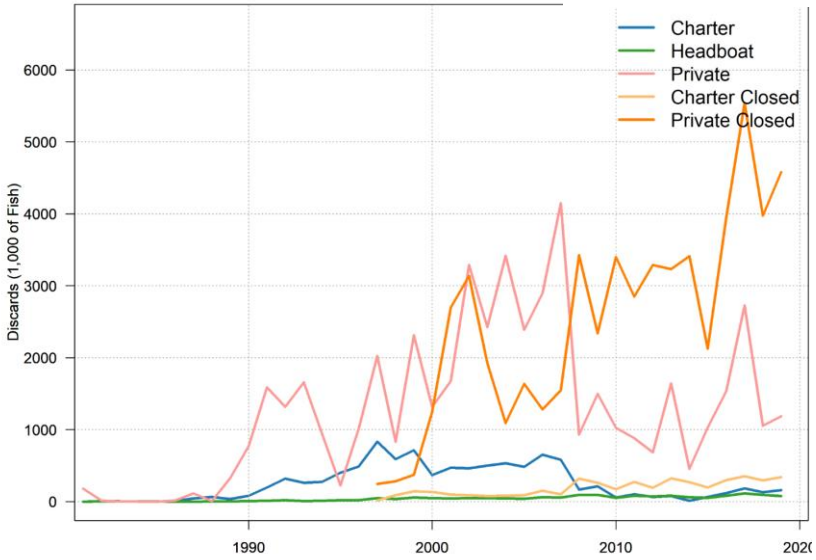


Open & Closed Season Discards

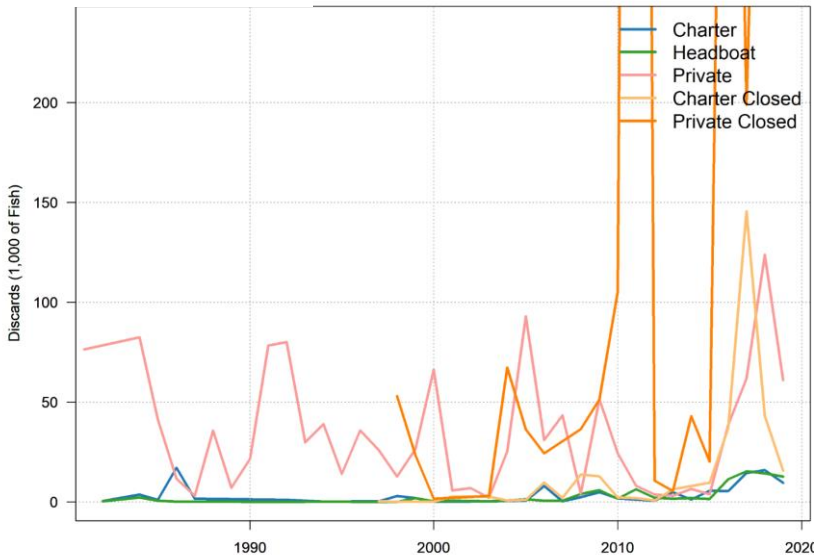
West



Central



East



Indices of Abundance

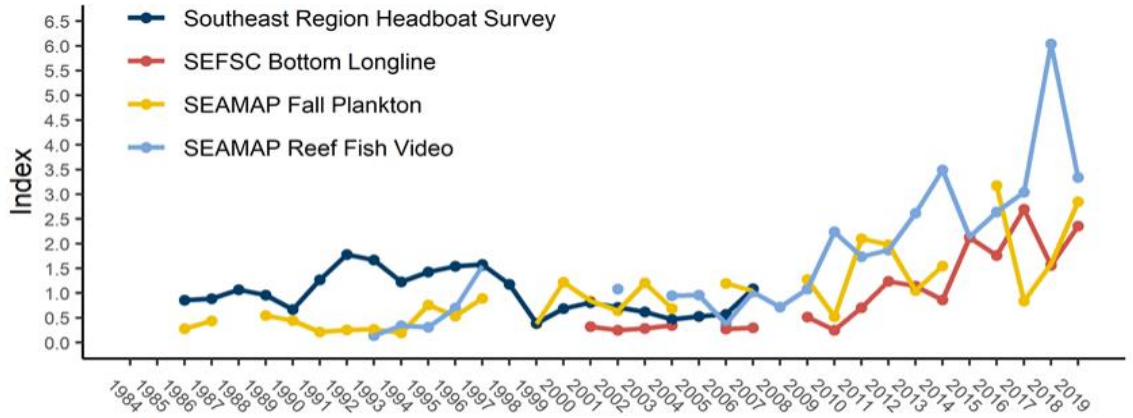
Indices

- Data Workshop Index Working Group reviewed 28 fishery-independent and 12 fishery-dependent regional relative abundance indices

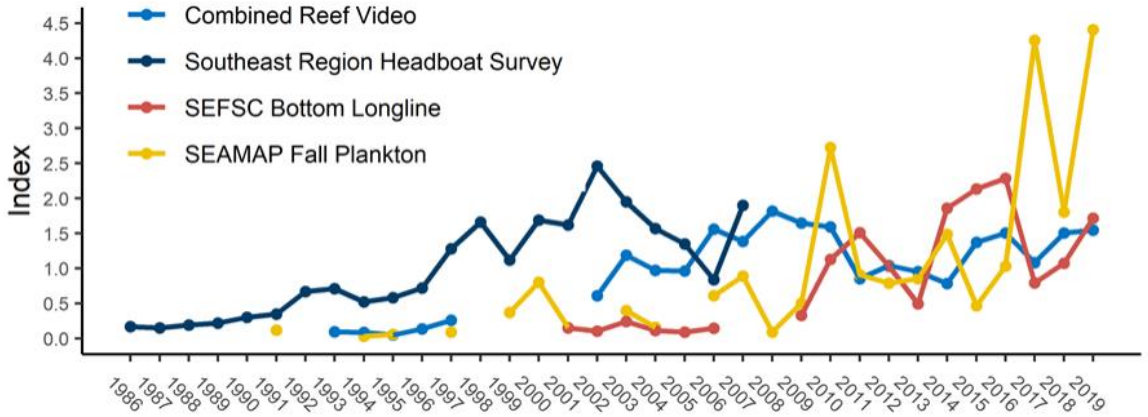
- Evaluated indices as “recommended”, and “not recommended” based on the following:
  - Temporal range
  - Spatial range
  - Survey design
  - Sampling method
  - Ages and/or sizes represented
  - Appropriate analytical methods used
  - Adequacy for the assessment

Age 2+

West



Central



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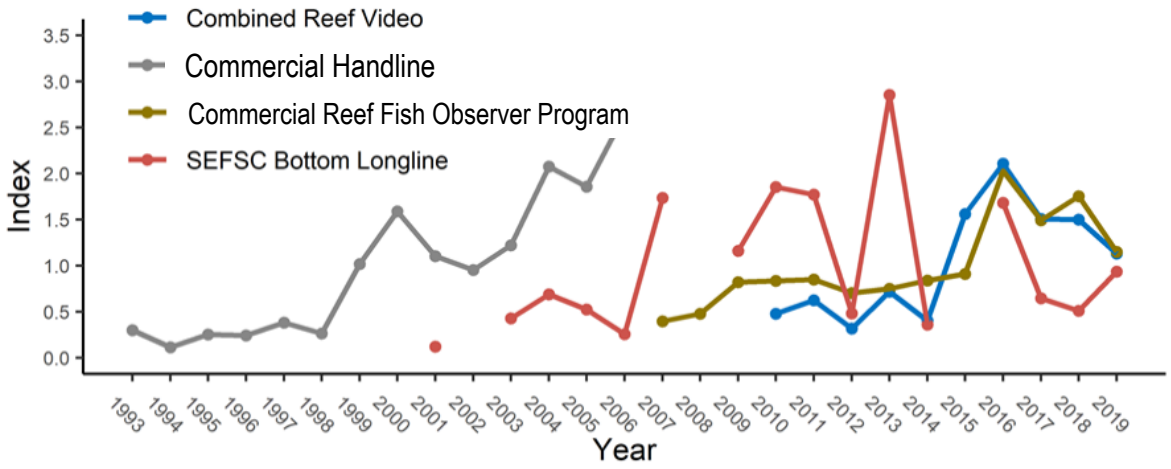
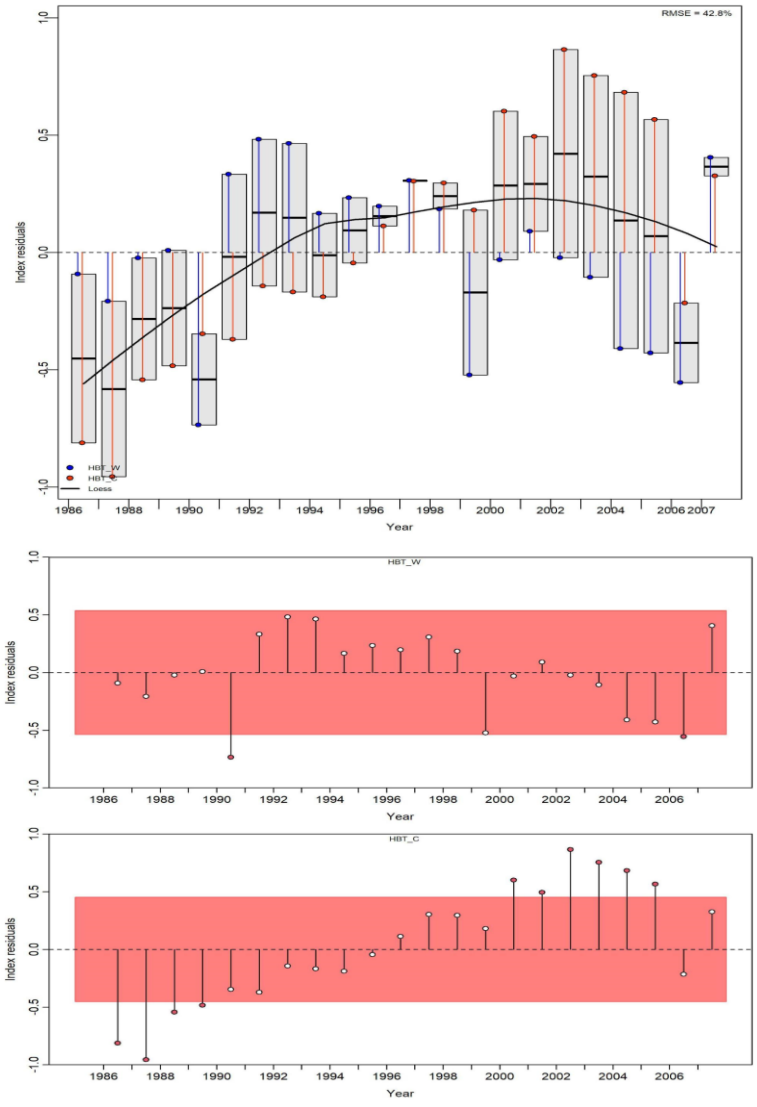


