Synthesis of Commercial Trawl Fishing Effort Data
for Pacific Northwest Coast Ecoregional Assessment

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Introduction

This document describes the synthesis of commercial trawl fishing data for use in the Nature Conservancy's Offshore Ecoregional Assessment for the Pacific Northwest Coast. For a complete ecosystem-based assessment, it is necessary to include information about human uses of the marine environment in tandem with the biological and physical ecosystem components.

Commercial trawl fishing is only one of the many types of commercial and recreational fishing occurring in this region that should be considered within an ecoregional assessment. However, it is the only type of fishing that has detailed spatial information on the location of the fishing activity. Other types of fishing, such as commercial longline or pot/trap are only tracked at the port where fish are landed, and therefore offer minimal information about the location of fishing activity.

Source Data

On the West Coast, logbooks recording commercial trawl fishing data are kept by fishermen and collected by state fish and wildlife agencies. These data are then transferred to a central, standardized database, Pacific Fisheries Information System (PACFIN), which is housed and managed by Pacific States Marine Fisheries Commission (PSMFC). PACFIN contains coastwide data on trawling locations, hours towed, and species caught during trawling for the years 1987 to the present. See the PACFIN website, http://www.psmfc.org/pacfin/index.html, for more detail about the database.

The original logbook data are confidential and cannot be accessed directly by individuals or organizations outside of the management agencies. However, it is possible for outside entities to receive data that has been spatially and temporally summarized in a way that protects the confidential information.

For the ecoregional planning process, The Nature Conservancy (TNC) is primarily interested in the current spatial patterns of fishing effort. Because a single year may not be indicative of fishing patterns, we acquired data covering the most recent seven years of logbook data, 2000-2006. The data were provided by PACFIN as total trawl hours summarized by 5-minute latitude/longitude blocks. Effort data are categorized by general gear group, bottom trawl or midwater trawl. [Note that effort data for the large offshore midwater trawl fishery for Pacific whiting is not included in the PACFIN database].

In order to protect confidentiality, any 5-minute block with fewer than three vessels was omitted from the data provided to TNC. Based on annual statistics provided by PSMFC, this results in approximately 9% of the total annual trawl hours being omitted from the non-confidential data set (Figure 1). From a spatial standpoint, confidential blocks account for approximately 40% of all blocks that contain fishing effort (Figure 2). The spatial distribution of commercial trawl fishing effort is significantly under-represented using the non-confidential data, but the time spent fishing in those blocks is less than 10% of the total annual hours of fishing. [Note that these statistics are for the entire west coast, including Washington, Oregon, and California].

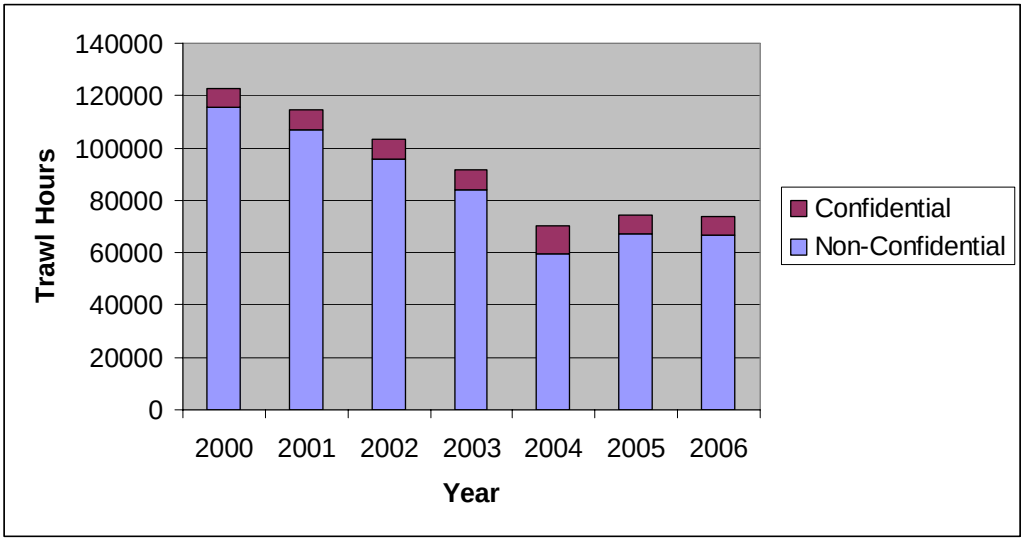

Figure 1. Annual West Coast Trawl Hours for Confidential and Non-Confidential Logbook Data

