| SALAMANDRA | 45 | 2 | 115-118 | Rheinbach, 20 May 2009 | ISSN 0036-3375 |
|---|---|---|---|---|---|

# The floristic composition of the habitat of *Malacochersus tornieri* at a hill in Tarangire National Park, Tanzania

Reginald T. Mwaya

**Abstract.** During the wet season, April 2006, vegetation sampling was performed at a hill in Tarangire National Park, Tanzania, the habitat of *Malacochersus tornieri*. A total of 68 plant species were identified to occur in the area. The family Poaceae was most species-rich represented with 21 (30.9%) different species. The second, third and fourth highest species representation were found in Papillionoideae (7 species = 10.3%), Compositae (6 species = 8.8%) and Labiatae (4 species = 5.9%). The herbaceous species composition at a hill is potentially higher considering the xeric nature of this Maasai heartland area.

Key words. Chelonia, Testudinidae, *Malacochersus tornieri,* floristic composition, habitat.

Despite the previous allowance by the government of Tanzania to collect and trade pancake tortoises, *Malacochersus tornieri* (Siebenrock 1903), for international markets, our understanding of the species' ecology has been very meager and in most cases superficial. Specifically, for instance, the vegetation composition of the species' microhabitat remains inadequately known despite the fact that the species interacts with its immediate environment, the herbaceous layer serving as its food source, as well as being an inevitable transitory shelter and hideout from predators when venturing outside the safety of their crevices.

The pancake tortoise is the only testudinid endemic to the Somali Maasai and Zambesian 'miombo' woodland phytochoria in east Africa (Broadley 1989, Klemens & Moll 1995, Wood & MacKay 1997, Spawls et al. 2002). Klemens & Moll (1995) pointed out that the species' major conservation threat in Tanzania emanates from wild collection by humans for the international live animal trade. Wood & MacKay (1997) argued that in Kenya habitat destruction, due to bad agricultural practices, might be one of the dimensions linked to the species' vulnerability.

There is scanty literature on the species' natural ecology, which might be important for charting out a long-term strategy for management of the species. The few notable recent fieldwork publications include those of Klemens & Moll (1995) and Moll & Klemens (1996) in Tanzania and Wood & MacKay (1997) as well as Malonza (2003), both from Kenya. The study in Tanzania concentrated on the species' population distribution and status along the prominent 'trade' routes where excessive exploitation for live trade had been reported by Klemens & Moll (1995). Moll & Klemens (1996) highlighted the tortoises' microhabitat affinities of the rocky crevices. Although this literature mentions the few grasses eaten by the species, no detailed analysis of the herbaceous layer was made. On the other hand, the Kenyan literature largely focused on the population distribution dynamics and likewise, there has been no in-depth determination of the vegetation analysis. Other recent field ecological study includes that of Chansa & Wagner (2006) who elucidated on the range extension of the species into northern Zambia. Mwaya (2006) reported on the tortoises' patterns of diurnal activity and spatial

behavior in Tarangire National Park, Tanzania. The most recent ecological study in Tanzania evaluated the effect of the exploitation moratorium on pancake tortoise population recovery in habitats whose populations were thought to have been severely affected (own unpubl. data).

This note seeks to contribute to the understanding of the pancake tortoise habitats' floristic composition at a hill in Tarangire National Park. This hill is one of the sites within the Park where a pancake tortoise population has been identified (Klemens & Moll 1995, Mwaya 2006). The thorough understanding of the herbaceous vegetation is important because plants are the primary food source of the tortoises (Kabigumila 2001), but it also provides a hideout from potential predators when tortoises are outside their crevices.

Tarangire National Park lies between latitudes 3°40' and 5°35' south and longitudes 35°45' and 37° east, at an elevation between 1200 and 1600 m a.s.l. Within the Park, the study was conducted at a hill located in the northeast area of the park. The specific study site covers approximately 23,000 $m^2$. The site was divided into square blocks of 30 × 30 m and each block was given numerical grid reference. The study site is situated at the foot of the hill and is characterized by scattered broken rocks, sandy soils, and wooded grassland. This site was chosen because the respective population was readily accessible for study.

During the wet season, April 2006, vegetation sampling was performed. Ten quadrats of 1 × 1 m were randomly placed in each of the 30 × 30 m blocks. All plants falling within each of the quadrats were identified *in situ* except for those which could not be identified in the field; samples were collected and kept for later identification at herbaria facilities at Mweka Wildlife College, and in some cases at Tanzania Pesticide Research Institute in Arusha and the Department of Botany, University of Dar-Es-Salaam, Tanzania.

