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Fisheries Training Course for BMU members in Kenya

Fisheries information for improved artisanal fisheries co-management

Course leader: Dr. Melita Samoilys
Facilitation leader: George Waweru Maina

Introduction to course

- Course objective: effective fisheries management through:
  - fishers playing a major role in the process
  - adequate information available for good decision making
- 5 days, ~ 3 lessons or units each day
- field work on day 2 & 3
- evening videos and exercises
Coastal Marine Ecosystems & East Africa Marine Ecology

- **The marine ecosystem**
  an ecosystem is a community of living organisms (plants, animals) and non-living components of the environment (like air, water, rock, sand), interacting as a system
- **Coastal**
  defined as waters within 12 nautical miles of the coast
- **Ecology**
  is the scientific study of the relations between living organisms and with their natural environment

- Fished species are a key component of marine ecosystems, however, in terms of production, they account for only a small fraction of production (energy) and biomass
- Fish depend on **primary production** — the fixation of carbon by marine plants which is then transferred up the food chain.
- Humans are also part of the marine ecosystem, particularly with regard to fishing
- Fish and humans convert carbon into energy and body tissue
Coastal Marine Ecosystems & East Africa Marine Ecology

Coral reefs are one of the most productive and diverse ecosystems on the planet. They are a defining feature of Kenya’s coast. What other ecosystems occur on Kenya’s coast?
Coastal Marine Ecosystems & East Africa Marine Ecology

Coral reefs are one of the most productive and diverse ecosystems on the planet. They are a defining feature of Kenya's coast. What other ecosystems occur on Kenya’s coast?

- mangroves

- seagrass beds
- muddy & sandy bays, beaches and estuaries

We can consider these as separate ecosystems or one large integrated ecosystem.
...there are a million stories on the blue highway... the Red Emperor is just one of them...

- Nutrients are washed downstream, rivers and mangrove creeks in the rainy season.
- Creates phytoplankton (marine algae) blooms which are in turn eaten by zooplankton (microscopic animals in water) that are in turn eaten by larvae of big fish predators e.g. kingfish.

Mangrove jacks (Kiungo) span different habitats—juveniles in fresh water, sub-adults in mangroves, adults on coral reefs.

© Russell Kelley & Australian Coral Reef Society
Day 1: Unit 1.1

Coastal Marine Ecosystems & East Africa Marine Ecology

Discussion and feedback session

Day 1: Unit 1.1

Coastal Marine Ecosystems & East Africa Marine Ecology

Ecological relationships - Predator-prey relationships and competition

- Predator A
- Predator B
- Prey C
- Prey D
- Resources
Coastal Marine Ecosystems & East Africa Marine Ecology

Ecological relationships - Predator-prey relationships and competition

Predator A

Predator B

Prey C

Prey D

Resources
Coastal Marine Ecosystems & East Africa Marine Ecology

Ecological relationships - Predator-prey relationships and competition

Day 1: Unit 1.1

Coastal Marine Ecosystems & East Africa Marine Ecology

Ecological relationships - Herbivory

1. healthy reef
2. parrot fish grazing
3. surgeons & parrotfish grazing
4. reef overgrown with brown algae
Day 1: Unit 1.2
Effects of Fishing on Marine Ecology

VIDEO: FISH AND PEOPLE MODULE 1
1:02-2:12;
The effects of fishing can be broadly categorised into two types:
i) impacts on the ecosystem
ii) direct effects on fish populations themselves

impacts on the ecosystem
what about some of the destructive fishing methods that impact habitats?
what about land based activities such as agriculture? (clearing; fertilisers)

Day 1: Unit 1.2
Effects of Fishing on Marine Ecology

direct effects on fish populations

we need to understand the life cycle of fish – how fish are created

VIDEO: FISH AND PEOPLE MODULE 2
1:33-5:21; 5:25 –12:45;
• larvae - dispersal & connectivity
• reproduction – spawning aggregations, fish size

VIDEO: FISH AND PEOPLE MODULE 3
6:34-9:26
• fecundity
Day 1: Unit 1.2
Effects of Fishing on Marine Ecology

Plenary Discussion: how has fishing changed over the years? What effects of fishing have you noticed?

- VIDEO: FISH AND PEOPLE MODULE 3
- age and growth
- removal of predators – release of prey
- removal of herbivores
- by-catch

Day 1: Unit 1.1
Coastal Marine Ecosystems & East Africa Marine Ecology

Discussion and feedback session
Coastal Fisheries and co-management

Co-management is when government and fishers cooperate and share responsibility for fisheries management:
- formally recognises fishers’ role in management
- often fisheries departments provide the scientific information and advice and the legislative mechanisms
- fishers take responsibility for management through providing advice on management strategies and through self-policing
- BMUs are Kenya’s (and Tanzania’s) mechanism for co-management, providing the institutional and legislative base

Coastal Fisheries and co-management

Successful co-management is usually linked to:

1) existence of fisher cooperatives or village units
2) boundary of fish stocks clearly defined and stocks not shared with other fishers
3) government regulations are supportive particularly for devolved power
4) community has alternative sources of income
5) locals police the fishery but with government legal back-up

co-management works best when local fishers have control eg quotas or tenure

Discussion: what do we have in Kenya? list examples.
Coastal Fisheries and co-management

Example of co-management governance structures in Kenya

Example - Fisheries Co-management Committees these are committees that bring together BMUs, government and other stakeholders to plan together, agree management measures, monitor implementation of plans and mobilise resources.

Coastal Fisheries and co-management

WARNING: with no strong history of self-policing and traditional ownership of resources, heavy reliance on community-based management can be risky. Government can abrogate its responsibilities and communities can fish out resources. Co-management will not solve overfishing caused by too much effort (no. of fishers) or catches being too high for the stocks being fished.

