



WIOMSA *Newsbrief*

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Sharing experiences on mariculture development with stakeholders

Three types of finfish and shellfish are now growing in ponds in Zanzibar together with some species of seaweed - a success story in mariculture is unfolding in Tanzania.



Women tend a fenced shellfish farm in a muddy intertidal zone on the west coast of Zanzibar.

A three-day workshop was conducted in Mazsons Hotel, Zanzibar, Tanzania, from 25th August to 27th August 2004. 90 participants representing representatives of academic and research institutions, relevant government departments, businessmen as well as fisherfolk attended the workshop. The aim of the workshop was to share the knowledge and experiences obtained by the Institute of Marine Science (IMS), Zanzibar, after 3 years of research through a MASMA grant, with stake holders from different parts of Tanzania, evaluate the available knowledge and decide on the way forward.

The first day of the workshop was devoted to the presentations of the research results on various aspects of the project including pond construction, water flow dynamics, water quality, finfish, shellfish and seaweed farming (survival and growth rates). Other aspects included artificial feed formulations and feed efficiency, natural fry feed growth by mesocosm, the ability of seaweed to filter nutrients and repl-

nish oxygen to fishpond waters and the sediment oxygen demands. The presentations also discussed studies on the availability of fry, fingerlings and mature stages of the different species of the farmed finfish including the possibilities for hatcheries. On the second day, the participants visited the Makoba Bay, the main study site of the project.

On the third day, fourteen participants who were already engaged in some form or the other of fish farming, were given opportunity to present their activities. These presentations were followed by discussion, and as appropriate, general and specific advice were offered to them on how to improve their projects. Also the workshop had general discussion on the state of knowledge, the gaps and recommendations for future developments.

Fish, shellfish and seaweed in ponds - a success story

During the last three years, the finfish culture in the project has expanded from one to three species. More than three shellfish species have also been cultured. For the first time some species of seaweed are now growing both in the experimental ponds and the channels. The research team has also been involved in assessing the water quality and they recently included a research component to study pesticides in the water, sediment and fish.

Some of the tangible achievements that this project has realised include the following:

- It is now possible to routinely identify where and when to obtain fry and fingerlings for milkfish, rabbit fish and mullet;
- The number of earthen experimental ponds at the Makoba study site has now increased to 10, and there are also 2 extra concrete ponds constructed for stocking fry;
- Awareness and publicity regarding the success of this mariculture project has spread widely both in public and aca-

demical spheres. Many scientific publications based on the results from the project have been produced in the last couple of years, and there has also been coverage through the local mass media;

- Attempts on mariculture have increased from two before 1996; Mlalangaoni in Chwaka, Zanzibar from 1989 and Kiuyu Minungwini, in Pemba from 1994, to 12 new attempts at present. Various interested groups are now attempting mariculture in Tanzania especially on the west coast of Zanzibar (oyster farming), Mafia Island (pearl farming), Pemba Island (lobster farming), Tanga (oyster farming) and Bagamoyo (cage culture).

Team that made it possible

Attempts to culture shellfish and seaweed were initially not as successful. In 2001 five marine scientists from IMS, namely Dr. Alfonse Dubi, Mr. Aviti Mmochi, Dr. Margareth Kyewalyanga, Dr. Narriman Jiddawi and Dr. Flower Msuya in collaboration with a social scientist from the State University of Zanzibar (SUZA), Ms Zainab Ngazy applied for the MASMA research grant from WIOMSA. Using the grant, the-

se scientists have over the past 3 years been researching on various components under their Mariculture Project entitled "*Development of Integrated Mariculture Pond System (IMPS)*", to culture finfish, shellfish and seaweed.

Way forward

The workshop made several key recommendations including the formation of the National Mariculture Task Force to address the following key issues:

- Finding markets for the products;
- Fund raising and conducting further research;
- Experimenting with culturing other types of seafood such as crabs;
- Visiting other regions renowned worldwide for mariculture such as South East Asia in order to gain experience.

As it is coming to end, indications are that the project has succeeded to lay a foundation for establishment of integrated mariculture of finfish, shellfish and seaweed, an important step in providing sustainable livelihood for the coastal communities in Tanzania and the region at large.



Makoba Integrated Mariculture Pond System.

Conservation of sea turtle, for whose benefits?

