

## Research Notes...

# Mangrove Restoration: Determined young Seychellois offer vulnerable wetland ecosystems a second chance of survival

**Terence Vel**

The Seychelles archipelago, comprising 115 islands, has been endowed with a unique and fragile environment, largely untouched until the eighteenth century. It is a biodiversity hotspot and showcases the interesting effects of species evolution in a remote environment, exhibiting very high levels of endemism; of approximately 200 plants and animal species in Seychelles, around 80 of them are unique to these islands. Nonetheless, there are many challenges to this unique environment, including the many threats facing important wetlands, due to development and human impact. It is too often the case that the mangrove ecosystem is thought of as wasteland but that is not the case at all. In fact, mangroves are amongst the most productive marine ecosystems on planet earth, offering unique habitat opportunities for many species and key advantages for human beings.

The early colonizers who arrived in Seychelles encountered thick fringes of mangrove species that used to exist around much of the coastal zone of Mahé Island and around other islands too. At that time, one of the world's largest salt crocodiles (*Crocodylus porosus*, locally named the Kayman) lived in this habitat and was feared by settlers, who also thought that the mangrove habitat could be a potential danger as a source of disease (which was later shown to be unlikely). In response to these fears and the view that they were unproductive, mangrove trees were progressively removed, with the settlers not realizing they were destroying a very important ecosystem. Clearing, draining, reclamation for construction projects and farmland during development have drastically reduced and altered mangrove species distribution. As a result, mangrove species now exist in relatively small patches around the coastline of the granitic islands of Seychelles.

Overall, 90% of the original mangrove swamps around the country had been destroyed by the 1970s, making the protection and conservation of the remaining 10% all the more urgent. Eventually, mangroves started to be used locally for timber, poles and firewood, while the red mangrove species (*Rhizophora mucronata*) was used as a dye to polish floors; by the early 20th century, mangroves were also exploited for commercial gain on some islands.

As a species, mangroves take the form of dominant vegetation found in tropical and sub-

tropical regions, mostly along the coast, and are a salt-tolerant species. It is a unique ecosystem which provides a habitat for numerous creatures, ranging from shrimps, crabs, and fish to seabirds. In Seychelles, there are seven types of mangrove, although not all of the seven types are found growing in any one location. On Mahé Island, the seven species of mangrove, growing together, can only be found at the Port Glaud Ramsar sites; elsewhere, local conditions vary and some mangrove species favour one site rather than another. For example, *Rhizophora mucronata* and *Ceriops tagal* prefer muddy areas, whereas *Avicennia marina* is well adapted to sandy areas. The larger the area of mangrove coverage, with varying conditions, the more likely there will be a variety of mangrove species.

For a small island state like Seychelles, which derives most of its income from the ocean, a flourishing mangrove habitat is a valuable feature. Nonetheless, mangroves are degraded and threatened due to numerous human activities. The loss of mangroves leads to a number of threats to human safety and shoreline development, including: erosion, flooding, storm waves and surges; reduced water quality and biodiversity; destruction in fisheries habitats and reduced catches; destruction of coastal habitats; and reduction in revenue from tourism. For these reasons, mangrove rehabilitation initiatives are usually undertaken to reduce these threats and increase the resilience of mangrove habitats.

## Youth involvement and community participation

Rehabilitation projects are now high on the environmental agenda. In order to be successful, there are a number of steps that need to be taken into consideration, including understanding the ecology of each species being planted, as well as any modifications to the original mangrove habitat and restoration of appropriate hydrological conditions, plus the actual planting technique. During the past few decades, there has been a growing recognition of the importance of mangroves and the need for their rehabilitation. Mass production of mangrove seedlings and successful germination of propagules are essential as part of the process of restoring degraded mangrove forests. However, there also needs to be a greater understanding of the underlying factors leading to successful mangrove growth and propagation for rehabilitation programmes.

Youth involvement in planting and rehabilitation activities has emerged through the establishment of working groups, so that most Wildlife Club members, BSc Environmental Science students at Unisey, and the Seychelles National Youth Council have come together to form a group to participate in the various rehabilitation activities. At the same time, while young people invariably show an interest in environmental issues and are eager to be involved, there are generally more girls than boys who participate. With this particular rehabilitation project – drawn from the above organizations – there are constant cleanup activities, art works and educational exhibits,

presentations and community visits designed to improve education and awareness of mangroves.

The Project Leader, Terence Vel at the Unisey Centre for Environment and Education, also works closely with the Department of Community Development in order to get the local communities and other partners on board and to enable them to participate in mangrove rehabilitation activities. Social media and other media outlets are additional tools that are used, providing information about the activities that are being carried out, and the wider public is encouraged to participate. At the same time, young people have conducted community visits to encourage participation and to gather information about the public perception of these wetland habitats, their roles towards such habitats, and what they perceive as their responsibilities. This is a feature of ongoing mangrove rehabilitation activities with youth groups, the University of Seychelles and its local and international partners. However, measuring the impact on increasing awareness within local communities through participation in such activities is a challenge, though there is evidence that residents are now more eager and willing to engage in activities and projects that restore and conserve wetlands.

