

Stock Assessment of Georges Bank Yellowtail Flounder for 2019

Chris Legault and Monica Finley

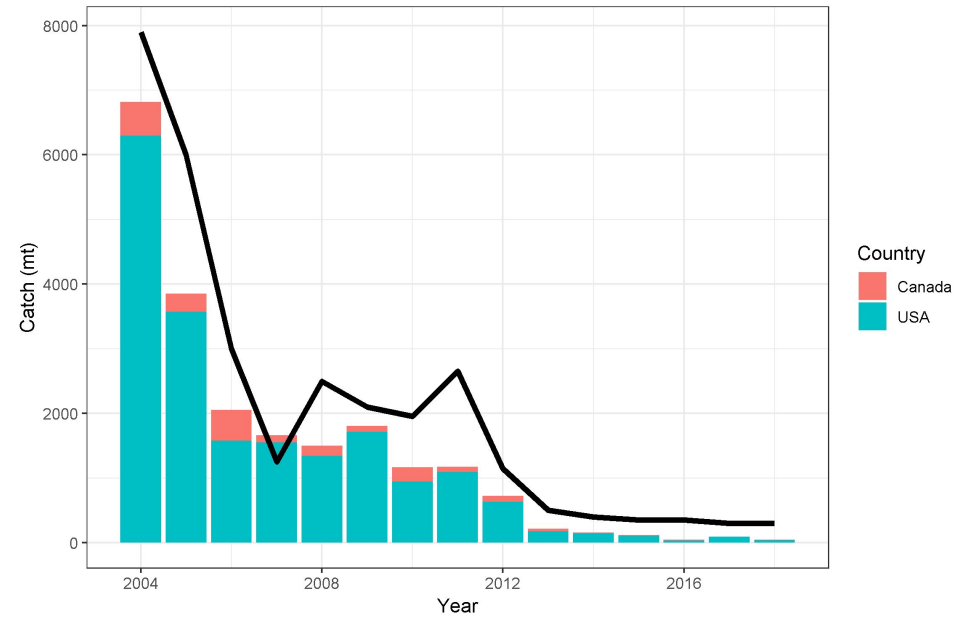
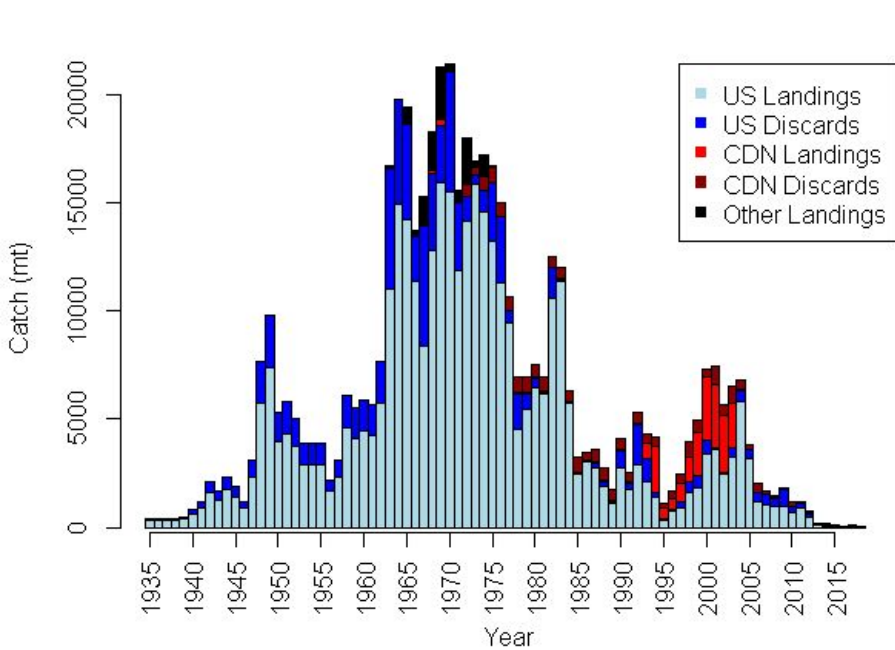
What happened last year?

- TRAC recommended quota of 66 mt
 - All three surveys and 6% exploitation rate
- NEFMC SSC set upper limit of 162 mt
 - Modified empirical approach
 - Dropped spring 2018 survey
 - Used 10% exploitation rate
- TMGC selected quota of 140 mt for 2019

Terms of Reference

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- Describe the rationale for the range of exploitation rates provided by TRAC as catch advice compared to previous guidance.

Catch



| | metric tons | | | | | | |
|--------|-------------|----------|-------|--------|----------|----------|-------|
| | Landings | Discards | Catch | | Landings | Discards | Catch |
| US | 32 | 11 | 42 | US | 70% | 23% | 93% |
| Canada | 0 | 3 | 3 | Canada | 1% | 6% | 7% |
| Sum | 32 | 13 | 45 | Sum | 71% | 29% | 100% |

2018 2nd lowest in 84 years
 15% of 300 mt quota caught

Catch Uncertainties

- Low catches hard to sample
 - 400 lengths and 30 ages for US landings
 - 1,258 lengths / 100 mt
 - No lengths from CDN landings
 - 343 lengths and borrowed ages for US discards
 - Many lengths and borrowed ages for CDN discards
- Catch and weight at age again uncertain this year due to low catches
- No adjustments have been made to US catch of Georges Bank Yellowtail Flounder to account for catch misreporting due to lack of information
- Groundfish PDT found observer effect

Carlos Rafael

- Currently in jail for misreporting catch
- Only clearest examples of misreporting in indictment
- Yellowtail split among 3 stocks for sector accountability measures
 - Many ways to do so
- Total misreported catch of GBYT not currently available
 - Records sealed as part of grand jury proceedings
 - Trip by trip corrections needed in databases

United States v. Carlos Rafael

Summary of Fish Sold in Violation of Reporting Requirements (in pounds)

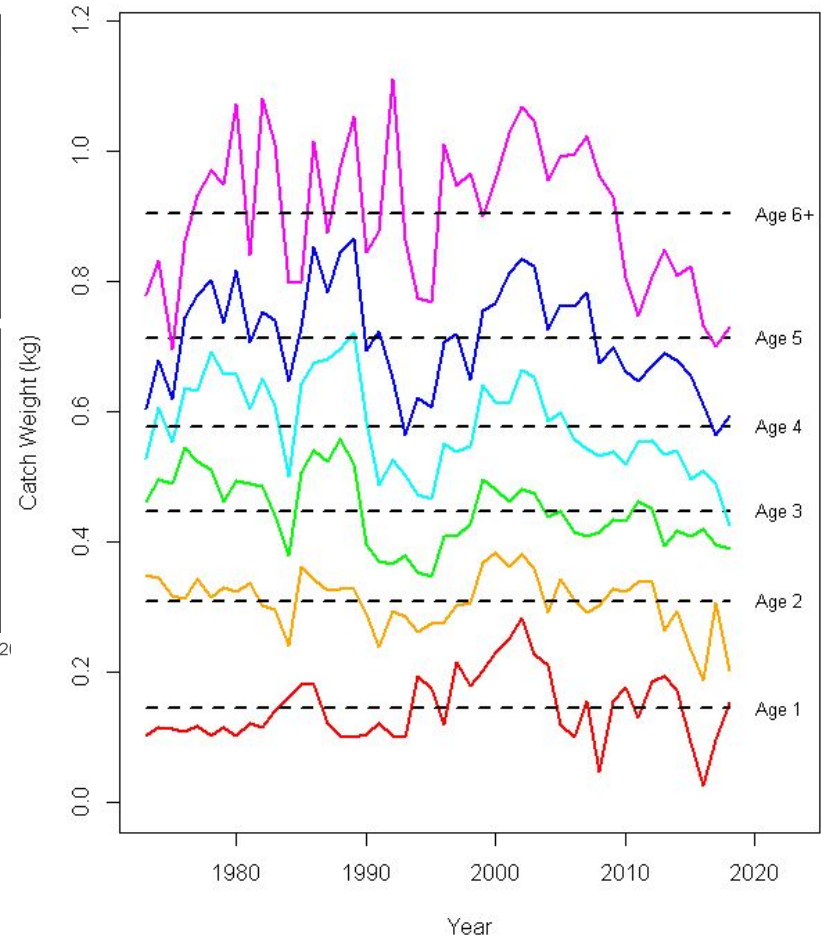
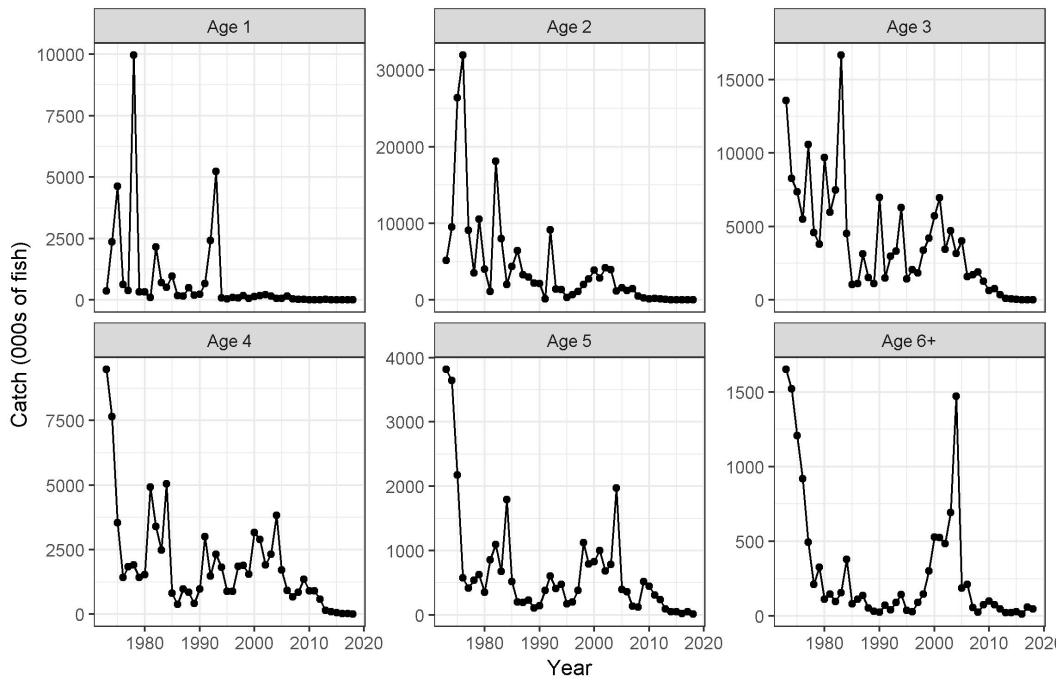
| Species | 2015 | 2014 | 2013 | 2012 | TOTAL |
|-------------|---------|---------|---------|--------|---------|
| COD | 80,731 | | | | 80,731 |
| SEA DABS | 160,785 | | | | 160,785 |
| GREY SOLE | 144,180 | 72,805 | 25,948 | 20,919 | 263,852 |
| YELLOW TAIL | 46,840 | 141,025 | 73,305 | 16,274 | 277,444 |
| TOTAL | 432,536 | 215,007 | 131,076 | 37,193 | 782,812 |

| FY | GBYT (mt) |
|------|-----------|
| 2012 | 9.5 |
| 2013 | 10.3 |
| 2014 | 10.4 |
| 2015 | 1.9 |

