

**PILOT PROJECT: THE DEVELOPMENT OF MONITORING AND MANAGEMENT SYSTEMS FOR THE SHALLOW WATER PENAEID PRAWN / SHRIMP RESOURCE IN THE INDIAN OCEAN**

Rationale and Background

The background to this proposal will be familiar to readers who were present at the First Conference of the Indian Ocean Global Ocean Observing System (IOGOOS) held in Grand Baie Mauritius in November 2002. It should also be seen in the context of the "Integrated Design Plan for the Coastal Module of GOOS" presented at the Conference by Thomas C. Malone of the University of Maryland Center for Environmental Science which is available on the web. (<http://ioc.unesco.org/goos/COOP-4/coop4.htm>). The Coastal Session Report submitted at the Conference by T.C. Malone and J. Hall outlines the events at the conference which preceded the identification of this particular project and provides more specific background to the development of this proposal, which was one of three based on perceived major coastal issues amongst Indian Ocean rim countries.

Historically the GOOS programme has been oriented towards oceanic processes. The aim of the coastal module of GOOS is to focus more closely on the interface between oceanic and terrestrial environments and to incorporate human involvement and interactions whether as driving forces or as victims of environmental change.

The choice of the penaeid prawns, the term which is more commonly used in the Indian Ocean region, as a focal point of the proposal is based on several factors including the economic value of this resource, which is enhanced by the association of these animals with shallow inshore waters and estuaries during part of their life cycle. This renders the juvenile stages accessible to artisanal fisheries and also provides a source of seed stock for aquaculture operations in some countries. The adults migrate to offshore, but typically shallow water breeding grounds, where they are harvested by commercial trawlers. It is an extremely valuable resource and stocks are invariably heavily exploited. Fluctuations in stock size from year to year are, however, characteristic of these species and the forces driving these fluctuations have long been the subject of research wherever these animals occur. Influences appear to be both oceanic and terrestrial in origin and there is a strong case for the over-riding significance of physico-chemical rather than biotic determinants, although the nature of the cause and effect processes remains to be clarified. The shallow water penaeids arguably represent an interesting integration of oceanic influences on the adults and larvae and catchment events impinging on both the juvenile, estuarine environment and quite possibly also on the inshore marine environment and therefore on the adults and larvae. Anthropogenic impacts on the environment in combination with climatic change and sea level rise are confounding factors which add to the challenge. From a scientific point of view, the possibility of quantifying a biological response to environmental changes and challenges in the broad

sense provides an opportunity for assessing the resilience of a group of species of particular interest and significance to many coastal, tropical human populations. It should be emphasised that this is not simply a proposal for a fisheries research programme – the above details should bring out the human and the broader environmental components of the proposal.

Contributing countries: Representatives of the following countries, viz. Bangladesh, India, Madagascar, Reunion, South Africa, Kenya, Comores, Seychelles and Australia contributed to the initial discussions. Other countries were identified as possible participants. The latter group included Mozambique, Tanzania, Oman, Sri Lanka, Malaysia, Thailand, Indonesia and Australia.

1. Phenomena of interest: The particular issues identified included sustainable utilisation, anthropogenic effects on biodiversity and ecosystem function, impacts of trawling, factors affecting recruitment to the fisheries, effects of oceanic and catchment events and climate change

- 1.1 Specific Goals of project: An integral part of the proposed programme is the development of systems for collection, validation and exchange of information. This will require:
    - networking of coastal laboratories (fisheries biologists, oceanographers, climatologists), fishery operators and managers around the Indian Ocean;
    - development of a central data service / product hub which would be available to all, e.g. the India based INCOIS system;
    - building of sustainable capacity and infrastructure;
    - a commitment to the sharing of prawn fishery management techniques throughout the region;
    - agreement on methods and criteria for the monitoring of prawn recruitment and abundance using existing artisanal and commercial fisheries;
    - development of techniques for monitoring of significant catchment events, particularly in relation to freshwater run-off and associated water quality;
    - investigation of relevant remote sensing oceanic technology and methods for accessing and handling such data bases
    - development of methods to facilitate access by user groups to relevant information

