FWRI data summary for Gulf of Mexico red grouper maturity, sexual transition 2014-2017

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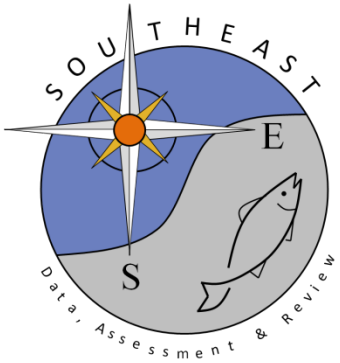

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Data:

- Key objective: review female maturity, sex transition and batch fecundity since SEDAR 42 (reproductive record terminal year 2013).
- N=1,080 red grouper were sampled for reproductive analysis over 2014 to 2017. However, for twenty-six of these fish there was not enough tissue to assign a reproductive phase. However, it was possible to assign maturity and sex.
    - Of these fish 152 were male, 920 were female, and 8 were transitionals, resulting in 14% males and 0.7% transitionals.
        - These estimates of proportion male and proportion transitional are less than reported in Lowerre-Barbieri et al., (S42_DW_07_repro_v2). The data for that analysis included 2008-2013 and there were 19% male and 2% were undergoing transition in those samples.
- Samples were collected along the west coast of Florida (Figure 1)
- All samples came from the FWRI fishery independent reef fish survey: 38% were collected with hook and line, 6% by vertical longline, 23% by chevron traps, 5% by Z traps and 28% by trawl.
- Female maturity was based on the presence of cortical alveolar or vitellogenic oocytes, i.e., females in the developing or spawning capable phases (Brown-Peterson *et al*., 2011).
- All analysis was conducted in SAS 9.4

Results:

- A total of 894 females were sampled in 2014 through 2017 and assigned to a reproductive phase (Figure 2). However, monthly sampling was uneven. Most samples came from the months of June through October. Spawning capable females (including actively spawning) occurred in February through June. Only seven of these were active spawners, which were collected in March, May, and June. Thus, the spawning season used in SEDAR42 of March through June is supported. However, similar to Lowerre-Barbieri et al., 2014, individual spawning periods in red grouper are asynchronous as demonstrated by a few spawning capable females were collected in September and November.
- A total of 383 females were assessed for maturity (from the months of March through June), 88 of which were immature.
    - 50% size at maturity was estimated using logistic regression (Figure 3), with an estimate of 269.5 mm FL (95% confidence intervals: 262.0 TO 276.9 mm FL).
    - 50% age at maturity was estimated as 2.03 (95% confidence intervals: 1.92 to 2.14).

        - These estimates are smaller than those reported by Lowerre-Barbieri et al., 2014 based on 273 fish collected over the time period of 2008-2013, using the same methods/analytical approaches as here. For that data set, 50% size at maturity was: 306.8 mm FL (95% confidence intervals: 294.5 to 319.; originally reported as 258 mm SL) and 50% age at maturity was 2.96 (95% confidence intervals: 2.48 to 3.44).
- A total of 1065 fish were used to assess sex-specific size.
    - Mean FL of females was 403.6 mm TL and mean FL of males was 551.6 mm FL and these differences were significant (ANOVA, P<0.0001);
    - logistic regression resulted in an estimated 50% male FL of 713.2 mm FL (95% CI 681.5 to 744.8 mm FL) and anA50% of 10.7 years (95% CI: 10.1 to 11.2 years).
        - Redoing our estimates for SEDAR 42 using logistic regression and FL, the estimates for this time period were 50% male size was 739.7 mm FL and A50 was 11.5 years (95% CI: 10.3 to 12.7).

Figure 1. Location of histological samples by sex.

