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PROTECTION OF KARST IN THE PHILIPPINES
VARSTVO KRASA NA FILIPINIH

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Abstract UDC 551.44:502.7(599)

Sonata Dulce F. Restificar, Michael J. Day, & Peter B. Urich: Protection of Karst in the Philippines

The article presents an overview of the current status of karst protection in the Philippines. Prior studies indicate that of the 35,000km^2 of karst landscape in the country, about 29% is protected . However, protection of karst has not to date been a priority of the Philippine government, and the country has no existing legislation that is directly decreed for protection and conservation of karstlands. Most contemporary karst protection is indirect, in that the karst is located within protected areas established for other, although often related reasons, such as ecological conservation, water supply protection and tourism. However, it appears that the Philippine government is gradually recognizing explicitly the need to protect karst landscapes. The establishment of the National Caves and Cave Resources Management and Protection Act in 2001 and the inclusion of karst water resources in the country's National Action Plan (NAP) under the United Nations Convention to Combat Desertification (UNCCD) are significant steps towards explicit protection of karst areas. Although the existing legislation only addresses specific facets of karst landscape, it may stimulate additional programs and legislation that will more broadly protect karst landscapes nationally.

Key words: Philippines, karst, caves, protected areas, environmental legislation.

Izvleček UDK 551.44:502.7(599)

Sonata Dulce F. Restificar, Michael J. Day & Peter B. Urich: Varstvo krasa na Filipinih

Članek predstavlja pregled stanja zaščite krasa na Filipinih. Prejšnje raziskave kažejo, da je zaščitenega 29% od 35.000 km^2 filipinskega krasa. Vendar pa do sedaj zaščita krasa ni bila prednostna naloga vlade in država nima zakonodaje, ki bi izrecno zahtevala zaščito in ohranjanje kraške pokrajine. Današnja zaščita krasa je posredna, ko je kras v zaščitenih področjih, razglašenih zaradi drugih, čeprav pogosto podobnih razlogov, kot so ekološka zaščita, zaščita pitne vode ali turizem. Vseeno pa kaže, da filipinska vlada postopoma spoznava pomen neposredne zaščite kraške pokrajine. Pomembni koraki k zaščiti kraških področij so ustanovitev National Caves and Cave Resources Management (Državne uprave jam in jamskih virov), Odlok o zaščiti iz 2001 in vključitev kraških vodnih virov v National Action Plan (Državni izvedbeni plan) v okviru United Nations Convention to Combat Desertification (Listina ZN za boj proti dezertifikaciji). Čeprav obstoječa zakonodaja upošteva samo določene poteze kraške pokrajine, lahko vzpodbuja dodatne programe in akte, ki bi omogočali celovitejšo zaščito kraške pokrajine v državnem okviru.

Ključne besede: Filipini, kras, jame, zaščitena področja, okoljska zakonodaja.

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INTRODUCTION

The Philippines' natural resources have long been stressed (Ong *et al*. 2002), and deforestation, degradation of land and water resources, and air, water and soil pollution are among the serious environmental problems that the country currently faces. Recognizing this, the Philippine government has passed legislation and instituted programs designed to preserve its remaining natural resources and to rejuvenate the environment. This legislation and the resource protection and conservation programs apply to the broad spectrum of national natural resources, including forest, marine and aquatic resources, wildlife, and natural landmarks, but they often lack a sound geomorphological basis.

The Philippines contains a diverse array of tropical karst landscapes that cover about 10% of the total land surface (Piccini & Rossi 1994; Balázs 1973). Despite this, the country has no legislation that is specific to the protection and conservation of these distinctive and significant physical resources. The inclusion of karst protection in the country's resource conservation effort would enhance the emerging resource protection program by explicitly including a landscape resource that differs from others in its geomorphology and hydrology. Moreover, other critical components of the national ecosystem would also be protected since the conservation of karst landscapes will concomitantly protect watersheds and habitats of unique wildlife, especially the cave-dwelling species whose existence depends on the karst.