Groundfish PDT Observer Analyses

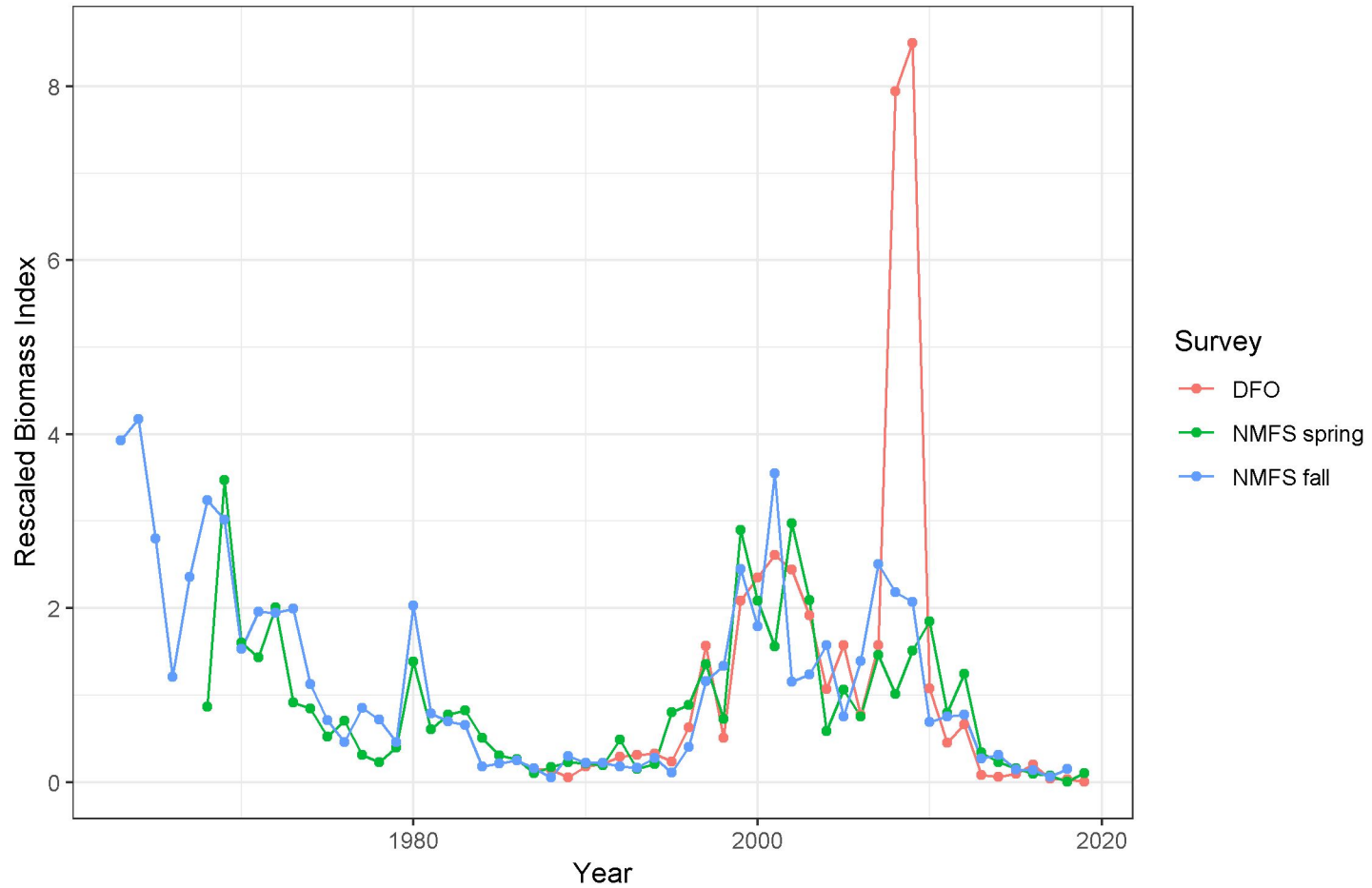
- Four analyses
 - Discard incentives
 - O-U vs U-U comparisons (O=observed, U=unobserved)
 - Modeling discards from observed properties
 - Groundfish landing effort ratio patterns
- Concluded observer effect present
- Could not estimate magnitude of bias
- Sub-panel of SSC reviewed and agreed with findings
- SBRM 3-year review FMAT did not find systematic observer effect across all fleets using different methods

Catch and Weight at Age



Figs 3-4

Surveys



All three surveys track well, with exception of 2008 and 2009
DFO surveys (large tow effects)

Survey Time Series

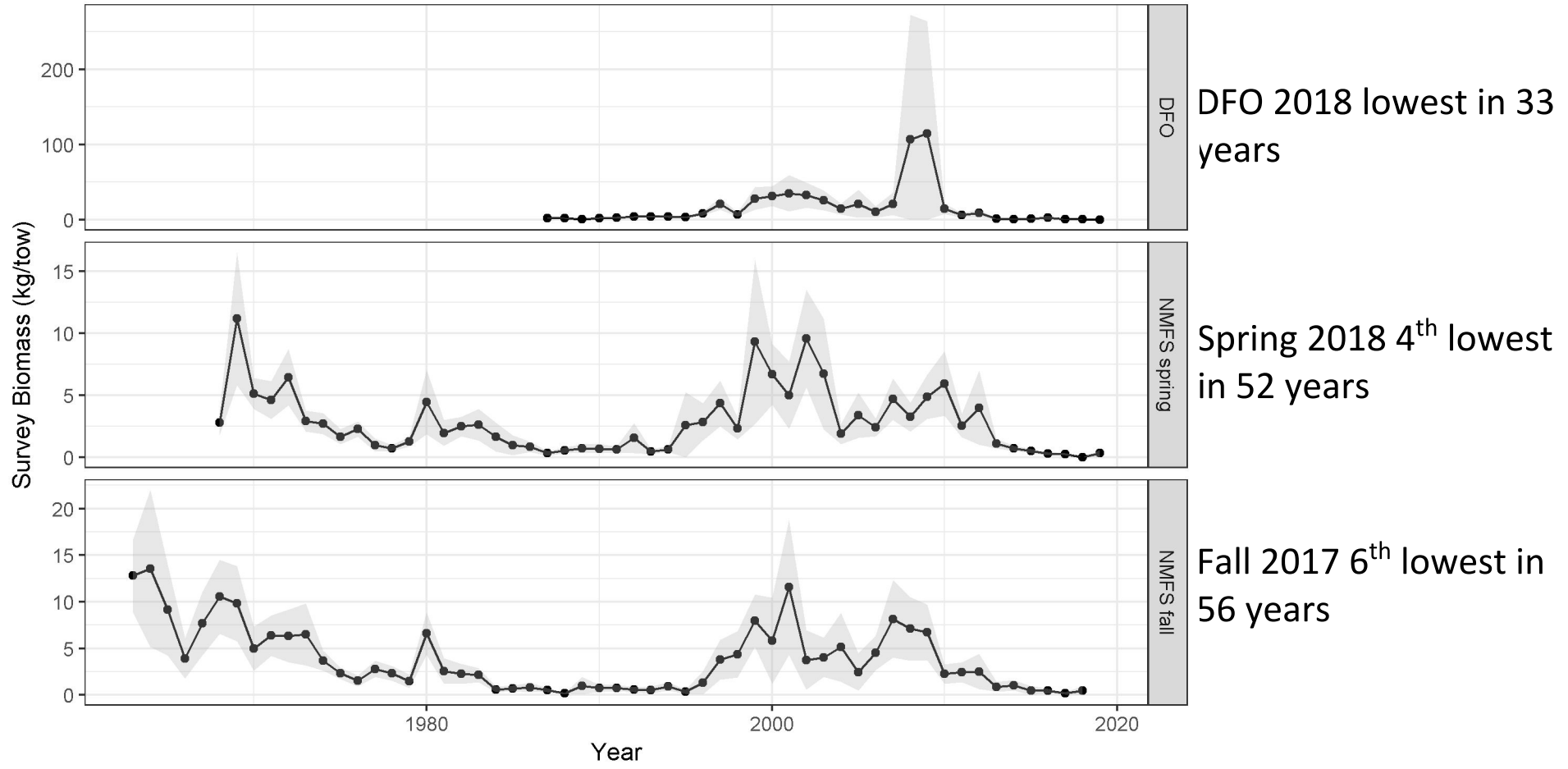


Fig 9

Surveys at Age

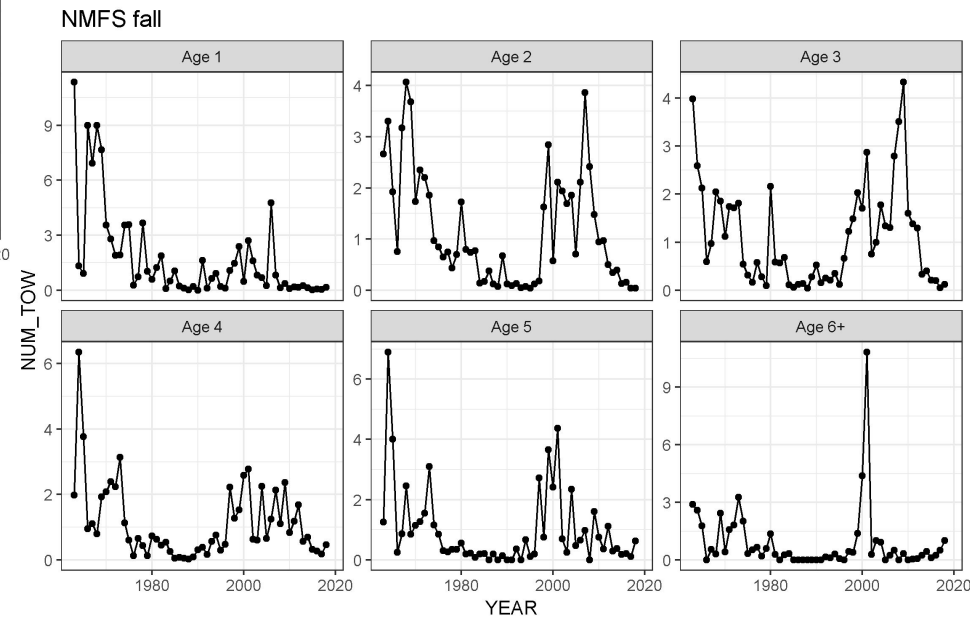
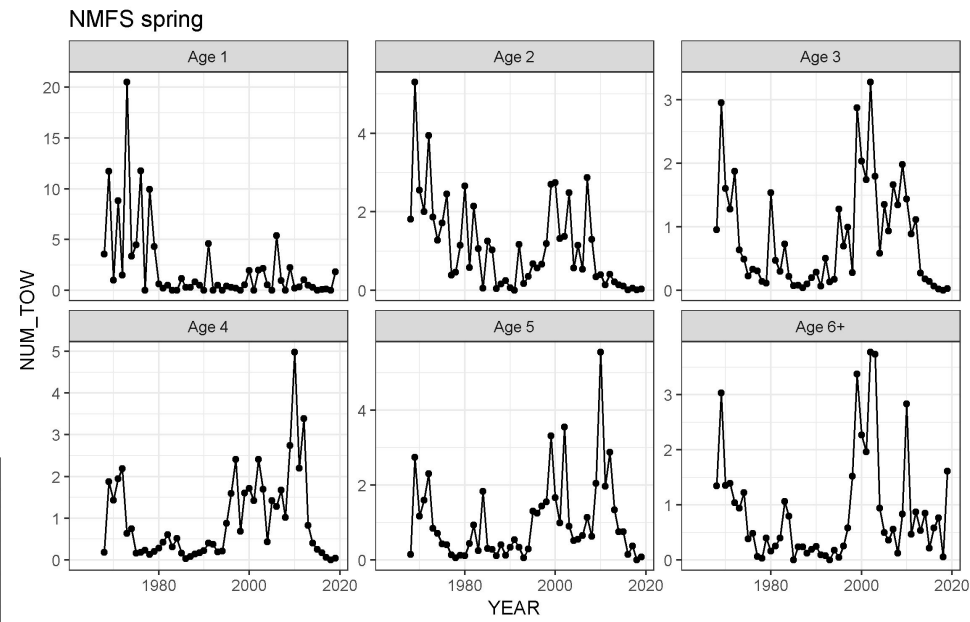
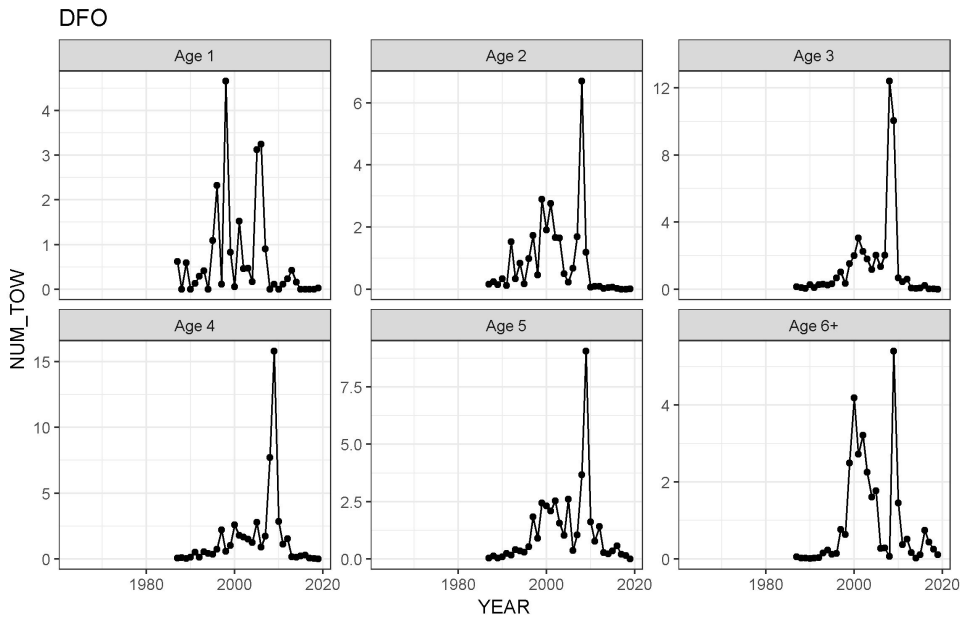