A total of 68 plant species of 26 families were identified (Table 1). The six most important families, in terms of species representation, were Poaceae (21 species = 30.9%), Papillionoideae (7 species = 10.3%), Compositae (6 species = 8.8%), Labiatae (4 species = 5.9%), Cyperaceae (3 species = 4.4%) and Acanthaceae (3 species = 4.4%). The herbaceous species richness at the hill is potentially higher considering the xeric nature of the study site and surrounding Maasai heartland area. As expected, Poaceae included a greater species diversity than other plant families. However, herbs in general, which apart from Poaceae provide forage for the species, are relatively richer in the study site. Moll & Klemens (1996) carried out faecal analysis of pancake tortoise scats in Tanzania and found fragments of grasses (Poaceae) including *Cynodon* spp., *Sporobolus* spp., *Themeda triandra*, *Panicum* spp. and leaves of *Achyranthes aspera* (Amaranthaceae). All Poaceae species observed by Moll & Klemens (1996) consumed by the tortoises were also found at the Hill. However, *Achyranthes aspera* was absent from the sampled study area. The presence of diverse vegetable matter is consistent with the report of Poelchau & Mistry (2006) who found higher forb diversity in the kopjes of Serengeti National Park, Tanzania. Furthermore, as the result of habitat heterogeneity, these rocky outcrops contain higher species diversity relative to the surrounding areas (Timbuka & Kabigumila 2003). This suggests that the diverse herbs may meet adequate forage choices for the species' nutritional requirements.

It therefore appears that any factor leading to the removal of the herbaceous layer, either through natural or anthropogenic activities such as slash-and-burn cultivation and frequent late burning, characteristic of tropical savannah habitats, is predicted to have significant negative impact on the species fitness (Wood & MacKay 2007). This might be mediated through forage reduction, increased risks of hyperthermia and amplified predation pressure. In the face of increased human population and subsequent encroachment (Gamassa 1989) to the species' prime habitat, detailed research is recommended.

Tab. 1. Identified plant species in a habitat of the pancake tortoise at a hill in Tarangire National Park, Tanzania.

| Family | Species |
|---|---|
| Poaceae | *Aristida adoensis* Hochst. |
| | *Cynodon plectostachyus* (K.Schum.) Pilg. |
| | *Dactyloctenium aegyptium* (L.) Willd. |
| | *Dichanthium annulatum* (Forssk.) Stapf |
| | *Digitaria milanjiana* (Reendle) Stapf |
| | *Eragrostis aspera* (Jacq.) Nees |
| | *Eragrostis caespitosa* Chiov. |
| | *Eragrostis superba* Peyr. |
| | *Harpachne schimperi* A. Rich. |
| | *Heteropogon contortus* (L.) Roem. & Schult. |
| | *Hyperrhenia filipendula* (Hochst.) Stapf |
| | *Hyperrhenia rufa* (Nees) Stapf |
| | *Isachne mauritiana* Kunth. |
| | *Microchloa kunthii* Desv. |
| | *Panicum coloratum* L. |
| | *Panicum maximum* Jacq. |
| | *Rhyncheltrum repens* (Willd.) C.E. Hubbard |
| | *Setaria sphacelata* (Schumach.) Moss. |
| | *Sorghum arundinaceum* (Desv.) Stapf |
| | *Sporobolus pyramidalis* P. Beauv. |
| | *Themeda triandra* Forrsk. |
| Caesalpiniodeae | *Cassia mimosoidea* L. |
| Capparidaceae | *Cadaba faricosa* Forssk. |
| Malvaceae | *Sida ovata* Forssk. |
| Papillionoideae | *Crotolaria massaiensis* Taub. |
| | *Dalbegia melanoxylon* Guill. & Perr. |
| | *Erythrina abyssinica* DC. |
| | *Indigofera arrecta* A. Rich. |
| | *Indigofera schimperi* Jaub. & Spach. |
| | *Tephrosia pumila* (Lam.) Pers |
| | *Vigna vexilata* (L.) A. Rich. |
| Mimosoideae | *Dichrostachyus cinerea* (L.) Wight & Arn. |
| Labiatae | *Leonotis mollissima* Gurke |
| | *Ocimum suave* Willd. |
| | *P. caninus* (Roth.) Vatke |
| | *Plectranthus prostatus* Gurke |
| Rubiaceae | *Psychotria* sp. L. |
| | *Richardia brasiliensis* Gomes |
| Compositae | *Aspilia mossambiensis* (Oliv.) Wild. |
| | *Bidens pilosa* L. |
| | *Helichrusum glumeceum* DC. |
| | *Microglosa oblongifolia* O. Hoffm. |
| | *Senecio* sp. |
| | *Vernonia galamensis* (Cass.) Less. |
| Capparidaceae | *Cadaba farinosa* Forssk. |
| | *Cleome monophylla* L. |
| Polygalaceae | *Polygala fischeri* Gurke |
| Cyperaceae | *Cyperus laevigatus* L. |
| | *Cyperus rotundus* L. |
| | *Kyllinga arrecta* Schumach. |
| Acanthaceae | *Asystasia schimperi* T. Anderson |
| | *Blepharis hildebrandtii* Lindau |
| | *Justicia flava* Vahl |
| Euphorbiaceae | *Euphobia hirta* L. |
| Cucurbitaceae | *Cucurmis dipsaceus* Spach |
| | *Momordica foetida* Schumach. |
| Rutaceae | *Clausena aniseta* (Willd.) Benth. |
| Simaroubaceae | *Harrisonia abyssinica* Oliv. |
| Piperaceae | *Piper capense* L.f. |
| Adiantaceae | *Pteris dentata* Forssk. |
| Scrophulariaceae | *Craterostigma plantagineum* Hochst. |
| Commelinaceae | *Commelina petersii* Hassk. |
| | *C. benghalensis* Wall. |
| Anacardiaceae | *Lannea alata* (Engl.) Engl. |
| Convolvulaceae | *Ipomoea spathulata* Hallf. |
| Thymelacaeceae | *Gnidia involucrata* A. Rich. |
| Orchidaceae | *Aerangis confusa* J. Stewart |
| Vitaceae | *Cyphostemma cryphopetalum* (Fresen.) Wild. |
| Total number of species: 68 | |

