



# NOAA FISHERIES

## Social Sciences Branch

# Revenue-Intensity Raster Dataset

## Background Information

Under BOEM Interagency Agreement No. M12PG00028, the Social Sciences Branch developed a revenue-intensity raster dataset using fishery dependent landings' data, to produce a report on the socio-economic exposure of commercial fisheries to wind energy development in the U.S. Atlantic.

Revenue-intensity rasters were built as part of an effort to improve upon the spatial precision of self-reported Vessel Trip Report (VTR) fishing locations. Merging VTR information with data collected by at-sea fisheries observers, statistical models were developed to estimate cumulative distribution functions (CDF) for the distance between VTR points and observed set/haul locations. This method allows us to generate predictions for the spatial footprint of fishing based off of variables, such as gear type and length of trip, reported on the VTR, and theoretically linked to the trip's footprint.

This process was used to develop a fishing revenue-intensity raster dataset for the years 2007 through 2012, the period studied in the above-mentioned NMFS socio-economic impact report. For additional detail on the process of developing this raster dataset of "fishing footprints," see NOAA Tech Memo NE-229 (DePiper 2014).

## Developed By:

Social Sciences Branch  
NOAA Fisheries - Northeast Fisheries Science Center  
Woods Hole, MA  
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## Report Citation:

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## Contact Info:

Social Sciences Branch  
Northeast Fisheries Science Center  
NOAA National Marine Fisheries Service  
Woods Hole, MA

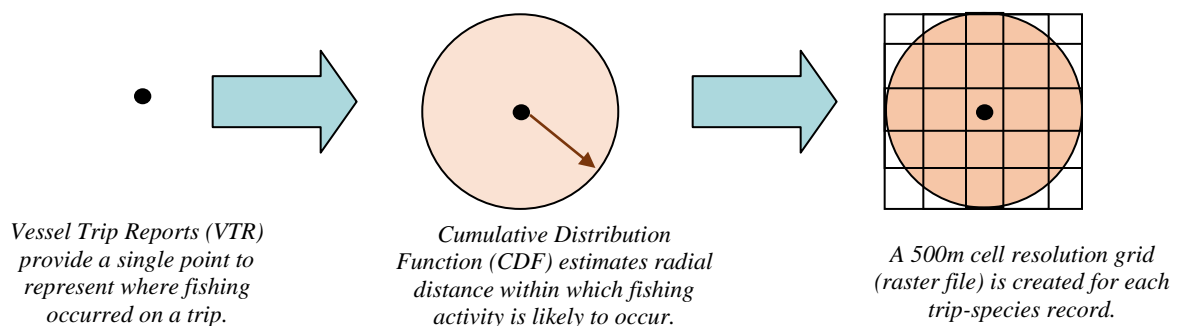
## Raster Metadata

Geographic Coordinate System:	GCS North American 1983
Projection:	Albers Conic Equal Area
Resolution:	500m cells
File format:	.TIF

## Notes on Rasters

Raster data provide a model of the world defined as a regular set of cells, usually squares in a grid pattern. This data format is used to represent [continuous spatial data](#) such as elevation, and the attribute value of each cell represents the value of that variable at a specific location (Bolstad, 2008). Additional general information on the raster data format can be found at the [ESRI ArcGIS Resources webpage](#) on raster data.

The rasters included in this dataset represent the intensity of landing revenue from federally-managed fisheries that were caught in U.S. federal waters. Fishing locations are documented in VTRs as single point locations. The value of revenue for that trip record is distributed over concentric circles centered on the reported point, and is stored in the raster file format. For each concentric circle, the radial distance from the point is determined by the previously mentioned CDF, which models the distance representing the 25, 50, 75, and 90 percentiles from the reported point location, conditional on the trip characteristics. Revenue from the trip is then proportionally attributed to the non-overlapping portions of the circles (i.e. the portion of the circle representing the 50<sup>th</sup> percentile which does not overlap with the circle representing the 25<sup>th</sup> percentile (A simplified visualization of this process is illustrated below.)



This method was used to create a raster database for all VTR data between 2007 and 2012, as part of the socio-economic analysis described in the report. These individual rasters are summed in groups determined by trip variables – species landed, homeport state of the vessel, etc. The individual trip raster files are not provided due to the prohibition on distributing Personally Identifiable Information (PII). However, individual trip information cannot be extracted from the summed revenue-intensity rasters included in this database. The summed subsets of rasters provided here allow enough detailed information on multiple user groups' fishing activity, while avoiding the risk of sharing confidential information.

## Using Revenue-Intensity Rasters

Raster files should be opened in spatial analysis software such as [ESRI ArcGIS](#) or [QGIS](#). It is inappropriate to attempt to view or analyze this type of file in programs that are not meant for spatial analysis, such as Microsoft Window's 'Preview', or Windows Explorer.

Rasters are built using all fishing records between 2007 and 2012, filtered by certain criteria depending upon the level of analysis. For example, "FMP" rasters are built using records for all fish caught under a single Fishery Management Plan, such as the Skates FMP.

This ReadMe file provides background information for working with rasters organized in the following five folders:

- Fishery Management Plan (FMP)
- Gears
- States
- top30\_exposed\_ports
- top30\_exposed\_spp

Fishery Management Plans (FMPs) are developed by the regional fishery management councils, such as the New England and Mid-Atlantic Fishery Management Councils (the [NEFMC](#) and [MAFMC](#), respectively). Plans are implemented by [NOAA's National Marine Fisheries Service](#). Some FMPs manage multiple species as a group

because they exhibit similar life histories, share habitat, or are fished by a single fleet. Some FMPs are jointly managed under both Councils.