Plenary discussion on traditional ownership: case studies of *iriaichi* from Japan and *qoli-qoli* from Fiji
Fisheries Training Course for BMU members in Kenya

fisheries information for improved artisanal fisheries co-management

Course leader: Dr. Melita Samoilys
Facilitation leader: George Waweru Maina

Recap of Day 1

Plenary session with group presentations on evening reflections.
Key points captured here:
Fisheries Data & Information for Management

This course has a particular objective: to develop local data-collection capacity to:

a) improve the monitoring of artisanal fisheries
b) to assess how well they are being managed

- part of an overall strategy to improve Monitoring, Control and Surveillance (MCS) of artisanal fisheries in East Africa, which in Kenya falls under the Ministry of Fisheries Development.

“Monitoring provides the baseline information for MCS and is used to develop the control regime” (FID)

Plenary questions and discussion

What sort of information do we need to manage a fishery?

How do we define a fishery?

How do we monitor a fishery?
Day 2: Unit 2.1

Fisheries Data & Information for Management

Defining a fishery

- the gear – fishing gear and boat
- fishers (no. of men per gear/boat)
- where do they fish?
- how often and for how long?
- catch – species, weights
Day 2: Unit 2.1

Fisheries Data and Information for Management

Monitoring a fishery
- Do you keep records?
- If so why and how do you keep records?
- What is monitoring?

Day 2: Unit 2.1

Fisheries Data & Information for Management

Monitoring fishery variables

VIDEO FISH AND PEOPLE MODULE 1
7:45-10:47

This video explains two types of measures to record when monitoring a fishery:
- Abundance – e.g. from underwater visual surveys to get independent/separate information on fish populations - stock size
- Catch and Effort – from surveys of the fishery to get Catch per Unit Effort (CPUE)
Day 2: Unit 2.2

How to collect good fisheries data

Sampling - designing the data collection plan
Example: what is the average height of men in the village?

- **strata** or levels of sampling
  - eg - time (days/months/seasons)
  - location (landing site)
  - fishers (old, young)
- **random sampling** for measuring variables
- means and accuracy
- error and precision

Day 2: Unit 2.3

Data Collection: Field Exercise

Monitoring catch and effort at Msambweni landing site

Designing the data collection sheet – what are the questions and therefore what variables need to be recorded and what is their unit?

Some typical questions
- what is the average catch per fisher (at this time - in the kusi monsoon)?
- which gear has the highest catch per fisher?
- which gear uses the most effort?
# FOMU MAPATO YA SAMAKI

(Catch Per Unit Effort (CPUE) Form Data sheet)

**BANDARI:** (LANDING SITE)…………………………

**TARAHE (DATE & TIME)……………………………**

**MWANDISHI (DATA COLECTOR)……………………**

<table>
<thead>
<tr>
<th>CATCH RECORD NUMBER</th>
<th>AINA YA CHOMBO/ MGUU VESSEL/ FOOT</th>
<th>ZANA YA UVUVI GEAR</th>
<th>IDADI YA BAHARIA CREW SIZE</th>
<th>ENEO LA UVUVI FISHING ZONE</th>
<th>AINA YA SAMAKI FISH TYPE (FAMILY/SPECIES)</th>
<th>IDADI YA SAMAKI NUMBER</th>
<th>UZITO WA SAMAKI CATCH WEIGHT (KG)</th>
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Fisheries Training Course for Beach Management Unit (BMU) members in Kenya:

Fisheries information for improved artisanal fisheries co-management

17-21 September 2012

Day 2 – 18th September

Field Exercise - CPUE Data collection at Mkunguni fish landing site (Unit 2.3)

The first field exercise will focus on collecting catch and effort data from one landing site using pre-prepared data sheets. Data will be collected from which Catch per Unit of Effort (CPUE) can be calculated. See separate datasheet.

Field instructions

- Please work in four groups of ~ 5 participants
- each group will have a facilitator
- assign one data recorder in the group
- assign two people to work together to identify and count the fish in the catch
- assign one person to read the weight measured by the Mkunguni clerk
- materials: clipboard and datasheet and pens

Each group records all the variables on the datasheet for each catch (record number) that is landed.

Extra things to think about for discussion later

- what unit is used to measure catch
- how fishing effort (fishing time) can be measured
- how to sample the catches randomly next time (Day 3)
- how to measure KSh value of the catch
Fisheries Training Course for BMU members in Kenya

fisheries information for improved artisanal fisheries co-management

Course leader: Dr. Melita Samoilyns
Facilitation leader: George Waweru Maina

Reflection – key messages of Day 2

• Evening reflection on the previous day’s teaching on fisheries data and collection
  presented by 4 groups
Day3: Unit 3.1
Review of field practice & analysing data

The following parameters can be calculated from the data and visual presentation (graphs) drawn:

a) CPUE by gear: compare gears
b) CPUE by gear trend: available over time
c) Fishing effort: can this be calculated?
d) Species composition of catch by gear
e) Most frequently used fishing grounds

Day3: Unit 3.1
Review of field practice & analysing data

![Chart showing CPUE by gear: compare gears (histogram)]

- Number Fish/fisher/day
- Kg fish/fisher/day

Bars for Bunduki, Malema, Mshipi, Nyaru
d) Species composition of catch by gear (pie chart)

e) Most frequently used fishing grounds (histogram)
Day3: Unit 3.1

Review of field practice & analysing data I

Plenary discussion on data graphs:
- what have we plotted of the original list?
- draw an example of the missing graphs

  a) CPUE by gear: compare gears
  b) CPUE by gear trend: available over time
  c) Fishing effort: can this be calculated?
  d) Species composition of catch by gear
  e) Most frequently used fishing grounds

Day3: Unit 3.2

Data Collection field practice II

4 groups; data sheets provided for each group

Group 1) Repeat CPUE data collection of field practice I with revisions based on reflection and analysis
- focus on how to measure effort
  - total number of fishers per landing site
  - total hrs fished per fisher/per boat
  - consistency in units
  eg handline = catch per fisher per hour
gill net = catch per boat (with crew), set overnight
Day3: Unit 3.2