**Acknowledgements**

I am indebted to the generous support from the European Union, through the Southern Africa Development Cooperation (SADC) Wildlife Management project, for funding field data collection in Tarangire. Many people have helped to make this paper a reality. These include Martin Jones, Leslie Lace and Barry Stevenwood. I also thank Joshua Mushi, who provided invaluable help with field data collection. Peter Balint and Fabian Schmidt generously commented on the manuscript. Eliena Macha and Frank Mbago were very helpful in providing information on plant identification.

**References**

Broadley, D.G. (1989): *Malacochersus tornieri*, pancake tortoise; soft-shelled tortoise. – pp. 62-64 in Swingland, I.R. & M. Klemens (eds.): The Conservation Biology of Tortoises. – Gland, Switzerland: IUCN/SSC Occasional Papers.

Chansa, W. & P. Wagner (2006): On the status of *Malacochersus tornieri* (Siebenrock 1903) in Zambia. – Salamandra, **42**: 187-190.

Gamassa, D. (1989): Land use conflicts in arid areas. A demographic and ecological case study: The Kwakuchinja Wildlife corridor in northern Tanzania. – Master Thesis, Agricultural University of Norway.

Kabigumila, J. (2001): Sighting frequency and food habits of the leopard tortoises, *Geochelone pardalis*, in northern Tanzania. – African Journal of Ecology, **39**: 276-285.

Klemens M.W., D. Moll, & A. Njalale (1993): A preliminary assessment of the status and exploitation of the pancake tortoise (*Malacochersus tornieri*) in Tanzania: A report of research funded by Wildlife Conservation International, American Museum of Natural History, IUCN/SSC Trade Specialist Group, and People's Trust for Endangered Species, 48 pp.

Klemens, W.M. & D. Moll (1995): An assessment of the effects of commercial exploitation on the pancake tortoise, *Malacochersus tornieri*, in Tanzania. – Chelonian Conservation and Biology, **1**: 197-206.

Malonza, P.K. (2003): Ecology and distributions of the pancake tortoise, *Malacochersus tornieri* in Kenya – Journal of East African Natural History, **92**: 81-96

Moll, D. & M.W. Klemens (1996): Ecological characteristics of the pancake tortoise, *Malacochersus tornieri*, in Tanzania. – Chelonian Conservation and Biology, **2**: 26-35.

Mwaya, R.T. (2006): Some insights of the pancake tortoise, *Malacochersus tornieri*: Testudinidae ecology from Tarangire National Park, Tanzania. – Chelonii, **4**: 115-126.

Poelchau, M.F. & S. Mistry (2006): Forb diversity and community similarity of kopjes in the Serengeti National Park, Tanzania. – African Journal of Ecology, **44**: 38-46.

Spawls, S., K. Howell., R. Drewes & J. Ashe (2002): Field guide to the reptiles of East Africa. – London, United Kingdom (Academic Press), 543 pp.

Timbuka, C.D & J. Kabigumila (2003): Diversity and abundance of small mammals in the Serengeti Kopjes, Tanzania. – pp. 153-169 in Keyyu J.D., E.K. Batamuzi, B.M. Mutayoza & D.G Mpanduji (eds.): Proceedings of the TAWIRI 4th Annual Scientific Conference, 4-6 December 2003, Arusha, Tanzania.

Wood, R.C. & A. MacKay (1997): The distribution and status of pancake tortoises, *Malacochersus tornieri*, in Kenya. – pp. 314-321 in Van Abbema, J. (ed.) Proceedings: Conservation, Restoration, and Management of Tortoises and Turtles.

Manuscript received: 5 December 2006

Author's address: Reginald T. Mwaya, 100 Western Avenue, Elmwood Apt., J3, Kalamazoo, MI 49008, USA, E-Mail: rmwaya@yahoo.com; reginald.mwaya@wmich.edu.