WORLD HERITAGE NOMINATION – IUCN TECHNICAL EVALUATION

PHONG NHA – KE BANG NATIONAL PARK (VIETNAM) – ID N° 951Rev

Background note: The Phong Nha Nature Reserve was first nominated as a World Heritage site in 1998 and IUCN carried out a field inspection in January/February 1999. The complete IUCN evaluation report is attached in annex A.

The following is the decision of the Bureau at its twenty-third ordinary session (July 1999):

"The Bureau noted that the nominated area has potential value as a World Heritage site under natural criteria (i) and (iv) on the condition that it was expanded to include the larger Phong Nha/Ke Bang National Park with an associated fully integrated management structure. The site is part of an extremely complex and ancient karst plateau with high geodiversity which also encompasses Ke Bang and Hin Namno karsts. The reserve is largely covered in tropical forest with a high level of biodiversity and endemic species. Lack of research means that the true significance of the biodiversity and geology of the area cannot be fully assessed. The area on its own is not considered to meet World Heritage criteria. However, if jointly nominated with the Hin Namno karst ecosystem in Lao PDR, the combined site would constitute the largest surviving area of karst forest in South-east Asia and may merit World Heritage status.

The Bureau decided to ***defer*** *a decision on the site, pending review of the possibility of expanding the boundaries of the site as proposed. It is also strongly recommended that there be discussions with the Lao PDR State Party with a view to further expanding the boundaries of the site, at a later stage, to include the Hin Namno Karst reserve of Lao PDR and any other relevant areas."*

The site was thus subject to a revised nomination submitted in 2000 including a much larger area. At this time, however, the State Party also advised that it would be constructing the north-south Ho Chi Minh Highway and a link road between the Highway and Route 20 that bisects part of the core area of the Phong Nha Nature Reserve. When the Government of Vietnam made public its plans for road construction in the Reserve a number of organizations (e.g. IUCN, Flora and Fauna International) urged caution and advised the Government of the potential impact of roads on the conservation values of the area and, in particular, the potential loss of outstanding values. Consideration of the nomination, therefore, did not proceed further at that time.

Additional information was submitted in May 2002, announcing the decision of the Prime Minister of Vietnam (December, 2001) on the upgrading of the Phong Nha – Ke Bang Nature Reserve to the Phong Nha – Ke Bang National Park with a total area of 85,754 ha; providing information on projects for the conservation and development of the Park and revised maps. This revised nominated site has a much smaller area than the 2000 nomination, though still relatively larger than that of 1998. The size of the area proposed in each of the three nominations varies, as set out in Table 1 below.

1998	Phong Nha Nature Reserve	41,132 ha.
2000	Phong Nha – Ke Bang National Park	147,945 ha.
2002	Phong Nha – Ke Bang National Park	85,754 ha.

Table 1. Size of the area proposed in each new or revised nomination

1. DOCUMENTATION

i) **IUCN/WCMC Data Sheet:** 13 references

ii) **Additional Literature Consulted**: Many of the references cited in the 1999 evaluation remain relevant, but only those recently and directly utilized are repeated here. Wikramanayake, E.D. et al., 2002, **Terrestrial Ecoregions of the Indo-Pacific: A conservation Assessment.** Island Press; Cao Van Sung & Le Quy An (eds.) . 1998. **Environment and Bioresources of Vietnam,** Gioi Publishers; WWF, *LINC*. 1998. **Linking Hin Namno and Phong Nha through Parallel Conservation**; Timmins, R.J., Do Tuoc & Trinh Viet Cuong. 1999 **A preliminary assessment of the conservation importance and conservation priorities of the Phong Nha - Ke Bang proposed national park, Quang Binh Province, Vietnam**. Flora and Fauna International. Hanoi; Meijboom, M. & Ho Thi Ngoc Lanh. 2002. **He Dong – Thuc Vat / O Phong Nha – Ke Bang Va Hin Namno.** Phong Nha-Ke Bang National Park with WWF; Gilmour, D.A. & Nguyen Van San. 1999. **Buffer Zone Management in Vietnam.** IUCN Vietnam; Pham Khang. 1985. The development of karst landscapes in Vietnam**. Acta Geologica Polonica**. 35 (3-4). pp 305-319; Anon. 1999. Geology of the Phong Nha – Ke Bang Area. Unpublished Paper; Do Tuyet. 1998. Overview on Karst of Vietnam, in Daoxian, Y & & Zaihua, L. (eds.) **Global Karst Correlation, Science Press, Beijing.** pp. 179-192; Drew, D. & Hotzl, H. (eds.) 1999. **Karst Hydrogeology and Human Activities: Impacts, Consequences and Implications.** Balkema; Nguyen Quang My & Limbert, Howard. 2002. **Ky Quan Hang Dong Vietnam** (The Wonders of Vietnamese Caves). Trung Tam Ban Do Va tranh Anh Giao Duc.

