MANGROVE BIODIVERSITY
Why not in the Southern Mekong Delta, Vietnam

Phan Van Hoang GIZ Vietnam

> "*Biodiversity, which is variation among species, can only occur by means of variation within species. It is the product of evolution*."
>
> *Stefaan Blancke*

The above message was from a report of an Electronic Conference, March 2010, on the Evolutionary Basis of Biodiversity and its potential for Adaptation to Global Change. In addition to this message, Stefaan Blancke (2010) assumes that adaptation to a changing or changed environment will lead to future variation by providing alternatives or new possibilities for populations. However, in the modern world, changes in environment caused by socio-economic development are far beyond the adaptabilities of wildlife itself. The author then argues that human being is the only species that can value biodiversity on Earth and "know perfectly well" how to accomplish the preservation of a minimum diversity. More remarkably, Stefaan Blancke (2010) reminds our generation of the moral instinct not to leave our offsprings with "a less interesting and less fascinating world."

In response to that thorny reminder, this paper briefly aims at some general concepts of biodiversity, the status of mangrove biodiversity in specific territories, and finally some challenges to the current management of Mangrove Biodiversity in the southern Mekong Delta, Vietnam.

Biodiversity – It depends on your thought

*"**Biological diversity**" [or Biodiversity] means the variability among living organisms from all sources including, inter alia, terrestrial, marine and other aquatic ecosystems and the ecological complexes of which they are part: this includes diversity within species, between species and of ecosystems."*

*"**Ecosystem**" means a dynamic complex of plant, animal and micro-organism communities and their non-living environment interacting as a functional unit."*

(Convention on biological diversity, concluded at Rio de Janeiro on 5 June 1992, Article 2)

These definitions imply that

- every species presents a complex of genetic biodiversity;
- every population contains a complex of species biodiversity;
- every community consists of variable populations; and
- so on for an ecosystem.

Thus, due to the fact that the diversity of life on Earth is both a result and a 'seed' for evolutionary processes driven by “mother nature”, a certain value of biodiversity can be assigned dependently on your thought to an individual species or population and surrounding ecosystems that it belongs to. Even a sole-species forest could be seen as a complex of variability in terms of heights, crown canopies, stem diameters, shapes, etc., and more importantly the endless interactions between individuals, which allow a typical ecosystem to develop. To that extent, a forest ecosystem naturally provides habitats for a range of animals and forms its own resilience to cope with negative changes in the surrounding environment.

Figure 1. Mono-*Rhizophora apiculata* forest, a habitat for monkeys at the Forestry Company of Ngoc Hien, Ca Mau Province, Vietnam.

On the other hand, in a broader perspective of resilience to climate change, biodiversity should be more comprehensively viewed at the socio-ecological system level (Brown, Benjamn, 2007). A resilient ecosystem implies sustainable capacities to cope with unexpected impacts and

reproduce itself for further adaptation. Meanwhile, social resilience places a focus on prediction of negative phenomena and planning for future response.

It follows that development projects on biodiversity conservation should aim to balance benefits between the ecological environment and human society. It is undeniable that the more diverse the socio-ecological system, the greater its resilience. However, the concept of “a little bit is better than nothing” should be applied in some cases.

Mangrove Biodiversity – It depends on your view

Mangrove forests play a role as natural barriers against coastal erosion, strong winds and storm floods, a role that, arguably, is enhanced by greater species diversity. Mangrove biodiversity, within the scope of this paper, refers to the variation of ‘true’ mangrove plants which play a vital role in development of mangrove ecosystems in the context of adaptation to climate change.

The Mangrove Guidebook for Southeast Asia (FAO, 2006) stated that there were 52 species of true mangrove plants having been recognized in Southeast Asia, of which 42 are trees and shrubs. At least 35 species of true mangrove are reported from Vietnam (Hong and San, 1993), with the greatest species diversity in the south from Camau Peninsular to Can Gio, and gradually decreasing species diversity with increasing latitude further north (Hong, 2008).

In the latest study supported by GIZ in the southern Mekong Delta province of Bac Lieu, Vietnam, Nam (2010) recognized 15 true mangrove species, of which 12 are trees, two are herbs and one is a fern. However, the situation becomes more pessimistic when we look at individual mangrove forests. Only four species of mangrove tree play a dominant role in Bac Lieu Province (Nam 2010) and they are found mainly as more or less single-species stands.

