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COORDINATING WORKING PARTY ON FISHERY STATISTICS

Twenty-sixth Session

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Meeting Document – CWP-IS/2019/6

Finalization of GIS data and geospatial section of the Handbook

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1. Background

The CWP 25 plenary meeting held in FAO headquarters (Rome, 2016), adopted the intersessional work plan for the Fishery Subject Group (FS-Group). Amongst the tasks in this work plan, the further refinement of the GIS section was one of the first priority tasks concurring to the broader goal of develop and publish the CWP handbook. The development of the GIS section should build on the Concept Note presented and agreed during the FS-Group and that has been jointly reviewed by the CWP Members.

The proposal was welcomed by the meeting and for this purpose, a technical working group on GIS was launched, which terms of references are primarily based on the content and recommendations circulated as concept note at the t CWP 25 Plenary session[1] (part of the CWP 25 meeting report), with the objective to expand and develop a GIS Section of the CWP Handbook. The working group terms of reference were split into 3 activities including:

- Activity 1: Spatial gridded systems for fishery data reporting
- Activity 2: Strengthening promotion and implementation of geographic information standards and best practices
- Activity 3: Establish a list of GIS reference datasets and layers relevant for fishery and aquaculture data

A survey was shared to the working group participants in order collect material from CWP members on the three main working areas and trigger discussions for recommendation proposals. Participants included FAO, GFCM, IOTC, ICES and ICCAT. A tentative structuring of the GIS Section of the CWP Handbook was drafted and presented at the CWP Fifth Intersessional meeting[2] (Copenhagen, 2017) under the item *Further elaboration of GIS data and geospatial presentation section of the handbook.* Discussions were oriented on the distinction to be done between:

1. References to *classifications and metadata standards* (GIS working group activities 1 and 2), for insertion into the CWP handbook, concluding need for further discussions on how to refer to GIS metadata standards for data exchange (ISO, OGC),
2. References to *GIS catalogues* (GIS working group activity 3), not be included in the CWP handbook but rather be available from a dedicated 'best practices' area of the CWP webpage.

Further discussions occurred at the CWP Tuna Workshop on Global Harmonization of Tuna fisheries Statistics[3] (Rome, 2018) with active participation of eight CWP members namely CCSBT, FAO, GFCM, IATTC, ICCAT, IOTC, SPC and WCPFC. The group acknowledged the importance and value of this work and didn't express any concern regarding proposed recommendations (Use of ISO/OGC 19115/19139 and CWP standard and provide mapping / the CWP grid as a reference given its flexibility for mapping). Recommendations proposed were supported by the group.

The present document presents a proposal of GIS Section structure and content, further elaborated, based on the draft section and recommendations of the CWP GIS working group.

Proposed additions and amendments to the CWP Handbook are indicated as follows: revised paragraphs are highlighted in blue and new/additional paragraphs are highlighted in yellow.

[1] http://www.fao.org/3/a-i6261e.pdf
[2] CWP Fifth Intersessional meeting Report available at http://www.fao.org/3/a-i7805e.pdf
[3] CWP Tuna Workshop Report available at http://www.fao.org/3/CA3132EN/ca3132en.pdf

2. Content distinction between CWP Handbook vs. CWP Website

The table below summarizes the different parts recommended at CWP Fifth Intersessional meeting[4] (Copenhagen, 2017), here revised to make a clear distinction between content aimed to be part of the GIS section of the CWP Handbook, and content that should not be part of the CWP Handbook but instead put in the new proposed "Data sharing and protocols" section of the website:

Title	Definition	Target
Spatial reference systems	Standards to use for handling a spatial reference system (SRS) used with fisheries dataset. *Definitions; rationale; equivalent terminologies; recommended standard format & notations; use of Spatial Reference Identifiers (SRIDs); SRS use cases*	CWP Handbook GIS Section
Geographic coordinates	Standards for handling properly geographic coordinates for reference shapes and fisheries datasets. *Definitions; rationale; recommended standard formats; Geographic coordinates use cases.*	CWP Handbook GIS Section
Geographic classification and coding systems	Geographic classification and coding systems used for fisheries data. *General; Types of geographic classification systems (Irregular areas, grid reporting systems, Others); Main geographic classification systems (FAO Major Fishing areas, Breakdown of major fishing areas; Geographic coding systems;*	CWP Handbook GIS Section
Geographic information formats & protocols	Standards format for data and metadata, and related standard protocols. *Data formats and protocols; Metadata formats and protocols;*	CWP Data sharing and protocols/ Geospatial Section
Geographic information resources of interest for CWP	Geographic information list of resources of interest for the CWP. *Geographic information reference web-catalogues; GIS datasets of primary interest;*	CWP Website

[4] CWP Fifth Intersessional meeting Report available at http://www.fao.org/3/a-i7805e.pdf

3. Proposed structuring of the GIS section in the CWP website

The present proposal includes a tentative structuring of the GIS Section in the CWP website and its distribution among the **CWP Handbook** and the newly proposed **CWP Data sharing and protocols** component. This proposal also lays out proposed content for each section.