iii) **Consultations:** 5 external reviewers. Additional consultations were held with staff of Flora and Fauna International; many individual speleologists; Senior officials of the Department of Conservation and Museology (DOCAM), Vietnam; Geologists from the Karst Studies Group of the Research Institute of Geology and Mineral Resources; Park staff and senior officials from many branches of the Quang Binh Provincial People's Committee; the Chairmen and others from the communes of Son Trach and Xuan Trach.

iv) **Field Visit:** E. Hamilton-Smith, January 2003. E. Hamilton-Smith and H. Friederich, January-February 1999.

2. SUMMARY OF NATURAL VALUES

The Phong Nha – Ke Bang National Park (PNKB) covers a total area of 85,754 ha, including three zones:

Strictly protected zone	64,894 ha
Ecological recovery zone	17,449 ha
Administrative service zone	3,411 ha

It is bounded on the west by the Lao People's Democratic Republic (PDR), and consists of a limestone plateau and hills. The limestone province extends to and adjoins the Hin Namno and Khammoune karst of Lao PDR. Both sectors are rich in large, often spectacular and scientifically significant caves.

The Phong Nha–Ke Bang karst has evolved since the Palaeozoic (some 400 million years ago) and so is the oldest major karst area in Asia. It has been subject to massive tectonic changes, and comprises a series of rock types that are interbedded in complex ways. Probably as many as seven different major levels of karst development have occurred as a result of tectonic uplift and changing sea levels, thus the karst landscape of PNKB is extremely complex with high geodiversity and many geomorphic features of considerable significance. Like much of Vietnam, it has been subject to extensive tectonic change, and so the limestones of Phong Nha are inter-bedded with a number of other rocks. There is also strong evidence that sulphurous solution and hydrothermal action have played an important role in shaping the broad-scale landscape and the caves, though this has not yet been properly assessed.

The incorporation of the Ke Bang forest into the park has added another very important dimension. This sector has many "fossil" caves at a high level, which occur when the groundwater and rivers move to a lower level. Like many such caves, they are probably repositories of a great deal of palaeontological and geomorphological scientific evidence. Only a very few have been visited to date and based on the limited information available it is possible to say that some of these caves have ancient deposits of geological importance, some have unusual calcite (and perhaps other) mineral displays, and some are home to bat populations and a diversity of cave-adapted invertebrates still to be properly studied.

Special problems arise in assessing the biodiversity of the site. It is a sample of the Northern Annamites eco-region, one of the most important eco-regions of the Indo-Pacific (Wikramanayake et al.). A large number of faunal (568 vertebrate) and floral (876 vascular plant) species, including some endemic to the site (13 species of plants and 7 species of primates), are listed in the 2000 nomination document. However, systematic assessment began only five years ago and collections have been limited. Statistical analyses of the rate at which new species have been added to the fauna indicate that many more will be discovered and identified. Field workers also report the collection of currently undescribed species. For example Timmins *et al.* and others have been locating new species on a virtually daily basis right up to the end of each period of fieldwork, suggesting that many species remain to be found. More importantly, many of the species that have been identified are considered to be extremely rare and little known.

It should be noted that knowledge of the PNKB is remarkably limited, and this has constrained both the preparation of the nomination document and the IUCN evaluation.

3. COMPARISON WITH OTHER AREAS

3.1. Karst Areas and Geomorphology

Most of the 41 existing World Heritage sites containing karst are in temperate regions and include Skocjan Caves (Slovenia); Caves of the Aggtelek Karst/Slovak Karst (Hungary/Slovakia); Plitvice Lakes National Park (Croatia); Canadian Rocky Mountain Parks and Nahanni National Park (Canada); Mammoth Cave National Park and Grand Canyon National Park (USA); Te Wahipounamu (New Zealand); Huanglong and Jiuzhaigou Valley (China); Tasmanian Wilderness and Fossil Mammal Sites (Australia); and East Rennell World Heritage site (Solomon Islands) which is an insular tropical site in the South Pacific. None of these can be compared with Phong Nha as they have very dissimilar geologic, geomorphic, climatic and biotic conditions.

