Development of an ageing error matrix for U.S. red snapper *(Lutjanus campechanus)*

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Development of an ageing error matrix for U.S. red snapper

(Lutjanus campechanus)

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July 20, 2015

Introduction

Ageing error has recently been incorporated in SEDAR assessed species in the U.S. south Atlantic to provide an estimate of uncertainty among ages. Inclusion of ageing error in a catch-at-age type stock assessment tends to accentuate recruitment estimates, as compared to the same estimates without ageing error. Other estimates from a stock assessment are affected as well, but the direction and magnitude of change is often unpredictable due to other data sources and factors in the model. This analysis computes an ageing error matrix for red snapper in the U.S. south Atlantic.

Methods

A random set of 94 red snapper otoliths were exchanged between South Carolina Department of Natural Resources (SCDNR), National Marine Fisheries Service (NMFS) in Beaufort, North Carolina and Florida Fish and Wildlife Conservation Commission (FWC).

This set of three separate age readings were then compared in a pairwise fashion. Average percent error among the three readers was 11 %. Figures 1-3 suggests strong agreement to age 15.

Methods described in Punt et al. (2008) and AGEMAT software were used to compute an ageing error matrix for red snapper. No attempt was made to account for bias since the true age of the sample was unknown. Four samples (4%) were removed from the analysis if the sample was not assigned an age by all three readers. Punt et al. (2008) suggests excluding the top 1% of older aged samples due to small sample sizes. For red snapper, one sample (1%) was excluded. The input data used to develop the ageing error matrix are provided in Appendix 1.

Results

The resulting ageing error matrix is in Table 1.

Table 1. Red snapper ageing error matrix for use in SEDAR 41 Assessment Workshop.

	0	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16
0	0.93	0.07	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
1	0.07	0.86	0.07	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
2	0.00	0.07	0.86	0.07	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
3	0.00	0.00	0.07	0.86	0.07	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
4	0.00	0.00	0.00	0.07	0.86	0.07	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
5	0.00	0.00	0.00	0.00	0.07	0.86	0.07	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
6	0.00	0.00	0.00	0.00	0.00	0.07	0.85	0.07	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
7	0.00	0.00	0.00	0.00	0.00	0.00	0.07	0.85	0.07	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
8	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.08	0.84	0.08	0.00	0.00	0.00	0.00	0.00	0.00	0.00
9	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.08	0.83	0.08	0.00	0.00	0.00	0.00	0.00	0.00
10	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.09	0.82	0.09	0.00	0.00	0.00	0.00	0.00
11	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.10	0.79	0.10	0.00	0.00	0.00	0.00
12	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.12	0.75	0.12	0.00	0.00	0.00
13	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.15	0.70	0.15	0.00	0.00
14	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.19	0.62	0.19	0.00
15	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.02	0.22	0.53	0.24
16	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.04	0.24	0.71

Figure 1. Red snapper age comparison between NMFS and SCDNR. Error bars represent ±1 S.D.