Fig 13a-c

Surveys Spatially

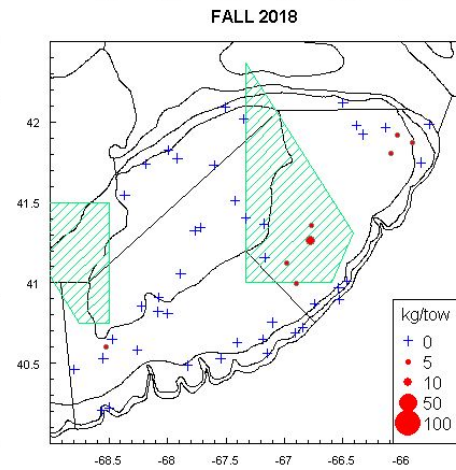
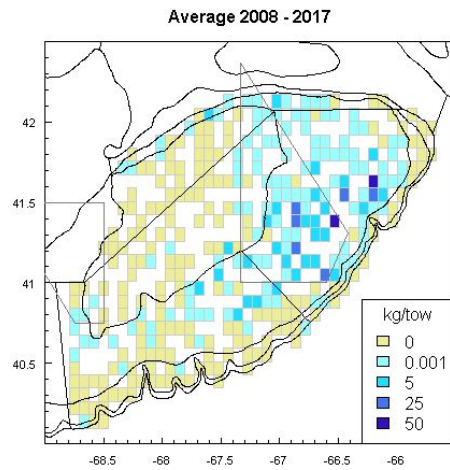
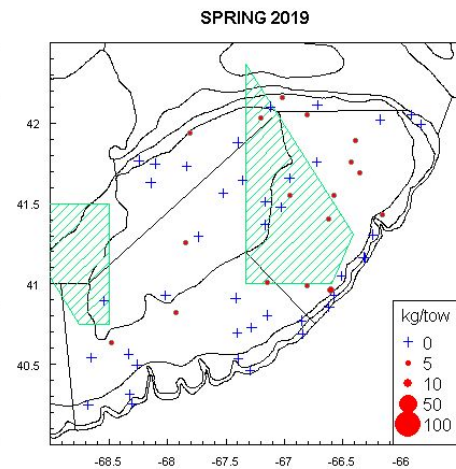
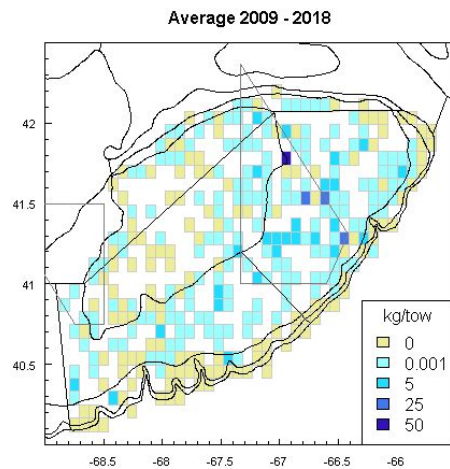
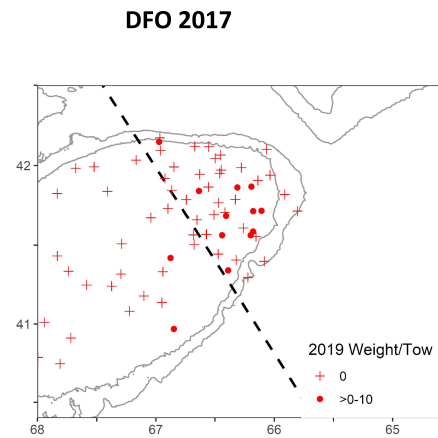
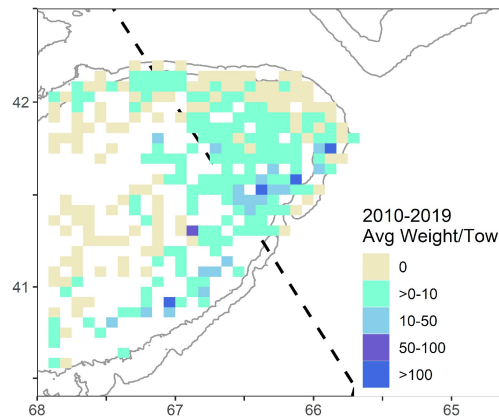


Fig 11a-b

Survey Uncertainties

- Low catch in all three surveys indicates low population abundance
- CVs of survey biomass in Table 9a-c, Fig 10
- Survey catch at age as a measure of population at age more uncertain due to few fish caught
- Low catch makes interpretation of spatial distribution more difficult

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2020 Catch Advice

| Year | Biomass (mt) Wings | | | | Exploitation rate | |
|------|--------------------|--------|---------------|---------|-------------------|------|
| | DFO | Spring | Fall (year-1) | Average | 0.02 | 0.06 |
| 2010 | 29452 | 68752 | 83490 | 60565 | 1211 | 3634 |
| 2011 | 12344 | 29621 | 27821 | 23262 | 465 | 1396 |
| 2012 | 18113 | 46209 | 30354 | 31559 | 631 | 1894 |
| 2013 | 2249 | 12766 | 31199 | 15404 | 308 | 924 |
| 2014 | 1654 | 8564 | 10828 | 7015 | 140 | 421 |
| 2015 | 2650 | 5861 | 12682 | 7064 | 141 | 424 |
| 2016 | 5569 | 3610 | 5811 | 4997 | 100 | 300 |
| 2017 | 1104 | 2819 | 5432 | 3118 | 62 | 187 |
| 2018 | 812 | 143 | 2424 | 1126 | 23 | 68 |
| 2019 | 182 | 3735 | 6047 | 3322 | 66 | 199 |

| Assmt Year | Quota Year | Quota (mt) | Catch (mt) | Quota/Avg | Catch/Avg | Model Type |
|------------|------------|------------|------------|-----------|-----------|------------|
| 2009 | 2010 | 1956 | 1170 | 3% | 2% | VPA |
| 2010 | 2011 | 2650 | 1171 | 11% | 5% | VPA |
| 2011 | 2012 | 1150 | 725 | 4% | 2% | VPA |
| 2012 | 2013 | 500 | 218 | 3% | 1% | VPA |
| 2013 | 2014 | 400 | 159 | 6% | 2% | VPA |
| 2014 | 2015 | 354 | 118 | 5% | 2% | Empirical |
| 2015 | 2016 | 354 | 44 | 7% | 1% | Empirical |
| 2016 | 2017 | 300 | 95 | 10% | 3% | Empirical |
| 2017 | 2018 | 300 | 45 | 27% | 4% | Empirical |
| 2018 | 2019 | 140 | | 4% | | Empirical |
| | mean | 810 | 416 | 8% | 3% | |

2020 Catch Advice

| Exploitation Rate | Catch Advice (mt) |
|-------------------|-------------------|
| 2% | 66 |
| 4% | 133 |
| 6% | 199 |
| 8% | 266 |
| 10% | 332 |
| 12% | 399 |
| 14% | 465 |
| 16% | 531 |