In this paper we provide an overview of environmental and resource protection in the Philippines, and assess the extent of karst protection in the country. We examine the legislation passed by the Philippine government in order to conserve natural resources and to protect the environment, and we identify legislation that directly or indirectly protects karst landscapes. We conclude with a brief outline of the karst areas that are currently being afforded protection.

PROTECTED AREA LEGISLATION: A HISTORICAL PERSPECTIVE

The enactment of Executive Order No. 33 on April 25, 1910 marked the beginning of a conscious effort to protect the Philippines' physical patrimony. Executive Order 33 created the first park in the country – the Rizal National Park in Zamboanga, which is established in honor of the country's national hero (PAWB 1989). The 1930s witnessed the Philippine National Park Movement, pioneered by then Senator Camilo Osias and Forestry Director Arthur Fisher, who explored the country, identifying natural wonders that should be set aside for public enjoyment (PAWB 1989). The Philippine's first legislation regarding park establishment and management was established in 1932, when Act No. 3915, entitled "An Act for the Establishment of National Parks, Declaring such Parks as Game Refuges and for Other Purposes", passed on February 01, marking the formal beginning of the country's resource conservation effort. Act 3915 defined a national park as "a portion of the public domain reserved or withdrawn from settlement, occupancy, or disposal under the laws of the Philippine Islands, which because of its panoramic, historical, scientific or aesthetic value, is dedicated and set apart for the benefit and enjoyment of the people of the Philippine Islands" (WCMC 1992). The Act became effective in 1934 through the issuance of Forestry Administrative Order No. 7, entitled the National Park Regulations, which specified the management, development, conservation and use of national parks (PAWB 1989).

In 1975, the National Park Regulations were updated through Presidential Decree 705, or the Revised Forestry Code of the Philippines. The Revised Forestry Code included a provision for the allocation of forestland for purposes such as national parks, national historical sites, game refuge, wildlife sanctuaries and forest reserves. The Code was subsequently amended in 1978 by Presidential Decree 1558 (PAWB 1989), and in 1981 the Code was further amended by Presidential Decree 1559 in order to "… further strengthen the code to make it more responsive to present realities and to the new thrust of government policies and programs and forest development and conservation…" among others. In addition, the 1981 revision provided an updated definition of a national park: "a forest land reservation essentially of primitive or wilderness character which has been withdrawn from settlement or occupancy and set aside as such exclusively to preserve the scenery, the natural and historic objects and the wild animals or plants therein, and to provide enjoyment of those features in such a manner as will leave them unimpaired for future generations."

From 1932 to 1952, the Bureau of Forestry in the Department of Agriculture and Natural Resources (DANR) was responsible for national parks administra-

tion (WCMC 1992). In 1952, the Commission of Parks and Wildlife was created under Republic Act No. 826, and was placed under the control and supervision of the President of the Philippines (PAWB, 1989). This Republic Act was amended several times through Executive Orders, Letter of Implementation, and Presidential Decrees (WCMC 1992). In 1987, through Executive Order No. 192, the Department of Environment and Natural Resources (DENR) was created and was vested with primary institutional responsibility for the management of national parks, reserves and other protected areas. Executive Order 192 also created six staff bureaus within the DENR, among which the Protected Areas and Wildlife Bureau (PAWB) was given the primary responsibility of managing the country's protected areas as well as the conservation of biodiversity, genetic resources, and endangered wildlife resources.

CONTEMPORARY PROTECTED AREA LEGISLATION

The Philippine Constitution mandates the State "to protect and advance the right of the people to a balanced and healthy ecology" (Tan 1998). This duty is codified in the Philippine Environmental Policy, which is the national blueprint for environmental protection (Tan 1998). This Policy, together with the Philippine Environment Code, which contains the basic principles regarding the country's environmental and natural resource concerns, represents the basic law pertaining to the Philippine environment (Tan 1998). The Philippine government's commitment to environmental and resource protection is manifested in the 1990 Philippine Strategy for Sustainable Development, which includes "a clear commitment on the behalf of government to establish protected areas as the principal instrument for conservation" (WWF 1991 in WCMC 1992).

