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Contact
Francesca Santoro, Julian Barbiere
E-mail: f.santoro@unesco.org,
j.barbiere@unesco.org
Phone: +33 1 45683952

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INDICATORS FOR INTEGRATED COASTAL ZONE MANAGEMENT (ICZM): *Methodological Factsheets in support of comparable measurements and an integrated assessment in coastal zones*

The **ICZM Protocol for the Mediterranean Sea** (the 'ICZM Protocol'), signed in Madrid on 21 January 2008 and ratified on 24 March 2011, represents a milestone for the implementation of ICZM in the Region and can serve as a blueprint for the implementation of ICZM in other Regional Seas. The **PEGASO project** builds on existing capacities and develops common approaches to support integrated policies for the Mediterranean and Black Sea Basins in ways that are consistent with the ICZM Protocol.

The PEGASO project has developed **a core set of indicators** that are instrumental in measuring the implementation of ICZM policies and programmes. The core set of ICZM indicators addresses the specific requirement of Article 27 of the Protocol to *'define coastal management indicators*' and '*establish and maintain up-to-date **assessments of the use and management of coastal zones***'. In doing so, the PEGASO project has widely built on previous and existing indicator sets developed by different institutions and projects, and which are duly acknowledged (see *'Methodological paper for the selection and application of PEGASO ICZM indicators'* for further reading and background material)

The present Methodological Factsheet is part of a set of 15 factsheets that are made available to end-users. This set of factsheets is conceived to support a harmonized approach to calculate ICZM indicators at different spatial scales in the Mediterranean and Black Sea regions.

Pegaso Project
People for Ecosystem based Governance
in Assessing Sustainable development of
Ocean and coast

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Integrated Coastal Zone Management

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Large scale integrating Project

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Name of the Indicator

State of the main commercial fish stocks by species and sea area

Objective of the indicator

EU policies, and in particular the Marine Strategy Framework Directive (MSFD) and the revised Common Fisheries Policy (CFP), aim for sustainable fishing with a long-term perspective through appropriate management of fisheries within a healthy ecosystem, while offering stable economic and social conditions for all stakeholders involved in the activity.

Descriptor 3 the **Marine Strategy** MSFD addresses the status of exploited fish stocks. The MSFD explicitly demands that *all* exploited fish stocks achieve Good Environmental Status GES. In practice, this means that populations of all commercially exploited fish and shellfish are within safe biological limits, exhibiting a population age and size distribution that is indicative of a healthy stock. A stock achieves GES when each indicator for each of the 3 criteria (exploitation rate, stock size and size structure), has achieved a good status. Moreover, achieving GES will involve both ensuring that commercial fish and shellfish stocks are harvested sustainably (as set out in MSFD Descriptor 3), and ensuring that the impacts of fishing activities on the wider marine ecosystem are sustainable (as set out in MSFD Descriptor 1, biodiversity, Descriptor 4, food webs and Descriptor 6, seafloor integrity). Objectives of MSFD for fisheries will be delivered through existing policies and management mechanisms, including the reformed Common Fisheries Policy (CFP), existing mechanisms for national fisheries management, and the designation of marine protected areas

For the revised **Common Fisheries Policy**, the objective is to restore fish stocks in EU waters above levels that can produce Maximum Sustainable Yield (MSY) by 2015, where possible. Member States (MS) and the EU subscribed to the MSY objective in the 1982 UN Convention on the Law of the Seas. They then reiterated it in the 1995 UN Fish Stock Agreement, in 2002 in the Johannesburg Declaration and finally in 2010 in Nagoya (COM(2006) 360 final). The concept of MSY covers both biomass and fishing mortality. B_{msy} is the biomass (the weight of all fish) that a fish stock must have so that it can produce MSY. F_{msy} is the fishing mortality (the amount of fish that die from fishing) that would let the fish grow to the stock size B_{msy}. Moving towards MSY requires moving from the B_{lim} and F_{lim} thresholds to the more stringent B_{msy} and F_{msy} thresholds. While reaching the *biomass* MSY target by 2015 may not be possible for many stocks, the *mortality MSY target* can indeed be reached.