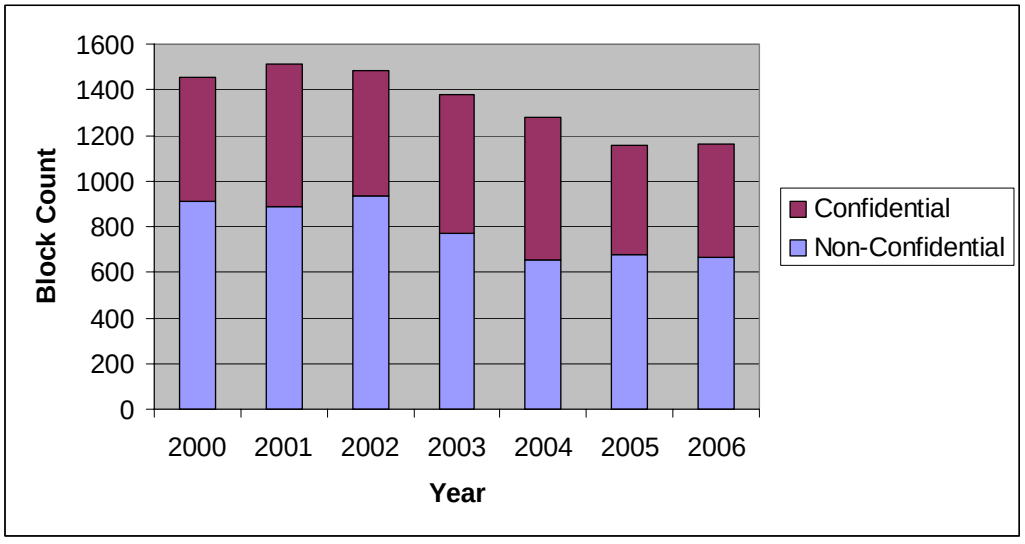

Figure 2: Annual 5-Minute Block Count for Confidential and Non-Confidential Logbook Data

Fishing Effort Data Synthesis

The source data were reviewed to assess spatial and temporal patterns of fishing effort that may be helpful to capture within the ecoregional planning process. Spatial management of trawl (and other) fisheries has changed significantly during the time period represented by these data. In fall of 2002, the first Rockfish Conservation Area (RCA) was put into place, and since that time, fairly extensive closure areas or spatially-explicit gear restrictions have been added, although the spatial extent of some areas may change seasonally. See National Marine Fisheries Service, Northwest Regional Office's Groundfish Closure website for more detail on current and historic closures: http://www.nwr.noaa.gov/Groundfish-Halibut/Groundfish-Fishery-Management/Groundfish-Closed-Areas/Index.cfm. In 2003, there was a federal voluntary capacity reduction of trawl vessels, (referred to as the buyback), that required that participants surrender their permits and these vessels be removed from the groundfish trawl fishing fleet by the end of 2003.

Based on the data (Figure 1), and the regulatory history, the effort data were compiled into two separate indexes to depict spatial patterns of trawl effort before and after initiation of spatial management measures and the buyback. Because 2003 was clearly a transition year, (because the buyback was initiated but not complete), it was not included in these multi-year indexes. The index for "before" extensive spatial management includes the years 2000-2002 (Figure 3), and the index for "after" spatial management includes 2004-2006 (Figure 4). The data synthesis also includes a midwater and bottom trawl index of trawl effort for the entire time period of the data, 2000-2006, in order to provide a perspective on the relative importance of each area, regardless of the regulatory environment. The index for each 5-minute cell is calculated as the total hours of effort within that time period, divided by the maximum total for that period, creating a relative effort value which ranges from 0 to 1.

The total number of years that a 5-minute block has had fishing effort is also an indication of the importance of an area for trawl fishing over the long term. This statistic was compiled for each gear group, bottom and midwater trawl, as well as for all gear types. This value was calculated as an index as well – the number of years with fishing effort divided by the maximum (which in this case is 7). One could also set a threshold to indicate the most important areas over time, such as blocks that have had trawl fishing at least 5 of the past 7 years.