Kenya Wildlife Services (KWS) and Kenya Sea Turtles Conservation Committee (KESCOM) hosted the first regional marine turtle workshop in Mombasa, Kenya on 16th and 17th September 2004.

The workshop was attended by 57 participants from Kenya, Madagascar, Mauritius, Reunion, Seychelles, South Africa, Tanzania and U.S.A. Representatives of the seven WIO regional states presented national status reports highlighting the background information on the status of marine turtles in their countries, turtle research and monitoring activities and their conservation and management. Distinguished marine and coastal conservationists in attendance included Dr Richard Bagine of KWS, Dr Nyawira Muthiga and Dr Simon Harding of WCS, Dr Hykle Douglas of CMS and Dr Jack Frazier of the Conservation Research Centre based at Smithsonian Institution, USA. In his keynote presentation, Dr Frazier discussed the historical perspectives of turtle research in the WIO region. Furthermore, Dr Frazier emphasized that conservation efforts should focus on how to motivate communities to respect and conserve marine turtles. In conclusion, the key questions put forth were: Whose property are sea turtles? Who has the rights to utilize them? Who owns the seas? Promotion of community participation, development of private enterprise to empower communities that utilize sea turtles and strengthening of regional cooperation should be prioritised for successful conservation and management of sea turtle populations in the WIO region.

During the workshop some key questions were raised and discussed. Some of them were:

- In Mnazi Bay Tanzania, there are several turtle nesting beaches. How can one convince the decision-maker to choose between establishing a resort on these beaches and conserving the turtle? Research should be able to elucidate the values of the two activities and give value to the conservation of the turtle. There should be a value



Fishermen onboard a vessel retrieve a turtle caught in the fishing gear off the coast of Kenya.

attached to the turtle that would enhance its conservation.

- Why is it that communities are taught only about the protection of turtles and not the benefits of the turtle to them? It would be important to empower communities for conservation rather than using legislation.

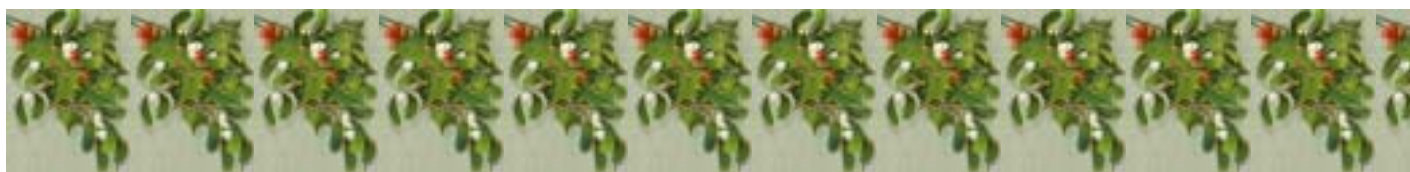
Development of proposal on sea turtle research and management

A regional concept proposal on WIO turtles was drafted and presented for review and discussion by participants during the workshop. The proposal, which was initiated by KESCOM, will be submitted to WIOMSA for application of the Marine Science for Management (MASMA) research grant. As the development of the proposal progressed, it was noted that issues concerning sea turtle research, conservation and management were more extensive than previously envisaged. The growing commitment at local, national and regional level for sea turtle conservation was recognized. This prompted the participants to observe that in or-

der to achieve regional collaboration, there is need to explore ways of strengthening existing national and regional frameworks.

Some of the key objectives of the proposal include:

- Address research and monitoring needs for sea turtle conservation and management. A number of research topics were proposed including: comprehensive mapping of sea turtle habitat in region, identification of management units through genetics studies, description of turtle migration using flipper-tags and satellite tracking; and Description of environmental parameters in turtle habitats (nesting, foraging, migratory corridors, etc.)
- Integration of sea turtle research and management with sustainable fisheries management. In this



objective, proposed activities include:

- i) Assess and evaluate the direct effects of fishing gear on turtle mortality in at least 3 countries in the WIO
- ii) Build on existing Turtle Exclusion Device (TED) and By-catch Reduction Device (BRD) initiatives in the WIO
- iii) Conduct research into the effects of coastal development and tourism on the breeding and feeding populations of sea turtles (Mauritius, Kenya) with linkages with national/regional initiatives (IOC, ICAM work, KESCOM)
- iv) Assessment of the impact of coastal mineral extraction and/or sand mining on the nesting and feeding grounds of Sea Turtle (Madagascar, Tanzania) with linkages with national/regional initiatives (e.g ICAM)
- v) An assessment of the status of traditional harvesting of Sea Turtles to determine whether this can be a sustainable activity in the region for specific communities (Madagascar, South Africa)

