# Specifying Quotas in Numbers vs. Weight

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# Why Numbers?

- Help to track Recreational landings in a more timely manner
  - Headboats report weekly, but need to wait until end of Wave to get weight estimates
  - Planning to have charter boats report weekly by 2017
  - If Rec ACL was in numbers, could track For-Hire landings weekly and use as index for entire Rec sector to prevent overages
- Reduce uncertainty caused by conversion from numbers to weight
- Solve issue of there being 2 estimates of Rec landings in weight
  - SEFSC and MRIP use different methods to estimate Rec weight
  - MRIP readily available to public but quota tracked with SEFSC

# Background

- Council set Recreational ACL in numbers due to low ACLs for two species:
  - Golden Tilefish – 3,019 fish (Originally 1,578 fish)
  - Snowy Grouper – 4,152 fish (Originally 523 fish)
- ABCs set in pounds, Recreational ACL converted to numbers using average weight
- Used projections from assessment in numbers and weight to calculate average weight
  - Too few Recreational samples to get average weight (Golden Tilefish ~ 10 fish and 4 trips on avg. per year, Snowy Grouper ~ 5 fish and 5 trips on avg. per year)
  - Therefore commercial average weight is used but commercial average weight may differ from recreational average weight

# Background

- Council wants to set Recreational ACL for Hogfish in numbers
- SSC recommends ABC for assessed stocks in both pounds and numbers
- Council specified allocations based on catch percentages using pounds
- Questions:
  - Should the Recreational ACL be specified in numbers at all?
  - Should this be done for all stocks or just those with low Recreational ACLs?
    - What is a “Low” ACL?
  - What method should be used to specify the Recreational ACL in numbers?

# Conversions: Numbers ⇔ Weight

- Either Recreational or Commercial landings must be converted
  - Recreational catch collected in numbers
  - Commercial landings collected in weight
- Two things to consider when converting Recreational from numbers to weight:
  1. Error in Recreational estimates from numbers vs. weight
  2. Error/sampling effort of Recreational landings vs. Commercial landings
- Data shown are the average of 2013 and 2014
- Sampling level is:
  - % landings (in number) sampled for weight

# Difference in % Stand Err

- With exception of Snowy Grouper, differences are small for species in following table (<5%)
- However, % Standard Error (PSE) for numbers are all smaller than PSEs for weight
- These PSEs do not consider the validity of the assumption that the average weight of fish reported killed but not observed (B1) is similar to observed fish (A)

# Difference in PSEs:
## Number vs. Weight

| Species | PSE | |
|---|---|---|
| | Num | Weight |
| Black Sea Bass | 18.2 | 18.5 |
| Blueline Tilefish | 40.1 | 43.7 |
| Gag | 27.8 | 29.7 |
| Gray Snapper | 11.2 | 13.2 |
| Gray Triggerfish | 17.4 | 18.3 |
| Greater Amberjack | 21.9 | 22.0 |
| Hogfish | 36.7 | 37.3 |
| Mutton Snapper | 19.6 | 22.9 |
| Red Grouper | 29.5 | 31.6 |
| Red Porgy | 28.0 | 30.2 |
| Snowy Grouper | 60.3 | 77.7 |
| Vermilion Snapper | 26.5 | 29.1 |
| White Grunt | 19.6 | 21.7 |
| Yellowtail Snapper | 16.3 | 16.5 |
| Dolphin | 11.8 | 13.9 |
| King Mackerel | 11.7 | 12.4 |
| **Average** | **24.8** | **27.4** |

# Sampling Level

- ~ 17 times more Comm fish sampled on avg. than Rec fish for weight
  - Calculated as ratio of number of Commercial fish sampled/fish landed:number of Rec fish sampled/fish landed
- Typically many more Comm lengths taken than weights in any given year
- Can also use Len-Wgt relationship to get average weight, especially if there are few weights available
  - These relationships tend to have very high Correlation Coefficients (>0.90)
  - Adds another layer of uncertainty
- For 2013-2014, MRIP had no missing weights for the species shown
  - Meaning they weighed all fish inspected and took lengths

