Title

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Abstract:

**Introduction**

* Marine protected areas / marine reserves
* Marine fish species age distribution
  + Effect of marine reserve implementation
  + Explanation of transient dynamics
    - Importance of M and k values for describing transient dynamics
  + Importance of variability about population trajectory
* Designation of marine reserves off coast of Oregon
  + Goals of marine reserves
  + Upcoming assessment in 2023
* Description of study species
* Overview of methods
  + Reconstruction of base model, based off of (Babcock and MacCall 2011)

**Methods**

* Reconstruction of base model
  + Breakdown of sub-models into various functions
  + For more detailed equations and parameters, see Appendix A.

Table 1. Study species parameters

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
|  | Species | | **Black Rockfish** | **Cabezon** | **Lingcod** | **Copper Rockfish** |
|  | Scientific name | | *Sebastes melanops* | *Scorpaenichthys marmoratus* | *Ophiodon elongatus* | *Sebastes caurinus* |
|  | Source | | (Cope et al. 2016) | (Cope and Key 2009) |  |  |
| Category | Value | Symbol |
| Lifespan | Age at recruitment | arec | 3 |  |  |  |
| Maximum age | amax | 40 |  |  |  |
| Natural mortality | M | 0.17 |  |  |  |
| Female weight at length | Coefficient | a |  |  |  |  |
| Exponent | b |  |  |  |  |
| Female growth | Age 1 | a1 |  |  |  |  |
| Length at age 1 | L1 |  |  |  |  |
| Age 2 | a2 |  |  |  |  |
| Length at age 2 | L2 |  |  |  |  |
| von Bertalanffy growth parameter | k |  |  |  |  |
| Male weight at length | Coefficient | a |  |  |  |  |
| Exponent | b |  |  |  |  |
| Male growth | Age 1 | a1 |  |  |  |  |
| Length at age 1 | L1 |  |  |  |  |
| Age 2 | a2 |  |  |  |  |
| Length at age 2 | L2 |  |  |  |  |
| von Bertalanffy growth parameter | k |  |  |  |  |
| Reproduction | Length at 50% maturity | L50 |  |  |  |  |
|  | Slope of maturity curve | Kmat |  |  |  |  |
|  | Recruitment standard deviation | σR |  |  |  |  |
|  | Recruitment autocorrelation | ρR |  |  |  |  |
|  | Steepness | h |  |  |  |  |
|  | Egg production slope | ME |  |  |  |  |
|  | Egg production intercept | BE |  |  |  |  |
| Movement | Larval drift proportion | DL |  |  |  |  |
|  | Adult movement proportion | DA |  |  |  |  |
| Fishing | Depletion | D |  |  |  |  |
|  | Associated fishing mortality | FD |  |  |  |  |
| Selectivity | Number of fleets |  |  |  |  |  |
|  | Fraction of fishery | CF |  |  |  |  |
|  | Length at first vulnerability | Lv |  |  |  |  |
|  | Slope of upcurve | Mu |  |  |  |  |
|  | Upcurve halfway point | Hu |  |  |  |  |
|  | Switch length | Ls |  |  |  |  |
|  | Length at start of downcurve | Ld |  |  |  |  |
|  | Slope of downcurve | Md |  |  |  |  |
|  | Downcurve halfway point | Hd |  |  |  |  |
|  | Final selectivity | Sf |  |  |  |  |
| Sampling | Proportion of positive transects |  |  |  |  |  |
|  | Mean individuals seen in positive transects |  |  |  |  |  |
|  | Standard deviation of positive transects |  |  |  |  |  |
|  |  |  |  |  |  |  |
|  |  |  |  |  |  |  |

Table 2. Control rules

**Results**

**Discussion**

**Acknowledgements**

Thanks to Dr. Elizabeth Babcock for help reconstructing the base model in R.

**Appendix A**

**References**

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