

EBM Nature Communications main script

Kirstin Holsman

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*Data and code are under review and subject to change. Do not use without permission from lead author:
kirstin.holsman@noaa.gov*

- Kirstin Holsman
Alaska Fisheries Science Center
NOAA Fisheries, Seattle WA
kirstin.holsman@noaa.gov
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Overview

This is an overview of the data, code, and workflow used to generate intermediate and final data for the Holsman et al. in review Nature Communications paper.

Primary Data sources and access:

Various simulation outputs were made available for use in this analysis through the interdisciplinary Alaska Climate Integrated Modeling (ACLIM) project. An overview of the project and simulation experiments can be found in Hollowed et al. 2020.

ROMSNPZ

Downscaled hindcasts and CMIP5 projections of oceanographic and lowertrophic conditions were developed as part of the ACLIM project. An overview of these projections and the Bering10K ROMSNPZ project can be found in Hermann et al. 2019, Kearney et al. 2020, and Hollowed et al. 2020.

CEATTLE Model

CEATTLE is a multispecies stock assessment model that has been updated annually and included as an appendix to the walleye pollock stock assessment since 2016 as part of the Bering Sea fishery stock assessment process. As part of ACLIM CEATTLE was coupled to the ROMSNPZ model and the ATTACH model (below) to generate projections of species biomass and catch under future climate conditions in the Bering Sea. Methods for this coupling and projection simulation can be found in Holsman et al. submitted and Hollowed et al. 2020.

ATTACH Model

The ATTACH model

Intermediate data:

Intermediate data can be found in the main EBM_Holsman_NatComm in the form of .Rdata files but can be recreated (although this is not recommended; see below) from the ADMB model using the EBM_Holsman_NatComm/assessment_scripts/README_EBM_Holsman_Analysis.pdf.

Figures and tables:

Final figures and tables (including illustrator files that were used to add fish icons) can be found in the **Figures** folder.

Running the analyses

Below are instructions for downloading input data, code and scripts to recreate the figures, tables, results, and run the risk and threshold analyses for the paper.

Download input data from figshare:

To run the analyses or create the paper figures you will need to first download the large zipped data folder here: <https://figshare.com/s/6dea7722df39e07d79f0> (Data DOI:10.6084/m9.figshare.11864505) and copy - paste the contents (folders “in” and “out”) it in the directory: [your local directory path]/EBM_Holsman_NatComm/data

If you plan to use the data within the folder for purposes beyond rerunning the paper analyses and figures please contact kirstin.holsman@noaa.gov and provide the cite the following Data DOI:10.6084/m9.figshare.11864505 along with Holsman et al. 2020.

```
url      <- "https://figshare.com/s/6dea7722df39e07d79f0"
dest_path <- "/Users/kholsman/GitHub_new/EBM_Holsman_NatComm/EBM_ceattlenew.Rdata"
# Apply download.file function in R
download.file(url=url, destfile=dest_path,method="libcurl")
```

Re-generate plots

If running plotting code below (recommended) you will need to download the final data “EBM_ceattlenew.Rdata” from figshare and place it in the main directory: “EBM_Holsman_NatComm/EBM_ceattlenew.Rdata”.

- access EBM_ceattlenew.Rdata here: <https://figshare.com/s/6dea7722df39e07d79f0> and place it in the directory: EBM_Holsman_NatComm/EBM_ceattlenew.Rdata. (Data DOI:10.6084/m9.figshare.11864505)

Re-running the intermediate data

If re-running the intermediate data analysis (not recommended) the following files will need to be downloaded unzipped and placed in the assesment_files folder:

- access aclim_00_JunV2_2019_2.zip here: <https://figshare.com/s/3a1aaa86837b79d6aa07> and place it in the EBM_Holsman_NatComm/data/runs/aclim_00_JunV2_2019_2.zip and unzip. (Data DOI: 10.6084/m9.figshare.11864586)
- access aclim_00_JunV2_2019_0.zip here: <https://figshare.com/s/d9c35dbe0880f4169041> and place it in the EBM_Holsman_NatComm/data/runs/aclim_00_JunV2_2019_0.zip and unzip. (Data DOI: 10.6084/m9.figshare.11864577)

This is the main script for running analysis and plotting results and requires R version 3.5.3 (available at <https://cran.r-project.org/bin/macosx/el-capitan/base/>). To update the analysis using .Rdata outputs run the R() code below as is currently configured. If you want to update the intermediate data, set “readdat” to TRUE in line 80 below. The CEATTLE stock assessment is also included but requires AD Model builder (<http://www.admb-project.org>). To run the assessment scripts (not recommended or tested outside of macOSX) see “README_EBM_Holsman_Analysis.pdf”.

EMB_paper.R script:

```
## -----
## plotting code for EBM paper
## Kirstin Holsman
## Feb 2020
## Kirstin.holsman@noaa.gov
## -----

# 1. Set up
# 2. load data
# 3. make figures

rm(list=ls())
graphics.off()
interactive()

#-----
# 1. SET THINGS UP
#-----
# set your local path:
main <- path.expand("~/GitHub_new/EBM_Holsman_NatComm/")
setwd(main)

# load data, packages, setup, etc.
source("R/make.R")

# -----
# optional: Make the paper figures:
# -----
source("R/sub_scripts/make_plotsV2.R") # this will generate the paper figures without overwriting
# You can also call individual plots like this:

fig2()
fig3()
fig4()
fig5()
fig6()
```

```

figS1()
figS2()
figS3()
figS4()
figS5()
figS6()

update.figs <- TRUE
stop("warning! this will overwrite existing figures in the Figures folder")
source("R/sub_scripts/make_plotsV2.R")

update.figs <- FALSE # return this to it's default setting

# -----
# optional: Rerun paper analyses including risk and threshold/tipping points
# -----
# to re-run the paper analyses set update.outputs = TRUE
# (this is set to FALSE by default) in the R/setup.R script

update.outputs <- TRUE
stop("warning! this will overwrite Rdata files in the data folder")
source("R/sub_scripts/SUB_EBM_paper.R")

update.outputs <- FALSE # once complete set to FALSE and reload new datafiles:
source("R/make.R")

# see the workflow
#vis_drake_graph(plan)

```