However, comparison with the karsts of the wet tropics of South-east Asia is realistic. Many of these areas, like Phong Nha, are located within large and spectacular limestone plateaux, and the caves have often only been recognised and explored in recent years. Some have been the subject of considerable scientific research, and have been proven to be significant on a wide range of criteria. Three areas have recently been inscribed to the World Heritage List:

- Gunung Mulu National Park World Heritage site in Malaysia, has caves and underground river systems of greater international importance than those of PNKB. It has a rich biodiversity, but from a totally different faunal province to that at Phong Nha.

- St. Paul Subterranean Park on Palawan in the Philippines is again centred about a large underground river, but it is a relatively young (in geological terms) and simple system.

- The Massive Baliem River karst of the Lorentz National Park World Heritage site of West Irian in Indonesia is even less investigated than PNKB but is again totally different in character as it has been influenced by glaciers and it is combined with metamorphosed oceanic sediments of Cretaceous and Eocene origin.

Other Southeast Asian karst areas of note include large sites found in Vietnam and China; the Niah Caves and Gomantong of East Malaysia, each of great biodiversity and palaeontological / archaeological significance; many karst areas of Indonesia, including the famous Gunung Sewu of Java – one of the archetypal tropical karst landforms; Papua New Guinea, with extensive cave systems and underground rivers such as those of Atea Kanada, Mamo Kanada, Selminum Tem and the Nakanai mountains of New Britain; many of Thailand's National Parks and major areas of largely unexplored karst in Lao PDR.

However, many of these are both younger and much less complex areas, which do not rival PNKB in their contribution to understanding the geological history of the region. Of these areas, the only one that is of very similar character to PNKB is the adjacent Hin Namno and Khammoune karst of Lao PDR.

On broad criteria that take into account the totality of the karst system, PNKB must be seen as one of the most significant karst sites in south-east Asia. As in many other aspects of the site, there is, however, a lack of knowledge and previous research, so the significance of the site will only be fully identified and demonstrated when the site has been researched as thoroughly as many others have been.

3.2 Biodiversity

There are three other forest protected areas in South-east Asia which have World Heritage status: the Thungyai-Huai Kha Kheng Wildlife Sanctuaries in Thailand (Tropical Dry Forest); the Ujung Kulon National Park in Indonesia (Tropical Moist Forest); and the 3.5 million ha Lorentz National Park in Indonesia (West Papua province). This latter is the largest protected area in South-east Asia and includes one of the largest expanses of tropical forest in that region. The forest biodiversity values of PNKB as currently known are probably less rich than these three sites. However, if the nominated area were expanded, especially by linking it with the Hin Namno and Khammoune karst ecosystems of Lao PDR (both existing protected areas), then this would constitute an area of extremely high significance for forest biodiversity conservation. Adjoining forests in Lao PDR have been identified as priority areas for conservation and protect forest ecosystems, and exhibit high levels of species endemism. Such a transboundary protected area system would constitute one of the largest surviving areas of karst forest in South-east Asia, totalling 317,754 ha.

4. INTEGRITY

4.1 Site Integrity

Although considerable progress has been made in protection of the surface environment, the rugged nature of the country, difficulty of control, low income of many local families and relative shortage of resources for control purposes mean that wildlife poaching and illegal timber gathering are difficult to eliminate. Staff have been making great efforts to improve the protection regime, but this remains a challenging issue, particularly considering the demand associated to the growing 'wild meat' market.

4.2 Road Construction

In the 1999 evaluation report of the site (annex A), IUCN noted serious integrity concerns with the proposed road construction project. The project includes two different elements: the Ho Chi Minh Highway and the connection road between the Highway and the Route 20 (see attached map).

- The Ho Chi Minh Highway is clearly justifiable, appropriately located, outside and to the north of the nominated area, and has been constructed with a high level of environmental responsibility. It will provide an important benefit to the National Park in opening up views of and access to the Ke Bang forest area. It also greatly enhances year-round traffic flow from North to South of the country as a whole, with related benefits.

