Catch-In-Areas TRENDS database

The Trends database was developed to provide NMFS analysts with consistent spatial data on groundfish harvests from 1992 to 2013. The spatial resolution of Trends is approximately 7.5 km, the same spatial resolution as the Catch-In-Areas production database.

The Trends database is based on two existing databases: the Blend, a processor-based database covering the years from 1992 to 2002; and the Catch Accounting database, a similar but more detailed database that covers the years from 2003 to the present. The Blend catalogs data on harvests by date of haul and week-ending date and identifies the processer, target species, weight of catch, species retained, species discarded, harvest sector, gear, and NMFS reporting area. The Catch Accounting database adds to these categories data on specific vessels (catcher vessels and catcher-processors) while retaining statistics on the processors. The Blend and Catch Accounting databases have the spatial resolution of a NMFS Reporting Area.

To increase the spatial resolution to 7.5 km, we used a combination of data from the Observer Program and from Alaska Department of Fish and Game Fish Tickets. Earlier attempts to increase the spatial resolution met with limited success, as many of the fishing areas for the smaller catcher vessels were not captured by observer data alone. This limitation occurs for two reasons: first, vessels less than 60 feet are not observed; and second, the larger, observed vessels frequently use trawl gear and are therefore restricted from areas where the smaller vessel fishing fleets fish with hook-and-line, pot, and jig gear.

To capture both the observed and unobserved fleets, we used Fish Ticket and Observer datasets made available by AKFIN along with their respective user guides.

Observer data

About the dataset: The dataset includes observer locations of fishing recorded by latitude and longitude along with species caught, target fisheries, data and time, harvest sector, processor id, gear type and more.

The observer data was processed by a geographic information system using the deploy location (when available) and the retrieve location. These latitude and longitude points were connected via a line and then intersected (overlaid) onto the Catch-In-Area's grid ID polygons. This line-to-polygon overlay operation assigned the grid-IDs to the observed catch locations.

If a single grid-ID was assigned to a line during the overlay operation, the percent-in-grid is 1. If more than one grid-ID was assigned in the overlay operation, the database calculated the percent of the line in each grid-ID based on line length in each of the grid-iIDs; if one grid-ID holds ¼ of the total line length and another ¾, the percentages of catch associated with the grid-IDs were respectively .25 and .75.

Integrating ADF&G Fish Ticket Data and Essential Fish Habitat (EFH) Data

Essential Fish Habitat (EFH) data.

About the dataset: Essential Fish Habitats (EFH) are species-related areas that were identified as EFH in the 2006 EFH EIS. Trends selected the EFH of each of these species and related the EFH species to a respective target fishery. For instance Pacific cod EFH was related to the Pacific cod target fishery. Since observer and survey data were heavily relied upon when building the EFH areas, Trends appends the state statistical inside waters to EFH. Note that these inside waters state statistical areas were only selected when the fish ticket references that statistical area.

ADF&G Fish Ticket data

About the dataset: Data includes Alaska Department of Fish and Game Fish Tickets by state statistical areas from 1992 to 2013. Two subsets of fish ticket data were created due to a State Statistical Area change in 2001; one set of fish ticket data was created for 1992 – 2000 and another set for 2001 to 2013. Data has similar variables to the observer data such as vessel id, target fishery, gear, harvest sector, and date period but instead of reporting a latitude and longitude, only state statistical areas are reported. A state statistical area is one degree in longitude and ½ degree in latitude – an area approximately 30x33 nautical miles wide. Approximately sixty-four grid ids fit inside one outside waters state statistical area.

To prepare the fish ticket data for Trends, we selected the grid-IDs by state statistical area by each of the target fisheries. We then sub-selected the grid-ids but only when they overlapped Essential Fish Habitat for the specified target-species. This process created a database by target fishery when 1) a fish ticket's state statistical area was listed; and 2) the grid-IDs overlaps the EFH target-species as indicated on the fish ticket.

In order to apply the catch from the fish ticket grid-IDs (with the sub-selection for EFH as identified above), we programmatically counted the number of grid-IDs selected by each state statistical area and created a divisor. If eight grid-IDs were selected for a given state statistical area, then 1/8 of the catch was apportioned to each of the grid-ids in that state statistical area. If all 64 grid-IDs were selected for a given state statistical area, then 1/64 was applied to each of the 64 grid-IDs in that state statistical area.

Matching to the Blend-CA using Observer and Fish Ticket data.

Data was matched to the Blend-CA by in an iterative manner. Data was grouped by set of variables such as vessel id, week, target, NMFS reporting area, and gear type. When the variables match, exactly, between the Blend-CA and the Observer or Fish Ticket data, the grid-IDs are applied for those records. Not all the data was matched in first set of groupings. In fact, thirty-two sets of groupings were made to match all the data; with each iteration a slightly more granular set of grouping variables were applied. When data is matched, it no longer is a candidate for matching within the Blend-CA. Each iterative step was cataloged and annotated in a metadata column that resides in the final table.

