

The state of world fishery resources

Expanding efforts to determine the status of global fish stocks

Since 1971, the Food and Agriculture Organization of the United Nations (FAO) has been assessing the state of world marine fishery resources to support policy formulation and decision-making. According to FAO's latest assessment, a third of global fish stocks are overfished (35.4%). However, 82.5% of the fish landings in 2019 came from biologically sustainable stocks, demonstrating that the larger and more economically valuable stocks are generally better managed than smaller, less valuable ones. Scientific evidence shows that when efficient management is in place, fish stock status improves to reach biologically sustainable exploitation levels (FAO, 2022a).

FAO's assessment is based on a targeted group of stocks used as a proxy to track the state of fisheries around the world. While these stocks collectively account for 70% of global catches, many smaller stocks remain unassessed due to insufficient data and information. In an effort to improve knowledge about stock status and to reduce information gaps, FAO is working to update the methodology to better quantify the state of the world's marine fishery resources and support long-term sustainability. The methodological update proposed by FAO is expected to increase the number of fish stocks currently assessed and supports alignment with other related reporting initiatives such as the Sustainable Development Goal (SDG) indicator 14.4.1.

FAO has been providing and distributing regular information on the state of fish stocks for more than 50 years. The results have been published biennially in FAO's flagship

report, the State of the World Fisheries and Aquaculture (SOFIA), since 1995. Over the years, SOFIA has become a global reference on the status and trends of stocks in global and regional fisheries

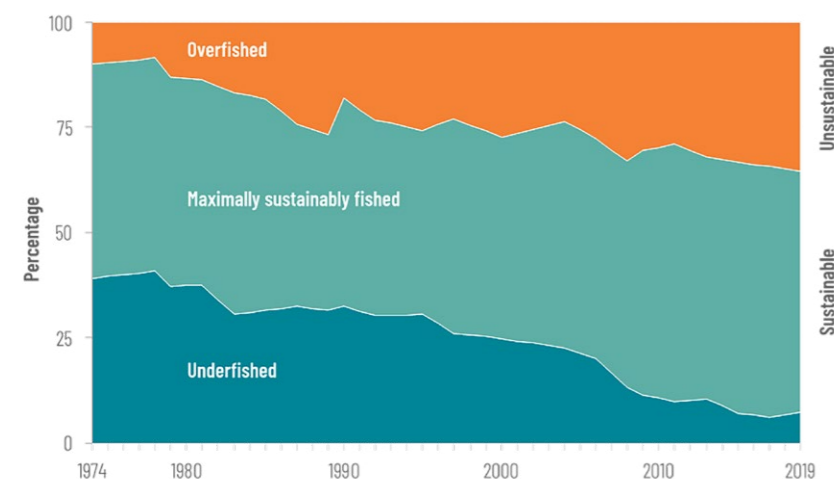


Figure 1. Global trends in the state of the world's marine fish stocks (1974–2019) (FAO 2022a).

¹These stocks can in some cases be aggregated for practical reasons (eg, various neighboring stocks of the same species can be considered a single stock). These stocks are part of a so-called 'Reference List of Stocks'.

and aquaculture (figures 1 and 2). Data, statistics, and information included in this flagship report have been helping scientists, policy and decision-makers to improve fisheries' sustainability around the world (Ovando et al, 2021).

To ensure consistency and comparability over time, SOFIA's analyses of the state of fish stocks have been based on a fixed list of approximately 500 stocks¹, and on a clear process and methodology that, with the exception of minor adjustments, have remained consistent since the start of the series (FAO 2011).

Moreover, the fisheries sector is undergoing continual change: there are changes in dominant stocks, in the ways they are exploited, as well as in the data and tools available for assessing their sustainability. In addition, Sustainable Development Goal (SDG) indicator 14.4.1 (*Proportion of fish stocks within biologically sustainable levels*), which needs to be reported by countries, has generated requirements for parallel monitoring processes. This requires that the list of stocks considered both nationally and globally are consistent and connected to FAO's and national monitoring processes.

