A rapid review of socioeconomic indicators for the IOTC

Sarah Martin[1]

Background

To ensure the conservation and optimum utilisation of the stocks under its management, one of the key responsibilities of the IOTC is to review the socioeconomic aspects of tuna and tuna-like fisheries within the IOTC Area of Competence, with particular consideration of the interests of developing Coastal States.

In 2023, the Commission adopted Resolution 23/10 on *Terms of Reference for a Working Party on Socio-Economics (WPSE)* to provide the Commission with information on the socioeconomic status and dynamics of fisheries targeting tuna and tuna-like species in the IOTC Area of Competence. The WPSE is mandated to carry out studies concerning socioeconomic data and indicators for IOTC fisheries in order to assess and advise on potential impacts to CPCs arising from the Conservation and Management Measures, allocation of quotas and catch limits, and recommendations of the IOTC Scientific Committee.

During its first session in 2024, the WPSE assessed the availability and quality of socioeconomic data related to IOTC fisheries. The meeting synthesised findings from a scoping study on socioeconomic indicators involving primary data collection over 7 months (MacFadyn and DeFaux, 2019). The WPSE acknowledged the need to verify and validate proposed indicators by evaluating their applicability, identifying the underlying data requirements, and clarifying each indicator's purpose and objectives. The Secretariat was tasked with distributing a list of potential indicators to CPCs prior to the next session for further review and input.

Approach

This report comprises a rapid review of the literature that took place over four weeks in early 2025 to identify potential socioeconomic indicators for WPSE to consider. Indicators were designed through a stepwise and iterative process (Bennet et al., 2021; ICES, 2024b). This included:

1) defining key objectives,
2) reviewing socioeconomic evaluation frameworks to systematically and comprehensively consider potential overarching domains,
3) identifying key domains of interest and related attributes from objectives,
4) identifying and selecting candidate indicators,
5) determining data requirements and methodologies, and
6) refining indicators based on criteria for good indicators, in consideration of logistics (e.g. data availability, budget, methods), and through stakeholder input (the WPSE02)[2]

[1] University of Leeds, UK

[2] Step 6 is to be undertaken through discussions at the WPSE

Objectives

The first step in identifying appropriate indicators for any research is to identify the purpose and relevance for policy and management. However, while fisheries environmental objectives are typically related to achieving stock performance corresponding to B_{MSY}, socioeconomic objectives are rarely explicit and vary widely by fishery with little consensus regarding priorities (Anderson et al. 2015). In their review of socioeconomic evaluations in fisheries, Bennet et al. (2021) raised concerns that many socioeconomic assessments are being done without a clearly articulated end goal or pathway to influence decision-making. In line with this, the ICES Working Group on Economics (WGECON) and Working Group on Social Indicators (WGSOCIAL) have been set the broad challenge of examining the social and economic dimensions of fishing activities to bring these into ICES science and advice, involving a wide range of indicators and policy questions and large expert working groups as part of an ongoing iterative process (ICES, 2021). Nevertheless, in an example of very clear objective setting, the Forum Fisheries Agency (FFA) and the Pacific Community set out four goals in their 2015 *regional roadmap for sustainable Pacific fisheries* and a relatively small set of indicators to measure their progress towards the goals (FFA, 2015a). These included three socioeconomic objectives: (i) a doubling of catch value, (ii) 18 000 new jobs created in the tuna industry and (iii) An increase of 40 000 t in the supply of tuna for domestic consumption to be achieved between 2014 and 2024. These clear goals and targets are updated annually through a 'fishery report card' with relatively simple indicators (FFA, 2015a).

For the IOTC, the main goal of the WPSE is "*to assess the social and economic dynamics of fisheries*" (Resolution 23/10) and to "*provide guidance to the TCAC[3] on matters related to socioeconomic indicators and inputs into the allocation regime*" (IOTC-2024-WPSE01-R). More specifically, they must be evaluated based on the criteria below.

- Relevance. The socioeconomic contribution of[4]/ dependence on[5]/ importance of[6] IOTC fisheries (Resolution 23/10) to:
    - Food security[7]
    - Employment[8]
    - Exports[9]
    - Subsidies[10]
- Feasibility[11]
- Standardisation[12]
- Robustness[13]

[3] Technical Committee on Allocation Criteria
[4] "social and economic contribution of fisheries for tuna and tuna-like species" (Res. 23/10)
[5] "respective economic dependence on fish stocks" (Res. 23/10)
[6] "the social and economic importance of the fishery" (Res. 23/10)
[7] "contribution to national food security needs, domestic consumption" (Res. 23/10)
[8] "contribution to… employment" (Res. 23/10)
[9] "income from exports" (Res. 23/10).
[10] "contribution to… fisheries subsidies" (Res. 23/10)
[11] "this new data requirement should not be an administrative burden" (Res 23/10)
[12] "regionally harmonised" (Res. 23/10)
"based on internationally standardised classifications" (WPSE, 2024)
[13] "robust metrics and indicators" (Res. 23/10)

Conceptual framework

Well-being is affected by a vast number of sociocultural and economic variables (Pollnac et al., 2015) and so a comprehensive, structured, and transparent conceptual framework is useful to guide the development of potential indicators based on the research agenda (Angel et al., 2019). A conceptual framework sets socioeconomic indicators within the full suite of fisheries indicators (ecological, environmental, economic), providing the linkage for integrative analysis and advice in order to identify opportunities for triple-bottom line improvements (McLuney et al., 2019; STEFC, 2024). There is, however, no universal approach to indicator selection or agreed indicators for fisheries ecosystem services. Consequently, indicator selection is often inconsistent with an arbitrary focus on monetary values. Without a coherent approach there is a danger that the information contained in the indicators is incomplete, biased, not standardised, and not relevant to management (Hattam et al., 2015).

This report reviews a range of socioeconomic evaluation frameworks for fisheries with the aim of using a systematic approach to comprehensively capture different aspects of socioeconomic performance and to ensure international harmonisation and standardisation. There are a vast number of frameworks for assessing socioeconomic or human well-being dimensions in fisheries (Bennett et al., 2021) so, as this was a time-limited rapid review, this is not intended to be an exhaustive review of all existing frameworks. Nevertheless, it provides a critical review of a selection of frameworks to provide a baseline understanding of the current status of fisheries socioeconomic evaluation and identify the key socioeconomic domains involved.

The literature review revealed that there is no one-size-fits-all socioeconomic framework or approach that can be applied to all fisheries and for all purposes since the objectives of management interventions, scale, scope and context of evaluations all vary so widely. Bennett et al., (2021) concluded that a unique method to assess socioeconomic aspects of a fishery should be developed to fit each project depending on factors such as objectives, scale, and available resources. Since no single framework was wholly applicable to the IOTC or adaptable for its needs, it is suggested that a new framework is developed for the needs of the IOTC. A series of observations and insights was extracted as learnings points from the review.

Key takeaways from frameworks review

- Frameworks arise from different theoretical backgrounds

The evaluation frameworks have been developed from a variety of perspectives and theoretical framing, such as wellbeing theory, economic performance, socioeconomic dynamics or interdisciplinary triple bottom-line sustainability, which results in a large difference in focus.

- Objectives are highly variable

Objectives also vary widely, ranging from understanding the broad social context (Jepson et al., Himes-Cornell et al., 2016), to assessing performance (van Holt et al., 2016; Anderson et al. 2015), to assessing the impact of management (MMO, 2024) to auditing for certification (USA Fair Trade). While there may be many overlapping themes among these, the specific purpose can lead to different types of indicators. For example, there have been a number of variations of Fisheries Performance Indicators developed which measure performance and efficiency relative to the fishery's potential (Anderson et al., 2015) or review fisheries performance as comparatively 'best', 'worst' and 'middle (Ashe et al., 2025). These measures of individual fishery performance do not

align very closely with the IOTC objectives of comparing dependence and contribution to economy and society across fisheries.