# Weight Sampling by Sector

| Species | Weight Samples | | Landings (num) | | % Landings Sampled | | Ratio |
|---|---|---|---|---|---|---|---|
| | Comm | MRIP | Comm | MRIP | Comm | MRIP | Comm/MRIP |
| Black Sea Bass | 440 | 593 | 401,106 | 744,170 | 0.11% | 0.08% | 1.4 |
| Blueline Tilefish | 122 | 95 | 49,138 | 93,340 | 0.25% | 0.10% | 2.4 |
| Gag | 143 | 43 | 28,620 | 104,477 | 0.50% | 0.04% | 12.1 |
| Gray Snapper | 721 | 565 | 44,810 | 1,407,764 | 1.61% | 0.04% | 40.1 |
| Gray Triggerfish | 960 | 462 | 87,047 | 375,033 | 1.10% | 0.12% | 9.0 |
| Greater Amberjack | 131 | 187 | 34,659 | 73,288 | 0.38% | 0.25% | 1.5 |
| Hogfish | 184 | 44 | 6,851 | 216,347 | 2.68% | 0.02% | 131.7 |
| Mutton Snapper | 201 | 139 | 14,129 | 181,539 | 1.42% | 0.08% | 18.6 |
| Red Grouper | 64 | 21 | 16,872 | 22,207 | 0.38% | 0.09% | 4.0 |
| Red Porgy | 773 | 94 | 78,966 | 70,886 | 0.98% | 0.13% | 7.4 |
| Snowy Grouper | 131 | 4 | 14,583 | 3,425 | 0.90% | 0.12% | 7.7 |
| Vermilion Snapper | 2,649 | 347 | 763,498 | 522,522 | 0.35% | 0.07% | 5.2 |
| White Grunt | 67 | 265 | 34,083 | 840,160 | 0.20% | 0.03% | 6.2 |
| Yellowtail Snapper | 2,281 | 375 | 1,127,051 | 829,497 | 0.20% | 0.05% | 4.5 |
| Dolphin | 389 | 1,480 | 77,710 | 1,274,169 | 0.50% | 0.12% | 4.3 |
| King Mackerel | 889 | 1,165 | 71,493 | 1,126,359 | 1.24% | 0.10% | 12.0 |
| **Average** | | | | | **0.80%** | **0.09%** | **16.8** |

# Length Sampling by Sector

| Species | Weight Samples | | Landings (num) | | % Landings Sampled | | Ratio |
|---|---|---|---|---|---|---|---|
| | Comm | Rec | Comm | Rec | Comm | Rec | Comm/Rec |
| Black Sea Bass | 3,105 | 593 | 401,106 | 744,170 | 0.77% | 0.08% | 9.7 |
| Blueline Tilefish | 579 | 95 | 49,138 | 93,340 | 1.18% | 0.10% | 11.6 |
| Gag | 967 | 43 | 28,620 | 104,477 | 3.38% | 0.04% | 82.1 |
| Gray Snapper | 1,110 | 565 | 44,810 | 1,407,764 | 2.48% | 0.04% | 61.7 |
| Gray Triggerfish | 1,735 | 462 | 87,047 | 375,033 | 1.99% | 0.12% | 16.2 |
| Greater Amberjack | 501 | 187 | 34,659 | 73,288 | 1.44% | 0.25% | 5.7 |
| Hogfish | 414 | 44 | 6,851 | 216,347 | 6.04% | 0.02% | 296.8 |
| Mutton Snapper | 258 | 139 | 14,129 | 181,539 | 1.83% | 0.08% | 23.9 |
| Red Grouper | 450 | 21 | 16,872 | 22,207 | 2.67% | 0.09% | 28.2 |
| Red Porgy | 1,648 | 94 | 78,966 | 70,886 | 2.09% | 0.13% | 15.7 |
| Snowy Grouper | 739 | 4 | 14,583 | 3,425 | 5.07% | 0.12% | 43.4 |
| Vermilion Snapper | 5,955 | 347 | 763,498 | 522,522 | 0.78% | 0.07% | 11.8 |
| White Grunt | 621 | 265 | 34,083 | 840,160 | 1.82% | 0.03% | 57.8 |
| Yellowtail Snapper | 5,783 | 375 | 1,127,051 | 829,497 | 0.51% | 0.05% | 11.3 |
| Dolphin | 924 | 1,480 | 77,710 | 1,274,169 | 1.19% | 0.12% | 10.2 |
| King Mackerel | 3,418 | 1,165 | 71,493 | 1,126,359 | 4.78% | 0.10% | 46.2 |
| **Average** | | | | | **2.38%** | **0.09%** | **45.8** |