The proposed structure presents the main levels of geographic information that are required for a proper handling of geo-referenced fisheries reference and detailed data, as well as for proper harmonization among georeferenced statistical datasets.

The required levels of geographic information are:

1. Spatial reference systems
2. Geographic coordinates
3. Geographic systems (including classification and coding systems)
4. Geographic information formats and protocols

The following structuring of these levels take into account a consistency with the proposed Reference Harmonization standard, and the required visibility of fundamental concepts such as FAO major fishing areas or Areal Grid systems.
The proposal for the GIS Section to be inserted in the **component A] CWP Handbook**, with title "Geographic dimension" (in bold) is inserted as following in the handbook structure:

General concepts

Water environments (it is proposed to move under general concepts the Inland and marine waters concepts developed in this page http://www.fao.org/cwp-on-fishery-statistics/handbook/general-concepts/major-fishing-areas-general/en/)

Geographic dimension

1. **Spatial reference systems**
2. **Geographic coordinates**
3. **Geographic systems**
4. **Country or areas**
5. **Main water areas**
   - **FAO Major Fishing Areas for Statistical Purpose**
   - **Areal Grid System**
   - **Water Jurisdictional Areas**

Capture fishery statistics
Aquaculture statistics
Socio-economic dimension
Etc.

The content describing *Geographic information formats and protocols* is foreseen for the **component B] CWP Data sharing and protocols** under a geospatial section.

3.1. CWP Handbook – GIS Dimensions

1. Spatial reference systems *[NEW CONTENT]*

In order to be properly geo-referenced, statistical datasets require to be associated with the reference system used for geographic coordinates. This system is known as Spatial Reference System (SRS), sometimes also referred as Coordinate Reference System (CRS).

Each SRS is defined by a unique numerical Spatial Reference Identifier, abbreviated SRID, but it is very common to find it named "EPSG code " or "EPSG authority code" in reference to the EPSG working group (European Petroleum Survey Group) that first established the registry of spatial reference systems worldwide[5].

The EPSG code is a character string compound by the EPSG prefix and the SRID. For example, the most common SRS used worldwide is the one used by the Global Positioning System (GPS). This spatial reference system is known as *World Geodetic System 1984* (abbreviated WGS84). Its EPSG authority code is ***EPSG:4326*** (SRID is 4326). It is worth mentioning other registries than EPSG exist and are used for different purposes. We can mention the ESRI registry[6]. Example of SRS in ESRI registry: *ESRI:54012* (*Eckert IV* projection used for area calculation).

Another SRS notation, endorsed by the Open Geospatial Consortium (OGC), consists in using a Unique Resource Name (URN). This notation is highly recommended when possible. For EPSG:4326, this notation is: **urn:x-ogc:def:crs:epsg::4326.**

It exists a large set of Spatial Reference Systems that were created for different purposes including positioning, spatial calculations or visualization.

SRS for data production, exchange and dissemination of datasets

Whatever the domain, and especially in the context of fisheries, geo-referenced datasets must be accompanied by the corresponding spatial reference system, specified by its EPSG code. The use of WGS84 (*EPSG:4326*)[7] is recommended for the production/exchange/dissemination of datasets of regional or global extent.

SRS for areal calculation

When dealing with areal calculation, it is necessary to switch to a spatial reference system based on metric units (uniform unit around the world), designed to conserve area proportions around the world, namely an *equal areal* projection. The SRS recommended for areal calculation is *Eckert IV* (*ESRI:54012*)[8], or any other *equal area* projection system.

Note: WGS84 is by nature a non-uniform, non-equal areal system, and must not be used for areal calculation.

SRS for visualization

The use of WGS84 (EPSG:4326) should be considered by default for any visualization of geo-referenced datasets. The use of Mercator projection system is highly deprecated. When distances and area proportions are important criteria for the visualization considered, an *equal areal* SRS should be also considered for visualization (see above).

