Ecology and Management of Fisheries Resources

The management of aquatic ecosystems, particularly the inland water bodies has been of great concern in the recent time. This is because these ecosystems, endowed with some unique natural resources are being increasingly degraded leading to ecological instability and disappearance of valuable resources, some of which are irreversible.

For an ecosystem approach, the fisheries and management systems may be compared using different systems of boundaries relating to biomes, fishing areas, provinces, LMEs, ecoregions, EEZs, mangroves, coral reefs, seamounts, estuaries, etc. The last slide reminds that theses ocean areas are more explicitly tri-dimensional than continental ecosystems. These boundaries do not match, are often fuzzy and shift seasonally, from year to year and with climate change.

The management of inland water bodies and conservation of fisheries resources in Nigeria has therefore been principally in the traditional domain, where traditional strategies such as water tenure, taboos, ritual prohibitions, magic, closed seasons, gear restrictions and flood plain intensification are employed.

According to Scudder and Connelly (1985), some of these traditional strategies (water tenure, taboos, ritual prohibitions, magic etc.) are inadvertent or unintentional in that they were initially put in place for reasons other than the management and conservation of the local fisheries, while others (gear restrictions, closed reasons, flood plain intensification) were termed intentional because they were designed to protect, conserve and increase some specific fisheries for particular events or reasons.

Ita (1993) reported some unintentional traditional strategies in some northern states of Nigeria, for example in Sokoto and Kano, where seasonal rivers and flood ponds are closed for fishing in the rainy season principally to protect the interest of full-time farmers, who return to part-time fishing in the dry season rather than the protection of the fisheries. Ita (1993) also identified intentional traditional strategies e.g. gear restrictions, closed seasons in the management of the Argungun fishing festival and flood plain intensification in Lake Ndakolowu and the flood plains of Anambra and Imo Rivers.

In Edo State, some communities have various forms of traditional beliefs (ritual prohibitions and taboos), restricting or preventing fishing activities and in some cases as in Ekpoma, even consumption of the fishes from a local water body.

A CPFM (community practise on fisheries management) would be a dynamic community **of people** involved in fisheries management and conservation, knowing each other and working in common ways,

learning jointly how to improve resources conservation and management in fisheries.

It would associate competencies from the necessary disciplines and stakeholder groups and recognize

the value of general concepts, the specificities of ecosystems, political and socio-economic conditions,

jurisdictions, etc. and the possibility to learn from their comparison

It would actively work towards developing a common information repository and memory (social

knowledge)

_ We need to learn our new job faster

_ We need to share more and faster

_ For that, we need:

_ To develop one or more Communities of Practice

_ To support them with a more organized web information network
_ Many elements exist on the web that need to be strengthened and interconnected.
_ If we stay fragmented, fisheries will lose the biodiversity challenge

Freshwater fisheries management

River fisheries management
• Focus on maintaining native fishes, game and non-game
• Shenandoah River: Habitat modeling to inform water use decisions in Shenandoah Basin
• New River: Marker-assisted restoration of the native walleye stock
• Smith River: New operating regimes for Philpott Dam recommended based on 5 years of population and habitat analyses

Reservoir fisheries management

• Focus on sport fisheries
• Reproductive failure of bass in Virginia's trophy lakes:
• Assessing and modeling individual growth and condition
• Protected spawning areas
• Management of striped bass in Smith Mountain Lake

Marine fisheries management

• Population dynamics and stock assessment for fishery resources
• Fisheries management
– design of management programs
– Adaptive management
• Develop new models and new modeling approaches in fisheries
• Groupers, hammerhead sharks, horseshoe crabs
• Single-species management, move towards ecosystem management

Management of non-game species

• Landscape-scale models of fish distribution and abundance
• Habitat associations and causes of rarity in fishes
• Use of fish communities to assess water quality
• Development of risk-assessment tools for conservation planning
• ~300 freshwater mussel species in North America
• 35 sp. considered extinct
• ~70% listed as threatened or endangered
• Tennessee River system a biodiversity hotspot…
• What can we do to conserve freshwater mussels?
• Habitat protection, incl. host fishes, population transfer and augmentation

Human dimensions of fisheries management

• How best to involve the public in setting of management policy?
• Succession planning for the fisheries and wildlife profession
• Management effectiveness of state fish and wildlife agencies
• Evaluation of outreach efforts
• Continuing education—leadership development, public involvement

Lecture 2: Flora-algal Blooms and Eutrophication

Eutrophication is the process whereby water bodies become enriched by nutrients (Phosphorus and
Nitrogen) from both external and internal sources. It is considered as one of the most pressing

environmental problems in both the developed and the developing countries. Eutrophication and excess blue-green algal (cyanobacteria) growth are one of the major water-quality problems. Elevated nutrient levels in aquatic ecosystems are normally derived from point sources (e.g. municipal and industrial effluent) and non-point (diffuse) source (e.g. agricultural runoff from fertilised top soils and livestock operation).

Effects of eutrophication on food web structure—Nutrient enrichment causes an intensification of all biological activity and typically leads to dramatic changes in the composition and structure of aquatic food webs. Two of the most consistent eutrophication effects are a shift in algal species composition and an increase in the frequency and intensity of nuisance algal blooms, which in eutrophic freshwater lakes are typically dominated by harmful cyanobacteria. One of the most important recent advances in our understanding of freshwater eutrophication is the discovery that the biological responses of producer organisms to nutrient availability can be strongly modified by consumer communities. Eutrophication and grazing can also profoundly alter the biotic community structure of marine ecosystems. Olsen et al. (2006) found that mesozooplankton dominated by doliolids (Tunicata), but not by copepods, appeared to buffer the responses of autotrophs to high rates of nutrient loading. Among the many factors that potentially modify the responses of marine primary producers to nutrients, they suggested that the timescale over which the enrichment is made and the precise mode of nutrient enrichment could be very important.

Effects of eutrophication on aquatic biogeochemistry— Nutrient enrichment of aquatic ecosystems typically results in significant alterations in biogeochemical cycling over both space and time. Elemental fluxes can be followed with a variety of tools, including mass balance methods. Mass balance models is an integral part of the eutrophication modeling process.