# All Stocks or Just Low ACLs?

- The sampling level of each sector can also help with this question

- Even key recreational species such as Dolphin and King Mackerel have much higher sampling intensity in Commercial than MRIP
  - Dolphin has over 4x more weight samples and over 10x more length samples per fish landed
  - King Mackerel has 12x more weight samples and over 46x more length samples per fish landed

# Commercial and Recreational Sector Sampling Ratio:

## Weight and Length

| Species | Ratio: Comm/Rec | |
|---|---|---|
| | Wgt | Len |
| Black Sea Bass | 1.4 | 9.7 |
| Blueline Tilefish | 2.4 | 11.6 |
| Gag | 12.1 | 82.1 |
| Gray Snapper | 40.1 | 61.7 |
| Gray Triggerfish | 9.0 | 16.2 |
| Greater Amberjack | 1.5 | 5.7 |
| Hogfish | 131.7 | 296.8 |
| Mutton Snapper | 18.6 | 23.9 |
| Red Grouper | 4.0 | 28.2 |
| Red Porgy | 7.4 | 15.7 |
| Snowy Grouper | 7.7 | 43.4 |
| Vermilion Snapper | 5.2 | 11.8 |
| White Grunt | 6.2 | 57.8 |
| Yellowtail Snapper | 4.5 | 11.3 |
| Dolphin | 4.3 | 10.2 |
| King Mackerel | 12.0 | 46.2 |
| Average | 16.8 | 45.8 |

# How to Specify ABC?

- Currently, ABC specified in weight
- For ACLs in number, used average weight calculated from projections in weight/projections in number
- Can specify ABC in numbers from projections and use same formula to convert Commercial ACL into weight
  - Projections do not give average weight for just Commercial or Recreational sector – gives overall average weight
  - There are assumptions in projections that may or may not be met – could affect average weight
  - Example: Florida Keys/East Florida (FLK/EFL) Hogfish