[5] https://www.epsg-registry.org/, http://spatialreference.org/ref/epsg/
[6] http://spatialreference.org/ref/esri/
[7] http://spatialreference.org/ref/epsg/wgs-84/
[8] http://spatialreference.org/ref/esri/world-eckert-iv/

2. Geographic coordinates *[NEW CONTENT]*

In the context of fisheries data, geographic coordinates will consist in pairs of (x,y) numerical values handled in the spatial reference system considered (see part 1). If needed, these pairs may be extended to include a third dimension with a *z* coordinate to handle the depth.

In order to handle and exchange properly longitude/latitude pairs geographic coordinates, the CWP recommends the following three methods:

- Method 1: To handle latitude and longitude, as numerical values, in decimal degrees (DD).
- Method 2: To handle latitude and longitude separately (e.g in a table: two separate columns), in that way any ambiguity is avoided related to the SRS axis ordering (Latitude/Longitude or Longitude/Latitude order) and the identification of what coordinate is Longitude and Latitude. See below the note on *axis ordering -Lon/Lat vs. Lat/Lon.*
- Method 3: As alternative to method 2: To handle latitude and longitude together using the OGC standard Well-Known-Text (WKT) format (See below section for details).

Note on axis ordering - Lon/Lat vs. Lat/Lon

In the initial definition of the EPSG 4326 reference system (as defined by EPSG working group), coordinates should be specified as *(latitude/longitude*) pairs, instead of *(longitude/latitude*). Practically, backed by legal OGC standard specifications (including the WKT format definition specified by the OGC Simple Feature Access), the use of the *(longitude/latitude*) axis ordering was generalized. From 2005, with the ISO 19128:2005 specification EPSG:4326 refers to WGS84 geographic latitude first followed by the longitude, but most of geographic information systems keep relying on OGC standards which supposes a Longitude/Latitude axis ordering.

Geographic Coordinates WKT Format

In the above method 3, the recommended format for handling coordinates is the OGC Well-Known-Text format[9], abbreviated WKT. Whatever the geometric shape, the WKT provides a simple string representation of the geometry. In that way, a single column is enough to handle the dataset geo-reference. When using the WKT format with a geographic coordinate reference system such as EPSG:4326, **it is mandatory to follow the axis order specified by the OGC standards, which is: Longitude first followed by the Latitude.**

It is also possible to handle both geometry WKT and SRS (identified by its SRID) in a unique format, named EWKT (for Extended WKT), by prepending the SRID to the WKT geometry.

Example:

```
SRID=4326;POINT(-44.3 60.1)
```

In this example: -44.3 is the Longitude, 60.1 is the latitude.

The EWKT format is not an OGC international standard but a format introduced with the PostGIS software. However, this format is more and more used for geo-referencing and is recommendable by CWP as substitute to WKT, and a good practice to make sure the SRS is well-defined.

Use of geographic classification/coding systems

Alternatively, in the case where a dataset is geo-referenced based on a reference geographic classification and coding system, this can be used (e.g. FAO Major area codes, grid cell codes).

[9] http://www.opengeospatial.org/standards/sfa

Use of Degrees-Minutes-Seconds (DMS)

In the case of handling geographic coordinates in official reports and publications, the geographic coordinates can be enumerated using the Degrees-Minutes-Seconds (DMS) notation. This notation is generally used in the legal context where the DMS appears to be more precise than the DD notation, and convenient for describing textually the geographic boundaries. However, in order to facilitate the digital exploitation of the geographic coordinates, reports handling geographic coordinates in DMS notation should be complemented by digital files providing geographic coordinates in decimal degrees (DD), and following the recommended geographic data formats (See section 4.1).

3. Geographic systems *[NEW CONTENT]*

3.1 Geographic classification systems - Definition, Types

A geographic classification system can be defined as a way of grouping and organizing geographic references (reference points, lines or areas) to be used as reference data for geo-referencing statistical datasets. To facilitate its use, a geographic classification system is generally complemented by a coding system (See section 3.4) for the elements that compound the classification. A geographic classification system can be hierarchical (e.g. nested areas, grid cells with various resolutions) or not. It may also be time-dependent (e.g. change of area boundaries over time).

Different types of geographic classification systems can be distinguished such as:

- **Irregular Area classification systems**: Systems where the elements correspond to irregular areas. e.g.
    - Country or Areas (see http://www.fao.org/cwp-on-fishery-statistics/handbook/general-concepts/country-or-areas/en/)
    - FAO Major Fishing Areas for Statistical Purpose (see section 4.1)
    - Exclusive Economic Zones (see section 4.1)
    - Regional Fishery Bodies Competence areas
    - Reporting areas, Fishing zones.

