Fishing and Climate Change in Coastal Bangladesh: The Economic and Health Impacts of Increasing Salinity

Overview

The code in this replication package constructs the analysis file from the data sources on the World Bank Development Data Hub and local data using R. A main script run all of the code to generate the data for the figures and tables in the World Bank Policy Research Working Paper entitled, "Fishing and Climate Change in Coastal Bangladesh: The Economic and Health Impacts of Increasing Salinity" (No. 11048). The replicator should expect the code to run for about <2 hours.

Data Availability and Provenance Statements

Statement about Rights

- I certify that the author(s) of the manuscript have legitimate access to and permission to use the data used in this manuscript.

License for Data

The data are licensed under a Creative Commons/CC-BY-NC license.

Summary of Availability

- The user must download data from the DHS see https://dhsprogram.com/data/available-datasets.cfm

Dataset list

local data directory has three categories: gis_data and tab_data. The gis_data include the locations of markets (Artisanal_Locations.shp), river monitorings (Bangladesh_River_Monitors.shp), species occurrence regions including: Coilia dussumieri.shp, Lates calcarifer.shp, Lates calcarifer.shp and Mystus gulio.shp from (Dasgupta et al. 2014a) and administrative boundaries (WB_countries_Admin0_10m.shp). The tab_data includes information for markets, salinity in ppt with location and date/time (IWM), fish catch price and date, death/diarrhea/stunt rates from DHS (2018 and 2022) and species information.

Data file	Source	Notes	Provided
`local/geo_data/Artisanal_Locations.shp`	Authors	Public	Yes
`local/geo_data/Bangladesh_River_Monitors.shp`	Authors	Public	Yes
`local/geo_data/Coilia dussumieri.shp`	Authors	Public	Yes
`local/geo_data/Lates calcarifer.shp`	Authors	Public	Yes
`local/geo_data/Mystus gulio.shp`	Authors	Public	Yes
`local/geo_data/Boundary_Data_10mil/WB_countries_Admin0_10m.shp`	WB	Public	API

Data file	Source	Notes	Provided
`local/tab_data/Bangladesh_Market_Fish_Full_Reference.csv`	Authors	Public	Yes
`local/tab_data/Bangladesh_River_Salinity_Data.csv`	IWM	Public	Yes
`local/tab_data/Full Salinity Range.csv`	Authors	Public	Yes
`local/tab_data/Full_Catch_Record_With_Periods.csv`	Authors	Public	Yes
`local/tab_data/DHS_Salinity_Area_2000_2022.dta`	Authors	Public	Yes
`local/tab_data/DHS Analysis Changes.csv`	Authors	Public	Yes
`local/tab_data/Monthly Upazila Salinity.csv`	Authors	Public	Yes
`local/tab_data/Species IDs and Names.csv`	Authors	Public	Yes
`local/tab_data/Species_Price_Class.csv`	Authors	Public	Yes

Data file	Source	Notes	Provided
`local/tab_data/Species Map Image Scores.dta`	Authors	Public	Yes
`local/tab_data/GBIF_Econometric_Species.csv`	Authors	Public	Yes

Sources include: IWM: The Institute of Water Modeling

Computational requirements

Software Requirements

- The replication package contains one or more programs to install all dependencies and set up the necessary directory structure.

basemaps_0.0.8 spatialEco_2.0-2 openxlsx_4.2.5.2 purrr_1.0.2 rSDM_0.4.0 readxl_1.4.3 ggpattern_1.1.3 exactextractr_0.10.0 doSNOW_1.0.20 snow_0.4-4 gdistance_1.6.4 Matrix_1.6-1.1 igraph_1.5.1 fasterize_1.0.5 lwgeom_0.2-13 rgeos_0.6-4 readstata13_0.10.1 rgdal_1.6-7 patchwork_1.2.0 raster_3.6-26 sp_2.1-2 ggpubr_0.6.0 colourvalues_0.3.9 XML_3.99-0.14 dplyr_1.1.3 stars_0.6-4 abind_1.4-5 gt_0.10.0 xfun_0.40 modelsummary_1.4.5 ordinal_2023.12-4 terra_1.7-55 archive_1.1.8 RColorBrewer_1.1-3 R.utils_2.12.2 R.oo_1.25.0 R.methodsS3_1.8.2 ggplot2_3.5.1 renv_1.0.5 tidyr_1.3.0 nngeo_0.4.7 foreign_0.8-84 doParallel_1.0.17 iterators_1.0.14 foreach_1.5.2 data.table_1.14.8 readr_2.1.4 Hmisc_5.1-2 stringr_1.5.1 httr_1.4.7 sf_1.0-19

Controlled Randomness

- No Pseudo random generator is used in the analysis described here.

