Coordinating Working Party on Fishery Statistics (CWP)

Introduction

The scope of this Handbook is to:

- Document concepts that are relevant to capture fishery and aquaculture statistics
- Define statistical standards for specialized concepts as adopted by CWP
- Define statistical standards for concepts that have a wider scope as adopted internationally (mainly UN statistical standards)
- Review methodological issues that are specific to capture fishery and aquaculture statistics
- Define minimum requirements for data collection
- Define desirable levels of information.

The Handbook contains sections which cover (1) Introduction, (2) General concepts, (3) Capture fishery statistics, (4) Aquaculture statistics, (5) Socio-economic dimension, and (6) Tools and resources. There is also a search tool. The Handbook does not cover the processing industry of aquatic products. However, there are examples when it is difficult to distinguish between the industry resources used for fishing or aquaculture and those used for processing fish and other aquatic organisms, such as the processing of fish on-board a fishing vessel.

CWP follows internationally-agreed statistical concepts, standards, classifications and practices and develops this general approach with methodologies and guidelines that are specific to capture fishery and aquaculture statistics. The Handbook is the documentation of this work.

Many of the CWP-defined concepts, classifications, data exchange protocols and codes may be applied in a wider context and users are advised to ensure the validity of such applications.

In its efforts to develop useful and practical systems, CWP is consistently keeping statistical standards under review and welcomes feedback from national authorities on the application of these international standards at the national level.

Development of the Handbook

The eleventh session of the then Coordinating Working Party on Atlantic Fishery Statistics (now Coordinating Working Party on Fishery Statistics; CWP) proposed in 1982 that a Handbook of Fishery Statistics (referred herein as the Handbook) be brought together. The first edition of the Handbook was published in English in 1990 with L.P.D. Gertenbach, M.A. Robinson and David G. Cross as lead editors; the Spanish and French editions of the Handbook followed in 1993 and 1994 respectively. The Handbook included contributions by the secretariats of the

CWP Member Agencies (refer background) and covered statistics on capture fisheries. The Handbook was converted to a live document on the CWP website in 1996. Following the establishment of CWP-aquaculture in 2007 (CWP-22) the Handbook chapter on aquaculture statistics was further developed. Further revisions in 2013, 2017 and 2020 were led by the CWP Secretariat and included in particular reviews of the gear classifications plus new sections on ecosystem approach, green accounting and socio-economic statistics. Within the CWP framework, further developments are envisaged including standards for reference harmonization (refer CWP Task Group of Reference Harmonization), fishing activity information and metadata standards for data exchange (e.g. OGC and ISO). These developments share the objective to harmonize common dataset structures and metadata to facilitate data reporting and exchange among data agencies at national, regional and global levels. The developments also align the Handbook with the related frameworks developed for the Fisheries and Resources Monitoring System (FIRMS) and Global Record of Stocks and Fisheries (GRSF).

General concepts

In the context of CWP, a statistical concept is a representation of a notion or entity based on a unique set of characteristics which defines a statistical measure, dimension or domain, and which has been developed by CWP or recommended by CWP for use.

General statistical concepts which are relevant to both capture fisheries and aquaculture are presented in this section of the Handbook. Other statistical concepts specific to capture fishery statistics, aquaculture statistics or the socio-economic dimension are presented in the relevant sections of the Handbook.

In addition, CWP has developed or recommended various international standard statistical classifications for use in statistics on capture fisheries and aquaculture. Code lists and mappings are also available for use with statistical concepts and classifications. Links to these are provided in the section on tools and resources, and related information may be located using the search tool.