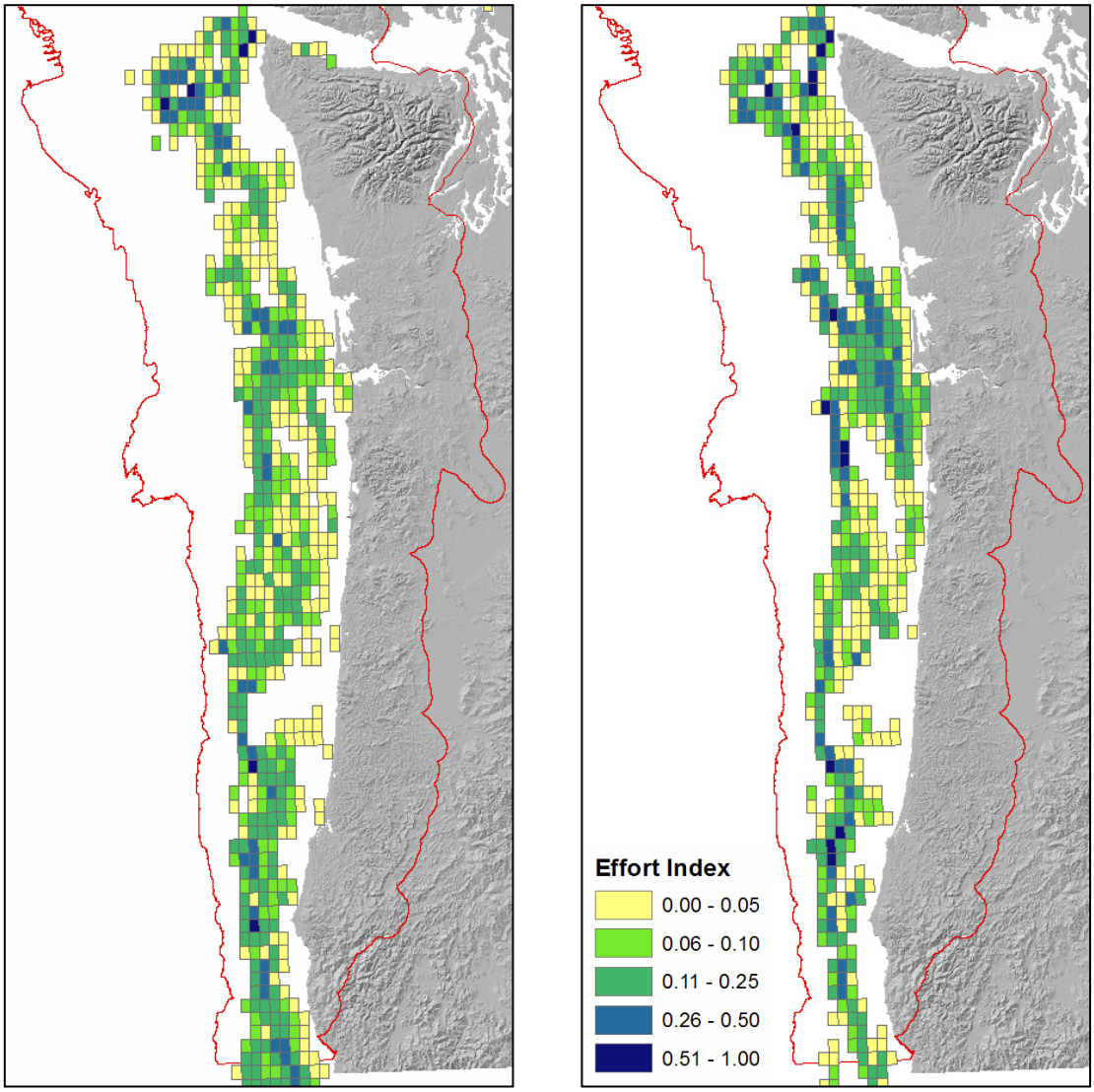

Figure 3. Multi-year index of bottom trawl effort, (a) 2000 – 2002, (b) 2004 – 2006.

