

Part of a brief report, written by Shigalla Mahongo at the Tanzania Fisheries Research Institute (TAFIRI), to the POGO-SCOR Fellowship Programme, which supported him with a POGO-SCOR Fellowship to visit Rutgers University, USA, for one month in July and August 2008. During the visit he received training on the Regional Ocean Modeling System (ROMS) from Dr. Javier Zavala-Garay.

Name of Trainee: Shigalla Mahongo

Supervisor (Parent Institution): Benjamin Ngatunga

Supervisor (Host Institution): Javier Zavala-Garay

Dates of Training: 16 July – 16 August, 2008

Subject of Training: Modelling the dynamics of the Zanzibar Channel, Tanzania

1) Please provide a brief description of activities during the training period:

First of all, I had to compile and install the Regional Ocean Modelling System (ROMS) in my laptop computer so that I could run it anytime after returning to Tanzania. Compiling and installing ROMS is a lengthy process which includes installation of various sub-programmes. There is an upwelling test case in the ROMS tutorial which when run successfully, is a confirmation that the model is properly installed. Since ROMS is Unix-based, I had to install an interface (Cygwin) for running the model in a windows platform. During the process of installation, I realized that the latest versions of the various sub-programs do not always work; hence returning to lower, stable sub-programmes in some instances.

After completing the process of ROMS installation, I had to learn and prepare the forcing files for ROMS with an aim of describing the annual cycle of the Zanzibar Channel. These included boundary, surface and initial forcing files. The boundary forcing file was obtained from the annual cycle of HYCOM with a resolution of 1/12, kindly provided by Dr Luis Zamudio (a friend of Dr Zavala-Garay). The surface forcing file consisted of 20 years (1985-2004) of monthly meteorological observations from Zanzibar (rainfall flux, air temperature, air pressure, relative humidity and winds), as well as net short-wave and long-wave radiation fluxes from the OPENDAP server of NCEP2. After running the model for one year it reaches a steady state describing the annual cycle.

The Zanzibar Channel model is actually not the final version, several improvements are needed. The model can however still be used as a basic tool to guide us about what is needed to better improve the model. There are remaining challenges to be able to get a realistic model for the Channel. First, the bathymetry of the Channel, especially the southern portion is incomplete (the grid was made available by Gabriela Mayorga-Adame). Secondly, the tidal forcing has not yet been included because of current lack of data at the boundaries. The only available software that could provide such data is the Oregon State Tidal Prediction Software (OTPS). However the resolution in Tanzania is actually too low to produce a nice forcing for ROMS.

The model was configured to include 10 sigma layers in the vertical. The time-step size to solve the 3D momentum equation was set to 10 min. The meteorological variables were assumed to be uniform over the entire domain, and the model was run for 365 days (1 year) to reach a stable state. In my laptop, it took about 23 hours to run the model for one year.

2) What applications of the training received do you envision at your parent institution?

All the practical training modules that I received in my training will be useful in a variety of applications at my parent institution. The Zanzibar Channel is an area of interest for research at my institute, but the dynamics are poorly known. Scientists working on different fields such as fisheries, coral reefs, physical-chemical characteristics etc. are often faced with challenges of explaining some of their findings when physical processes are involved as causal factors. The model results will therefore assist in understanding the driving forces of the oceanic waters both in space and time to be able to explain many of the unknowns. The model results will also provide an opportunity for scientists to develop a dataset that can be used for evaluating the responses of various organisms and habitats to annual variability. The dynamical model would as well provide the necessary information on determining and predicting the variability of physical variables.

The training has also opened up new opportunities in modelling. First of all I may participate in the Theiss Research NSF Funded Zanzibar Channel Project due to commence next summer. I have also submitted a pre-proposal to START (grants in support of one year research related to global environmental change in Africa) to carry out a study on "*Modelling the dynamics of the Tanzanian coastal waters*". Dr Zavala-Garay has agreed to provide technical advice if the proposal is eventually approved. I also intend to use the START funds to purchase a customized professional workstation because ROMS requires an exceptional computing power to perform advanced, CPU intensive calculations. Such a computer is currently unavailable at my institute (TAFIRI).

There are also plans for continued collaboration with Dr Zavala-Garay on modelling the dynamics of the Zanzibar Channel, and we also intend to submit one or two manuscripts for publication in the very near future (we shall acknowledge POGO-SCOR when we do that). We intend to submit the first manuscript in a reputable journal by December 2008. We also intend to submit another manuscript on tides using the outputs of the model sometimes in 2009. These publications, whose titles have not been firmly decided, will be very useful for marine scientists in East Africa as they will provide the basic references on the physical processes in the region.

3) Please provide your comments on the Fellowship Programme.

The fellowship programme provides an excellent opportunity for building capacity in ocean observations for scientists from developing countries, I would however, wish to say that the fellowship is probably not well known to many scientists in East Africa. One way of making the fellowship known (thereby making it much more competitive) is to circulate the announcement through such bodies as the regional IOC representatives and previous fellowship recipients, and ask them to circulate widely. Having benefitted from the fellowship, I will on the other hand, make sure that the next announcements are circulated widely in East Africa. As for the stipend, it looks adequate depending of course on the cost of accommodation.