UPDATED METHODOLOGY AND PROCESSES

As a result, FAO is undertaking an in-depth methodological update that leverages advancements in computing and data availability to enhance the understanding of the state of world fish stocks. This aims to expand the scope of available information and align it with national SDG reporting initiatives, thereby strengthening the evidence

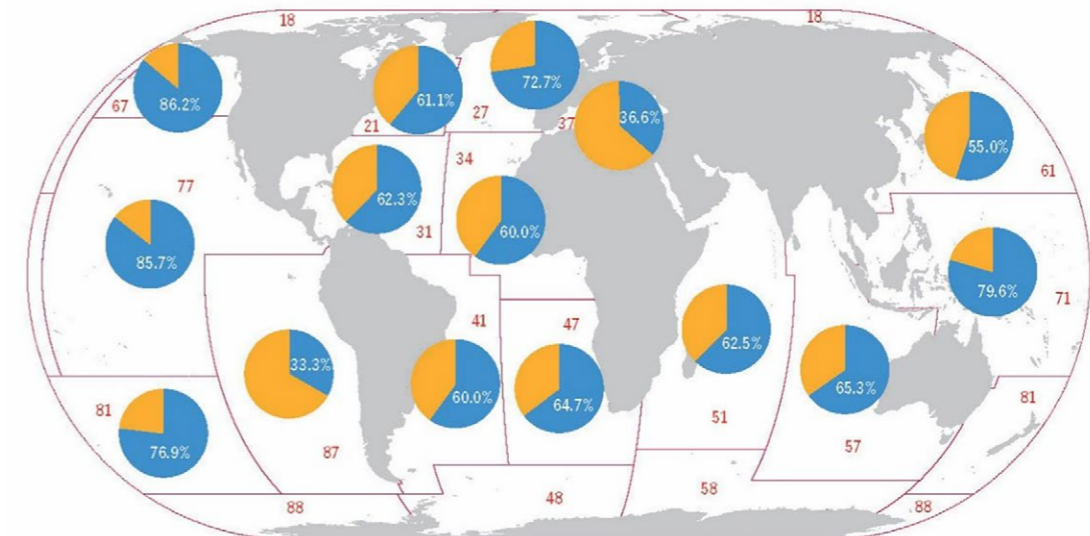


Figure 2. Percentages of biologically sustainable² and unsustainable³ fishery stocks by FAO major fishing area, 2019 (FAO 2022a). Note that the digital percentages represent the proportion of sustainable stocks.

Stock status
■ Sustainable
■ Unsustainable

base for decision-making in the sector in transparent ways.

The updated methodology encompasses a more comprehensive set of stocks (around 2,500 disaggregated stocks) that accurately reflect the current social, economic, and ecological context of fisheries across the world. This approach allows for a more nuanced understanding of the status of each stock, including potential variations within a given geographic area. Additionally, it will continue to generate indices of stock status in FAO regional fishing areas, identifying potential gaps in assessment and facilitating actions to address them in a continuous process of improvement.

National and regional fisheries institutions, as well as local experts, play a crucial role in upgrading the methodology. These experts are already contributing through regional workshops and new consultation methods, such as country-specific questionnaires on computing and reporting on SDG indicator 14.4.1, conducted by FAO.

²Stocks with abundance at or above the level associated with maximum sustainable yield (MSY).
³Stocks less abundant than the level needed to produce MSY.

To further support these efforts, FAO is working to develop and improve capacities of national and regional fisheries institutions to assess the state of the stocks in every region of the world, particularly those with limited information. The programme is being revitalised to encourage greater participation of these institutions so their regular analyses can be considered in the FAO global analysis, while reporting their own progress on SDG indicator 14.4.1.

Since the level of available information inevitably varies across stocks and regions, the proposed upgraded methodology is based on a three-tiered system:

Tier 1 includes stocks with a formal assessment considered scientifically sound and reliable. The stocks status for this tier is derived directly from national or regional assessments without additional computations by FAO.