Republic Act No. 7586, also known as the National Integrated Protected Areas System (NIPAS) Act, was passed in 1992 to make provision for the establishment of integrated protected areas system as well as to "replace the fragmented and obsolete legislative foundation of protected areas in the Philippines" (Pollisco 1995). The NIPAS Act of 1992 established the National Integrated Protected Areas System (NIPAS) that "shall encompass outstanding remarkable areas and biologically important public lands that are habitats of rare and endangered species of plants and animals, biogeographic zones and related ecosystems, whether terrestrial, wetland or marine, all of which shall be designated as protected areas." The management and administration of NIPAS was placed under the DENR through the Protected Area Management Board (PAMB). The NIPAS Act mandates that a PAMB should be created for each established protected area, with each PAMB being composed of the following members: the Regional Executive Director, a representative of the regional government, a representative from the municipal government, a representative from each barangay covered by the protected area, a representative from each tribal community, at least three representatives from Non-Government Organizations and/or the local community, and a representative from other departments or national government agencies involved in protected area management. Each board member serves for a term of five years.

Eight categories of protected areas were established under the NIPAS Act: strict nature reserves; natural parks; natural monuments; wildlife sanctuaries; protected landscapes and seascapes; resource reserves; natural biotic areas; and other categories established by law, conventions or international agreements to which the Philippine Government is a signatory. As of 2004, about 5.1 million hectares or about 17% of the Philippines' total land area is classified as protected (DENR 2004). The country has 293 protected areas; of which 209 are created under the initial components of the system and 84 were created under the NIPAS system (DENR 2004).

DISTRIBUTION OF KARST

The Philippines contains a wide array of tropical karst landscapes. The most significant karst areas are on the larger islands, with the most extensive being the Calbiga Karst on the island of Samar. There are also significant karst areas in the Cagayan, Kalinga-Apayao, Ilocos and Bicol regions of Luzon, on Bohol and Cebu in the Visayas, and in Negros, Davao and Cotabato in Mindanao (Fig. 1). The karst areas vary considerably in terms of landforms and age, although most of the karst is formed in Tertiary and Quaternary carbonates (Balázs 1973). The most striking surface karst landforms are steep-sided karst towers, which are exemplified by the towers of Coron Island in northern Palawan and on the west coast of Palawan. Pinnacle karst is also developed in Palawan (Longman & Brownlee 1980). Dome-shaped karst hills dominate the karst landscape of the island of Bohol, and there are also locally numerous dolines, dry valleys, poljes and caves. The longest reported cave extends to about 15