- Regrettably, the road that provides a link between the highway and Route 20 is a very different matter. The road is likely to carry little traffic and is used mainly for the movement of cattle and other domesticated animals, which raises the question of its necessity. It is most unlikely that any benefits will affect the immense economic and environmental costs of its construction. Its location, crossing through core natural areas of the site, is environmentally insensitive and inappropriate, running along the Chay River valley and destroying strategic wildlife habitats, then cutting across and through dominant geomorphic landforms of the park. Also, given the well documented negative impacts of new roads in protected areas (encroachment, removal of timber and non-timber forest products, increased wildlife hunting and trade), the task of park management and monitoring will be substantially increased.

The construction of this connecting road has inevitably faced considerable difficulties and this is reflected in the severe environmental impacts of the construction. It is a striking contrast with the care exercised along the main highway. Major impacts include:

- important faunal habitats have been destroyed, and there is a extensive swathe of vegetation destruction;

- enormous cuttings impact upon the landforms and geomorphic quality of the route (in a letter to UNESCO dated 15 December 2000, Fauna and Flora International advised that 4.5 tonnes of explosives per kilometre would be needed for construction);

- aesthetic considerations have been ignored; and

- the large-scale soil erosion along the route has led to sedimentation of the groundwater system and the surface streams which emerge from the plateau, e.g. through the Phong Nha Cave. This is not only likely to alter patterns of groundwater movement and the continuing evolution of the cave system, but in particular will have major impacts upon the biodiversity of the groundwater and in turn that of the emergent streams.

4.3 Boundaries

The watershed is not fully included in the nomination, and as the integrity of any karst area is dependent upon the quality and quantity of the water input, this is a matter of concern. Moreover, the current boundary appears to be arbitrary and needs to be further reviewed and expanded to ensure it can more effectively protect natural values, including large areas to maintain viable populations of species such as the tiger and the Asiatic Black Bear.

It is emphasized that both the 2000 and 2002 nomination dossiers have given due attention to the identification of a properly delineated buffer zone. However, IUCN is not aware of any documentation of the regulations and managerial procedures for these buffer zones.

IUCN would recommend the State Party to consider two strategies to address these serious issues:

- Extending the boundaries to those proposed in the 2000 nomination, returning the park to the 147,945 ha as proposed by the State Party at that time.

- Promoting a transboundary agreement with the Lao PDR that would integrate PNKB and Hin Namno, either as two parks operating on agreed and equivalent management protocols or with fully integrated management. It is recognized that this will be a long process and will demand further resource inputs. This is particularly true in Lao PDR as on-ground management is still at the early stages of development. But should such integration take place it would result in the most important karst protected area of Southern Asia.

4.4 Visitor management

A visitor management plan does not exist for the site but information made available during the field inspection is cause for some concern. It suggests a more-or-less opportunistic development of attractions scattered throughout the park as opposed to systematic planning for current and future sites for recreation and visitation. Clearly Phong Nha Cave already offers a major opportunity for visitation. The strikingly beautiful Hang Vom probably provides the best (and only viable) basis for another cave-based visitor's experience foreseen

for the site. The very different character of the Ke Bang area provides a valuable opportunity for a soundly based ecotourism programme, yet this is not considered in the current plan.

It is also proposed by the Provincial authorities that a series of associated and complementary attractions should be developed at the Phong Nha park entrance. While these may be economically viable, it is not at all clear how they would forward the objective of experiencing the values of the park itself. A botanic garden, for instance, might be much better located in Dong Hoi, on the North-eastern border of the Park, while the park budget might be better spent on the development of boardwalks and focal points within the park itself.

5. ADDITIONAL COMMENTS

The broad and specific conservation values of PNKB have been recognized for many years and, as indicated above, ongoing research has confirmed the regional and global importance of the area. Acknowledgement of the high value of the area has led the State Party to submit the area for World Heritage nomination. However, as noted above, the link road between the Ho Chi Minh Highway and Route 20 has been constructed and appears to have resulted in substantial damage to key values of PNKB, damage that – in the view of the current evaluation – would be difficult to repair in order to return the area to its original ecological and geomorphological condition. The fact that this happened during the period of re-nomination and review of the PNKB nomination unfortunately brings into question the State Party's commitment to maintaining the World Heritage values should the site be listed.

6. APPLICATION OF WORLD HERITAGE CRITERIA

PNKB has been nominated under natural criteria (i) and (iv).