Catch of 140 mt in 2020 has an exploitation rate of 4%

Catch Advice Uncertainty

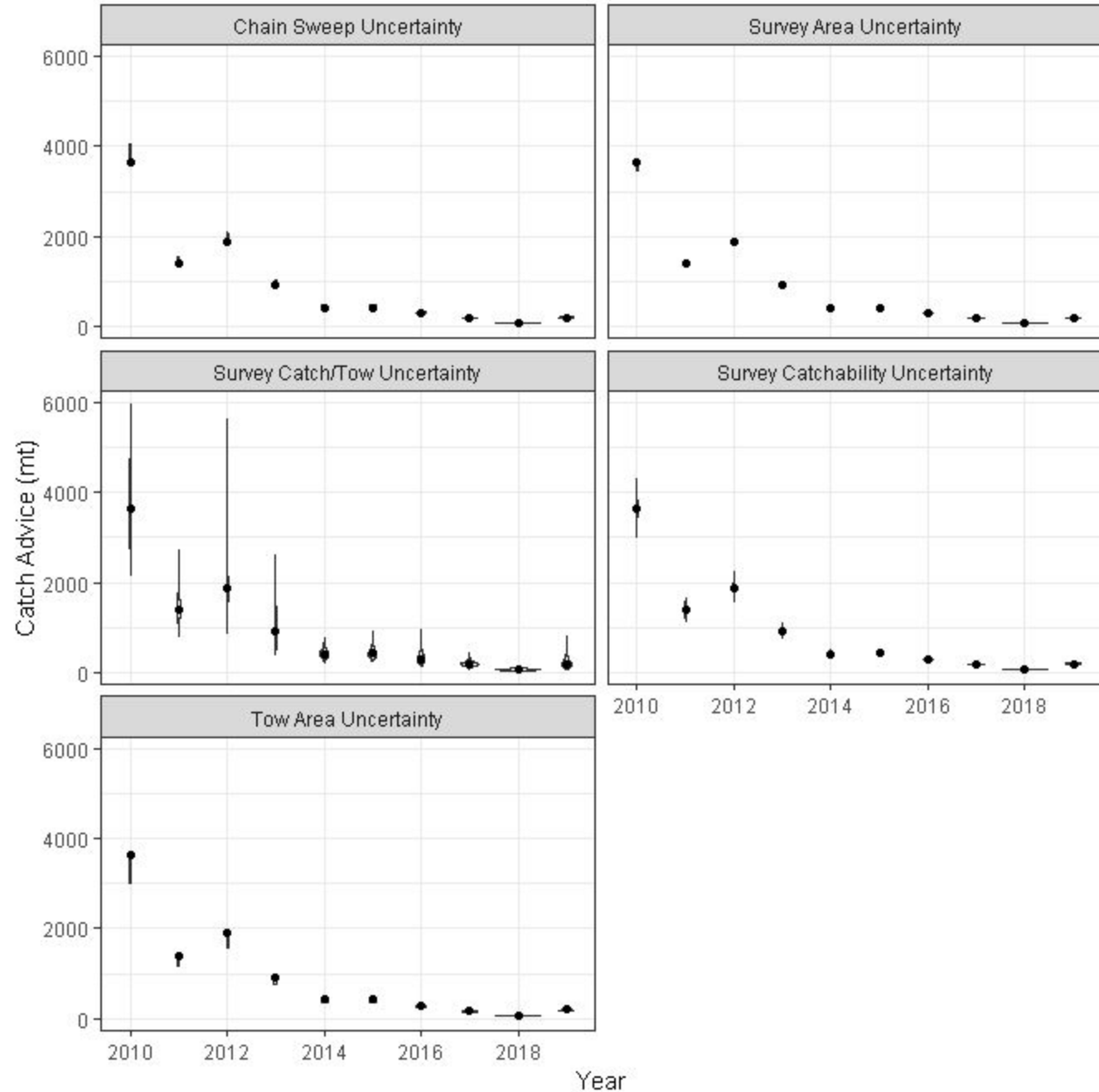


Fig 19

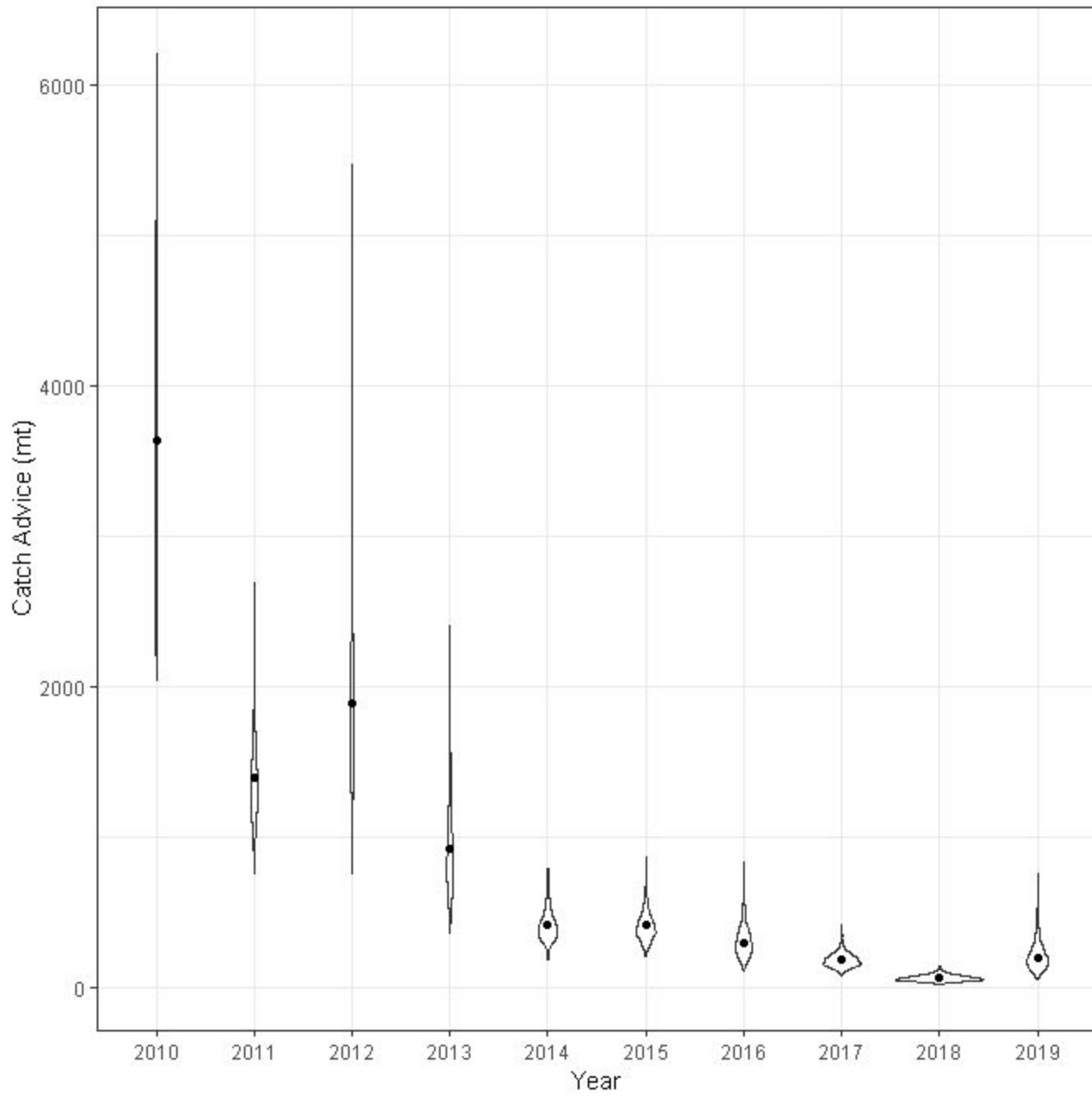


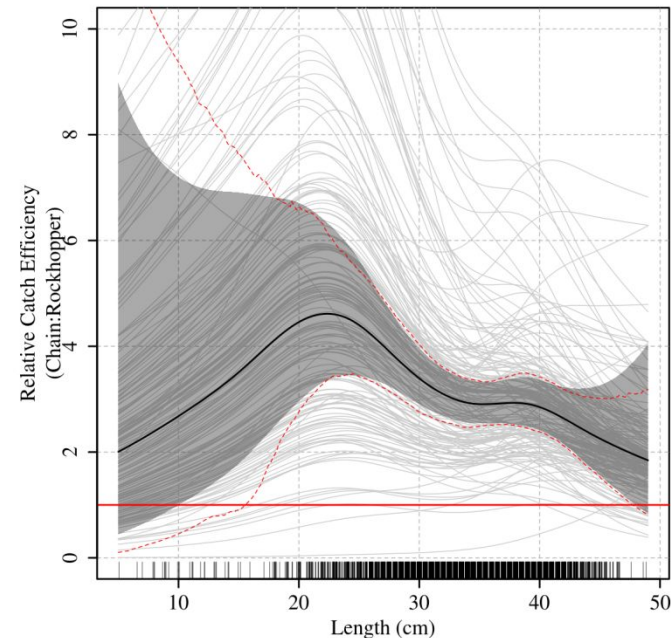
Fig 20

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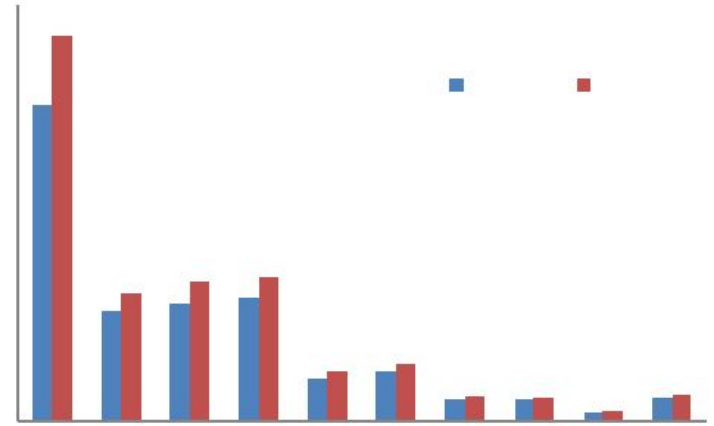
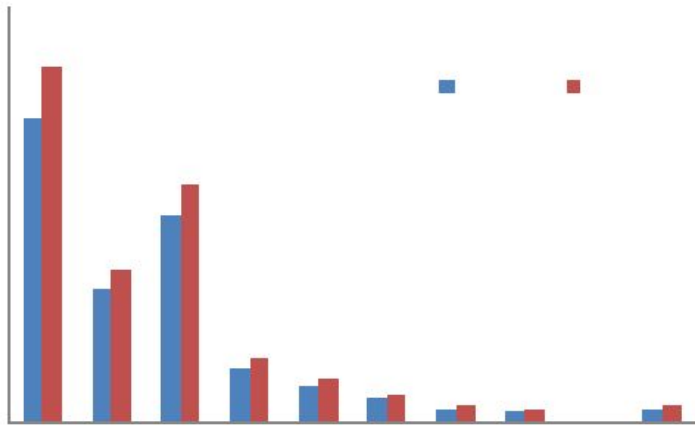
None

- FYI Tim Miller recently updated twin-trawl experiment to include more data
- Preliminary results show slightly higher q than current TRAC value of 0.31, meaning slightly lower biomass estimates
- Not applied to DFO survey



Preliminary Results

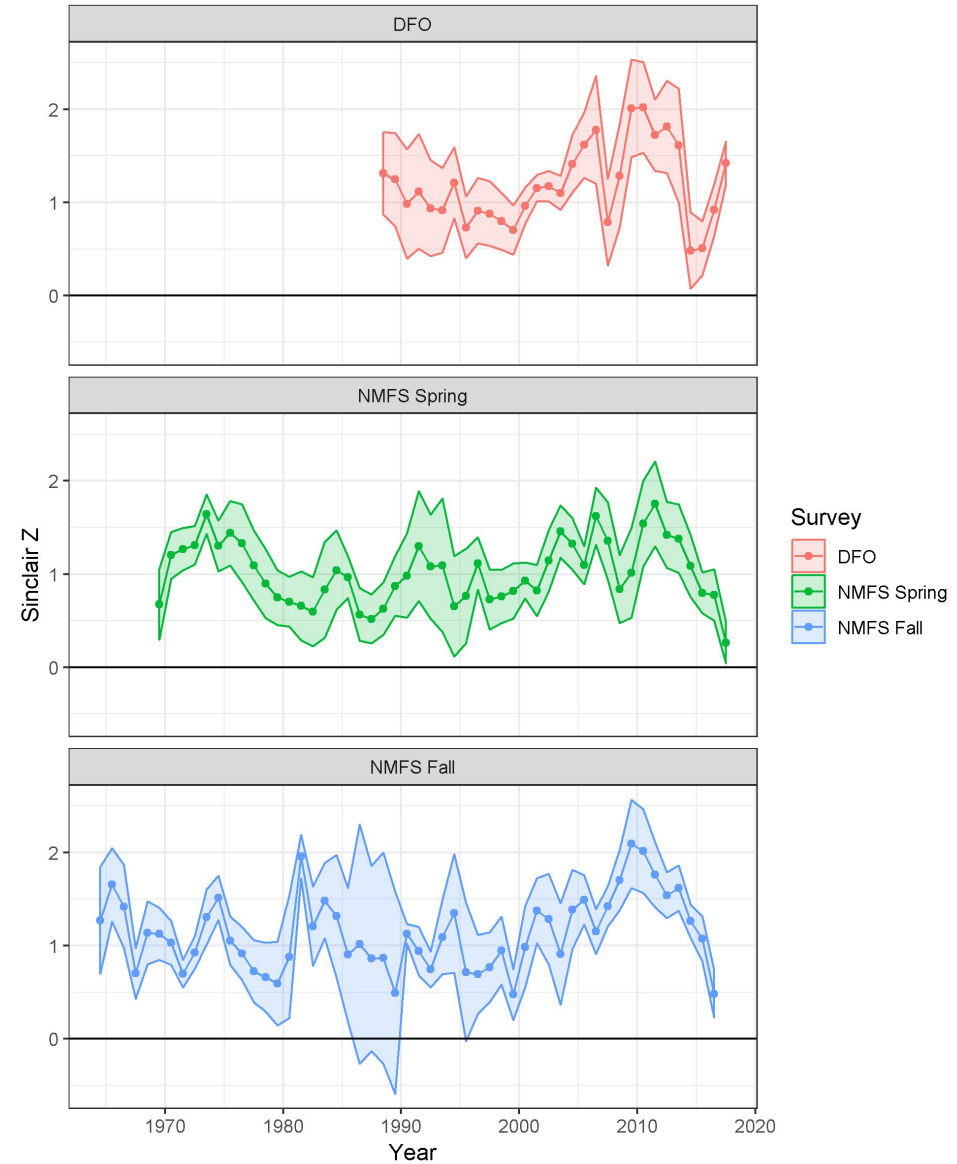
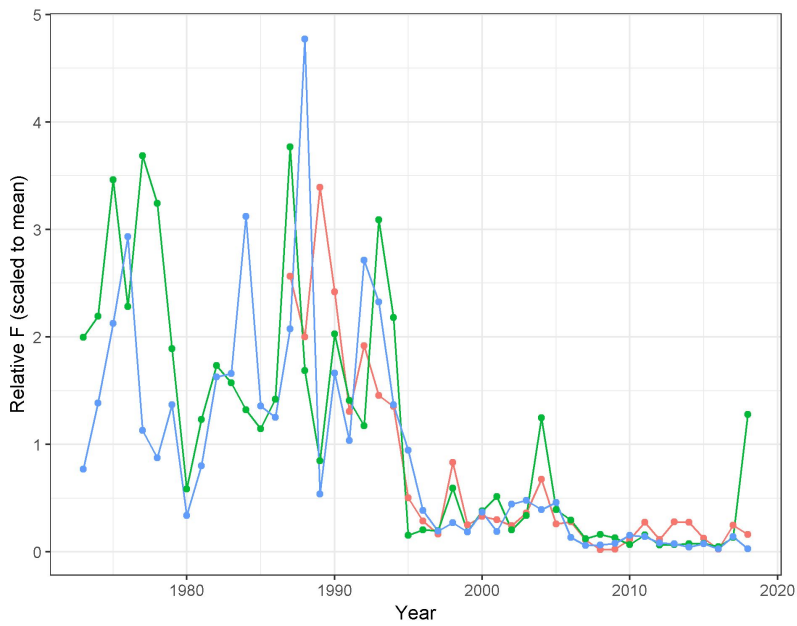
| Year | Spring Survey | | Fall | | Miller implied q | |
|------|---------------|-------|--------|-------|------------------|------|
| | Miller | TRAC | Miller | TRAC | spring | fall |
| 2010 | 58853 | 68752 | 68523 | 83490 | 0.34 | 0.35 |
| 2011 | 25909 | 29621 | 23814 | 27821 | 0.34 | 0.34 |
| 2012 | 40167 | 46209 | 25563 | 30354 | 0.34 | 0.34 |
| 2013 | 10910 | 12766 | 26648 | 31199 | 0.34 | 0.35 |
| 2014 | 7169 | 8564 | 9416 | 10828 | 0.35 | 0.34 |
| 2015 | 5022 | 5861 | 10858 | 12682 | 0.34 | 0.35 |
| 2016 | 3004 | 3610 | 4926 | 5811 | 0.36 | 0.35 |
| 2017 | 2334 | 2819 | 4816 | 5432 | 0.35 | 0.34 |
| 2018 | 129 | 143 | 2009 | 2424 | 0.32 | 0.35 |
| 2019 | 2972 | 3735 | 5239 | 6047 | 0.37 | 0.34 |



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Relative F and Survey Z



Figs 17-18

Comments

- Survey Z estimates hindered by zeros and low catches recently

| Year | age 3 | age 4 | age 5 | age 6 | age 7 | age 8 |
|------|---------------|-------|-------|-------|-------|-------|
| | DFO | | | | | |
| 2016 | 3.151 | 2.104 | 1.257 | 0.452 | 0.171 | 0.034 |
| 2017 | 0.185 | 0.435 | 0.437 | 0.195 | 0.159 | 0.034 |
| 2018 | 0.263 | 0.194 | 0.315 | 0.137 | 0.067 | 0.019 |
| 2019 | 0.029 | 0.045 | 0.005 | 0.055 | 0.037 | 0.000 |
| | Spring | | | | | |
| 2016 | 0.233 | 0.283 | 0.072 | 0.121 | 0.013 | 0.000 |
| 2017 | 0.070 | 0.109 | 0.180 | 0.098 | 0.057 | 0.022 |
| 2018 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.013 |
| 2019 | 0.086 | 0.060 | 0.038 | 0.132 | 0.153 | 0.051 |
| | Fall | | | | | |
| 2015 | 0.589 | 0.303 | 0.069 | 0.020 | 0.000 | 0.000 |
| 2016 | 0.553 | 0.258 | 0.085 | 0.034 | 0.010 | 0.000 |
| 2017 | 0.142 | 0.172 | 0.042 | 0.055 | 0.041 | 0.000 |
| 2018 | 0.344 | 0.438 | 0.247 | 0.116 | 0.032 | 0.030 |

< 0.1 shaded

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2017 Rationale (TSR)

“The TRAC external reviewers and science members recommend low exploitation to allow for the possibility of rebuilding. The average exploitation rate associated with the quota during the past eight years has been 6% (Table 3). The TRAC external reviewers and science members feel this is an appropriate upper bound for the exploitation rate given the declines continuing in the surveys so recommend using a range of 2% to 6% for setting the 2018 catch advice, resulting in 62 mt to 187 mt (Table 2).”

2018 Rationale (TSR)

“The TRAC recommend an upper bound for the exploitation rate of 6% for catch advice, which results in 68 mt for 2019.”

“The 2017 TSR noted the reason for changing the exploitation rate range last year from 2%-16% to 2%-6% was the change from door spread to wing spread and from survey catchability of 0.37 to 0.31. There were no changes to the empirical approach this year compared to last year other than adding the three new survey values. Thus, there was no change in the empirical approach requiring a change in the exploitation rate this year.”

This Year's Rationale

- To be determined
- No reason to change from last year's rationale

Questions?