- 1.2 User groups: The following user groups are anticipated:
    - subsistence & artisanal fisher communities
    - the commercial fishing industry
    - the aquaculture industry
    - coastal / fisheries managers

- coastal scientists
- conservation agencies
- integrated coastal community

1.3 Data products: The following products are envisaged:

- a centralised, user- friendly data base relevant to prawn fishery operators and interested coastal scientists;
- an agreed upon level of data and information synthesis to facilitate provision of ecological and management advice, e.g. quotas, changes in stock, extent of fishing grounds, closed areas/seasons;
- guidelines / education for sustainable utilisation and monitoring; short term forecasts of stock spatially and temporally; economic benefits of harvesting in different ways and at different times, information to allow community based fisheries management;
- assessment of condition and reproductive states of potential broodstock for the aquaculture industry;
- real time information on fisheries – interpretation of trends by analysis of catch/effort data.

2. Major anthropogenic and natural drivers of change: A characterisation and assessment of the relative significance of different drivers of changes would be important in determining future lines of research. The following are presently thought to be significant.

- direct impacts - fishing pressure on offshore adult populations, juvenile exploitation in estuarine nursery grounds both for direct human consumption and also for seed stock for aquaculture
- indirect impacts – effects of trawling on target species habitat;
- estuarine / shallow water coastal habitat degradation;
- monsoons / rainfall regime fluctuations in relation to climate change;
- ocean current effects on larval dispersal;
- upwelling/downwelling variations in relation to climate change.

3. Measurements / Data required: The following parameters are considered basic but would have to be standardised where necessary to allow international comparisons.

- o Fisheries data including
  - catch – mass, species composition,
  - effort – trawling hours standardised to allow for variation in boat size, engine power and type of net.
- o Chlorophyll-a (remote sensing)
- o Physical oceanographic parameters (large scale)

- salinity
  - dissolved oxygen
  - temperature
  - currents
- o Local physical parameters (small scale)
    - salinity
    - dissolved oxygen
    - temperature
4. International collaboration This would be required and would involve regional or national Fisheries Institutes, Research Institutions and potentially FAO, Ocean Observing Panel for Climate, as well as programmes such as LOICZ, IGBP, LME, GTOS, GLOBEC.
  5. Priorities for capacity building This would involve agreement on participating institutions and, where necessary, upgrading of facilities, infrastructure development and appropriate training to allow uniform access to the internet.
  6. Community based monitoring Community liaison systems would be required to involve local people in small scale time series measurements. Potential organisations to be involved could include local conservation agencies, NGO's and international donor organisations.
  7. Development of a network of coastal laboratories, universities and other organisations This is an essential component of the proposal as part of the programme would involve the collaboration of laboratories and research institutions already involved in relevant research and prepared to share experiences. This might require prioritisation of institutes to be supported in order to allow for regional synchronisation.
  8. Establishment of Marine Protected Areas If present these might provide important information sources and reference points allowing the separation of "natural" environmental influences from anthropogenic impacts but these are not considered essential to the successful achievement of the project.
  9. Funding sources and Requirements:  
Seed funding would be required for a workshop to plan details of the project and the potential contributions and requirements of the participating countries in the region. Potential sponsors include the IOC, ONR and UNEP. Other sources include GEF, FAO, EU and FAD. A suitable venue for the workshop would also have to be chosen.

Matrix showing GOOS goals and pilot project criteria addressed by project

	<b>INTERNATIONAL COLLABORATION</b>	<b>CAPACITY BUILDING</b>	<b>USERS</b>
(1) improve the safety and efficiency of marine operations			
(2) more effectively mitigate the effects of natural hazards			
(3) improve predictions of climate changes and their effects on coastal populations	✓	✓	✓
(4) reduce public health risk			✓
(5) more effectively protect and restore healthy coastal marine ecosystems	✓	✓	✓
(6) promote the sustainable use of marine resources	✓	✓	✓