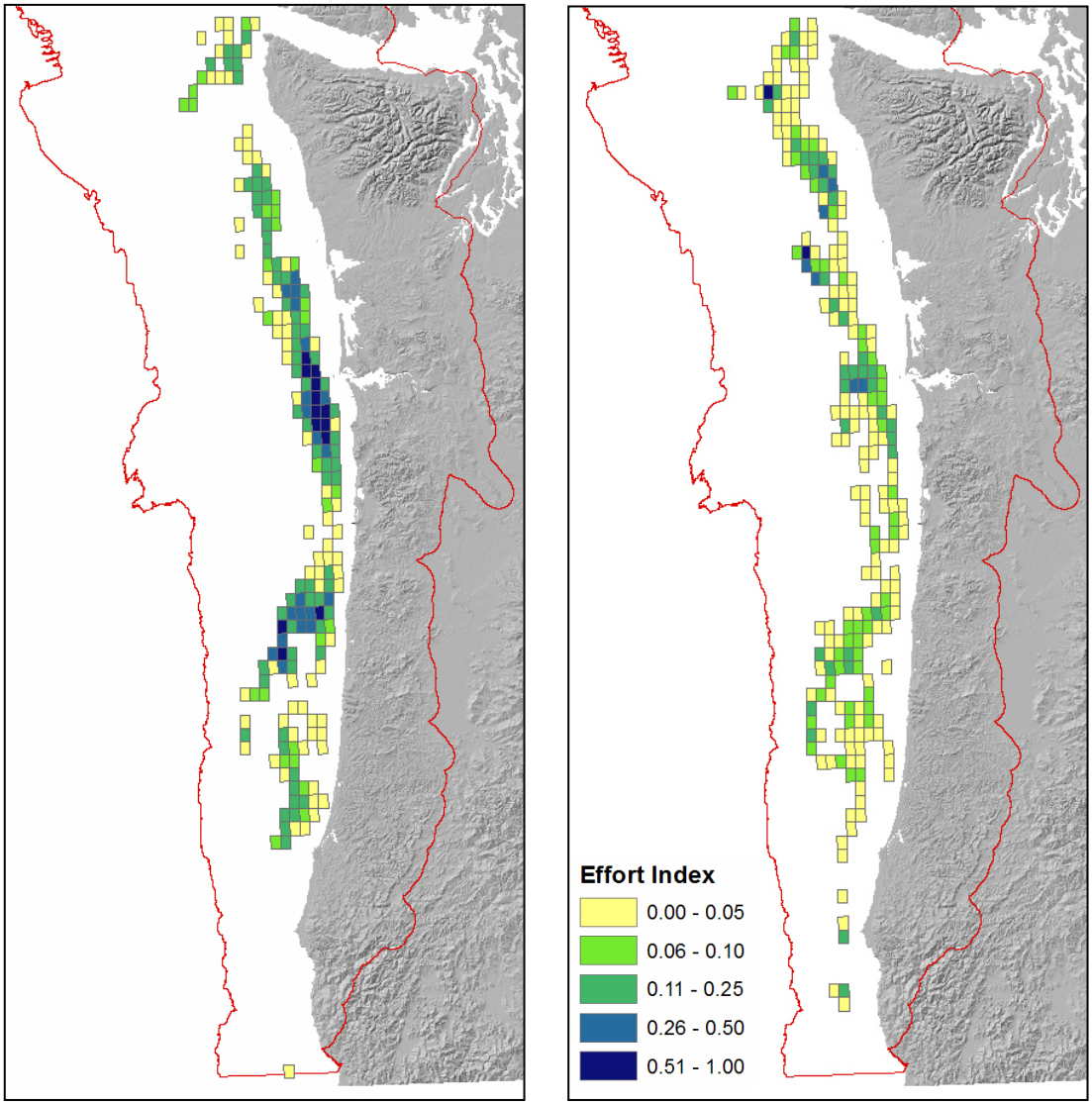

Figure 4. Multi-year index of midwater trawl effort. (a) 2000 – 2002, (b) 2004 – 2006.