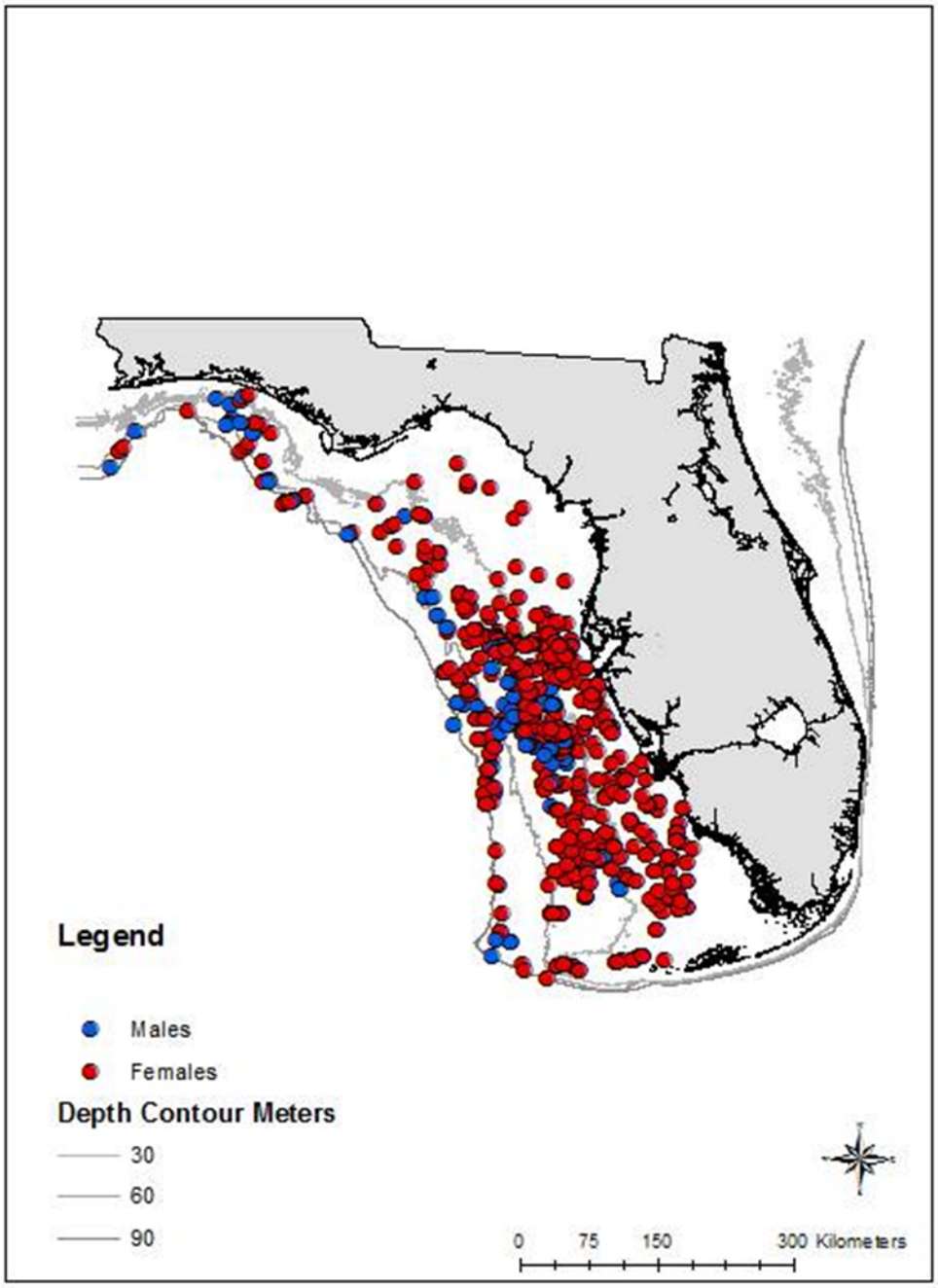


Figure 2. Source of histology samples by gear type.