Data Collection field practice II

*Groups 2 & 3*) collecting fish size data to explore effects of fishing & management through size limits

i) Select catches of two species:
identify *Siganus sutor* (tafi)
and *Lethrinus mahsena or obsoletus* (changu)

ii) record at least 40 fish lengths of each species
Day 3: Unit 3.2

Data Collection field practice II

*Group 4*) Historic catches - interviewing fishers to recall catches in the past
- in focus group discussion with 4-5 fishers
- collect recall of catch 10, 20, 30 years ago
- ask for average daily catch
- agree on monsoon season
- select one gear only
**FISH SIZE DATA SHEET**

FOMU MAPATO YA SAMAKI

BANDARI: (LANDING SITE)…………………… TAREHE (DATE & TIME)……………………………………

MWANDISHI (DATA COLLECTOR)…………………… RECORD NO……………… GEAR …………………

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**FOMU MAPATO YA SAMAKI**

(Catch Per Unit Effort (CPUE) Form Data sheet)

**BANDARI:** (LANDING SITE).................................

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Fisheries Training Course for BMU members in Kenya

Fisheries information for improved artisanal fisheries co-management

Course leader: Dr. Melita Samoilys
Facilitation leader: George Waweru Maina

Recap of Day 3
Group presentations in plenary on field exercise and lessons of data collection
Day 4: Unit 4.1

Review of field practice and analysing data II

Group work to draw up data from field trip II into graphs – guidance sheets and graph paper provided

1. Fish size – calculate % of juveniles in catch by gear

2. Fishers recall of historic catches – average CPUE per decade to plot trends

3. Re-analysis of CPUE data

Fisheries management and lessons from fish ecology power point presentation.

Day 4: Unit 4.2

Coastal Fisheries and Co-management

Fisheries management and lessons from fish ecology

• Overfishing and size limits: minimum and maximum

• Recap of reproductive strategies

Video: Fish and People Module 3
10:07 - 6:30
9:39 - 12:21
Day 4: Unit 4.2
Coastal Fisheries and Co-management

1) Ecosystem based approaches - broader ecological context

strives to balance diverse societal objectives by:

• taking account of the knowledge and uncertainties of biotic, abiotic and human components of ecosystems and their interactions

• applying an integrated approach to fisheries within ecologically meaningful boundaries

Day 4: Unit 4.2
Coastal Fisheries and Co-management

There are three broad approaches to the management of small scale fisheries:

1) Ecosystem-based approaches - broader ecological context

2) rights-based approaches and co-management

3) Resilience based fisheries management
Coastal Fisheries and Co-management

1) Ecosystem based approaches - broader ecological context
   • sustainability of stocks is central
   • covers watershed management and large marine ecosystems
   • ecologically holistic and in principle is arguably a sound approach
   • practically on the ground is not yet very effective due to a lack of tradition in research & adaptive management

Plenary Discussion: examples in Kenya?
Coastal Fisheries and Co-management

2) rights-based approaches and co-management
   - thinking about common property rights has resulted in recognising:
     - fishing communities should be stewards of shared resources;
     - fishers have a right to manage their resources
   - central to this framework are awareness of rights and the capacity to demand rights and hold government accountable

Coastal Fisheries and Co-management

2) rights-based approaches and co-management
   - less focus on sustainability, more on allocation of rights and responsibilities
   - large focus on property rights - addresses issues of common property of fisheries
   - has led to access rights and to human rights e.g. the right to food security
Coastal Fisheries and Co-management

2) rights-based approaches and co-management

- this has all led to **co-management** or community-based management
- Co-management is broadly defined as collaboration in decision-making: through a partnership between government and resource users, but also with other stakeholders and independent organisations (NGOs, CBOs and research organisations)
- the role of stakeholders in co-management: each brings their knowledge and skills to the decision-making table

- co-management should embody principle of good governance: democracy, transparency, accountability and sustainability
- requires political and social transitions such as decentralisation and effective legislative and judicial institutions and integrated planning
Coastal Fisheries and Co-management

2) rights-based approaches and co-management

Plenary Discussion: what do we have in Kenya? are there rules on the different roles of stakeholders? who defines the rules?

3) Resilience based fisheries management

- Definition of resilience in ecological systems (Holling 1973):

Resilience determines the persistence of relationships within a system and is a measure of the ability of these systems to absorb changes of state variables, driving variables, and parameters, and still persist.

no value assigned – ie ecological resilience is neither good nor bad

Discuss example: productivity, connectivity, maintaining healthy coral reef habitat (see Day 1 lessons)
Coastal Fisheries and Co-management

3) Resilience based fisheries management

- Definition of the resilience of a social-ecological system:
  
  ... the capacity of a system to absorb disturbance and reorganise while undergoing change so as to still retain essentially the same function, structure, identity, and feedbacks

  value is assigned: resilience in people is good

Discussion: example(s)?
Day 4: Unit 4.2

Coastal Fisheries and Co-management

Group Exercise lead by facilitators

Provide a real example of the three management approaches:
- ecosystem-based
- rights-based
- resilience based

Each group can pick one ensuring all 3 covered by the 4 groups

---

Day 4: Unit 4.2

Coastal Fisheries and Co-management

Summary of management in small scale fisheries
- Management that only defines sustainability in terms of ecology has tended to fail
- People are an integral part of these ecosystems, and their exclusion from analysis and the search for practical solutions will not provide a path to sustainability
- An operational form of the term 'social-ecological resilience' within an ecosystem-based approach is needed
Coastal Fisheries and Co-management

Combining all three approaches:
• management for a resilient small scale fishery should prevent the fishery from failing to deliver benefits by nurturing and preserving ecological, social and institutional attributes that enable it to endure, renew and reorganise itself