# How to Specify ABC?

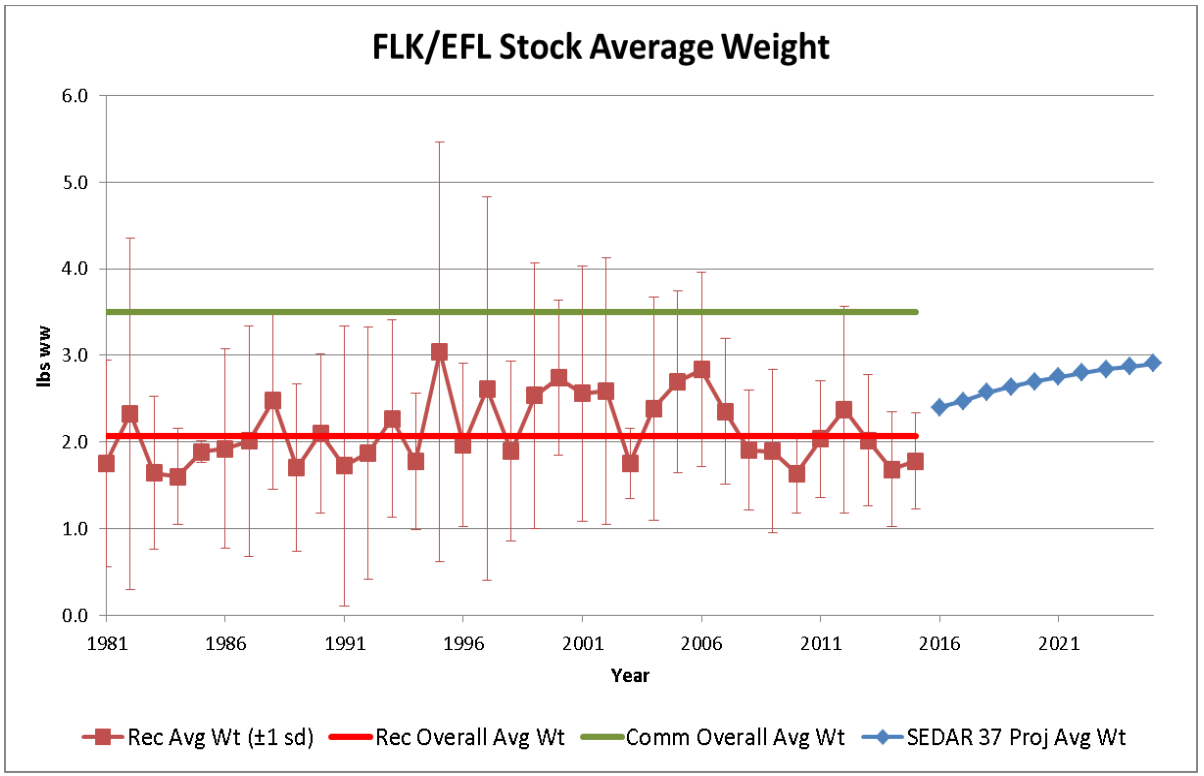
- Average weight from projections predicts an increase in weight over time due to assumption of rebuilding
- Observations do not indicate a trend in average weight over time, even in time before stock was overfished
- Projection assumption of increased average weight of landings as stock rebuilds may not be realized
- Also, average weight ranges from 2.4 to 2.91 lbs from projections
  - Commercial average weight is 3.5 lbs according to observations
  - Projection avg wgts not appropriate to convert Comm ACL from numbers to weight
- May be better to use observed Comm avg wgt

# FLK/EFL Hogfish Average Weight Projections

| Year | ABC (lbs ww) | ABC (numbers) | Avg Wgt |
|---|---|---|---|
| 2016 | 81,610 | 33,970 | 2.40 |
| 2017 | 96,230 | 38,930 | 2.47 |
| 2018 | 111,800 | 43,570 | 2.57 |
| 2019 | 127,900 | 48,380 | 2.64 |
| 2020 | 144,210 | 53,330 | 2.70 |
| 2021 | 160,440 | 58,250 | 2.75 |
| 2022 | 176,310 | 63,000 | 2.80 |
| 2023 | 191,560 | 67,490 | 2.84 |
| 2024 | 206,010 | 71,680 | 2.87 |
| 2025 | 219,520 | 75,540 | 2.91 |

# FLK/EFL Hogfish Recreational Average Weight

- Projections predict an increase in weight over time
- Proj Avg weight ranged from 2.4 to 2.91 lbs
- No trend in obs average weight