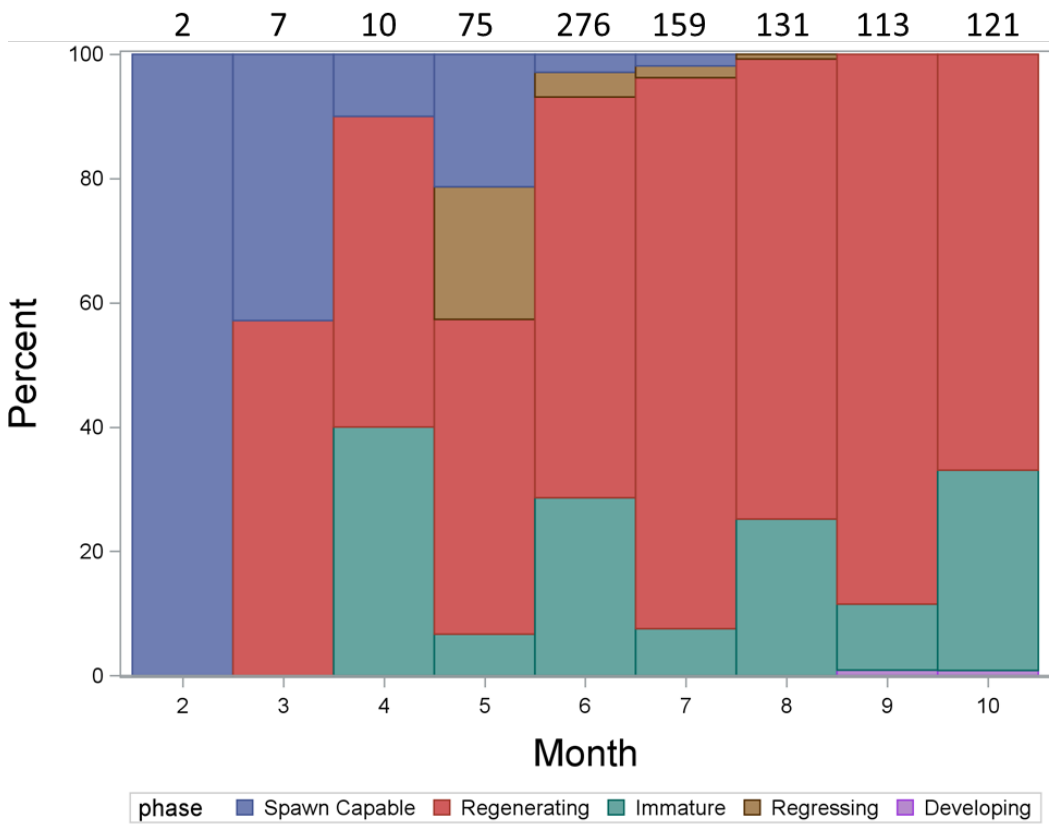
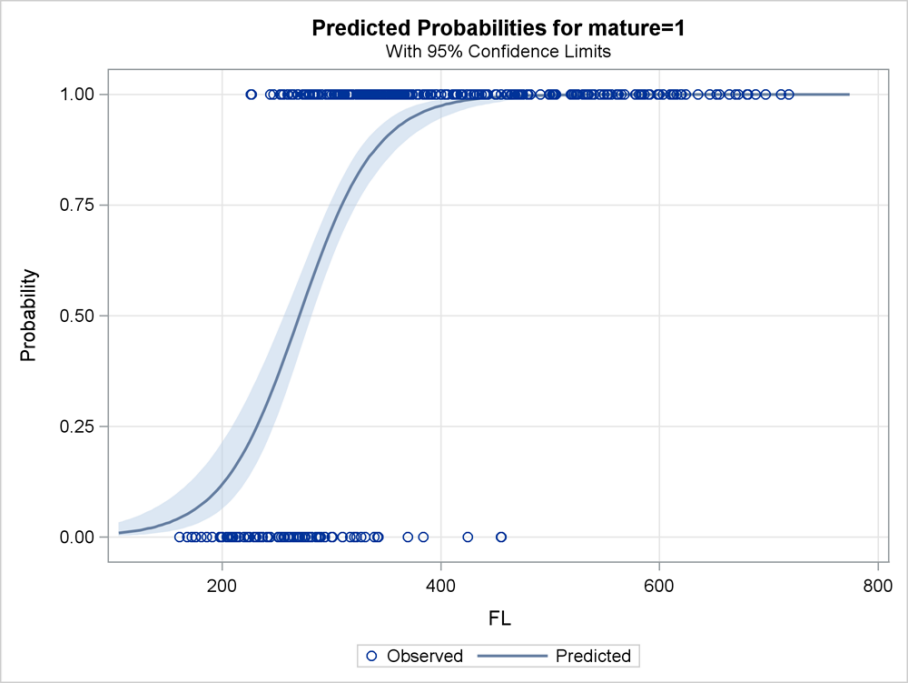


