

Life on a block of limestone: Evolutionary, ecological and geological dynamics of isolated malacofaunas on tropical karst

M. Schilthuizen

Schilthuizen, M. Life on a block of limestone: Evolutionary, ecological, and geological dynamics of isolated malacofaunas on tropical karst. *Scripta Geologica*, **143**: 27, Leiden, May 2011.

Menno Schilthuizen, Department of Terrestrial Zoology, NCB Naturalis, Postbus 9517, NL-2300 RA Leiden, The Netherlands (Menno.Schilthuizen@ncbnaturalis.nl) and Institute for Tropical Biology and Conservation, Universiti Malaysia Sabah, Locked Bag 2073, 88999 Kota Kinabalu, Malaysia.

The karst formations of southeast Asia are a wonderful evolutionary and ecological experiment, and a sad example of observable extinction (Clements *et al.*, 2006). In this paper, I shall focus on those in Malaysia and, in particular, on the land snail faunas that they support.

Limestone in Malaysia comes in the form of around 800 discrete units, most of them karst towers of, on average, a few hundred metres diameter (Price, 2001). Ecologically, and often also geologically (many are lenticular), these hills often show a considerable degree of isolation. In invertebrates with high calcium requirements, like terrestrial gastropods, this situation has led to the evolution of flocks of endemic species, many occurring on a single outcrop and nowhere else on earth.

In some instances, we have a good insight into the evolutionary processes responsible for this insular endemism. Many species of the bizarrely-shaped subgenus *Plectostoma*, for example, appear to engage in an evolutionary arms race with their slug predators, leading to site-specific evolutionary trajectories of ever-changing morphological defense and behavioural offense (Schilthuizen *et al.*, 2006). Studies of fossil deposits combined with molecular phylogenetics allow parts of these trajectories to be retraced. Ecologically, the dense and diverse land snail communities living on limestone provide good opportunities for testing macroecological models of niche-based and dispersal-based community assembly.

The geological characteristics of these karst habitats also prove to be their undoing. Easily accessible carbonate formations as they are, they are prone to quarrying by the cement industry (Clements *et al.*, 2006). Also, land clearing in the surrounding area often leads to fires which sweep up the dry karst vegetation. Sadly, extinctions of endemic species have already been documented and, based on successive satellite images of quarried hills, it is possible to predict future ones (Schilthuizen & Clements, 2008).

References

- Clements, R., Sodhi, N.S., Schilthuizen, M. & Ng, P.K.L. 2006. Limestone karsts of southeast Asia: imperiled arks of biodiversity. *Bioscience*, **56**: 733-742.
- Price, L. 2001. *Caves and Karst of Peninsular Malaysia. A Register*. Gua Publications, Kuala Lumpur, Malaysia: 98 pp.
- Schilthuizen, M. & Clements, R. 2008. Tracking extinction from space. *Tentacle*, **17**: 8-9.
- Schilthuizen, M., van Til, A., Salverda, M., Liew, T.-S., James, S.S., Elahan, B. & Vermeulen, J.J. 2006. Micro-allopatric divergence in a snail associated with behavioural differences in its predator. *Evolution*, **60**: 1851-1858.