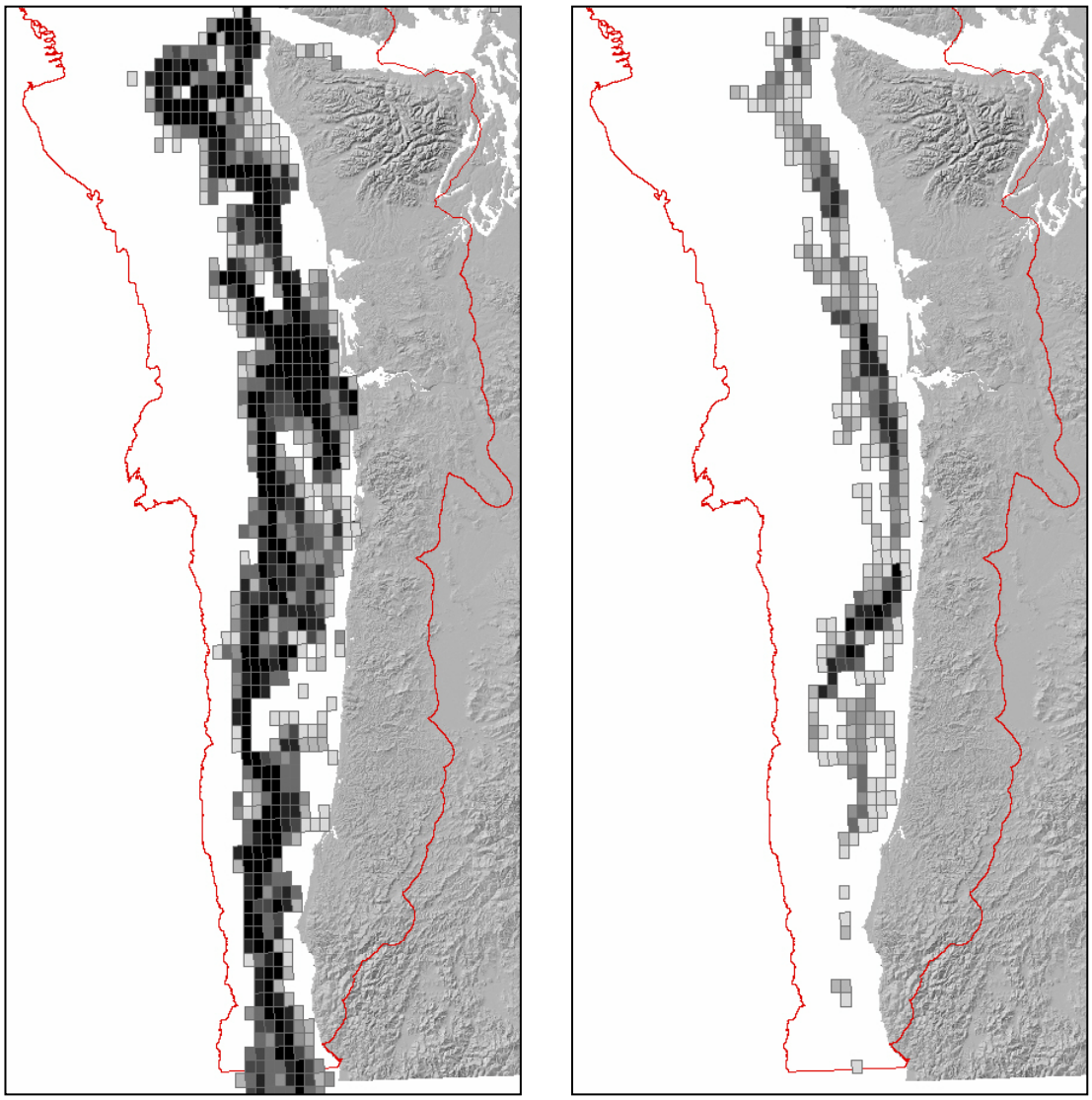

Figure 5. Number of years with trawling within 5-minute blocks, 2000 – 2006.
(a) bottom trawl (b) midwater trawl

Annual Catch Data

PACFIN also provided a summary table of annual species catch by year and gear type. These data provide an overview of the predominant species that were targeted and harvested in the commercial trawl fisheries from 2000 - 2006. Figure 6 shows the species comprising 90% of the total annual catch for bottom trawl fisheries. The term "Nominal", (abbreviated as Nom.), indicates that the particular species was targeted, but it is not known if 100% of the catch can be attributed to that species. Dover sole, sablefish, arrowtooth flounder, and petrale sole are the predominant species of the annual bottom trawl catch. Pacific whiting comprises 90-99% of the annual midwater trawl catch, depending on the year.