[benefits = ecosystem goods and services]

Case study: lessons from Asia
As stocks become more overfished as human populations rise, conflicts invariably increase

Fish wars: Conflict and collaboration in fisheries management in Southeast Asia

Robert Pomeroy, John Parks, Richard Pollnac, Tammy Campson

Co-management can reduce conflict between fishers and management agencies and leads to better management of fisheries
Coastal Fisheries and Co-management

**Case study: lessons from Asia**

This study in South-East Asia (Thailand, Philippines, Vietnam) reports overfishing is causing:

- lower productivity of fisheries
- high levels of conflict among different users
- increasing impoverishment of fishers
- loss of food security in coastal communities that are highly dependent on fish supplies for protein, livelihoods and income

---

Coastal Fisheries and Co-management

**Case study: lessons from Asia**

Conflict has resulted in:

- fights over territorial waters and piracy (e.g., Vietnam and Cambodia; Philippines and China, Indonesia and Australia)
- fights between different gears users — e.g., passive gears vs. active gears
- a complex, negative feedback cycle
Coastal Fisheries and Co-management

rapid population growth with fewer economic opportunities and access to land
1. increases the number of people living at the coast dependent on fishery resources
   
   ![Diagram](image1)
   
   1. human population → coastal population
2. increased fishing pressure results in fish population decline, stock collapse & increased resource competition between fishers and between operations (small vs. commercial).

2. increased fishing pressure results in fish population decline, stock collapse & increased resource competition
3. reduced income and food security, increased poverty, lower standard of living and national welfare
4. more destructive and overefficient fishing technologies in the “rush” to catch what remains
Coastal Fisheries and Co-management

This cycle continues: further depleting fishery populations & increasing user competition, leading to higher rates and probabilities of human conflict.

This destructive cycle leads to a pattern of self-reinforcing “fish wars” with deteriorating social and environmental consequences.

Co-management leads to reduced resource conflict levels and increased civil order.

If resource conflicts are reduced, food security improves.

Effects of climate change on fisheries

How is climate change likely to affect coastal fisheries?

Discussion session to brainstorm thoughts and ideas
draw on previous lessons in:
ecology
ecosystems
management approaches
Day 4: Unit 4.3

Effects of climate change on fisheries

How is climate change likely to affect coastal fisheries?
- Coral bleaching
- Sea level rise
- Ocean acidification
- More storms
- Erratic/less rainfall >> less production in coastal fisheries due to less nutrients from coast during rains
- More fishing effort (no. of fishers, more time spent fishing) because agriculture is less productive
Fisheries Training Course for BMU members in Kenya

Fisheries information for improved artisanal fisheries co-management

Course leader: Dr. Melita Samoilys
Facilitation leader: George Waweru Maina

Reflection – key messages of Day 3

Group presentations in plenary on field exercise and lessons of data collection
Group 3: we learnt how to measure fish size at the landing site
Group 4: we learnt how to ask fishers questions on what catches they used to catch from 30 years ago until the present, including what gears they used
Group 1: we learnt how to record fishing time effort in our data collection, and how this varied between gears. We also learnt about collecting historic data.
Group 2: we learnt about drawing graphs, e.g. how to calculate percentages and to calculate CPUE. To compare fishing effort between gears and what fishers catch. We should display this at the bandariniis to help us understand the health of the fisheries and to make decisions
Day 4: Unit 4.1
Review of field practice and analysing data II

Group work to draw up data from field trip II into graphs – facilitated and graph paper provided

1. Fish size – plotting size classes to look at number of juveniles in catch by gear
   Group 2 and 3)
   1. Fishers recall of historic catches – average CPUE per decade to plot trends
      (group 4)
   1. Re-analysis of CPUE data (group 1)

HISTORIA YA MAPATO YA SAMAKI KATIKA BANDARI YA MKUNGUNI

MAHOJIANO NA WAVUVI

GROUP 4: Mwakira, Kitwebwe, Abubakar, ..............

19/09/2012
MAHOJIANO: Historia ya mapato (kg/fisher/day)

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<td>-</td>
<td>35</td>
<td>4</td>
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<tr>
<td>Mvuvi 6</td>
<td>Malema</td>
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MATOKEO
HISTORIA YA MAPATO YA SAMAKI

![Graph showing changes in fish catch by Mwaka (1980-2000). The graph shows a decrease in fish catch over the years.]
MAELEZO/MAJADILIANO

Sababu za mapato kushuka

1) Kuongezeka kwa idadi ya wawuvi na vyombo
2) Mababiliko ya kimaumbile ya kimazingira
3) Uwuni haramu
4) Ukosefu wa tengefu
Day 4: Unit 4.1

Review of field practice and analysing data

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Size at first maturity
Review of field practice and analysing data

Plenary discussion on:

- trap exits for small fish – being promoted by FiD and being tested (?) by WCS in Wasini to bring in min. size limit
- maximum sizes – how to reconcile this with minimum sizes – see illustration in video
- many people rely on small fish – there is market demand for small fish (grade 3 fish) which take under minimum size fish. So can these buyers (mama karanga) help us solve this problem and change to buying big fish and cut them in half? Knowing how many times fish spawn per year and for how many years is important to know.
- does this also apply to aquarium fishery species? Yes, they are part of the ecosystem and they also have their biology and life cycles – some live for many years, some not
Coastal Fisheries and Co-management

Fisheries management and lessons from fish ecology
• overfishing and size limits: minimum and maximum
• recap of reproductive strategies

VIDEO: FISH AND PEOPLE MODULE 3
1:07- 6:30
9:39-12:21

Day 4: Unit 4.2
Coastal Fisheries and Co-management

There are three broad approaches to the management of small scale fisheries:

1) Ecosystem-based approaches - broader ecological context

2) rights-based approaches and co-management

3) Resilience based fisheries management
Day 4: Unit 4.2
Coastal Fisheries and Co-management

1) **Ecosystem based approaches - broader ecological context**
strives to balance diverse societal objectives by:
- taking account of the knowledge and uncertainties of biotic, abiotic and human components of ecosystems and their interactions
- applying an integrated approach to fisheries within ecologically meaningful boundaries

Day 4: Unit 4.2
Coastal Fisheries and Co-management

1) **Ecosystem based approaches - broader ecological context**
- sustainability of stocks is central
- covers watershed management and large marine ecosystems
- ecologically holistic and in principle is arguably a sound approach
- practically on the ground is not yet very effective due to a lack of tradition in research & **adaptive management**
Coastal Fisheries and Co-management

1) Ecosystem based approaches - broader ecological context

Plenary Discussion: examples in Kenya?