Challenges to mangrove diversification in the Mekong Delta

Mangrove forests have faced many challenges leading to the loss of both quality and areal distribution, including the increase in human population living adjacent to the coastal zone and, arising from that, land use development. The case in Ca Mau peninsula could be taken as an example. According to Hong (2008), conversion of mangrove to shrimp culture has significantly reduced the mangrove area in Ca Mau province from 150,000 ha prior to 1962 to 64,572 in 1999 (Tan 2001 cited by Hong 2008). An inventory on three types of forest in Ca Mau province in 2006 showed that there exist only 63,607 ha of mangrove in the whole province. Specific figures include

Special use forest	8,925 ha
Protective forest	26,314 ha
In Fully Protected Zone	10,252 ha
In integrated Protection and Production Zone	16,062 ha
Production forest	28,368 ha

Mangrove in the production forests as well as in the integrated production and protection zone (accounting for 44,430 ha – 69.85% of total forested area) is in form of *R. apiculata* mono-culture, since this species has the greatest economic value. Within the areas of special use forest and fully protected forest, mono-plantations of *R. apiculata* also occupy a significant proportion in the province.

Figure 2. Mono-plantation of Rhizophora in integrated Protection and Production Zone

The same land use concept is applied in remaining Mekong Delta provinces of Bac Lieu, Soc Trang and Tra Vinh under the Government Decision No. 116/1999/QD-TTg on zoning of mangrove forest rehabilitation. This trend certainly leads to the reduction of biodiversity landwards in the whole delta.

Further risks to biodiversity in the Mekong Delta in relation to land use activities could be the intentional isolation of mangrove within dike encasement and the one outside the dike systems. According to Clough, B (2009), the increasing elevation of mangrove areas through natural sedimentation in the past and the current cultivation of shrimp may help mangroves, mostly *R. apiculata* plantations, survive from sea level rise. In contrast, mangroves that lie outside dikes may suffer hydrological changes resulted from sea level rise and their landward migration potential will probably be limited by the dikes, particularly sea dikes for coastal protection. Unfortunately, the ones that possess the greatest potential to survive in the circumstance are mostly *R. apiculata* plantations, only because they are mostly inside dikes. Thus, mangrove biodiversity will also be at risk if the future concepts of land use or mangrove rehabilitation remain unchanged.

Another challenge to mangrove biodiversity deriving from current land use concepts is plantation in active shrimp ponds. The result from the latest forest land use mapping in Bac Lieu conducted by Can Tho University in 2010 shows that about 50% of the coastal forest area in the province applies the model of integrated shrimp-mangrove production. Due to the requirement of raising shrimp, a certain water level must be kept permanently in the ponds. *R. mucronata* seems to be the only option on lower elevation ground in this condition. It is reiterated that the concept of "a little bit is better than nothing" should be thought of in this case.

Figure 3. Three-month *R. mucronata* plantation in shrimp pond, supported by GIZ Bac Lieu project.

Conclusion

Though there still exists a large number of mangrove species in the Mekong Delta, species and ecosystem biodiversity has declined due to changes in land use and the focus on planting mono-cultures. More than two third of the mangrove area in Ca Mau province, the largest mangrove forest in the region, consists of *R. apiculata* mono- forests. Other mangrove species will probably have to face the effects of sea water rise and have very few opportunities for landward migration due to the construction of sea dikes as well as the farming systems which are planned for aquaculture or agriculture crops.

The current challenges described above show that feasible options to maintain or enhance mangrove biodiversity should only be developed together with further land use planning at provincial and/or regional levels.

REFERENCES

Brown, Benjamn (2007). "Resilience Thinking Applied to the Mangroves of Indonesia." IUCN & Mangrove Action Project; Yogyakarta, INDONESIA. PDF file

Clough, B. 2009. Climate change and mangroves – Impacts, resiliency and management

Convention on biological diversity (with annexes). Concluded at Rio de Janeiro on 5 June 1992.

Grant, F., Mergeay, J., Santamaria, L., Young, J. and Watt, A.D. (Eds.). 2010. Evolution and Biodiversity: The evolutionary basis of biodiversity and its potential for adaptation to global change. Report of an e-conference. PDF

Hong, P.N. (2008). Mangroves and Coastal Dwellers in Vietnam - A Long and Hard Journey Back to Harmony. Commemorative Lecture. The International Cosmos Prize. PDF file.

Hong, P.N. and San, H. T. (2003). Mangroves of Vietnam. IUCN, Bangkok. 173 pp.

Minh, V.Q. (2010). Mapping the forest cover and gaps in the mangrove forest shelter belt in Bac Lieu province using high-resolution satellite image, Can Tho University. Project Sustainable Management of Coastal Forest Ecosystems in Bac Lieu province, Vietnam.

Nam, V.N. (2010). Inventory on the biodiversity of mangrove flora in order to find out which species thrive in particular environments and propose solutions for sustainable use and management of these coastal resources in Bac Lieu province. University of Agriculture and Forestry, HCMC. Project Sustainable Management of Coastal Forest Ecosystems in Bac Lieu province, Vietnam

Stefaan Blancke (2010). Human perspectives on biodiversity. Evolution and Biodiversity: The evolutionary basis of biodiversity and its potential for adaptation to global change. Report of an electronic conference. PDF file