Source: SEDAR74 Data Workshop Figure 5.10.3,5.10.4, 5.10.5

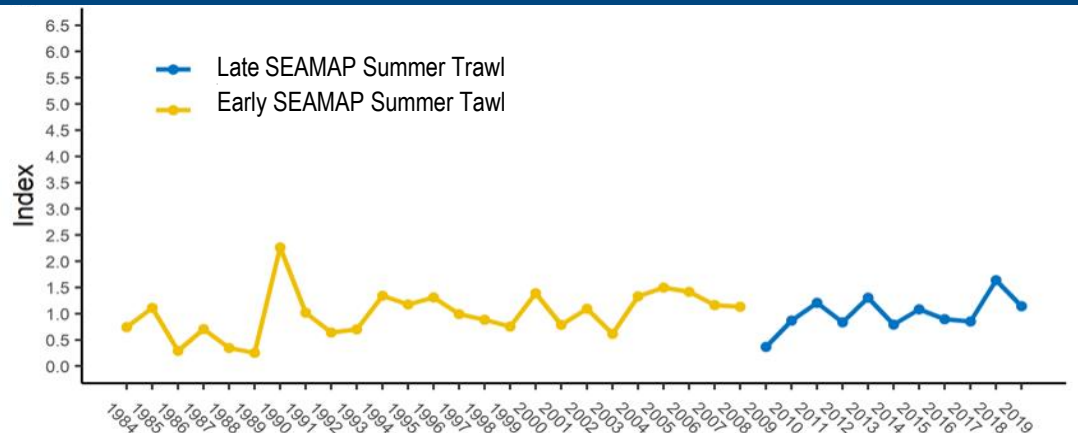
Post Data Workshop Removal of Headboat (HBT) Index



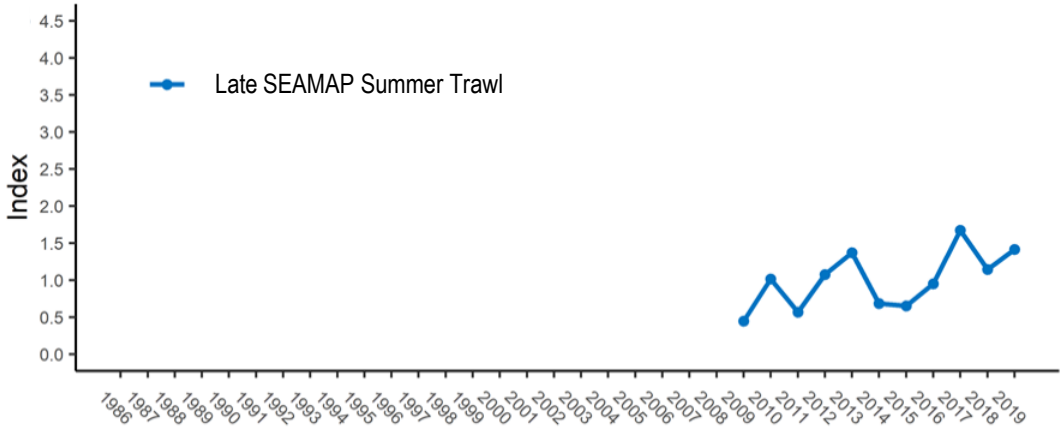
- Originally included for their temporal coverage
- Surveys fit poorly in assessment model.
- Residual patterns likely tied to impact of management history on index development.
- Excluded based on various caveats:
  - West:
    - "Potential conflict in relative abundance trends in the early time period between the SRHS data and the other indices"
  - Central:
    - Poor residuals throughout the time series
    - No contrasts in abundance early on where it could be useful

Age 1

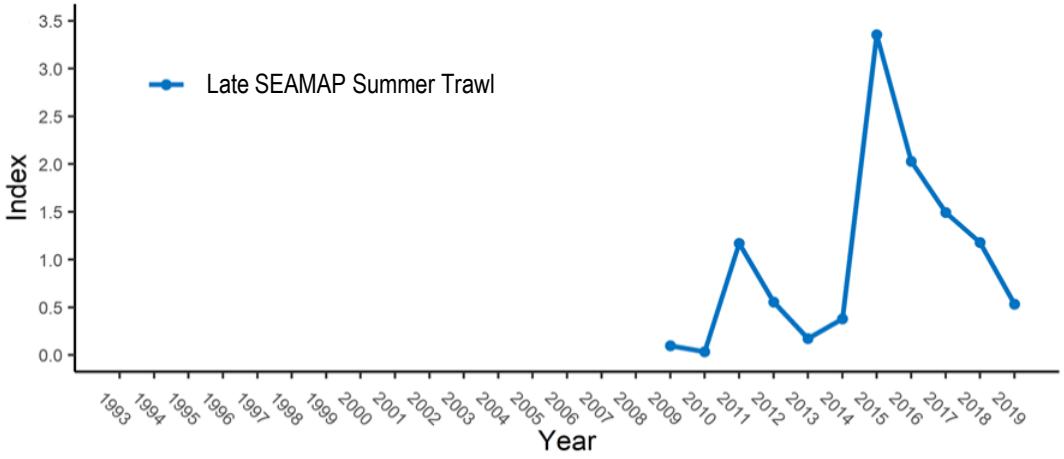
West



Central



East



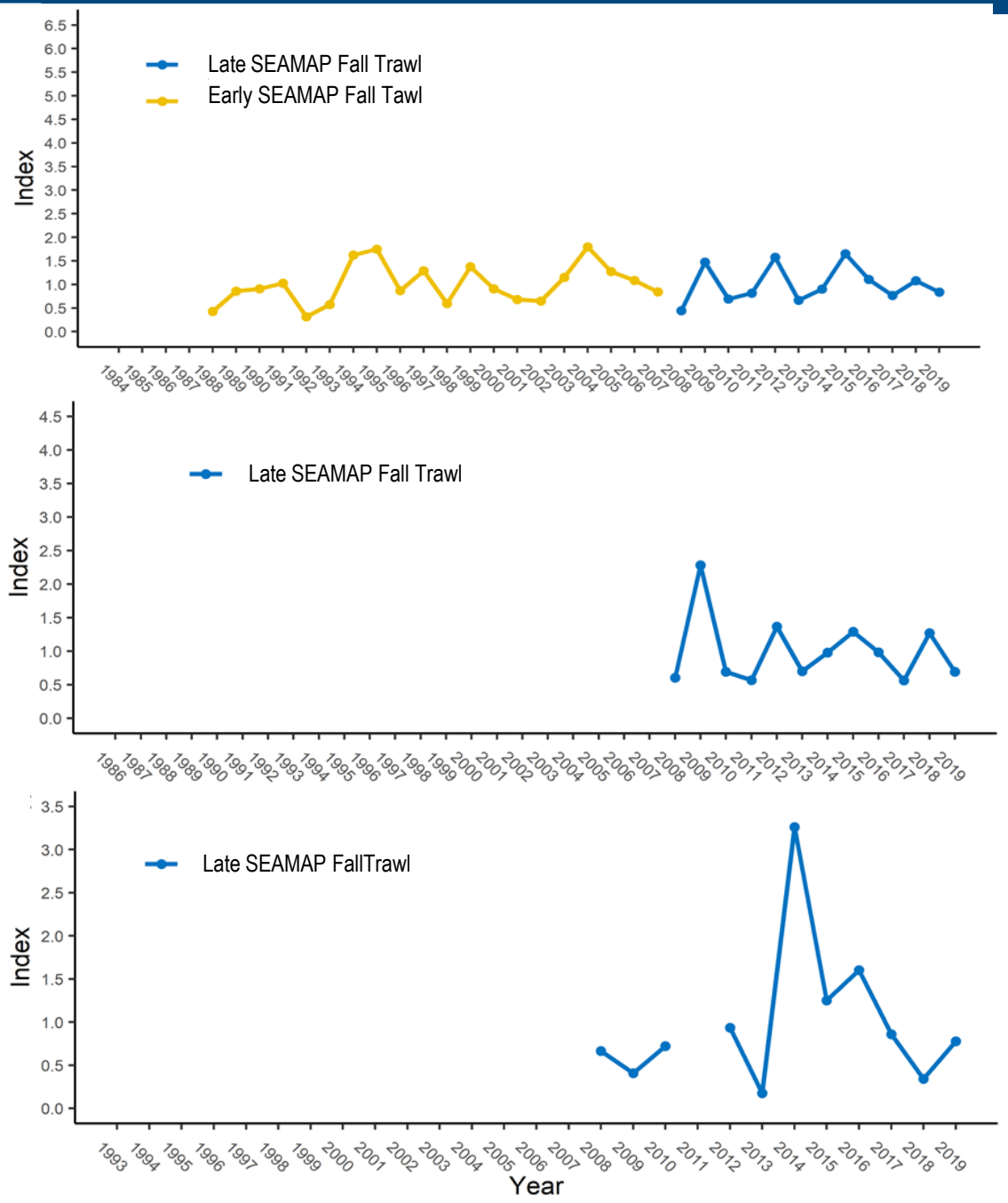
Source: SEDAR74 Data Workshop Figure 5.10.3,,5.10.4, 5.10.5