- **Grid classification systems**: System defined by a regular geo-referenced grid characterized by (i) a maximum geographic extent or scale (global, regional, local), (ii) a grid unit/cell shape (e.g. square, rectangle), (iii) a grid resolution (e.g. 1 x 1deg, 5 x 5 deg). (see section 4.1)

- **Linear classification systems**: System defined by elements characterized by a linear shape, e.g.
    - Haul trajectories.

- **Locations**: System defined by elements characterized by points (locations), e.g.
    - Landing sites

3.2 Geographic coding systems

To facilitate the use of geographic classification systems and the geo-referencing of fishery statistics, the enforcement of geographic coding systems is recommended. A geographic coding system consists in identifying each element of the classification with a unique, permanent and meaningful code (generally in the form of a combination of text elements and numbers). Depending on the purpose and nature of the geographic classification, the way to build the identifiers will differ.

Coding system conventions for the main Irregular Area classification systems of interest to fisheries are described in the relevant classification systems sections.

Grid coding systems

A *grid coding system* can be defined as the logic associated to a grid classification system that allows converting a pair of geographic coordinates (Longitude / Latitude) into a string-based code, and vice-versa. In the computing field, coding will mean both *encoding* (to obtain a grid cell code from a pair of geographic coordinates) and *decoding* (obtain the geographic coordinates - center - for a given grid cell code). For a same Grid classification system, there can be different mechanisms to encode/decode, i.e. different grid coding systems.

Areal Grid Coding System

Recognizing the need for areal breakdown, the CWP has recommended the use of a global coding system. See Areal Grid Coding System – section 4.2

Other Grid coding systems

For the purpose of fisheries data reporting where square-based grids are used, other alternative grid coding systems can be used, as long as they are compatible with the above CWP Areal grid system and facilitate the enforcement of grid coding systems by fisheries management organization.

The C-Square coding system (CSIRO) is recommendable by the CWP as it is compatible with the above CWP Areal Grid system from the 10deg x 10deg resolution to smaller resolutions, and provides a coding mechanism solution for small scales where the above CWP Areal grid system is limited to 10min x 10min as minimum resolution.

4. Country or areas

(Content recycled from http://www.fao.org/cwp-on-fishery-statistics/handbook/general-concepts/country-or-areas/en/)

All countries or areas have official and formal designations. These are often very long and not suitable for use in statistical databases and publications, particularly in tabulations and graphs. These designations are therefore often simplified.

The list of Country or Areas is based on one of the FAO statistical standard series "Standard country or area codes for Statistical Use", which is a modified version, for FAO purposes, of the United Nations "Standard Country or Area Codes for Statistical Use" (originally published as Series M, No.49), commonly known as "M49" and owned by the UN Statistics Division (UNSD)[10] (see descriptor D below).

For example:

United Kingdom (or UK) refers to The United Kingdom of Great Britain and Northern Ireland.

Venezuela refers to the Bolivarian Republic of Venezuela. The designations employed and the presentation of material in publications are used simply for practical reasons, and are usually accompanied by a note that they do not imply the expression of any opinion whatsoever on the part of the publishing agency concerning the legal status of any country, territory, city or area, or of its authorities, or concerning the delimitation of its frontiers or boundaries.

The list of countries or areas includes the following descriptors:

A. FAO multilingual country or area code (maximum 12 characters) used for statistical purposes.
B. 3-alpha country or area code by the International Organization for Standardization (ISO)[11].
C. 2-alpha country or area code by the International Organization for Standardization (ISO)[14].
D. 3-digit numerical country or area code by the United Nations (UN)[13].
E. Continents: 002 = Africa; 019 = Americas; 142 = Asia; 150 = Europe; 009 = Oceania.
F. Country or area names in English (maximum 24 characters).
G. Country or area names in French (maximum 24 characters).
H. Country or area names in Spanish (maximum 24 characters).

Resources for Country or areas

- List of countries or areas

[10] https://unstats.un.org/unsd/methodology/m49/

[11] International Standard ISO 3166-1, Codes for the representation of names of countries and their subdivisions--Part 1: Country codes, ISO 3166-1: 2006 (E/F), International Organization on Standardization (Geneva, 2006). The latest version is available online at http://www.iso.org/iso/home/standards/country_codes.htm

5. Main water areas

This section includes three main types of water areas used to characterize e.g. Fishing areas, each one may have its own page within the CWP website for a better visibility.