Fish species are managed on the basis of the concept of 'stocks' that may be considered as reproductively isolated in space and time. Fish Stocks are generally defined based on biological criteria and knowledge of population migration, mixing and spawning areas. In the Mediterranean Sea -due to lack of biological knowledge - stocks are generally defined by area and not on the basis of well established biological knowledge on population units.

An indication of the sustainability of fisheries in a particular area is the ratio of the number of stocks that are above levels that can produce MSY (within safe biological limits) to the total number of formally assessed commercial stocks per fishing area in European seas.

Policy context

ICZM Policy Objective	Preserve the wealth of natural capital in coastal zone
ICZM Protocol Article	Article 9: *Economic activities*
UNEP-MAP Ecological Objective	Objective 3: *Populations of selected commercially exploited fish and shellfish are within biologically safe limits, exhibiting a population age and size distribution that is indicative of a healthy stock*
INSPIRE ANNEX I-III Data Theme (34)	Annex III III.9. Agricultural and aquaculture facilities

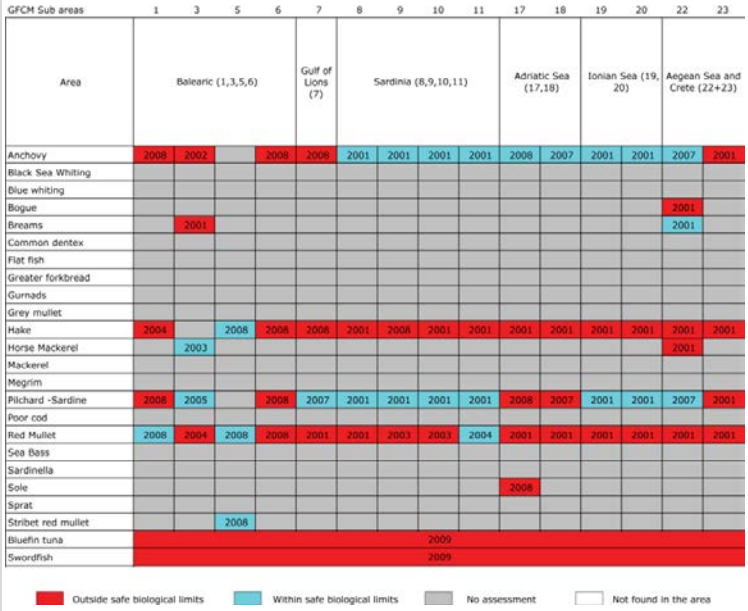
CALCULATION OF THE INDICATOR

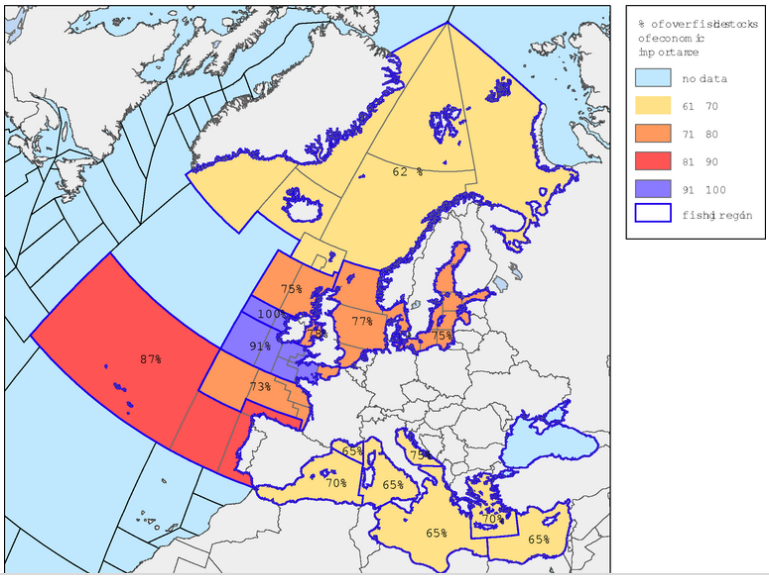
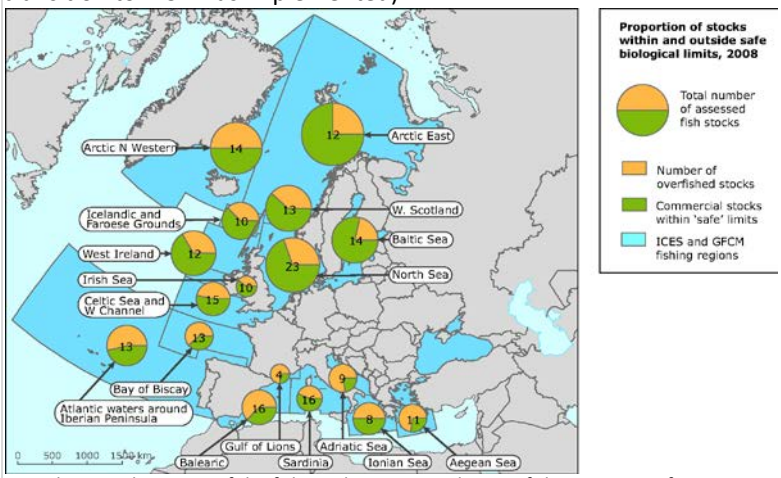
Spatial consideration	
Coverage	Resolution – Reporting units
Marine waters of the Mediterranean Sea and Black Sea.	Fishing area(s) Note: a fishing area can be defined at different scales according to the parameter under review e.g. ICES statistical rectangle (e.g. for landings), ICES (sub)division, ICES fishing area, others, which can be spatially aggregated.

Temporal consideration	
Period	Resolution (time interval or unit)
Time series should be as long as possible, ideally from the start of the fisheries.	Year. Data are reported in relation with the previous year, according to the reporting of the results of the formal stock assessments

Parameter(s)	
(i)	Numbers of commercially exploited fish stocks, and (of these) number of formally assessed stocks by sea area;
(ii)	Proportion of commercial stocks above MSY level, proportion of commercial stocks below MSY, proportion of commercial stocks for which an assessment has not been carried out.
(iii)	Fish catches (or landings, in the absence of total catches) from assessed and non assessed commercial stocks, by sea area.
(iv)	Status (MSY) of stocks by species and sea area.
