Supplementary-material

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Last updated 19 enero, 2020

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## Introduction

This supplementary material is associated with figure X, XX, and XXX of main text. By following this supplementary it is possible to replicate in full the both figures and the analysis.

In this supplementary, we assume some basic knowledge of the R programming language. If instructions are followed, this should be fully reproducible using R studio. For further comments on the results of this analysis please refer to the main paper, or please find [Contacts][Contacts] to get in touch with the authors to report comments, bugs or problems.

Data and R code scripts to replicate can be downloaded from:

The R code (v.3.6.1) was written using R-studio IDE (v.1.2.1511), as well as this document, using the following packages that can be installed in R or through R-studio using the following commands:

* install.packages("tidyverse")
* install.packages("readxl")
* install.packages(cowplot)
* install.packages(ggthemes)

Libraries needed:

library(dplyr)  
library(ggplot2)  
library(readxl)  
library(ggpubr)  
library(broom)

Loading data:

ecosocial <- read\_excel("data/BP-10-Dataset.xlsx", sheet = "ecosocial")

## lm models  
  
  
tidy(lm(pressures\_spp~Biodiversity\_points, data=ecosocial))

## # A tibble: 2 x 5  
## term estimate std.error statistic p.value  
## <chr> <dbl> <dbl> <dbl> <dbl>  
## 1 (Intercept) 27.9 1.60 17.5 1.98e-40  
## 2 Biodiversity\_points 0.0324 0.00547 5.93 1.53e- 8

extract <- ecosocial %>%   
 select(Country, EEZ\_area, MPA, GDP\_tot) %>%   
 na.omit() %>%   
 mutate(percent\_GDP = (GDP\_tot/max(GDP\_tot))\*100) %>%   
 mutate(percent\_MPA = (MPA/EEZ\_area)\*100)   
  
tidy(lm(percent\_MPA ~ percent\_GDP, data=extract))

## # A tibble: 2 x 5  
## term estimate std.error statistic p.value  
## <chr> <dbl> <dbl> <dbl> <dbl>  
## 1 (Intercept) 9.56 1.67 5.74 0.0000000487  
## 2 percent\_GDP 0.375 0.174 2.15 0.0330

data3 <- ecosocial %>%   
 select(Country, EEZ\_area, MPA, GDP\_tot, Biodiversity\_points) %>%   
 na.omit() %>%  
 mutate(percent\_MPA = (MPA/EEZ\_area)\*100)   
  
tidy(lm(Biodiversity\_points ~ percent\_MPA, data=data3))

## # A tibble: 2 x 5  
## term estimate std.error statistic p.value  
## <chr> <dbl> <dbl> <dbl> <dbl>  
## 1 (Intercept) 272. 13.4 20.3 6.85e-44  
## 2 percent\_MPA 0.00688 0.781 0.00882 9.93e- 1

# Data Sources

Beware that while all data used are open source (except for kelp which has been removed until the dataset is published), specific permission to reuse and publish them are needed from data providers. Credit for the use of those data should also go to the proper source listed in the table in the [Methods in brief][Methods in brief] section.

## Habitat data

To understand habitat area within each Exclusive Economic Zone (EEZ) and the proportion of each habitat that is within an MPA (Marine Protected Area), we collected spatially referenced habitat data for coastal and oceanic ecosystems between February and April 2019. Data for thirty different habitats were found spanning oceanic features digitized from bathymetric data to satellite derived area estimates for many of the coastal habitats. We used a dataset that combined both EEZ area and land that was created by Sala et al., (2018) and intersected it with each habitat using ArcGIS 10.5 Desktop.

Next we calculated the area for each habitat by dissolving the resulting layer by Country and projecting it into the World Cylindrical Equal Area projection, and using the “Calculate Geometry” tool. To extract habitats that are of high conservation importance and the focus of our analysis, we selected habitats that individually contributed less than 0.5% of the cumulative habitat area. Seamounts did not fall under this classification, but due to their ecological importance were combined with guyots in our analysis (Rogers 1994). We used 6 habitats closely associated with the coast and 6 more closely associated with open ocean, for a total of 12 habitats. The table below lists these habitats and datasource used in the analysis. Losses and gains past the dates the data describes were not accounted for.