- Different fishery types

Fishery evaluation frameworks can be highly tailored and specific to particular fisheries and can therefore have the potential to be highly accurate in their ability to predict social outcomes related to policy changes, such as NOAA's Fisheries' Social Indicators for Fishing Communities (e.g. Jepson and Colbern, 2013). But these may have very limited applicability to other fisheries or regions. Varied fishery types make social outcomes challenging to evaluate, particularly when comparing across large-scale industrial and small-scale artisanal fisheries, and those with very different value chains, so indicators need to be broad enough to fit within the context of the different IOTC fisheries.

- Scale of analysis

Another factor which varied across frameworks was the scale of measurement used. This ranged from national-level to fishery-level to individual-level to enterprise-level to entire community-level indicators, with many indicators only relevant to analyses at that level. Therefore the scale of analysis must be determined before indicators are defined.

- Indicators can be static or time variant

Smith et al., (2019) categorised indicators as 'performance indicators' that are *'tracked annually or at regular intervals',* or 'contextual' indicators that are *'not evaluated for performance over time'.* Indicators were similarly categorised as static or trend based by the Indiseas project.

- Methods variability

Frameworks included a variety of methods ranging from quantitative to qualitative with highly variable time and resource needs. Community well-being, resilience, and vulnerability are typically assessed through time consuming and expensive qualitative primary data collection methods (e.g., ethnographic fieldwork or household surveys). Other methods rely on existing data which can work well in data-rich contexts (eg Himes-Cornell and Kasperski, 2016), but can have limited applicability to data-limited fisheries.

To address these issues, Anderson et al. (2015) developed the Fisheries Performance Indicators (FPIs) as a rapid assessment tool based on rankings by key informants (rather than on-site field research). The FPIs used innovative methods and employed a broad overall framework, but are still fairly limited in terms of social indicators and completely lacking in measures related to employment or food. The framework was adapted to focus on social dimensions as part of the Social Wellbeing in Fisheries Tool (SWIFT), utilising publicly available data that are readily-accessible though desk-based research (van Holt et al., 2016). Simth et al. (2019) also adapted the FPI framework to develop the Fishery Socioeconomic Outcomes Tool (FSOT) which evaluates socioeconomic outcomes relative to management objectives based on expert and key informant rankings (Table 1).

Table 1. Frameworks and approaches towards operationalising socioeconomic wellbeing

Framework/approach	Main focus	Source of information	Methods	Scale	References
Social Indicators of Fishing Community Vulnerability and Resilience (NOAA)	Social Impact Assessment. Socio-economic wellbeing/vulnerability and fishing dependence indices	Secondary data primarily from government sources	Factor analysis to reduce multiple metrics into one indicator. Indicators adapted for community relevance.	Fishing community	Jepson & Colbern, 2013; Pollnac et al., 2015; Himes-Cornell and Kasperski, 2016
Fishery Performance Indicators (FPIs)	Measures performance: ecology, economics, community (harvest and post-harvest)	Experts and key informants	Ordinal rankings developed that are accurate but imprecise. 68 metrics to compensate for lack of data	Fishery	Anderson et al., 2015
Social Wellbeing in Fisheries Tool (SWIFT)	Social wellbeing performance: flexibility, security, viability	Public data and stakeholders/key informants	Ordinal rankings developed that are accurate but imprecise. Includes extra review stage	Fishing community	van Holt et al., 2016
Fishery Socioeconomic Outcomes Tool (FSOT)	Evaluating socioeconomic outcomes relative to management objectives	Experts and key informants	Indicators scored by key informants and weighted according to objectives	Fishery	Smith et al., 2019
IndiSeas	Characterise the ecological, environmental and human dimensions of fisheries	Indicators derived from national data	Scientific experts from each ecosystem calculate the indicators	Whole fishing sector	http://www.indiseas.org/
Measuring the effects of catch shares	Impact of catch shares (ecological, economic, social, and governance)	Published data	Reports on status and trends of catch share fisheries in the US	Fishery	https://catchshareindicators.org/
A wellbeing approach	Socioeconomic contributions of fisheries to communities: Wellbeing approach	Primary data collection	Detailed interviews with a range of stakeholders in the fisheries sector	Fishing community	Voyer et al., 2017
Illuminating Hidden Harvests	Quantify the contributions of SSF: catch, poverty eradication, governance, gender equity and nutrient supply	Primary and secondary data	In-country and international experts collating data and using proxies or predictions when not available	National	FAO, 2023; Basurto et al., 2025

These rapid assessment methods involving expert judgement favour accuracy over precision. Several key informants provide scores for each indicator to avoid bias, and the mode is taken as the final score. These are categorised into bins or rankings to provide a semi-quantitative measure. Using a binned quantitative scale (e.g., percent change in revenue) enables scoring even when precise data are not available, and qualitative categories (e.g., a change in the existence of cultural, traditional, or historic practices in the community), can be used for measuring social outcomes, providing a consistent evaluation methodology to facilitate comparison among fisheries (Smith et al., 2019). Quality assessment ratings (1-3) can also be used to describe the level of confidence in indicator scoring. This allows scores to be discarded or weighted as appropriate, as well as prioritisation of dimensions with the poorest quality scores that require further investigation to collect more information. This type of methodological approach may be very useful for the IOTC given its numerous and highly diverse fisheries.

Overall, the global Illuminating Hidden Harvests (IHH) project provided some of the most relevant methods for the IOTC, given its similar objectives and focus on small-scale, data-limited fisheries. Basurto et al., (2025) developed a process using a combination of primary and secondary data sources whereby data were collected by in-country and international small-scale fisheries experts, forming diverse teams across academia, non-profit and civil society organizations, government officials, and independent researchers. This type of approach may also be particularly suitable for IOTC.

- Multiple indicators can increase robustness

Rapid assessment methods can be useful tools for data-limited situations. The use of multiple indicators (68 in the FPIs) can improve robustness by covering dimensions using a wide range of indicators which facilitates robustness despite uneven availability of information.

- Social v economic indicators

Although social and economic issues can be treated as separate domains, a deliberate approach was taken here to combine social and economic aspects based on the argument that economics and the economy as a whole fit within a larger social realm (Angel et al., 2019). This interconnectedness is apparent in the varied categorisation of indicators and metrics across studies. Some studies classify employment as economic (e.g. Smith et al 2019; Kaplan-Hallam and Bennett 2017; Voyer et al., 2017) while others have considered it social (e.g. MacFadyn and DeFaux, 2019), while other classify it as socioeconomic (e.g. Indiseas) or include it in both social and economic reporting (e.g. STEFC 2024 and STEFC 2024). In turn, food security has been considered a social variable (e.g. Smith et al, 2019; MacFadyn and DeFaux, 2019) or neither social nor economic (e.g. Indiseas; Bennet et al., 2021). Other studies do not differentiate between social and economic factors at all, rather calling them ‘socioeconomic’ or instead focussing on the dimensions of overall wellbeing (e.g. Himes-Cornell and Kasperski, 2016). In this review indicators and domains have all been termed ‘socioeconomic’.

A framework for IOTC

While the original aim of this review was to identify a standardised, internationally recognised approach and framework suitable for the IOTC, none of the evaluation frameworks reviewed were considered appropriate for the objectives of the IOTC. Some were developed at the level of the whole fishing community (van Holt et al., 2016) and were too specific to a certain location (Jepson and Colen, 2013; Himes-Cornell and Kasperski, 2016). Others were centred on fishery efficiency

and performance (Anderson et al., 2015; van Holt et al., 2016; Smith et al., 2019), rather than an inter-fishery comparison of the contribution of fisheries. Many contained dimensions not central to the IOTC objectives (e.g. governance or environmental) or lacked dimensions of relevance (e.g. food and employment).

Results confirmed the assertion of Bennet et al. (2021), that although many socioeconomic monitoring and evaluation frameworks already exist for fisheries, it is appropriate to establish a new one. Therefore, the approach taken was to review all of the higher level socioeconomic domains and catalogue these with their corresponding indicators. This process was similar to one the ICES Working Group on Social indicators (WGSOCIAL) has been undertaking which involved a systematic literature review of the use of social and economic indicators in fisheries management and decision-making to identify a common set of core social indicators that could be used in fisheries management (ICES, 2024b).