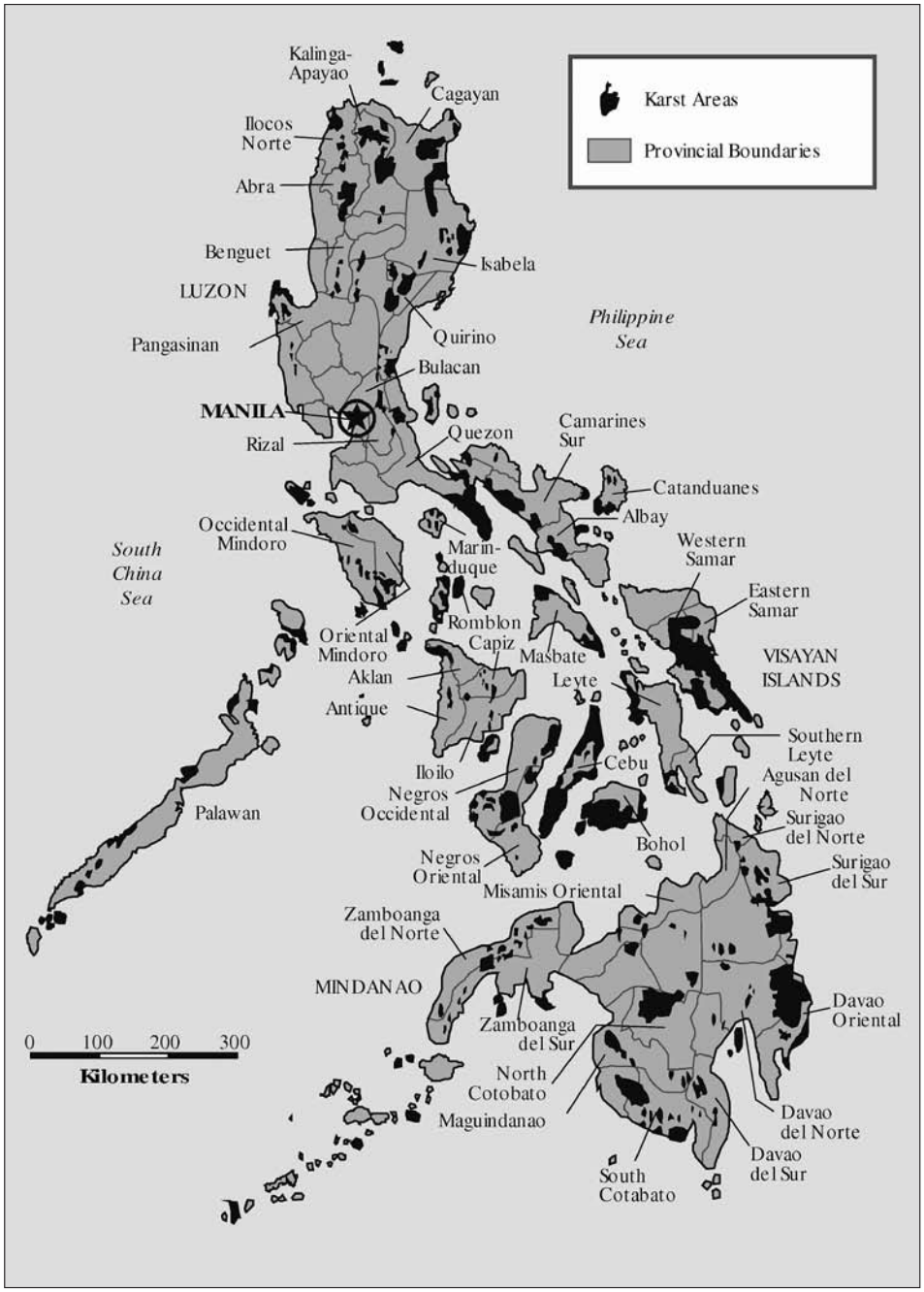

Fig. 1: Karst areas in the Philippines (based on Balázs 1973)

km – and the deepest cave reaches a depth of about 163 m (Urich 1996).

PROTECTION OF KARST

Day & Urich (2000) reported that the Philippines protects about 29% of its total karst landscape. Protection of karst areas has not, however, been a deliberate policy on the part of the Philippine government. The country has no existing legislation that directly addresses the protection and conservation of karst areas, and karst protection is largely effected through indirect means, that is karst happens to occur within areas designated for protection on the basis of other, although perhaps related criteria. Some existing karst areas are protected essentially because of their aesthetic and therefore tourism value, while others fall within nature or resource reserves, natural parks and monuments, wildlife sanctuaries or protected landscapes and seascapes. Recently, however, it appears that the Philippine government is beginning to recognize explicitly the importance of protecting certain karst areas

and components. One significant step was undertaken by the government to protect the country's caves through the issuance of DENR Department Administrative Order No. 4, Series of 1994, which established the Cave Management and Conservation Program (CMCP). The CMCP is intended to protect and safeguard the country's caves through various programs including policy development, research, human resource development, information, education and communication campaigns, and community and stakeholder involvement in management and conservation (PAWB 2004a). The CMCP is also more broadly significant particularly in the context of protection of karst because "…almost all caves in the Philippines are formed in limestone" (Bacalian 1993). One of the initial components of CMCP is the assessment of the state of Philippine caves, which produced an initial inventory of about 2,466 caves in 35 of the country's 76 provinces (Bacalian 1993). In the implementation of the CMCP under the NIPAS Act, three caves have been proclaimed as protected areas: Calbiga Protected Landscape, Pamitinan Protected Landscape, and Peñablanca Protected Landscape (PAWB 2004a).