5.1. FAO Major Fishing Areas for Statistical Purpose

(Content recycled from http://www.fao.org/cwp-on-fishery-statistics/handbook/general-concepts/major-fishing-areas-general/en/ and http://www.fao.org/cwp-on-fishery-statistics/handbook/general-concepts/fishing-areas-for-statistical-purposes/en/)

FAO Major Fishing Areas for Statistical Purposes are arbitrary areas, the boundaries of which were determined in consultation with international fishery agencies on various considerations, including

1. the boundary of natural regions and the natural divisions of oceans and seas;
2. the boundaries of adjacent statistical fisheries bodies already established in inter-governmental conventions and treaties;
3. existing national practices;
4. national boundaries;
5. the longitude and latitude grid system;
6. the distribution of the aquatic fauna; and
7. the distribution of the resources and the environmental conditions within an area.

The rationale of the FAO Major Fishing Areas has been that the areas should, as far as possible, coincide with the areas of competence of other fishery commissions when existing. This system facilitates comparison of data, and improves the possibilities of cooperation in statistical matters in general. For statistical purposes, 27 major fishing areas have been internationally established to date. These comprise:

- eight major inland fishing areas covering the inland waters of the continents,
- nineteen major marine fishing areas covering the waters of the Atlantic, Indian, Pacific and Southern Oceans with their adjacent seas.

The Water Environment concepts Marine and Inland waters are presented at http://www.fao.org/cwp-on-fishery-statistics/handbook/general-concepts/major-fishing-areas-general/en/

The major fishing areas, inland and marine, are listed below by two-digit codes and their names. To access maps and description of boundaries of each fishing area click on the relevant item in the list below or in the map showing the 19 major marine fishing areas.

INLAND WATERS

01	Africa - Inland waters
02	America, North - Inland waters
03	America, South - Inland waters

04	Asia - Inland waters
05	Europe - Inland waters
06	Oceania - Inland waters
07	Former USSR area - Inland waters *
08	Antarctica - Inland waters

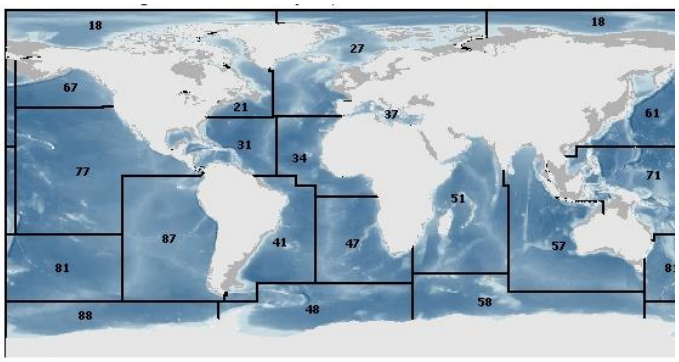
The fishing area 07 ("Former USSR area - Inland waters") referred to the area that was formerly the Union of Soviet Socialist Republics. Starting with the data for 1988, information for each new independent Republic is shown separately. The new independent Republics are: Armenia, Azerbaijan, Georgia, Kazakhstan, Kyrgyzstan, Tajikistan, Turkmenistan, Uzbekistan (statistics assigned to the fishing area "Asia - Inland waters") and Belarus, Estonia, Latvia, Lithuania, Republic of Moldova, Russian Federation, Ukraine (statistics assigned to the fishing area "Europe - Inland waters").

MARINE AREAS

18	Arctic Sea
21	Atlantic, Northwest
27	Atlantic, Northeast
31	Atlantic, Western Central
34	Atlantic, Eastern Central
37	Mediterranean and Black Sea
41	Atlantic, Southwest
47	Atlantic, Southeast

48	Atlantic, Antarctic
51	Indian Ocean, Western
57	Indian Ocean, Eastern
58	Indian Ocean, Antarctic and Southern
61	Pacific, Northwest
67	Pacific, Northeast
71	Pacific, Western Central
77	Pacific, Eastern Central
81	Pacific, Southwest
87	Pacific, Southeast
88	Pacific, Antarctic

Browse FAO Fishing Areas Fact Sheets by map



Regional breakdown of FAO Major Marine Fishing Areas

The internationally accepted standard practice is to divide each of the MAJOR FISHING AREAS into:

first:	subareas
second:	divisions
third:	subdivisions

Such systems of subareas, divisions and subdivisions have been successfully developed and implemented in the Atlantic Ocean by ICNAF, the predecessor of NAFO, for major fishing area 21, by ICES for area 27, by CECAF for area 34, by GCFM for area 37, by CARPAS for area 41, by ICSEAF for area 47, by CPPS for area 87 in the Pacific Ocean, and by CCAMLR for areas 48, 58 and 88 in the Antarctic.