Back pocket slides

Survey Strata

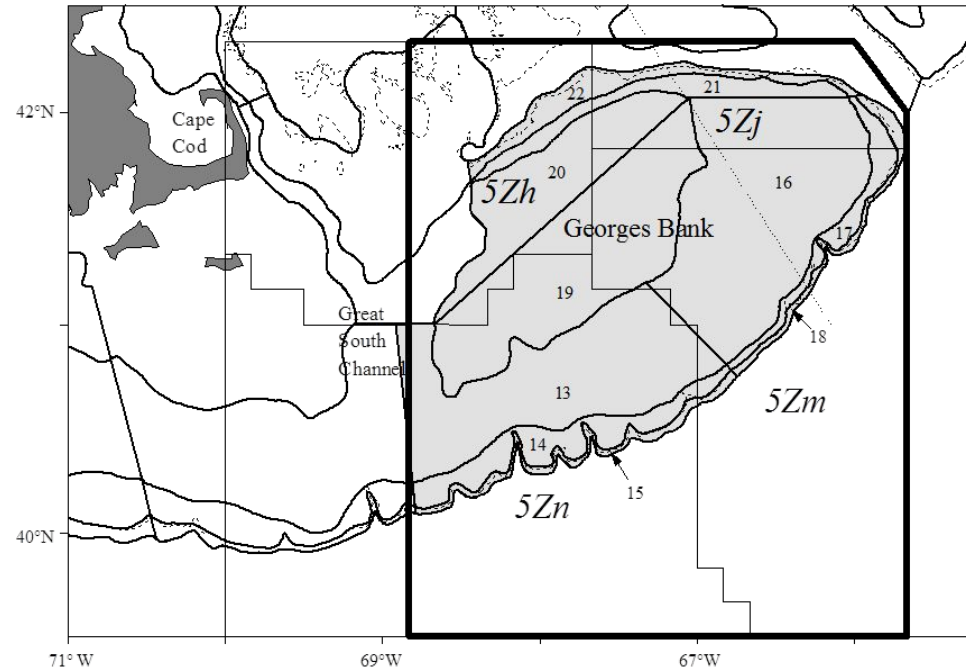


Fig 5

Convert kg/tow to B (mt)

| Year | DFO | Spring | Fall (year-1) |
|------|--------|--------|------------------|
| 2010 | 14.532 | 13.339 | 16.198 |
| 2011 | 6.091 | 5.747 | 5.398 |
| 2012 | 8.937 | 8.965 | 5.889 |
| 2013 | 1.109 | 2.477 | 6.053 |
| 2014 | 0.816 | 1.662 | 2.101 |
| 2015 | 1.308 | 1.137 | 2.460 |
| 2016 | 2.748 | 0.700 | 1.127 |
| 2017 | 0.545 | 0.547 | 1.054 |
| 2018 | 0.401 | 0.028 | 0.470 |
| 2019 | 0.090 | 0.725 | 1.173 |

| | DFO | Spring | Fall | Units |
|--|---------|----------|----------|-------------------|
| Total Area in Survey = | 25453 | 37286 | 37286 | square kilometers |
| Wing Width = | 12.5 | 12.6 | 12.6 | Meters |
| Length of Tow = | 3.241 | 1.852 | 1.852 | Kilometers |
| Area Swept by Tow (Wing) = | 0.0405 | 0.0233 | 0.0233 | square kilometers |
| Expansion Factor to Min Swept Area Biomass in mt (Wing) = | 628.275 | 1597.844 | 1597.844 | None |

$$B(\text{mt}) = \text{kg/tow} * \text{Expansion factor} / q$$

$$q = 0.31$$

Survey Timing

DFO strata 5Z1-5Z4, NMFS strata 13-21
DFO 2019, Spring 2019, and Fall 2018 shown as thick black lines

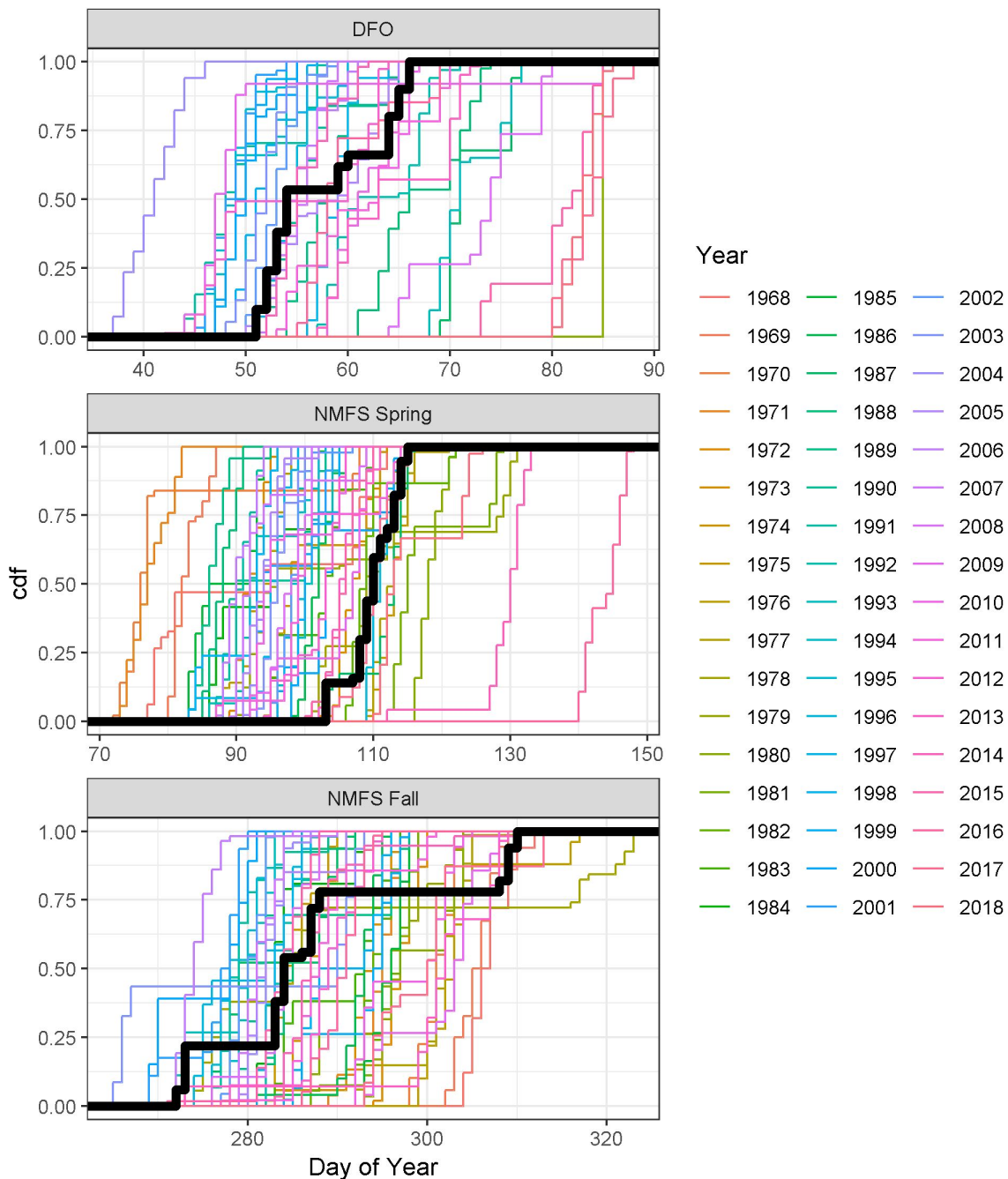


Fig 6

Valid Survey Tows

| Year | DFO | NMFS Spring | NMFS Fall |
|------|-----|-------------|-----------|
| 2009 | 50 | 48 | 49 |
| 2010 | 57 | 53 | 53 |
| 2011 | 74 | 53 | 49 |
| 2012 | 75 | 54 | 54 |
| 2013 | 63 | 60 | 56 |
| 2014 | 52 | 47 | 57 |
| 2015 | 47 | 56 | 58 |
| 2016 | 61 | 56 | 58 |
| 2017 | 50 | 57 | 47 |
| 2018 | 58 | 39 | 50 |
| 2019 | 71 | 57 | - |

Positive and Total Tows by Stratum

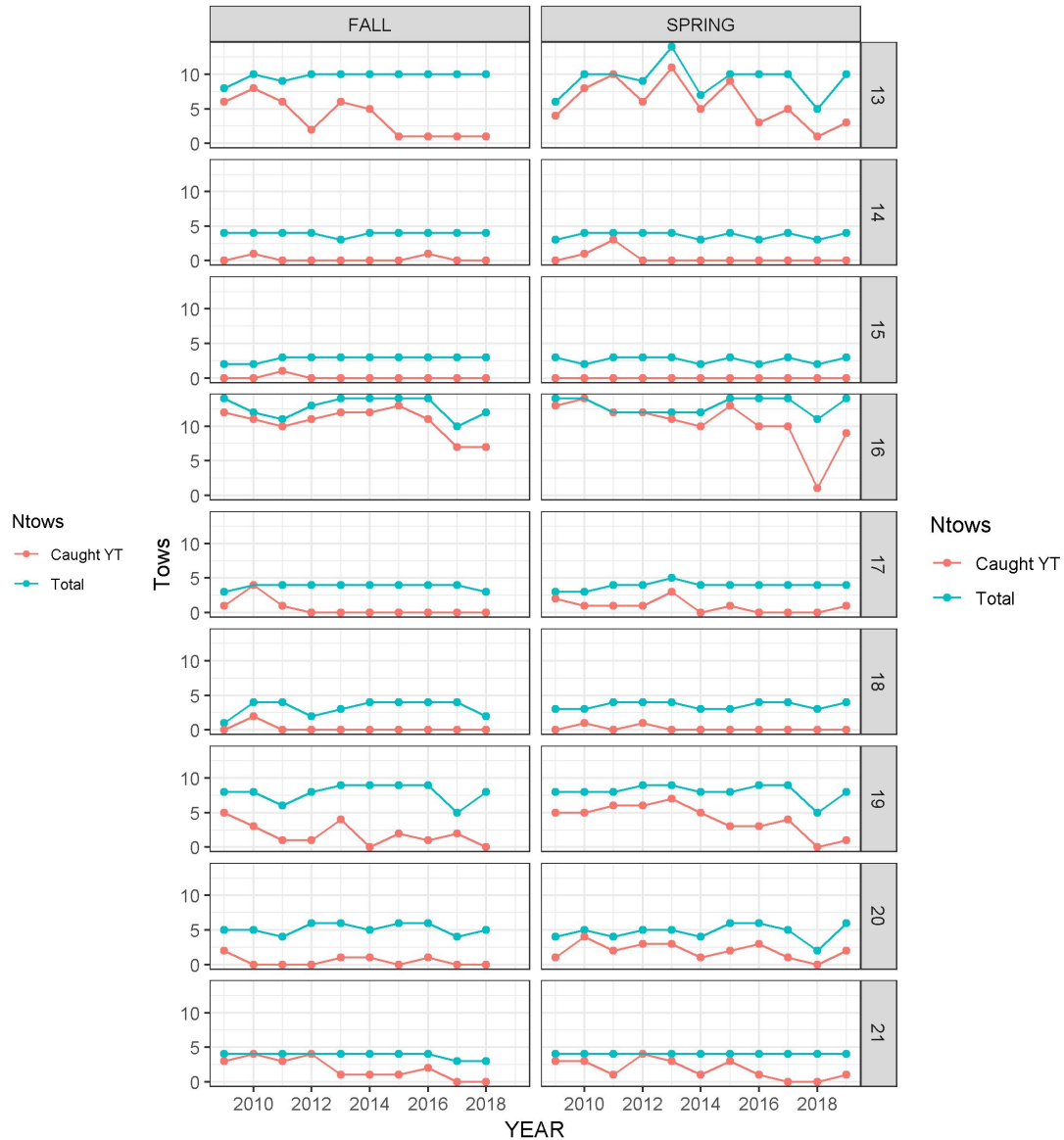
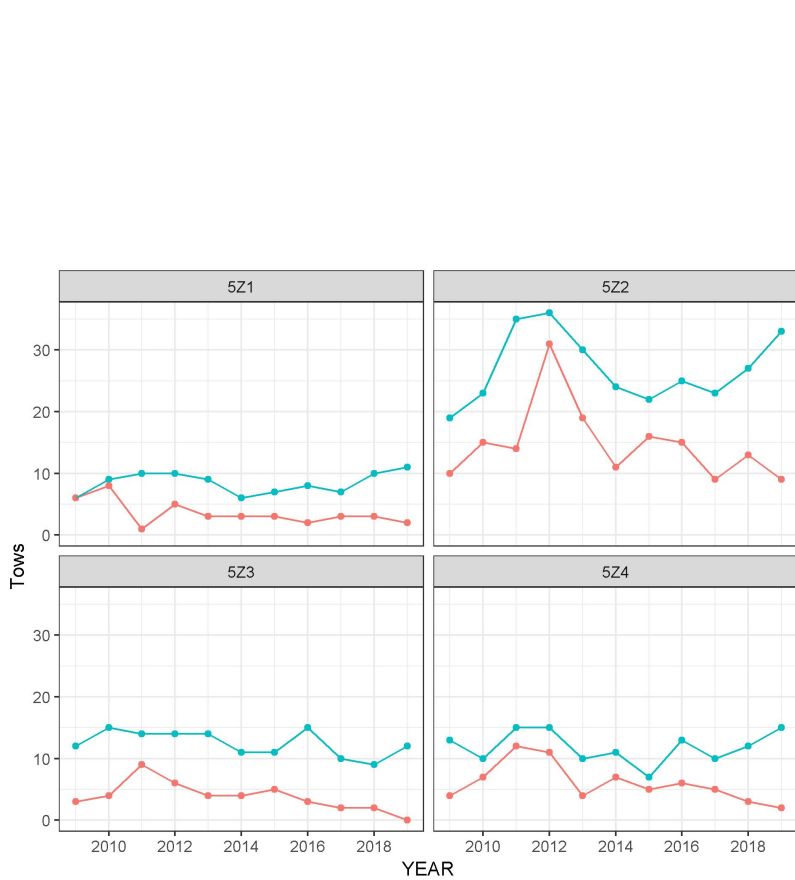