For the FMP, Gear, and States groups, there are seven rasters for each category: one raster for each of the six years in that period and one raster that represents the sum of all fishing activity from 2007-2012. The last two sets of rasters refer to the 30 individual species and port groups which are the most exposed (in terms of landings revenue) to Wind Energy Areas, as described in the NMFS socio-economic impact report.

## Interpreting Raster Data & Caveats

The filtered rasters may occasionally lead to some confusion over what is represented. For example, the species-based rasters include all records of that species caught, using any gear type. Certain species are generally caught with one gear type but may be caught, less frequently, with other gears – for example, lobster pots occasionally catch groundfish species like Atlantic cod. Certain gears are prohibited from certain areas. However, a raster may indicate a small amount of fishing activity in the closure area for that species, if that species was caught using gear that is permitted in the closed area (such as hand or pot gear). Finally, certain gear category groups may include several gear types that are differentially affected by area closures.

The rasters are also accompanied by an Excel Spreadsheet ("Rasters\_Info\_Sheet") that lists additional information for each raster. The Excel file includes tabbed pages that match the five folders listed above; these pages list the individual rasters stored in those folders. The Excel file provides the Gear, FMP, Year, and States of the records used to build each of the summed rasters. In addition, it provides the number of active, unique permits; the number of individual trips; and the total sum of value represented by the raster file.

The Excel file also includes two tables "FMP\_Species" and "GearCat\_gears" which provide detail on the species included in each Fishery Management Plan, and each gear type included in each Gear Category. This information is provided to support interpretation of the raster data.

For those 30 most-exposed port groups and species rasters included in this dataset, “exposure” refers to those ports with the greatest landings revenue (in USD\$2012) from fish caught from within a Wind Energy Planning Area.

These rasters are a valuable resource to estimate relative intensity of fishing effort off the U.S. Atlantic coast. It is important to consider that the rasters **only** provide an historic approximation of fishing effort during the period 2007 through 2012, and should not be used to model future fishing behavior. They provide a historical reference, and thus will not reflect changes in coastal communities, fishery management plans, the health of fish stocks, the impacts of climate change, or other changes.

## List of Rasters Included in Dataset

### Fishery Management Plans (Total 105 rasters)

1 raster for total 2007-2012, and 1 raster for each of these years

Atlantic Herring	None
Bluefish	River Herring
Golden Tilefish	Sea Scallop
Large-Net Northeast Multispecies	Skates
Highly Migratory Species	Spiny Dogfish
Mackerel, Squid, Butterfish	Summer Flounder/Scup/Black Sea Bass
Monkfish	Surf Clam/Ocean Quahog
Small-Net Northeast Multispecies	

### Gear Categories (Total 77 rasters)

1 raster for total 2007-2012, and 1 raster for each of these years

Dredge	Seine
Scallop Dredge	Bottom Trawl
Gillnet	Scallop Bottom Trawl
Hand	Mid Water Trawl
Longline	Lobster Pot
Pot	

### States (Total 84 rasters)

1 raster for total 2007-2012, and 1 raster for each of those years, except where noted

CT	NH
DE (only for total for 2007-2012)	NJ
MA	NY
MD	RI
ME	SC
NC	VA

### Fishing Activity of Top 30 Exposed Port Groups (Total 30 rasters)

Exposure to Wind Energy Planning Areas - 1 raster for the years 2007-2012

CT - New London	NJ - Long Beach
CT - Stonington	NJ - Point Pleasant
MA - Chatham	NJ - Sea Isle City
MA - Fairhaven	NY - Freeport
MA - Gloucester	NY - Montauk
MA - New Bedford	NY - Point Lookout
MA - Westport	RI - Little Compton
MD - Ocean City	RI - Narragansett
NC - Engelhard	RI - Newport
NC - Oriental	RI - North Kingstown
NC - Wanchese	RI - Tiverton
NJ - Atlantic City	VA - Hampton
NJ - Barnegat	VA - Newport News
NJ - Belford	VA - Seaford
NJ - Cape May	VA - Virginia Beach

### Fishing Activity of Top 30 Exposed Species' (Total 30 rasters)

Exposure to Wind Energy Planning Areas - 1 raster for the years 2007-2012

(Big) Winter Skate	Loligo Squid
Bluefish	Atlantic Mackerel
Black Sea Bass	King Mackerel
Butterfish	Menhaden
Channel Whelk	Monkfish
Atlantic Cod	Ocean Quahog
Jonah Crab	Scup
Croaker	Sea Scallop
Spiny Dogfish	Silver Hake
Summer Flounder	Little Skate
Winter Flounder	Skates
Red Grouper	Vermillion Snapper
Red Hake	Illex Squid
Atlantic Herring	Surf Clam
Lobster	Yellowtail Flounder

### References

- Bolstad, Paul. *GIS Fundamentals: A First Text on Geographic Information Systems*. 3rd ed. White Bear Lake, MN: Eider, 2008.
- DePiper, Geret. June 2014. 'Statistically Assessing the Precision of Self-reported VTR Fishing Locations.' NOAA Technical Memorandum NOAA Tech Memo NMFS-NE-229. National Marine Fisheries Service.  
<http://www.nefsc.noaa.gov/publications/tm/tm229/>
- Kirkpatrick, A.J., S. Benjamin, G.S. DePiper, T. Murphy, S. Steinback, and C. Demarest. 2015. Socio-Economic Impact of Outer Continental Shelf Wind Energy Development on Fishing in the U.S. Atlantic. US Dept. of the Interior, Bureau of Ocean Energy Management, Atlantic OCS Region, Washington, DC. OCS Study BOEM 2015-xxx. xxx pp.