The socioeconomic domains emerging from the literature review were all very different with no clear trends or overarching patterns arising. Interchangeable terminology among indicators, metrics and domains, varying scales and the lack of mutually exclusive categories made collation very challenging, so dimensions were grouped under high-level thematic headings (domains). Socioeconomic domains considered most relevant to the IOTC were selected for inclusion in this study (Table 2). This provided a broad framework for indicator selection and is intended to be used as a 'live' framework for consideration and iterative development by the IOTC WPSE.

It is recommended that the IOTC develops an overarching conceptual framework which positions social indicators within the full suite of fisheries indicators (ecological, environmental, economic), providing the linkage for interdisciplinary analysis and advice. This would enable more integrated analyses and the formulation of more holistic management policies (Barclay et al., 2023).

Table 2. A framework for evaluating the socioeconomic dimensions of fisheries (domains highlighted in grey were not selected for IOTC).

Socioeconomic domain/dimension	Potential indicators	References (fisheries socioeconomic evaluation frameworks)
Poverty (national)	Poverty Index; Personal Disruption Index; Housing Characteristics Index; Housing Disruption Index; Commonwealth /Universal Vulnerability Index (CUVI); Small Islands Developing State (SIDS) status; Human Development Index (HDI); Gross National Income Status (GNI)	Jepson and Colburn 2013; Himes-Cornell and Kasperski, 2016; IOTC-2024-TCAC13-REF02
Economic value	Gross landings value (entire fleet or by vessel); revenue trend; revenue volatility; catch value in local currency;	Voyer et al., 2017; Smith et al., 2019; Carpenter et al., 2021; FFA, 2022; Gillett and Fong, 2023; STEFC, 2024; Basurto et al 2025.
Economic contribution	Fisheries value as % of GDP; Growth rate of contribution to GDP	Indiseas; Carpenter et al., 2021; IOTC-2024-TCAC13-REF02; Gillett and Fong, 2023; Sri Lanka Statistics report, 2024
Employment	Full Time Employment (FTE) by nationality, education level, age, average wage per FTE; wages relative to average; labour force structure index; Part-time v full-time fishing opportunities; employment turnover (captains/crew post-harvest), employment trends, average years experience (crew), importance of fisheries-related employment in community; proportion of fish workers employed in small-scale and artisanal fisheries	Jepson and Colburn 2013; MAG, 2013; Anderson et al., 2015; Himes-Cornell and Kasperski, 2016; van Holt et al., 2016; Voyer et al., 2017; Smith et al., 2019; Carpenter et al., 2021; Gillett and Fong, 2023; STEFC 2024b; IOTC-2024-TCAC13-REF02; WIOFish, 2024; Basurto et al., 2025.
Livelihoods	Other income sources; number of alternative sectors for employment; commercial harvesting reliance (index); commercial processing reliance (index); degree to which vessels also participate in other fisheries; subsistence harvesting involvement; total number of livelihoods dependent on fishing (including non-fishing household members; Fishers have alternate income (Y/N); % contribution to fisher income.	Jepson and Colburn, 2013; MRAG, 2013; Himes-Cornell and Kasperski, 2016; Indiseas; STEFC, 2024; WIOFish, 2024; Basurto et al., 2025.

Food and nutrition	Micronutrients (average contribution to dietary micronutrient intake (%); apparent consumption (from household surveys); subsistence harvest volume; subsistence harvest volume per capita; % households involved in subsistence activities; per capita fish production (food availability); per capita consumption; fish as a % of total protein consumed; fish contribution to animal nutrition intake; household expenditure contribution to food basket; Fishers eat a portion of the catch, Import Dependency Ratio IDR); Self-Sufficiency Ratio (SSR)	Himes-Cornell and Kasperski, 2016; Smith et al., 2019; Carpenter et al., 2021; Gillett and Fong, 2023; Sri Lanka Fisheries Statistics report 2024; IOTC-2024-TCAC13-REF02; WIOFish, 2024; Basurto et al 2025; Indiseas; FAO Food Balance Sheets.
Exports	Exports to main markets (volume and value); fisheries exports as % of total exports;	IOTC-2024-TCAC13-REF02; FFA, 2022; Gillett and Fong, 2023, Sri Lanka Fisheries Statistics report 2024; Indiseas.
Government revenues and expenditure/ public finance	Licence and access fee revenue; access fees as a % of state budget; subsidies; management and research related costs; taxes; port revenue.	Macfadyen and Defaux 2019; FFA, 2022; STEFC, 2024; Gillett and Fong, 2023; WIOFish, 2024.
Post-harvest and pre-harvest sectors (cross-cutting)	Onshore processing volume; location of seafood processing/post harvest facilities; seafood processor employment; value of post harvest sector; post harvest supply chain characteristics; processing workers wages cf. non-fishery wages; processing workers social standing; pre-harvest employment.	MRAG 2013; Voyer et al.,2017., Smith et al., 2019; Basurto et al., 2025.
Gender (cross-cutting)	Employment by gender; unpaid labour by gender; women in leadership roles; gender ratio; change in gender ratio.	van Holt et al., 2016; Smith et al., 2019; STEFC 2024b; Bassurto et al., 2025; WIOFish, 2024.
Environment/production	Catch volume (by flag and by EEZ)	MRAG, 2013; FFA, 2022; Gillett and Fong, 2023; STEFC, 2024; Basurto et al 2025.
Fleet characteristics/activity	Number of active vessels over time, vessel tonnage, vessel power, condition of/investment in vessels	Smith et al., 2019; FFA, 2022; STEFC, 2024
Economic efficiency	Gross Value Added (GVA); Net Value Added (NVA); Gross Profit; Net profit; Energy consumption; GVA to revenue %; Gross profit margin%; GVA per FTE; business profitability; trade restrictions on harvesters; Economic Conditions Index	MRAG, 2013; van Holt et al, 2016; Voyer et al., 2017; Carpenter et al., 2021; STEFC, 2024; ICES WGECON, 2024; FFA, 2022.

Health, welfare and safety	Number of incidences/fatalities reported on commercial fishing vessels per year; number of safety incidences per trip; national level protections for right to strike; Structures in place to address worker grievances; significant improvement in under-five mortality rate at fishery level; Seafood company has implemented programmes to improve healthcare at fishery level; fishery wages v. non-fishery wages; crew social standing; access to health care, sanitation.	MRAG, 2013; Anderson et al., 2015; van Holt et al., 2016; Voyer et al., 2017; Smith et al., 2019; Carpenter et al., 2021, Indiseas.
Education and knowledge generation	Education and training opportunities; formal training in value-added production; seafood company has implemented programmes to improve education; status of schools; % children out of school; community and sector-based interest.	Himes-Cornell and Kasperski, 2016; van Holt et al., 2016; Voyer et al., 2017; Carpenter et al., 2021.
Vessel accounting	Personnel costs, energy costs, repair and maintenance costs, other variable costs, other non-variable costs, consumption of fixed capital, opportunity cost of capital, lease payments for quota, value of physical capital, value of quotas, investments	STEFC, 2024
Fishery infrastructure	Change in amount of fishery infrastructure; condition of infrastructure	Smith et al., 2019
Conflict	Conflict on the water within the fleet, conflict on the water with other fleets, relationship between harvesters and supply chain, IUU fishing activity; Proportion of fishers who believe that, overall, most fishers comply with fishing rules and regulations; conflicts reported in last 12 mo.	Brooks et al., 2015; Smith et al., 2019; WIOFish, 2024.
Leisure and recreation	Contributions of infrastructure for recreational users, contributions of bait for recreational fishing, contributions of fishing knowledge to recreational users, importance of local bait for recreational users	Voyer et al., 2017.
Governance	Management rights (level of participation), exclusion rights, transferability rights; Level of perceived transparency by fishers of fisheries management decision-making processes.	Brooks et al., 2015; Basurto et al., 2025
Compliance	Number of infringements/number of inspections, transparency	Carpenter et al., 2021

Cultural identity	History of the fishery and identity, cultural significance, natural amenities index, retiree migration index, level of satisfaction fishers have achieving the cultural, recreational and lifestyle benefits important to them; cultural significance of seafood products; contributions to cultural events; opportunities for different socioeconomic and cultural groups; Importance of fishing to the culture and heritage of a community/region	Jepson and Colburn 2013; Brooks et al., 2015; Voyer et al., 2017; Smith et al., 2019; Carpenter et al., 2021.
Diversity & equity	Population composition index; Opportunities for different socioeconomic groups; opportunities for small-scale operators; ratio of crew wages to gross profits; Level of fisher perceived equity/ fairness of the processes and outcomes of fisheries management; affordability; ratio of artisanal to industrial catches	Jepson and Colburn 2013; Himes-Cornell and Kasperski, 2016; Voyer et al., 2017; Smith et al., 2019; Carpenter et al., 2021; Barclay at al., 2023.