LMMAS

Kuruwitu – community conservation area because... it protects coral reefs, seagrass beds, beaches and fully protects (no fishing) ie protects habitat and species that are not fished (part of the foodchain, habitat for others etc) and fully protects fished species. Do monitoring and research. Are planting casuarinas to reduce soil erosion.

Day 4: Unit 4.2

Coastal Fisheries and Co-management

1) Ecosystem based approaches - broader ecological context

Plenary Discussion: examples in Kenya?

Wasini – conservation area: of coral reefs protecting all fish and the habitats, coral transplanting, suggests seaweed farming is providing food for fish, + mangrove conservation & planting. stopped sand mining.

Kibuyuni – tengefu (LMMA) – protects and conserves fish populations so they can breed and protects corals and is resulting in recovery of fish stocks – the reef was “dead” with no/only tiny fish
Coastal Fisheries and Co-management

1) Ecosystem based approaches - broader ecological context
Plenary Discussion: examples in Kenya?

Government approach – KWS marine parks (coral reefs) then reserves to include mangroves and seagrass beds + others. + Fisheries regulations to harvest populations of fish sustainably;

2) rights-based approaches and co-management

• less focus on sustainability, more on allocation of rights and responsibilities
• large focus on property rights - addresses issues of common property of fisheries
• has led to access rights and to human rights e.g. the right to food security
Day 4: Unit 4.2
Coastal Fisheries and Co-management

2) rights-based approaches and co-management
• thinking about common property rights has resulted in recognising:
  - fishing communities should be stewards of shared resources;
  - fishers have a right to manage their resources

• central to this framework are awareness of rights and the capacity to demand rights and hold government accountable

Day 4: Unit 4.2
Coastal Fisheries and Co-management

2) rights-based approaches and co-management
• this has all led to co-management or community-based management

• Co-management is broadly defined as collaboration in decision-making: through a partnership between government and resource users, but also with other stakeholders and independent organisations (NGOs, CBOs and research organisations)

• the role of stakeholders in co-management: each brings their knowledge and skills to the decision-making table
Coastal Fisheries and Co-management

2) rights-based approaches and co-management

• co-management should embody principle of good governance: democracy, transparency, accountability and sustainability
• requires political and social transitions such as decentralisation and effective legislative and judicial institutions and integrated planning
Day 4: Unit 4.2

Coastal Fisheries and Co-management

2) rights-based approaches and co-management

Plenary Discussion: what do we have in Kenya?
are there rules on the different roles of stakeholders? who defines the rules?
which rights are we talking about?
who has the right to fish who’s resources?
Kenyans have rights to fish coastal waters but within legislative framework of Fisheries Regulations and BMU by-laws.

Mikoko pamoja – partnership between Gazi & Kinondo and govt – to get benefits on carbon credits from their mangroves purchased by countries who are polluting (CO2 emissions) – legal framework = CFA (comm. forest assoc.)
Day 4: Unit 4.2

Coastal Fisheries and Co-management

3) Resilience based fisheries management

- Definition of resilience in ecological systems (Holling 1973):
  Resilience determines the persistence of relationships within a system and is a measure of the ability of these systems to absorb changes of state variables, driving variables, and parameters, and still persist.
  No value assigned – i.e. ecological resilience is neither good nor bad

Discuss examples: productivity, connectivity, maintaining healthy coral reef habitat (see Day 1 lessons)

Day 1: Unit 1.1

Coastal Marine Ecosystems & East Africa Marine Ecology

Ecological relationships - Herbivory

1. healthy reef
2. parrot fish grazing
3. surgeons & parrotfish grazing
4. reef over-grown with brown algae
Coastal Fisheries and Co-management

3) Resilience-based fisheries management

• Definition of the resilience of a social-ecological system: the capacity of a system to absorb disturbance and reorganise while undergoing change so as to still retain essentially the same function, structure, identity, and feedbacks. Value is assigned: *resilience in people is good*.

Discussion: example(s)?

---

A resilient small scale fishery may be defined as: one that ‘absorbs stress and reorganises itself following disturbance, while still delivering benefits for poverty reduction’ (Andrew and Evans 2011).

The capacity of people and institutions to learn and adapt, and to self-organise and reorganise, is critical to building resilience.
Coastal Fisheries and Co-management

Case study: lessons from Asia
As stocks become more overfished as human populations rise, conflicts invariably increase

Fish wars: Conflict and collaboration in fisheries management in Southeast Asia
Robert Pomeroy, John Parks, Richard Pollnac, Tammy Campson,

Co-management can reduce conflict between fishers and management agencies and leads to better management of fisheries

Coastal Fisheries and Co-management

Case study: lessons from Asia
This study in South-East Asia (Thailand, Philippines, Vietnam) reports overfishing is causing:
- lower productivity of fisheries
- high levels of conflict among different users
- increasing impoverishment of fishers
- loss of food security in coastal communities that are highly dependent on fish supplies for protein, livelihoods and income
Coastal Fisheries and Co-management

rapid population growth with fewer economic opportunities and access to land

1. increases the number of people living at the coast dependent on fishery resources

2. increased fishing pressure results in fish population decline, stock collapse & increased resource competition between fishers and between operations (small vs. commercial).

