Statistics on Aquatic Biological Resources – Session 3

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WS on Environmental Statistics

Contents:

- Theory of natural resource management;
- Characteristics of Aquatic biological resources – issues;
- Ecosystem approach of fishery and aquaculture management
- Current status of data availability;
- Link with “fish resources” in SEEAs;
- List of information sources;

Dynamics of natural biological resource:

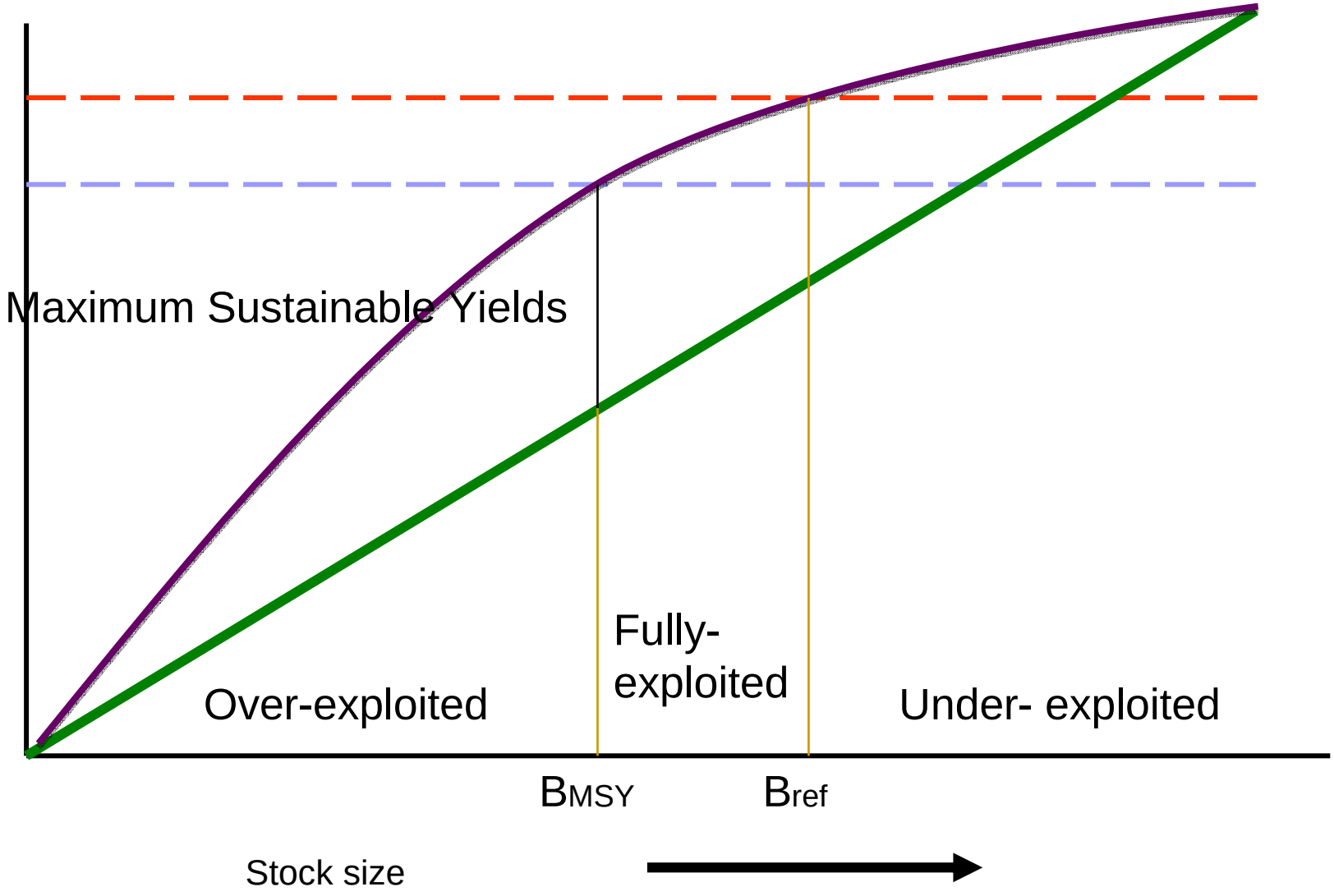
- Increase:
  - Recruitment (R): Increase in number
  - Growth (G) : Increase in biomass
- Decrease:
  - Extraction through human exploitation (F) – Catch
  - Death by natural causes (M): competition, predation, diseases etc

When R+G = F+M, resource is in sustainable state

- R, G, M – compensatory with stock density
  - R: when stock is abundance, maturity age higher, fecundity lower
  - G: competition in food and space to lower growth
  - M: competition in food and space to higher mortality