Other objectives are aiming at building capacity for sea turtle conservation, research and management; strengthening of community participation in sea turtle research, management and conserva-

tion and Reinforcing networking and collaboration amongst regional sea turtle practitioners and decision-makers

Key recommendations

The workshop made several key recommendations such as

- The Indian Ocean and South-East Asia (IOSEA) Marine Turtle Memorandum of Understanding provides a specific framework for marine turtle conservation, which is already operational and has been signed by most of the WIO States. The Nairobi Convention could provide additional political and potential financial support for implementation of the IOSEA MoU within the region. This could be achieved through the establishment of a WIO-IOSEA Marine Turtle MoU Task Force under the Nairobi Convention, with the explicit purpose of facilitating implementation of the IOSEA Marine Turtle MoU, as well as contributing to fulfilling the general programme of work of the Nairobi Convention.
- Participants recommended that the task force to be formed be comprised of IOSEA Focal Points (where they have already been appointed) or other officials in those countries that have yet to sign the IOSEA MoU; as well as ex-officio members from selected in-

ternational nongovernmental organisations (e.g. IUCN, WIOMSA, WCS, WWF), and observers from other relevant organisations contributing to or affecting marine turtle conservation (e.g. SWIOFC, IOTC). The Task Force will organise its own business and will elect its own Chair and Vice-Chair on a three-year rotational basis.

- The Task Force would have as its mandate to review implementation of specific activities of the IOSEA Conservation and Management Plan, to foster coordination of activities within the region, to prioritise future work, and to provide advice on other matters, as appropriate.
- The Task Force will maintain regular contact by email and will meet at least once a year in conjunction with the Meeting of IOSEA signatory States to review progress, confirm funding and decide on a regional workplan. Meetings will be held in different venues and will communicate, as appropriate, with the IOSEA Marine Turtle MoU, the Nairobi Convention, and other related instruments, such as CITES, EAME, NEPAD, SWIOFC and other regional and international fora.

The workshop was jointly organized by the Western Indian Ocean Marine Science Association (WIOMSA), the World Conservation Union (IUCN), the World Wide Fund for Nature (WWF), the Convention on Migratory Species (CMS) and the World Conservation Society (WCS). The theme of the workshop was to "Strengthen regional collaboration in research, conservation and management of sea turtles" in the Western Indian Ocean (WIO). The main objectives of the workshop were to:

- Discuss and adopt a coordination/networking strategy for marine turtle stakeholders in the WIO region;
- Review national status reports and adopt modalities for the production of a regional marine turtle status report;
- Discuss and adopt a draft proposal focusing on marine turtle research, conservation and management needs for the WIO region;
- Discuss components of the draft proposal for submission to WIOMSA for consideration for a Marine Science for Management (MASMA) grant

Training course in use of satellite data in oceanography

Through using altimetry (satellite data), paths of hurricanes can be predicted, rainfall can be calculated, ocean wave heights forecasted and fisheries managed sustainably. In September this year, the first regional training course on application of satellite altimetry was organised in Malindi in Kenya.

This Course focused on the use of satellite altimetry data to study changes in sea level, forecast ocean wave height, find fish-feeding ocean eddies, and look at large scale climate patterns. The course comprised of lectures, practical exercises, demonstrations and discussion sessions. The following topics were covered:

- Principles of satellite altimetry and applications to sea level studies;
- Ocean circulations/currents and eddies from altimetry;
- Marine gravity and geoid from multi-satellite altimetry and applications;
- Altimeter waveform tracking for land/ocean use;
- Bathymetric estimation from altimetry;
- Improved methods/theories of altimeter data processing;
- Inland sea/lake monitoring using altimetry;
- Operational oceanography using altimetry.