Capture fishery statistics

The term capture fishery is used to describe a fishery conducted in an aquatic environment (e.g. marine, brackish or freshwater) and involving one or more fishery sectors (e.g. artisanal, industrial, subsistence, sport or recreational). Some fisheries require the use of fishing vessels while other fisheries may be conducted from the shoreline (e.g. shore-based). Catches may consist of wild-caught fish (herein taken to mean finfish) and other aquatic organisms, These catches may be landed for commercial purposes, or traded amongst communities or at markets, or utilized solely by fishers and their families, or some combination of each. In addition in some fisheries, a component of the catch may be utilized in aquaculture, such as the collection of wild-caught fish and other aquatic organisms for subsequent rearing in cages. Fisheries may be managed by local communities, national fisheries organizations or Regional Fishery Bodies (RFBs) such as a Regional Fisheries Management Organization (RFMO). The diversity of capture fisheries reflects each fishery’s purpose and adaptation to regional environmental, economic and cultural factors.

CWP develops and promotes common standards for capture fishery statistics for use by RFBs and other intergovernmental organizations involved with the collection and dissemination of fishery statistics. These include statistical concepts for catch and landings and fishing effort. A diagrammatic presentation of these concepts and their relationships in a generalized capture fishery is illustrated here and the reader may wish to refer to the sections on catch and landings and fishing effort where these concepts are described.

In the diagrammatic presentation of a generalized capture fishery, a fisher (or angler) conducts a fishing trip with the intention to catch fish or other aquatic organisms. Each fishing trip involves a sequence of fishing activities during which the fisher may practice one or more métier, each characterized by the type of fishing gear used, the target (or intended) species or species groups, the fishing ground used as well as the fishing mode where applicable. A métier is an overarching statistical concept which may also involve searching for aquatic organisms and/or conducting one or many fishing operations which, if successful, result in catch. Note that the statistical concept of métier corresponds to the fishing activity domain defined by FLUX (refer data exchange formats). Other fishing related activities conducted during a fishing trip may include inter alia transiting to/from a base, resting, sheltering, transhipments and transmitting/receiving fishery-related notifications. The catch may be retained whole or converted to fishery products and landed for commercial consumption, industrial use, or for the purposes of subsistence. A component of the catch may also be lost, depredated or discarded (alive or dead) during fishing. For statistical purposes, the nationality of the catch and landings is usually determined by the nationality of the fisher or the Flag state of the fishing vessel (if used), noting that this general arrangement may be modified to reflect established practices in specific cases.

Capture fisheries are an economic sector of society and coherent and consistent fishery statistics are required for effective policy-making, sectoral planning and the management and sustainable development of a fishery.

Purpose

Capture fishery statistics generally fall into three categories: (1) statistics documenting the removal of aquatic organisms, (2) statistics documenting the fishing effort and the fishing vessels/fleets (if used) that harvest the resources and (3) statistics documenting the labor force, income, costs and invested capital in each fishery sector.

Capture fishery statistics are essential as a basis for describing the contribution of fisheries to the national food supply and economy (e.g. through the system of national economic accounts) and the total removal of fish and other aquatic organisms from their environment. Policy-making often is done with one or more of the following objectives:

- Manage capture fisheries within sustainable limits and in general accordance with the FAO Code of Conduct for Responsible Fisheries
- Maintain or develop fishery production for domestic and export markets
- Improve the socio-economic conditions of fishers.

The relationships between capture fishery statistics and essential policy objectives are key factors in analyzing the needs for fishery information. Fishery statistics may also inform monitoring, surveillance and control of capture fisheries.

The focus in best practice fishery management is the conservation and sustainability of natural resources using a precautionary ecosystem approach, ensuring food supply security and sustained economic performance through the control of fishing capacity, fishing effort (e.g. temporal/spatial access to resources) and the equitable allocation of catch limits and/or quotas. Refer also to the section on Fisheries statistics for an ecosystem approach.

CWP has developed a global standard to facilitate the reporting and exchange of statistical data on capture fisheries and aquaculture for use by CWP parties and national, regional and international organizations. This standard, known as the CWP Standard for Reference Harmonization, establishes the framework for a modular set of data structures for use in data collection and reporting among CWP parties at different levels of the data value chain.