Tier 2 includes stocks without formal or reliable assessments but reliable catch

data and other supporting information such as an index of abundance or effort. The stocks status in this tier is inferred by surplus-production type models (Winker et al, 2018).

Tier 3 includes stocks where a formal assessment has not been conducted and information is not sufficient for a model-based approach. Instead, stock status is determined using a weight-of-evidence approach combining all the data, knowledge, and information available, combined with a peer-review process (Stobutzki et al, 2015).

This approach will ensure transparency and flexibility to the updated methodology: a clear decision matrix will be used to classify stocks in one of the tiers and the process will be carried out in a well-documented framework, allowing full transparency in choices and assumptions, while enhancing peer-review and future revisions. All the data and assumptions will be stored and retrievable through the FAO web system.



Key results and outputs

The implementation of the upgraded stock assessment process will lead to several significant results and improvements, including:

- A transparent and fully documented methodology to generate FAO reports on the State of the World Fishery Resources.
- A coordinated and sustainable framework for collecting and processing information for the FAO State of Resources report and for SDG 14.4.1 monitoring.
- A development programme that reinforces the capacity of fisheries institutions of member countries to collect, manage, and process data and information for assessing and reporting on the state of fisheries and fish stocks.
- A clear and transparent system that documents all data and information, facilitating peer-review, access, revision, and auditing.

To fish or not to fish

The Fishery Committee for the Eastern Central Atlantic (CECAF) was established as an advisory body to promote the sustainable use of living marine resources of its area of competence, which includes high seas and national waters, through the proper management and development of fisheries and fishing operations. CECAF has 33 members, including coastal and non-coastal states, and the European Union, and regularly assesses the status of more than 50 fish stocks and provides management advice for between 20 and 30 fisheries. The commitment of these countries to identify overfished stocks and implement appropriate management approaches has resulted in a decrease of the percentage of overfished stocks from 49% in 2013 to 40% in 2019 in the CECAF area of competence (FAO Fishing Area 34), while the percentage of stocks fished at biologically sustainable levels⁷ has increased from 51% to 60% in those six years.

The categories of the updated methodology will be consistent with what FAO already uses: *underfished*⁴, *maximally sustainably fished*⁵, and *overfished*⁶. The proportion in each category will continue to be estimated using the revised 'Reference List of Stocks' for each of the 19 FAO major marine fishing areas, and for the world's fisheries overall.

The methodology has already been tested in five selected FAO fishing areas, involving national and regional fisheries institutions and stakeholders. This testing has facilitated the development of capacity in regional areas and institutes to assess the status of fisheries resources within a particular region. FAO will produce a manual on the upgraded methodology, guidance on its application, and a dedicated information system for the retrieval and dissemination of data.

SAILING AHEAD

A more accurate understanding of the status of fishery stocks, both globally and regionally, will foster the development of policies and strategies that better support biologically sustainable fishing. This will enable governments and other decision-makers to better address issues related to unsustainable practices in their jurisdiction. FAO's updated methodology will also help support the global effort to achieve biologically sustainable fishing and increase the contribution of sustainable fisheries to food security and nutrition.

This effort aligns with FAO's Blue Transformation vision, one of whose objectives is to achieve the effective management of 100% of marine and inland fisheries (FAO 2022b). Evidence shows that when fisheries are properly managed, their stocks are consistently found to be within biologically sustainable

The Agenda 2030 and the Sustainable Development Goal 14

The Sustainable Development Goals (SDGs) seek to balance and synthesise social, economic, and environmental objectives in pursuit of a prosperous and equitable future for all. The fisheries and aquaculture sector offers ample opportunities to reduce hunger and improve nutrition, alleviate poverty, generate economic growth, and ensure better use of natural resources. The sector plays a vital role in achieving SDG 14, which aims to *conserve and sustainably use the oceans, seas, and marine resources for sustainable development*. SDG 14 has ten targets and indicators to monitor, review and follow-up the process effectively.

