1. Impact of nutrient load reduction on coastal marine ecosystem: data analysis and field experiments in the eastern Seto Sea

Tateki Fujiwara
Professor Emeritus, Kyoto University

The impact of reducing the nutrient salt load on marine ecosystems and bioproductivity was investigated by means of data analysis and site cultivation experiments. In all of the compartments of the marine ecosystem that were surveyed, bioproductivity was strongly governed by the quantity of phytoplankton (chlorophyll concentration); bioproductivity was high in locations where the total nitrogen (TN) concentration was high, and low in locations where it was low. Primary production was proportional to (TN - 0.2 mg/L).

There was found to be a high correlation between input and output in each of the production processes in the lower trophic levels of the ocean, and the ecosystem in this ocean region is a generally linear system. In other words, this is a bottom-up food web, in which an increase in primary production results in a proportional increase in production at the trophic levels above that level as well.

This study confirmed for the first time that oligotrophication causes organic matter to become persistent and thereby reduces the transfer of nutrients by the detritus food web and diminishes regenerated production.

Throughout the survey period, 5 - 8% of the input of nitrogen into the ocean region was taken out as output in the form of the fish catch, and the increase and decrease in input (nitrogen load) produced an increase and decrease, respectively, in the output (fish catch). This is known to be the quintessential response of a bottom-up system.

2. Evaluating progress toward sustainable marine and coastal ecosystems – including the challenges of climate change and marine debris

Dave Nemazie[1] and Robert M. Summers, Ph.D.[2]
[1]Chief of Staff and [2]Research Scientist, University of Maryland Center for Environmental Science

Marine and coastal ecosystems are under tremendous stress largely due to human activities and resource demands. Many governments, agencies and nongovernmental organizations all over the world have been working for decades using integrated coastal zone management techniques to address multiple marine and coastal ecosystem stressors with varying degrees of success. The overwhelming human population growth and associated resource and energy demands, land development and pollution are continuing to increase even as we have made great strides in reducing the per capita impacts. Two areas of impact are particularly challenging: 1) climate change driven by more people releasing more greenhouse gases, particularly from the use of fossil fuels; and 2) the exponential increase in the use of plastics in all areas of the economy and the irresponsible handling of plastic waste, which is causing significant damage to aquatic ecosystems.

The United States is one of the highest energy consuming and polluting nations in the world. At the same time, the U.S. federal government is questioning the scientific consensus and is pulling back from previous commitments to reduce the emissions leading to climate change. Despite the U.S. federal government backsliding, many states and cities in the U.S. are leaders in the world-wide fight to reduce the emissions causing climate change and adapt to the changes that are already occurring. In this presentation we will discuss these efforts with emphasis on the evaluation of progress in the Chesapeake Bay region, which has one of the longest running coastal restoration efforts in the world.

The second major challenge we will discuss in this presentation is the increasing production of plastic and resulting plastic marine debris. While plastic waste is discharged by fishing operations and ships at sea, it is estimated that 80% of marine debris originates from land. The U.S. is one of the biggest generators and consumers of plastic in the world. The plastic that winds up being discarded in coastal and marine ecosystems comes from: products produced and used in the U.S. and other major economies; products that are sold to developing nations; and waste materials that have been shipped overseas (often to developing countries) for "recycling". The highest direct contributors are more densely populated developing countries that lack waste management funding and infrastructure, but major producers are responsible for seeking ways to reduce the impacts of the products they are profiting from. In this presentation we will discuss efforts in the U.S. to reduce plastic generation and waste using the Federal Clean Water Act to require improvements in debris management and other laws to restrict the single use plastic products in the U.S. The Clean Water Act "trash TMDL" (Total Maximum Daily Load) in the Washington D.C. and Baltimore metropolitan area is driving increased efforts by the City of Baltimore, Maryland and other local governments to measure, control and reduce their contribution to this world-wide problem.