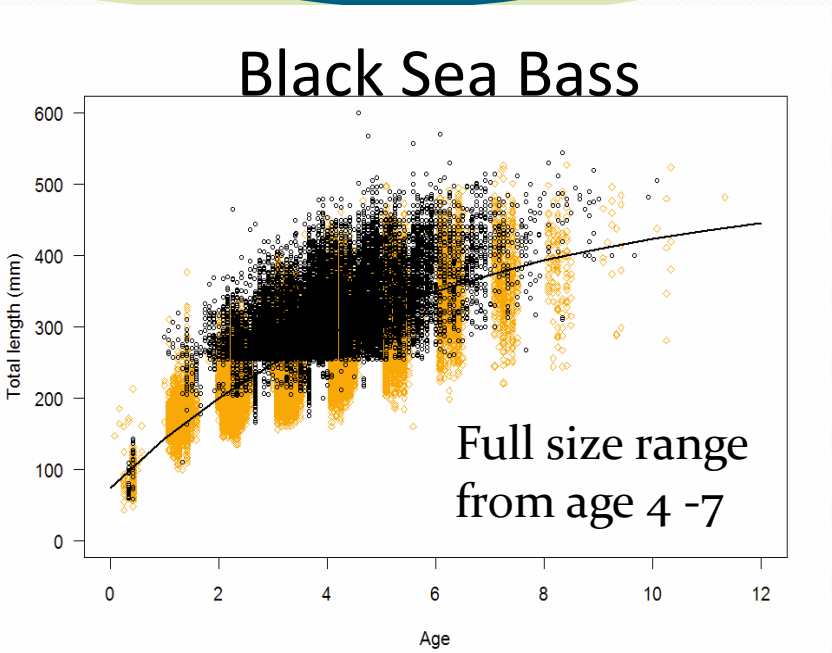


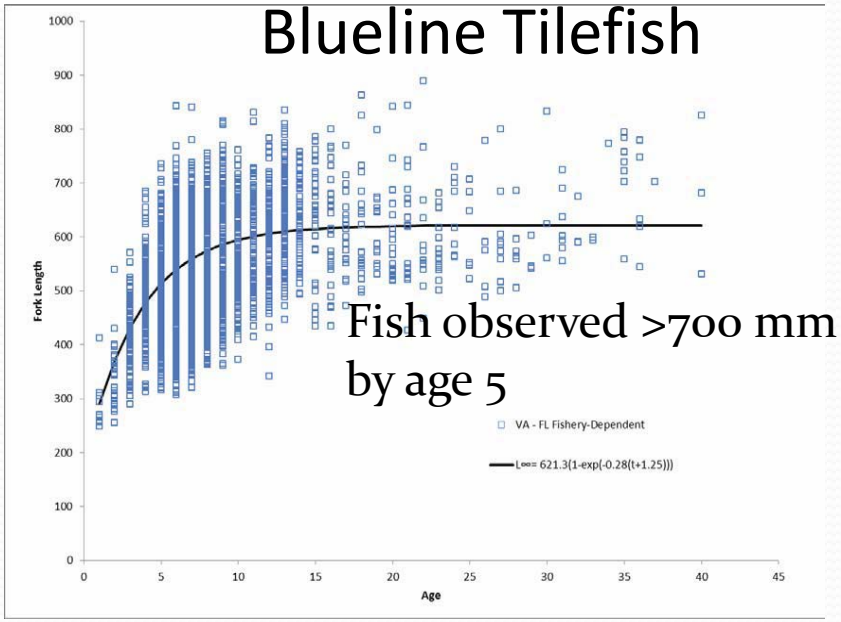
# How to Specify ABC?

- For stocks that do not have assessments and instead use a landings based approach, need to convert historical Commercial landings to numbers
- Can be done using average weight per year from observed data
- Otherwise, methods such as ORCS or the Decision Tree would work exactly the same
  - Specify the ABC in numbers of fish
  - Convert Commercial ACL to weight using avg wgt