	Note: • Commercial stocks are those stocks of economic importance on which the fishing effort is focused in each area. It is a broader term encompassing all species that are of economic importance, including target species as well as by-catch, species that are caught in the industrial fisheries and in small-scale and artisanal fisheries. • Stocks outside safe biological limits: B is below B_{msy} and F is above F_{msy} • Safe stocks or stocks inside safe biological limits: B is above B_{msy} and F is below F_{msy} • Non-assessed stocks are stocks for which no assessment has been carried out. Landings and spawning stock biomass are given in thousand tonnes, recruitment in million tonnes; fishing mortality is expressed as the proportion of a stock that is removed by fishing activities, and is generally reported per annum.

Calculation method		
	Steps	Products
1	Identify and delimit the fishing area related to the fisheries and of relevance to the regional or local coverage.	Spatial coverage and delimitation of 'fishing area' as reporting unit.
2	After contacting the data holder of your region/country and making the necessary recompilation of information on stock management in your region/country, select a set of commercial stocks for which data and temporal coverage is available.	Set (number) of fish stocks selected for their importance to commercial fisheries and their data availability.

3	Obtain the total number of commercial stocks per fishing area and assign one of the next categories to each stock: above MSY (safe), below MSY and non-assessed stocks.	Number and status category of commercial stocks per fishing area.
4	Adding the first two categories, obtain the number of assessed stocks.	Number of assessed stocks.
5	Obtain the number of non-assessed stocks.	Number of non-assessed stocks
6	Obtain the percentage of non-assessed/stocks of economic importance.	Percentage of non-assessed/stocks of economic importance.
7	Obtain and represent the percentage of stocks below MSY/stocks of economic importance.	Percentage of stocks below MSY/stocks of economic importance. (Note: the map below is still expressed as 'SBL', before the transition to MSY was implemented).  The figure shows the state of commercial fish stocks in the Mediterranean Sea. Status of fish stocks was assessed from 2001-2009 in the GFCM regions, although data refers to 2005. Year in the cells refer to year of ICCAT or GFCM assessments.