Fig 7a-b

Survey CV

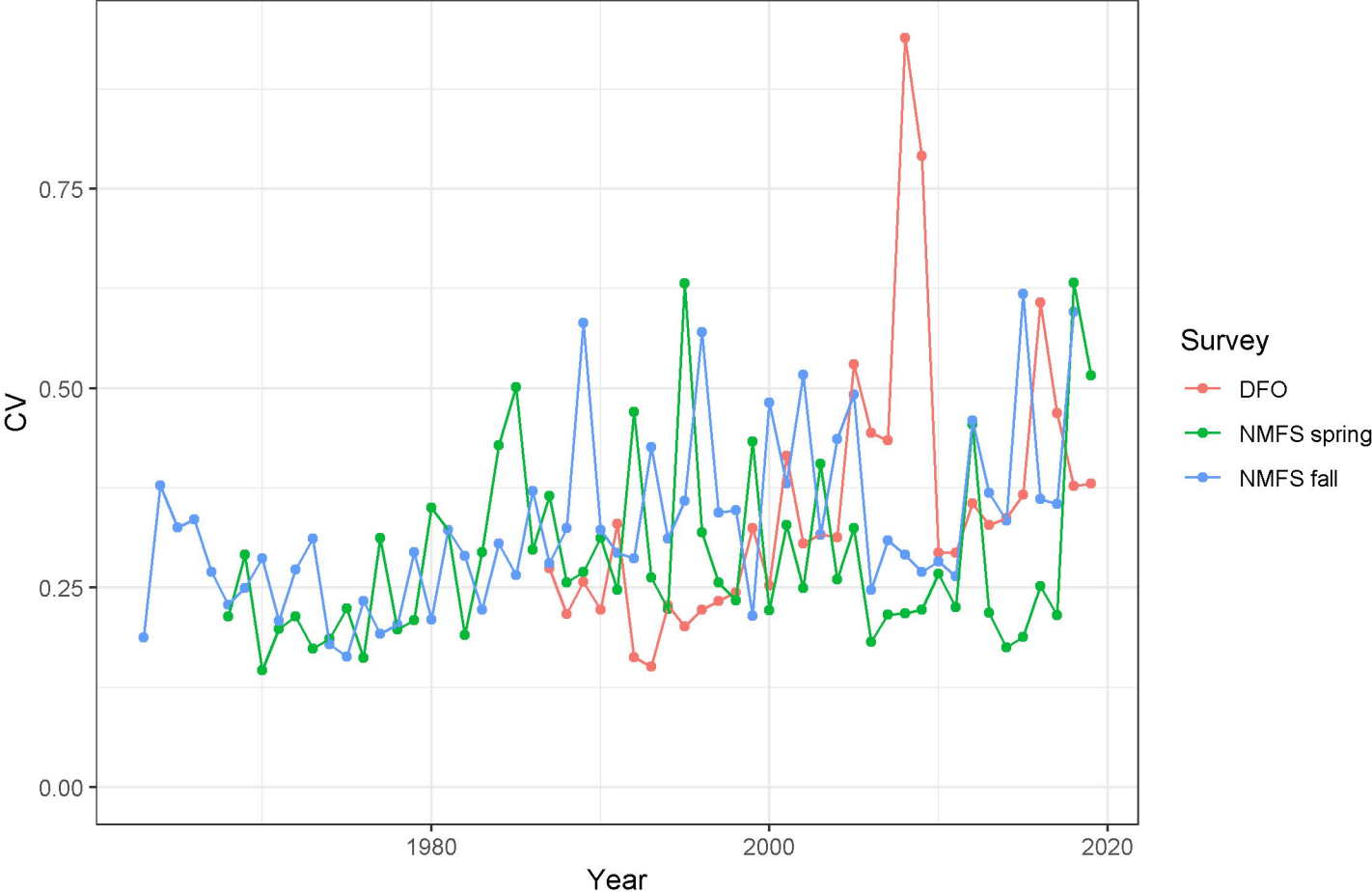


Fig 10

Surveys by Stratum

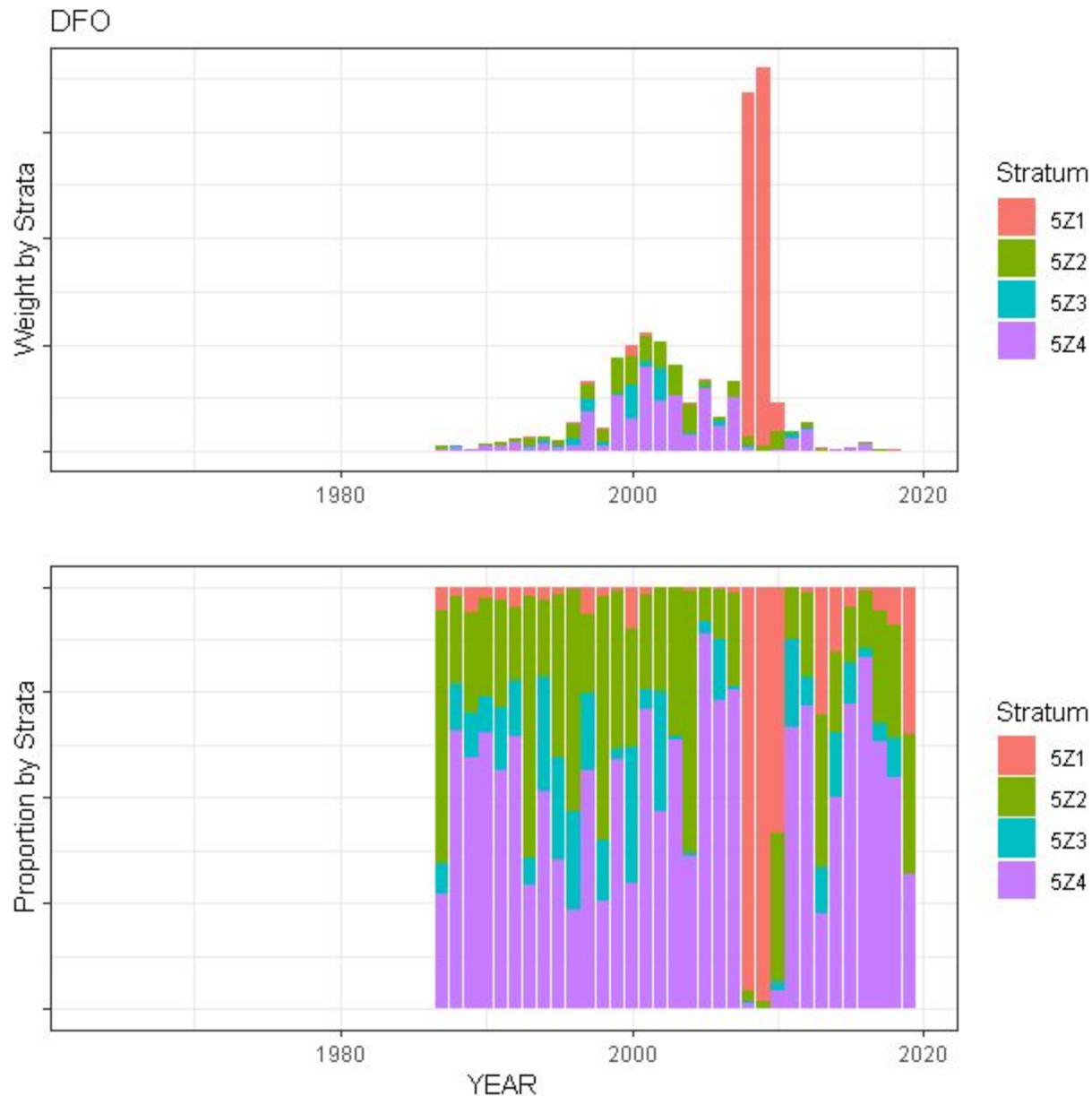


Fig 12a

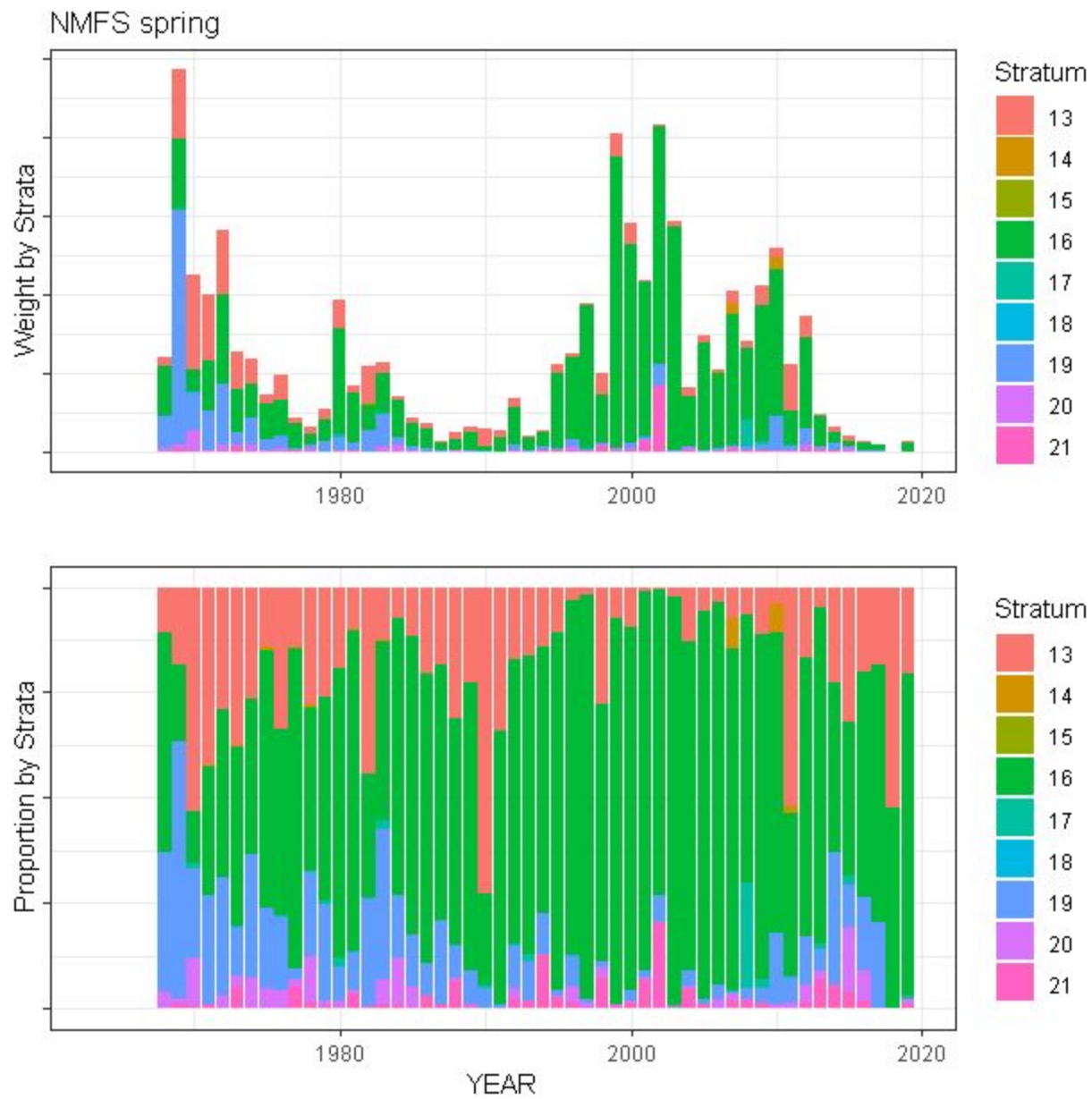


Fig 12b

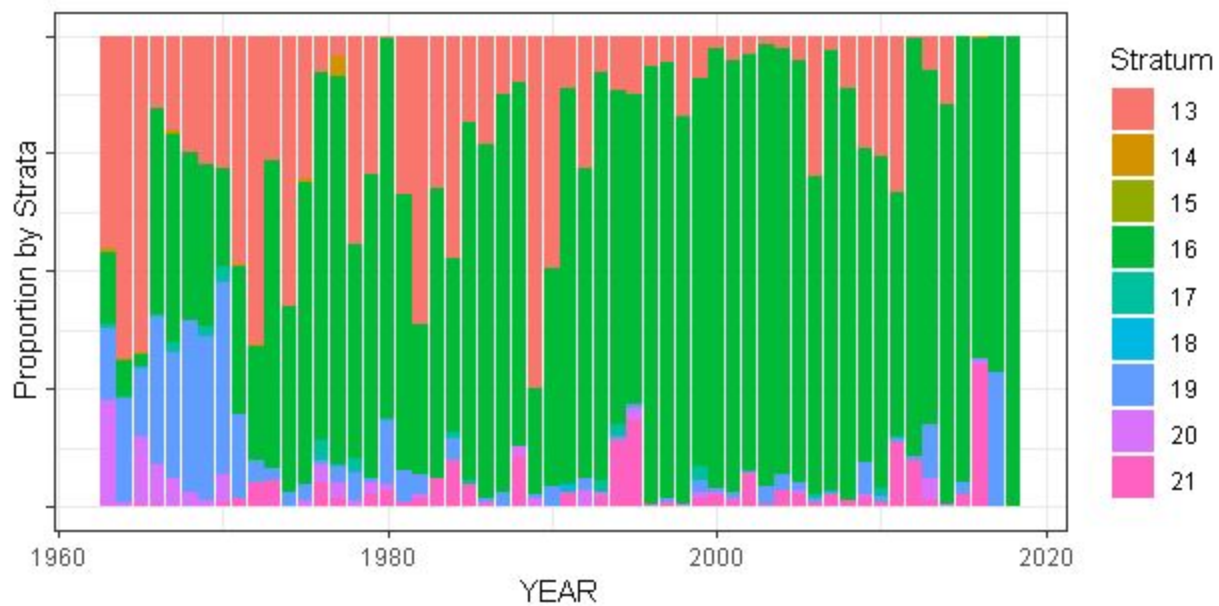