Criterion (i): Earth's history and geological features

IUCN reiterates its recommendation from the 1999 evaluation report (see Annex A) that "the nominated site has potential to meet criterion (i), however the potential value for World Heritage would be greater under criterion (i) if the nominated area was linked to the Hin Namno karst reserve in Lao PDR".

Criterion (iv): Biodiversity and threatened species

As noted in Section 2, information arising from research on flora and fauna that is occurring within the site highlights its importance for biodiversity conservation. However, the nominated site, despite it being larger than that nominated in 1998, is still too small to provide adequate protection for threatened species such as the tiger and the Asiatic Black Bear. Thus IUCN does not consider that the nominated site by itself meets this criterion. However, if the site is expanded the revised area may have potential to meet this criterion. The further consideration of a transboundary site with Hin Namno and Khaummoune protected areas in Lao PDR would considerably enhance the potential of the site to meet criterion (iv).

As noted in Sections 4 and 5 the nominated site does not meet the Conditions of Integrity.

7. RECOMMENDATIONS

7.1 The impact of the link road construction through Phong Nha - Ke Bang National Park is a major new factor in the evaluation of the site since it was nominated in 1998 and re-

nominated in 2000. IUCN, therefore, recommends that the World Heritage Committee **defer** the decision on Phong Nha - Ke Bang National Park.

IUCN recommends the Committee to urge the State Party to undertake an independent assessment of the impacts of the road construction so as to:

- determine the precise nature and scope of the impacts of the link road construction on the biodiversity, landscape and karst geomorphological values of the site;
- determine whether and how identified impacts can be mitigated and the site's values restored; and
- assess if exclusion of the area impacted by the link road construction from the Phong Nha - Ke Bang National Park is a feasible option for the viability and integrity of the World Heritage nomination, should restoration / mitigation not be possible.

7.2 IUCN also recommends that the Committee reiterates the request made to the State Party in the 1999 evaluation of this site, to review the boundaries of the nomination, as noted in point 4.3 above, so as to provide more complete coverage of natural values and karst geomorphological processes.

7.3 IUCN recommends that the Committee request the State Party to prepare and submit:

- a visitors management plan for the site;
- information on the regulations that apply to the management of the buffer zone, and
- information on enforcement measures and other actions that will be taken to control illegal poaching.

7.4 IUCN recommends that the Committee reiterates the request made in 1999 to the State Party to continue dialogue on a transboundary agreement with the State Party of Lao PDR that would integrate Phong Nha–Ke Bang and Hin Namno National Conservation Area, either as two parks operating on agreed and equivalent management protocols or with integrated management. This might form the basis of a potential transboundary World Heritage site.

Annex A – IUCN evaluation report 1999

IUCN TECHNICAL EVALUATION REPORT FROM 1999 PHONG NHA CAVE (VIETNAM)

1. DOCUMENTATION

i) **IUCN/WCMC Data Sheet** (13 references)

ii) **Additional Literature Consulted**: Deharveng, L. 1999. **Phong Nha Cave Biodiversity**. Unpublished Report. 3p; Government of the Socialist Republic of Vietnam and Global Environment Facility**.** 1994. **Biodiversity Action Plan for Vietnam**. Hanoi; Dillon, T.C. & Wikramanayake, E.D. 1997. **A Forum for Trans-boundary Conservation in Cambodia, Laos and Vietnam**. WWF, Hanoi and Washington. Project VIE/91/G31-1994; Limbert, H. 1992. The caves of Phong Nha and Hang Toi, Quang Binh Province, Vietnam. **The International Cave.** Vol. 2. pp 4-9; Limbert, H. 1992. Vietnam 1992, Return to the river caves of Quang Binh. **The International Caver**. Vol. 5. pp 19-25; Limbert, H. 1994. **Vietnam 1994.** The 1994 British/Vietnamese Speleological Expedition Report. Privately published; Limbert, H. 1994. Vietnam: A Caver's Paradise. **The International Caver.** Vol. 12. pp 3-9; Limbert, H. 1997. Vietnam '97. **The International Caver**. Vol. 20. pp 11-18; WWF, *LINC*. 1998. **Linking Hin Namno and Phong Nha through Parallel Conservation**. WWF Indochina Programme. Hanoi; Nguyen Quang My & Vu Van Phai. n.d. **Cavern Tourism in Vietnam***;* Pham Khang. 1985. The development of karst landscapes in Vietnam**. Acta Geologica Polonica**. 35 (3-4). pp 305-319; Nguyen Van Thang. ed. 1997. **Danh gia hien trang moi truong khu bao ton thien Phong Nha nam 1996-1997**; Multiple Authors. 1997. **Report of Field surveys on biodiversity in Phong Nha - Ke Bang Forest**. Mimeo Report. Hanoi. 84 p; Quang Binh Peoples Committee. 1998. **Investment Project: Establishment National Park Phong Nha-Ke Bang, Quang Binh**. Mimeo report; Timmins, R.J., Do Tuoc & Trinh Viet Cuong. in prep. **A preliminary assessment of the conservation importance and conservation priorities of the Phing Nha - Ke Bang proposed national park, Quang Binh Province, Vietnam**. Draft Report only, to be published by Flora and Fauna International. Hanoi; Vermeulen, J. & T. Whitten. eds. in prep. **Impacts of industrial use of limestone resources on biodiversity and cultural heritage (in East Asia).** Draft Report only of the joint World Bank-IUCN project, together with various background papers; Watson, J. *et al.* 1997. **Guidelines for Cave and Karst Protection**. IUCN.