Figure 2. Seasonality of female reproductive phases (2014-2017). Sample sizes by month are indicated above the chart

A.



B..

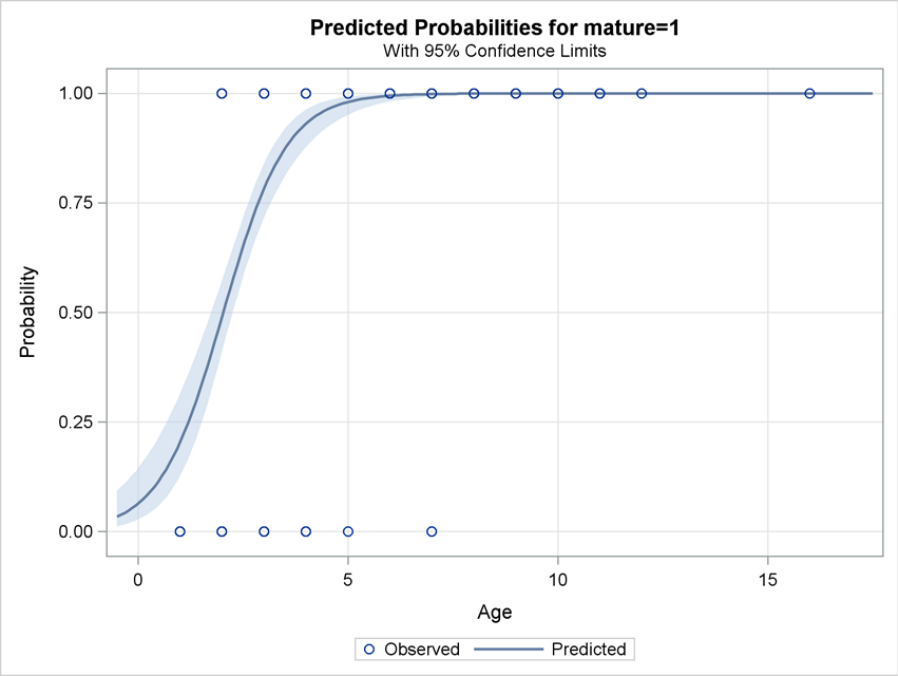
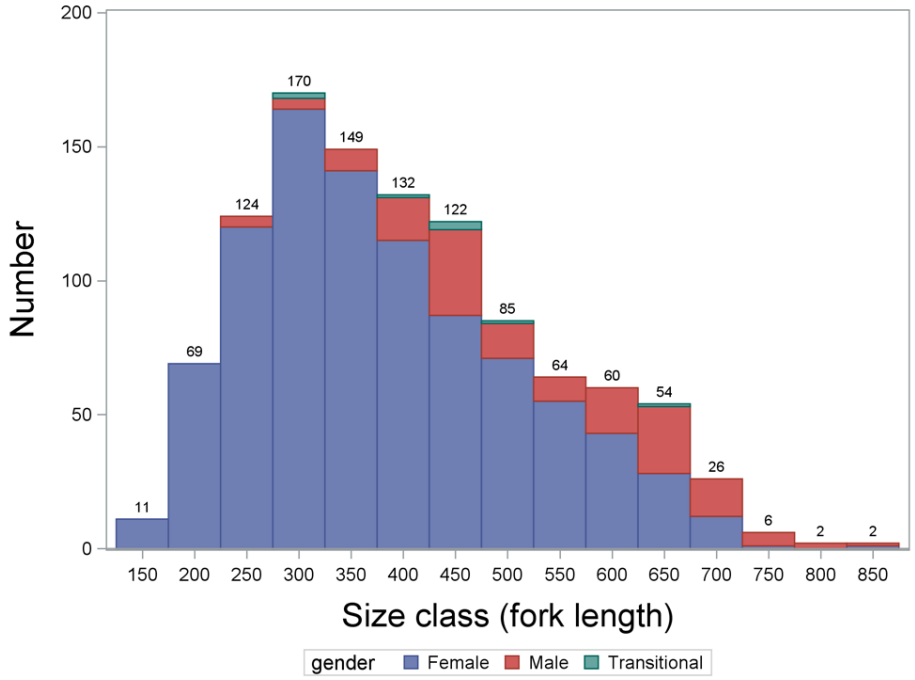


