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Consolidating catch and effort data from IOTC national reports, a prototype interactive tool

Authors: Alex Tidd, Mariana Tolotti, Julien Lebranchu, David Kaplan, Patrice Guillotreau

Purposes: The purse of the paper is to inform the WPTT of a prototype interactive tool developed to consolidate catch and effort data extracted from IOTC national reports

Executive summary

This paper presents a prototype interactive tool developed to consolidate catch and effort data extracted from IOTC national reports submitted by 28 CPCs, mainly covering the period 2020–2024. The tool provides a single interface to explore catch composition and effort by country, species, gear and vessel characteristics, and allows comparisons between selected CPCs.

The work has highlighted several issues that make it difficult to compare information between national reports and other data sources. These include inconsistencies in the units used to report catch and effort, differences in how vessels and fleet subtypes are classified, and discrepancies between vessel numbers and effort reported nationally and information held by the IOTC or other vessel registers.

The prototype shows that information from national reports can be brought together in a common format and made easier to access and compare. However, extracting and consolidating the information still requires manual work. Although the IOTC already provides a template for national reports, more specific guidance on reporting vessel categories, effort measures and units would help improve consistency between CPCs (IOTC–2026–SC29–NRXX). Ensuring that the existing reporting guidelines are followed is also important for making the information comparable and suitable for scientific analyses. Extending the application to accept submissions in a common format could further automate data processing and comparison, reducing manual work and helping to identify inconsistencies in reporting.

The CPCs are invited to:

1. Note the difficulties in comparing national catch and effort data arising from differences in reporting units, vessel classifications and fleet characteristics.
2. Consider developing a standard reporting template, including common definitions, units and vessel classifications.
3. Consider extending the prototype to accept data submissions in the proposed format and automate data validation, consolidation and comparison with existing IOTC datasets.
4. Consider how this work could be taken forward within the Scientific Committee work plan, including the possibility of pooling expertise and resources to improve the consistency and verification of fisheries data.

1. Background

National reports submitted by IOTC CPCs contain useful information on catches, fishing effort and fleet characteristics. However, the information is presented in different formats, with varying levels of detail and different measurement units. Bringing these data together for analysis or comparison therefore requires considerable manual work.

This project was developed to consolidate the information into a common database and provide an interactive tool for exploring the data. It also provided an opportunity to examine some of the difficulties in comparing information between national reports and existing IOTC datasets and vessel registers.

Three main issues were identified during the work. First, catch and effort are not always reported using consistent units or clearly defined measures. Second, vessel roles and fleet subtypes are classified differently between reports, particularly for fishing vessels, supply vessels and carriers. Third, vessel numbers and effort reported in national reports do not always match the corresponding information available from other sources.

These differences do not necessarily mean that the data are incorrect. They may reflect differences in definitions, fleet coverage, reporting periods or the way information has been compiled. However, they make comparisons more difficult and can limit the use of the data in analyses of fishing activity and fleet dynamics.

Ensuring that the existing reporting guidelines are followed is also important for making the information comparable and suitable for scientific analyses. It would also provide a basis for automating the compilation and comparison of national reporting data.

2. Prototype tool

Data were extracted from national reports submitted by 28 CPCs, mainly covering 2020–2024. The available information varies between countries, and the compilation also includes historical data extending back to 1987 for one CPC. No current information was available in the material compiled for the United Kingdom, the Philippines or Liberia.

Data extraction was undertaken using R (https://www.r-project.org/) and the tabulapdf package, together with other tools and manual checks where needed. The extracted information was organised into database-style tables for catch (tblCatch), effort (tblEffort) and lookup tables for gear, country and species. These tables were brought together in a single Excel workbook, with each table stored on a separate sheet.

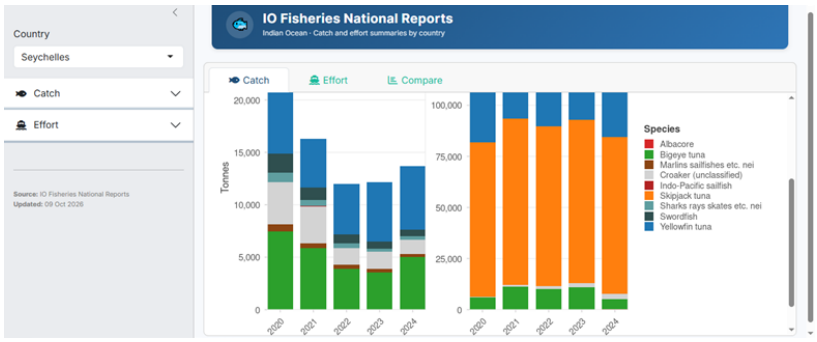
The interactive application was developed using R Shiny. It allows users to select a country and examine the available catch and effort information. The catch interface shows catch composition by species and gear, while the effort interface summarises the reported measures by gear, vessel class and effort type. A comparison page allows up to three CPCs to be examined side by side over a common reporting period.