> There is most productive points = target for management

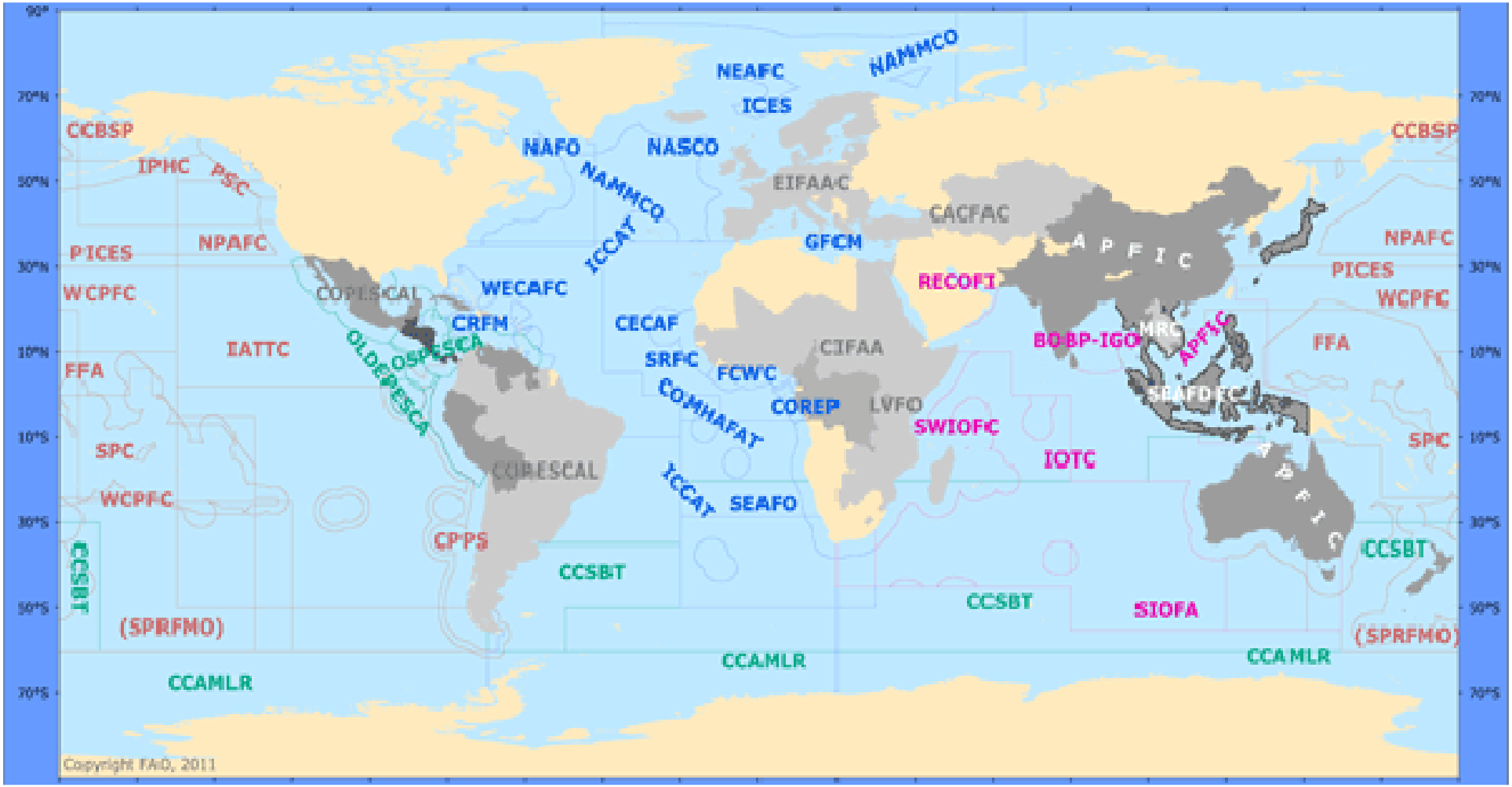
Concept of sustainable yields:



Characteristics of aquatic resources:

- Invisible:
  - except extraction from water (i.e. catch)
- Dynamic – fluctuation in stock size:
  - Many with high fecundity, with low early survival
  - Small difference in survival results in substantial change in recruitments
    - *Uncertainty in stock size measurement*
    - *Low predictability of stock behavior*
    - *High potential of stock elasticity for recovery*
- Dynamic – spatial moving :
  - Hard to define boundaries
  - Spatial mixing of multiple stocks
  - Fishers (i.e. predator) also highly movable (in location and flags)
    - *Shared management scheme for Highly migratory, High Sea stocks and straddling stocks*
    - *Illegal, Unregulated and Unreported activities*

List of existing Regional Fishery Organizations



How to measure stock status:

- Direct measurement:
  - Sighting survey (whale, marine mammals)
  - Tag-recapture survey
  - Acoustic survey
    - *Expensive, small observations with high precisions, highly variable due to low coverage*
    - *possible to estimate absolute level*
- Modeling approach (incl. composite):
  - Resolving mathematical formulas
  - Inputs – catch (age, size), abundance index (e.g. CPUE, survey results)
    - *Large observations with less accuracy and precisions*
    - *Highly reliable in trend, low reliability in absolute estimates*
    - *Detailed catch and effort data as minimum requirement*