Age 0

West

Central

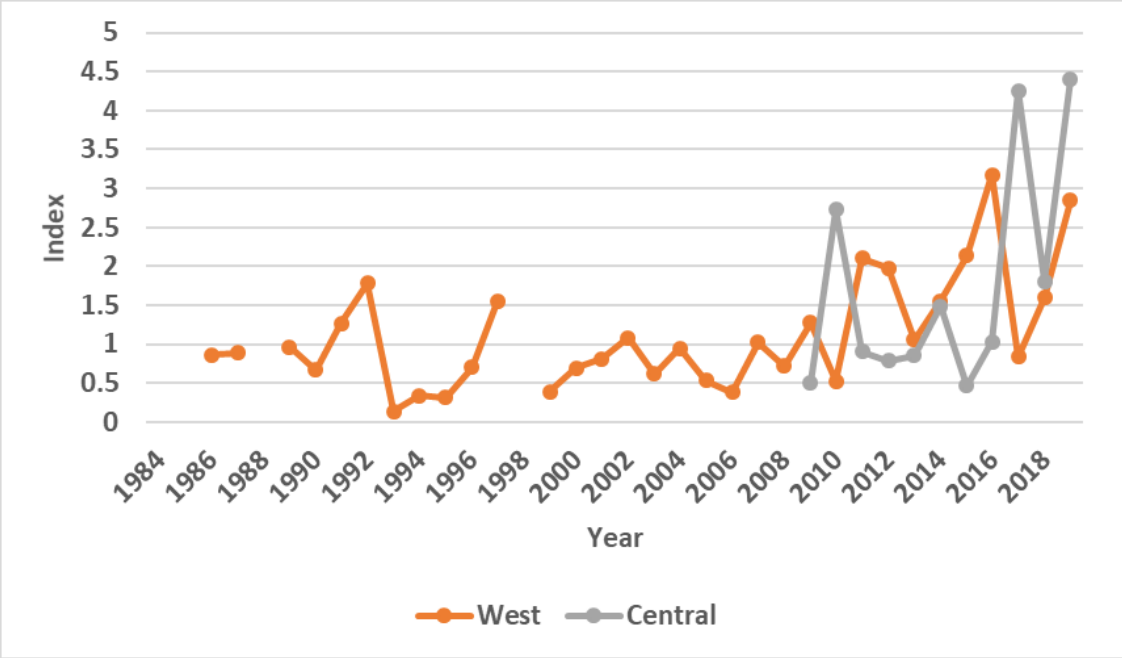
East



Source: SEDAR74 Data Workshop Figure 5.10.3,5.10.4, 5.10.5

SEAMAP Fall Plankton Survey/Larval Survey

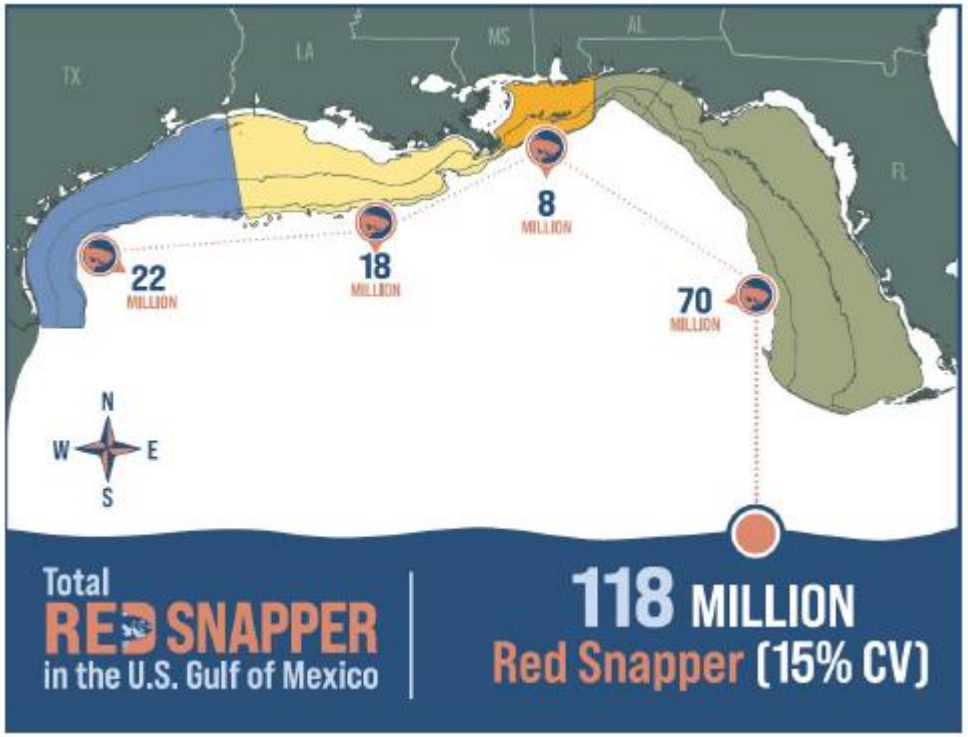
- Not recommended in the East, due to lack of samples
- Takes place towards end of spawning season late August and September
- Possible better representation of spawners than recruits



Great Red Snapper Count (GRSC)

An estimate of age 2+ Red Snapper in the GOM conducted in 2018 by various institutions using ROVs, sonar, towed cameras, and tagging.

- Sampling methods differed by state given differences in habitat
- State estimates broken up by habitat type including depth zone, natural and artificial reefs, pipelines and "uncharacterized bottom"

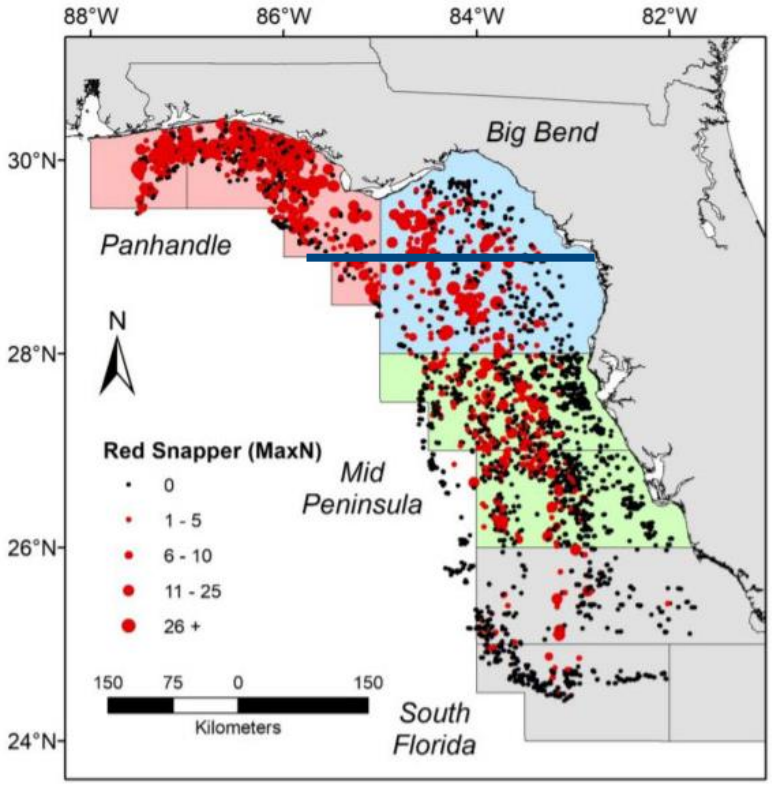


Steps to use the GRSC Data in the Assessment

- Original Louisiana estimate imputed data from Texas due to sampling complications
  - New data collected in 2021 by LGL Ecological Research Associates, Inc.
- 2021 Florida Random Forest model rerun using new depth stratification (post-stratified GRSC)
- 2022 GRSC stratification translated to Stock ID stratification
  - Florida needed to be split into the new Central and East
  - Resulted in a new estimate for Florida overall

GRSC - New Estimates for Florida

- New Stock ID split estimate for Florida total was lower than previously reviewed
  - 46,965,780 to 32,512,132
    - 15,420,666 central & 17,091,466 east
- New estimate not peer reviewed
  - ADT Decision:
    - Use stock ID split GRSC proportions 47.4% central & 52.6% east and apply them to non-stock ID split GRSC estimate



G-FISHER - site specific red snapper abundance. Presented at January 2022 SSC Meeting

Approx. Stock ID boundary

GRSC Absolute Abundance Estimates Used

West (Texas & Louisiana)**(30,823,985)**

- Original Texas abundance estimate (22,025,035)
- LGL Louisiana abundance estimate (8,377,591)
- ~83% of the pipeline estimate split by region (421,359)

Central abundance **(30,806,497)**

- GRSC estimate of MS/AL abundance (8,461,085)
- 47.4% of the post-stratified GRSC FL abundance estimate (22,261,780)
- 16.4% of the pipeline abundance estimate (83,632).

East abundance **(24,707,670)**

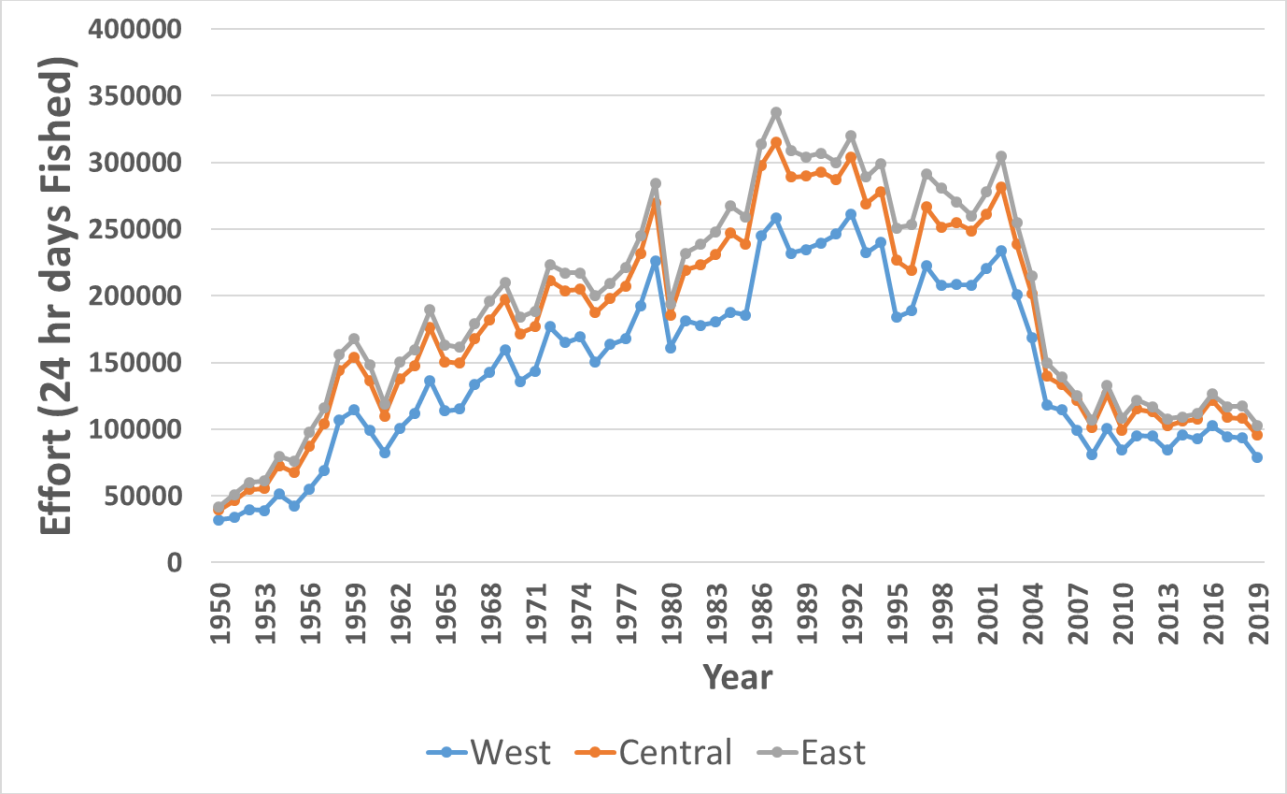
- 52.6% of the post-stratified GRSC FL estimate (24,704,000)
- 0.53% of the pipeline estimate (2,670)

GRSC Stock ID CVs are the numbers weighted average of the state/region/pipeline estimated CVs

- West -27.30; East - 21.80, Central 22.00

Shrimp Effort

Effort was split into the new east and central areas using effort data from the previous east 1985 -1989 estimates



Source: Lew Coggins, Personal Communication

Index CV treatment

Provided CVs vary based on region, gear and sampling design/intensity. Scaling variability to a mean of 0.2 attempts to correct for this (Francis et al. 2003).

Francis et al. 2003. Quantifying annual variation in catchability for commercial and research fishing. Fish. Bull. 101: 293-304.

