Online Data Platform: An interactive fisheries management tool

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Abstract:

This paper introduces the online data platform developed to showcase the characteristics of Pakistan fisheries, primarily drift/gillnet fisheries by providing a spatial inventory on catch and bycatch data collected from the crew-based observer program. The online data platform is an interactive tool, which allows fisheries managers to articulate queries and infer results based on the choice of parameters, and characteristics of a or type of fisheries. The online data platform comprises of data collected from five crew observers from four vessels which had the longest period/duration of data collection (five years). By the end of the five-year period, a total of 3,800 sets have been recorded, which means that a total of 3,800 entries have been made into the online data platform, as each set is comprised of a soak time of 12 hours. Four vessels, having an average length of xx m, and length of net xx Km participated in the program. A preliminary analysis from the platform showcases that 70 per cent of the catch was composed of tunas (neritic and tropical), whereas the remaining 30 per cent comprised of other teleosts, sharks, and mobulids/rays, sea turtles and marine mammals. The online platform allows to disaggregate data by set, month, and year and even different gear setting, such as surface and sub-surface. This allows to compare catch data in different seasons, area, gear setting and with overlay of important information such as physical and chemical parameters would allow to identify hot spots and areas of higher aggregation. The online data platform is still in its development phase, and work in progress, with tiers of information being added to make it a fishery manager interactive tool.

Introduction:

Tuna and tuna like fishes are key components of pelagic resources, comprising both neritic and oceanic species. There are around 709 tuna gillnet boats which operate in the EEZ of Pakistan (Wasim, 2017). These vessels target large pelagic resources and contribute to around 26.9% of the marine capture fish production, of which the major share belongs to tunas (70%). Among tunas are, tropical species such as yellowfin (33.3%), and skipjack (1.6%), whereas the neritic species include longtail (29.7%), frigate (19.6%), tuna-nei (8.5%) and kawakawa (7.6%). There have been speculations of changing of fishing grounds and drastic increase in fishing operations in the coastal area resulting in changing in the composition of tuna landings in Pakistan. There have been attempts made for reconciliation of this information through the programme run by WWF-Pakistan on the crew-based observers or self-reporting system (Moazzam, 2017).

The data collected through the crew based observer programme is collated and entered in an online data platform, based in Arc GIS for updating a spatial inventory of the observer data base. WWF-Pakistan has included 5 observers namely Ismail, Nisar, Shah Zameen, Saeed Zaman and Iqrar as they have consistent data for five years that 2012-2017. The spatial data base also includes physical parameters, such as ocean surface temperature, DO levels, Chlorophyll concentrations etc. to identify the correlations between the catch, the fishing grounds and related physical parameters.

The data platform also defines the skipper trend of catch and bycatch, fishing grounds, use of different gears such as surface gillnetting, sub-surface gillnetting, bottom set gill netting, and trawling and the increase and decrease of target catch. The platform also visualizes the catch and sighting data of ETP species, helping define hotspots of the large cetaceans and their interaction with tuna gillnetters.

Methodology:

Raw Data:

The raw data from 05 observers from 04 fishing vessels was downloaded and entered into an excel master sheet. This master sheet was analysed, customized and converted into shapefile (.shp) to upload on the ArcGIS online (AGOL). The master sheet consisted of 16 columns, with information of catch and bycatch data, fishing location longitude and latitude, observer name, trip ID, date of catch retrieval, quantity and weight of catch and bycatch as given below

	A	B	C	D	E	F	G	H	I	J	K	L	M	N	O	P
1	E#	OS#	Observer Name	FLID	Date	Year	Mon	Day	Lat	Long	Fishing Method	Category	Fish type	QTY	WGT	Status
3707	8472	2195	Shah Zameen	FLID-13	2/7/2013	2013	2	7	22.13.494	65.39.607	SUGN	TU	TUSJ	1	6	RE
3708	8478	37	Iqrar	FLID-07	2/19/2013	2013	2	19	65.43	24.05	SUGN	TU	TUSJ	1	3	RE
3709	8479	222	Iqrar	FLID-07	12/1/2013	2013	12	1	64.01.837	22.27.901	SUGN	TU	TUSJ	1	4	RE
3710	8481	3239	Syed Zaman	FLID-15	12/23/2013	2013	12	23	23.01.700	66.28.480	SUGN	TU	TUSJ	1	3	RE
3711	8482	3246	Syed Zaman	FLID-15	12/30/2013	2013	12	30	22.45.370	65.53.330	SUGN	TU	TUSJ	1	6	RE
3712	8483	217	Iqrar	FLID-07	11/26/2013	2013	11	26	64.03.658	23.08.332	SUGN	TU	TUSJ	1	4	RE
3713	8491	3243	Syed Zaman	FLID-15	12/27/2013	2013	12	27	23.16.900	66.58.270	SUGN	TU	TUSJ	1	3	RE
3714	8496	1185	Ismail	FLID-10	2/27/2013	2013	2	27	23.04.370	66.16.030	SUGN	TU	TUSJ	1	4	RE
3715	8497	1365	Ismail	FLID-10	12/22/2013	2013	12	22	21.48.120	65.19.678	SUGN	TU	TUSJ	1	4	RE
3716	8499	2187	Shah Zameen	FLID-13	1/29/2013	2013	1	29	21.29.010	63.53.900	SUGN	TU	TUSJ	1	3	RE
3717	8501	28	Iqrar	FLID-07	2/10/2013	2013	2	10	66	24.21	SUGN	TU	TUSJ	1	9	RE
3718	8503	2189	Shah Zameen	FLID-13	2/1/2013	2013	2	1	21.46.314	65.13.800	SUGN	TU	TUSJ	1	3	RE
3719	8504	2191	Shah Zameen	FLID-13	2/3/2013	2013	2	3	21.53.041	65.24.150	SUGN	TU	TUSJ	1	2	RE
3720	8505	2341	Shah Zameen	FLID-13	12/6/2013	2013	12	6	22.13.300	64.18.718	SUGN	TU	TUSJ	1	3	RE
3721	8507	3242	Syed Zaman	FLID-15	12/26/2013	2013	12	26	23.05.900	66.23.300	SUGN	TU	TUSJ	1	4	RE
3722	8510	30	Iqrar	FLID-07	2/12/2013	2013	2	12	65.49	24.29	SUGN	TU	TUSJ	1	7	RE
3723	8514	2165	Shah Zameen	FLID-13	1/6/2013	2013	1	6	22.07.918	65.41.348	SUGN	TU	TUSJ	1	5	RE
3724	8515	3237	Syed Zaman	FLID-15	12/21/2013	2013	12	21	23.06.550	66.26.400	SUGN	TU	TUSJ	1	3	RE