Case study: lessons from Asia

Conflict has resulted in:
- fights over territorial waters and piracy (eg Vietnam and Cambodia; Philippines and China, Indonesia and Australia)
- fights between different gears users – e.g. passive gears vs. active gears
- a complex, negative feedback cycle
Day 4: Unit 4.2

Coastal Fisheries and Co-management

2. Increased fishing pressure results in fish population decline, stock collapse & increased resource competition
3. Reduced income and food security, increased poverty, lower standard of living and national welfare
4. More destructive and overefficient fishing technologies in the “rush” to catch what remains

Day 4: Unit 4.2

Coastal Fisheries and Co-management

This cycle continues: further depleting fishery populations & increasing user competition, leading to higher rates and probabilities of human conflict.
This destructive cycle leads to a pattern of self-reinforcing “fish wars” with deteriorating social and environmental consequences.

Co-management leads to reduced resource conflict levels and increased civil order.
If resource conflicts are reduced, food security improves

Key lesson: bring in co-management approaches to address conflicts (e.g., ring net and beach seine fishers vs. others)
Day 4: Unit 4.3

Effects of climate change on fisheries

How is climate change likely to affect coastal fisheries?
• Coral bleaching
• Sea level rise
• Ocean acidification
• More storms
• Erratic/less rainfall => less production in coastal fisheries due to less nutrients from coast during rains
• More fishing effort (no. of fishers, more time spent fishing) because agriculture is less productive

Day 4: Unit 4.3

Effects of climate change on fisheries

• Climate change effects on coral reefs – bleaching – grazers help coral re-grow
Day 4: Unit 4.3

Effects of climate change on fisheries

How is climate change likely to affect coastal fisheries?
Who is likely to be the most vulnerable to these changes?

Discussion session to brainstorm thoughts and ideas
draw on previous lessons in:
ecology
ecosystems
management approaches

note

- the following 3 slides were skipped due to the lesson being too long – too much theory for the participants.
- a video clip would have been good – did not find one on co-management approaches
Day 4: Unit 4.2

Coastal Fisheries and Co-management

Group Exercise lead by facilitators

Provide a real example of the three management approaches:
- ecosystem-based
- rights-based
- resilience-based

Each group can pick one ensuring all 3 covered by the 4 groups

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Day 4: Unit 4.2

Coastal Fisheries and Co-management

Summary of management in artisanal fisheries
- Management that only defines sustainability in terms of ecology has tended to fail
- People are an integral part of these ecosystems, and their exclusion from analysis and the search for practical solutions will not provide a path to sustainability
- An operational form of the term 'social-ecological resilience' within an ecosystem-based approach is needed
Day 4: Unit 4.2

Coastal Fisheries and Co-management

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• Management that only defines sustainability in terms of ecology has tended to fail
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Fisheries information for improved artisanal fisheries co-management

Fisheries Training Course for BMU members in Kenya

fisheries information for improved artisanal fisheries co-management

Course leader: Dr. Melita Samoilys
Facilitation leader: George Waweru Maina

Smart Fish
CORDIO
East Africa

Recap of Day 4

• plenary group presentations of reflections on yesterday’s lessons
Day 5: Unit 5.1
Planning and logistics for data collection and management

- Who is responsible and who does the data collection
- When and where – recap on sampling design
- Data sheet storage and input data to computer
- Analysis of data and display of results
- Feedback loop for adaptive management
- Review of management plan/ regulations
- Links between BMUs

Plenary Discussion: ideas from participants>>
commitment to implement, a plan to take home

Day 5: Unit 5.2
Options for sustainable fisheries

By necessity fisheries management involves restrictions.
Examples:
1) Location
2) Gear
3) Catch
4) Time
5) Effort

Management also involves financing mechanisms.

Plenary Discussion: provide examples from Kenya
Day 5: Unit 5.2

Options for sustainable fisheries

Management restrictions and financing:
1) Location – e.g. government Marine Parks/Reserves and Community-managed areas
2) Gear – ban on destructive gears, restricted mesh sizes
3) Catch – some species protected; minimum and maximum size limits
4) Time – seasonal bans on fishing certain species e.g. during spawning time
5) Effort – reduce number of fishers
6) Financing mechanisms – government taxes, Payment for Ecosystem Services (PES), tourism levies

Day 5: Unit 5.2

Options for sustainable fisheries

Restricted catch
protect Endangered and Vulnerable species
(Kenya is signatory to CITES, CBD)

Why do we care?
Options for sustainable fisheries

Restricted catch
- minimum and maximum size limits
  are these possible options?
Capture of juveniles is high

how can we address this with gear restrictions/modifications?
How would we implement this?
How would we measure how effective it is?

Plenary discussion: to answer questions and propose options

Options for sustainable fisheries

Location or Time
Species that aggregate at specific locations to spawn:
can close fishing temporarily during spawning time
OR protect the spawning sites as community conservation areas (which can have other benefits also… such as?)

Plenary discussion: to answer questions and propose options
Day 5: Unit 5.2
Options for sustainable fisheries

Restricted Effort

- over capacity in a fishery – how to decrease effort?

Plenary discussion: to propose options

Optional video summarising lessons:
VIDEO: FISH AND PEOPLE MODULE 5
0.51-10:49

Day 5: Unit 5.3
Review of Training Course and Close

Plenary Discussion:
What data recording could you start up?
Will you engage in nation wide community-level fishery monitoring?
How will you link with the government’s monitoring of fisheries?
What action will you now take home to your BMU?
What further assistance would you like?
What was the most useful lesson?
Review of Training Course and Close

Plenary Discussion continued:
What was your least favourite or most irrelevant lesson or unit?
What resource materials or exercises were most useful?
What would you like more of? or what was missing?

Shukrani!