Composition Data

Composition Criteria

- Sample size greater than 10 fish or trips per year
- n = number of fish where available, else finest unit available
  - Commercial & Recreational size comp
    - n = # of trips
  - Commercial Reef fish observer program & Late Fall Trawl
    - n = # of fish
  - Early SEAMAP Trawl comp
    - n = # of stations

Landed Length Composition Sample Sizes

Year	HL_E	HL_C	HL_W	LL_E	LL_C	LL_W	CBT_E	CBT_C	CBT_W	HBT_E	HBT_C	HBT_W	PRIV_E	PRIV_C	PRIV_W
1981	0	0	0	0	0	0	0	13	3	3	12	1	5	12	4
1982	0	0	0	0	0	0	0	19	3	0	13	16	2	21	33
1983	0	0	0	0	0	0	1	21	70	29	42	54	1	3	100
1984	23	18	49	32	4	22	3	6	30	10	5	4	2	4	100
1985	48	14	66	38	2	40	1	6	8	2	10	17	1	4	105
1986	31	17	42	102	1	18	5	29	39	10	64	413	3	6	87
1987	32	16	40	41	0	7	1	78	31	1	99	393	1	58	99
1988	11	11	55	20	2	9	1	61	6	1	93	299	6	7	112
1989	2	24	54	6	0	18	1	38	7	4	122	289	4	3	81
1990	22	46	211	43	7	8	0	32	11	2	114	247	2	17	95
1991	6	68	201	25	5	9	1	100	34	1	143	212	1	38	104
1992	11	27	164	27	2	5	3	193	52	1	181	323	1	82	158
1993	14	52	215	35	0	4	0	108	26	0	126	328	0	52	181
1994	16	116	173	23	2	1	0	87	31	29	132	324	0	36	245
1995	10	80	125	32	0	3	0	43	25	0	111	357	1	32	407
1996	12	51	49	21	0	2	1	48	29	0	115	241	2	30	330
1997	18	64	158	11	1	1	3	197	34	0	164	231	0	46	309
1998	20	80	221	25	1	6	9	309	37	0	248	343	0	39	266
1999	42	122	179	56	0	5	5	585	23	6	126	221	4	151	184
2000	17	175	138	46	0	17	3	638	29	1	136	150	0	103	222
2001	19	183	156	40	3	8	5	474	26	2	88	187	0	116	191
2002	24	170	226	48	2	24	12	1258	76	0	126	221	2	139	247
2003	22	179	194	45	3	13	8	4455	88	2	134	190	5	165	269
2004	16	183	114	49	1	17	8	3430	95	1	106	93	2	183	271
2005	24	145	160	69	3	8	3	4806	96	53	46	101	4	124	355
2006	29	106	169	43	0	14	7	2695	114	86	98	79	5	119	409
2007	21	174	76	17	5	14	4	544	143	4	113	65	2	106	266
2008	25	169	110	33	8	18	12	417	85	49	231	37	12	75	211
2009	39	144	101	9	3	16	66	393	92	324	278	63	5	77	247
2010	67	152	127	101	1	5	121	1424	19	298	245	40	14	71	141
2011	99	300	141	71	2	1	73	873	56	366	209	53	15	126	190
2012	150	420	277	36	2	10	16	1361	77	166	142	35	3	161	178
2013	155	497	305	74	1	10	23	1689	88	194	271	120	9	176	245
2014	160	378	311	74	1	8	36	757	61	6	313	142	15	450	238
2015	127	447	283	104	3	16	45	361	113	11	201	193	1	294	322
2016	125	509	294	114	3	15	22	318	89	54	76	149	8	415	229
2017	140	457	275	81	9	19	71	262	132	133	188	130	97	334	341
2018	107	445	250	80	15	22	59	307	176	110	158	201	25	298	405
2019	130	523	212	97	7	42	83	373	104	112	172	204	21	456	455

Discard Length Composition Sample Sizes

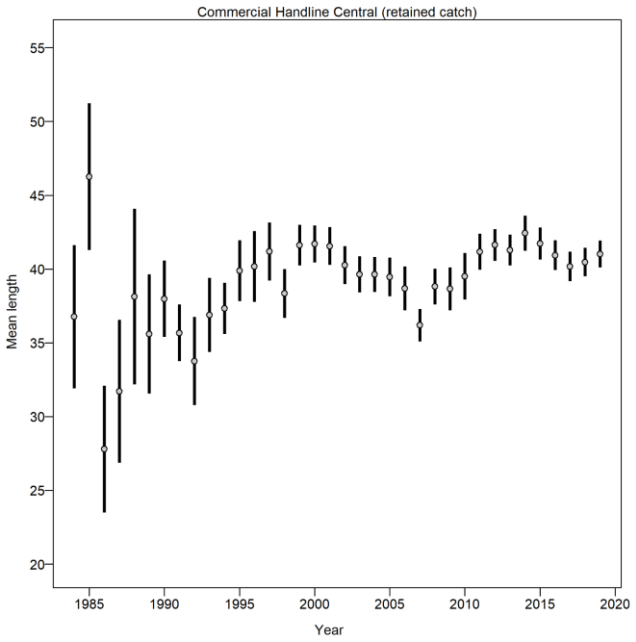
Year	HL_E	HL_C	HL_W	LL_E	LL_C	LL_W	SHR_E	SHR_C	SHR_W
1997								1	3
1998									2
1999								6	20
2000							3	8	19
2001							3	15	33
2002							26	70	71
2003							5	23	43
2004							5	23	34
2005							4	22	30
2006							16	13	34
2007	24	44	15	8	0	0	4	11	38
2008	13	12	8	2	0	1	19	15	85
2009	14	14	3	20	4	1	26	17	77
2010	15	16	4	30	1	3	18	18	65
2011	26	29	10	64	5	1	6	11	43
2012	68	74	27	14	0	1	18	14	56
2013	17	41	9	52	6	2	7	18	71
2014	23	19	13	16	1	1	7	29	69
2015	33	53	29	18	1	1	23	26	62
2016	42	39	22	37	1	6	27	46	69
2017	14	21	12	7	0	2	15	40	75
2018	11	15	6	4	0	0	9	30	51
2019	4	13	7	2	0	0	6	31	37

Survey Length Composition Sample Sizes

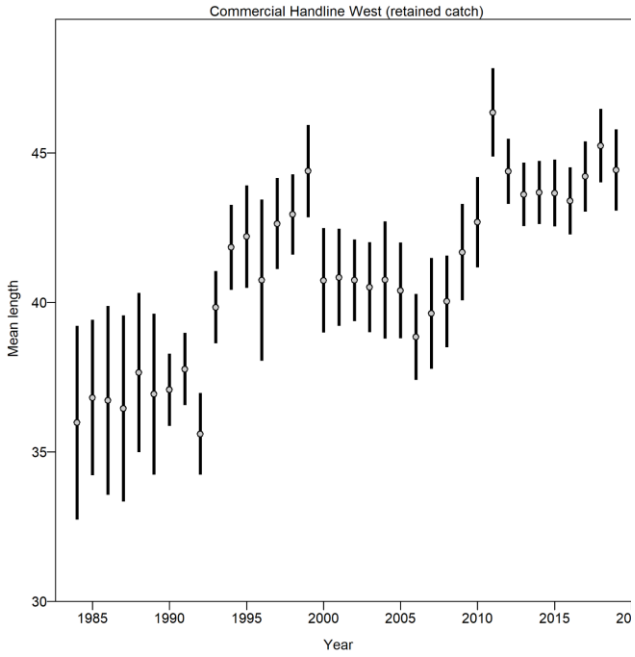
Year	BLL_E	BLL_C	BLL_W	VID_E	VID_C	VID_W	Summer_E	Summer_C	Summer_W	Fall_E	Fall_C	Fall_W	Comm. Obs
1987									32				
1988									37			79	
1989									25			91	
1990									79			115	
1991									61			122	
1992									57			95	
1993									57			100	
1994									66			117	
1995						4			73			130	
1996					1	23			72			111	
1997					1	30			70			114	
1998					0	0			59			100	
1999					0	0			58			123	
2000					0	0			84			122	
2001	1	1	23		0	5			32			108	
2002	0	2	35		11	33			73			108	
2003	2	3	18		0	11			50			120	
2004	3	1	19		22	35			78			127	
2005	1	1	0		40	19			74			145	
2006	1	1	13		14	45			90			117	
2007	2	0	13		32	16			65			98	287
2008	0	0	0		11	0			76	3	23	175	310
2009	4	1	14		62	12	2	33	90	7	63	188	219
2010	5	6	8	18	44	36	1	19	86	11	24	96	496
2011	11	16	42	23	96	33	7	13	81	0	18	101	750
2012	2	3	19	23	67	38	9	21	79	3	23	92	1532
2013	1	2	22	25	41	58	2	17	68	3	15	56	660
2014	1	6	15	34	17	50	9	17	72	16	24	102	490
2015	0	9	25	49	38	17	15	17	83	21	27	112	853
2016	3	8	27	119	139	68	20	23	81	11	12	72	871
2017	1	4	42	103	164	78	13	30	70	15	23	84	457
2018	2	4	26	113	139	108	15	19	84	6	21	102	158
2019	2	4	23	99	234	118	6	17	76	12	19	83	81

Commercial HL Retained Length

Central



West



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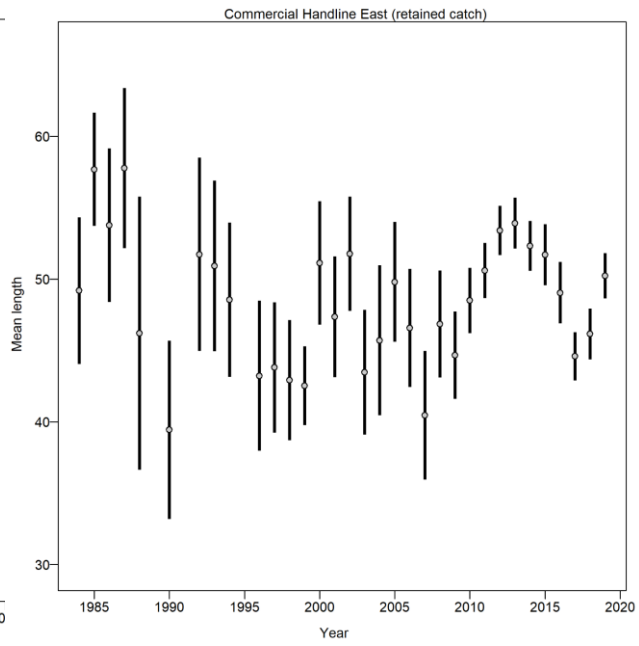
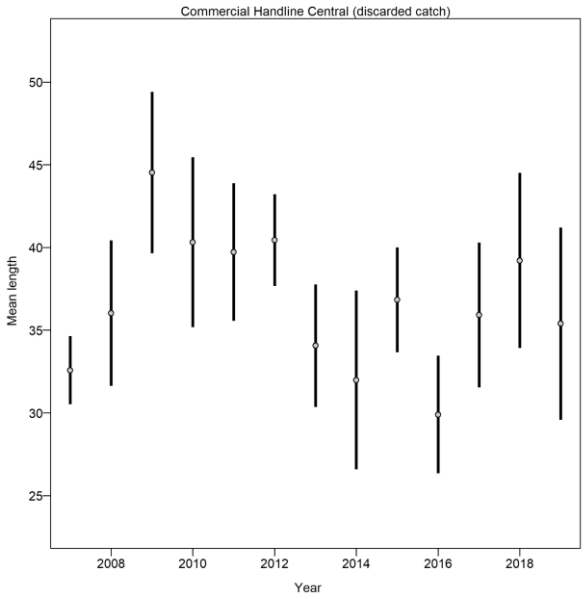