In 2001, efforts to protect, conserve and manage the country's caves and cave resources were further strengthened via the passage of Republic Act No. 9072, which is also known as the "National Caves and Cave Resources Management and Protection Act". The implementation of this Caves Act is directed through multiple agencies whose main functions are as follows:

1. *DENR:* permit issuance, information dissemination and education campaign;

2. *Department of Tourism:* promotion of caves classified as ecotourism sites, and visitor management;

3. *National Museum:* protection and management of caves with cultural and archeological features;

4. *National Historical Institute:* protection of sites with historical value;

5. *Local Government Units;* and,

6. *Palawan Council for Sustainable Development:* in the case of Palawan Province.

One of the provisions of the Caves Act is the continuing inventory of the country's caves. As of 2003, the cave inventory listed 1,525 caves (PAWB 2004b), only 204 of which have been studied in detail. There is some duplication in terms of provisions between the Caves Act and the NIPAS Act; for instance, 87 of the caves listed under the former also fall under the Integrated Protected Area Program (IPAP).

The Caves Act's role in terms of protecting the karst landscape is limited at best. It is intended mainly for the management and conservation of a wide mélange of the country's caves and cave resources and it is not directly targeted toward the protection of broader karst landscapes. Although the Act may serve to protect individual caves in karst areas, it is not specifically decreed for their protection. However, other legislation does exist that indirectly protects karst landscapes:

1. Republic Act 9147 or the "Wildlife Resources Conservation and Protection Act" aims to conserve the country's wildlife resources and their habitats, and can be used to protect wildlife resources in specific karst areas.

2. Republic Act 7942 or the "Mining Act" contains provisions relating to areas closed to mining operations. These include all areas under NIPAS, which includes several karst areas.

3. DENR-DOT Memorandum Circular 98-02 (Guidelines for Ecotourism Development in the Philippines) and Executive Order No. 11 (Establishing the Guidelines for Ecotourism Development in the Philippines) provide guidelines for the management of caves used for ecotourism activities.

4. Republic Act 4846 or the "Cultural Properties Preservation and Protection Act" may be invoked to protect cave resources of cultural significance.

The Philippine Government is a signatory to the United Nations Convention to Combat Desertification (UNCCD), which is a United Nations agenda aimed at combating desertification and at mitigating the effects of drought in countries experiencing serious drought and/or desertification. UNCCD was ratified by the Philippine Senate in February 2000 and came into full force in May of the same year. UNCCD requires each signatory nation to prepare a National Action Plan (NAP), which is one of the key instruments in the Convention's implementation (UNCCD 2004). The Philippines' proposed National Action Plan is designed as a Convergence Plan of Action of the National Government for combating land and water degradation and desertification, and for reducing poverty (Concepcion 2004). The implementation of the plan will involve the participation of the Department of Agriculture (DA), the Department of Agrarian Reform (DAR), the Department of Science and Technology (DOST), and the DENR. One of the six Community-Based Thematic Programs included in the NAP is "Participatory Management of Karst Water Resources in Small Islands", and this program potentially will have a direct impact on karst water resource conservation nationally.

PROTECTED KARST AREAS

At the national scale, there is surprisingly limited information about many protected areas that do or may include karst, so here we focus on those major karst areas that are known to be protected. In this context, twenty-three karst areas in the country are currently known to have protected status (Table 1). These are areas whose