Closure - participants speeches

Photos
Fisheries information for improved artisanal fisheries co-management

Fisheries Training Course for BMU members in Kenya

Course leader: Dr. Melita Samoilya
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Reflection – key messages of Day 4

- Plenary group presentations of reflections on yesterday’s lessons

Group 1

- Learnt a new approach to management that is very important: the rights-based approach to fisheries management. It reduced conflicts and ensures agreement. It is a MUST use approach.

Climate change and impacts??

- Algae (zooxanthellae) gets out of coral when temperatures increase leading to whitening of corals.
- Whitening of corals affects food chain,
- Climate change has resulted to reduced rain which has lead to reduced food for fish and nutrients to the sea.
- Climate change resulted to reduced catches and fish numbers
Who is affected by climate change and who is most vulnerable???
- Fishermen who mostly rely on marine resources
- Community dependent on marine resources - when supply of fishery products within the community affected.

Lessons from the Kuruwitu Marine Conservation Group Video
- Fishers spent more time fishing because catches were low
- Aquarium fishery affected fish populations
- Sea urchins populations were too high and their predators were few in numbers
- Co-management was present...EAVLS, FID
- After co-management and conservation through LMMA, the environment has shown a lot of improvement

Reflection – key messages of Day 4
- Plenary group presentations of reflections on yesterday’s lessons

Group 1 continued

Who is affected by climate change and who is most vulnerable???
- Fishermen who mostly rely on marine resources
- Community dependent on marine resources - when supply of fishery products within the community affected.

Lessons from the Kuruwitu Marine Conservation Group Video
- Fishers used to spend a lot of time fishing searching for very few fish...very low catches.
- Aquarium fishery was a big issue for Kuruwitu fishers as it affected fish populations and habitats
- Sea urchins populations were too high. The number of sea urchins predators were low...sea urchins increased, after conservation efforts, the predators of sea urchin have shown signs of coming back.
• Sea urchins populations were too high. The number of Sea urchins predators were low...sea urchins increased, after conservation efforts, the predators of sea urchin have shown signs of coming back.

• From the video, it was evident that Co-management approach is being implement by Kuruwitu fishers. Several stakeholders have been involved in the Kuruwitu conservation efforts (NGOs, Government, community, Provincial admin)

• The ecosystem with the Kuruwitu community conservation area has shown that the environment is improving rapidly e.g. fish populations, coral cover, important species such as key predators of sea urchins which is bring back the balance between predator and prey relationships

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**REFLECTIONS- – key messages of Day 4**

- **Group 2**
  - Awareness is needed by those planning to implement fisheries management activities for better understanding and reducing conflicts
  - Resilience: learnt that the communities have to be able support themselves when challenges within the fishery occur. E.g. low catches, bad incidents. The environment also need to be able to continue supporting communities
  - need to respect rights of all when planning for activities

**Climate change and their impacts to fishery**

- Learnt what and how climate change is impacting or is likely to impact the marine ecosystem and fisheries

  - Who are most affected by climate change or who are most vulnerable???
  - Business establishments dependant on the fishing communities goes down as...

**Lessons form the Kuruwitu conservation group Video.**

- Learnt about some key species that play a big role in bringing balance to an ecosystem predator prey relationship e.g. sea urchins, triggerfish, parrot fish
- Education and awareness is key to the success of conservation efforts e.g. Kuruwitu
- Kuruwitu had cooperation with researchers who advised them how their area of conservation was responding e.g. climate
Reflections - key messages of Day 4

Group 2
- Learnt about climate change and its impacts to the fishery sector
- Learned about what is coral bleaching and how it is affecting marine organisms
- There must be cooperation between different stakeholders for fisheries co-management initiatives to succeed

Kuruwitu Video
- Stakeholders consultations was high that's why Kuruwitu have registered success in their community marine conservation project.

Reflection – key messages of Day 4

- From Melita
  Generally women will be more vulnerable to the impacts of climate change because of:
  - their social roles
  - inequalities in the access and control of resources
  - lower education
  - poorer health
  - low level of participation in decision-making
Reflection – key messages of Day 4

- From Mr. Mugo. DFO
  - we are lacking enough data to make or inform decisions on management
  - we have a big responsibility all of us to take data on fisheries
  - Participation of all participants in the four days indicates participants have well understood the teachings

Reflection – key messages of Day 4

- From Gufu Husein Golicha
- Encouraged by BMUs...
- Eliakim - Cooperation from all participants on logistics was great
- Suleiman: I am the great beneficiary of the training... BMUs in this training from his area of jurisdiction. His work from now will be easier in working with the BMUs... connectivity between him ND BMUs be there
- George Wawerus: I was very impressed with how BMU participants understood the lessons and in particular were able to graph up the data and understand these analyses
- Njuguna – key messages on ecology which inform us on reasons for gear regulations; go back and teach these lessons – teach your colleagues and do this quickly before you forget the lessons; collecting data is vital - we need you to do this, we don’t have enough people in FiD to do this
Group 4

Reflections - Key messages
- Learnt the three broad approach to managing fisheries... ecosystem approach, risk-based approach, resilience (kuhimi l mabadiliko) based approach

Climate change and impacts
- Coral bleaching...fish numbers reduced, fishing sites reduced,
- Sea level rise, people displaced... eg. Ngowa, Aleni Islands where people have been displaced
- Floods affects fishery... sedimentation and rubbish washed into the sea, nutrients into the sea, too much rain water into the sea brings in cold water to the sea that can affect some organisms such as algae
- Storms: Tsunami, dislocation, runoff into the sea, fishers can't go fishing.
- Kuitia kwa bahari...affecting fishing sites and destroying habitats
- Chemicals...oceans balances chemistry of the water...??
- Fishing effort is high and fishing is the only livelihood... many entries
- Affects the socio-economics of the fishers
- National economy affected

Group 4

Key messages

Madaliko ya CC affects cooperation of environment and organisms relationships

affects fish stocks causing conflicts between resource users and other stakeholders

Uzalishaji wa rasimali ?????
Video lessons

-learnt about social resilience
-stakeholders consultation was high in Kuruwitu
-Ecosystems was in bad state and improved greatly after establishment of the Kuruwitu LMMA
-Coral damage due to sea urchins was high...research very useful un giving answers...monitoring
-Fishers targeting LMMA boundaries...fish increase
-Regulations crucial in setting up conservation areas

Key lesson...Without having historical data about a place /ecosystem, it is difficult to get an idea of the original staus of the ecosystem.