The Joint Working Party of Experts on Indian Ocean and Western Pacific Fishery Statistics (JWP) by 1978 established subareas for statistical purposes through the IOFC (for areas 51 and 57 in the Indian Ocean) and through the IPFC (for areas 71 and 81 in the Western Pacific; subareas for these two areas were never fully described and are not shown in the relevant pages). No breakdown by subareas has yet been established for areas 18, 31, 61, 67 and 77. Partitions of their area of competence implemented for statistical purposes by the tuna regional bodies are often encompassing more than one major fishing area and are not considered here and in the description of single areas.

Several CWP members have recently modified the original partition within the relevant FAO Major Fishing Area. These are ICES (area 27), GFCM (area 37), FAO and SEAFO (area 47), and FAO on behalf of RECOFI (part of area 51). Whereas changes in boundaries between major fishing areas should be approved by CWP and comply with conditions mentioned in Section G of this Handbook, modifications of subareas, divisions and subdivisions within a major fishing area do not need a formal CWP approval but should be communicated to maintain the Handbook updated.

Development sequence of FAO Major Marine Fishing Areas

Boundaries of fishing areas established for statistical purposes have gone through a series of modifications since the first world chart was presented in Volume VI of the FAO Yearbook of Fishery Statistics (1956). A series of historical fishing area maps is made available to assist the interested users in matching the historical data included in the FAO capture production database with the major fishing areas in place at that time.

Resources for Fishing areas

- Global map of FAO Major Fishing Areas
- Global map Global map of FAO Major Fishing Areas with inserts of areas 27 and 37 (related to European regulation no. 1379/2013)
- List of FAO Major Fishing Areas
- Interactive maps, GIS datasets, satellite imagery and related applications

5.2. Areal Grid System

(Content recycled from http://www.fao.org/cwp-on-fishery-statistics/handbook/general-concepts/major-fishing-areas-general/en/)

Recognizing the need for areal breakdown, the CWP has recommended the use of a global coding system with the following methodology:

1. the identification of the latitude should be given before that of the longitude;
2. each quadrangle (rectangle) should be identified by its graticule-based boundaries as defined by the latitude and the longitude meeting in its corner nearest to the point where the Equator is crossed by the Greenwich Meridian;
3. the foregoing data on latitude and longitude should be preceded by
    1. the first digit identifying the size of the quadrangle
    and then by
    2. a second digit indicating the quadrant of the globe in which the quadrangle is located.

The following Tables show how this graticule coding should be achieved.

Coding system for identifying statistical quadrangles

Format of the code identifying statistical quadrangles

A	B	XX XX	XXX XX
Size	Quadrant	Latitude	Longitude

A. Code to indicate size of quadrangle

Code	Latitude		Longitude
1	10′	X	10′
2	20′	X	20′
3	30′	X	30′
4	30′	X	1°
5	1°	X	1°

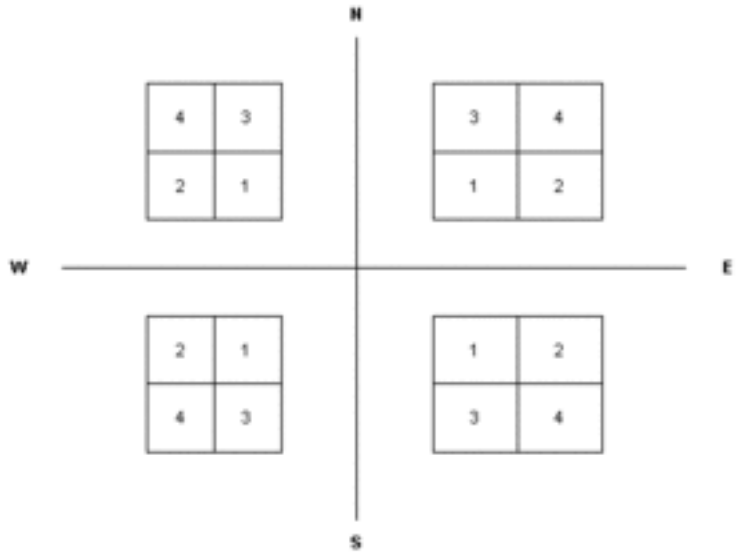
6	5°	X	5°
7	10°	X	10°
8	20°	X	20°
9	30°	X	30°