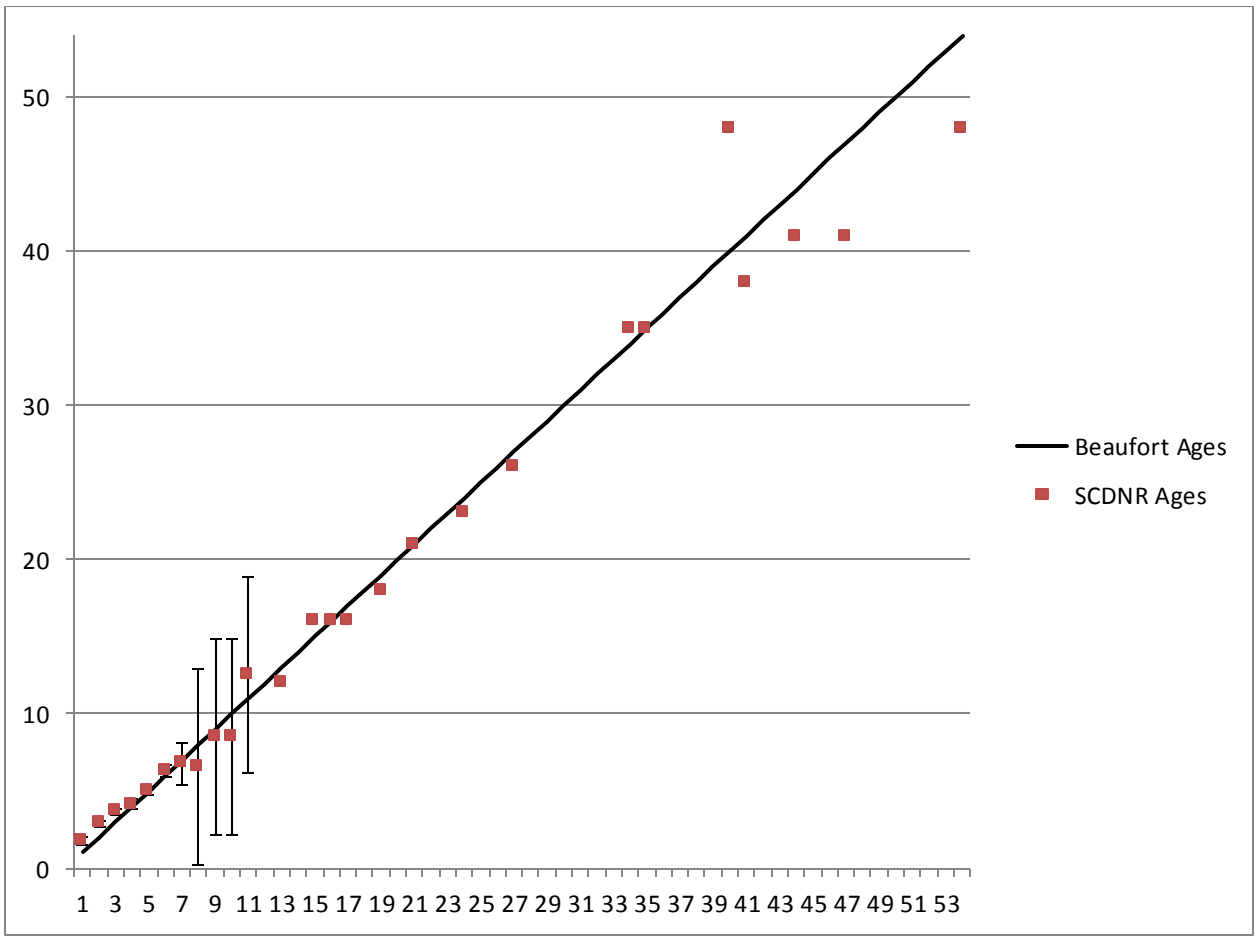


Figure 2. Red snapper age comparison between NMFS and FWC. Error bars represent ±1 S.D.