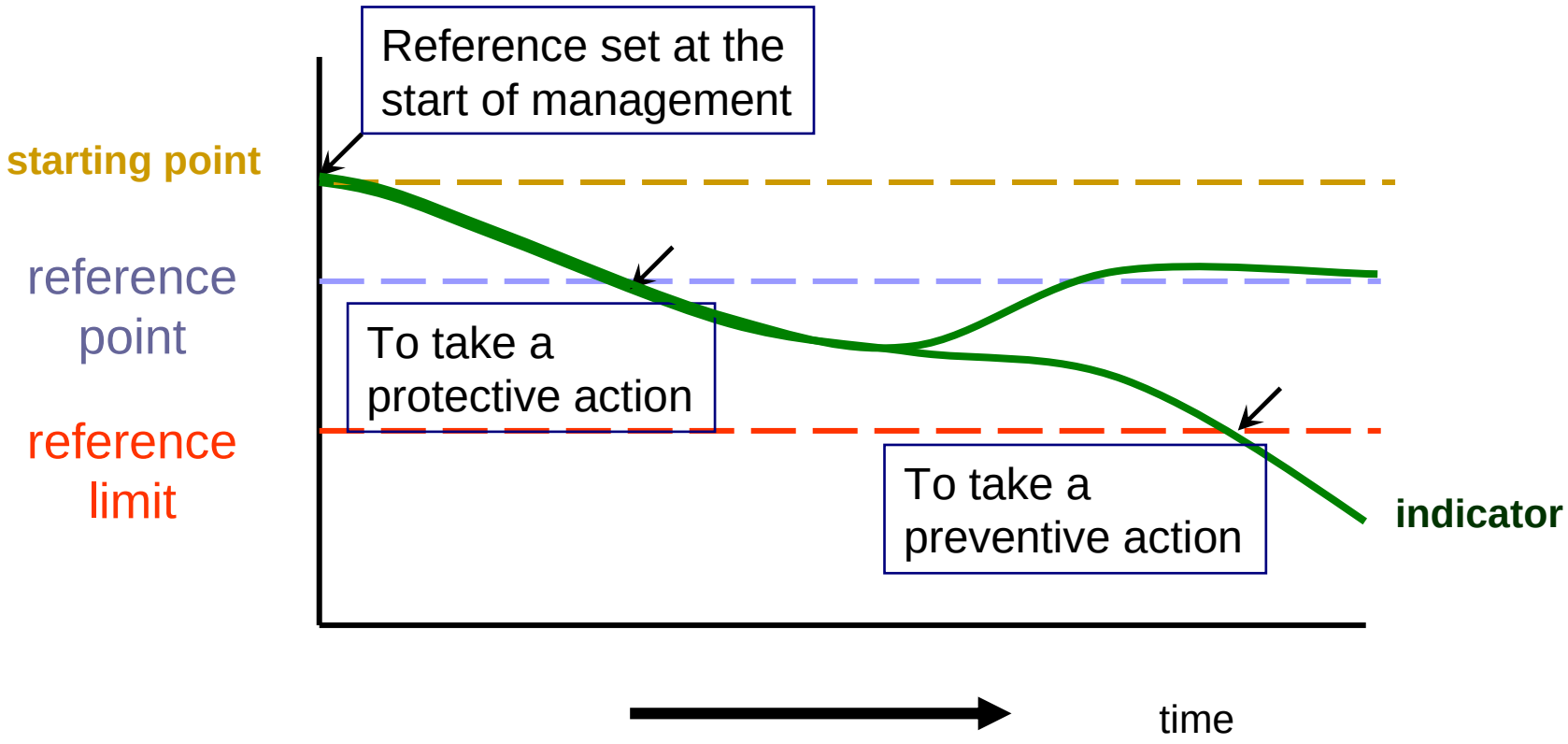
All are in principle only applicable to single-stock
High uncertainty results in difficulty to reach agreement

What is Ecosystem Management Approach?

- targeting toward long-term sustainability of healthy ecosystem:
  - To pass all benefits to the next generations (income and fish supply, status of key commercial species, vulnerable components, ecosystem services)
  - Fishing community, and its livelihood, food security, as a part of ecosystem
- type of risk management – “Adaptive management”:
  - Prepare a plan of monitoring risks and corresponding actions when risks are detected
- participatory process and broadly accepted
- can be extremely simple, or can be very complex, very flexible
- easy to address conflicting targets