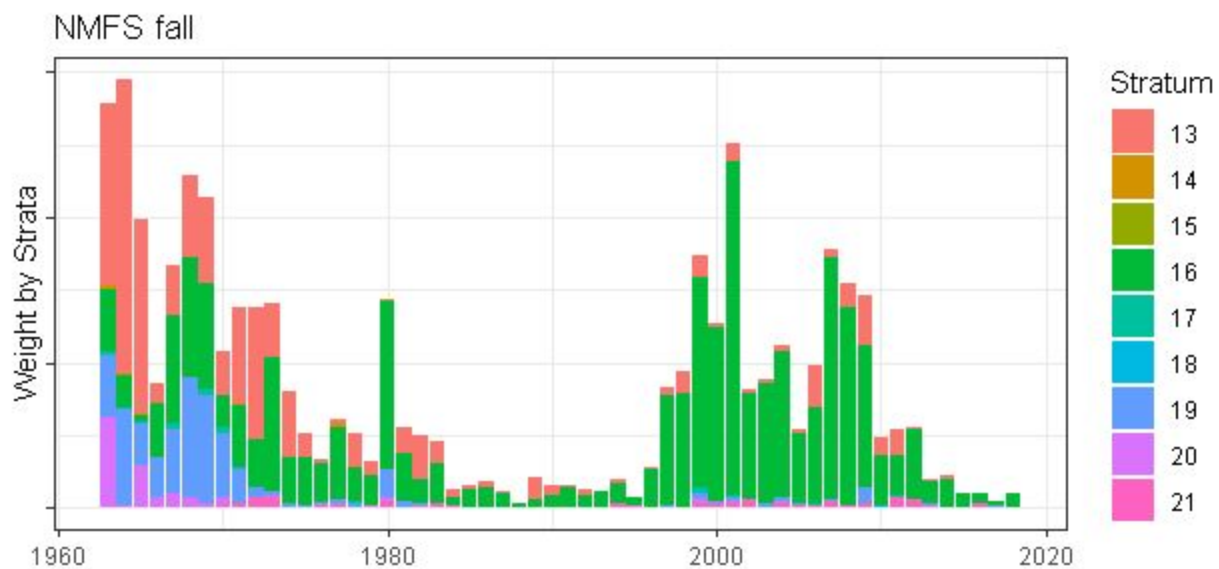


Fig 12c

Rescaled Surveys at Age

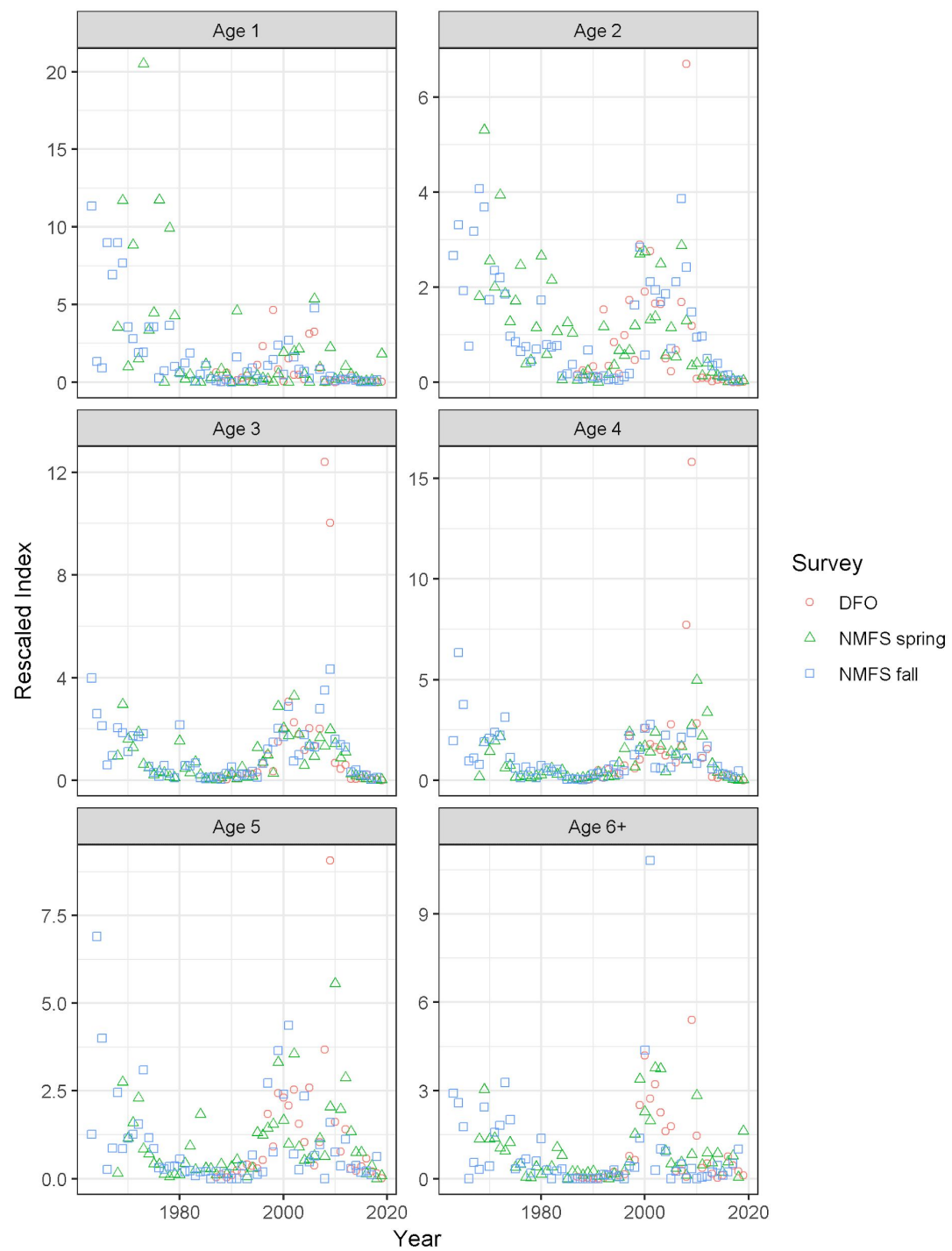
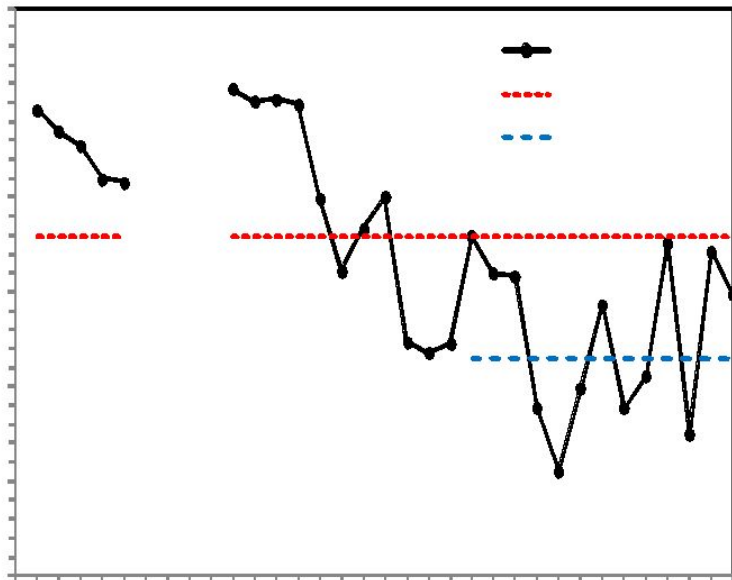
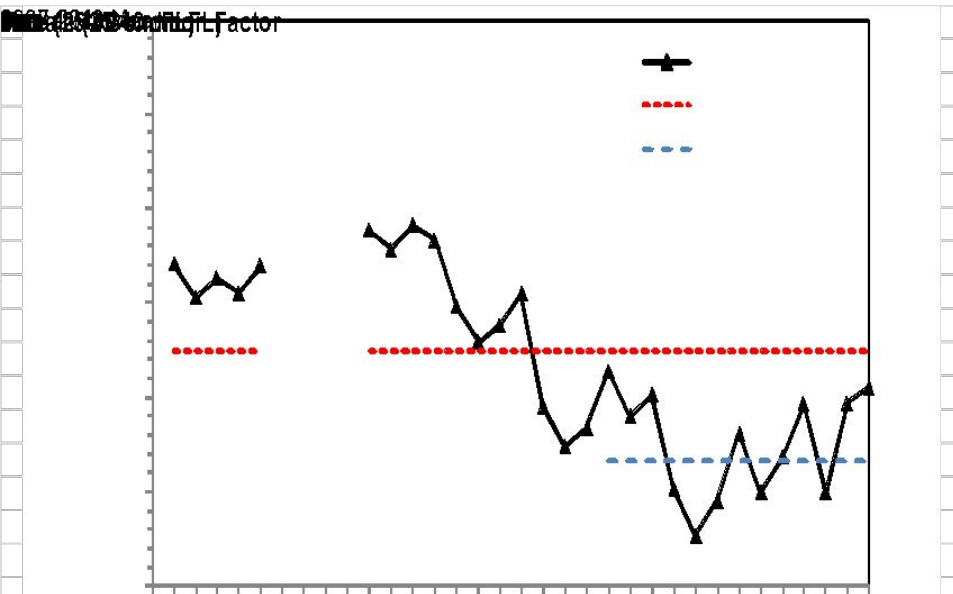