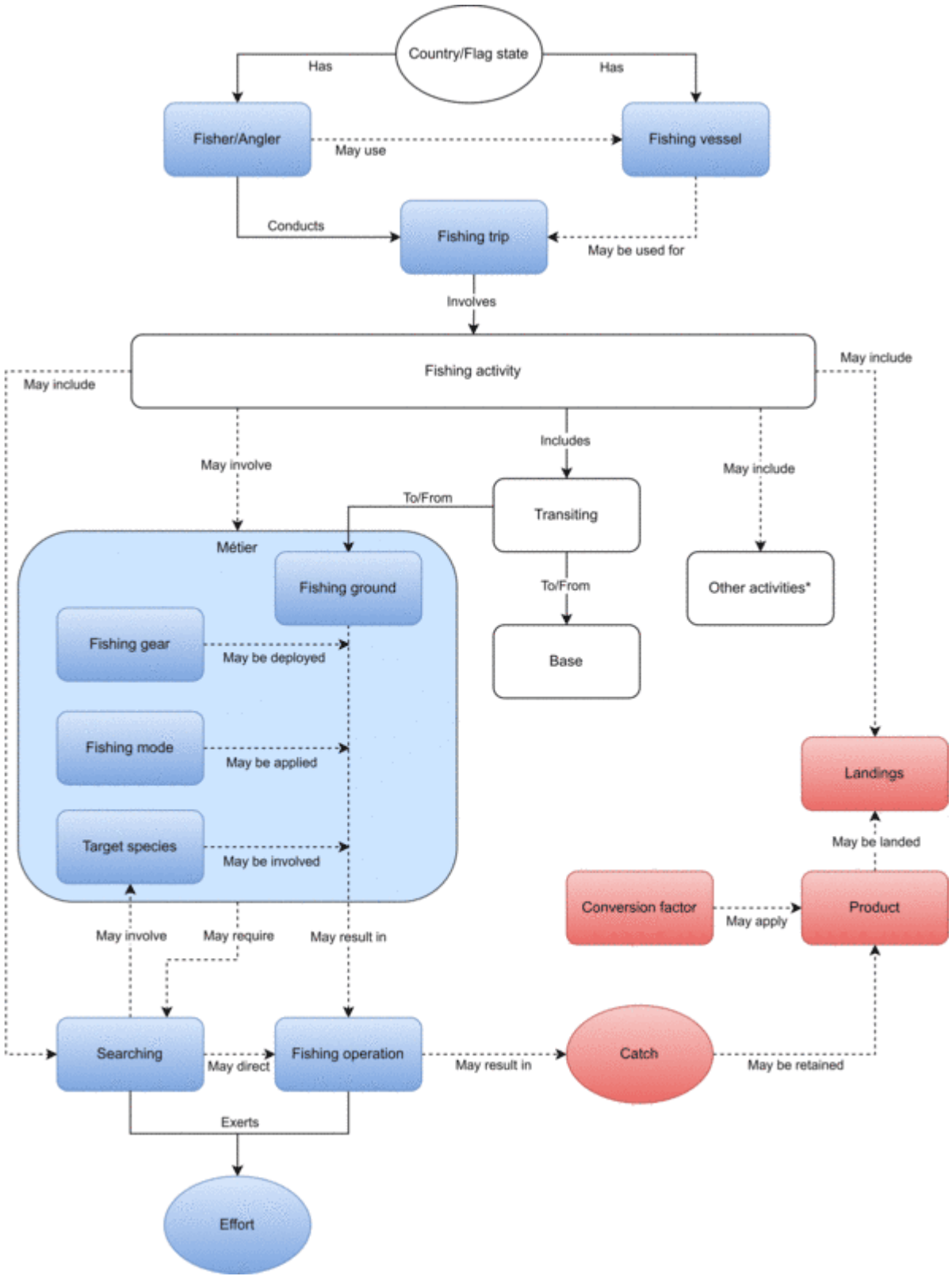
The standard consists of data structures and harmonized statistical concepts and four data structures are currently available for use in capture fisheries: (1) Global capture production, (2) Catch, (3) Catch and effort and (4) Logbook. The implementation of this standard and details on the data structures are available under the CWP information sharing practices.

