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## RESEARCH STUDIES ON LIMESTONE BIODIVERSITY IN THE ASEAN REGION

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## ABSTRACT

The paper cites some of the research studies on limestone biodiversity (either completed or being implemented) in the ASEAN Region, focusing on those studies under the Research Grant Programme of the ARCBC. It also enumerates some of the unique findings and background information of limestone biodiversity of each country. Current trend shows that researches are conducted in a collaborative approach with participation of international agencies. Likewise, technical findings are usually converted to usable and practical forms, such as publications, database, instructional materials to formulate protection and conservation measures, recommendatory documents, among others. However, basic information on limestone biodiversity is still lacking, hence further and in-depth researches are usually being suggested. The paper also includes recommendations in the conduct of researches in limestone biodiversity in the ASEAN.

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### INTRODUCTION

#### **Limestone Areas in ASEAN**

Asean Regional Centre for Biodiversity Conservation (ARCBC) is currently developing the Protected Area (PA) Database in the ASEAN region. Based on the Centre's initial figure, there are about 49 limestone areas identified as protected areas out of 2,117 PAs contained in the database (Database Branch, 2003). The low number also supports the premise that karst ecosystems and landscapes are poorly represented on the World Heritage List, particularly in Asia and the Pacific (see Figure 1) (Asia Pacific Focal Point Newsletter, 2002).

Limestone areas (cave and karst) are commonly valued as cultural heritage sites and are important sites of archaeological and anthropological

discoveries (e.g. in prehistoric times caves as homes, burial grounds and ceremonial sites of cave dwellers). However, recently the significant role of limestone areas in conservation of biological diversity was realized. Due to its unique physical, aesthetic and biological features, these areas have become a perfect place to conserve many life forms of which most of them are yet to be discovered. Likewise, each limestone area serves as an ideal record book of the ancient biodiversity as shown in areas with preserved fossils of plant and animal remains.

Limestone areas are also prone to excessive use to the level of exploitation and eventually to destruction. For instance, due to its aesthetic values (as a



**Figure 1:** World Heritage sites in the Asia-Pacific Region with important karst features East and South-East Asia (Wong *et al.*, 2001).



natural wonder of earth's creation), they have become sites of ecotourism, for sports, rock climbing, caving, fishing and other recreational activities, which cause habitat destruction. Extreme spelunking in caves has also become a potential threat as it brought disturbances to the natural ecological set-up. Major culprits also (due to economic benefits) include mining and quarrying of speleothems (stalactites and stalagmites), guano and phosphate deposits, extraction of other cave resources (e.g. endemic and rare plant species with ornamental and medicinal value), water pollution, land-use conversion and treasure hunting (Philippines during Marcos Regime). The clearing of forests surrounding species-rich limestone hills disturbed habitats that led to the extinction of endemic plant species.

### **Biodiversity in Limestone areas**

Other than an area for biodiversity conservation, limestone areas provide high levels of radiation and endemism in both plant and animal species, including the little studied subterranean fauna of caves (Bandarin, 2001). A wide array of flora and fauna composition is present in limestone areas. Fauna comprising both vertebrates (primates, bats, rodents, birds (swiftlets), fishes, reptiles, etc.) and invertebrates (crustaceans, molluscs, arachnids, beetles, ants, etc.) can be found in this type of habitat. Interestingly, some of them have developed some specialized morphological features to adapt to the environment. For instance, some insect species living in caves (dark condition) are blind due to undeveloped eyes or absence of eyes. Plant species, such as timber trees, mosses, cycads, tree-ferns, bonsai-like palms and other ornamental plants such as orchids, thrive well in limestone environment. Other than these, many medicinal plants were identified to be associated with the limestone habitat. For instance, Cuc Phuong National Park, a limestone area in Vietnam is a haven of 1,799 vascular plant species. Worth mentioning is the Vietnamese ginseng (*Panax vietnamensis*) which is rare and has economic value. Thus such plant and other plants command high prices in national and international markets due to their valuable uses.

### **Karst and Limestone Caves as a priority research area under the ARCBC Research Grant Programme**

Limestone caves and karst are widespread throughout SE Asia and are potential reservoirs of biodiversity. Pressure on the caves, stream and underground water pollution and development around the bases of towers come mainly from visitors. Karst has never been clearly examined for biodiversity reservoirs in the literature. Indeed, karst landscapes are extremely important places for human, economic and scientific reasons, but they are also extremely vulnerable environments and may suffer serious