8	Obtain and represent the percentage of stocks above MSY/stocks of economic importance.	Percentage of stocks above MSY/stocks of economic importance. (Note: the map below is still expressed as 'SBL', before the transition to MSY was implemented). Note the fishing areas boundaries in the Mediterranean Sea (Balearic, Gulf of Lions, Sardinia, Adriatic Sea,..) 
9	From the percentages of the different categories by fishing area develop a map representing the data you have analysed.	Numbers of commercially exploited stocks and over-fished stocks by fishing area (Note: the map below is still expressed as 'SBL', before the transition to MSY was implemented)  Map showing the status of the fish stocks in ICES and GFCM fishing regions of Europe in 2008. http://www.eea.europa.eu/data-and-maps/figures/status-of-fish-stocks-in

Current monitoring	Data sources
ICES, International Council for the Exploration of the Sea, www.ices.dk/indexfla.asp	FAO (www.fao.org/fi/fcp/fcp.asp): For each country, information on general fisheries topics can be consulted at this website. The main fisheries institutions of the country are also listed, and main data providers are available or can be contacted. GFCM 2005: General fisheries commission for the Mediterranean

	http://www.gfcm.org/gfcm/en Scientific Co-operation to Support Responsible Fisheries in the Adriatic Sea. www.faoadriamed.org Advice technical Support and Establishment of Co-operation Networks to Facilitate Co- ordination to Support Fisheries Management in the Western and Central Mediterranean: www.faocopemed.org Assessment and Monitoring of the Fishery Resources and the Ecosystems in the Straits of Sicily: www.faosudmed.org
Assessment context	
Use of the indicator in previous assessments/initiatives	MSSD coastal indicators
DPSIR framework	State
Link to anthropogenic pressure	Fishing
Sustainability target or threshold	Sustainable exploitation of fish stocks (MSY) is a target of the EU common fishery policy (CFP). Total Allowable Catches (TACs) and quotas for the individual stocks in the NE Atlantic and the Baltic Sea are set annually by the Fisheries Council. In the Mediterranean Sea, where no TACs have yet been set (except for the highly migratory tunas and swordfish), fisheries management is achieved by means of closed areas and seasons that are designed to keep fishing effort under control and make exploitation patterns more rational.
Link with other assessment tools	
Example of integrated assessment	UNEP-MAP- Plan Bleu : State of the environment in the Mediterranean 2009

Scope for future improvements

A fairly reliable picture of stock development can be derived by comparing trends over time in recruitment (R), spawning stock biomass (SSB), landings and fishing mortality (F). However, landings are one component of the fishing mortality, since part of the catch may be thrown overboard as discards, or may suffer underwater mortality in the gear. Hence not only the quantity of fish taken from the sea is important, but also their species and size, and the techniques used to catch them. In the future, it is important to adequately take into account discard rates (and discard survival rates) in stock assessments.

Indicator references (i.e. UNEP, EEA, …)

DEDUCE, n° 23.1, http://www.deduce.eu/IFS/IFS23.pdf and http://www.deduce.eu/SIF/SIF_23.1.pdf
EEA, CSI 032, http://www.eea.europa.eu/data-and-maps/indicators/status-of-marine-fish-stocks/status-of-marine-fish-stocks-8/
SDI for ICZM in the South-East Baltic : http://corpi.ku.lt/SDI-4-SEB/state/23.pdf
Plan Bleu, MSSD, Coastal indicators, COA_C30
FAO Fisheries department :
ftp://ftp.fao.org/FI/DOCUMENT/FIGIS_FIRMS/Method_Guidelines/MarineResourcesInventoryGuidelines.pdf
GFCM : http://www.gfcm.org/gfcm/en
UNCSD see fishstocks.pdf on www.un.org/esa/sustdev/natlinfo/indicators/methodology_sheets/oceans_seas_coasts