Commercial HL Discard Length

Central



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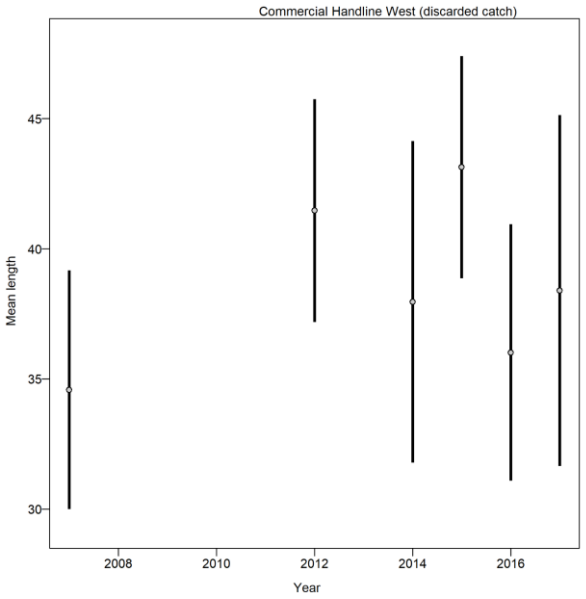

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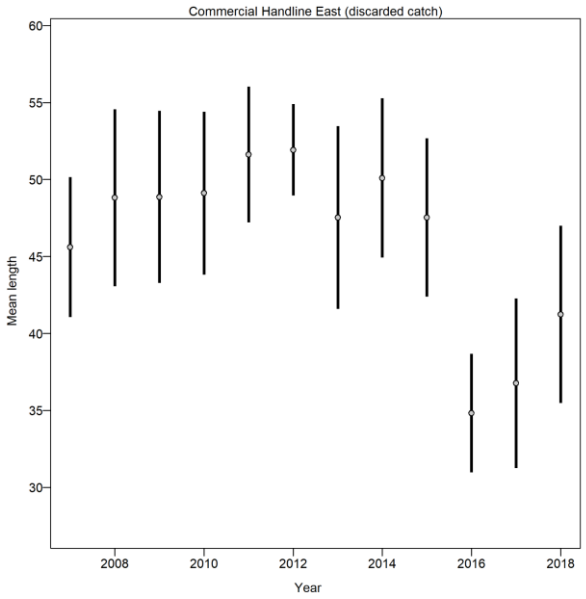
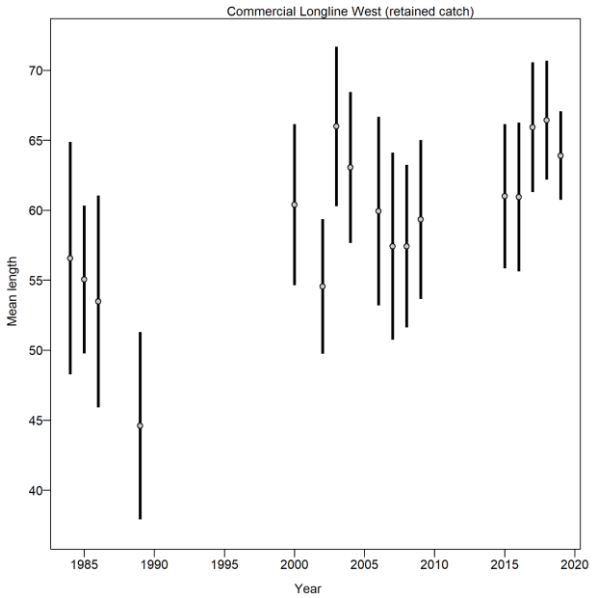
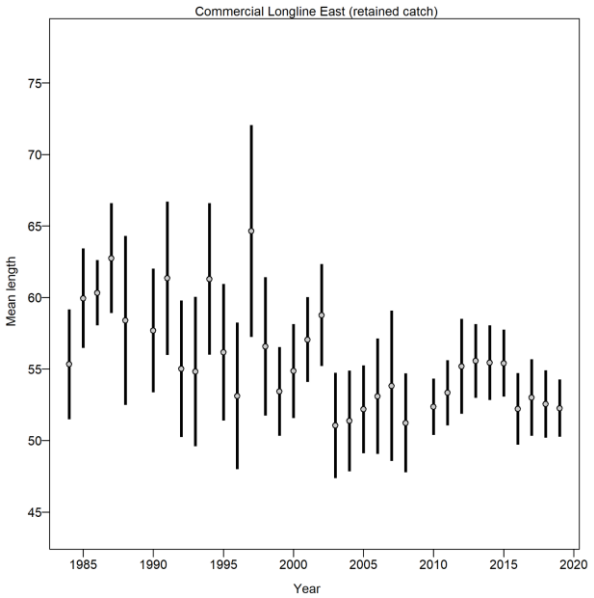


Commercial LL Retained Length

Central West East

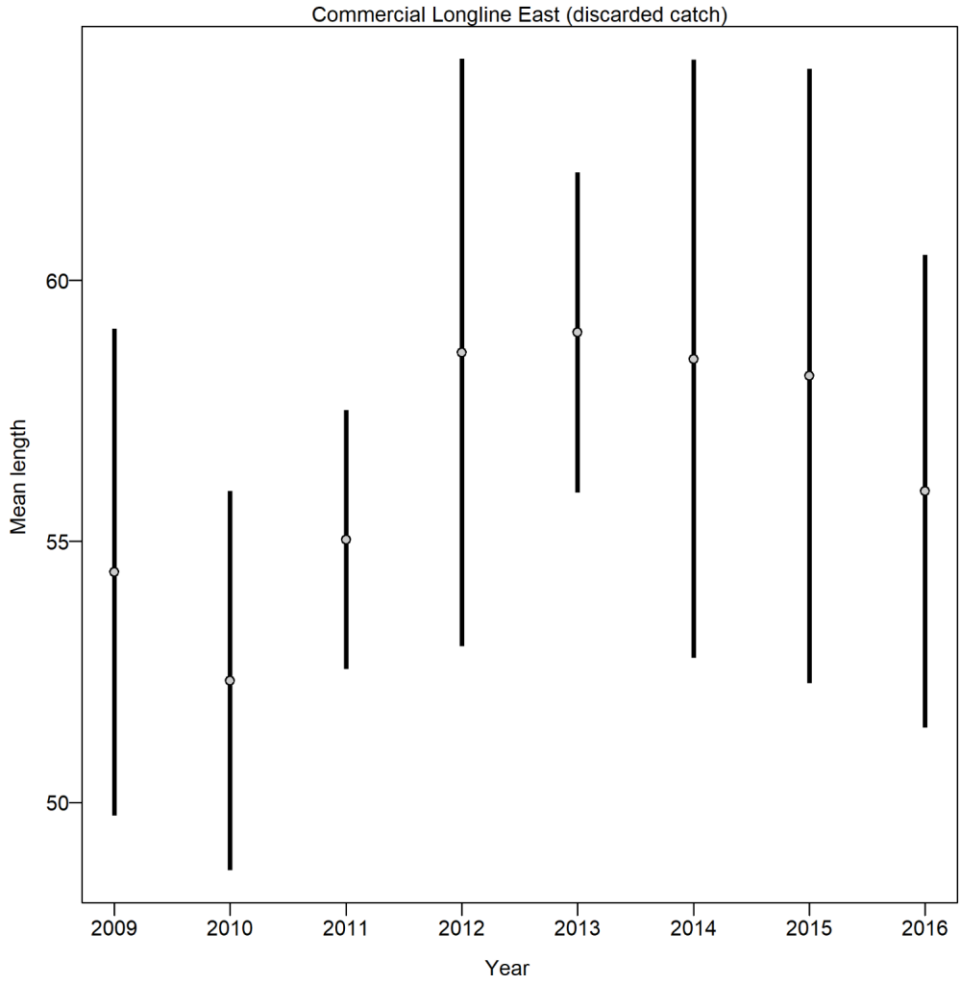
One year of data





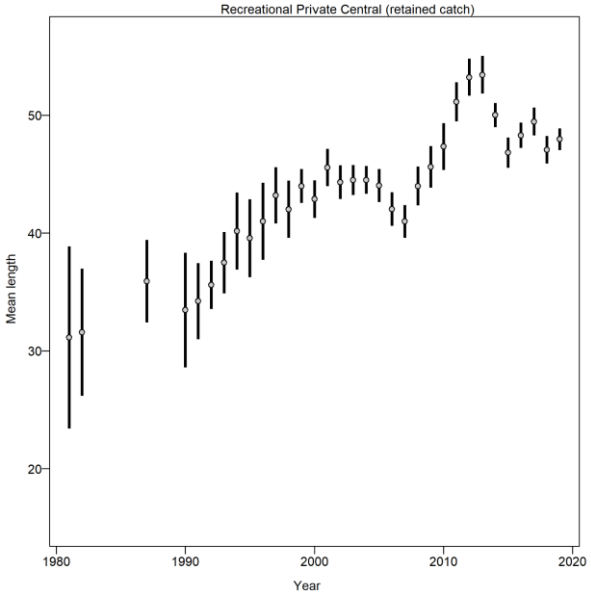
Commercial LL Discard Length

East



Recreational Private Retained Length

Central



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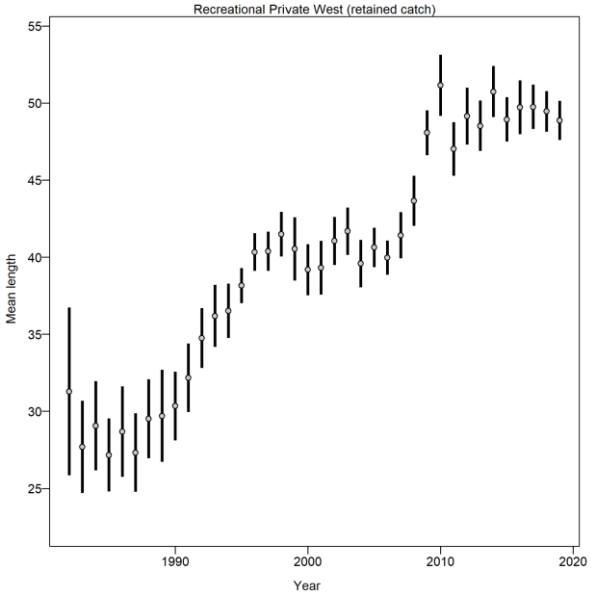

