**README**

This repository contains all data and code used in the paper titled “Marine protected areas for dive tourism”. This README document provides a brief description of the different files in this repository that are necessary to be able to run the MPA tourism model.

**Scripts**

The scripts folder contains the following folders:

*…/scripts/****00-data-analysis****/ -* Containsscripts used to create and wrangle the global database of dive prices, the crowdsourced database of dive sites and logged dives from Diveboard.com, and a literature derived database of diver origins.

*…/scripts/****01-model-prep/*** - Contains scripts used to prepare inputs for the global models of fish biomass, biodiversity, and demand for diving. The main model prep scripts are as follows:

* ***prep\_stock\_geogrange.R*** – Converts stock distribution to Mollweide
* ***prep\_distance\_matrix.R*** – Reformats global distance matrices. Distance of each pixel is needed because adult movement and larval dispersal are distance-dependent.
* ***prep\_eez\_coords.R*** – Code for generating the EEZ shapefile, i.e., this allowed us to assign each dive pixel to EEZ.
* ***prep\_biodiversity\_inputs.R*** – Code for preparing the inputs for the biodiversity model.

*…/scripts/****02-run-model****/* - Contains the main scripts used to run the dive tourism model. This folder contains the ***tourism-mpa.R*** script which is the key script that controls the model.

*…/scripts/****03-figures****/* - Contains scripts used to make the figures for the paper.

*…/scripts/****functions****/* - Contains a number of helper functions that are required to run***tourism-mpa.R.*** The main helper functions are as follows:

* ***func\_evaluateMPA\_explicit.R*** – Function for evaluating the biomass change from a network of MPAs.
* ***calculate\_relative\_bio\_benefit.R*** – Code for calculating changes in biodiversity scores, given a network of MPAs.
* ***func\_evaluate\_divefee.R*** – Code used for the sensitivity analysis. This code calculates the changes in dive fee revenue under different assumptions like different numbers of dive estimates, different price estimates, etc.

**Data**

The data folder contains a number of raw and edited data files. Some key files are as follows:

* ***tourism\_model\_input.RData*** – Key scuba dive tourism input data. This file contains the following objects:
  + "ocean\_df\_with\_eezs" – dataframe containing all the ocean pixels (with pixel ids)
  + "dives\_input" – Number of scuba dives per pixel
  + "suitability\_input" – Pixels that have existing scuba diving are identified here
  + "price\_constant\_input" – Price per dive per pixel, assuming that a constant dive price is used for all dive sites in the word (i.e., global median dive price)
  + "price\_country\_region\_input" – Price per dive per pixel, assuming median dive price per region.
  + "price\_interpolated\_input" - Price per dive per pixel generated by spatially interpolating actual dive price data
* ***MegaData\_Sala.rds*** – Fisheries data from Sala et al. (2021).
* ***transformed\_stockdistrib.rds*** – Stock distribution data used in Sala et al. (2021).
* ***pld\_rf\_predictions\_final.csv*** – This is the pelagic larval duration (PLD) data used in our model. This PLD is based on a combination of a comprehensive literature search and a machine learning model to fill out data gaps. See Bradley et al. (2023).
* ***homerange\_rf\_predictions\_10112022.csv*** – This is the species home range data used in our model. This PLD is based on a combination of a comprehensive literature search and a machine learning model to fill out data gaps. See Bradley et al. (2023).

**References**

D. Bradley, A. M. Caughman, S. A. Fogg, R. B. Cabral, J. Mayorga, W. Goodell, K. D. Millage, T. D. White, Marine Fish Movement: home range sizes for commercially relevant species. *Sci. Data*. **In review** (2023).

E. Sala, J. Mayorga, D. Bradley, R. B. Cabral, T. B. Atwood, A. Auber, W. Cheung, C. Costello, F. Ferretti, A. M. Friedlander, S. D. Gaines, C. Garilao, W. Goodell, B. S. Halpern, A. Hinson, K. Kaschner, K. Kesner-Reyes, F. Leprieur, J. McGowan, L. E. Morgan, D. Mouillot, J. Palacios-Abrantes, H. P. Possingham, K. D. Rechberger, B. Worm, J. Lubchenco, Protecting the global ocean for biodiversity, food and climate. *Nature*. **592**, 397–402 (2021).