Fig 15



Condition Factor

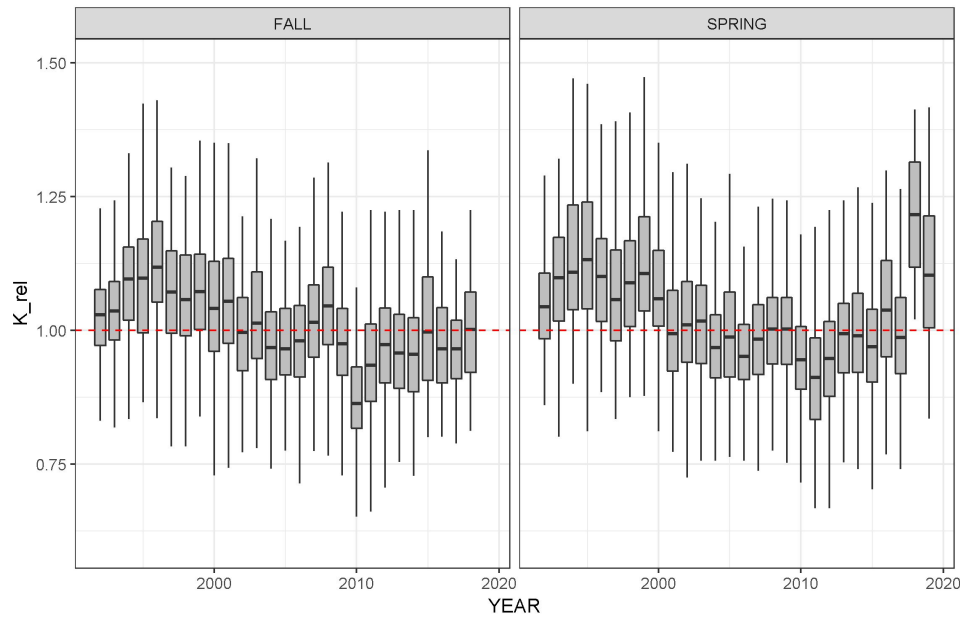
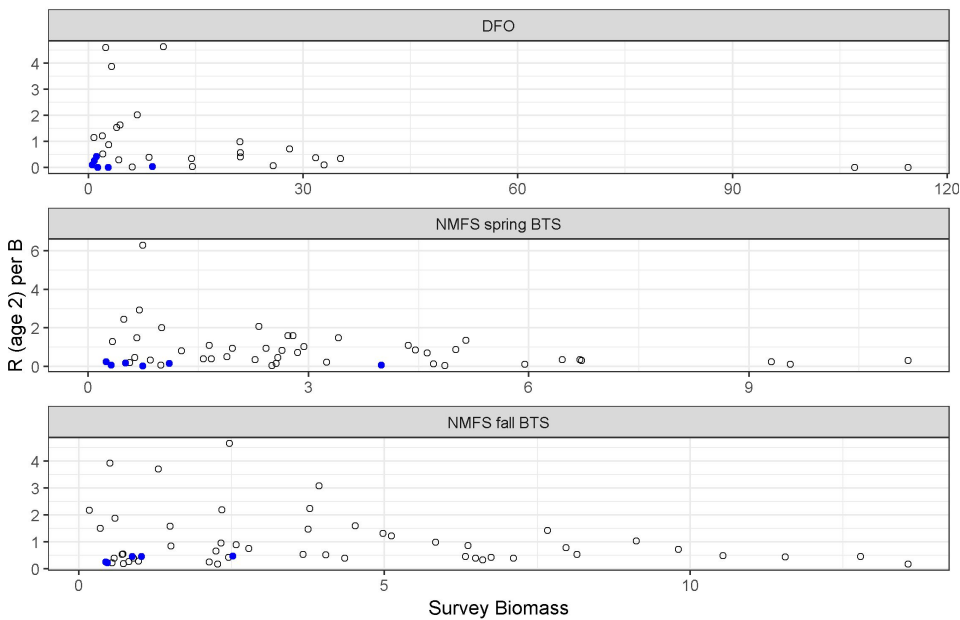
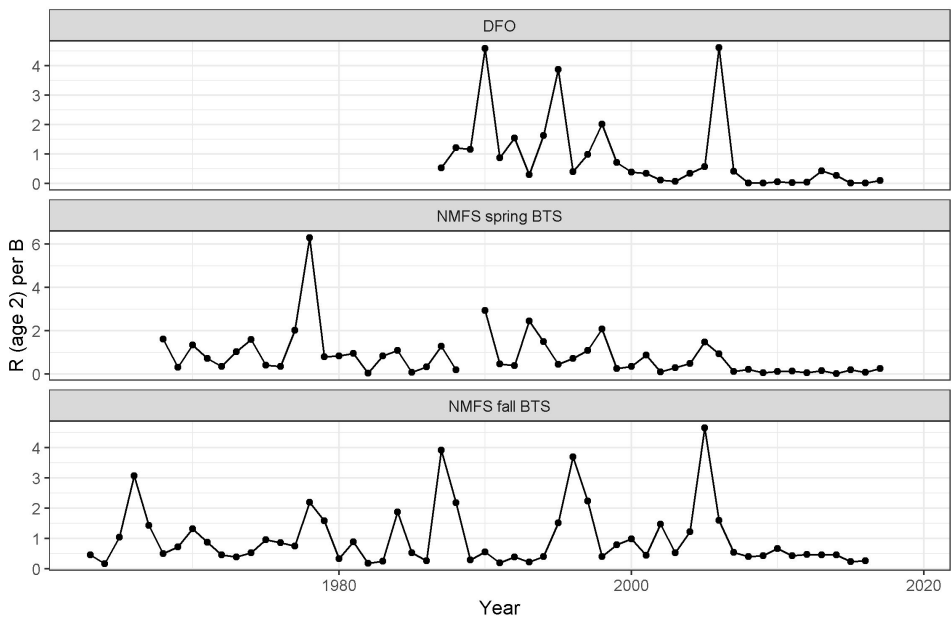
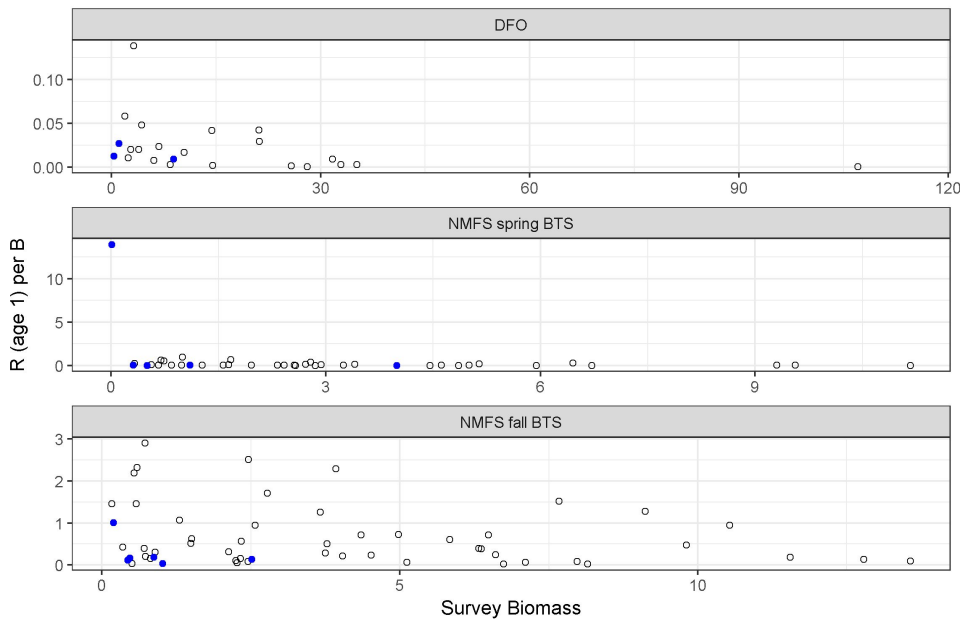
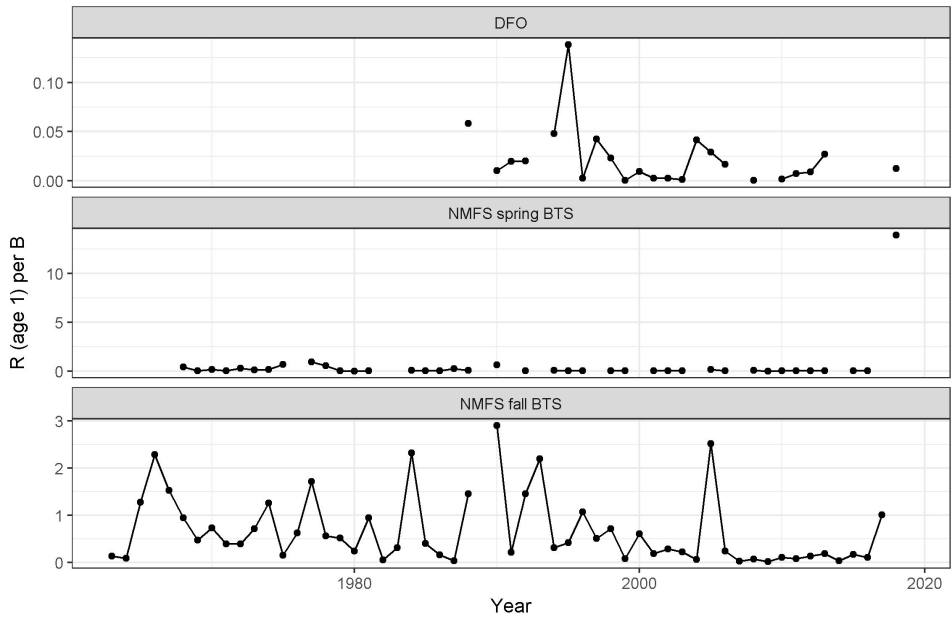


Fig 16a-b

R per B



Appendix

| TRAC | Catch Year | TRAC Analysis/Recommendation | | TMGC Decision | | Actual Catch ⁽¹⁾ Compared to Risk Analysis | Actual Result ⁽²⁾ |
|------|------------|---|---|---------------|---|---|--|
| | | Amount | Rationale | Amount | Rationale | | |
| 2014 | 2015 | (1) 45-354 <u>mt</u> (2) 400 <u>mt</u> | (1) constant exploitation rate 2%-16% (2) constant quota | 354 <u>mt</u> | One year quota at 16% exploitation rate, reduction from 2014 quota | 118 <u>mt</u> | Now <u>Avg</u> survey B decreased 31% 15-16 |
| 2015 | 2016 | (1) 45-359 <u>mt</u> (2) 354 <u>mt</u> | (1) constant exploitation rate 2%-16% (2) constant quota | 354 <u>mt</u> | Constant quota (and essentially no change in surveys) | 44 <u>mt</u> | Now <u>Avg</u> survey B decreased 36% 16-17 |
| 2016 | 2017 | (1) 31-245 <u>mt</u> (2) | (1) constant exploitation rate 2%-16% (2) | 300 <u>mt</u> | Decline in surveys and low inter-annual changes in quota | 95 <u>mt</u> | Now <u>Avg</u> survey B decreased 64% 17-18 |
| 2017 | 2018 | 62-187 <u>mt</u> | Constant exploitation rate 2%-6% | 300 <u>mt</u> | Balance yellowtail flounder stock conditions and the utilization of other species | 45 <u>mt</u> | Now <u>Avg</u> survey B increased 195% 18-19 |

| TRAC | Catch Year | TRAC Analysis/Recommendation | | TMGC Decision | | Actual Catch ⁽¹⁾ Compared to Risk Analysis | Actual Result ⁽²⁾ |
|------|------------|------------------------------|----------------------|---------------|---|---|------------------------------|
| | | Amount | Rationale | Amount | Rationale | | |
| 2018 | 2019 | 68 <u>mt</u> | Exploitation rate 6% | 140 <u>mt</u> | Balance yellowtail flounder stock conditions and the utilization of other species | | |

Groundfish Monitoring

Commercial Summary Table (Sector and Common Pool) Catch Monitoring

Report run on:
For data reported through:
Quota Period:
Quota Period Dates:

June 24 2019
April 30 2019
2018
May 1, 2018 to April 30, 2019

| Stock | Cumulative Kept (mt) | Cumulative Discard (mt) | Cumulative Catch (mt) | Sub-ACL* (mt) | Percent Caught |
|----------------------------|----------------------|-------------------------|-----------------------|---------------|----------------|
| GB Cod East | 105.0 | 1.4 | 106.4 | 257.0 | 41.4 |
| GB Cod | 833.1 | 4.7 | 837.7 | 1,194.3 | 70.1 |
| GOM Cod | 306.8 | 8.5 | 315.3 | 368.6 | 85.5 |
| GB Haddock East | 561.2 | 61.9 | 623.1 | 15,600.0 | 4.0 |
| GB Haddock | 4,708.6 | 434.8 | 5,143.4 | 44,658.6 | 11.5 |
| GOM Haddock | 2,820.5 | 50.1 | 2,870.6 | 8,738.4 | 32.9 |
| GB Yellowtail Flounder | 27.4 | 0.2 | 27.6 | 187.9 | 14.7 |
| SNE/MA Yellowtail Flounder | 7.3 | 1.1 | 8.5 | 43.3 | 19.6 |
| CC/GOM Yellowtail Flounder | 149.0 | 21.4 | 170.3 | 398.1 | 42.8 |
| Plaice | 1,020.0 | 58.7 | 1,078.7 | 1,579.6 | 68.3 |
| Witch Flounder | 754.1 | 58.5 | 812.6 | 829.8 | 97.9 |
| GB Winter Flounder | 419.3 | 0.6 | 419.9 | 730.7 | 57.5 |
| GOM Winter Flounder | 89.3 | 2.4 | 91.7 | 356.7 | 25.7 |
| SNE Winter Flounder | 247.6 | 3.0 | 250.6 | 518.0 | 48.4 |
| Redfish | 5,294.4 | 67.8 | 5,362.1 | 10,754.9 | 49.9 |
| White Hake | 2,085.6 | 11.0 | 2,096.5 | 2,735.3 | 76.6 |
| Pollock | 3,374.0 | 106.8 | 3,480.8 | 37,400.1 | 9.3 |
| Northern Windowpane | 0.0 | 33.3 | 33.3 | 63.0 | 52.8 |
| Southern Windowpane | 0.0 | 66.6 | 66.6 | 53.0 | 125.6 |
| Ocean Pout | 0.0 | 16.8 | 16.8 | 94.0 | 17.9 |
| Halibut | 27.0 | 43.7 | 70.6 | 77.0 | 91.7 |
| Wolffish | 0.0 | 1.5 | 1.5 | 82.0 | 1.8 |

14.7%

* Does not include Sector Carryover or Overages. GB Cod and GB Haddock include GB Cod East and GB Haddock East respectively.

Scallop Monitoring

Yellowtail and Windowpane Bycatch Estimates in the Scallop Fishery

Report Run on: 2019-03-18

For data reported through 2019-03-17

Quota Period: 2018

Quota period dates: April 1, 2018 to March 31, 2019

Georges Bank Yellowtail

Southern New England/Mid-Atlantic Yellowtail

Georges Bank Windowpane

Southern New England/Mid-Atlantic Windowpane

Georges Bank Yellowtail (sub-ACL 72,973 pounds)

| | Apr-18 | May-18 | Jun-18 | Jul-18 | Aug-18 | Sep-18 | Oct-18 | Nov-18 | Dec-18 | Jan-19 | Feb-19 | Mar-19 |
|--|-------------|--------------|---------------|---------------|---------------|---------------|---------------|---------------|---------------|---------------|---------------|---------------|
| Limited Access | | | | | | | | | | | | |
| LA-CAI-Dredge | 37 | 290 | 262 | 131 | 125 | 116 | 64 | 20 | 56 | 18 | 11 | 3 |
| LA-CAII-Dredge | 148 | 1,309 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| LA-OPEN-Dredge | 298 | 3,729 | 6,116 | 7,588 | 5,710 | 1,614 | 258 | 0 | 3 | 0 | 11 | 0 |
| Limited Access General Category | | | | | | | | | | | | |
| LAGC-CAI-Dredge | 1 | 12 | 7 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| LAGC-OPEN-Dredge | 0 | 0 | 2 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Month Total | 484 | 5,340 | 6,387 | 7,719 | 5,835 | 1,730 | 322 | 20 | 59 | 18 | 22 | 3 |
| Cumulative Total | 484 | 5,824 | 12,211 | 19,930 | 25,765 | 27,495 | 27,817 | 27,837 | 27,896 | 27,914 | 27,936 | 27,939 |
| Percent of Sub-ACL | 0.7% | 8.0% | 16.7% | 27.3% | 35.3% | 37.7% | 38.1% | 38.1% | 38.2% | 38.3% | 38.3% | 38.3% |

¹ Abbreviations: CAI = Closed Area I, CAII = Closed Area II, OPEN = Open Areas

² For Closed Area I, only Statistical Areas 522 and 525 are used for this report

³ Stratifications where there are < 5 observed trips use previous years final discard rate

⁴ The limited access fleet is not split into dredge and trawl components because there is insufficient observer coverage for such a stratification

38.3%