Protected Karst Area	Location	Karst Features
National Parks		
1. Balbalasang-Balbakan	Kalinga-Apayao	Caves with outstanding stalactites and stalagmites, karst tower
2. Callao Cave	Cagayan	9-kilometer long cave with an active stream
3. Hundred Islands	Pangasinan	Caves, some caves are underwater
4. Minalungao	Nueva Ecija	Cathedral-like caves
5. Biak-na-Bato	Bulacan	Several caves with rivers
6. Mt. Banahaw-Mt. Cristobal	Laguna and Quezon	Series of caves
7. Libmanan	Camarines Sur	Several caves, series of crystal caverns and cataracts
8. Mt. Isarog	Camarines Sur	Series of crystal caverns
9. Caramoan	Camarines Sur	Cave
10. Bulusan	Sorsogon	Limestone formations
11. Puerto Princesa Subterranean River	Palawan	Several caves, sinkholes, karst tower, karren, 8-kilometer long St. Paul Cave with tidal underground river, pinnacle karst
12. Bulabog-Putian	Iloilo	Caves, springs
13. Guadalupe Mabugnao-Mainit	Cebu	Interconnected caves
14. Sudlon	Cebu	Cave system
15. Kuapnit Balinsasayao	Leyte	Caves
16. Sohoton Natural Bridge	Samar	Stone bridge, cave with cathedral-like chamber and underground river, caves are typically phreatic
17. Initao	Misamis Oriental	Caves
18. Mt. Kitanglad	Bukidnon	Caves
Protected Landscape		
1. Pamitinan	Rizal	Caves
2. Calbiga	Samar	Cave system with 3 prominent caves, sinkholes, cave with active stream, uvalas, underground rivers, cockpits, karst plateau
3. Rajah Sikatuna	Bohol	Caves, sinkholes, isolated mogotes
4. El Nido	Palawan	Cave, marine karst tower
Natural Monument		
1. Chocolate Hills	Bohol	Conical karst hills, polje

Tab. 1: Protected karst areas

karst landscapes are recognized as such and whose protected status is clear (Fig. 2). The following summarizes some of these known protected karst areas.

Puerto Princesa Subterranean River National Park (PPSRNP) in Palawan features a spectacular karst landscape. "More than 90% of the park comprises sharp, karst limestone ridges around Mount St. Paul which is itself part of a series of rounded, limestone peaks aligned on a north-south axis, along the western coast of Palawan" (WCMC 2000). The principal feature of PPSRNP is its more than 8-kilometer long underground river (Fig. 3). A distinguishing feature of this underground river is that "it emerges directly into the sea, and that the lower portion of the river is brackish and subject to tidal influences" (IUCN 1999). In 1991, the Philippine Government nominated PPSRNP as a UN Natural World Heritage Site but the nomination was deferred upon the recommendation of IUCN since the proposed area was deemed