*This table has not been produced from a systematic review of the literature. It is more in the nature of a scoping review to identify key thematic domains, for the purpose of stimulating debate rather than providing a comprehensive list of all possible indicators.

Selection of dimensions

A number of domains, such as those related to environmental and governance aspects, were considered to be outside the scope of this study. Only those most relevant to the IOTC objectives were included: poverty (national level context), economic value and contribution, employment, livelihoods, food and nutrition, exports, and government revenues and expenditure. The FFA have developed an *economic conditions index* based on fish prices, fishing costs and catch rates to monitor changes in economic conditions over time across whole fleets/gear types (FFA, 2015b; Skirtun and Reid, 2018). However economic efficiency was not considered to be one of the IOTC's central objectives, as it is related to performance over time rather than relative contribution or dependency, so was not included as a domain.

Given the huge array of small-scale fisheries (SSF) in the IOTC, using an approach that is as relevant for SSF as industrial fleets is paramount. To fully capture SSF benefits, including information beyond catch and catch value is important, particularly livelihoods, employment of women and nutrition (Bassurto et al., 2025). Fish is a particularly important source of food in developing countries due to its relative affordability, availability and accessibility for poor communities (OECD, 2025). This can address the deficiency in micronutrients often found among women of reproductive age and young children (O'Meara et al., 2021).

In a review of the literature on social objectives for fisheries Barclay et al., (2023) documented an even wider range of social dimensions not included in Table 2. These included maintaining communities, social capital, social resilience, quality of life and well-being (See Annex I for full list). While these did not always include proposed indicators, the list of objectives may be a useful reference for future consideration as the IOTC progresses further with the development of its own social objectives for monitoring and evaluation.

Cross-cutting themes

Two dimensions were included as cross-cutting themes across multiple other dimensions: the post-harvest sector and gender.

Post-harvest sector

Fisheries have often been defined narrowly in terms of harvesting activity. As a result, the significant pre- and post-harvest activities that support livelihoods and contribute significantly to economies are regularly overlooked or diminished (Mills et al., 2011; Smith and Basurto, 2019). McLuney et al., (2019) found that the largest differences in tuna fishery performance arose in the post-harvest sector due to differences in value chains that preserve quality and transport to high-value markets. The Illuminating Hidden Harvests (IHH) project estimated that the post-harvesting sector constituted 52.4 % of total fisheries employment compared with 44.3 % in the harvest sector and 3.2 % in the pre-harvest sector (FAO, 2023), highlighting the importance of including the post-harvest sector in socioeconomic considerations.

Gender

The importance of women in the harvesting sector, as well as pre-harvest and post-harvest activities is also increasingly recognised (Harper et al., 2020), with estimates that women account for 40% of employment in small-scale fisheries (FAO, 2023). Women commonly participate in fisheries through informal and unpaid activities, limiting their social protection and security. Much participation is systematically excluded from official fisheries data collection and analysis, resulting in insufficient considered of women' activities in fisheries decision-making.

Estimating engagement in subsistence activities as well as including the pre- and post-harvesting sectors can help monitor and highlight this participation.

It is crucially important that IOTC is forward-looking and considers gender dimensions. As emphasised by FAO (2023a), *"gender disaggregation should be the minimum requirement for all monitoring and research that informs fisheries policies and programmes."* The FAO argues that gender-blind or biased data collection methodologies overlook women in fisheries, obscuring their full contributions to the achievement of the Sustainable Development Goals (SDGs) and the development of gender-inclusive fisheries policies, as outlined in the SSF Guidelines[14].

Socioeconomic indicators

Following the identification of relevant domains, the challenge is to narrow down the list of multiple candidate indicators to those that best measure the corresponding dimensions. Indicators are measurable elements that show or communicate the status, condition, or trends related to a topic of interest (Breslow et al., 2016). Good indicators are unambiguous, comprehensive, have a clear direction (i.e., better or worse), are operational and understandable (Bennet et al., 2021).

According to the University of Leiden WISE database, 'beyond-GDP' socioeconomic measurement systems take one of two approaches:

1. An Index providing one summary number, developed to capture a suite of broader dimensions. Indices are useful for simplifying multidimensional concepts (e.g. human development).
2. A Dashboards of Indicators presenting performance in a set of individual metrics without aggregating them into one number. This is useful in considering the different dimensions in more detail and how these are impacted separately.

Composite indices may be most appropriate for providing baseline context, where multiple dimensions are simplified to establish a broad background knowledge base for decision-making. A dashboard approach is then recommended for more specific fishery-level indicators where the details of how different elements may be affected by management are of greater interest.

While there are thousands of potential indicators that could be used, *"the objective is not to include every sociocultural element in the system" (Pollnac et al., 2015).* In their review on the EU fisheries sector, Carpenter et al. (2021) found that some indicators within domains were highly correlated, however, low correlation existed between indicators among different domains (e.g. economic and social domains). This suggests that it is important to include indicators across all domains of interest included within a defined framework but that, within domains, some indicators may serve as adequate proxies of others. Therefore, if a few representative indicators are selected within domains, assessment results may not vary too much based on which specific indicators are selected. As such, at least one indicator was proposed for each domain.

The indicators also comprise a combination of absolute (e.g. catch value) and relative (e.g. contribution to GDP) measures. While relative measures are generally more useful for inter-country comparisons, absolute measures are also helpful for determining the overall scale of a

[14] *Voluntary Guidelines for Securing Sustainable Small-Scale Fisheries in the Context of Food Security and Poverty Eradication (SSF Guidelines)*

variable. Some of the metrics used to compute indicators may therefore also be useful as stand-alone indicators themselves.

Selection criteria

The indicators have been drafted with reference to good practice in the development and use of social indicators in marine contexts (Hattam et al. 2015), which recommends that indicator quality is assessed in five areas: measurability; sensitivity; specificity; scalability; and transferability.

- Measurability: are there data available for the measurement and quantification of the indicator?
- Sensitivity: does the indicator detect change in the ecosystem service over time?
- Specificity[15]: does the indicator reflect a priority area of management interest?
- Scalability: can the indicator be aggregated or disaggregated to a different spatial scale and still retain its ability to indicate the change of interest?
- Transferability: is the indicator useful for other locations and hence studies?

These are based on yes/no answers and so if the answer was no, indicators was re-examined and amended where possible.

Performance metrics (measuring efficiencies within a fisheries system) were not included, while indicators which focussed on the relative importance/contribution/dependence of people on the tuna fisheries were prioritised, as well as those related to allocation of fishing opportunities.