Training of trainers

Mr. David Kirugara of KMFRI spent two months at the Southampton Oceanographic Centre (SOC) in UK working with the satellite team there to prepare lessons for the training programme for countries of the Western Indian Ocean and the pioneering Bilko project. Bilko is an international project aimed at developing specialist software and training material in coastal and marine satellite remote sensing without charge to forecasters and coastal managers worldwide. Bilko is a complete system for learning and teaching remote sensing image analysis skills. The software, specially written for educational use, is supported by lessons that exemplify its power and come with inbuilt images and other files needed to complete the work.

Access to near-real time satellite data

Following the successful completion of the training course at San Marco, and in anticipation of similar courses planned for the near future, the marine and coastal managers and practitioners in the WIO region will soon have access to up-to-the-minute satellite data and information. These will be useful in various ways including: (i) predicting the path of hurricanes and storms, (ii) calculating and mapping out rainfall patterns, (iii) forecasting ocean wave heights and (iv) the sustainable management of fisheries and other marine and coastal resources of the region.

Follow-up activities

The discussions on follow-up activities focused on identification of resources available (e.g. facilities and equipment, software, literature and other information sources, datasets etc); problems that can be addressed using the skills acquired in the training course and the products that are required to address these problems; and the potential users of these products. The participants resolved to:

- Establish a network for regular contact (email group), which will be moderated by Mr. David Kirugara of KMFRI and Mr. Rezah Badal of MOI;
- Develop and generate products as a team - the topics to work on will be selected based on the knowledge and skills acquired;
- Apply for a planning grant from WIOMSA's Marine Science for Management (MASMA) Programme to develop a project proposal to be implemented in each of the countries to address problems of national/regional importance. This will be developed on the basis of ideas discussed during the training course. The activities to be covered by the planning grant will include preparation of national reports outlining resources that can be availed by each

country, investigation of facilities available in the region that can be used for the project (e.g. San Marco Research Centre in Malindi, Regional Centre for Remote Sensing in Nairobi, Remote Sensing faculties in Reunion etc), and organization of a meeting of a small group to finalise the project proposal.

The San Marco Research Centre offered to collaborate with the team in the development of the proposal, and the use of their facilities by the team in implementation of their activities.

The training course was held from 6-17 September 2004 at the San Marco Research Centre, (also known as Luigi Broglio Space Centre - BSC), in Malindi, Kenya.

The course was attended by eight trainees from Kenya (2), Madagascar (1), Mauritius (1), Mozambique (2) and Tanzania (2). Resource persons were provided by Kenya Marine and Fisheries Research Institute (KMFRI), Mauritius Oceanography Institute (MOI) and Italy's University of Rome "La Sapienza" - Centro di Ricerca Progetto San Marco as well as the Italian Space Agency. This course is the first in a series of remote sensing training courses planned jointly by the Western Indian Ocean Marine Science Association (WIOMSA) and the Intergovernmental Oceanographic Commission of UNESCO (IOC-UNESCO), with support from the IOC regional programme for the Western Indian Ocean (IOWIO), the Western Indian Ocean Satellite Applications Projects (WIOSAP), the Ocean Data and Information Network for Africa (ODINAFRICA) Project and the Italian Space Agency.

Scientists awarded for excellence

Jacqueline Uku and Maricela de la Torre Castro, both financed by WIOMSA and PhD-students at Stockholm University, Sweden, received excellence awards during the 6th International Seagrass Conference in Australia.

From the 24th September to 1st October, 2004, scientists from different corners of the world gathered in Townsville, Australia to discuss what Prof. William Dennison termed "*the heart of the ocean*" at the International Seagrass Conference (Seagrass 2004) and the 6th International Seagrass Biology Workshop (ISBW6) convened by Dr. Michelle Waycott and a team from James Cook University, Townsville. Approximately 150 participants attended the conference and there were about 90 participants at the workshop.

Jacqueline and Maricela awarded

During the conference, student presentations were evaluated and two presenters, Jacqueline Uku and Maricela de la Torre Castro, whose work focuses on seagrass ecosystems in the WIO region

received excellence awards. Both are PhD students at the Stockholm University, Sweden.

Conference participants shared ideas on topics covering a diverse array of subjects. There were sessions on habitat connectivity, population ecology, remote sensing, temporal change, reproductive ecology, physiology, herbivory, nutrient interactions, monitoring approaches, macrofaunal and invertebrate interactions, algal and epiphytic interactions, transplantation, biology, evolution, socio-economic values and hydrology. Several keynote speeches during the conference challenged seagrass scientists to focus on solving the problems facing these ecosystems. The need for partnerships with communities and political leaders was emphasised. It was also stressed that

CONGRATULATIONS!