Matching data by Observer data when source is observed

The first sets of grouping variables used to match the observer data to the Blend-CA data were selected when the report type in Blend-CA was observed and the haul-date, vessel-id, target, harvest sector, gear type, and reporting area match the same set of observed variables. The next grouping was slightly more granular – dropping the requirement for the actual haul-date and replacing it with week-ending-date. The next grouping is even more granular. Here the data was grouped by haul date, reporting area, target, gear type, processor-id, and harvest sector but without the vessel-id. Ever more granular groupings continue until almost the entire observer database was matched to the Blend-CA. Keep in mind that the Blend data (1992-2002) was a processor based dataset and did not include a vessel-id for catcher vessels.

Matching data by Fish Ticket Data when source is Fish Ticket

The Fish Ticket data was matched in a similar way to the observer data but instead of the source in Blend-CA having a requirement to be observed; only unobserved fish tickets were selected as the data source. The grouping variables remain nearly the same as the observer data. They are also applied in an iterative fashion with increasing granularity. The matching iterations were applied until the process was exhausted and no more group matching could be made.

Matching data by Observer data

The final step matched the last of the unmatched catch in the Blend-CA by a series of extrapolations using only the observer data. This was handled in the same way as observer and fish ticket data but without a restriction on the source of the data in Blend-CA. This final step accounts for the unobserved catcher-processors.

Testing TRENDS

The testing procedure was a design element of Trends from its inception. Testing was implemented by consistently running the Trends database creation procedures from 1992 – 2013, even though our production Catch-In-Areas database already provided us with peer reviewed data from 2003 to present. Producing this comprehensive Trends database through 2013 provided us with an entire decade of overlapping catch. This overlap was an excellent comparative testing platform. Further, Trends, like the production Catch-In-Ares, incorporates an embedded metadata column that specifies what step (1-32) was used to capture the data.

The final testing procedure involved querying both Trends and the production Catch-In-Areas datasets by the same set variables such as date, target fishery, gear type, harvest sector, reporting area, inside and outside state waters, steller sea lion zone at 0-3nm, 3-10nm, 10-20nm, outside of Critical Habitat by the sum of catch. The tables below provide a summary of those testing results for the Aleutian Islands sub area. In short the Trends database closely matches the production Catch-In-Area database and accounts for the catch in the Blend and Catch Accounting.

Aleutians Islands ALL Groundfish Fisheries: Average 2004-2012

Trends Tons	Catch In Areas Tons	Steller Zone	Difference	% of Total
611	521	0-3	-15%	0.45%
39,689	40,933	10-20nm	3%	35.49%
15,625	14,835	3-10nm	-5%	12.86%
57,709	58,484	OutsideCH	1%	50.70%
934	579	Sequam	-38%	0.50%
114,568	115,352	Total	1%	100.00%

Aleutians Islands Atka Mackerel Fishery: Average 2004-2012

Trends Tons	Catch In Areas Tons	Steller Zone	Difference	% of Total
13	2	0-3	-87%	0.00%
19,195	19,205	10-20nm	0%	28.69%
816	658	3-10nm	-19%	0.98%
46,759	46,936	OutsideCH	0%	70.12%
154	137	Sequam	-11%	0.21%
66,937	66,937	Total	0%	100.00%

Aleutians Islands Pacific Cod Fishery - ALL Gear Types: Average 2004-2012

Trends Tons	Catch In Areas Tons	Steller Zone	Difference	% of Total
409	289	0-3	-29%	1.12%
12,031	12,719	10-20nm	6%	49.19%
8,426	8,433	3-10nm	0%	32.62%
3,973	4,403	OutsideCH	11%	17.03%
314	11	Sequam	-96%	0.04%
25,152	25,856	Total	3%	100.00%

Aleutians Islands Pacific Cod Fishery-HAL and Pot: Average 2004-12

Trends Tons	Catch In Areas Tons	Steller Zone	Difference	% of Total
138	225	0-3	63%	3.48%
1,842	1,784	10-20nm	-3%	27.62%
2,732	3,417	3-10nm	25%	52.91%
1,038	1,032	OutsideCH	-1%	15.98%
6	1	Sequam	-86%	0.01%
5,755	6,459	Total	12%	100.00%

Aleutians Islands Pacific Cod Fishery - Trawl: Average 2004-2012

Trends Tons	Catch In Areas Tons	Steller Zone	Difference	% of Total
268	63	0-3	-77%	0.32%
10,179	10,925	10-20nm	7%	56.40%
5,677	5,000	3-10nm	-12%	25.82%
2,935	3,371	OutsideCH	15%	17.40%
308	10	Sequam	-97%	0.05%
19,366	19,369	Total	0%	100.00%