fishRman: A Shiny R Dashboard improving Global Fishing Watch data availability

Pasquale Buonomo[1]

1 Open-Source for Marine and Ocean Sciences (OSMOS)

Summary

One of the burdens of fisheries scientists is the scarcity or lack of consistent, extensive data on the subject. When such data do exist, they are often only available:

- To universities or other research institutions;
- Through bureaucratic ordeals;
- For a fee.

This issue has been tackled by Global Fishing Watch, an independent, international, non-profit organization promoting ocean sustainability through greater transparency, visualizing, tracking and sharing data about global fishing activity for free (Global Fishing Watch, 2021).

While the datasets are indeed publicly available, they are also rather large and quite difficult to manage, since they require proficiency in coding. In fact, at present, the most notable reading material instructing on the use of the datasets targets an audience who is proficient in the languages R (Clavelle, 2019a), Python, JavaScript (Clavelle, 2019b), or SQL (Mayorga, 2018) to download, filter, summarise, and visualise the data.

Statement of need

Life sciences will soon need a widespread integration of computational approaches to store, manage, analyse, and visualise datasets that are quickly growing in size and complexity (Carey et al., 2019). This is rather concerning, given how, although the number of published papers reporting the use of the R statistical language (R Core Team, 2013) increased fivefold from 2007 to 2018 in the field of ecology (Lai et al., 2019), most life science majors do not offer basic programming courses (Mariano et al., 2019).

Designed with ease of use in mind, `fishRman` is intended for a public of researchers, students, managers, and stakeholders in the fields of fisheries science, life sciences, and economics, with little to no proficiency in programming, data analysis, or both, who intend to query, download, filter, analyse, and visualise Global Fishing Watch data.

Users who can program in R may also benefit from the software to avoid writing lines of code for what has already been implemented in the dashboard, in order to focus on other aspects of their research, or even customize the source code to better meet their specific needs.

Users with a deeper understanding of statistics and fisheries science, and with prior knowledge of the datasets, only need to get acquainted with the software, while users that are new to the field can easily learn what they need to know via `fishRman`'s official instructions for use, the Handbook. Regardless of the prior knowledge of the user, reading the Handbook, which

is available in the software itself and in the GitHub repository, is key to the correct usage of the software.

The user-friendly interface (Attali, 2020; Bailey, 2015; Chang et al., 2021; Perrier et al., 2021) allows users to easily interact with the SQL query constructor, seamlessly building (Arel-Bundock et al., 2018; Gagolewski, 2020; Hester, 2020) and running queries (R Special Interest Group on Databases (R-SIG-DB) et al., 2021; Wickham & Bryan, 2020). In a few clicks, users are able to analyse retrieved data in several different ways, such as:

- visualising the top n-th percentile of the dataframe for any percentage (Becker et al., 2018; Garnier et al., 2021; Pebesma, 2018; Wickham, 2016), a key passage in assessing how fishing effort overlaps fishing stocks, protected or restricted areas, or another country's jurisdiction.
- calculating the fishing effort exerted by specific countries via certain geartypes, in precise areas. This is vital in assessing who is fishing where, when, and how they are doing it, so that fisheries management plans can address the right issues even at an international level with a clear understanding of each country's responsibilities.
- producing time series of fishing effort with a daily, monthly, or yearly frequency (Wickham et al., 2019, 2021), which is indispensable when searching for patterns to compare to species' life-cycles, seafood prices over the years, compliance to maritime and market laws, and overall consistency with data from third-parties.

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