Resources for capture fishery statistics

FAO. 1995. Code of Conduct for Responsible Fisheries. Rome, FAO. 41 pp. (also available at http://www.fao.org/3/v9878e/V9878E.pdf).

FAO. 2022. Report of the twenty-seventh session of the Coordinating Working Party on Fishery Statistics. Rome, Italy, 20-24 June 2022. FAO Fisheries and Aquaculture Report No. 1397. Rome, FAO. 51 pp. (also available at https://www.fao.org/3/cc3232en/cc3232en.pdf).

FAO. Concepts and definitions - Fisheries and Resources Monitoring System (FIRMS). [Cited 15 September 2024]. http://firms.fao.org/firms/concepts/en



Diagrammatic presentation of statistical concepts and relationships in a generalized capture fishery. Concepts that exert fishing effort are shaded blue (refer fishing effort for detail) and simplified catch concepts are shaded red (refer catch and landings for detail). Dashed lines represent optional relationships. *Other activities include inter alia fisher resting, vessel at anchor/sheltering, transhipments and transmitting/receiving fishery-related notifications.

Socio-economic dimension

The *Code of Conduct for Responsible Fisheries* (FAO, 1995) stresses that "in order to ensure the sustainable management of fisheries and to enable social and economic objectives to be achieved, sufficient knowledge of social, economic and institutional factors should be developed through data gathering, analysis and research" (FAO, 1995, p. 12).

In general fisheries administrators have given greater attention to the collection of production data and biological information, while the acquisition of socio-economic data has not yet received the same level of effort. Nevertheless, socio-economic information is of critical importance in fisheries management and for policy definitions.

Relevance of socio-economic statistics

Fish and other aquatic organisms are mainly produced for human use and consumption through economically focused capture fisheries and aquaculture activities and thus one important mechanism to monitor the two sectors is through assessment of their economic performance. In addition to the cost and revenue variables for socio-economic statistics the number of people engaged in the sectors and their earnings are crucial information. Such information is required to enable management discussions that include the economic contributions to society from fisheries and aquaculture as well as reflect the motivation for people to act in the sector.

Assessing the economic contribution of fisheries and aquaculture involves monitoring the performance and sustainability of activities relating to the use of aquatic resources throughout the whole value chain, and separately from other agricultural and commercial activities. However, information on the social and economic contributions of the sector is fragmented, often with a focus on commercial (rather than artisanal and subsistence) activities of the primary production sector, and for the secondary sector often aggregated with value chains of other industries, hence not fully recognizing the full value chain or associated activities. Such data deficiencies can result in erroneous policies, e.g. food security and nutrition policies overlook fish despite its importance in people's diets, poorly assessed contribution of women result in inadequate gender-aware policies, or under-reporting of the impacts of disasters on the fisheries and aquaculture sector. There is a need for guidelines and standard methodologies to evaluate the specific contribution of aquatic biological resource use throughout the value chain.

Primary production sector

Socio-economic statistics refer to fishing enterprises or fishing vessels and when vessels are used as the unit of observation, they are most often grouped into fleet segments (EU, 2008). The fleet segments allow for the division of the entire population into homogeneous, mutually exclusive, groups of vessel types/sizes/geographic locations. Aquaculture segments are often defined by species/farming technique (EU, 2016).

Socio-economic statistics refer to fishing enterprises or fishing vessels and when vessels are used as the unit of observation, they are most often grouped into fleet segments. The fleet segments allow for the division of the entire population into homogeneous, mutually exclusive, groups of vessel types/sizes/geographic locations. Aquaculture segments are often defined by species/farming technique. Depending on the policy goal, whether an overall sectorial performance assessment, or a more detailed analysis, based on fleet or aquaculture segments, the socio-economic statistics should be linked to the catch (including effort) and respectively aquaculture production statistics in order to allow for more coherent policy recommendations. Frequently the link between the two datasets represents difficulties due to the different populations (in fisheries: enterprises vs vessels; in aquaculture: companies *vs.* production facilities), used for the collection of these data. For example, capture production statistics are usually collected by flag state and not segmented by fleet classes or fishing gears. Aquaculture production statistics are mostly collected from the production facilities, not enterprises, and defined as **farm-gate production**.