Figure 3. Data for size (A) and age (B) at maturity and predicted probabilities to estimate 50% mature. Note there is a large overlap in both size and age if immature and mature fish.

A.



B.

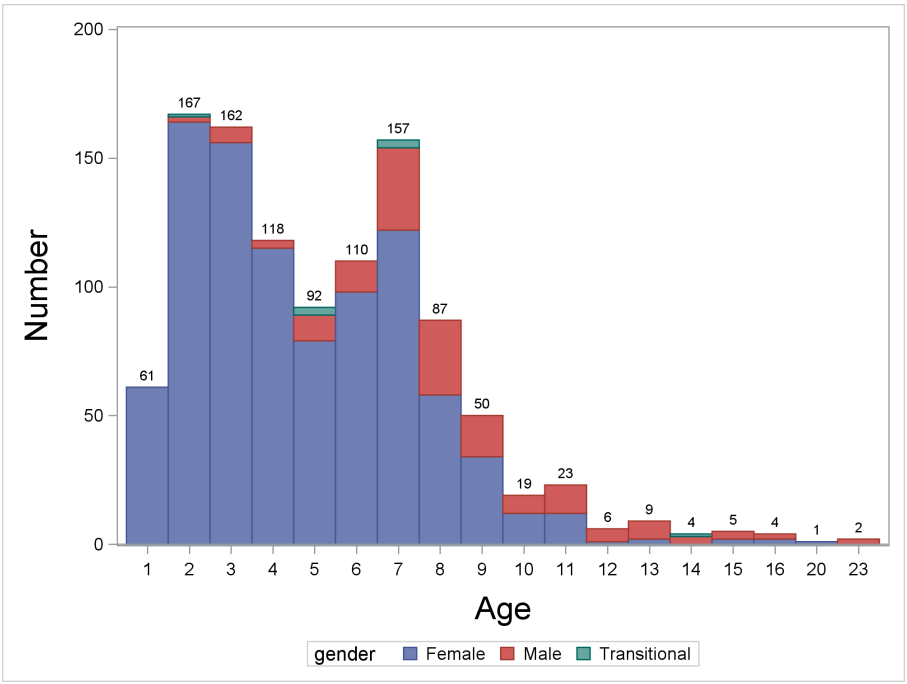
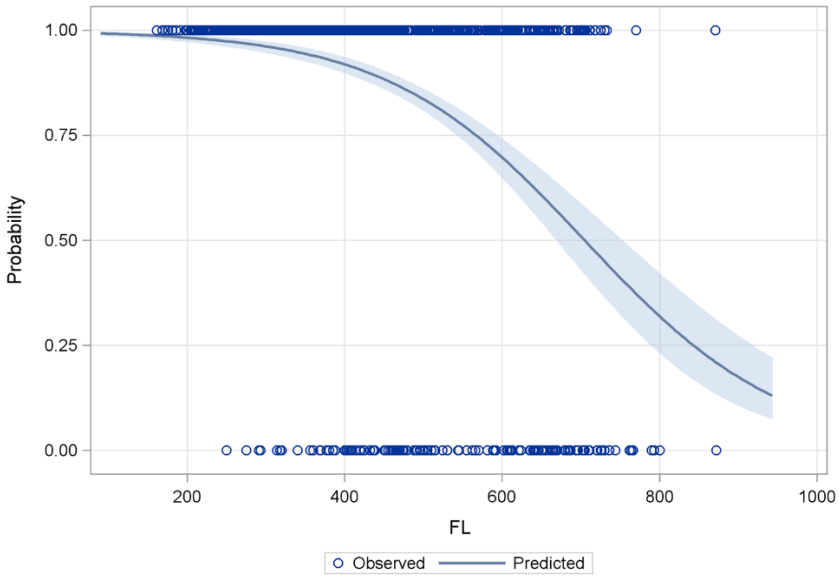