To our knowledge this could be the first time scientists working in the region to win such an international-recognized award. WIOMSA wish to congratulate Jacqueline and Maricela for this outstanding achievement, which will no doubt encourage other scientists in the region to aim for even higher accomplishment in their scientific endeavors.

data collected should be translated into information that can be shared and applied in environmental problem solving.

Productivity patterns of seagrasses

Jacqueline Uku, also a researcher from Kenya Marine and Fisheries Research Institute and currently undertaking PhD studies at the Botany Department Stockholm University, gave a presentation on the evaluation of productivity patterns of seagrass species exposed to groundwater nutrient inputs along the Kenyan coast. Most seagrass studies along the Kenyan coast focus on *Thalassodendron ciliatum* due to its dominance in coastal lagoons. Her studies focused on evaluating productivity patterns of *Thalassodendron ciliatum* as well as two other intertidal seagrass species, *Thalassia hemprichii* and *Cymodocea rotundata*, in a nutrient impacted and a low nutrient site. The findings of the study indicate that of these three seagrass species studied, the most obvious difference in leaf productivity was for the seagrass *Thalassia hemprichii*, which was higher at the nutrient impacted site. Additionally, a preliminary study of associations of epiphytic macroalgae has revealed that there are more blue-green algae on the seagrasses of the low nutrient site, which



The African team after working hard on their conceptual diagram at the seagrass workshop (ISBW6) in Magnetic Island, Australia (from left: Martin Gullström, Maricela de la Torre Castro, Kathryn McMahon, Elaine Christy and Jacqueline Uku).

le epiphytic macroalgae were more abundant at the high nutrient site. These findings emphasise the importance of studying several species in multi-specific seagrass environments as well as the importance of epiphytic indicators in East African seagrass ecosystems.

Social-ecological importance of seagrasses

Maricela de la Torre Castro, based at the Department of Systems Ecology, Stockholm University, gave a presentation on the social-ecological importance of sea-grasses for the coastal communities. Using the example of Chwaka Bay, Maricela showed that seagrasses are deeply linked with human well being. Seagrass ecosystems are valued and used by the people in the community. They are used as fishing grounds for finfish and invertebrates, substrate for seaweed farming, medicines and fertilizers and moreover; a range of social, cultural, information and religious values

and services were associated with sea-grasses. For example, fishers can make small packages of sea-grasses and put them in the boats "*to have always the wind with you...*". However, maybe the most important issue related to seagrasses is the contribution to food security and in turn the provision of resilience in the combined system. The results presented showed that seagrass associated fishery is economically important (e.g. Siganidae, Scaridae, Lethrinidae, Labridae, Mullidae, Lutjanidae). These seagrass associated families constitute the most important source of daily animal protein for the population in Chwaka village. It was also pointed out, that no institutions seem to focus on seagrasses; this fact is an extremely important aspect to the management of the "*heart of the ocean*" and should be addressed further.

Next time in Zanzibar

The next time that seagrass scientists meet to discuss "*the heart of the ocean*"

will be in Zanzibar in 2006 (ISBW7). Hopefully, Africa will be the place where issues discussed in Australia can be developed into effective collaborative research and management programmes.

WIOMSA provided an air ticket grant to Jacqueline Uku to attend the meeting in Australia. Additional support to Ms. Uku came from a travel award by the organizing committee of Seagrass 2004 as well as Sida/SAREC. Maricela de la Torre Castro was financed by a travel award from the organizing committee of Seagrass 2004 and from Sida/SAREC. She is part of the MASMA grant project: "Sustainable Management and Valuation of Seagrass Ecosystems in the Western Indian Ocean Region".

Staff exchange for WIO

Positions for visiting wardens or rangers of up to 3 months on Cousin island Special Reserve, Seychelles.

Nature Seychelles can now offer positions for visiting wardens or rangers of up to 3 months on Cousin island Special Reserve. The employer will provide a living allowance, local transport, housing, work permits, on the job training (if necessary) and logistical back up. The partner organisation will have to provide

an international air ticket and insurance (if relevant). We assume the visiting warden will still be paid his/her salary by the employer whilst on this program.