Core variables

Core variables represent the minimum data to be collected to provide a basic assessment of the economic performance of the sector, and for which data collection can be implemented at regional and/or country level. Several socio-economic data collection programs are in place amongst the CWP agencies and these are identified under regional references programs. These data collection programs differ in coverage and detail depending on the objectives of the data collection. In order to set a global standard, the focus has been placed on the most universally available variables.

At the moment, only the **primary production sectors** of aquaculture and fishing are included here, but it is anticipated that the **secondary processing sector** will also be included. The fish processing sector follow the ISCO-08 definition 7511 (butchers, fishmongers and related food preparers) which describes more generally the occupation of food preparers and refers to both fish and meat processing plus the definition 8160 (fish processing machine operators) can be used to define processing activities.

Fish processing refers to the processes associated with fish and fish products between the time fish are harvested, and the time the final product is delivered to the customer. Fish processing includes operations handled on board and/or on land to convert raw fish in a form which as acceptable for the consumer and that has a longer shelf life, e.g. preserving the harvested fish with ice; preparing fresh fish by removing heads, fins, scales, bones and entrails; salting, drying, smoking seafood; shucking and packing fresh shellfish; canning seafood; producing fish paste products (surimi), boiled fish products, fermented products, fish meal and fish oils; processing marine fats and oils; and freezing seafood.

Primary production sector: the first economic variables required to conduct a socio-economic assessment are **revenue**, **costs** and **employment**. However, the revenue and cost variables are composed of elements that can be complex to collect and are not universally available. At the moment, **production value** is available for aquaculture while data on the **production value** from capture fisheries is not consistently collected nor consistently available. In order to address the current limitations in data availability, CWP-26 followed a minimum data requirements approach and endorsed global standards for core variables of both **Fisheries production** and **Aquaculture production**.

Bibliography

European Union. 2008. Commission Regulation (EC) No 665/2008 of 14 July 2008 laying down detailed rules for the application of Council Regulation (EC) No 199/2008 concerning the establishment of a Community framework for the collection, management and use of data in the fisheries sector and support for scientific advice regarding the Common Fisheries Policy. *Official Journal of the European Union* 186(L): 3-5. (also available at https://datacollection.jrc.ec.europa.eu/c/document_library/get_file?uuid=17c246aa-aa19-401c-b1b3-6354a1ca2ebd&groupId=10213).

European Union. 2016. Segmentation to be applied for the collection of aquaculture data. In Commission Implementing Decision (EU) 2016/1251 of 12 July 2016 adopting a multiannual Union programme for the collection, management and use of data in the fisheries and aquaculture sectors for the period 2017-2019. *Official Journal of the European Union* 207(I): 172-173. (also available at https://datacollection.jrc.ec.europa.eu/c/document_library/get_file?uuid=a9a69267-d036-45ad-90b5-f2d0dcd4e80d&groupId=10213#page=60).

Resources for socio-economic dimension

FAO. 1995. *Code of Conduct for Responsible Fisheries.* Rome, FAO. 41 pp. (also available at http://www.fao.org/3/v9878e/v9878e.pdf).

Pinello, D., Gee, J. & Dimech, M. 2017. *Handbook for fisheries socio-economic sample survey – principles and practice*. FAO Fisheries and Aquaculture Technical Paper No. 613. Rome, FAO. 115 pp. (also available at http://www.fao.org/3/a-i6970e.pdf).

Content under revision

(see NOTE below)

Aquaculture statistics

In consultation with pertinent bodies, FAO and the CWP have formulated a working definition of aquaculture activities for statistical purposes.