iii) **Consultations:** 5 external reviewers. Staff of: CNRS, France; Gunung Mulu Caves, Malaysia; WWF Vietnam; University of Sydney; Nottingham Technological University; and the Geological Society of Australia. Individual speleologists and historians. Senior officials of the Department of Conservation and Museology (DOCAM), Vietnam. Park staff and senior officials form: Quang Binh Provincial People's Committee; Department of Science, Technology and Environment; Phong Nha / Ke Bang Program; Phong Nha Forest Protection Division; Relics and Landscape Management Board within Department of Culture and Information; Provincial International Relations Department; and the Department of Science, Technology and Environment.

iv) **Field Visit:** January-February 1999. Elery Hamilton-Smith, and Hans Friederich.

2. SUMMARY OF NATURAL VALUES

The Phong Nha Nature Reserve (PNNR) is situated on the edge of the Phong Nha/Ke Bang Karst plateau in Central Vietnam. It is only part of the total plateau, which extends to and adjoins the Hin Namno karst of Laos. Phong Nha contains many caves, 17 of which have been explored and mapped by members of the British Cave Research Association, in conjunction with the University of Hanoi. Many caves are large and spectacular, and together they total (to date) some 65km. in length. However, investigation has so far been limited to mapping the extent of the caves, which in itself is a major undertaking.

The karst landscape of (PNNR) is an extremely complex and ancient one, with high geodiversity and some geomorphic features of considerable significance.

The reserve is largely covered by tropical forest, and although this was severely damaged by fire during the war, it is recovering rapidly and is now in a healthy state. It has a high level of biodiversity and endemic species. Data also indicates a high level of faunal diversity. The nomination documentation reports that:

- there are currently 735 vascular plants recorded in 413 genera and 140 families;
- preliminary faunal surveys have identified 461 vertebrate species, comprising 65 species of mammals, 260 bird species, 53 reptile species, 22 amphibians and 61 freshwater fish.

In summary, it must be emphasised that knowledge of the Phong Nha area is remarkably limited, and this has constrained both the preparation of the nomination document and the IUCN evaluation.

3. COMPARISON WITH OTHER AREAS

3.1. Karst Areas and Geodiversity

Attention to date on karst features has concentrated upon the caves, but the surface features, and in particular a large polje (a flat floored area surrounded on all sides by steep limestone hills), are considered to be of greater importance.

Most existing World Heritage sites containing karst are in temperate regions and include Skocjan Caves (Slovenia); Caves of the Aggtelek Karst/Slovak Karst (Hungary/Slovakia); Plitvice Lakes National Park (Croatia); Canadian Rocky Mountain Parks and Nahanni National Park (Canada); Mammoth Cave National Park and Grand Canyon National Park (USA); Te Wahipounamu (New Zealand); East Rennell (Solomon Islands); Huanglong and Jiuzhaigou Valley (China); Tasmanian Wilderness and Fossil Mammal Sites (Australia).

None of these can be justly compared with Phong Nha as they have vastly dissimilar geologic, geomorphic, climatic and biotic conditions. It is interesting that the surface topography of Phong Nha is not unlike that of Skocjanske (source of the term karst, and generally seen as the classical karst site) but the geologic structure and processes are vastly different. Ha Long Bay in Vietnam is an outstanding example of partly submerged towerkarst, and is totally different from Phong Nha. These are other karst areas under consideration by IUCN in 1999. These include the Alejandro do Humbolt National Park and the System of Marine Terraces of Cabo Cruz and Maisi, both in Cuba. Neither are directly comparable with Phong Nha. These two occur within an island ecosystem and do not have the complexity and diversity of karst geomorphology.