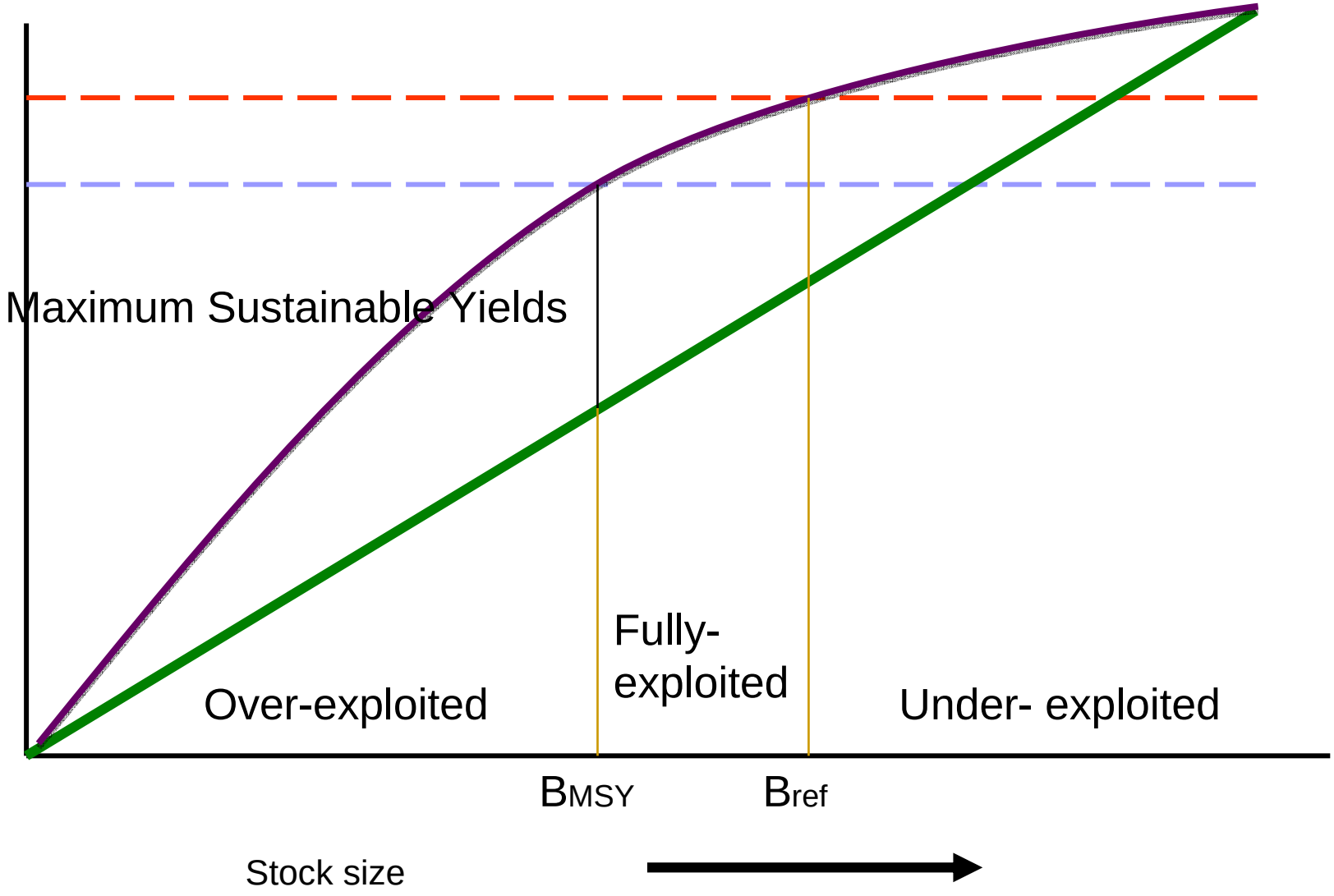
Principle of adaptive management:

All actions are taken based on indicators.



Reference points and actions should be pre-determined.

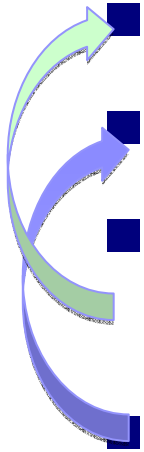
Concept of sustainable yields:



Three types of issues:

- MANAGE:
  - Under direct “legislative” responsibility
  - Regulation/management can be generated to deal explicitly and directly with the issues.
- INFLUENCE:
  - Not under “legislative” responsibility and unable to manage them directly
  - Put input to influence to the management process
- REACT:
  - Generated by external environment unable to manage nor influence
  - Prepare to deal with them as much as possible

Monitoring indicators need to describe:



- Pressure/ affecting factors:
- Status of targets – operational objectives:
- Factors directly controlled by management procedures – monitoring implementation of management procedures:
- Response of targets to managements.

- Support management decision making
- Track progress towards meeting management objectives
- Communicate effects of complex impacts and management processes to a non specialist audience
- Perception that indicators would be a way of dealing with increased complexity

Selection criteria of indicators:

- Directly measurable, not abstractive concepts:
- Sensitive and responsive to change in targets:
- Clear reflective relation to behavior of targets;
- Cost-effective:
- Robust and less sensitive to noise:
- Consistent with public understandings and technical indications:
- Adequate time-series:

A range of indicators required:

In the context of Ecosystem Management Approach

Impacts of fishing and aquaculture operations:

- Status and changes of fishing/aquaculture operations
- Status and changes of targeted resources (i.e. main target of conventional management)
- Status and changes of non-targeted biological environment
- Status and changes of physical environments

Contribution of fishery and aquaculture sector:

- Food security
- Social aspects (number of people supported by sector)
- Economic aspect (contribution to national GDP, directly and indirectly)

Impacts from other sectors and environments:

- Interaction with other sectors (e.g. inputs, outputs, competitions)
- Shift and changes of environments supporting fishery sector (e.g. habitat deterioration, climate changes impacts)

Tools of data collection:

- Impacts of fishing and aquaculture activities

Sampling at landings; logbooks, VMS, observers, e-reportings, registries and licenses, research survey, market survey, census, etc

- Catch and CPUE could be reasonably reliable indicator with proper analysis and interpretation

- Contribution of fishery and aquaculture sector

Production statistics, market and economic surveys, population census, employment data, consumption survey, trade data

- Interference with other sectors, impacts from environment:

Satellite imagery, GIS, land-use, water-use information, meteorological data, administrative information, surveys and information from other sectors, etc.

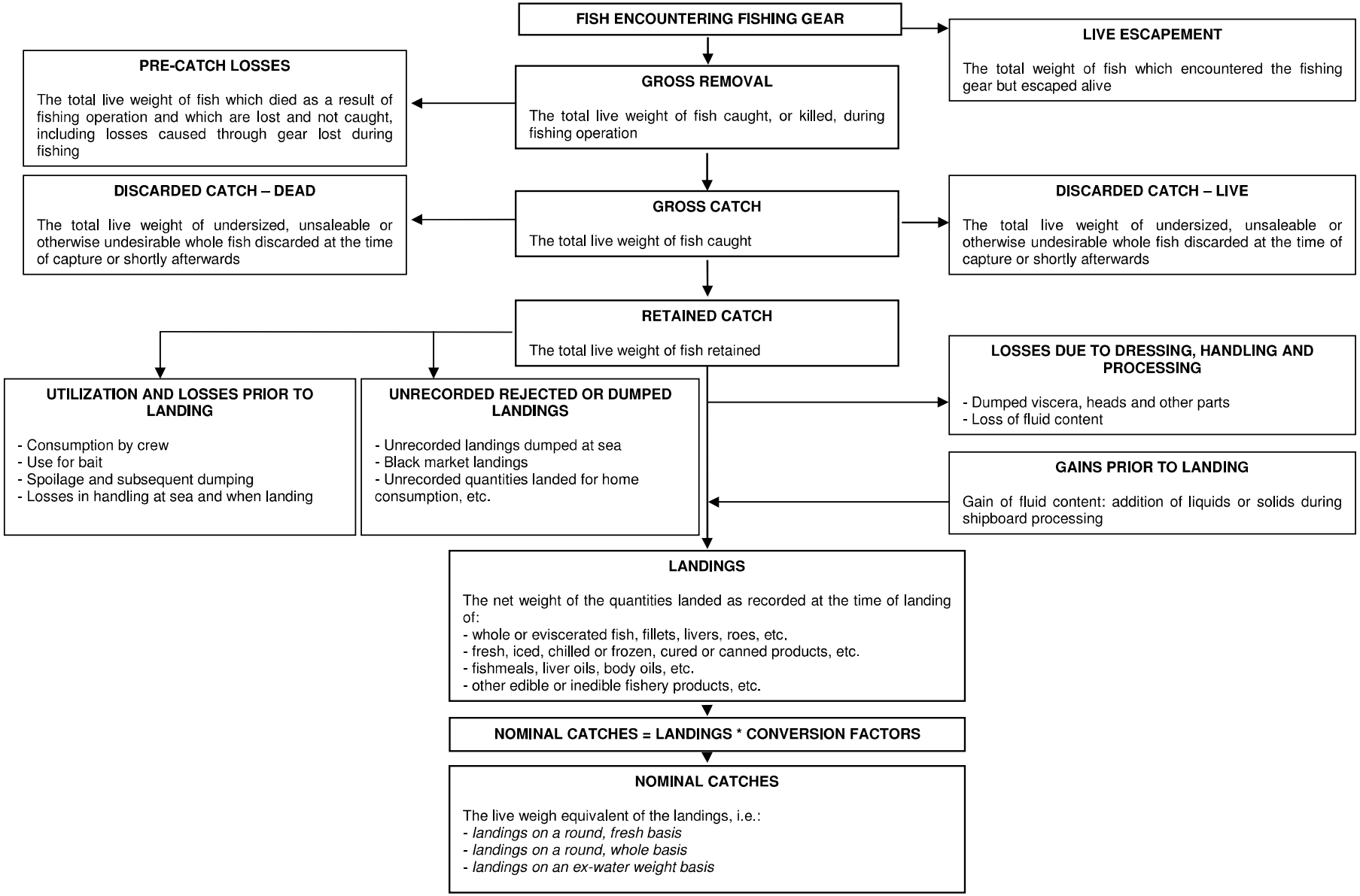
Productivity of stock:

	High Risk	Low risk
Maturity age	High	Low
Longevity	High	Low
Fecundity	High	Low
Trophic level	High	Low