Day 5: Unit 5.1
Planning for BMU’s next actions on data collection and management

Plenary Discussion: participants’ ideas to take home

•Who is responsible and who does the data collection
•When and where – recap on sampling design
•Data sheet storage and input data to computer
•analysis of data and display of results
•feedback loop for adaptive management
•review of management plan/ regulations
•Links between BMUs
•challenges in doing this
Options for sustainable fisheries
By necessity fisheries management involves restrictions.
Examples:
1) Location
2) Gear
3) Catch
4) Time
5) Effort
Management also involves financing mechanisms.

Plenary Discussion: provide examples from Kenya
Note: don’t forget about defining the boundary of the fishery – how this related to BMU jurisdiction

Options for sustainable fisheries
Management restrictions and financing:
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Day 5: Unit 5.2

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Day 5: Unit 5.2

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Plenary discussion: to answer questions and propose options
Day 5: Unit 5.2
Options for sustainable fisheries

Restricted Effort

- over capacity in a fishery – how to decrease effort?

Plenary discussion: how would you do this in Kenya?

Day 5: Unit 5.3
Review of Training Course and Close

Plenary Discussion:
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Plenary Discussion continued:
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What would you like more of? or what was missing?

Day 5: Unit 5.3
Review of Training Course and Close

Shukrani!

Closure
– certificates
- participants speeches & inspirational messages
- Smart Fish, CORDIO and DFO

Photos
RULES FOR CALCULATING CATCH PER UNIT OF EFFORT (CPUE)

SELECT STANDARD UNIT:

EFFORT =

- 1 FISHER
- 1 HOUR

CATCH =

- KG

Examples.

1) Nyavu fishermen bring in 10 kg of catch. There were 2 fishermen and they spent 5 hrs fishing.

>> 10 kg ÷ 2 fishers ÷ 5 hours

= 1.0 kg per fisher per hour

2) Malema fishermen bring in 5 kg of catch. There were 2 fishermen and they spent 2 hours fishing.

>> 5 kg ÷ 2 fishers ÷ 2 hours

= 1.25 kg per fisher per hour

You can compare the CPUE of these two gears with these standardised catches per effort, as above.

you compare 1.0 kg/fisher/hour for nyavu with 1.25kg/fisher/hour for malema

You do NOT compare 10kg from nyavu with 5 kg from malema; these are not comparable because of the difference in effort (time spent fishing) between these two gears.
La bonne gouvernance et de la gestion des pêches et de l'aquaculture permettent d'améliorer la contribution du secteur à la sécurité alimentaire, au développement social, à la croissance économique et au commerce régional ; ceci en assurant par ailleurs une protection renforcée des ressources halieutiques et de leurs écosystèmes.

La Commission de l'Océan Indien (COI) ainsi que la COMESA (Common Market for Eastern and Southern Africa), l'EAC (East African Community) et l'IGAD (Inter-Governmental Authority on Development) ont développé des stratégies à cette fin et se sont engagés à promouvoir la pêche et l'aquaculture responsable.

SmartFish supporte la mise en œuvre de ces stratégies régionales en mettant l’accent sur le renforcement des capacités et des interventions connexes visant à :

- la mise en œuvre d’un développement et d’une gestion durables des pêcheries ;
- le lancement d’un cadre de gouvernance pour les pêcheries durables dans la région ;
- le développement d’un suivi-contrôle-surveillance efficace pour les ressources halieutiques transfrontalières ;
- le développement de stratégies commerciales regionales et la mise en œuvre d’initiatives commerciales ;
- l’amélioration de la sécurité alimentaire à travers la réduction des pertes post-capture et la diversification.

SmartFish est financé par l’Union Européenne dans le cadre du 10ème Fond Européen de Développement.

SmartFish est mis en œuvre par la COI en partenariat avec la COMESA, l'EAC et l'IGAD et en collaboration avec la SADC. Une collaboration étroite a également été développée avec les organisations régionales de pêche de la région. L'assistance technique est fournie par la FAO et le consortium Agrotec SpA.

By improving the governance and management of our fisheries and aquaculture development, we can also improve food security, social benefits, regional trade and increase economic growth, while also ensuring that we protect our fisheries resources and their ecosystems.

The Indian Ocean Commission (IOC), the Common Market for Eastern and Southern Africa (COMESA), the East African Community (EAC) and the Inter-Governmental Authority on Development (IGAD) have developed strategies to that effect and committed to regional approaches to the promotion of responsible fisheries and aquaculture.

SmartFish is supporting the implementation of these regional fisheries strategies, through capacity building and related interventions aimed specifically at:

- implementing sustainable regional fisheries management and development;
- initiating a governance framework for sustainable regional fisheries;
- developing effective monitoring, control and surveillance for trans boundary fisheries resources;
- developing regional trade strategies and implementing regional trade initiatives;
- contributing to food security through the reduction of post-harvest losses and diversification.

SmartFish is financed by the European Union under the 10th European Development Fund.

SmartFish is implemented by the IOC in partnership with the COMESA, EAC, and IGAD and in collaboration with SADC. An effective collaboration with all relevant regional fisheries organisations has also been established. Technical support is provided by Food and Agriculture Organization (FAO) and the Agrotec SpA consortium.

Contact:
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