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Predicting the trajectories of dead sea turtles in Virginia using experimental data and model simulations

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Dataset Information

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Department of Fisheries Science

Title of Dataset: Predicting the trajectories of dead sea turtles in Virginia using experimental data and model simulations

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Description: This dataset contains the data and files from Santos 2017, Santos et al. 2018a, and Santos et al. 2018b. It is organized by chapters within the master’s thesis of Santos 2017, unless otherwise stated. The data from Santos et al. 2018a is predominantly within Chapter 1 files, including experimental data from the sea turtle decay and drifter release studies, as well as the raw results and other datafiles from the general 2001-2005 sea turtle carcass drift simulation model. The data from Santos et al. 2018b can be found mostly within the Chapter 2 files, including the raw results and other datafiles from the further developed sea turtle carcass drift simulation tool, and the comparisons of predicted mortality locations with anthropogenic causes. The supplement materials comparing the model results with the experimental drifter data from Santos et al. 2018b is also included in a separate subfolder. File types mostly include .xlsx, .doc, .nc, .R, .RDS, .shp and .csv files, all of which can be read by Rscript or Microsoft Office. Photos from the decay study are in .jpg format.

File Description Table:

File Name	Description
Ch1_Drift Release Study	Folder that contains the data for the drifter release study outlined in Santos et al. 2018a and Chapter 1 of Santos 2017.
Deplly 1_06.13.2016	Folder that contains the data for drifter release #1, deployed on June 13, 2016. <ul style="list-style-type: none">• “Deplly 1_Drifter position data.csv” contains drifter position data for deployment #1, including track ID, drifter type, GPS Message Time (GMT), and position (latitude and longitude).• “Deplly 1_Leeway data.csv” contains wind leeway data for deployment 1 computed using “Wind_analysis.R” in the “Ch1_Drift Release Study” folder.• “Deplly 1_Wind data.csv” contains wind data during deployment 1 obtained from the National Oceanographic and Atmospheric Administration’s Center for Operational

	<p>Oceanographic Products and Services (http://tidesandcurrents.noaa.gov/) monitoring station 8637611 York River East Rear Range Light.</p>
Deplly 2_06.24.2016	<p>Folder that contains the data for drifter release #2, deployed on June 24, 2016.</p> <ul style="list-style-type: none"> • “Deplly 2_Drifter position data.csv” contains drifter position data for deployment #1, including track ID, drifter type, GPS Message Time (GMT), and position (latitude and longitude). • “Deplly 2_Leeway data.csv” contains wind leeway data for deployment 1 computed using “Wind_analysis.R” in the “Ch1_Drift Release Study” folder. • “Deplly 2_Wind data.csv” contains wind data during deployment 1 obtained from the National Oceanographic and Atmospheric Administration’s Center for Operational Oceanographic Products and Services (http://tidesandcurrents.noaa.gov/) monitoring station 8638614 Willoughby Degaussing Station.
Deplly 3_08.01.2016	<p>Folder that contains the data for drifter release #3, deployed on August 1, 2016.</p> <ul style="list-style-type: none"> • “Deplly 3_Drifter position data.csv” contains drifter position data for deployment #1, including track ID, drifter type, GPS Message Time (GMT), and position (latitude and longitude). • “Deplly 3_Leeway data.csv” contains wind leeway data for deployment 1 computed using “Wind_analysis.R” in the “Ch1_Drift Release Study” folder. • “Deplly 3_Wind data.csv” contains wind data during deployment 1 obtained from the National Oceanographic and Atmospheric Administration’s Center for Operational Oceanographic Products and Services (http://tidesandcurrents.noaa.gov/) monitoring station 8637611 York River East Rear Range Light.
Deplly 4_08.15.2016	<p>Folder that contains the data for drifter release #4, deployed on August 15, 2016.</p> <ul style="list-style-type: none"> • “Deplly 4_Drifter position data.csv” contains drifter position data for deployment #1, including track ID, drifter type, GPS Message