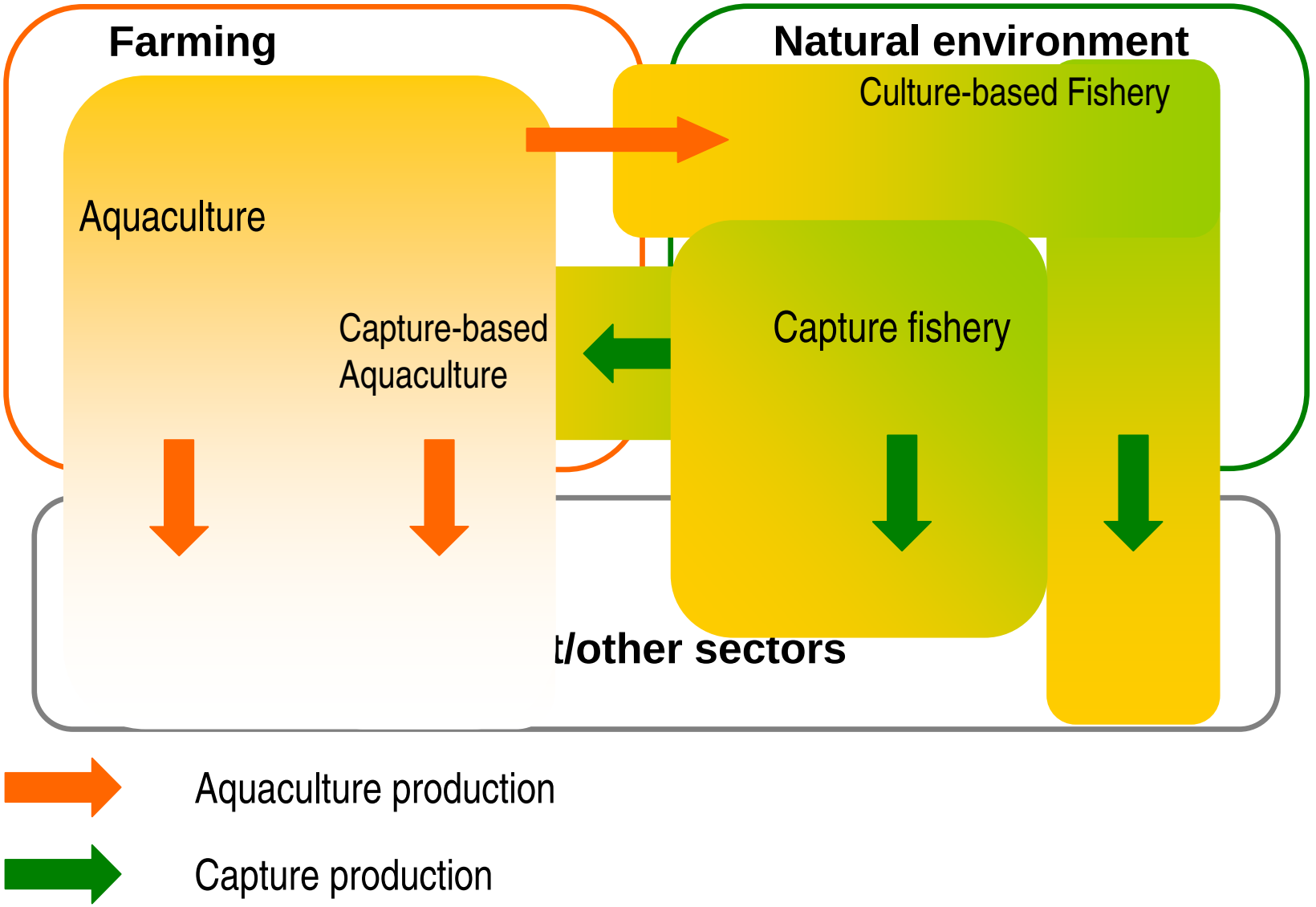
Susceptibility of stock to gears:

	High Risk	Low risk
Availability	High	Low
Encounterability	High	Low
Selectivity	High	Low
Post-harvest survival	Low	High

CATCH CONCEPTS: DIAGRAMMATIC PRESENTATION



Definition of Aquaculture and Capture Fishery



SEEAs – standard measures of natural resource sustainability:

- Standard methodology of macro indicators for natural resource sustainability – mineral and energy, land, water, soil, timber, fish, and other biological resources,
- Focus on natural resources utilized through commercial activities – including bycatch and discards for fish resources
- Fish Resource – consistency with UNCLOS and FAO CCRF:
  - Aquatic resources within national jurisdiction areas including its EEZ – based on geographical location of resource
  - Straddling, migratory and high-sea residential stocks – only part residential within a country or international approved quota is considered as national asset
  - Separation of natural resources and cultured resources, with transfer defined in consistent with CWP definitions
  - In a absence of stock assessment, relative indicators defined with catch and cost of operation

Other issues relevant to environment :

- Potential aquaculture role in climate change mitigations:
  - Potential sinks of green gases – bivalves, algae
  - Water quality control – herbivorous species, detritus feeders
  - Biofuel
  - Effective utilization of blackish water