The prototype is currently available through a web portal (see Figure 1):

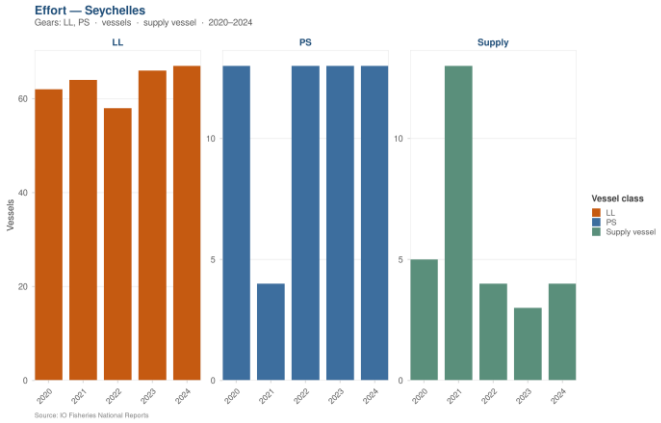
demo

The current version uses the compiled Excel workbook as its data source. The figures can be downloaded for further use, and the underlying data could also be made available for local analysis.

a)



b)



c)

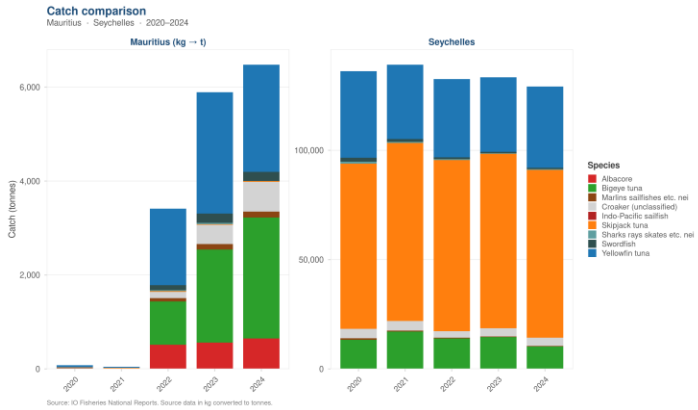


Figure 1. Prototype interactive tool showing a) catch composition by species and gear, b) effort summaries by gear and vessel class, and c) comparisons between up to three CPCs.

The tool provides a practical way to explore information that would otherwise need to be extracted manually from individual national reports. It also makes differences between reporting sources easier to identify. At present, however, the data still need to be extracted and compiled before they can be used in the application.

An extension of the prototype would be to accept submissions in a proposed standard format. This would allow data to be checked, processed and added to the database through a more automated workflow.

3. Data quality issues identified

3.1 Measurement units

The reports use different units to describe catches and fishing effort. Of the 28 CPCs included in the compilation, three reported catches in units other than tonnes, including kilograms or numbers of fish, without consistently providing the information needed to establish a standardised conversion.

Effort reporting was also variable, with 10 different units recorded across 14 effort types or indicators. These included vessels, hooks, sets, positive sets, searching, fishing days, trips, carrying capacity and fleet classification. The units used included days, hooks, thousands or millions of hooks, trips, sets, cubic metres, gross tonnage and vessel numbers.

Some of these represent different measures of fishing activity rather than alternative units of the same measure. For example, hooks, sets and fishing days cannot be treated as equivalent measures of effort. Similarly, vessel numbers and carrying capacity describe fleet characteristics rather than fishing effort directly.

Without clear definitions and consistent units, comparisons between countries require assumptions that the original reports may not support. A standard reporting template should therefore specify the measure being reported, its unit and the relevant gear or fleet category. It should also distinguish between missing information, zero values and information that is not applicable.

3.2 Vessel role and fleet subtype

The way vessels are classified also varies between national reports. Some reports distinguish fishing vessels from supply vessels and carriers, while others include these vessels within a general fleet count or do not clearly identify their role.