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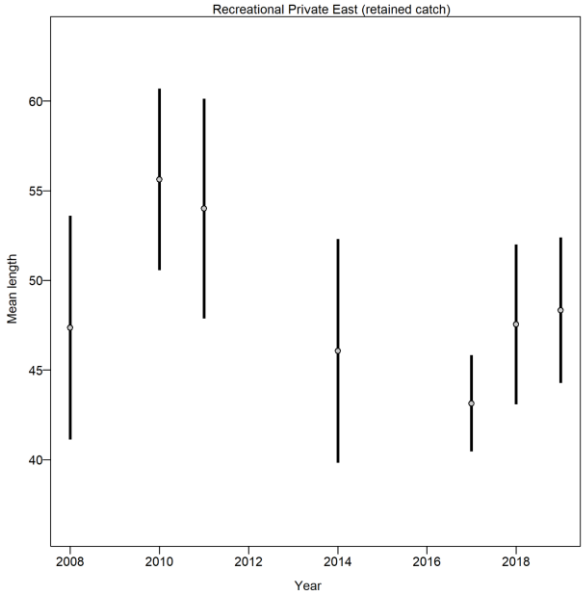
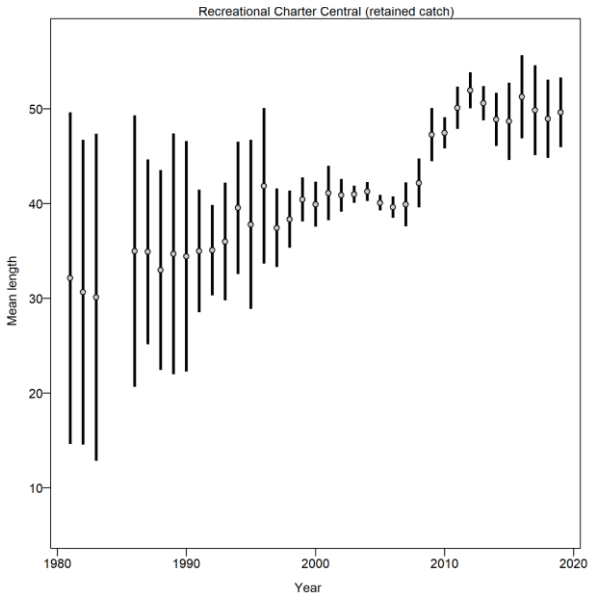


Recreational Charter Boat Retained Length

Central



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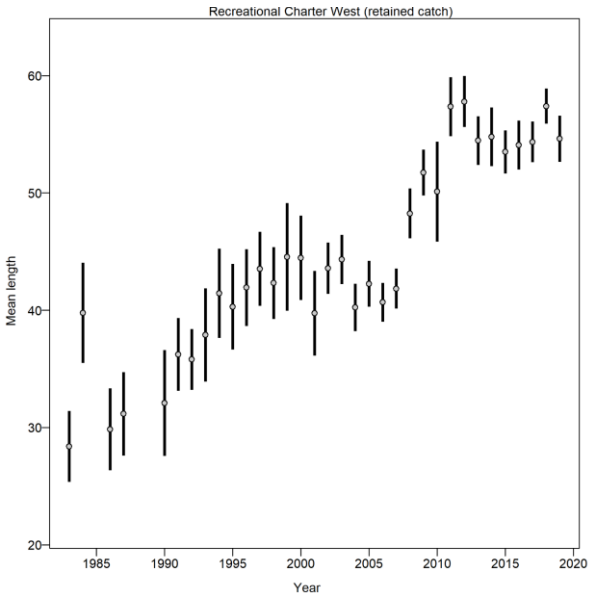

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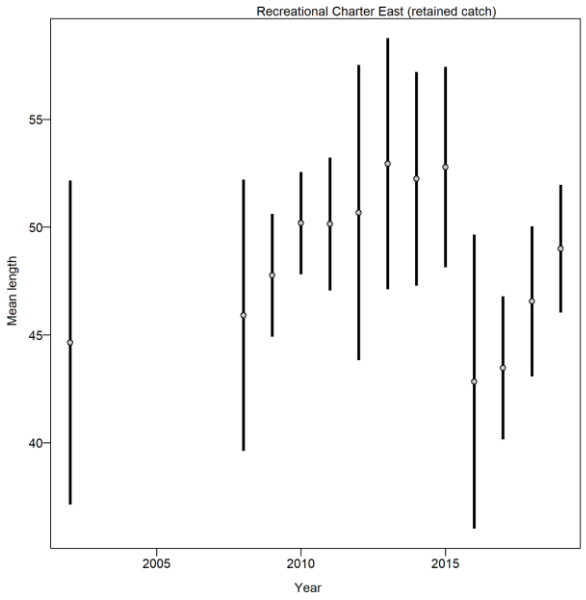
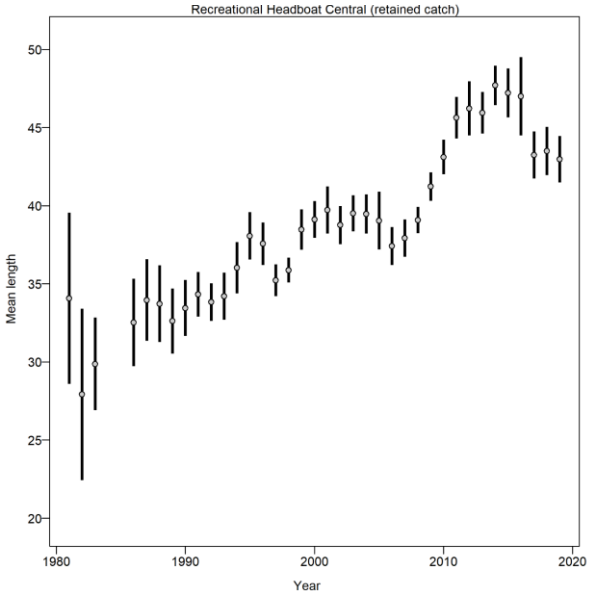


Recreational Headboat Retained Length

Central



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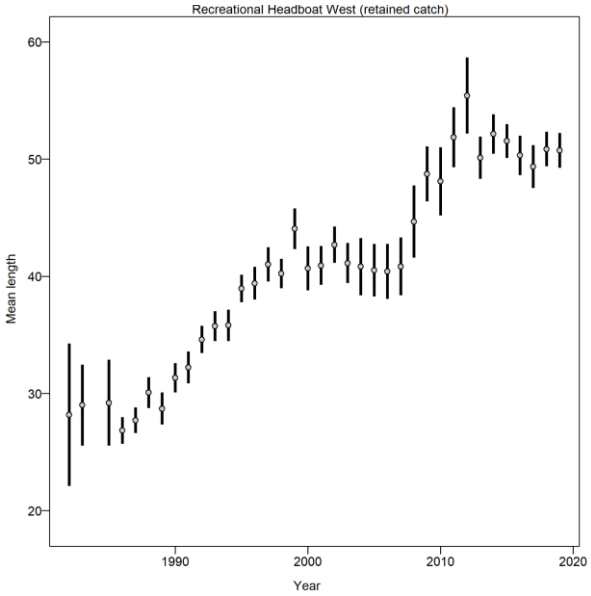

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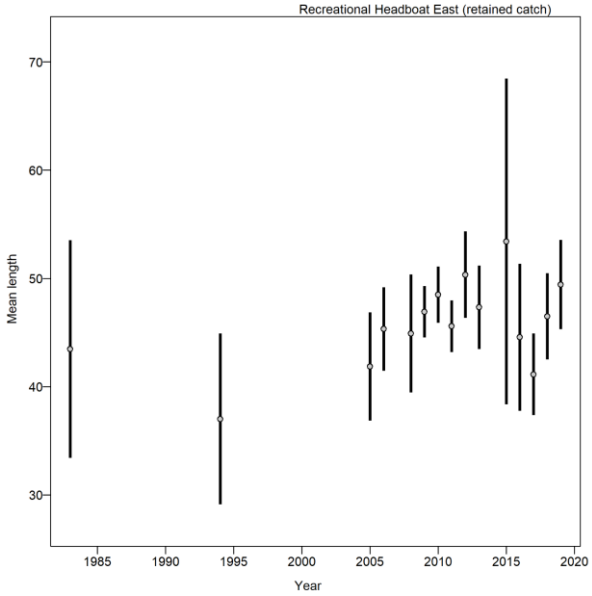
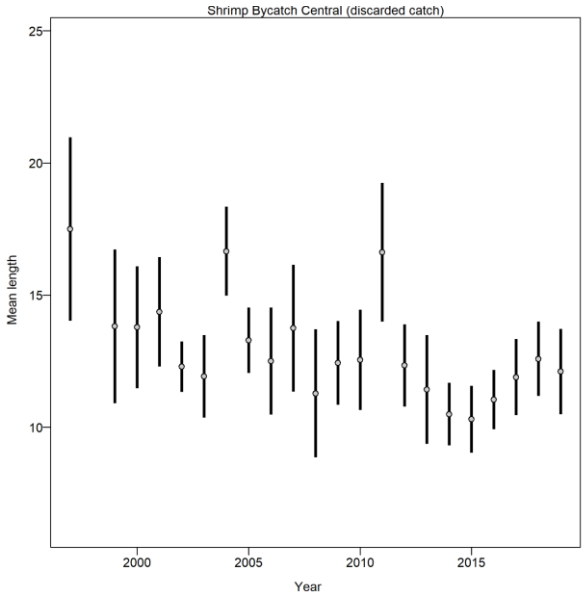


Shrimp Trawl Bycatch Length

Central



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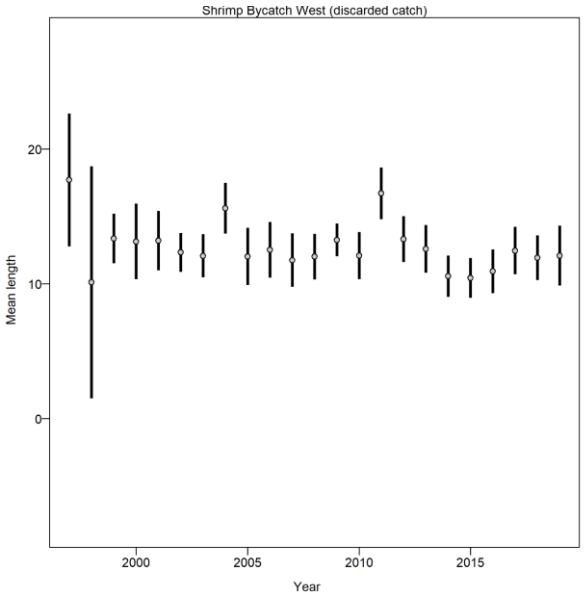