Figure 4. Data for size class by gender (A) and age by gender (B). Note males and transitionals as young as age two and females as old as age twenty.

(A)



(B)

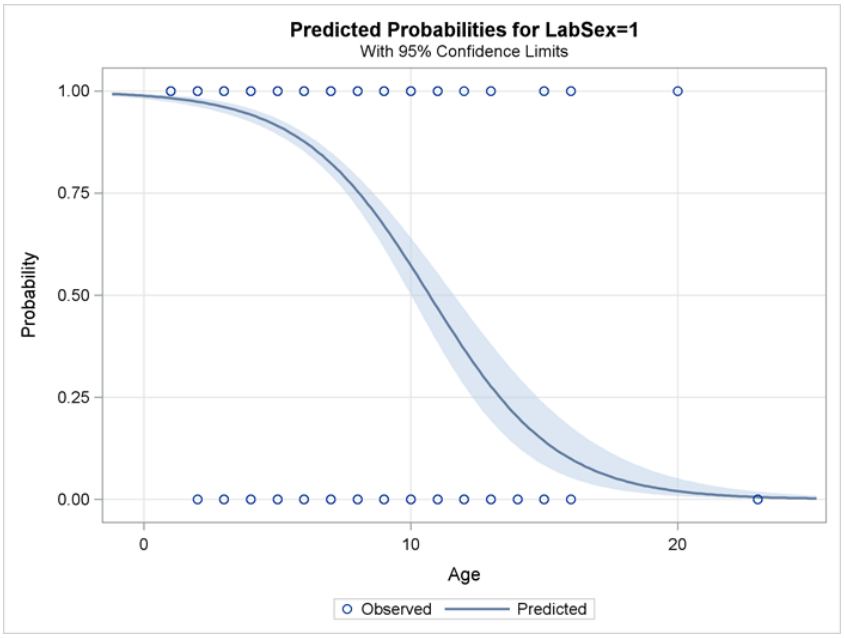


Figure 5. Proportion female by FL (A) Size at 50% male is 713.2. Logistic regression, logit model (sum binary), proportion female = 1/(1 + exp((-5.6079 – 0.00796* FL))). Shown with 95% confidence intervals. *N* = 1065. (B) A50 = 10.7 years. Logistic regression, logit model (sum binary), proportion female = 1/(1 + exp(-(4.4568 – 0.4166* age))). Shown with 95% confidence intervals. *N* = 838.

References:

Brown-Peterson, N.J., D.M. Wyanski, F. Saborido-Rey, B.J. Macewicz and S.K. Lowerre-Barbieri. 2011. A standardized terminology for describing reproductive development in fishes. Marine and Coastal Fisheries: Dynamics, Management and Ecosystem Science 3:1, 52-70.

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