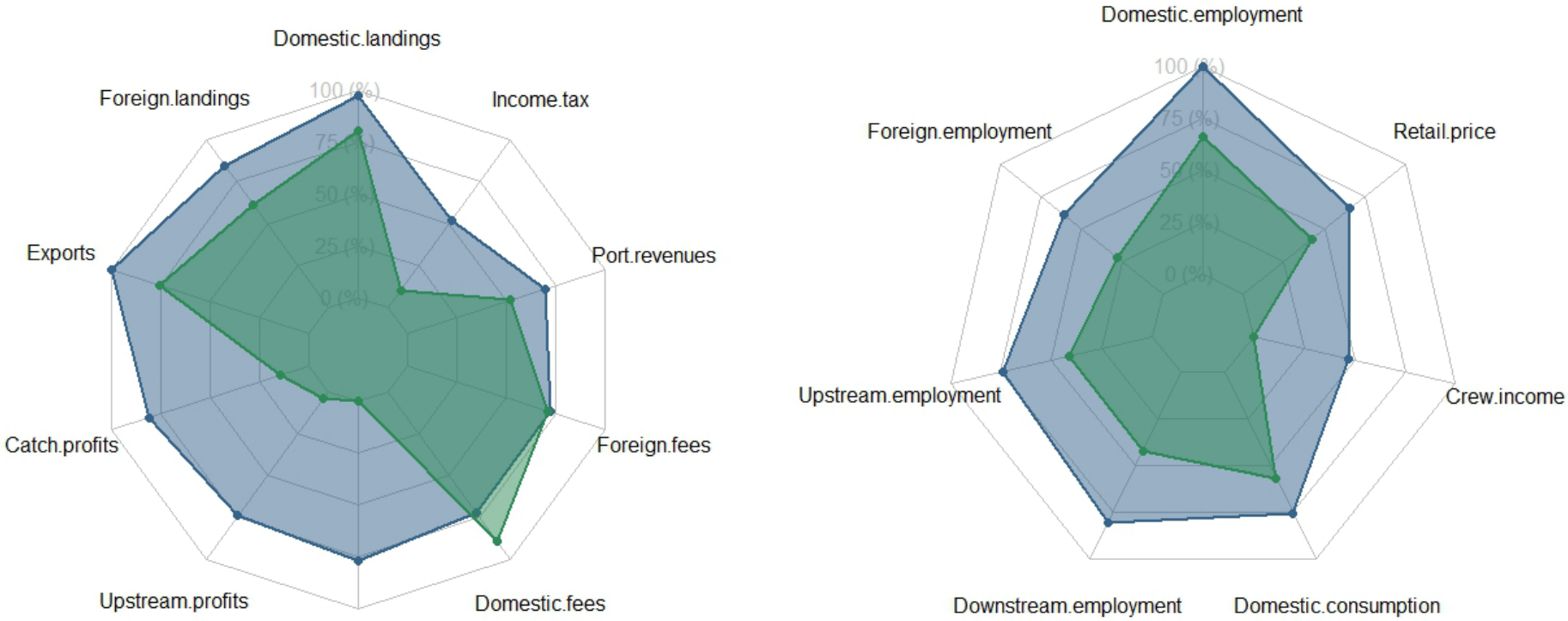
Measurability included the need to *"... take into consideration the logistical and financial impacts of adopted CMMs on CPCs."* (WPSE, 2024) which was mainly addressed by searching for open-access data sources or methodologies that have been widely used across a variety of small-scale fisheries systems and may be replicated (e.g. Basurto et al., 2025).

Rankings of indicator usefulness and feasibility provided by 17 IOTC CPCs[16] (Figure 1a and b) were also used as key measures of indicator acceptability and potential success (MacFadyn and DeFaux, 2019). Special attention was given to previous CPC proposals for indicators:

"CPCs suggested a range of other indicators not proposed by the consultants as being useful. Perhaps most notable and frequent in terms of suggestions were the usefulness of an indicator of tuna-related contributions to GDP, state management and research-related costs, and indicators of dependency (for example of coastal communities and/or households on tuna-related activities, of total employment on tuna-related employment)" (MacFadyn and Defaux, 2019).

[15] This criterion was adapted to reflect relevance to this study

[16] Australia, Bangladesh, the EU, Indonesia, Japan, Kenya, Rep. of Korea, Madagascar, Maldives, Mozambique, Oman, Senegal, Seychelles, Sri Lanka, Sudan and the UK.



(a) (b)

Figure 1. Economic (a) and social (b) indicators scored by IOTC CPCs according to perceived usefulness (blue) and feasibility (green) (MacFadyn and DeFaux, 2019).

Fishery level indicators

The proposed fishery level indicators are described below.

Indicator: Catch value (PPP)

Description: Total value of landings in Purchasing Power Parity (PPP) to describe the economic importance of the fishery in absolute terms

Catch value (PPP-adjusted dollars) = nominal catch x ex-vessel price (local currency) x PPP conversion factor

Data requirements

- Nominal catch data by species, flag and EEZ (in annual metric tonnes of live weight equivalent)
  Source: IOTC nominal catches.
- Average annual ex-vessel prices by species and country (local currency/ metric tonne).
  Sources:
  - IOTC price database[17],
  - UN Comtrade for unit export values by country using HS-6-digit level product codes for tunas (https://wits.worldbank.org/) where export price is a proxy for national ex-vessel price (see methods by Tidd et al., 2025).
  - FFA (https://www.ffa.int/download/economic-development-indicators-and-statistics/)[18].
- Annual Purchasing Power Parity conversion factor by country
  Source: World Bank conversion factors
https://data.worldbank.org/indicator/PA.NUS.PPP

National landings value was included as this was ranked highly (2nd) in terms of both usefulness and feasibility by CPCs (Figure 1a). Landings by foreign fleets in coastal state EEZs was also ranked highly in terms of usefulness (3rd) but was considered less feasible (5th).

Ex-vessel price is defined here as the price fishers receive for their catch or the price at which fish are sold when they first enter the seafood supply chain. Converting catch values to Purchasing Power Parity (PPP, i.e. a currency converter which expresses the number of local currency units per international $ and used to control for price level differences between countries) enables a better comparison of the value across countries and difference scales of fishery.

Indicator: Contribution to GDP (IO tuna)

Description: Relative importance of Indian Ocean tuna to CPC economy

Contribution to GDP (current market prices) = nominal catch x ex-vessel price / GDP

[17] The IOTC Secretariat currently holds ex-vessel price data for Bangladesh, Kenya, Sri Lanka, Madagascar, Mauritius, Malaysia, Thailand, India and Oman (form 7PR).

[18] Ex-vessel and import prices as proxies from major markets in Japan, Thailand and the US.

Data requirements

- Nominal catch data by species, flag and EEZ (in annual metric tonnes of live weight equivalent)
  Source: IOTC nominal catches.
- Average annual ex-vessel prices by species and country (price/ metric tonne).
  Sources:
  - IOTC price database[19],
  - UN Comtrade for unit export values by country using HS-6-digit level product codes for tunas (https://wits.worldbank.org/) where export price is a proxy for national ex-vessel price (see methods by Tidd et al., 2025).
  - FFA (https://www.ffa.int/download/economic-development-indicators-and-statistics/)[20].
  - IHH for SSF prices https://www.fao.org/voluntary-guidelines-small-scale-fisheries/resources/ihh-database/en
- GDP
  Source: World Bank https://data.worldbank.org/indicator/NY.GDP.MKTP.CD

Although this was not an indicator included in the survey and so received no ranking, it was proposed by a number of CPCs and so, alongside the datasets described above and references in the literature, was considered likely to be both useful and feasible (MacFadyn and Defaux, 2019).

Indicator: Contribution to employment

Description: Total number of people employed by sector (pre-harvest, harvest and post-harvest) and gender.