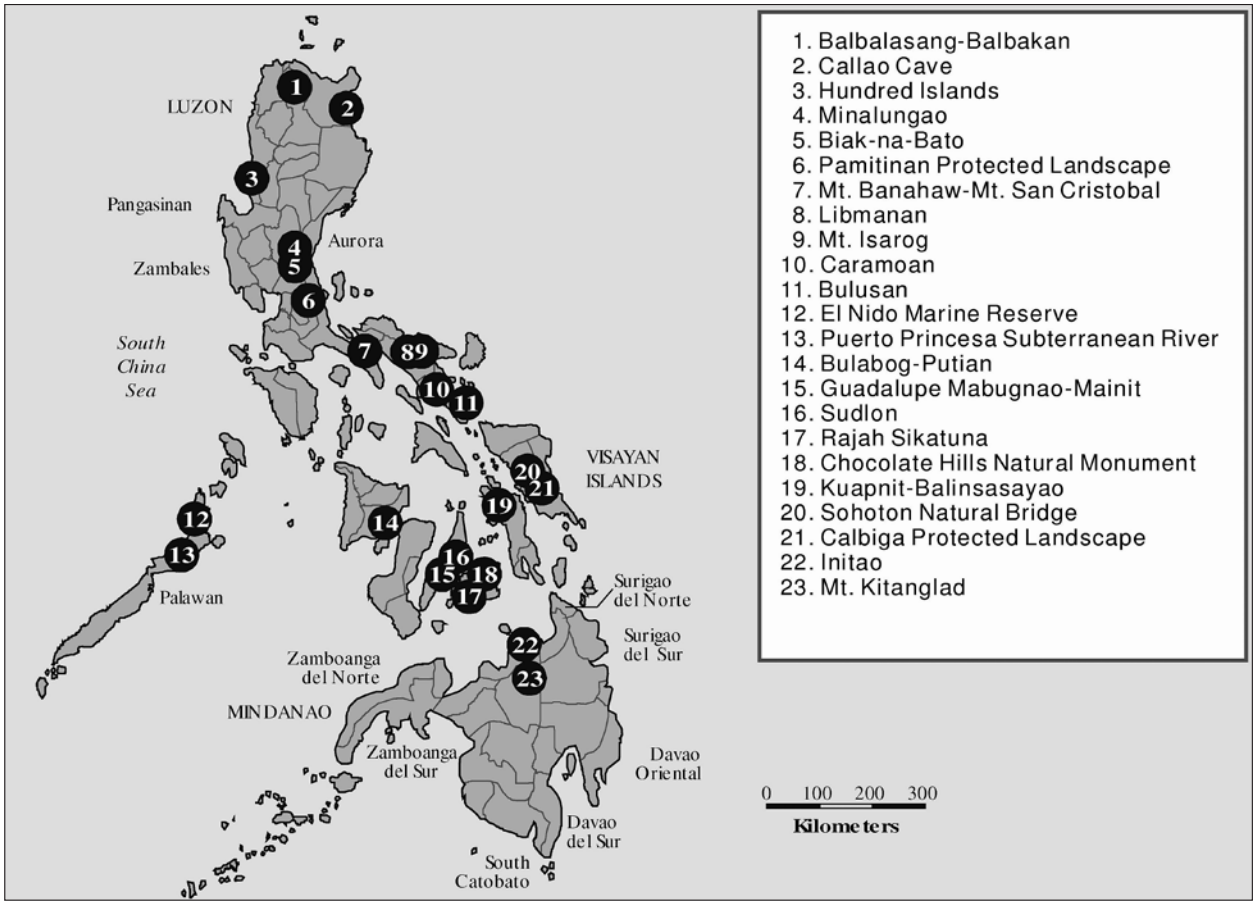

Fig. 2: Protected karst areas in the Philippines

too small by the IUCN Technical Evaluation Team to adequately protect its underground river watershed and to ensure the long-term viability of its significant biodiversity (PPSRNP 2000; IUCN 1999). In 1999, the area of the park was increased from its original mere 3,901 hectares to 22,202 hectares through Proclamation Order No. 212 (DENR 2000). This paved the way for its inscription as a Natural World Heritage Site in November of that year. The expansion of its boundary, however, brought some consequential resource use conflicts between the mandates of the park and the livelihood needs of the people whose lands have been included in its expanded boundary (Restificar 2004). Its importance as a distinctive geological feature is further recognized in 2004 when the National Committee on Geological Sciences (NCGS) declared it as a National Geologic Monument.

Samar Island Natural Park (SINP), which covers an area of about 333,300 hectares, including 37 municipalities and one city, was in 2003 declared a protected area under the NIPAS Act (Labro 2003). Several of the country's most significant karst landscapes are located in

Fig. 3: The outflow of the St. Paul Cave underground river

this area, in particular the Calbiga karst, which is one of the largest known karst areas in the country (eLGU 2004; IUCN Karst Project: Philippines undated). The Calbiga karst covers an area of about 900 km^2 (Balázs 1973) and, within this, the Calbiga Cave Protected Landscape, which was included in the NIPAS list in 1997, covers an area of 2,968 hectares (PAWB 2004c). The Calbiga Cave Protected Landscape includes 12 caves, the largest of which is the 5 km long Langun-Gobingob System (eLGU 2004; IUCN Karst Project: Philippines undated). Sohoton Natural Bridge National Park also includes Pahulugan Cave, Sohoton Cave and Bugasan Cave plus spectacular limestone formations, including the limestone bridge whence the name Sohoton (which means "to pass through") was derived (PAWB 1997).

