Global Fishing Watch

Global Fishing Watch recommendations for NSIN & NGA: Global Fishing Forecast Grand Challenge

NSIN & NGA: Global Fishing Forecast Grand Challenge

- The National Security Innovation Network (NSIN) and the National Geospatial-Intelligence Agency (NGA) are launching the Global Fishing Forecast Grand Challenge, a prize challenge to identify innovative solutions from across the commercial and academic communities to forecast maritime vessel traffic involved in illegal, unreported, and unregulated (IUU) fishing. The ability to forecast IUU fishing will inform U.S. and partner nations' responses to IUU fishing.
- In the Proposal Round, participants will submit fishing effort forecasts and written summaries of proposed capabilities via a concept of operations (CONOPS), from which a panel of subject matter experts will select up to ten finalists to advance to the Pitch Round.
- **The Challenge scoring team will use the Global Fishing Watch AIS-based apparent fishing effort data as a baseline/ground truth to score participant forecasts.**

More information on the Grand Challenge website: https://www.nsin.mil/events/2023-12-29-illegal-fishing/

Disclaimer: The event is not organized by Global Fishing Watch; however, we aim to provide support to any user utilizing our open data. If you enter in contact with Global Fishing Watch for support, please identify that you are participating in the challenge.

Goal of this document

This document explains recommended methods to get the apparent fishing effort data from Global Fishing Watch (GFW) and links important data caveats that any participant should be aware of. Additionally, please remember that GFW data is intended for non-commercial use only. For further information, you can review the details in our Terms of Use.

Note on data sources

- The recommended ways of accessing data for the challenge are the GFW 4Wings API / report endpoint and the GFW Map, which uses the same data provided by the GFW APIs.
- Global Fishing Watch maintains gfwr, an R package that communicates with the API. However, gfwr is not a recommended data source for this challenge because it currently uses version 2 of the GFW APIs, which will be deprecated on April 30.
- The static fishing effort data available for download on the GFW website is not a recommended data source because it was created in 2021 using older inputs and data processing relative to the fishing effort data currently in the Map and the APIs.
- We don't provide access to data via BigQuery or the Google Cloud Computing Platform

Getting apparent fishing effort via GFW API

The suggested approach for obtaining apparent fishing effort in gridded data is through the GFW 4Wings API / report endpoint. This particular endpoint enables you to retrieve apparent fishing effort based on specific regions, various criteria, and formats. Comprehensive documentation details can be found in our API Portal

To get access to our APIs follow the following steps:
- Register for a Global Fishing Watch account
- Request an API key
- Agree to the terms of use and attribute Global Fishing Watch in anything you publish

Global Fishing Watch

Besides the examples in the API Portal, we share some examples of requests that can work to what is requested in the Forecast Data Technical Specifications

Global Fishing Watch

Example 1 - Get apparent fishing effort for CTMFM region

- Region source here
- Curl Request for 6 months, in CSV format, daily and with high resolution (which means at 100th-degree resolution)

```
curl --location -g --request POST
'https://gateway.api.globalfishingwatch.org/v3/4wings/report?spatial-resolution=HIGH&tempo
ral-resolution=DAILY&datasets[0]=public-global-fishing-effort:latest&date-range=2023-06-01
,2023-12-31&format=CSV' \
--header 'Authorization: Bearer [YOUR TOKEN]' \
--header 'Content-Type: application/json' \
--data-raw '{
  "region": {
    "dataset": "public-rfmo",
    "id": "CTMFM"
  }
}'
```

- You will get a zip file containing:
  - folder 1 `layer-activity-data-0` including the CSV file and a README explaining the columns
  - folder 2 `layer-reference-geometry` including geojson that was used based on our reference data.
  - *Global Fishing Watch - Considerations when using automatic identification system (AIS) data.pdf* including the list of data caveats to consider.
- Example of the CSV:

Lat	Lon	Time Range	Vessel IDs	Apparent Fishing Hours
-34.54	-58.43	2023-06-11	1	0.6
-34.57	-58.34	2023-06-09	1	0.58
-35.22	-57.04	2023-06-13	2	1.83
-35.19	-57.06	2023-06-13	1	0.82
-35.2	-57.06	2023-06-13	1	1.43
-35.22	-57.05	2023-06-13	1	1.01
-35.29	-57.01	2023-06-09	2	1.8

Example 2 - Get apparent fishing effort for CTMFM region grouped by GEAR TYPE

- Region source here
- Curl Request for 6 months, in CSV format, daily, with high resolution (which means at 100th-degree resolution) and grouped by Gear Type

```
curl --location -g --request POST
'https://gateway.api.globalfishingwatch.org/v3/4wings/report?spatial-resolution=HIGH&tempo
ral-resolution=DAILY&group-by=GEARTYPE&datasets[0]=public-global-fishing-effort:latest&dat
e-range=2023-06-01,2023-12-31&format=CSV' \
--header 'Authorization: Bearer [YOUR TOKEN]' \
--header 'Content-Type: application/json' \
--data-raw '{
    "region": {
        "dataset": "public-rfmo",
        "id": "CTMFM"
    }
```

```
}'
```

- You will get a zip file containing the same information as Example 1 but the CSV will include a geartype column, for example:

Lat	Lon	Time Range	geartype	Vessel IDs	Apparent Fishing Hours
-34.47	-58.47	2023-06-10	fishing	1	0.33
-34.55	-58.39	2023-06-18	fishing	1	0.48
-34.53	-58.38	2023-06-04	trawlers	1	0.55
-34.53	-58.39	2023-06-11	trawlers	1	1
-34.53	-58.43	2023-06-11	trawlers	1	0.07
-34.62	-58.22	2023-06-24	trawlers	1	1
-34.66	-58.19	2023-06-25	trawlers	1	0.97
-34.77	-57.86	2023-06-03	fixed_gear	1	0.22
-34.76	-57.88	2023-06-05	fixed_gear	1	4.89
-34.78	-56.9	2023-06-16	trawlers	1	1
-34.83	-56.69	2023-06-16	trawlers	1	1.05
-34.82	-56.77	2023-06-07	trawlers	1	1.98

Important data caveats to review
- Region sources are described in this FAQ
- Make sure to review the PDF document (called *Considerations when using automatic identification system (AIS) data.pdf*) that you get in the zip file from the API
- AIS Apparent fishing effort

You can find full details of our data caveat here and useful FAQs here

Other 4Wings API / report endpoint considerations
- **Error 429 - Too Many requests**: It only allows 1 report at a time for each user
  - It is advisable to refrain from making parallel requests when using the API. Instead, it is recommended to wait for the response, with a maximum waiting time of 2 minutes, before initiating another report request. Ensure that the requests are scheduled in a sequential order to optimize usage.
- **Time range limit** for each request is 1 year
- **Error 524 - Timeout:** Due to security measures, we enforce a timeout of 100 seconds. If you encounter this error, it is probable that the report was generated but not delivered within the timeout period. Therefore, we recommend calling the **4Wings last-report endpoint** to retrieve the latest report.
  - Example of a request using your token

```
Unset
curl --location --request GET
'https://gateway.api.globalfishingwatch.org/v3/4wings/last-report' \
--header 'Authorization: Bearer [YOUR TOKEN]'
```

  - If the report finishes successfully, you will get the report. If not, you can get other error messages, check for more detail here.

Global Fishing Watch

Getting apparent fishing effort using GFW Public Map

Our Public Map uses the same API endpoints on the back of the platform, so to reproduce the Example 1 of API, you can:

- Go to our Public Map https://globalfishingwatch.org/map
- Search for the RFMO CTMFM and download gridded data. You can watch this video for more detail.

FAQs

How is Fishing Effort calculated?