Contribution to total employment =

(Total number of fish workers + total number of pre-harvest and post-harvest sector workers) / Total employment

Data requirements

- Total number of fish workers (harvest sector) in Indian Ocean tuna fisheries, by gender

  Sources:

  - WIOFish employment in tuna fisheries by gender (harvest sector)
  - OECD employment in fisheries by gender and sector (but not tuna-specific).
  - National labour force surveys (LFS[21]), Household Income Expenditure Surveys (HIES), Integrated Household Survey (Living Standards Measurement Survey, for household level, Fisheries administration registration data and population censuses.
  - IHH for SSF employment https://www.fao.org/voluntary-guidelines-small-scale-fisheries/resources/ihh-database/en

[19] The IOTC Secretariat currently holds ex-vessel price data for Bangladesh, Kenya, Sri Lanka, Madagascar, Mauritius, Malaysia, Thailand, India and Oman (form 7PR).

[20] Ex-vessel and import prices as proxies from major markets in Japan, Thailand and the US.

[21] ilo.org/surveyLib/index.php/catalog/LFS/?page=1&ps=15&repo=LFS

- Total number of pre-harvest and post-harvest sector workers (by gender)
  Sources:
  As above. A data request for excel sheet 1A_ECON_employ from the FAO IHH study may provide useful information (FAO, 2023a).

- Total national employment (by gender)
  Source: ILO

Employment is defined here according to the IHH definition, *"all persons of working age who engage in any activity to produce goods or provide services for pay or profit, including harvesting (e.g. removing or collecting live wild aquatic organisms from oceanic, coastal or inland waters), pre-harvest (e.g. building of ships and floating structures, repair of equipment) and post-harvest activities (e.g. processing and preserving of fish, crustaceans and molluscs; wholesale of fishery products; and retail sale of aquatic products). This includes both part- and full-time employment in order to capture seasonal variation"* (FAO, 2023).

Domestic employment across the different sub-sectors was considered relatively useful and feasible (Figure 1b), however, FTE was not considered useful based on survey feedback from CPCs so was not used, and instead all part time contributions were counted (MacFadyn and Defaux, 2019).

Indicator: Total livelihoods dependent upon IO tuna fisheries

Description: Total livelihoods dependent upon IO tuna fisheries are defined here as the total numbers of people employed along fisheries value chains plus the members of their households. Other members of the households of those employed in the fisheries or engaged in subsistence activities may engage in other occupations and so these are livelihoods at least "partially dependent" upon employment or subsistence.

Data requirements

- The total number of people living in households where at least one member is employed in tuna fisheries (commercial or subsistence fishing)

  Data sources:

  - population censuses (PCs),
  - labour force surveys (LFS) and
  - household income and expenditure surveys (HIES)[22]
  - IHH for SSF employment and subsistence https://www.fao.org/voluntary-guidelines-small-scale-fisheries/resources/ihh-database/en
  - FAO data request for sheet "1B_ECON_depend" from the IHH project (FAO, 2023a)

An alternative metric is the number of fully dependent livelihoods (calculated as the total number of household members who are solely dependent upon employment in small-scale fisheries).

[22] In total, the national representative household-based survey used to estimate employment and dependency in small-scale fisheries (PCs, LFS and HIES) were available for 78 countries over the period 2008-2018: LFS for 33 countries, HIES employment modules for 44 countries, and a PC for one country. These surveys represent almost 79% of the total world population in 2016 and cover an estimated 78.8 % of the world's employed population in 2016 (Basurto et al., 2025).

Livelihoods include subsistence fishing, also defined as "working mainly for own consumption". This refers to individuals of any sex and age that carry out an activity at least once over the survey reference period in order to produce and process fish which is predominantly consumed by their own household, with no transaction occurring in the marketplace" (FAO, 2023).

Missing data: If subsistence data were not provided directly in the survey used, the IHH study authors applied the ratio of the country's population engaging in fishing for subsistence to total employment in small-scale fisheries. The ratio was calculated from the mean of available data from other countries within a geographic archetype, according to the regional grouping provided by the International Labour Organization (ILO). A similar approach may also be taken if the proportion of tuna fish workers is unknown.

National LFS or HIES can typically be used to obtain information on the gender of the individuals participating in fisheries activities. Otherwise, social science and gender studies literature reviews can be used to identify average gender ratios and paired with existing data to make informed estimates about women's involvement (FAO, 2024).

As an alternative approach, a scoring approach could be used by key informants, consistent with the FPIs (Anderson et al., 2015) where the proportion of women in the tuna sub-sector are estimated by a range of expert key informants[23].

Indicator: Per capita tuna consumption

Description: The per capita supply of tuna available for human consumption.

Method 1. Apparent consumption (FAO)

Total tuna supply = production + imports – exports – non-food uses

Per capita tuna supply (kg live weight/capita/yr) = total tuna supply (t) / population (1000s)

Data requirements

- Nominal catch data by flag (in annual metric tonnes of live weight equivalent)
  Source: IOTC nominal catches.
- Tuna imports (including domestic landings by foreign vessels)
  Sources: UN Comtrade for unit export values (and volumes) by country using HS-6-digit level product codes for tunas (https://wits.worldbank.org/)
  OECD
  https://www.oecd.org/content/oecd/en/search/data.html?q=fish&orderBy=mostRelevant&page=0
  FAO FishStatj Global aquatic trade database[24]
  https://www.fao.org/fishery/en/statistics/software/fishstatj
  Data from major markets
  - EuroStats (http://ec.europa.eu/eurostat/data/database).

[23] E.g. Indicator = *Labour participation in harvest sector.* Categories: 80-100%, 60-80%, 40-60%, 20-405, <20% women (scoring criteria proposed by Anderson et al., 2015).

[24] FAO. 2024. Fishstat: Global Aquatic Trade Statistics 2019-2022. In: FishStatJ. Available at www.fao.org/fishery/en/statistics/software/fishstatj. Licence: CC-BY-4.0.

    - Japan Customs (https://www.customs.go.jp/toukei/info/index.htm) (excludes frozen whole tuna).
    - Thai customs (http://customs.go.th/index.php?view=normal).
    - NMFS http://www.st.nmfs.noaa.gov/st1/trade/monthly_data/TradeDataCountryMonth.html
- Tuna exports (including re-exports)
  Sources (as above)
- Non-food uses of tuna
  Source: government data on the amount of fish (tonnes/percent) sold for human consumption, and amount utilized for non-human consumption (fishmeal, fish oil, pet trade, etc.).
- Total population (to estimate per capita supply)
  Source: World Bank https://data.worldbank.org/indicator/SP.POP.TOTL

Other data sources for validation:

- Total fish available for human consumption (pelagics[25])
  Source: FAO FishStatj Food balance sheets of aquatic products (FAO, 2023b)
  https://www.fao.org/fishery/en/statistics/software/fishstatj

Method 2. Reported fish consumption (alternative to method 1)

Data requirements

- Average national level of tuna consumption per capita (kg/yr)
  Sources:
    - Consumption surveys (eg Living Standards Measurement Study, Demographic Health Survey, Seychelles Childhood Development Study),
    - Household income and expenditure surveys.

Missing data: If reported fish consumption is not disaggregated by species, national, subnational or local studies could be used to estimate species composition of fish supply.

Total tuna supply available for local consumption was ranked highly in the scoping survey for both usefulness and feasibility (Figure 1b). It was adapted here to include per capita tuna consumption, which was also proposed by CPCs (MacFadyn and Defaux, 2019).

Indicator: Micronutrient contribution of tuna to local diets

Description: Average % contribution of tuna to local diets across 6 micronutrients.

Daily micronutrient supply from tuna =

Total tuna supply by species x edible portion x nutrient concentration / 365

Per capita supply = daily micronutrient supply/coastal population

[25] Data currently available for 'pelagic fish', however, this also includes small pelagics. Nevertheless, FAO is working to disaggregate small and large pelagic fish in future.

Contribution of tuna to micronutrient intake = per capita supply of micronutrients from tuna / CPC per capita micronutrient supply.

These contributions can be averaged across the six nutrients to give the average contribution of tuna catches to per capita dietary micronutrient intake.