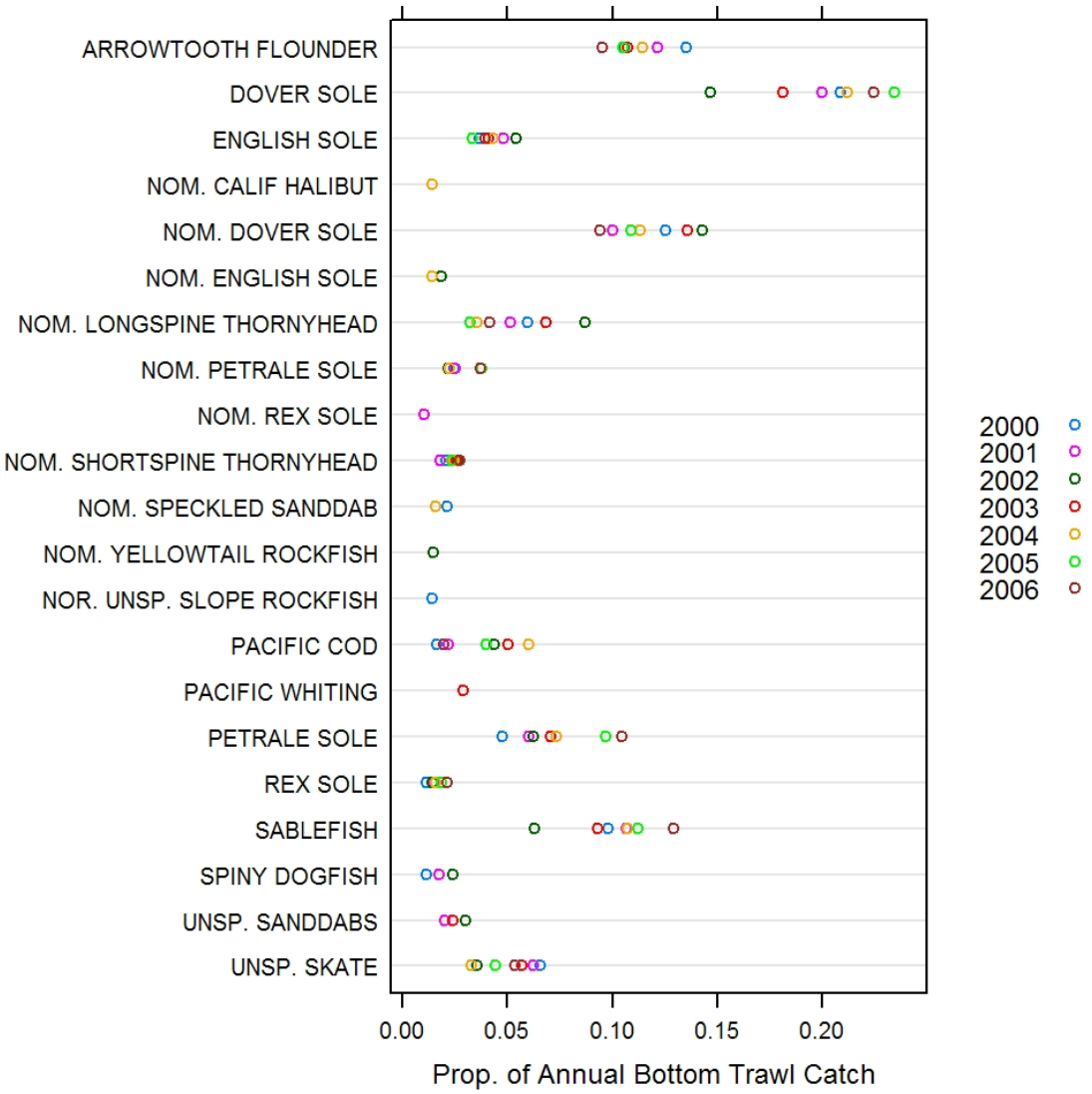

Figure 6. Species comprising 90% of total commercial bottom trawl catch, 2000 – 2006.

Recommendations

Several indexes of commercial trawl fishing effort have been developed through this project. If TNC is most concerned with current areas of fishing effort, within the current spatial management regime, the indexes representing the years 2004 – 2006 are the most appropriate to use for this process. However, if TNC would like to get an indication of all the potentially important fishing areas regardless of the spatial management measures, it will be useful to include the indexes for 2000 – 2002 or the indexes encompassing the entire time period, 2000 – 2006. In addition, the year count by 5-minute block provides a view into the areas that have been consistently fished in the last 7 years, throughout the changes in the spatial management and the decrease in the size of the fleet. Compiling boundaries of the spatial management areas will provide insight into the change in the areas that are fished. Finally, some sensitivity analysis and comparisons with the various inputs and outputs to the MARXAN modeling software will help inform the choice of index(es) to be used.

Data Deliverables

The following data and associated files are delivered with this report:

(1) lb_trawl.mdb: a personal geodatabase containing three items:
- lbk5x5yr: source effort data table from PACFIN
- cell5x5min: 5-minute latitude/longitude blocks
- lb5x5_min: spatial synthesis of effort data into 5-minute lat/long blocks

(2) Plain text FGDC metadata for spatial data:
- cell5x5min_metadata.txt
- lb5x5_dat_metadata.txt

(3) ArcGIS layer files to assist in visualizing fishing effort indices:
- Multi Year Indexes.lyr
- Multi Year Trawl Hours.lyr
- Year Counts.ly

(4) wcCatch_Pacfin.xls: PACFIN summary data of annual species catch by year and gear type