Turning to the karsts of the wet tropics in the South-east Asian region, one can much more justly make comparisons. Many of these areas, like Phong Nha, are located within large and spectacular limestone plateaux, and the caves have often only been recognised and explored in recent years. However, many have been the subject of considerable scientific research, and have been proven to be significant on a wide range of criteria. Three areas are currently in the process of consideration for World Heritage status:

- In East Malaysia, the Gunung Mulu Caves have National Park Status, have river systems which dwarf those of Phong Nha, and have the world's largest cave chambers and passages;
- St. Paul Subterranean Park on Palawan in the Philippines; and
- The Massive Baliem River karst of the Lorentz National Park of West Irian.

Other Asian karst areas of note include:

- Many regions of China, particularly in the South, and including the remarkable tower karst of Guangxi, have immense and complex karst systems;
- Niah Caves of East Malaysia with their great biodiversity and palaeontological/ archaeological significance;
- Gomantong, also in East Malaysia, with its truly significant geomorphic character, including cave passages of over 200m. in height and a remarkable biodiversity;
- Many karst areas of Indonesia, including the famous Gunong Sewu of Java – one of the archetypal tropical karst landforms;
- Neighbouring Papua New Guinea, which is at a very early stage of environmental management, has extensive cave systems and underground rivers such as those of Atea Kanada, Mamo Kanada, Selminum Tem and the Nakanai mountains of New Britain;
- Finally, many of Thailand's National Parks contain cave systems. There are some thousands of identified and documented caves, many of which are immense in size, very often richly and beautifully decorated, and many with well-researched biodiversity and important archaeological sites; and
- Major areas of largely unexplored karst in Laos.

However, all of these are less complex, and many of them probably younger, karst systems than those of Phong Nha. In brief, although the nomination document emphasises the extent to which the caves of Phong Nha are large and striking, they are in themselves no more and sometimes much less so than many other sites throughout SE Asia. On broader criteria which take into account the totality of the karst system, Phong Nha must be seen as possibly one of the most significant karst sites in south-east Asia. As in virtually all aspects of the site, there is a great lack of knowledge or previous research, so the significance of the site can only be fully identified and supported when the Nature Reserve is researched as thoroughly as many others have been.

3.2. Forest Biodiversity

There are two other forest protected areas in South-east Asia which have World Heritage Status: the Thungyai-Huai Kha Kheng Wildlife Sanctuaries in Thailand (Tropical Dry Forest) and the Ujung Kulon National Park in Indonesia (Tropical Moist Forest). The 3.5 million ha.

Lorentz National Park has been nominated as World Heritage this year. This is the largest protected area in South-east Asia and includes one of the largest expanses of tropical forest in South-east Asia. The forest biodiversity values of Phong Nha, on its own, does not compare favourably with these existing and proposed sites. However, if the nominated area were linked with the Hin Namno karst ecosystem of Lao PDR, then this would constitute an area of high significance for forest biodiversity conservation. Adjoining forests in Lao PDR have been identified as priority areas for conservation and protect forest ecosystems, which exhibit high levels of species endemism. Such a trans-boundary protected area system would constitute the largest surviving area of karst forest in South-east Asia. It is thus recommended that such an expansion should be considered by the State Party in conjunction with the government of the Lao PDR.

4. INTEGRITY

PNNR was established in 1986. By 1991, the reserve area had been expanded to the current total of 41,132ha, and a management plan has been approved for the reserve. The research summary of the plan, although adequate, highlights the lack of information on natural values within the nomination site.

The management board of the Reserve, responsible for protection of forest resources and biodiversity was set up in 1994. Cave conservation and the provision of a tourism service are the responsibility of the Phong Nha Historical Relic and Landscape Board. A total of 26 staff are engaged in management and protection of the reserve. The 1999 IUCN review mission noted a high standard of cave management and a dedicated and committed staff working in the reserve.