Definition of Aquaculture

Aquaculture: Aquaculture is the farming of aquatic organisms: fish, molluscs, crustaceans, aquatic plants, crocodiles, alligators, turtles, and amphibians. Farming implies some form of intervention in the rearing process to enhance production, such as regular stocking, feeding, protection from predators, etc. Farming also implies individual or corporate ownership of the stock being cultivated. For statistical purposes, aquatic organisms which are harvested by an individual or corporate body which has owned them throughout their rearing period contribute to aquaculture, while aquatic organisms which are exploitable by the public as a common property resource, with or without appropriate licences, are the harvest of capture fisheries.

Definition of culture environments

Freshwater Culture: By freshwater culture is understood the cultivation of aquatic organisms where the end product is raised in freshwater, such as reservoirs, rivers, lakes, canals and groundwater, in which the salinity does not normally exceed 0.5‰. Earlier stages of the life cycle of these aquatic organisms may be spent in brackish or marine waters.

Brackishwater Culture: By brackishwater culture is understood the cultivation of aquatic organisms where the end product is raised in brackishwater, such as estuaries, coves, bays, lagoons and fjords, in which the salinity may lie or generally fluctuate between 0.5‰ and full strength seawater. If these conditions do not exist or have no effect on cultural practices, production should be recorded under either "Freshwater culture" or "Mariculture". Earlier stages of the life cycle of these aquatic organisms may be spent in fresh or marine waters.

Mariculture: By mariculture is understood that the cultivation of the end product takes place in seawater, such as fjords, inshore and open waters and inland seas in which the salinity generally exceeds 20‰. Earlier stages in the life cycle of these aquatic organisms may be spent in brackishwater or freshwater.

Definition of ongrowing units

Ponds and tanks are artificial units of varying sizes constructed above or below ground level capable of holding and interchanging water. Rate of exchange of water is usually low, i.e. not exceeding 10 changes per day.

Enclosures and pens refer to water areas confined by net, mesh and other barriers allowing uncontrolled water interchange and distinguished by the fact that enclosures occupy the full water column between substrate and surface; pens and enclosures will generally enclose a relatively large volume of water.

Cages refer to open or covered enclosed structures constructed with net, mesh or any porous material allowing natural water interchange. These structures may be floating, suspended, or fixed to the substrate but still permitting water interchange from below.

Raceways and silos are artificial units constructed above or below ground level capable of high rates of water interchange in excess of 20 changes per day.

Barrages are semi-permanent or seasonal enclosures formed by impervious man-made barriers and appropriate natural features.

Rice-cum-fish paddiesr efer to paddy fields used for the culture of rice and aquatic organisms; rearing them in rice paddies to any marketable size.

Rafts, ropes, stakes refer to the culture of shellfish, notably mussels, and seaweeds usually conducted in open waters using rafts, long lines or stakes. The stakes are impaled in the seabed in inter-tidal areas and ropes are suspended in deeper waters from rafts or buoys.

Hatcheries refer to installations for housing facilities for breeding, nursing and rearing seed of fish, invertebrates or aquatic plants to fry, fingerlings or juvenile stages.

Nurseries refer generally to the second phase in the rearing process of aquatic organisms and refer to small, mainly outdoor ponds and tanks.

Other definitions

To help classifying ambiguous practices it should be noted that:

(a) by sea-ranching is understood the harvest of enhanced capture fisheries, i.e. the raising of aquatic animals, mainly for human consumption, under extensive production systems, in open space (oceans, lakes) where they grow using natural food supplies. These animals may be released by national authorities and re-captured by fishermen as wild animals, either when they return to the release site e.g. salmon, or elsewhere (seabreams, flatfishes).

(b) the production of wild-caught fish raised temporarily in holding facilities is considered as enhanced capture.

Note

To promote the monitoring of aquaculture in an internationally harmonised manner and separate aquaculture activities from capture fisheries, a classification is presented at the following link: Annex J. I.