	<p>Time (GMT), and position (latitude and longitude).</p> <ul style="list-style-type: none"> • “Deply 4_Leeway data.csv” contains wind leeway data for deployment 1 computed using “Wind_analysis.R” in the “Ch1_Drift Release Study” folder. • “Deply 4_Wind data.csv” contains wind data during deployment 1 obtained from the National Oceanographic and Atmospheric Administration’s Center for Operational Oceanographic Products and Services (http://tidesandcurrents.noaa.gov/) monitoring station 8637611 York River East Rear Range Light.
Wind_analysis.R	Rscript used to conduct wind leeway analysis on deployment data.
Ch1_Decay Study	Folder containing data and images from the decay study outlined in Santos et al. 2018a and Chapter 1 of Santos 2017.
Turtle 1 Turtle 2 Turtle 3 Turtle 4 Turtle 5 Turtle 6 Turtle 7 Turtle 8	<p>Folders with data and images for the decay trial of turtles 1,2,3,4,5,6,7 and 8, respectively.</p> <ul style="list-style-type: none"> • Images during each day of the trial are organized by day in individual folders. • “Turtle [X]_Daily picture comparison.docx” contains a compilation of plastron and carapace-side images per day with associated condition code • “Turtle [X]_GPTV2 Water Data.xlsx” contains water data during the decay trial obtained from the Virginia Estuarine and Coastal Observing System Gloucester Point continuous water quality monitoring station at Gloucester Point, VA (http://web2.vims.edu/vecos/Default.aspx)
Compiled data from decay study.xlsx	Compiled data from all eight decay rate trials.
Ch1_Carcass Drift Simulations 2001-2005	Folder that contains the data for the particle modeling/carcass drift simulations outlined in Santos et al. 2018a and Chapter 1 of Santos 2017.
0p of wind speed 2p of wind speed 4p of wind speed	<p>Folders that contains data from drift simulations with 0%/2%/4% of direct wind forcing, respectively.</p> <ul style="list-style-type: none"> • “Configuration_files” contains all of the Ichthyop configuration files for this set of drift simulations. • “Outputs” contains all of the Ichthyop output files for this set of drift simulations. • “chesapeake_box.xml” contains the domain of the Chesapeake Bay used by Ichthyop.

	<ul style="list-style-type: none"> • “config.head.template” and “config.tail.template” contains the templates used to create the configuration files. • “grid_simulation_results_6_[Xp].Rdata” contains the information obtained from processing the output data using “grid_simulation_results_county_level_june.R” • “centroid_coords_[Xp].csv” contains the coordinates of the centroid for the drift simulations, separated by zone and day. • “particle_distance_[Xp].csv” contains particle distance information for each 5km by 5km grid cell, separated by day and zone • “plots_p1_zone[1/2/3]_[Xp]_BW_border.pdf” contains black and white images of the results of the model simulations, separated by day and zone.
Shapefiles	<p>Folder with shapefiles needed for analyses</p> <ul style="list-style-type: none"> • “top5_buffered_counties_3km_3” is a shapefile with the buffered areas of each country-area
generate_ichthyop_release_dates.R	Rscript used to create the Ichthyop configuration files.
grid_simulation_results_county_level_june.R	Rscript used to process the Ichthyop output files to create “grid_simulation_results_6_[Xp].Rdata” .
calculate_distance_from_points_to_zone.R	Rscript used to process .Rdata files to calculate particle distance (“particle_distance_[Xp].csv”).
Ch2_Individual_Strandings_Drift_Simulations	Folder that contains the data for the drifter release study outlined in Santos et al. 2018b and Chapter 2 of Santos 2017.
0p of wind speed 2p of wind speed 4p of wind speed	<p>Folders that contains data from drift simulations with 0%/2%/4% of direct wind forcing, respectively.</p> <ul style="list-style-type: none"> • “Configuration_files” contains all the Ichthyop configuration files for this set of drift simulations. • “Outputs” contains all the Ichthyop output files for this set of drift simulations. <ul style="list-style-type: none"> • “dir.points.RDS” contains a subset of information from the drift simulation run that land in the target zone at any point in time. Created using “keep_interesting_particle_data.R” • “dir.result.RDS.reprocess.RDS” contains a subset of data from the “dir.points.RDS” file that meet all criteria as outlined in Santos et. al 2018b. Created using “posthoc_regridding_from_RDS.R”