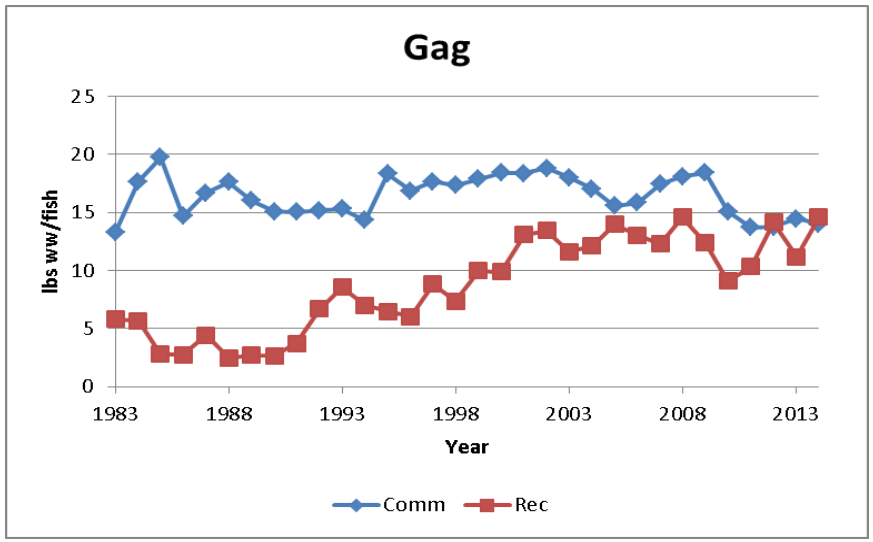
# Pros

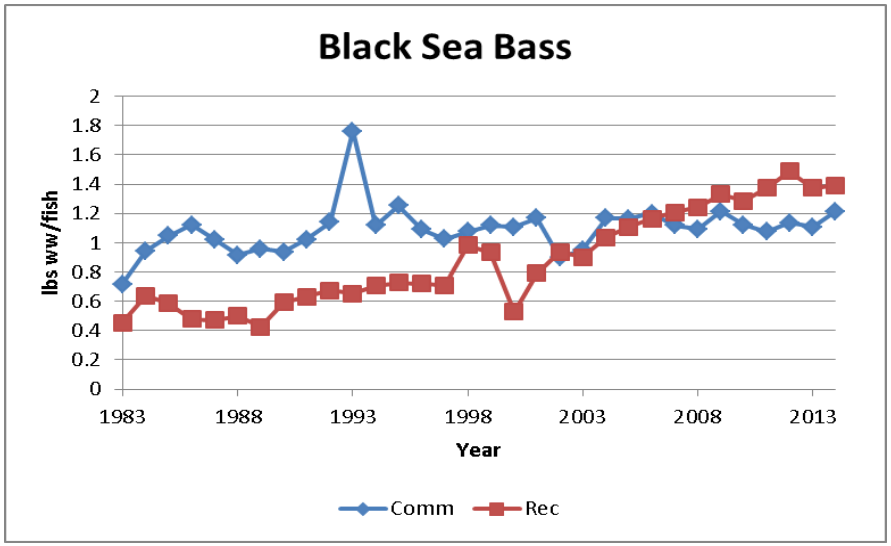
- Allows consideration of discards, which are collected in numbers
- Units in assessment is numbers
  - Abundance converted to biomass using von Bertalanffy Growth curve/size at age and Length-Weight relationship
  - Size at age has high variation for most species
  - Removes one source of uncertainty in the estimate of ABC
- Allows each sector's landings to be tracked in the native units
  - Neither Recreational nor Commercial landings need to be converted from reported value if ABC is set in numbers and the Commercial ACL is converted to weight