B. Code to indicate quadrant

Code	Quadrant of Globe
1	NE (NORTHEAST)
2	SE (SOUTHEAST)
3	SW (SOUTHWEST)
4	NW (NORTHWEST)

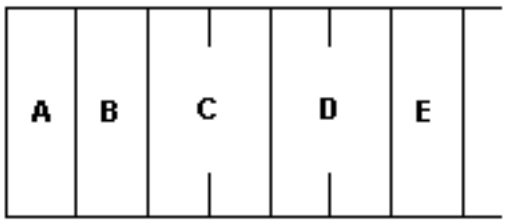
Certain agencies have found the need for an areal breakdown other than that offered by the coding system; for example, for a quadrangle of 30′ latitude by 1 degree longitude or for a finer breakdown than the smallest quadrangle identified by this coding system, namely 10′ x 10′. The CWP has therefore recommended the following standard coding procedures for areas smaller than 1 degree quadrangles:

1. where the 1 degree quadrangle is divided into two halves, each 30′ latitude by 60′ longitude, the one nearest to the Equator is coded number 1, and the other number 2
2. where the 1 degree quadrangle is divided into four quarters, each 30′ x 30′, the numbering depends on the quadrant in order to follow the latitude/longitude hierarchical structure, e.g.:



3. the code "0" will be used to indicate that it is not possible to show the data at a breakdown below the 1 degree quadrangle.

The structure of a code for identifying the size and location of a unit quadrangle of less than 1° by 1° could be presented as follows:



A	Size code unit quadrangle of less than 1° X 1°
B	Quadrant code
C	Latitude identifying 1x1 quadrangle
D	Longitude identifying 1x1 quadrangle
E	Position of the unit quadrangle of less than 1° X 1° within the 1 X 1 degree quadrangle

In order to strengthen the CWP recommendations and further support the countries, Regional Fishery Bodies and in general, all fishery statistics related institutions to make use of CWP recommended standards and methods, aerial grids have been generated and are now publicly available. Additionally, also the algorithm generating these grids and allowing for its reproducibility was developed using R language.

Resources for aerial grids

The global grids can be accessed online through the FAO GeoNetwork website together with the general metadata. The link for each grid and the available resources can be found in detail in the table below.

CWP aerial grids	URLs
Grid - resolution 10min x 10min	Not yet available
Grid - resolution 10min x 10min	Not yet available
Grid - resolution 30min x 30min	http://www.fao.org/geonetwork/srv/en/main.home?uuid=cwp-grid-map-30min_x_30min
Grid - resolution 30min x 1deg	http://www.fao.org/geonetwork/srv/en/main.home?uuid=cwp-grid-map-30min_x_1deg
Grid - resolution 1deg x 1deg	http://www.fao.org/geonetwork/srv/en/main.home?uuid=cwp-grid-map-1deg_x_1deg
Grid - resolution 5deg x 5deg	http://www.fao.org/geonetwork/srv/en/main.home?uuid=cwp-grid-map-5deg_x_5deg
Grid - resolution 10deg x 10deg	http://www.fao.org/geonetwork/srv/en/main.home?uuid=cwp-grid-map-10deg_x_10deg
Grid - resolution 20deg x 20deg	http://www.fao.org/geonetwork/srv/eng/main.home?uuid=cwp-grid-map-20deg_x_20deg
Grid - resolution 30deg x 30deg	http://www.fao.org/geonetwork/srv/eng/main.home?uuid=cwp-grid-map-30deg_x_30deg

5.3. Water Jurisdiction areas *[NEW CONTENT]*

Internal and Archipelagic waters

Article 8 of the Informal Composite Negotiating Text / Revision 2 (A/CONF.62/WP.10/Rev. 2, 11 April 1980) of the United Nations Third Conference on the Law of the Sea (UNCLOS) assigns a specific meaning to the term "INTERNAL WATERS" (IW) as part of the sea. This UNCLOS article considers INTERNAL WATERS as those waters of the sea on the landward side of the baseline used by the national authorities of the coastal country to measure further seawards the width of the territorial sea and any adjacent marine waters, whether salt, brackish, or fresh in character. Such "internal" marine waters will be found, for instance, when the baselines are drawn across the mouths of bays or along a "curtain" of islands lying close off the coast. Japan's well-known "Inland Sea" is not part of that country's inland waters but is one of the internal waters of Japan and forms part of the truly marine fishing areas of that country.

