Modeling Scenarios for the Western South Atlantic Humpback Whale Assessment, 14 December 2018.

|  |  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| Scenario | Absolute Abundance(s) | Target Year | Prior on R\_max | Growth rate estimate | Indices of Abundance | Shape parameter | Modern Whaling Catches | Pre-Modern Whaling Catches | Struck and lost rate | Genetic Constraint | Recent Anthropogenic Mortality | Observations |
| *Reference Case (RC)* | N(2008)=14264, CV=0.08 and N(2012)=20389, CV=0.07 | 2008 | Uniform [0-0.118] | Yes | Pavanato et al., 2017 (Breeding Grounds) and Branch et al. 2011 (Feeding Grounds). | Z = 2.39 | Core | Morais et al., 2017 | - Pre-modern whaling: correction factor is N(1.71, 0.073),  - Modern whaling prior to 1939: some distribution with a 5% probability that the SLR is greater than 13.9%. If we need an upper bound on that use 30%. We convert the SLR as 1/(1-%SLR), so for the period pre 1939, the correction factor should be a distribution with a 5% probability that the value of the correction factor is greater than 1.16 and it is truncated at 1 and 1.42  - 1939-1945: The correction factor for the period 1939 to 1945 should be U(1.25, 1.42).  - For the period after 1945, the correction factor should be N(1.0185, 0.0028). | None | TBD |  |
| Sensitivity to Input Data |  |  |  |  |  |  |  |  |  |  |  |  |
| DI 1 | N(2008)=14264, CV=0.08 and N(2012)=20389, CV=0.07 | **2012** | Uniform [0-0.118] | Yes | Pavanato et al., 2017 (Breeding Grounds) and Branch et al. 2011 (Feeding Grounds). | Z = 2.39 | Core | Morais et al., 2017 | Correction factors for struck and lost similar to Reference Case | None | TBD | This scenario assumes 2012 as the target year and trend comes from fitting the two absolute abundance estimates. It’s identical to RC. The purpose is to assess whether there are differences in the model outputs if the target year is set to 2012 |
| DI 2 | N(2008)=14264, CV=0.08 and N(2012)=20389, CV=0.07 | 2008 | Uniform [0-0.118] | **No** | **None** | Z = 2.39 | Core | Morais et al., 2017 | Correction factors for struck and lost similar to Reference Case | None | TBD | This scenario assumes information to estimate trends come only from the two estimates of absolute abundance (2008 and 2012) no other data are used to inform trends. |
| DI 3 | N(2008)=14264, CV=0.08 and N(2012)=20389, CV=0.07 | 2008 | Uniform [0-0.118] | Yes | **Wedekin et al. 2017 (Breeding Grounds)** and Branch et al. 2011 (Feeding Grounds). | Z = 2.39 | Core | Morais et al., 2017 | Correction factors for struck and lost similar to Reference Case | None | TBD | In this scenario, the indices of abundance from Pavanato et al. (2017) are replaced by those from Wedekin et al. (2017). These use data from the same surveys and can’t be used in combination. This scenario assess the effects of using the latter in the model outputs. |
| DI 4 | N(2008)=14264, CV=0.08 and N(2012)=20389, CV=0.07 | 2008 | Uniform [0-0.118] | Yes | Pavanato et al. 2017 (Breeding Grounds).  **Removal of feeding grounds indices of abundance.** | Z = 2.39 | Core | Morais et al., 2017 | Correction factors for struck and lost similar to Reference Case | None | TBD | In this scenario, the indices of abundance from the feeding grounds (Branch et al., 2011) were removed. This scenario assess the effects of using only indices of abundance in the breeding grounds. |
| DI 5 | N(2008)=14264, CV=0.08 and N(2012)=20389, CV=0.07 | 2008 | Uniform [0-0.118] | **No** | **Branch et al. 2011 (Feeding Grounds).** | Z = 2.39 | Core | Morais et al., 2017 | Correction factors for struck and lost similar to Reference Case | None | TBD | In this scenario, data to infer trends in abundance from the breeding grounds are removed and only the index of abundance in the feeding grounds from Branch et al. (2011) is used. |
| DI 6 | N(2008)=14264, CV=0.08 and N(2012)=20389, CV=0.07 | 2008 | **Approximate the distribution of Rmax computed by Zerbini et al. (2010)**  **Mean = 0.086, 95% CI = 0.05-0.114** | Yes | Pavanato et al., 2017 (Breeding Grounds) and Branch et al. 2011 (Feeding Grounds). | Z = 2.39 | Core | Morais et al., 2017 | Correction factors for struck and lost similar to Reference Case | None | TBD | This scenario replaces a uniform prior on Rmax with a more informative prior that approximates rates of increase for humpback whales derived from life history data. |