The February 2019 World Database of Protected Areas (UNEP-WCMC and IUCN (2019) was used to calculate the area or the number of reported locations of each habitat inside of an MPA. It needs to be clarified that being inside a MPA does not mean the habitat is protected, since the MPA objective and regulamentation might not involve the habitat at all. However, we consider that being inside an environmentally managed area should provide at least some indirect benefits to the habitat conservation.

The dataset was filtered by MPAs whose status was either designated, inscribed, adopted or established, thus removing not reported and proposed categories. The same methodology for the area calculation within each EEZ was used except the intersection included the filtered MPA dataset. The results were then compiled and compared to ensure that the maximum value of percent protection was 1 for each country.

### Table SI

|  |  |  |  |
| --- | --- | --- | --- |
| Habitat | Date of Data | Data Type | Source |
| Estuaries | 2003 | Polygon | Alder (2003) |
| Mangroves | 1997 - 2000 | Polygon | Giri, et al. (2011) |
| Saltmarsh | 1973 - 2015 | Points | McOwen, et al. (2017) |
| Seagrasses | 1934 - 2015 | Polygon | UNEP-WCMC, Short FT (2017) |
| Coral Reefs | 1954 - 2018 | Polygon | UNEP-WCMC, WorldFish Centre, WRI, TNC (2018) |
| Kelp | NA | Point | Jorge Assis (submitted for publication) |
| Cold Corals | 1915 - 2014 | Point | Freiwald A (2017) |
| Sills | 1950-2009 | Polygon | Harris et al. (2014) |
| Seamounts/Guyots | 1950-2009 | Polygon | Harris et al. (2014) |
| Bridges | 1950-2009 | Polygon | Harris et al. (2014) |
| Rift Valleys | 1950-2009 | Polygon | Harris et al. (2014) |
| Hydrothermal Vents | 1994-2019 | Point | Beaulieu, S.E., Szafranski, K. (2019) |

## The Global Habitat Strategy Framework

In this section, we applied a global marketing strategy to conservation. This strategy is based on the segmentation of a complex group of objects characterized by some attributes. Here, objects are countries’ Exclusive Economic Zones (EEZs), and the attributes are reported in the following table:

### Table SII

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| Categories | Attributes | Name | Description | Source |
| Population | Population growth | pop\_growth | Population growth (annual %) derived from total population. | World Bank Open data: <https://data.worldbank.org/> |
| Population | Population living less than 5m above sea level | pop\_coastal | Population living in areas where elevation is below 5 meters (% of total population) | World Bank Open data: <https://data.worldbank.org/> |
| Population | Poverty | poverty | Percent of population living under $1.90 | World Bank Open data: <https://data.worldbank.org> |
| Consumption | Greenhouse gasses emissions | emissions | Total greenhouse gas emissions (kt of CO2 equivalent) | World Bank Open data: <https://data.worldbank.org/> |
| Consumption | Gross Domestic Product per capita | GDP\_capita | GDP per capita (current USD) | World Bank Open data: <https://data.worldbank.org/> |
| Environment | Pressures on the Marine Environment | pressures | The ecological and social factors that decrease health status | Ocean Health Index: <http://www.oceanhealthindex.org/> |
| Environment | Amount of area protected | protected | Overlap between protected area and the target habitat | This paper |
| Government | Corruption | corruption | Corruption score index for each country | Worldwide governance indicators: <https://datacatalog.worldbank.org> |
| Government | Regulatory quality | reg\_qual | Regulatory Quality captures perceptions of the ability of the government to formulate and implement sound policies and regulations | Worldwide governance indicators: <https://datacatalog.worldbank.org> |
| Government | International cooperation | int\_cooper | Number of international treaties signed by a country | This paper |