- Increased trade of live-animals/plants for biodiversity:
  - Stock-enhancement and aquaculture breeding
  - Ornamental organisms

- Water access to running waters by aquaculture and fishery:
  - A set of alternative water use indicator is currently under development

Coordinating Working Party of Fishery Statistics

- FAO Statutory Body under Article VI

  Established in 1959 and modified to become global coordination mechanism in 1995 with TORs:

  - keep continuous review the requirements for fishery statistics (including aquaculture) for the purposes of research, policy-making and management
  - agree standard concepts, definitions, classifications and methodologies
  - make proposals and recommendations for action to coordinate activities so as to avoid duplication

- Members: International and Regional organizations who have relevance in fishery and aquaculture statistics

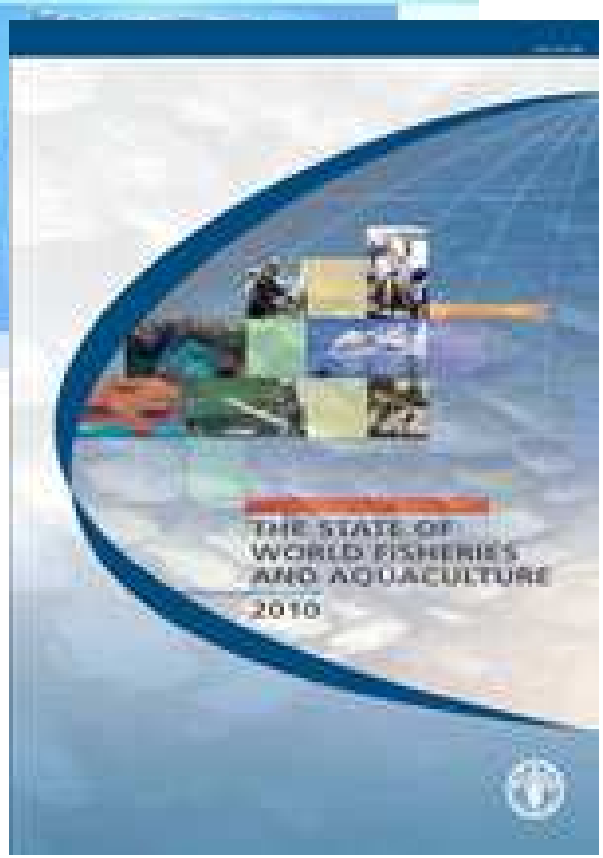
  CCAMLR, CCSBT, FAO, GFCM, IOTC, IATTC, ICCAT, ICES, IWC, NACA, NASCO, NEAFC, NAFO, OECD, SPC, SEAFDEC, SEAFO, Eurostat, WCPFC

- Revision of CWP Handbook :

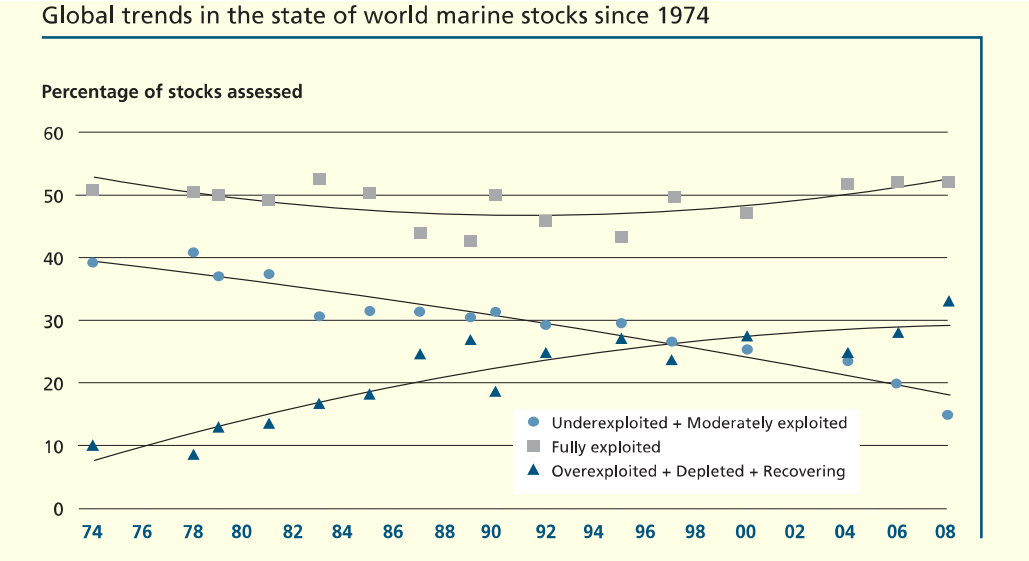
  - Substantial revisions – i) up to date basic concepts and standards, ii) enhance aquaculture component, iii) new development of social and economic components (including SNA, SEEAs, linkage with censuses), iv) inclusion of ecosystem monitoring

State of Fishery stocks:

Review of the state of world marine fishery resources – 2005: http://www.fao.org/docrep/009/y5852e/y5852e00.htm



The State of world Fisheries and Aquaculture – 2010: http://www.fao.org/docrep/013/i1820e/i1820e00.htm



Fishery Resources Monitoring System (FIRMS)

- to provide access to a wide range of high-quality information on the global monitoring and management of fishery marine resources. http://firms.fao.org/firms/en

Tools:

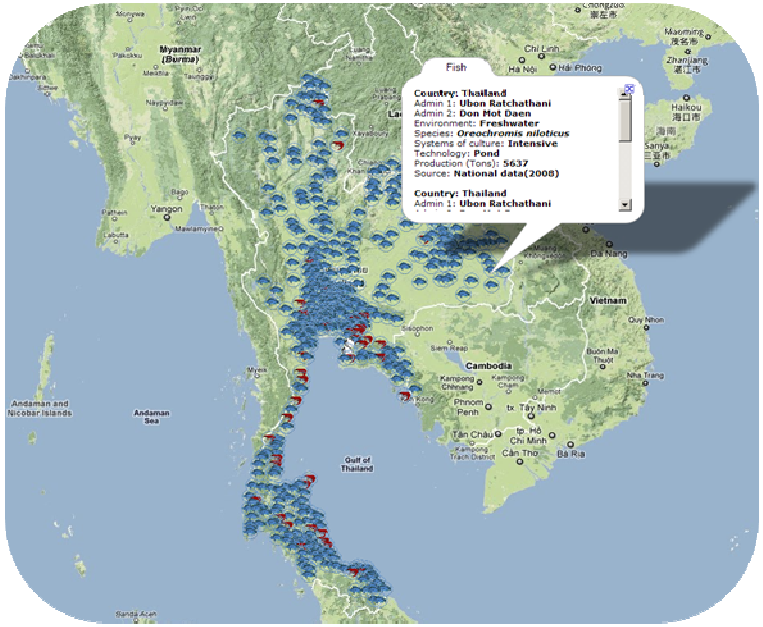
- Resource Inventory
- Search for Resource Reports
- Status & Trend Summaries (extracted from reports)

Thematic Areas

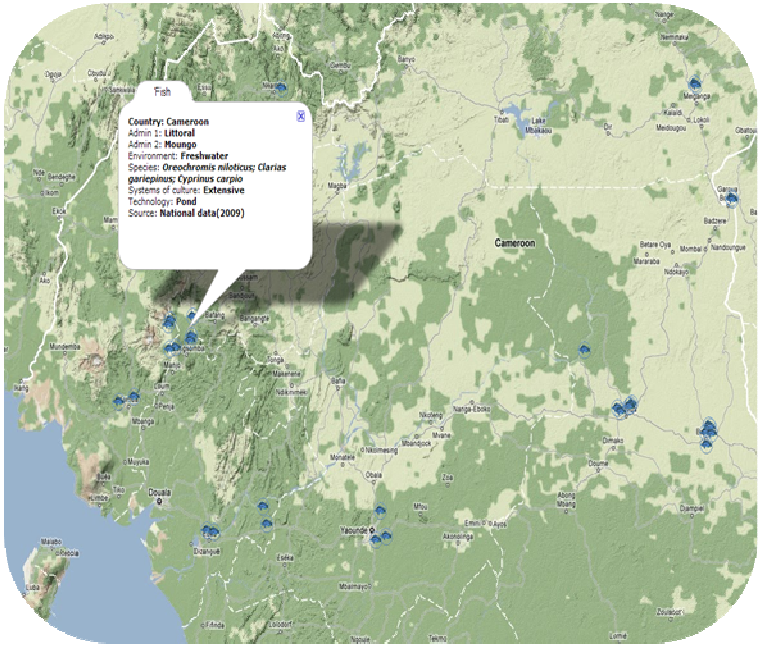
- The most up to date information on deep sea (high seas) demersal resources
- The most up to date information on tuna and tuna-like species

NASO mapping – farm location

The NASO map Excel form can generate Google maps showing the location of aquaculture sites and their characteristics at an administrative level (state, province, district, etc.) and in some cases even at an individual farm level.



Administrative level
e.g. Thailand



Individual farm level
e.g. Cameroon

Other information base available at web:

- Guideline for data/statistics collection and glossary;
  - CWP Handbook of Fishery Statistical Standards, Fisheries Glossary,
  - Glossary of Aquaculture,
- Biological information;
  - ASFIS Species List, Species distribution maps, Reference Tables
  - Taxonomical information management system, FishBase
- Market information:
  - Globefish
- Geographic Information;
  - The SADC Water Resource Database (WRD)
- Resource and Management Information;
  - Tuna ATLAS
  - Link to all Regional Fishery Bodies
  - List of Vessels authorized to operate at High Seas (HSVAR)
  - Legislation on foreign access, port access, aquaculture (NALO)
- General;
  - Aquatic Sciences and Fisheries Abstract (ASFA)
  - Country profile on fisheries, aquaculture