Data requirements:

- Total tuna supply by species
  Source: (estimated as above)
- Edible portion of tuna
  Source: default value = 0.87 for tuna (Basurto et al., 2025)
- Nutrient concentrations by species
  Source: www.Fishbase.org (Trait-based model by Hicks et al., 2019)
- Coastal population (population living within 20 km of the coastline)
  Source: https://zenodo.org/records/13887065)
- Total per capita nutrient supply from all foods
  Source: Dietary intake from the Global Dietary Database

  https://globaldietarydatabase.org/management/microdata-surveys/653

  https://zenodo.org/records/13887065 (see Basurto et al., 2025).

Indicator: Contribution to national export earnings (IO tuna)

Description: Relative importance of Indian Ocean tuna to foreign income

Contribution to national exports (%) = Export value / Total national export value

Data requirements

- Indian Ocean tuna export value (million US$/year)
  Sources:
  - UN Comtrade for unit export values (and volumes) by country using HS-6-digit level product codes for tunas (https://wits.worldbank.org/)
  - OECD https://www.oecd.org/content/oecd/en/search/data.html?q=fish&orderBy=mostRelevant&page=0
  - FAO FishStatj Global aquatic trade database[26] https://www.fao.org/fishery/en/statistics/software/fishstatj
  - Data from major markets
    - EuroStats (http://ec.europa.eu/eurostat/data/database).
    - Japan Customs (https://www.customs.go.jp/toukei/info/index.htm) (excludes frozen whole tuna).
    - Thai customs (http://customs.go.th/index.php?view=normal).

[26] FAO. 2024. Fishstat: Global Aquatic Trade Statistics 2019-2022. In: FishStatJ. Available at www.fao.org/fishery/en/statistics/software/fishstatj. Licence: CC-BY-4.0.

    - NMFS http://www.st.nmfs.noaa.gov/st1/trade/monthly_data/TradeDataCountryMonth.html
- Total national export value (million US$/year)
  Sources:
  - UN Comtrade (https://wits.worldbank.org/)

Exports were considered the most useful indicator of all those ranked by CPCs in the 2019 survey, and also ranked highly in terms of feasibility (3rd) (Figure 1a). However, global databases such as FAOSTAT and OECD do not tend to separate out trade information by ocean, so for CPCs which have tuna fleets in multiple oceans, (e.g. Indonesia), government statistics may also be needed.

Indicator: Contribution to government revenues

Description: revenues from ports/licences/access fees as a % of state budget

Contribution to government revenues = (Domestic fees + foreign fees) / state budget

Data requirements

- Licence fees paid by domestic flagged vessels
  Source: national accounts
- Access fees paid by foreign flagged vessels
  Source: national accounts
- Port revenues paid by foreign flagged vessels
  Source: national accounts
- State budget
  Source: national accounts

While access fees and port revenues were not considered the most useful indicators by CPCs, they had a high feasibility ranking, suggesting they would be easy to collate, and a suggestion to improve the usefulness of the indicator by comparing the revenues with the overall state budget to assess relative importance**.** Taxes had very low feasibility and usefulness rankings, so were not included here (MacFadyn and Defaux, 2019).

Indicator: Government expenditure

Description: Tuna fisheries expenses directly incurred by government as a proportion of state budget

Contribution to government revenues = (management and research costs + subsidies) / state budget

Data requirements

- Subsidies
  Source: national accounts
- Management and research costs
  Source: national accounts

While less general than most of the other indicators, subsidies were specifically mentioned by the Commission and should be straightforward to provide so were included here (Res. 23/10).

Management and research costs were proposed by CPCs during the survey (MacFadyn and Defaux, 2019).

Indicator: Processed tuna production

Description: Volume of processed tuna products in net product weight by country and product type.

Data requirements

- Process production volume in net product weight by country and tuna products
  Source: FishstatJ[27]

As the ocean tuna is sourced from is not provided in the processed volume dataset, a ratio approach could potentially be used to estimate the volume of processed product from the Indian Ocean based on the ratio of catches among oceans.

Context indicators

Table 3 provides a list of potential national level context indicators. These are available from open-source databases and so could be compiled across all CPCs. Although not directly related to tuna fisheries, these indicators may be useful for assessing and comparing the economic and development status as well as overall fisheries reliance of IOTC Contracting Parties. For example, Gross National Income (GNI) has been considered in the current draft proposal for criteria used to allocate stock quotas among the IOTC Contracting Parties (IOTC-2024-TCAC13-REF02). GNI is the most widely used measure of the domestic economy defined as the total market value of goods and services produced during a given period. It is important for IOTC fisheries because the returns from overseas, including income from fishing access fees from non-resident foreign operators, are often overlooked. It is also applied to compare economic performance or to assess the comparative advantage of different countries at the regional and international levels (Sweenarain, 2021).

Poverty domain was not considered not relevant at the fishery level as it is typically a national- or community-level metric. The Human Development Index (HDI) was included as a national measure of living standards, education and life expectancy useful for among country comparisons for its simplicity and interpretability. If community level scales are considered in future, the Multidimensional Poverty Index (MPI) of the Oxford Poverty & Human Development Initiative may be appropriate as it is computed for 1 359 subnational regions across 102 countries to show disparities in poverty within countries (Alkire et al., 2024). While similar to the HDI in that it measures health, education, and living standards, it focuses on deprivation and is more nuanced than HDI, highlighting which aspects of poverty people are most vulnerable to.

[27] FAO. 2024. Fishery and Aquaculture Statistics. Global Aquatic Processed Production statistics 1976- 2022 (FishstatJ). In: *FAO Fisheries and Aquaculture Division* [online]. Rome. Updated 2024. www.fao.org/fishery/en/statistics/software/fishstatj. Licence: CC-BY-4.0.

Table 3. Context indicators and data sources (open-access) for national summaries

Indicator	Description	Data source
Human Development Index	*Human Development Index* *This encompasses average conditions of life expectancy, education, and a decent standard of living.*	*https://hdr.undp.org/data-center/human-development-index#/indices/HDI*
Gross National Income	*Gross National Income (per capita) at PPP.* *Measure of national economic activities including GDP and returns from foreign investments and remittances.*	https://data.worldbank.org/indicator/NY.GNP.MKTP.CD
Fisheries contribution to GDP	*Sustainable fisheries contribution to GDP (SDG indicator 14.7.1)*	https://www.fao.org/faostat/en/#data/SDGB
Contribution of fisheries production to food supply	*Total fisheries production per capita*	*FAO FishStatj Global aquatic trade database*[28] https://www.fao.org/fishery/en/statistics/software/fishstatj *https://population.un.org/wpp/)*
Per capita fish consumption	*Estimated fisheries consumption per capita (g/capita/day)*	*https://www.fao.org/faostat/en/#data/HCES*
Fisheries contribution to employment	*Percent contribution of fishers to total national labour force (%)*	ILOstat; WIOFish; OECD
Fisheries contribution to exports	*Percent contribution of fisheries to national export earnings (%)*	https://wits.worldbank.org/ OECD; FAO FishStatj Global aquatic trade database
Number of active vessels	*Number of active vessels by size category (GT)*	Industrial and semi-industrial vessels https://clav.iotc.org/ Artisanal vessels OECD

[28] FAO. 2024. Fishstat: Global Aquatic Trade Statistics 2019-2022. In: FishStatJ. Available at www.fao.org/fishery/en/statistics/software/fishstatj. Licence: CC-BY-4.0.

Format

The EU Scientific, Technical and Economic Committee for Fisheries (STECF) has begun developing National Fishing Profiles (NFPs) which provide a socioeconomic overview of the fisheries. These have been trialled in five countries, but development is ongoing as a number of issues have been identified including confusion regarding their purpose and target audience, which in turn affects many items such as length, structure and format. They were also considered very time-consuming to produce. The Committee has have determined that *"The adaptability and flexibility of the template is crucial, especially since developing NFP is an iterative process"*. A web-based profile is their preferred format, rather than a pdf document, to facilitate links with different datasets, to enable more straightforward updates of (parts of the) data, as well as easier comparability between Member States (STECF, 2022). The IOTC may want to take some lessons learned from this process and consider limiting requirements to a simple set of priority metrics and potentially introducing a web-based format for national datasets.