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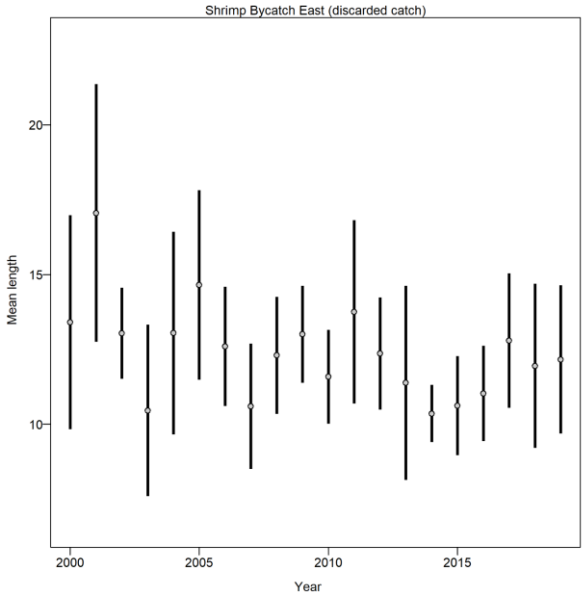
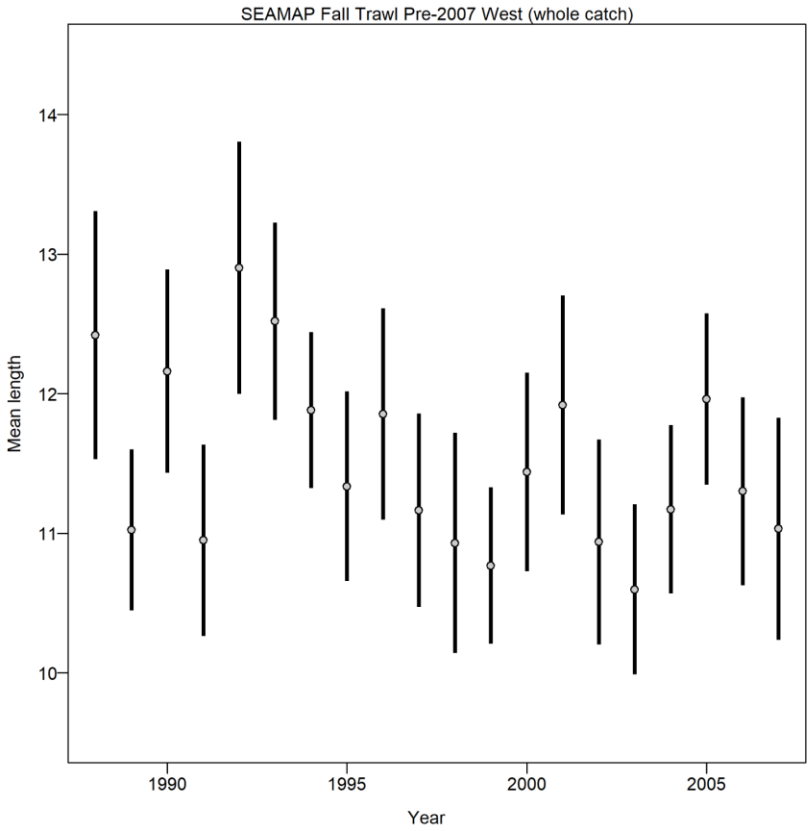


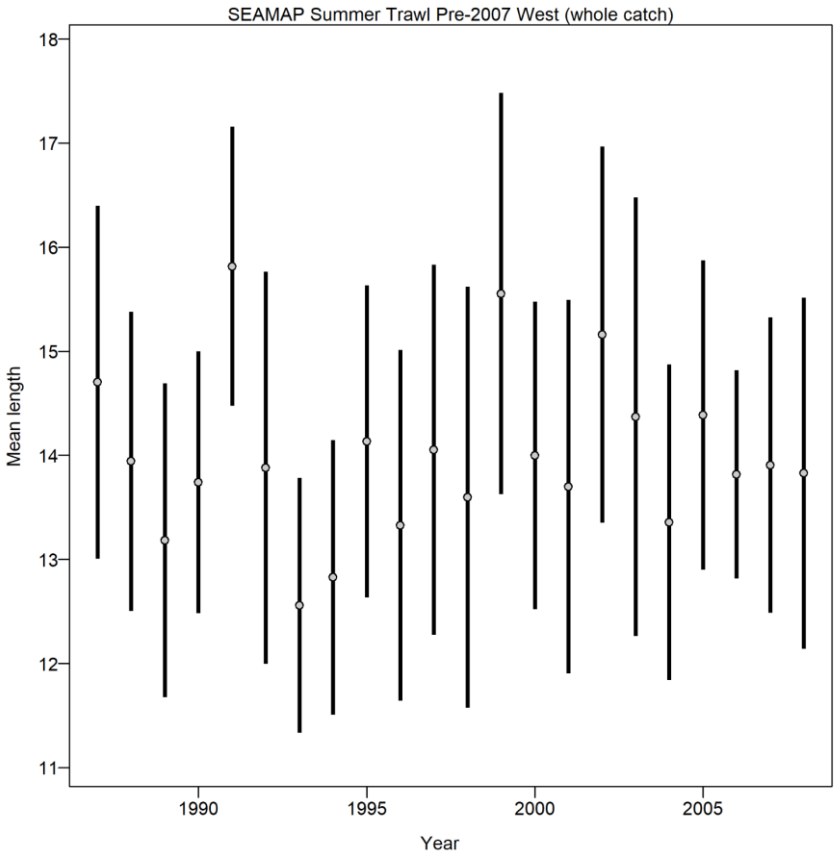
Early SEAMAP Fall Survey Length

West



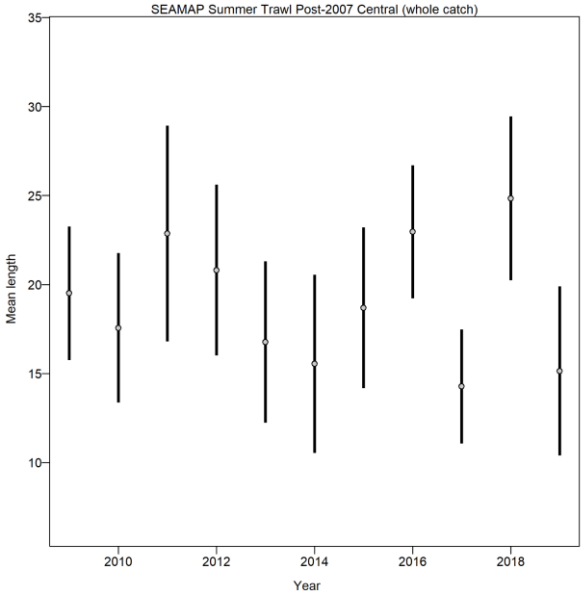
Early SEAMAP Summer Survey Length

West



Late SEAMAP Summer Survey Length

Central



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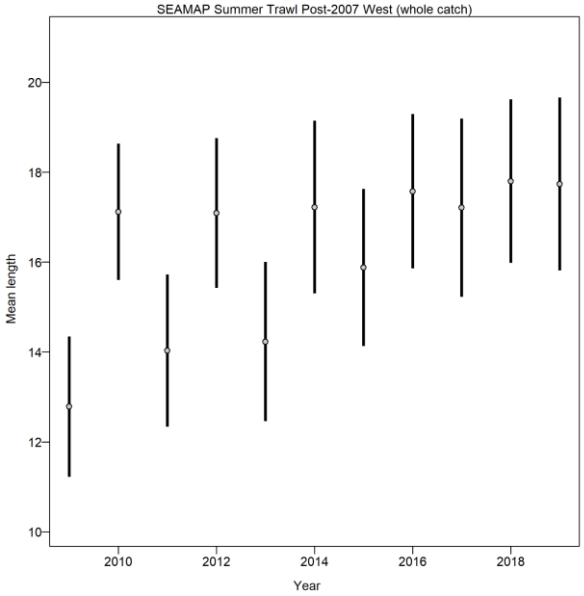

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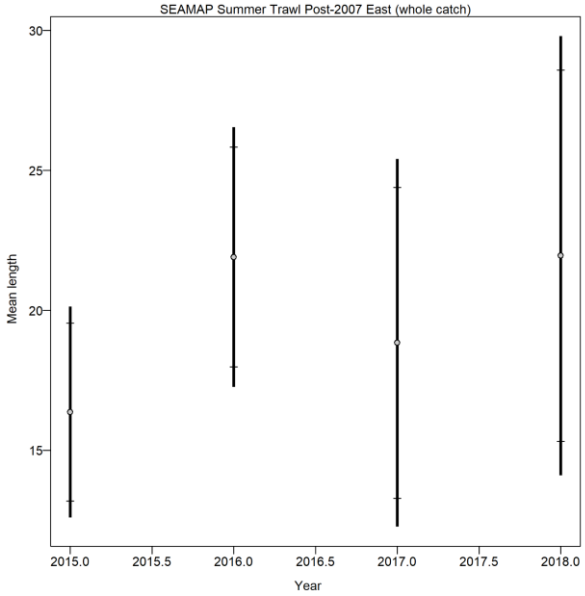
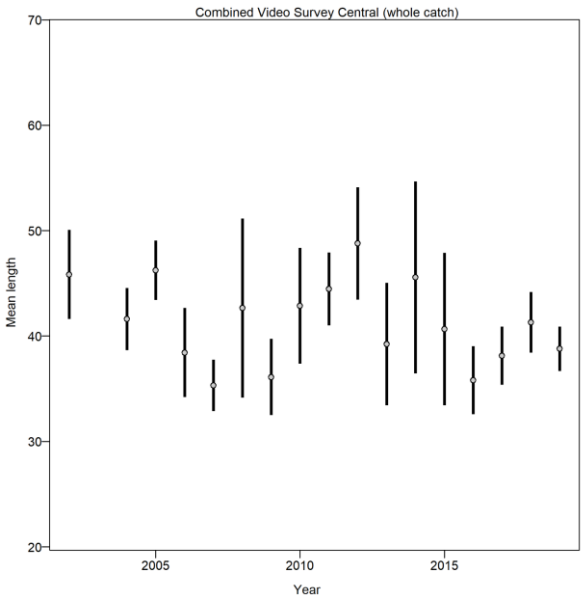
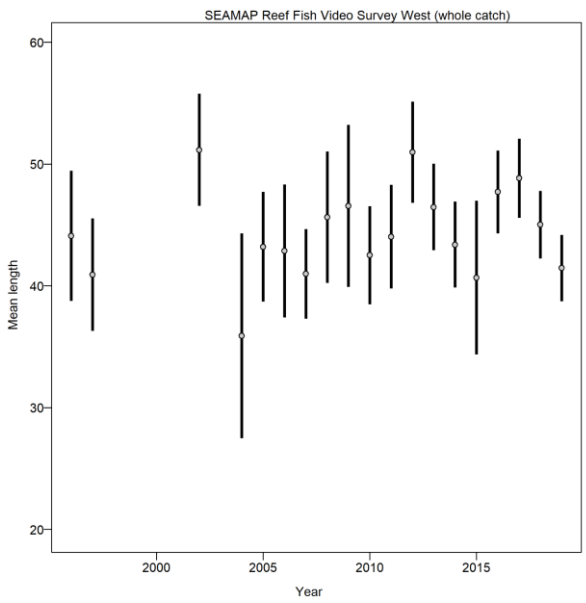