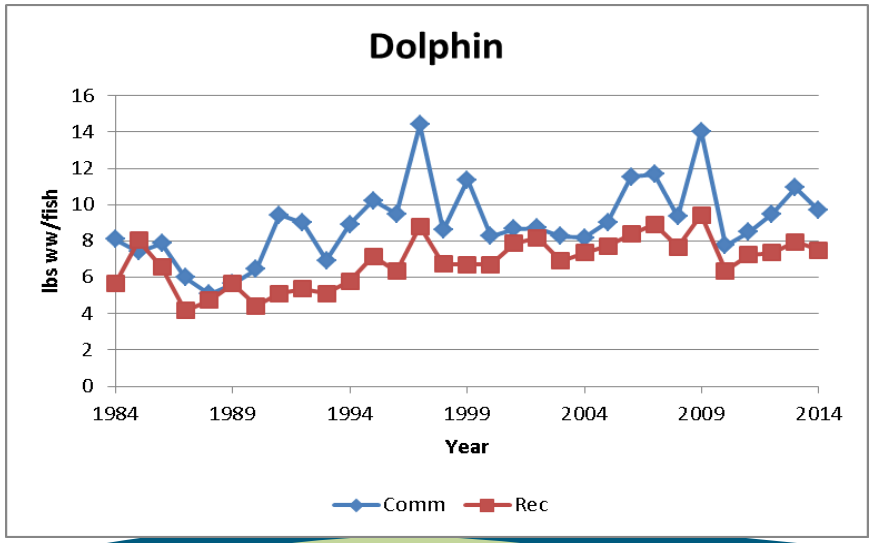


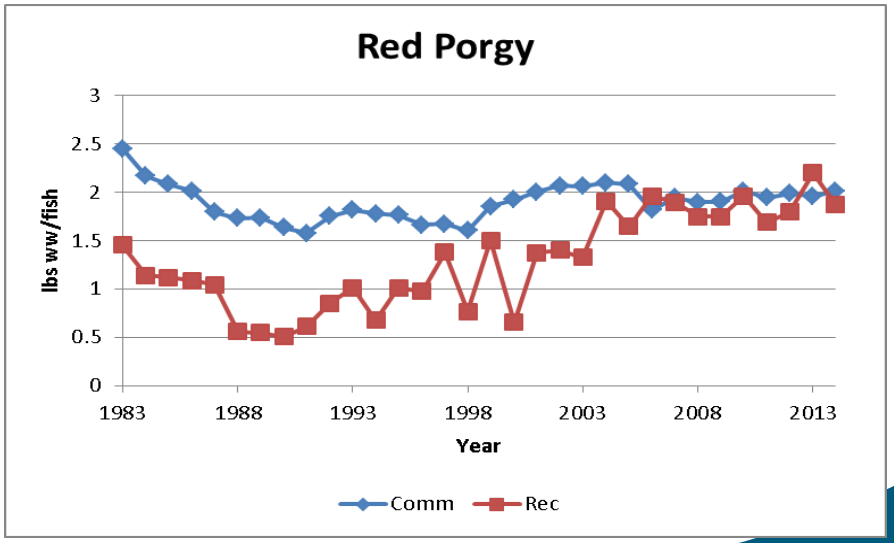



# Average Weight: Rec vs. Comm

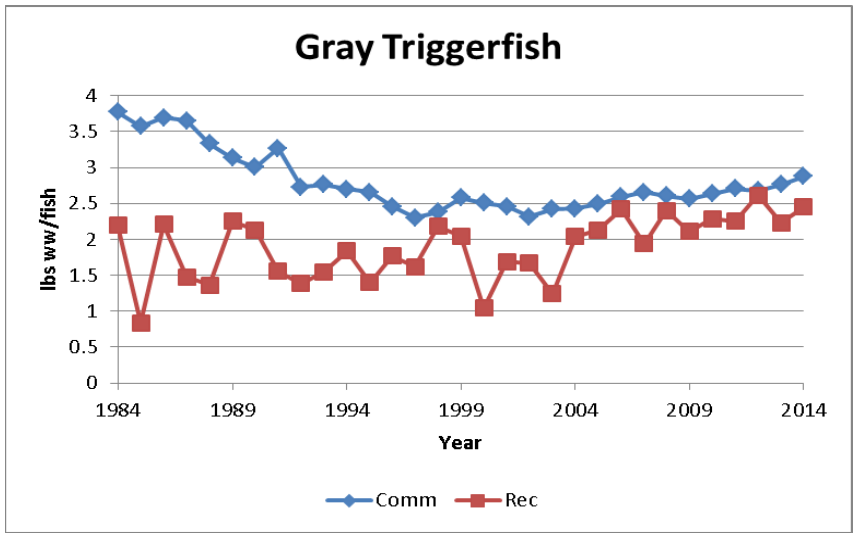


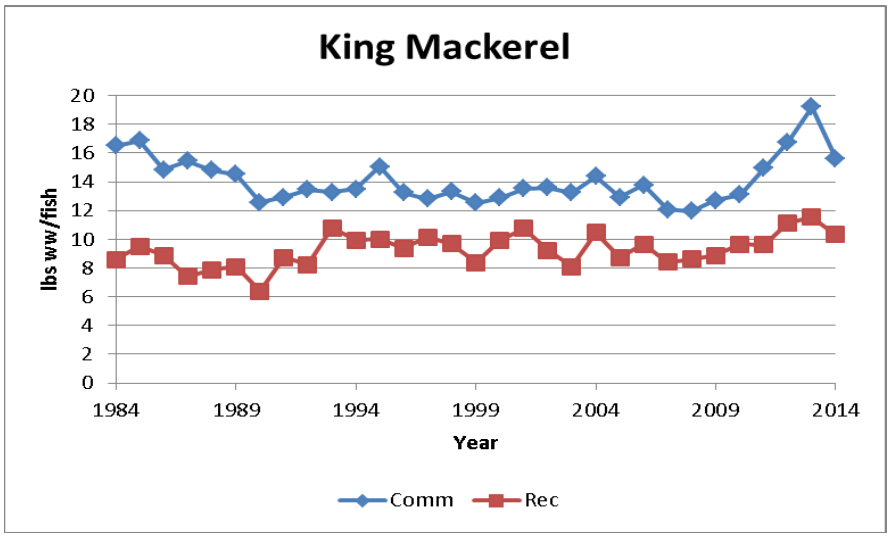



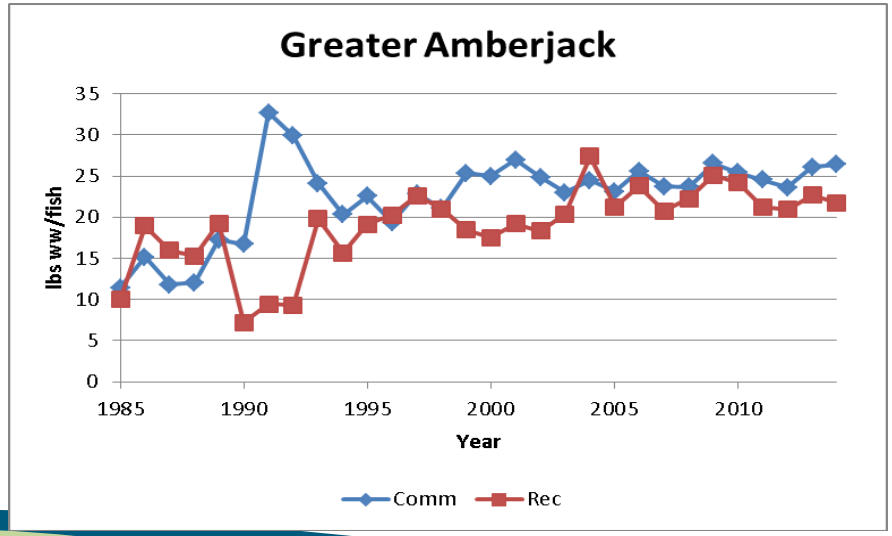



# Average Weight: Rec vs. Comm



# Changes in Average Weight

- Drastic changes in average weight mostly due to size limit implementation
  - Can be due to changes in sampling intensity, but would have to be significant to cause a drastic change in average weight
- Gradual changes can occur from several factors
  - Changes in abundance
  - Changes in targeting
  - Changes in sampling intensity
- If a management measure, such as size limit, is changed or implemented, can monitor commercial average weight closely and recalculate the ACL, if necessary
- Gradual changes in average weight will have little effect on the calculation of ACL after a single year
  - Review average weight next time the ABC/ACL is evaluated

# Conclusions

- PSEs from MRIP are lower for numbers than weight
- A higher percentage of Commercially landed fish are sampled than recreationally landed fish
  - Calculation of commercial average weight has less uncertainty
- Setting the ABC in numbers and converting the Commercial ACL into weight allows tracking of landings in each sector's native units (no conversions necessary)
- If an ACL (sector's portion of the ABC) is converted to alternate units, then average weight for that sector's landings would need to be monitored for significant changes and the ACL adjusted if necessary