There are obvious advantages if such projects are successful: livelihoods can be improved, coastlines protected from storms, and a reduction of salt intrusion into agricultural production areas along the coastal fringe. However, there is a need for proper management of rehabilitated areas to prevent the mortality of such large numbers of mangrove seedlings (as described above). Ongoing conservation management is one of the main reasons why local communities should be part of the process, so that they can feel a sense of ownership of the rehabilitated areas, existing mangrove and wetland habitats, and in this way making it easier to engage them in its conservation and monitoring of progress.

At the University of Seychelles, students have the opportunity to take the lead in independent research; one student, Krystel D'offay, undertook her final-year project in BSc Environmental Science on 'A comparison of survivorship and growth rates of *Rhizophora mucronata*, *Avicennia marina* and *Ceriops tagal* seedlings when irrigated by freshwater and seawater for mangrove propagation in nurseries'. The overall aim of her research is to gain better knowledge on the propagation of mangrove seedlings and their adaptive traits to freshwater and seawater in a nursery-based environment for mangrove rehabilitation.

The amount of information that this student has collected and observed can be useful to other people who are interested in conducting studies on the ecology of mangrove species, and people who are enthusiastic about raising mangrove seedlings in nurseries for rehabilitation purposes. Furthermore, if someone wanted to repeat this experiment, Krystel has suggested that a long-term monitoring of the growth rate of species irrigated

by freshwater or seawater will offer a clearer visualization of growth patterns in species comparisons in relation to roots and leaf length. More species of mangrove could also be included to gain information on the different species, providing better knowledge of each of the seven species of mangrove which occur in Seychelles. The experiment proved that mangroves can be irrigated with freshwater and that some species like *Avicennia marina* are less constrained by freshwater and hence grow better.

Nonetheless, it is evident that more work needs to be done in order to increase the rehabilitation success of mangroves, while also encouraging participation by the local communities in rehabilitation of mangrove habitats in their districts, as well as monitoring changes around their place of residence. At the same time, more education and awareness raising needs to be carried out to ensure that there is a greater understanding of the importance of mangrove habitats and of their role in mangrove conservation. Building a conservation ethic in new generations will allow local communities and leaders to understand the future benefits of mangrove conservation. In order for this to happen, there is a need for research work to be carried out, using scientific methods of monitoring mangrove parameters, so that baseline information can be gathered on these variables, allowing a proper site selection process when it comes to rehabilitation. Therefore, it is of vital importance to provide training for young people, community members and local research staff in conducting monitoring and assessments of relevant mangrove parameters; and to facilitate adaptive management, but also increase regional capacity in restoration and enhancement of mangrove wetlands. Youth involvement is very important for passing on information, monitoring techniques and awareness to other young people, teachers and parents in their community. Additional work also needs to be done to ensure gender balance in conservation initiatives so that all members of youth groups and communities feel a sense of ownership of these ecosystems.

As one of the priorities in addressing mangrove responses, the degree of resistance and resilience to climate-change effects should be increased, through reduction and elimination of other stressors that degrade mangroves. This can be achieved through ongoing and proper education and awareness programmes aimed at the local communities. To this end, there are two ecosystem-based adaptation projects in Seychelles that can assist in the process.

One of the projects focuses on 'Ecosystem-Based Adaptation in the Seychelles' (EbA), funded by the Adaptation Fund and implemented by UNDP/GEF and the Government of Seychelles. This project seeks to reduce the vulnerability of Seychelles to climate change. Focusing on two key issues, water scarcity and flooding, it has implemented a series of pilot actions. These include working in four water catchments on Mahé and one on Praslin to implement integrated adaptation measures including wetland enhancement and the management of catchment forests. The project requires a holistic assessment of

the ecosystem services of water catchments in Seychelles and an evidence-based management approach for the rehabilitation of catchment forests.

The other ecosystem-based adaptation project focuses on ‘Enhancing Capacity, Knowledge and Technology Support to Build Climate Resilience of Vulnerable Developing Countries’. This is being financed by the GEF Special Climate Change Fund (SCCF) and China’s South-South Cooperation Programme on Climate Change (SSCP). It is a joint initiative co-managed by the China National Development and Reform Commission (NDRC) and United Nations Environment Programme (UNEP). The aim is to address the vulnerabilities of local communities to climate change by using ecosystem-based approaches to adapt to climate change through on-the-ground interventions, increasing institutional capacity, mobilizing knowledge and transferring appropriate best-practice adaptation technologies.

After a long period of decline in the mangrove habitat, there are now grounds for hope. A young and enthusiastic Seychellois generation has arrived in time to take over the leadership in conservation, thus to provide a second chance for the mangrove ecosystem to survive another era, a celebration of nature restored.

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*Terence Vel is currently the Manager of the Centre for Environment and Education at the University of Seychelles. He is also a founding member and coordinator of the Wildlife Clubs of Seychelles.*