| Sensitivity to Catch Allocation |  |  |  |  |  |  |  |  |  |  |  |  |
| CA 1 | N(2008)=14264, CV=0.08 and N(2012)=20389, CV=0.07 | 2008 | Uniform [0-0.118] | Yes | Pavanato et al., 2017 (Breeding Grounds) and Branch et al. 2011 (Feeding Grounds). | Z = 2.39 | Core | Morais et al., 2017 | **None** | None | TBD | This scenario evaluates the impact of disconsidering the struck and lost rates both for modern and pre-modern whaling catches from the model in the parameter estimates. |
| CA 2 | N(2008)=14264, CV=0.08 and N(2012)=20389, CV=0.07 | 2008 | Uniform [0-0.118] | Yes | Pavanato et al., 2017 (Breeding Grounds) and Branch et al. 2011 (Feeding Grounds). | Z = 2.39 | Core | **None** | **Just include struck and lost rates for modern whaling catches** | None | TBD | This scenario evaluates the impact of disconsidering pre-modern whaling catches and respective struck and lost rates in the model parameters. |
| CA 3 | N(2008)=14264, CV=0.08 and N(2012)=20389, CV=0.07 | 2008 | Uniform [0-0.118] | Yes | Pavanato et al., 2017 (Breeding Grounds) and Branch et al. 2011 (Feeding Grounds). | Z = 2.39 | Core + **Falkland Islands** | Morais et al., 2017 | Correction factors for struck and lost similar to Reference Case | None | TBD | This scenario evaluates the impact of adding catches from the Falkland Islands in the modern whaling period. |
| CA 4 | N(2008)=14264, CV=0.08 and N(2012)=20389, CV=0.07 | 2008 | Uniform [0-0.118] | Yes | Pavanato et al., 2017 (Breeding Grounds) and Branch et al. 2011 (Feeding Grounds). | Z = 2.39 | **Fringe** | Morais et al., 2017 | Correction factors for struck and lost similar to Reference Case | None | TBD | This scenario evaluates the impact of using the Fringe catches instead of Core. |
| CA 5 | N(2008)=14264, CV=0.08 and N(2012)=20389, CV=0.07 | 2008 | Uniform [0-0.118] | Yes | Pavanato et al., 2017 (Breeding Grounds) and Branch et al. 2011 (Feeding Grounds). | Z = 2.39 | **Overlap** | Morais et al., 2017 | Correction factors for struck and lost similar to Reference Case | None | TBD | This scenario evaluates the impact of using the Fringe catches instead of Core. |
| Sensitivity to Genetic Constraints |  |  |  |  |  |  |  |  |  |  |  |  |
| GC 1 | N(2008)=14264, CV=0.08 and N(2012)=20389, CV=0.07 | 2008 | Uniform [0-0.118] | Yes | Pavanato et al., 2017 (Breeding Grounds) and Branch et al. 2011 (Feeding Grounds). | Z = 2.39 | Core | Morais et al., 2017 | Correction factors for struck and lost similar to Reference Case | **Yes, value of 54 \* 3 = 162.** | TBD | Similar to RC but with a lower limit on the minimum population. Testing the effect of the genetic constraint in the model outputs, assuming a minimum of 162 individuals were left when this population reached its lowest abundances. |
| GC 2 | N(2008)=14264, CV=0.08 and N(2012)=20389, CV=0.07 | 2008 | Uniform [0-0.118] | Yes | Pavanato et al., 2017 (Breeding Grounds) and Branch et al. 2011 (Feeding Grounds). | Z = 2.39 | Core | Morais et al., 2017 | Correction factors for struck and lost similar to Reference Case | **Yes, value of 5 \* 3 = 15.** | TBD | Similar to RC but with a lower limit on the minimum population. Testing the effect of the genetic constraint in the model outputs, assuming a minimum of 15 individuals were left when this population reached its lowest abundances. |
| Sensitivity to different assumptions of MSYL |  |  |  |  |  |  |  |  |  |  |  |  |
| M 1 | N(2008)=14264, CV=0.08 and N(2012)=20389, CV=0.07 | 2008 | Uniform [0-0.118] | Yes | Pavanato et al., 2017 (Breeding Grounds) and Branch et al. 2011 (Feeding Grounds). | **Z = 5.04** | Core | Morais et al., 2017 | Correction factors for struck and lost similar to Reference Case | None | TBD | Similar to RC but with a higher value of z, which assumes that MSYL occurs at 70% of K. |
| M 1 | N(2008)=14264, CV=0.08 and N(2012)=20389, CV=0.07 | 2008 | Uniform [0-0.118] | Yes | Pavanato et al., 2017 (Breeding Grounds) and Branch et al. 2011 (Feeding Grounds). | **Z = 11.22** | Core | Morais et al., 2017 | Correction factors for struck and lost similar to Reference Case | None | TBD | Similar to RC but with a higher value of z, which assumes that MSYL occurs at 80% of K. |
|  |  |  |  |  |  |  |  |  |  |  |  |  |
|  |  |  |  |  |  |  |  |  |  |  |  |  |