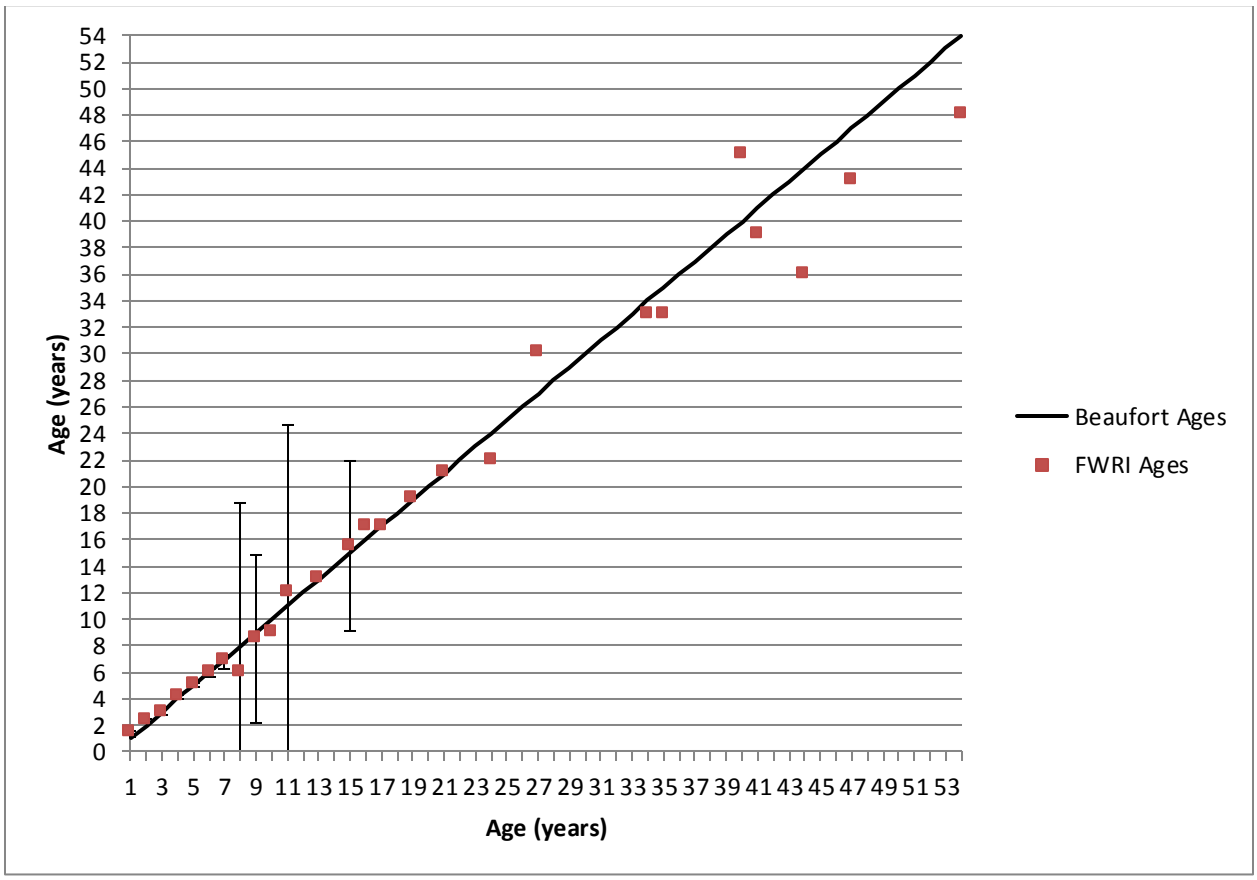
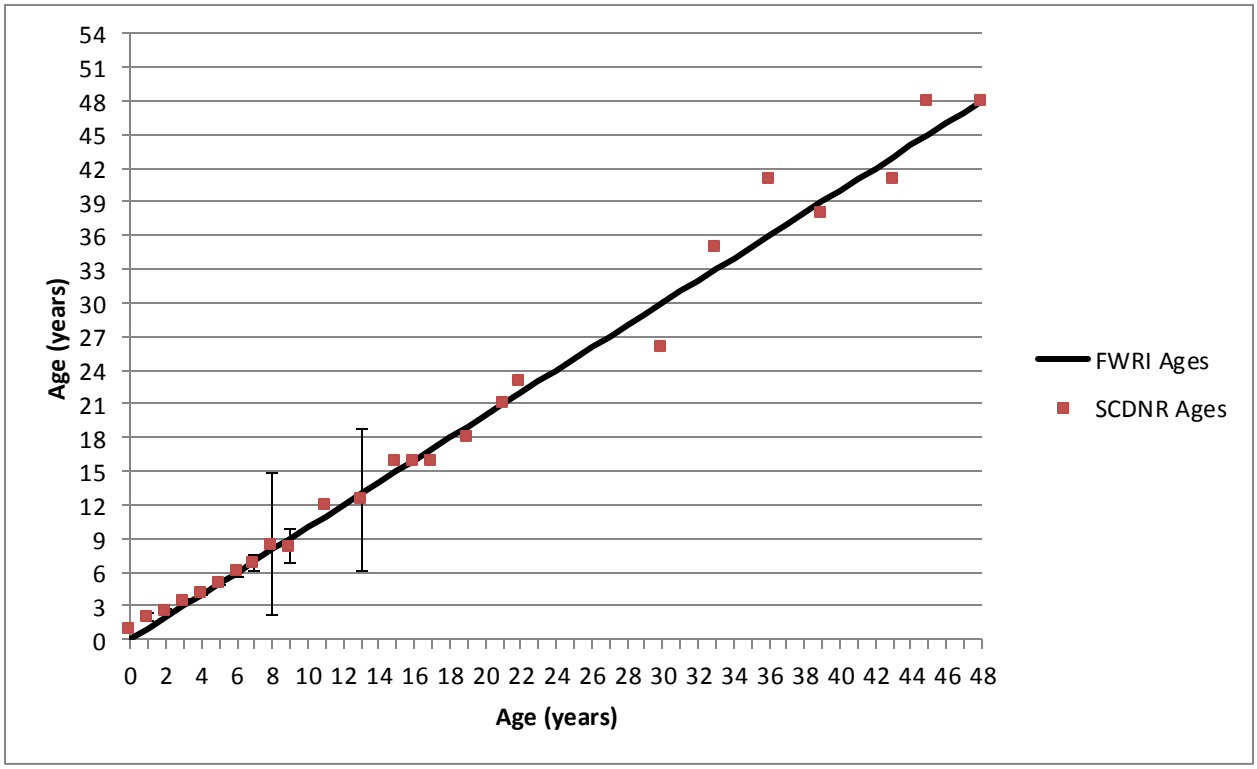


Figure 3. Red snapper age comparison between FWC and SCDNR. Error bars represent ±1 S.D.



Appendix 1. Red snapper ageing input file used in AGEMAT software to develop an ageing error matrix for SEDAR 41 Assessment workshop.

```
# Threshold   200
#    19    20   447
# Maximum number of readers
  3
# Number of data sets
  1
# Number of points per data set
  27
# Which readers per data set
  3
# Readers per data set:
   1  2  3
#  447   19   20
# minimum and maximum age
1   16
# Reference age
 4
# Minus groups
   1
# Plus groups
  11
# Option for bias
   0    0    0
# Option for standard deviation
   2   -1   -1
# Option for effective sample size
   0
# Use Par File (1=Yes)
0

# Min, Max, Init, Phase for sigma and bias
  0.0  40.0  0.2  1
-10.0   1.0  0.1  1
  0.0  40.0  7.0  1

# Min, Max, Phase for Probs
-20 20 2

# Min, Max, Init, Phase for the slopes
-10 1.0  0.0  2


# Data Set #    1 (AEP: the count of readings  should be column 1)

1          0          1          1
3          1          1          1
1          1          2          1
5          2          1          1
5          2          1          2
11         2          2          2
```

1	2	2	3
1	3	2	3
5	3	3	3
1	3	3	4
1	3	4	3
4	4	4	3
7	4	4	4
2	4	4	5
2	5	5	4
19	5	5	5
1	5	6	5
2	6	5	5
1	6	5	6
4	6	6	6
3	6	6	7
1	7	6	6
3	7	7	7
1	7	7	8
1	11	11	12
1	13	13	12
1	15	15	16

test number
123456