Video Survey (Combined & SEAMAP) Length

Central



SEAMAP West



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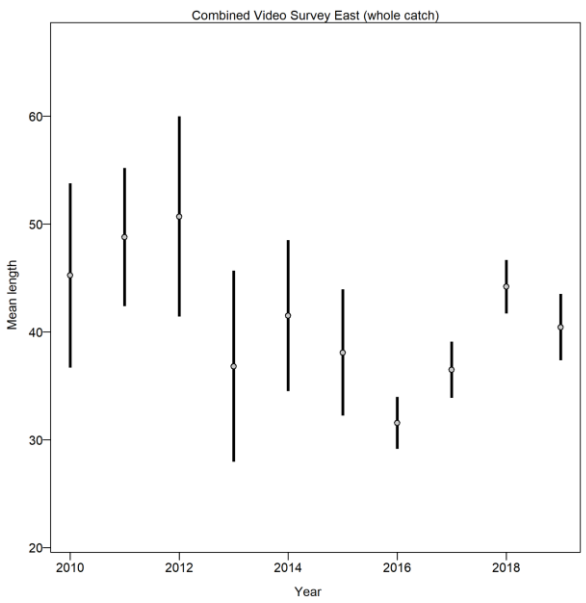
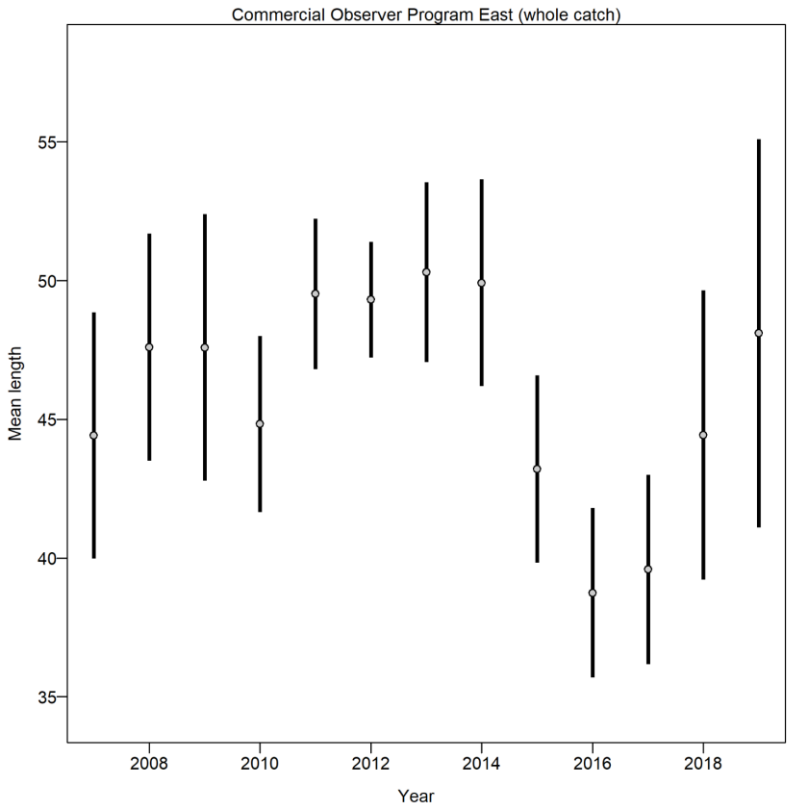


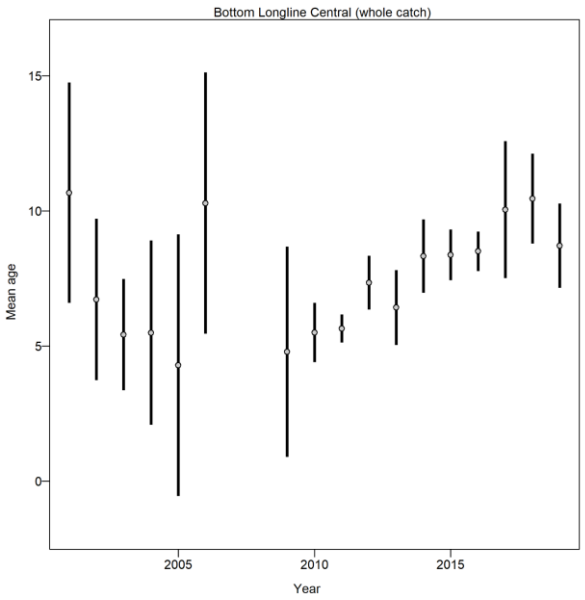
Commercial Reef Fish Observer Program Length

East

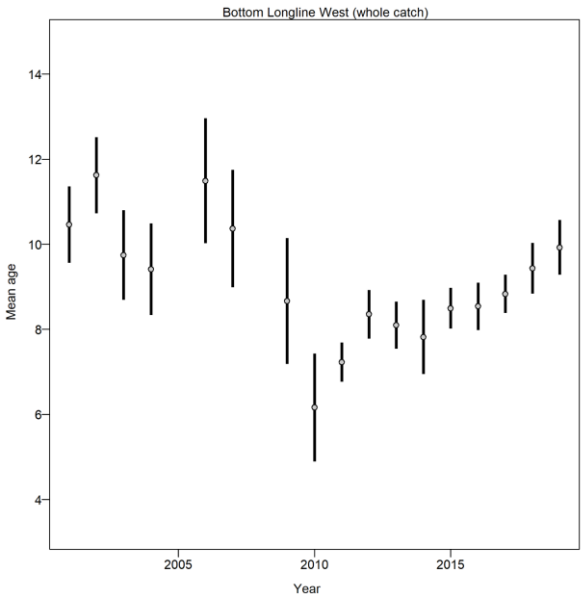


NOAA NMFS Bottom Longline Survey Length Converted Age

Central



West



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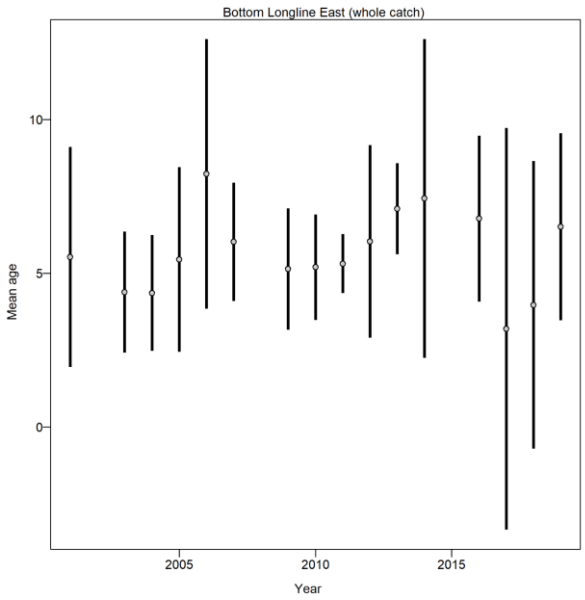
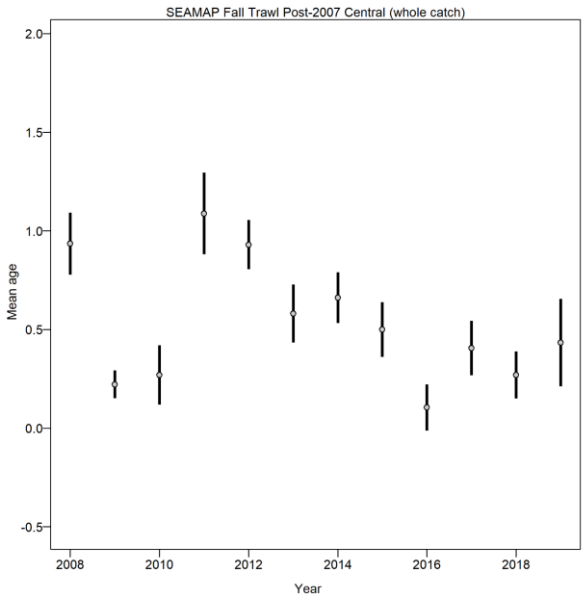


Late SEAMAP Fall Survey Length Converted Age

Central



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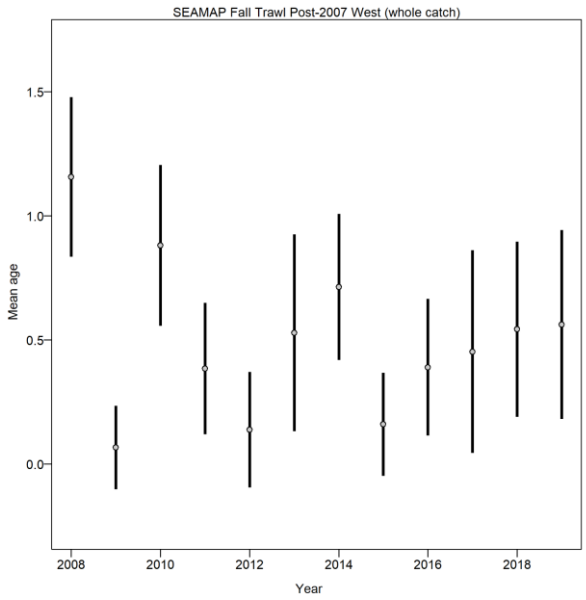

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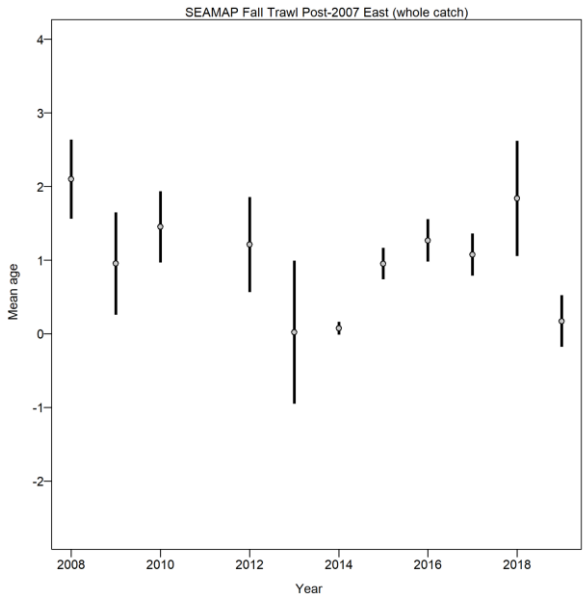

Great Red Snapper Count
Length Composition Data Description

Assessment Team Received Two Data Sets:

Data Set 1:

- Includes 2010-2020
- No indication of # measured vs seen (sampling protocol, max,etc.?)
- Only Alabama and Texas in 2018
  - VLL, BLL, ROV
- Multiple habitat types
- Data sources:
  - TAMCC, TWDP_ARP, TWDP_SEAMAP, University of South Alabama

Data Set 2:

- Assuming from one source across entire GOM FL shelf
- Stereocamera/Lasers for measurement
- Multiple habitat types
- Number seen vs measured available, max 24 measured at a site

Great Red Snapper Count
Length Composition Data Triage

- Texas data includes SEAMAP samples and Texas Parks and Wildlife
  - Risk of double counting data
  - Sampling protocol difference?
  - Which gear/habitat should be used?
    - May not have enough data for multiple gears
- Florida data was not split according to new stock ID bounds
  - When split, data weighting methodology needs to be discussed (considering habitat/depth, etc.)
- Discussion is needed on how to include the LGL Louisiana study for a complete western composition.

Questions about the Data?