The UNCLOS also defines a variant of Internal waters applicable to archipelagos, namely “ARCHIPELAGIC WATERS” (AW).

Territorial seas

The term “TERRITORIAL SEAS” (TS) corresponds to a band of 12 nautical miles’ width seaward calculated from the baseline. The internal / archipelagic waters are then not part of the Territorial Seas. As for the internal waters and archipelagic waters, the territorial seas are part of of the provisions of the UNCLOS.

Contiguous Zones

The term “CONTIGUOUS ZONES” (CZ) corresponds to a band extending from the outer limit of the Territorial seas up to a limit of 24 nautical miles from the baseline. As for the internal waters, archipelagic waters and territorial waters, the contiguous zones are part of of the provisions of the UNCLOS.

Exclusive Economic Zones

The term “EXCLUSIVE ECONOMIC ZONES (EEZ) corresponds to a band extending from the baseline up to a limit of 200 nautical miles seaward, or in some cases up to the outer limit of the continental shelf if it goes beyond 200 nautical miles... The Exclusive Economic Zones were introduced with the United Nations Convention on the Law of the Sea (UNCLOS, 1982) giving to nations sovereign rights for exploring and exploiting marine resources below the level of the sea, including fishing activities. The term Exclusive Economic Zone can be applied only the country established

International Waters / High seas / Areas Beyond National Jurisdiction

Initially, with the Convention of High Seas (1958), the “INTERNATIONAL WATERS”, also named “HIGH SEAS”, were defined as the water bodies outside national jurisdiction that are not included in the territorial seas or internal waters, where “no State may validly purport to subject any part of them to its sovereignty”. With the the UNCLOS (1982), and the introduction of Exclusive Economic Zones, the international waters / high seas were defined as the water column beyond the Exclusive Economic Zones. These international waters, high seas, are also referred nowadays as the “AREAS BEYOND NATIONAL JURISDICTION” (ABNJ).

3.2. CWP Data sharing format and protocols – Geospatial section

Geographic data formats & protocols *[NEW CONTENT]*

Geographic data formats & protocols are already driven by internationally-recognized standards from both the Open Geospatial Consortium (OGC) and the International Standardization Organization (ISO). Hence, the CWP recommends the production and exchange of geo-referenced datasets based on these standards.

The following formats are recommended by the CWP:

- Geographic Markup Language (GML), as the official standard format for geographic datasets endorsed by both OGC and ISO (ISO 19136:2007)
- GeoJSON, as alternative OGC standard format for geographic datasets
- Any other standard OGC data format approved by the Open Geospatial Consortium
- CSV (including for the geographic part the SRS definition, OGC WKT geographic coordinates representation - See sections 1 and 2 - and/or the coding system used, if applicable)

Note on the use of ESRI shapefiles: Although it is recognized that the ESRI Shapefile proprietary format is practically a widely used format, the CWP promotes and encourages fisheries management organizations to avoid using such proprietary format for data exchange, due to its limitations (eg length of field names, encoding issues).

The CWP promotes and encourages fisheries management organizations to foster FAIR (Findable Accessible Interoperable and Reusable) principles to their geo-referenced datasets by enabling (as far as possible) standard data protocols such as the OGC Web Feature Service (WFS) international standard protocol for exchanging geo-referenced data.

The CWP also acknowledges the importance of not dissociating data from its metadata information. Hence it is recommended that geographic datasets (referenced shape files or geo-referenced detailed datasets) produced and exchanged should be properly described with metadata (see section 4.2 below)

Geographic metadata formats & protocols *[NEW CONTENT]*

Geo-referenced data should be accompanied with proper geographic metadata that are, as for data, driven by internationally-recognized standards from both the Open Geospatial Consortium (OGC) and the International Standardization Organization (ISO).

The following metadata formats are recommended by the CWP:

- Dublin Core (Minimum metadata standard)
- ISO 19115/19139 (Geographic Metadata standard), endorsed by the Open Geospatial Consortium and the European INSPIRE Directive as the official metadata standard for geographic datasets.
- Ecological Metadata Language (EML): for emphasis on species identification (taxonomic coverage), such as species encounters

The CWP promotes and encourages fisheries management organizations to foster FAIR (Findable Accessible Interoperable and Reusable) principles to their geo-referenced datasets by enabling (as far as possible), standard metadata protocols such as the OGC Catalogue Service for the Web (CSW) international standard protocol for exchanging geographic metadata.