Structural data on aquaculture are collected by the statistical questionnaire FISHSTAT AQ and aquaculture production by FISHSTAT NS AQ.

Bibliography

Data for mariculture, aquaculture and other kinds of fish farming were previously presented in the Series "FAO Fisheries Circular" No. 815 up to revision No. 11. Rome, 1999.

Beginning with Volume 82 (printed in 1998) data on aquaculture were included in the Series "FAO Yearbook of Fishery Statistics".

Beginning with Volume 86 (printed in 2000) the aquaculture production is presented in the even-numbered volumes of the "FAO Yearbook of Fishery Statistics .../2."

FAO. "Aquaculture production, 2001". FAO Yearbook of Fishery Statistics - Vol.92/2 Rome, FAO. 2003 186p.

Rana, K. J. "Guidelines on the collection of structural aquaculture statistics" FAO Statistical Development Series 5b, Rome, 1997.

Resources for Aquaculture statistics

Classification proposed for various aquaculture and capture fisheries practices (former ANNEX J.I)

Note

A new section to address the aquaculture statistics is being prepared by the CWP Aquaculture Subject Group. The final version shall be approved by upcoming CWP Session (CWP 26th Session to be held early in 2019) for posterior publication. For further information please consult the **CWP Report of the Fifth Meeting of the Aquaculture Subject Group and the Twenty-Sixth Meeting of the Fisheries Subject Group**.

Tools and resources

International classifications

- ASFIS List of Species for Fishery Statistics Purposes
- Global map of FAO Major Fishing Areas
- Global map of FAO Major Fishing Areas with insets of areas 27 and 37 (related to european regulation no. 1379/2013)
- List of currencies sorted by country or area name (former ANNEX F.I)
- List of countries sorted by iso currency code and country or area multilingual name (former ANNEX F.II)
- List of FAO Major Fishing Areas
- List of revisions and correspondence between ISSCGG (1980) and ISSCFG Rev.1 (2013) (former ANNEX M.III)
- International Standard Statistical Classification of Fishery Commodities (ISSCFC) (in use until 1983) (former ANNEX R.I)
- International Standard Statistical Classification of Fishery Commodities (ISSCFC) (version July 2019) (former ANNEX R.II)
- International Standard Statistical Classification of Fishing Gear (ISSCFG,1980) (former ANNEX MI)
- International Standard Statistical Classification of Fishing Gear (ISSCFG Rev. 1, 2013) (former ANNEX M.II)

- International Standard Statistical Classification of Fishery Vessels by GRT Categories (ISSCFV - GRT category) (former ANNEX L.I)
- International Standard Statistical Classification of Fishery Vessels by Vessel Types (ISSCFV - Vessel Type) (former ANNEX L.II)
- International Standard Statistical Classification of Vessels by Length Classes (ISSCFV - Length Classes) (former ANNEX L.VI)
- ISCO-88 International Standard Classification of Occupations Major Group 6. Minor Group 615 - Fishery Workers, Hunters and Trappers (former ANNEX K.I)

Reference classifications

- Classification proposed for various aquaculture and capture fisheries practices (former ANNEX J.I)
- Simplified Classification of Fishing Vessels by Vessel Types (former ANNEX L.III)

Reference concepts

- Catch Concepts - Diagrammatic Presentation (former Annex B1)

Reference Data repository

- FAO Fishery Reference Data repository
- Gear codes and reference data
- Species codes and reference data
- Currencies codes and reference data
- Commodities codes and reference data
- Country Codes and Reference data

CWP grid maps

- CWP Grid - resolution 30min x 30min
- CWP Grid - resolution 30min x 1deg
- CWP Grid - resolution 1deg x 1deg
- CWP Grid - resolution 5deg x 5deg
- CWP Grid - resolution 10deg x 10deg
- CWP Grid - resolution 20deg x 20deg
- CWP Grid - resolution 30deg x 30deg