Conical karst hills, which are aptly called Chocolate Hills, are the most dominant feature of the karst landscape of central Bohol (Fig. 4). The Chocolate Hills Natural Monument, covering an area of about 1,776 hectares, was inscribed as a National Geologic Monument in 1988 by NCGS, and as a protected area under NIPAS in 1997. The Chocolate Hills Natural Monument consists of about 1,268 more-or-less symmetrical, haycock-shaped hills that rise some 30 meters above the surrounding ground. The plains around these conical hills have been transformed into thriving rice-growing landscapes that are "connected to the less accessible mountain tracts" by "karst-springs at their foot" supplying water for irrigation (Urich 1989; Uhlig 1987). However, "Bohol's 500-year history of sustained karstland occupation is seriously threatened today by the pressures of population, inappropriate application of agricultural technologies, and civil strife" (Urich 1993).

Fig. 4: The Chocolate Hills of Bohol

The Rajah Sikatuna National Park in Bohol is one of the most recent additions to the country's list of protected karst areas. The Park was established in 1987 and was assigned an area of 9,023 hectares (PAWB 1997). "The Park's geology is based on two distinct units: Pliocene to Pleistocene-aged limestone in the west and Late Miocene-to-Pliocene-aged limestone in the east and northeast" – wherein two distinct suites of karst landform have developed (Urich & Bliss 1992). The younger limestone is dissected by discontinuous valleys, cockpits, isolated mogotes and extensive corrosion plains, while the Miocene-aged limestone is dominated by interfluvial valleys and extensive ridges, although both geologic units express similar subterranean and micro-karst features such as caves, sinkholes, subsurface drainage, estavelles and swallets (Urich & Bliss 1992). In 2000, the area was de-listed as a National Park and was designated a Protected Landscape instead. This change was made because the large number of people resident within its boundaries prevented the area meeting the criteria of a National Park. The area of the Rajah Sikatuna Protected Landscape is currently about 10, 452 hectares (PAWB, 2005).

The Hundred Islands of the Lingayen Gulf consist of the lower rocks of the "Kegel" karst type (Uhlig 1980). The Hundred Islands National Park consists of about 123 islands and covers an area of 1,676 hectares. The Hundred Islands was declared a national park in 1983 (PAWB 2004d), and a National Geological Monument in 2001 (NCGS 2001). It is a resort area that has a vibrant tourism industry.

END NOTES

1. A barangay is the smallest political unit in the Philippines.
2. One of the programs of the National Committee on Geological Sciences (NCGS) is the establishment of National Geological Monuments, which aims to ensure the protection and preservation of the country's geological structures and features with high scientific, educational or aesthetic value as well as to promote awareness of geology among the public (Virtucio undated).
3. The Regional Executive Director (RED) is a DENR official. REDs are designated as Chairmen of the PAMBs under the NIPAS Act of 1992.

POVZETEK

Do sedaj varstvo krasa ni bila prednostna naloga filipinske vladne politike, čeprav se to pričenja spreminjati. Čeprav se v tej državi zakonodaja le malo neposredno ukvarja z varstvom in ohranjanjem kraških področij, jih je nekaj zaščitenih posredno, ker so vključena v področja, zaščitena iz drugih razlogov. Nekaj kraških področij je zaščitenih zaradi estetskih in turističnih vrednot, nekaj drugih pa je vključenih v parke in rezervate.

Na Filipinih je sicer malo kraških področij, ki so prepoznavna zaradi kraških značilnosti in pomena za kras, vendar jih je vedno več posredno zaščitenih zaradi vedno boljše okoljske zakonodaje. Še več, kaže, da filipinska vlada priznava pomen neposredne zaščite krasa. Sprejem Zakona o urejanju in zaščiti jam in jamskih virov ter podpis Konvencije Združenih narodov o boju proti napredovanju puščav (UNCCD) sta pomembna koraka filipinske vlade, ki bosta neposredno koristila kraškim področjem. Čeprav se ti pravni akti ukvarjajo le s posebnimi kraškimi oblikami, lahko vodijo v programe in dodatne akte, ki bodo neposredno zaščitili kras po vsej državi.

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