Apparent fishing effort: Global Fishing Watch analyzes AIS data collected from vessels that our research has identified as known or possible commercial fishing vessels, and applies a fishing detection algorithm to determine "apparent fishing activity" based on changes in vessel speed and direction. The algorithm classifies each **AIS broadcast data point** for these vessels as either apparently fishing or not fishing and shows the fishing on the Global Fishing Watch apparent fishing effort heat map.

The raw data we possess consists of data points or messages accompanied by timestamps, which we classified as apparent fishing. You can find below an example of the data points or positions and the calculation of hours from one position to the other one:

8	2023-06-03 01:11:39 UTC	0.098333333333333328
9	2023-06-03 02:07:42 UTC	0.9341666666666667
10	2023-06-03 02:11:58 UTC	0.0711111111111111111
11	2023-06-03 02:17:54 UTC	0.0988888888888888887
12	2023-06-03 02:56:06 UTC	0.63666666666666671
13	2023-06-03 02:58:22 UTC	0.037777777777777778
14	2023-06-03 03:34:26 UTC	0.60111111111111115

For example we have a data point from 2023-06-02 at 02:07:42 UTC that our model classified as fishing.

What is the location of the data submitted for the cell?

A: The downloaded data utilizes an "unprojected" format, commonly referred to as lat/lon projection or equirectangular projection, with a WGS84 datum.
The data corresponds to the center of each cell in the grid.

4wings API / report: some apparent fishing hours values are > 1, even when the time range values are consecutive. why?

Context

If you send a request to `/4wings/report` with the `temporal-resolution` parameter set to `HOURLY`, you may receive a result where apparent fishing hours exceed 1. In our explanation, we'll focus on the example highlighted in red below.

Global Fishing Watch

```
        MMSI    Lat    Lon        Time Range   Apparent Fishing Hours
0   710009191 -32.21 -51.78  2023-05-31 03:00                    0.41
1   710009191 -32.19 -51.76  2023-05-31 04:00                    1.04
2   710009191 -32.17 -51.75  2023-05-31 05:00                    0.96
3   710009191 -32.12 -51.72  2023-05-31 06:00                    0.57
4   710009191 -32.10 -51.69  2023-05-31 07:00                    0.72
5   710009191 -31.61 -50.97  2023-06-01 05:00                   22.52
6   710009191 -31.70 -51.00  2023-06-02 23:00                    0.64
7   710009191 -31.75 -51.04  2023-06-03 00:00                    1.20
8   710009191 -31.78 -51.06  2023-06-03 01:00                    0.25
9   710009191 -31.77 -51.06  2023-06-03 02:00                    1.78
10  710009191 -31.73 -51.02  2023-06-03 03:00                    0.60
11  710009191 -31.75 -51.03  2023-06-03 08:00                    5.10
12  710009191 -31.78 -51.05  2023-06-03 09:00                    1.33
13  710009191 -31.78 -51.04  2023-06-03 10:00                    0.16
```

The raw data we possess consists of data points or messages accompanied by timestamps, which we classified as apparent fishing. You can find below an example of the data points or positions and the calculation of hours from one position to the other one:

8	2023-06-03 01:11:39 UTC	0.098333333333333328
9	2023-06-03 02:07:42 UTC	0.9341666666666667
10	2023-06-03 02:11:58 UTC	0.071111111111111111
11	2023-06-03 02:17:54 UTC	0.098888888888888887
12	2023-06-03 02:56:06 UTC	0.63666666666666671
13	2023-06-03 02:58:22 UTC	0.037777777777777778
14	2023-06-03 03:34:26 UTC	0.60111111111111115

For example we have a data point from 2023-06-02 at 02:07:42 UTC that our model classified as fishing.

To obtain hourly data, we aggregate the data by hour, which may result in a cumulative value exceeding 1 for each hour. For instance, for 2023-06-03 02:00 summing up all individual time intervals occurring from 02:07 to 02:58 yields 1.77861111110542 fishing hours. Hence, Apparent fishing hours is the approach we utilize to estimate fishing effort at one hour.

You can also find the same situation at other levels like a day, check this FAQ for more details.