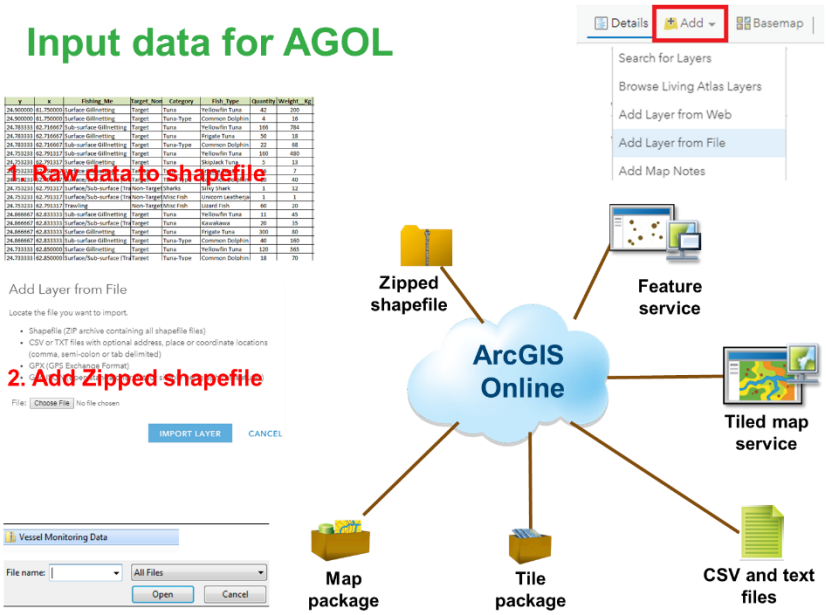
OBDB | Code

Online Spatial Inventory:

The spatial data platform was made using the online GIS tool named ArcGIS online. It is a cloud based mapping and analysis solution which is used to develop maps, analyze data, create web apps and share. This online tool can be used on various platforms but not limited to Tablets, Smart phones, desktop etc. Some services of the ArcGIS Online include publish maps and data without any additional software, publish data as shape files, tiles or features, create a service, edit features and also configure maps and additional services tailored to suit the usability of the application.

Input Mechanism:

The interface of ArcGIS online is very simple and easy to use. The inputs can be in any format such as csv, zipped shapefile, gpx or geoJSON. Input data can be viewed in the legend and its symbology can also be changed. Users can also add data from available online sources like ArcGIS Online Living Atlas and use basemaps of their own choice.



Outputs:

The web application provides in time and accurate results to its users. Users can click and get information of specific data, known as pop up result. Or they can visualize results on the map and can view the associated attributes in the form of table. AGOL also allows its users to perform cluster analysis on the data.

Additional Services/Packages:

Physical parameters of the Indian Ocean were also added to the spatial inventory such as dissolved oxygen, chlorophyll levels, salinity, and Sea surface temperature to compare the catch data and linking them to the hotpots of catch and bycatch.

Security Features:

An admin panel is also available for sharing and editing of information present on the spatial inventory for regional countries to add data as required but requires an authenticated AGOL user ID and login for accessing and editing data present for data security purposes.

Sharing:

The web application can also be shared on different levels, either it can be accessed publically or in specific online groups or restricted users.

Discussion and Conclusion

The online data platform offers something unique for Pakistan in the sense that all catch and bycatch data is stored in one place which can be assessed spatially. Vessel movements, activity, fishing sets, its

concentration, catch and bycatch data based on sets or by species can be segregated much easily, and in addition different gear setting plots can also be easily plotted on the maps in different timelines. Information can generally be filtered on the basis of need and the fishery managers can play with the interactive tool to evaluate hot spots, highly aggregation areas, and other observations can be strengthened by evaluating the different physical and chemical parameters which can identify areas of concentration of fish and why the fishing effort is concentrated in diferent.

The online platform can also help answer several questions regarding whether bycatch varies by area or not, by looking at different species entanglements in driftnet gillnet fishery and can help understand the nature of not just the species but also the nature of the fishery and its movements.

WWF-Pakistan will soon be launching the dashboard, which would provide much more details based integration of other sources of data and allowing other scientists to also contribute.