Memory, Runtime, Storage Requirements

Summary Approximate time needed to reproduce the analyses on a standard 2024 server machine: - 2 hours

Approximate storage space needed: - < 2GB

Details Portions of the code were last run on a 32-core Intel server with 256 GB of RAM, 100 GB of network storage.

Description of programs/code

- Script biod_bgdcoast_wp___main.R is the main script
- Script biod_bgdcoast_wp_global_libraries.R loads the libraries for R
- Scripts starting with biod_bgdcoast_wp_load load the data for R
- Scripts starting with biod_bgdcoast_wp_fig construct the figures for R

List of tables and programs

The provided code reproduces: - All tables and figures in the paper

Figure/Table #	Program / dataset	Output file	Note
Figure 1	fig01_monthly_mean .do	fig_01_..._Monthly_Salinity .png	
Figure 2a	fig02a_stations .R	fig_02a_station_locations... .png	
Figure 2	fig02_River_Monitor_S .do	fig_03a_unprotected .png	
Figure 4	fig04_markets .R	fig_04_markets .png	
Figure 5	fig05a_Coilia_dussumi .R	fig_05a_Coilia_dussumieri .png	

Figure/Table #	Program / dataset	Output file	Note
Figure 6	fig06a_Mystus_gulio .R	fig_06a_Mystus_gulio .png	
Figure 7	fig07a_Lates_calcarifer.R	fig_07a_Lates_calcarifer .png	
Figure 9a	fig09and10_Species_El .do	Scomberomorus_guttatus_Sara .png	
Figure 9b	fig09and10_Species_El .do	Scomberomorus_guttatus_Gala .png	
Figure 10a	fig09and10_Species_El .do	Scomberomorus_commerson_Mong .png	
Figure 10b	fig09and10_Species_El .do	Scomberomorus_commerson_Khul .png	
Figure 11a	fig11_Predict_Upa .do	Low-Price Quantity Salinity .png	
	fig11_Predict_Upa .do	Min and Max Quantity by Pri .csv	
Figure 11b	fig11_Predict_Upa .do	Mid-Price Quantity Salinity .png	
	fig11_Predict_Upa .do	Min and Max Quantity by Pri .csv	
Figure 11c	fig11_Predict_Upa .do	High-Price Quantity Salinity .png	
	fig11_Predict_Upa .do	Min and Max Quantity by Pri .csv	
Figure 12	fig12_New_Price_Reg .do	High-Price Price Salinity .png	

Table 1 | Table_1_Generate_Mark .do| tbl01_GBIF_Species_With_ .csv| |
Table 2 | Table_2_GBIF_Species .do| tbl02_Species_salinity_resp .csv| |
Table 3 | Table_3_Analyze_DHS .do| tbl03_Peaksal_childmorb_ .csv| |
Table A1 | A1_GBIF_Species .do| App_Table1_Econometric .xlsx | |
| biod_bgdcoast_wp_A1 .R| | |
Table A2 | A2_Price_Regressions .do| | |
Table A2a | A2_tbl_lowprice .R| App_Table2_Econ _low_price .xlsx| |
Table A2b | A2_tbl_medium_price .R| App_Table2_Econ _med_price .xlsx| |
Table A2c | A2_tbl_high_price .R| App_Table2_Econ _med_price .xlsx| |

References

Dasgupta, S., Blankespoor, B., & Wheeler, D. (2024a). Revisiting Global Biodiversity: A Spatial Analysis of Species Occurrence Data from the Global Biodiversity Information Facility (No. 10821). The World Bank.

Dasgupta, S., Blankespoor, B., & Wheeler, D. (2024b). Estimating Extinction Threats with Species Occurrence Data from the Global Biodiversity Information Facility (No. 10822). The World Bank.

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