3. A systems analysis approach for the sustainable integrated management of marine areas

Michael Elliott

Professor, University of Hull, UK / Co-Editor in Chief, ECSS

There is only one big idea in marine and estuarine management – *how to protect and maintain the ecological structure and functioning while at the same time protecting ecosystem services from which society gains goods and benefits*. Coasts, estuaries and marine areas currently have many historical challenges: recovery from historical pollution by domestic, industrial and agricultural pollution; adaptation to historical loss of area by land claim and changed/changing shape; accommodating continuing endogenic managed pressures from new industries and ports, and accommodating exogenic unmanaged pressures such as climate change impacts and isostatic rebound. The future threats for estuaries and coasts worldwide may be regarded as a 'triple whammy': (1) increased industrialisation and urbanisation; (2) increased use of physical (space, energy, water, etc) and biological (fish, shellfish) resources, and (3) decreased resistance and resilience to climate change (temperature, acidification, storminess, species distribution changes, alien species, etc). The successful and sustainable management of marine areas requires that many elements should be combined. This has been described as the so-called 10-tenets of sustainable management which require that our actions should be: *Ecologically sustainable, Technologically feasible, Economically viable, Socially desirable/tolerable, Legally permissible, Administratively achievable, Politically expedient, Ethically defensible (morally correct), Culturally inclusive* and *Effectively communicable*. Although all of these aspects will be illustrated using management examples from Europe and North America, the lessons learned and main messages are applicable to coastal seas worldwide.

4. China's estuaries: concerns towards more resilient and sustainable?

Zhongyuan Chen
East China Normal University, Shanghai, China

China geography is featured by the extensive estuarine-coast (>32000 km long), where there are numerous rivers discharging sediment and nutrients into the seas to have built up rich natural environment. This is also the zone being interacted between the land and ocean where there have been >700 million people living on engaging in farming, fishery, industry and tertiary services. The estuarine-coast environment has been largely degraded under the high pressure of our human development, since the rapid economic growth in the past 40 years, together with poor management sabotages the nature of coastal setting. Ecological health of estuarine-coast suffers greatly from human activities in the basin, including dam construction, overuse of fertilizers, and industrialization and urbanization. Largely reduced sediment fluxes (>50-70%) from terrestrial sources into the seas due to damming has significantly damaged the beauty of eco-setting of estuaries, such as the Yangtze and Yellow and Pearl rivers, which is eventually to be paid back by our human society. It is just reversal case that nutrient (Nitrogen and Phosphate) fluxes have little to do with dam construction in the river basin, rather increasing in their fluxes into the seas due to industrial and domestic sewage discharges, and fertilizers application as well. Apparently, additional nutrient sources come from the coastal aquacultural activities, such as intensifying unregulated cultivating fishes, shell fishes, crabs, via webs of box-chains in the estuarine waters. These have made our estuarine water to be acidifying. The consequences of overburden estuarine-coastal stresses will have transferred to negate our societal development. The recent initials of the Law of the Yangtze River (Changjiang) is being in the mid-debating through hearings of various administrative level via bottom-up/top-down approaches. This is the case of mechanism in China in present time, which tends to harmonize between economy and sustainable human society.

5．How should sustainable marine ecosystem management be evaluated?

Professor Eric Wolanski, FTSE, DSc *Honoris Causa* (Louvain & Hull)
James Cook University, Townsville, Australia

There is only one big idea in estuarine and coastal management: *how to maintain and protect the ecological structure and functioning while at the same time allowing the system to sustainably produce ecosystem services from which we derive societal benefits*.

To show how that can be done, I will first discuss what is ecohydrology, i.e. how to live with nature.

Then I will show several case studies dealing with management:

- Coral reefs
- A success story: megafauna in Moreton Bay, Australia
- Assessing estuarine recovery in (a) Chesapeake Bay, USA, and (b) Satoumi, Japan
- Measuring the sustainability or failure of river deltas, with a focus on the Mekong
- How to evaluate the effectiveness of the management of intertidal mud flats?
- Using the DAPSI(W)R(M) framework to evaluate management in the Arctic and Australian tropics.

6. EMECS13-ECSA58 Joint Conference

Michael Elliott
Professor, University of Hull (UK)
Tim Jennerjahn
Head, Working Group Ecological Biogeochemistry
Leibniz Centre for Tropical Marine Research (Germany)

ECSA (Estuarine & Coastal Sciences Association) is an international research organization dedicated to the promotion and advancement of multidisciplinary research into all aspects of estuaries and coasts, and the application of science and technology for their sustainable environmental management.
The EMECS13 Conference will be held at the University of Hull in Kingston upon Hull, a major port city in U.K., where ECSA has their secretariat office.

Date: 7-11 September, 2020
Venue: University of Hull, Kingston upon Hull, UK
Reference: https://www.emecs.or.jp/en/topics/item385