

# PmacHarvestSims

An RMarkdown that does lots of stuff!

Sophia

July 7, 2022

## Contents

Did Sperm whale populations in the Gulf of Mexico recover from historical commercial whaling prior to the Deep Water Horizon oil Spill? . . . . .	1
Including Plots . . . . .	2

## Did Sperm whale populations in the Gulf of Mexico recover from historical commercial whaling prior to the Deep Water Horizon oil Spill?

Our objective is to predict whether the sperm whale (*Physeter macrocephalus*) population in the US Gulf of Mexico had recovered from historical commercial whaling prior to the Deepwater Horizon oil spill in April 2010. We assume that the population was at carrying capacity prior to the onset of commercial whaling in the Gulf of Mexico, and hypothesize that this carrying capacity was equal to the abundance for this area estimated by [Roberts et al. 2016, 7] based on spatial modelling of line transect data. We start the population in year 1788 at this abundance, project the population forward using a population dynamics model including whaling harvest (see below) and see if it recovers to the initial population size by 2010. We include uncertainty on the initial abundance and demographic parameters by running multiple simulations, and sampling from distributions of inputs representing the uncertainty; we do not include uncertainty on harvest numbers.

To do the computations, existing code from Tiago A Marques [Marques 2022], implementing a deterministic, age-and sex-structured discrete-time model for common bottlenose dolphins' (*Tusiorps Truncatus*) response to the oil spill [Schwacke et al. In press], was adapted by Marques for offshore species including sperm whales. This will be adapted by adding harvest. To do this, we need to make assumptions about which ages and sexes the harvest applied to. We lay out some scenarios below, to receive feedback on them.

Sperm whaling in the Gulf of Mexico primarily took place seasonally, in the months of January to July [Reeves 2011, 41]. Suggested harvesting scenarios are as follows.

```
summary(cars)
```

```
##      speed      dist
##  Min.   : 4.0    Min.   : 2.00
## 1st Qu.:12.0    1st Qu.: 26.00
## Median :15.0    Median : 36.00
## Mean   :15.4    Mean   : 42.98
## 3rd Qu.:19.0    3rd Qu.: 56.00
## Max.   :25.0    Max.   :120.00
```

## Including Plots

You can also embed plots, for example:



Note that the `echo = FALSE` parameter was added to the code chunk to prevent printing of the R code that generated the plot.