	<ul style="list-style-type: none"> • “stranding.summaries_[Xp].RDS” contains the mortality location probability information for each individual stranding event. Created using “stranding.summaries.R” • “buffered_zones” contains the all the individual shapefiles with the buffered zone of each stranding event • “chesapeake_box.xml” contains the domain of the Chesapeake Bay used by Ichthyop. • “config.head2.template”, “config.mid2.template” and “config.tail.template” contains the templates used to create the configuration files.
Shapefiles	<p>Folder with shapefiles needed for analyses</p> <ul style="list-style-type: none"> • “3km_buffer” is a shapefile with the buffered areas of each individual stranding event • “ROMS_water_domain_polygon” is a shapefile that shows the extent of the water area within the ROMS domain • “stranding_subset” is a shapefile with a subset of the stranding data that meets all the criteria outlined in the model
Keep_interesting_particle_data.R	Rscript used to process output files from simulations and create a “.dir.points.RDS”
Buffered_stranding_zones.R	Rscript that creates buffered zones and configuration file for each individual stranding event
Subsetted_stranding_data.csv	Data on stranding events occurring in Virginia from 2009-2014 that were used in this study
Stranding.summaries.R	Rscript used to create “stranding.summaries_[Xp].RDS”
Extract_drift_duration_and_distance.R	Rscript that extracts drift time and distance from processed files
Drift_duration_and_distance_results_2p.csv	.Csv file with drift duration and distance. Calculated using results of drift simulations with 2% of wind speed. Created using “extract_drift_duration_and_distance_result.csv”
Ch2_Vessel_strike_analyses	Folder that contains data from the analyses on vessel strike stranding events outlined in Santos et al. 2018b and Santos 2017.
AIS_data	Folder with vessel density data from the Automatic Identification System (AIS) during the 2009-2014 period obtained from https://marinecadastre.gov/ais/ . Files created using “rasterize_AIS_data.R”
Domain_all_boatstrike	Folder that contains a .RDS file with the domain of all grid cells with any non-zero vessel strike death

	probability for all stranding events in that year. Results are separated by individual year.
Rasterize_AIS_data.R	Rscript that clips and rasterizes the AIS data downloaded from https://marinecadastre.gov/ais/ on a 5km2 grid
Monte_carlo_watercraft.R	Rscript to perform monte carlo randomization analysis on the predicted mortality locations of vessel strike stranding events.
Boatstrike_randomization_results_2p.csv	.csv file with the results from the monte carlo analysis on drift simulations results calculated with 2% of wind speed. File was produced using "monte_carlo_watercraft.R"
Calculate_combined_vessel_turtle_probability.R	Rscript that calculates the combined turtle-vessel probability layer for each year-month combination and sums it together, producing "combined_vessel_density_and_turtle_mortality_location_probability.RDS". Also creates a layer with just vessel density probability ("vessel_density_probability.RDS") and probability of mortality location of vessel strike turtles ("vessel_strike_turtle_probability.RDS"). All files are calculated using results of drift simulations with 2% of wind speed.
Combined_vessel_density_and_turtle_mortality_location_probability.RDS	Combined turtle-vessel probability layer for each year-month combination summed together. Calculated using results of drift simulations with 2% of wind speed. Created using "calculate_combined_vessel_turtle_probability.R"
Vessel_density_probability.RDS	Layer with vessel density probability. Calculated using results of drift simulations with 2% of wind speed. Created using "calculate_combined_vessel_turtle_probability.R"
Vessel_strike_turtle_probability.RDS	Layer with probability of mortality location of vessel strike turtles. Calculated using results of drift simulations with 2% of wind speed. Created using "calculate_combined_vessel_turtle_probability.R"
Supplement.Materials_model_and_experimental_data_comparison	Folder containing data on the comparison between drift simulation results and experimental results (from 2016 field study from Ch.1 of Santos 2017) as outlined in the Supplement Materials of Santos et al. 2018b.
Release stain	Folder with data from the release stain simulation
3km_buffered_areas.shp	Shapefile of a 3-km buffered area around each "stranding" event
0p of wind speed 2p of wind speed	Folders with data from the release stain drift simulation with 0%/2% of direct wind forcing, respectively