Recommendations

Based on the outcomes of this rapid review, it is recommended that WPSE considers the following for review and discussion:

- Consider the development of a framework containing priority thematic socioeconomic domains of interest related to clear overarching objectives. This may be positioned within a broader, overarching, integrated theoretical framing such as the Ecosystem Approach to Fisheries, providing a linkage for integrated analysis and advice.
- Agree on a small list of relatively simple indicators that can be initially developed for all CPCs based on currently available data and use a stepwise and iterative process approach to develop and refine these further (Bennett et al., 2021)
- Consider the addition of further indicators as objectives are refined, as the proposed indicators may not necessarily be the best or sufficient in all situations within the vast array of different fisheries and métiers so it is likely that additional indicators may be required.
- Consider the use of rapid, semi-quantitative assessment methods for greater accuracy and more widescale feasibility over precision (Anderson et al., 2015).
- Given that small-scale fisheries are responsible for more than half of IOTC landings, ensure that the framework and indicators developed have sufficient focus on these fisheries and their needs. Consider utilising outputs from the IHH as a starting point to make the most of readily available datasets from SSF and work with FAO to draw out tuna-specific results (Basurto et al., 2025).
- Consider using a suite of indicators/dashboard across all key socioeconomic domains to improve robustness
- Consider the most appropriate scale of indicators to be developed (eg national v fishery).
- Consider the most appropriate format of outputs and responsibilities for updating datasets, drawing on lessons learned from STECF (2022).

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Appendix I

Literature on Social Objectives Relating to Fisheries Management

Objective	*Commercial fisheries*	*Recreational fisheries*	*Indigenous fisheries*
Maintain or enhance family incomes and livelihoods, ***alleviate poverty***	Chesson et al. (1999); Coulthard (2012); Davis and Wagner (2006); Glaser and Diele (2004); Hilborn (2007); Lane (1989); Leung et al. (1998); Marshall (2007); Mascia (2003); Soma (2003); Stouten et al. (2011); Symes and Phillipson (2009); Tobin et al. (2009); Urquhart et al. (2011); *Standford et al. (2013); Brooks et al. (2015); Chaigneau et al. (2019)*	*Brooks et al. (2015)*	Andalecio (2011); Plagányi et al. (2013); *Cisneros-Montemayor and Cisneros-Mata (2018); Brooks et al. (2015)*
Maintain or maximise employment	Chesson et al. (1999); Cheung and Sumaila (2008); Fulton et al. (2007); Hilborn (2007); Mardle et al. (2002); Mardle et al. (2004); Nunan (2013); Pascoe et al. (2013); Stouten et al. (2011); Symes and Phillipson (2009); Urquhart et al. (2011)		Plagányi et al. (2013)
Maintain communities	Fulton et al. (2007); Hilborn (2007); Mardle et al. (2002); Mardle et al. (2004); Marshall (2007); Pascoe et al. (2009); Symes and Phillipson (2009); Tobin et al. (2009); Urquhart et al. (2011)	Cowx and Van Anrooy (2010)	Plagányi et al. (2013)
Equity	Andalecio (2011); Davis and Wagner (2006); Fulton et al. (2007); Glaser and Diele (2004); Mardle et al. (2004); Marshall (2007); Nunan (2013); Pascoe et al. (2013); Tobin et al. (2009); *Brooks et al. (2015)*		Plagányi et al. (2013); *Cisneros-Montemayor and Cisneros-Mata (2018); Richmond (2013); Kourantidou et al. (2021); Bodwitch et al. (2022)*
Maintain social capital	Brooks (2010); Davis and Wagner (2006); Marshall (2007); Soma (2003); Urquhart et al. (2011); *Voyer et al. (2017a); Bennet et al. (2018); Chaigneau et al. (2019)*		*Brooks et al. (2015); Bennet et al. (2018)*

Ensure health and Safety	Coulthard (2012); Mardle et al. (2002); Nunan (2013); Soma (2003); *Voyer et al. (2017a); Chaigneau et al. (2019)*		*Voyer et al. (2017b)*
Conserve traditional activities, culture and products, *spiritual life*	Chesson et al. (1999); Davis and Wagner (2006); Leung et al. (1998); Tobin et al. (2009); Urquhart et al. (2011); *Voyer et al. (2017a); Bennet et al. (2018)*	Cowx and Van Anrooy (2010); *Brooks et al. (2015)*	Plagányi et al. (2013); *Brooks et al. (2015); Trujillo-Osario et al. (2017); Voyer et al. (2017a); Bennet et al. (2018)*
Maintain or improve recreational access	Leung et al. (1998); Mapstone et al. (2008); *Voyer et al. (2017b)*	Leung et al. (1998); Mapstone et al. (2008); *Brooks et al. (2015); Voyer et al. (2017b)*	
Maintain or enhance social resilience; *resilience regarding climate change*	Brooks (2010); Marshall (2007, 2010); Marshall and Marshall (2007); Tobin et al. (2009); Urquhart et al. (2011)		*Cisneros-Montemayor and Cisneros-Mata (2018)*
Enhance quality of life, *social wellbeing*	Coulthard (2012); Lane (1989); Leung et al. (1998); Schirmer and Casey (2005); Tobin et al. (2009); *Brooks et al. (2015); Daw et al. (2015); Voyer et al. (2017a); Bennet et al. (2018); Chaigneau et al. (2019)*	*Brooks et al. (2015)*	*Brooks et al. (2015); Bennet et al. (2018)*
Avoid social exclusion (improve public perception)	Fulton et al. (2007); Symes and Phillipson (2009); *Voyer et al. (2017a)*		
Minimise conflicts between alternative users; *and within user groups*	Andalecio (2011); Davis and Wagner (2006); Fulton et al. (2007); Leung et al. (1998); Mardle et al. (2002); Mardle et al. (2004); Pascoe et al. (2009); *Brooks et al. (2015); Voyer et al. (2017a; b)*	Cowx and Van Anrooy (2010); *Brooks et al. (2015); Voyer et al. (2017b)*	
Ensure food supply, *food and nutrition security, food sovereignty, food safety*	Chesson et al. (1999); *Béné et al. (2016); Voyer et al. (2017a); Bennet et al. (2018); Hicks et al. (2019); Chaigneau et al. (2019); Ogier et al. (2020); O'Meara et al. (2021); Simmance et al. (2022);*		*Voyer et al. (2017a); Trujillo-Osario et al. (2017); Cisneros-Montemayor and Cisneros-Mata (2018); Bennet et al. (2018)*

Ensure management stability, acceptability	Fulton et al. (2007), Andalecio (2011)		
Participation in governance, self determination	*Brooks et al. (2015); Bennet et al. (2018); Chaigneau et al. (2019)*	*Brooks et al. (2015)*	*Trujillo-Osario et al. (2017); Richmond (2013); Brooks et al. (2015); Bennet et al. (2018)*
Education, knowledge/information creation and dissemination	*Brooks et al. (2015); Voyer et al. (2017a); Bennet et al. (2018); Chaigneau et al. (2019)*	*Brooks et al. (2015)*	*Brooks et al. (2015); Bennet et al. (2018)*

Notes

- This table was produced by Barclay et al., (2023), adapted from Pascoe et al. (2014).
- The table has not been produced from a systematic review of the literature, nor has the coding of papers to categories been rigorously tested for reliability. It is more in the nature of a scoping review, for the purpose of stimulating debate rather than giving a thorough assessment of the state of the field.
- The table should not be taken as an indication of how important social objectives are in each fishery – it is likely that social objectives should be rated more highly in recreational and Indigenous fisheries than the table suggests. The table contains a bias towards commercial fisheries because it uses papers published on social objectives, reflecting the fact that most papers published are on commercial fisheries.
- In low-income contexts the category of 'recreational' fishing may be meaningless. Papers on contexts where all fishing is for food or income have been put in the commercial or Indigenous columns as appropriate.

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