Fleet subtypes are not always reported consistently either. This makes it difficult to establish whether vessel numbers from different sources refer to the same fleet and can affect comparisons of fishing capacity and activity.

A common reporting format should distinguish vessel role from gear and fleet subtype, with clear definitions of which vessels are included in each reported total. This would help ensure that fishing vessels, supply vessels and carriers are not inadvertently treated as equivalent when comparing fleet numbers.

3.3 Discrepancies with other registers

A comparison was made between vessel numbers and effort information reported in national reports and corresponding information available from IOTC datasets and other sources.

Table 1 gives five randomly selected examples for 2023. The examples illustrate differences in reported vessel numbers and, in some cases, the effort measures available from each source.

Table 1. Examples of differences between vessel numbers and effort information in national reports and IOTC datasets for selected CPCs, 2023.

CPC ID	year	IOTC vessels	National report vessels	fleet	IOTC effort	National report effort
1	2023	8	6	PS	FDAYS	Sets/hours searching
2	2023	9	13	PS	FHOURS/SETS	NA
3	2023	41	44	LL	HOOKS	Set/Hooks*
4	2023	240	240	LL	HOOKS	NA
5	2023	1771	2171	TR	FDAYS	Fishing days

Note: reported_iotc_no_vessels taken from Fishing craft statistics_20250702.xlsx and https://iotc.org/data/datasets/latest/CE/All https://iotc.org/data/datasets *(11000 hooks more)

The examples show that vessel numbers reported nationally do not always match those available from IOTC datasets. In other cases, the effort information is missing or is reported using a different measure. Where the units or definitions differ, the values cannot be compared directly.

These differences may arise from the way vessels are classified, the fleet covered by each source, the timing of reporting or the definitions used for effort. The comparisons are therefore intended to identify issues requiring further investigation rather than to establish which source is correct.

A more systematic comparison would require consistent definitions of vessel roles and fleet subtypes, together with clear information on effort measures, units and reporting periods. Where differences remain, they could be checked with the relevant CPCs before the data are used in further analyses.

5. Potential further development

The current application provides a starting point for making national reporting data easier to access and compare. However, the extraction and compilation of the information remain largely manual.

One possible next step would be to develop a standard reporting template and extend the application to accept data submitted in that format. The submitted data could then be checked against agreed rules before being added to the database.

These checks could identify missing fields, unexpected units, inconsistent gear or species codes, and differences in the way vessel roles are reported. The application could also compare new submissions with existing IOTC datasets and flag discrepancies for review.

This would not remove the need to check the underlying information, particularly where different sources use different definitions or cover different fleets. It would, however, make the process more consistent and reduce the amount of manual work required to compile and compare the data.

The proposed approach could be tested with a small number of CPCs before being extended more widely. Feedback from the reporting countries and the IOTC Secretariat would help establish which fields and validation rules are practical and necessary.

The CPCs are invited to:

1. Note the difficulties in comparing national catch and effort data arising from differences in measurement units, effort definitions, vessel roles and fleet classifications.
2. Consider developing a minimum standard reporting template for catch, effort and fleet characteristics, including common definitions, units and procedures for recording missing or non-applicable information.
3. Consider how the work could be taken forward, including the possibility of testing the proposed format with selected CPCs and pooling expertise and resources to improve the consistency and verification of the information.

6. Concluding remarks and next steps

This paper presents a prototype tool for consolidating and exploring catch and effort information extracted from IOTC national reports. The work has shown that the information can be brought together in a common database and made more accessible for comparison. It has also highlighted differences in the reporting of measurement units, vessel classifications and effort, which complicate comparisons between national reports and other data sources.

The IOTC already provides a template for national reports; more specific guidance on reporting vessel categories, effort measures and units would help improve consistency between CPCs. Ensuring that the existing reporting guidelines are followed is also important for making the information comparable and suitable for scientific analyses. Extending the prototype to accept submissions in this format would allow data to be checked and consolidated more efficiently, while identifying differences that require further investigation. The prototype provides a starting point for this work. Further development would benefit from collaboration between CPCs and the Secretariat to ensure that the reporting format is practical, that differences between sources can be properly investigated, and that the resulting database can support future analyses of fishing activity and fleet dynamics.

Acknowledgements

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References

IOTC–2026–SC29–NRXX Guidelines for the Preparation of National Reports to the IOTC Scientific Committee in 2026
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