	<ul style="list-style-type: none"> • “Configuration_files” contains all of the Ichthyop configuration files for this set of drift simulations. • “Outputs” contains all of the output files for this set of drift simulations, including the .nc Ichthyop outputs and post-processed .RDS files • “chesapeake_box.xml” contains the domain of the Chesapeake Bay used by Ichthyop. • “config.head2.template”, “config.mid2.template” and “config.tail.template” contains the templates used to create the configuration files.
Grid_simulation_results.release_stain.R	Rscript used to process the ichthyop output files and create an .RDS file with trajectory results (in “outputs” folder)
deployment and stranding information.csv	Csv file with data on the beaching time of objects for each of the experimental drifter deployments
Drift_simulations	Folder with data on the drift simulations ran targeting the beaching location of the items from the experimental drifter study (Ch. 1 of Santos 2017)
Op of wind speed 2p of wind speed	<p>Folders with data from the drift simulations ran targeting the beaching location of the items from the experimental drifter study with 0%/2% of direct wind forcing, respectively</p> <ul style="list-style-type: none"> • “Configuration_files” contains all of the Ichthyop configuration files for this set of drift simulations. • “buffered_zones” contains the all the individual files with the buffered zone of each beaching event • “Outputs” contains all of the output files for this set of drift simulations, including the .nc Ichthyop outputs and post-processed .RDS files • “chesapeake_box.xml” contains the domain of the Chesapeake Bay used by Ichthyop. • “config.head2.template”, “config.mid2.template” and “config.tail.template” contains the templates used to create the configuration files. • “stranding_summaries_[X]p.2016_drifters” is a .RDS file with the final stranding probability. Calculated using “stranding_summaries.2016_drifters.R”
Grid_simulation_results.for_2016_drifters.R	Rscript used to process the output files, creating the [].dir.results.RDS files with simulation results
Stranding_summaries.2016_drifters.R	Rscript used to process the [].dir.results.RDS and calculate final stranding probability

Wind_inputs.2016_drifters	Folder with ROMS oceanographic inputs to Ichthyop for the drift simulations in this “Supplement.Materials_model_and_experimental_data_comparison” folder
Wind_inputs	Folder with ROMS oceanographic inputs to Ichthyop for the drift simulations at 0% (“ 0p_wind ” folder) and 2% (“ 2p_wind ” folder) of wind speed for all model runs <u>except</u> those in “Supplement.Materials_model_and_experimental_data_comparison”

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Keywords: sea turtle mortality, sea turtle decay, oceanographic simulations, sea turtle carcass drift model

Associated Publications:

Santos, B.S., Kaplan, D.M., Friedrichs, M.A.M., Barco, S.G., Mansfield, K.L., Manning, J.P. 2018a. Consequences of drift and carcass decomposition for estimating sea turtle mortality hotspots. *Ecological Indicators* 84:319-336.

Santos, B.S., Friedrichs, M.A.M., Rose, S., Barco, S.G., Kaplan, D.M. 2018b. Likely locations of sea turtle stranding mortality using experimentally-calibrated, time and space-specific drift models. *Biological Conservation* 226:127-143.

Santos, B.S. 2017. Integrating Empirical Data and Ocean Drift Models to Better Understand Sea Turtle Strandings in Virginia. Master’s Thesis, College of William and Mary, Virginia Institute of Marine Science, Paper 1516639566.