Table 1. Life history parameter values used in the Gulf of Mexico Gray Triggerfish population model simulation. The “Estimated” column denotes whether a parameter was estimated or fixed within the assessment models (Yes = Y, No = N).

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **Parameter** | **Symbol** | **Estimated** | **Value** | **Source** |
| Natural mortality reference | *Mref* | Y | 0.3016 | SEDAR (2015)\* |
| Lorenzen *c* for natural mortality | *c* | N | 1.776 | SEDAR (2015)\* |
| Start age | *a0* | N | 0 | SEDAR (2015) |
| Reference age | *a3* | N | 0.5 | SEDAR (2015) |
| Plus group age | *A* | N | 10 | SEDAR (2015) |
| Length at *a0* (cm) | *L0* | N | 28.3 | SEDAR (2015) |
| Length at *a+* (cm) | *L∞* | N | 58.97 | SEDAR (2015) |
| Growth rate (year-1) | *K* | N | 0.14 | SEDAR (2015) |
| Length-weight scaling (kg cm-3) | α | N | 2.16e-5 | SEDAR (2015) |
| Allometric factor | β | N | 3.007 | SEDAR (2015) |
| Maturity slope (cm-1) | Ω1 | N | -0.065 | SEDAR (2015) |
| Length at 50% maturity (cm) | Ω2 | N | 31 | SEDAR (2015) |
| Log mean virgin recruitment | *ln(R0)* | Y | 9.7608 | SEDAR (2015) |
| Steepness | *h* | N | 0.4593 | SEDAR (2015) |
| Recruitment SD | σr | Y | 0.3582 | SEDAR (2015) |
| Selectivity parameter B1 | B1 | Y | 4.375 | SEDAR (2015)\* |
| Selectivity parameter B2 | B2 | Y | -3 | SEDAR (2015)\* |
| Selectivity parameter B3 | B3 | Y | 1.124 | SEDAR (2015)\* |
| Selectivity parameter B4 | B4 | Y | 1.582 | SEDAR (2015)\* |
| Annual fully selected fishing mortality |  | Y | Figure X | SEDAR (2015) |
| Catchability of fishery index | *q* | Y | 0.0001 | Arbitrary |

\*Approximated from the stock assessment (SEDAR 2015)

Table 2. Population model equations. These apply to both simulator and estimator.

|  |  |
| --- | --- |
| Description | Equation |
| Length at age |  |
| Weight at age | = α |
| Natural Mortality at age |  |
| Maturity at age |  |
| Fecundity at age |  |
| Selectivity |  |
| Fishing mortality |  |
| Total mortality |  |
| Recruitment |  |
| Spawning biomass |  |
| Unfished survivorship |  |
| Initial abundance at age\* |  |
| Abundance at age |  |
| **Predicted Data** |  |
| Predicted catch |  |
| Predicted composition with ageing error |  |
| Predicted index |  |

\*Note simulator starts in year 1 and estimator in year 26 (when fishing begins)

Table 3. Convergence Table.

|  |  |  |
| --- | --- | --- |
| SM | EM | Convergence Percentage |
| No Ageing Error | No Ageing Error | 100 |
| Constant bias at age | 77 |
| Linear bias with age | 41 |
| Curvilinear bias with age | 75 |
| Constant bias at age | No Ageing Error | 99 |
| Constant bias at age | 100 |
| Linear bias with age | 14 |
| Curvilinear bias with age | 95 |
| Linear bias with age | No Ageing Error | 90 |
| Constant bias at age | 93 |
| Linear bias with age | 91 |
| Curvilinear bias with age | 74 |
| Curvilinear bias with age | No Ageing Error | 97 |
| Constant bias at age | 99 |
| Linear bias with age | 19 |
| Curvilinear bias with age | 95 |



Figure 1. Left Panel – Fishery Selectivity used in the population operating model. Right Panel - Time series of fishing mortality for Gray Triggerfish (minus shrimp fishery) used in the operating model.



Figure 2. Ageing error scenarios examined in this study. The bubbles denote the probability a fish will be coded age (y axis) given true age (x-axis). The diagonal represents the 1-1 line.

A group of black and white lines

AI-generated content may be incorrect.

Figure 3. Relative error for spawning stock biomass in each year of the assessment.

A group of black and white lines

AI-generated content may be incorrect.

Figure 4. Error in the terminal year estimates for F-ratio and B-ratio in each assessment.