Experience and skills are desirable in some of the following: conservation, boat handling, guiding, English and French,

mechanics, carpentry, report writing, first aid and monitoring/field studies.

For more information about the position and Cousin Island, go to the Bulletin Board on WIOMSA's website, www.wiomsa.org, or contact the Chief Executive of Nature Seychelles:

**Chief Executive, Nature Seychelles,
P.O.Box 1310, Mahe Seychelles.
Email: nature@seychelles.net.**

Indian Ocean Marine Environmental Conference in Australia

Linking science, Engineering and Management. 14 -18 February 2005 in Perth, Western Australia.

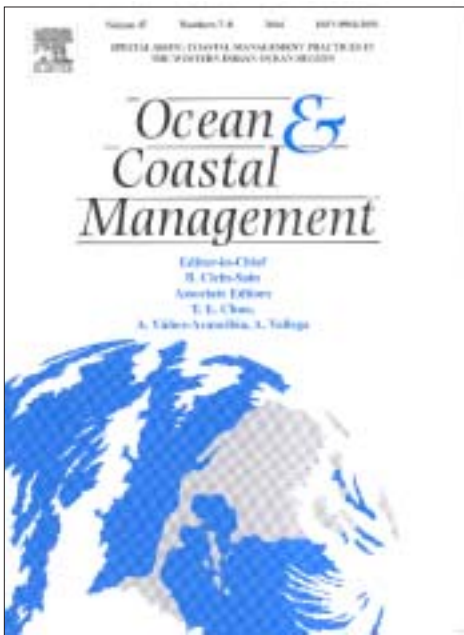
The Institute of Marine Engineering, Science and Technology (IMAREST), the University of Western Australia, Government of Western Australia and Intergovernmental Oceanographic Commission invite to a conference where "all aspects

of Indian Ocean marine science will be covered in the conference with aim the linking science, engineering and management." According to the organisers, this conference aims to bring together scientists working in the region to present re-

cent scientific endeavours in the marine environment of the Indian Ocean.

Read more about the conference on the Bulletin board on WIOMSA's website www.wiomsa.org, or under "events" on www.imarest.org.

Special Issue of Ocean and Coastal Management



A special Issue of Ocean and Coastal Management Journal (Volume 47, Number 7-8) is out now. This Issue, which is entitled "Coastal Management Practices

in the Western Indian Ocean Region" was sponsored and coordinated by WIOMSA and consists of seven papers which were among the papers presented in the Third WIOMSA Scientific Symposium held in Mozambique in October 2003. The papers in the Issue are:

- i) Francis, J. and Torell, E. Human dimensions of coastal management in the Western Indian Ocean region. 299-307
- ii) Verheij, E, Makoloweka, S. and Kalombo, H. Collaborative coastal management improves coral reefs and fisheries in Tanga, Tanzania. 309-320
- iii) Kamukuru, A.T., Mgaya, Y.D., Öhman, M.C. Evaluating a marine protected area in a developing country: Mafia Island Marine Park, Tanzania. 321-337
- iv) Torell, E.C., Amaral, M., Bayer, T.G., Daffa, J., Luhikula, G., and Hale, L.Z. Building Enabling Condi-

- v) de la Torre-Castro, M. and Rönnbäck, P. Links between humans and seagrasses — An example from tropical East Africa. 361-387
- vi) Ochiewo, J. Changing Fisheries Practices and their Socioeconomic Implications in South Coast Kenya. 389-408
- vii) Henri, K., Milne, G.R. and Shah, N.J. Costs of ecosystem restoration on islands in Seychelles. 409-428

Letters of Intent for MASMA Programme

WIOMSA promotes marine research through the awarding of research funds under the Marine Science for Management (MASMA). MASMA is a competitive grant scheme designed to support research projects for up to three years. MASMA funds, which range from US \$ 15,000 to 50,000 per annum, are available to multi-disciplinary teams of senior researchers from the region

In addition to providing research grants to support approved research proposals seeking to address priority themes,

MASMA programme provides grants to support organization of training courses/workshops and publication of books.

Letters of Intent for both the competitive research grant and the training course and book publications should be submitted to the WIOMSA Secretariat by fax, email or ordinary mail by **15 March 2005**. The Programme Committee will review the submitted Letters of Intent and select candidate proposals for full development at its Meeting in the fourth week of **April 2005**.



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