The indicator 14.4.1 (Proportion of fish stocks within biologically sustainable levels) measures progress towards SDG Target 14.4, which is to *effectively regulate harvesting and end overfishing, illegal, unreported, and unregulated fishing and destructive fishing practices and implement science-based management plans, in order to restore fish stocks in the shortest time feasible, at least to levels that can produce maximum sustainable yield as determined by their biological characteristics*. The indicator measures sustainability of the world's marine capture fisheries by their abundance relative to maximum sustainable yield.

FAO's updated stock status assessment process seeks to narrow gaps in assessment over time, primarily by utilising a tiered approach based on national and regional information. By improving our understanding of the state of the world's fisheries and our capacity to measure progress towards the SDG target 14.4, we can further enhance our management of global marine resources and improve the proportion of stocks within biologically sustainable levels.

limits (Hilborn et al, 2020), highlighting what can be achieved and maintained with adequate action. Positive effects of efficient marine management actions are often cumulative. As management methods are finessed and global goals are shared, fishery stock status can rebuild and become sustainable.

The next SOFIA in 2024 will feature examples of the tiered analysis and new visual approaches to better support policymakers, scientists, stakeholders, and the public interested in the sustainability of the sector. SOFIA 2026 will present the full analysis resulted from the application of the updated methodology.

Finally, a new edition of the *Review of the State of World Marine Fishery Resources* will be published as a FAO Fisheries Technical Paper in 2025, with full details of the methods, lists of stocks, and a detailed analysis of regional results.

⁴Stocks with abundance above the level corresponding to MSY. FAO defines a fish population as underfished when its biomass is above 120% of the target level (B/BMSY>1.2).
⁵Stocks with abundance at or close to MSY. FAO defines a fish population as maximally sustainably fished when its biomass is above 80% but below 120% of the target level (0.8B/BMSY-1.2 B/BMSY).
⁶Stocks having abundance lower than the level that can produce MSY. FAO defines a fish population as overfished when its biomass is below 80% of the target level (B/BMSY<0.8).
⁷Biologically sustainable stocks consist of the maximally sustainably fished and underfished stocks.

Behind the Research

Food and Agriculture Organization of the United Nations

For more information, please contact Rishi Sharma, Senior Fishery Resources Officer. E: rishi.sharma@fao.org

Collaborators: Rishi Sharma, Pedro Barros, Marcello Vasconcellos, Nico Guitierrez, Yimin Ye, Vera Agostini & Manuel Barange, FAO Fisheries and Aquaculture Division

References

- FAO (2022a) *The State of World Fisheries and Aquaculture 2022. Towards Blue Transformation*. Rome. doi.org/10.4060/cc0461en
- FAO (2022b) *Blue Transformation - Roadmap 2022–2030: A vision for FAO's work on aquatic food systems*. Rome. doi.org/10.4060/cc0459en
- Ovando, D, et al, (2021) Improving estimates of the state of global fisheries depends on better data. *Fish and Fisheries*, 22(6), 1377–1391. doi.org/10.1111/faf.12593
- Hilborn, R, et al, (2020) Effective fisheries management instrumental in improving fish stock status. *Proceedings of the National Academy of Sciences*, 117(4), 2218–2224. doi.org/10.1073/pnas.1909726116
- Winker, H, Carvalho, F, Kapur, M, (2018) JABBA: Just Another Bayesian Biomass Assessment. *Fisheries Research*, 204, 275–288. doi.org/10.1016/j.fishres.2018.03.010
- Stobutzki, I, et al, (2015) *Stock status determination: weight-of-evidence decision-making framework*, In: Reducing uncertainty in stock status, ABARES research report, Canberra, August. ISBN 978-1-74323-254-5. daff.ent.sirsidynix.net.au/client/en_AU/search/asset/1027248/12
- FAO (2011) *Review of the state of world marine fishery resources*. FAO Fisheries and Aquaculture Technical Paper No. 569. Rome. www.fao.org/fishery/en/publications/45897

