

## Final Report

### Research:

So far, research was conducted on the flowering phenology and flower density of *Sonneratia caseolaris* during the course of the year. The attractiveness and the value of *Sonneratia caseolaris* flowers for flower visitors was identified and the effectiveness of different pollinators and the pollen travel and outcrossing distance promoted by them as investigated. This was done by setting up an experiment evaluating the fruit quality (percentage of fruit set, fruit size, seed number and seed size) resulting from different pollination schemes (including natural pollination and experimental cross-pollination). Furthermore, representative samples of seeds from these fruits were brought to germination and the germination capacity was monitored.

The data, while preliminary, suggests that the mangrove tree *Sonneratia caseolaris* is dependent on cross-pollination as the potential for auto-selfing is extremely low. Most of the pollen transfer is promoted by macroglossine nectar bats (mainly *Macroglossus minimus* and to a lesser extent *Eonycteris spelaea*) and to a much lesser extent also by Lepidopterans (mainly hawk moths) and bees. The other flower visitors do not contribute significantly to pollination; therefore they have to be considered as either “nectar thieves” or “pollen robbers”. Therefore nectar bats have to be considered as absolutely crucial for the stability and dynamics of this riverine mangrove ecosystem. The loss or significant reduction of the nectar bat population would lead to a decline of the reproductive potential of the *Sonneratia caseolaris* population with all the combined adverse effects for the whole habitat and ecosystem. Whilst the nectar bats also have other food sources and might be able to survive without the food supply from the mangrove forest (at least in theory), *Sonneratia caseolaris* cannot survive without the pollination promoted by bats. Therefore it is legitimate to refer to macroglossine bats in this area as “keystone species” for the mangrove community.

### Activities:

To implement the results of the research and bring it to practical use an education project was started in the Kuala Selangor Nature Park near the study site. This park is a very popular tourist destination and has an educational centre with an exhibition and lecturing hall. The park is managed by the Malaysian Nature Society, the oldest and largest conservational NGO in Malaysia. Aim of this project was to prepare guidelines for mangrove-related educational work. Therefore, a manual of mangrove education for the park staff was set up, information material for park visitors was prepared, guided tours were organized and various scientific talks and presentations about the 'Mangrove Connection' were given. Activities took place at the Nature Park itself and at the firefly zone in Kampong Kuantan, where information material was given to local and foreign visitors. A few of the more popular groups and organizations which took part in talks, guided tours and nature camps were Wetlands International, Raleigh International and the BP Conservation

Programme. Special emphasis was on nature education for children and youths, but also on other groups (e.g. university students and tourists). The project runs very successful and was also covered by "The Star", the largest English daily in Malaysia (see attached link to an online article from an issue of "The Star").

[http://www.ecologyasia.com/news-archives/2003/jan-03/thestar\\_20030204\\_1.htm](http://www.ecologyasia.com/news-archives/2003/jan-03/thestar_20030204_1.htm)