However, there are some major problems in relation to site integrity:

- Although considerable progress has been made in protection of the surface environment, the rugged nature of the country, difficulty of control, low income of many local families and relative shortage of resources for control purposes mean that wildlife poaching and illegal timber gathering will be extremely difficult to eliminate. Staff are making great efforts to progressively make the protection as strict as possible but this remains a challenging issue;

- IUCN is particularly concerned that road #20 traverses the site and provides ready access to core areas. It is also used for the movement of cattle and other domesticated animals, and so, in various ways, it seriously threatens the integrity of the site. Further, these is a proposal to upgrade this road and IUCN strongly suggests that an alternative route be found which by-passes the nature reserve; and

- The watershed is not included in the nomination, and as the integrity of any karst area is dependent upon quality and quantity of the water input, this is a matter of concern. More widely, the current boundary appears to be an arbitrary one, and needs to be reviewed, to ensure it can more effectively protect natural values.

5. ADDITIONAL COMMENTS

The nomination names the site as *Phong Nha Caves.* However, the nomination document deals with the Phong Nha Nature Reserve as a whole, and it is clear that this is the intended site, It also gives special attention to biodiversity of the surface environment, which may well prove to be far more significant than the caves. Accordingly, we recommend that the nomenclature of the site be amended at an early stage to ensure consistency.

The IUCN mission noted the lack of research and knowledge of the PNNR. Topographic mapping was inadequate and significant errors were noted in the available maps. All published information on the area and the nomination itself described a relatively young karst system, with a single-generation cave development and a corresponding simple overall geology and biology. However, the IUCN mission discovered that the area contains a very complex and ancient karst system. In addition, there are large outcrops of sandstone, laterite and shale, which have a significant impact on both the landscapes and the flora and fauna of the area. Detailed geological maps were not available.

One indication of the problem is that the work in progress by Timmins *et al.* is the first to survey the important bat populations. Further species were still being located on a virtually daily basis right up to the end of the field work phase, suggesting that many species remain to be found. More importantly, many of the species which have been identified are considered to be extremely rare and little known.

6. APPLICATION OF WORLD HERITAGE NATURAL CRITERIA

Each of the four criteria are dealt with in turn below:

Criterion (i): Earth's history and geological features

The nomination lists this as one of the criteria for inscription, but no real evidence was presented to support this. On inspection, it is now clear that the simple description of the area provided in the nomination document is an over-simplification; the evolution of the landscape and caves has been both discontinuous and complex. Unlike other karst areas in Vietnam, which generally consist of tower karst, Phong Nha is probably best described as part of a larger dissected plateau, which also encompasses the Ke Bang and Hin Namno karsts. Most importantly, the limestone is not itself continuous, but demonstrates complex interbedding with shales and sandstones. This, together with the capping of schists and apparent granites which has probably been thrust over the limestones and is now eroded to a remnant outcrop, has led to a particularly distinctive topography.

The caves alone demonstrate discrete episodic sequences of events, leaving behind various levels of fossil passages, some of them very high, and one of these in fact being near the summit of the plateau; formerly buried and now uncovered palaeokarst (karst from previous, perhaps very ancient, periods of solution); evidence of major changes in the routes of underground rivers; changes in the solutional regime; deposition and later re-solution of giant speleothems and unusual features such as sub-aerial stromatolites (speleothems which are shaped by interaction between blue-green algae and the deposition of calcite). In particular, the location and form of the caves suggests that they might owe much of their size and morphology to some as yet undetermined implications of the schists and granites which overlay the limestone and if so, this is an unusual feature in itself. There are also both re-sorted and layered schist-derived sands and granitic gravels in the caves.

On the surface, there is a striking series of landscapes, ranging from deeply dissected ranges and plateaux to an immense polje (a flat-floored and enclosed valley) This may be either a solutional or tectonic landform, but in the context of what is known about the geological history of the region, this suggests the karst system is an old and relatively mature one. There is evidence of at least one period of hydrothermal activity in the evolution of the karst. The plateau is probably one of the finest and most distinctive examples of a complex karst landform in SE Asia and, as already noted, has more in common with the Skocjan karst of Slovenia than with most other Asian karst landscapes.

Thus, there is, in brief, a large and unexpected amount of evidence of earth's history. Without further research, the significance of the site to science cannot be properly assessed. However,

it is potentially a site of very great importance for increasing our understanding of the geologic, geomorphic and geo-chronological history of the region. This is the highest priority for further research. IUCN considers this site has potential to meet criterion (i), however the potential value for World Heritage would be greater under criterion (i) if the nominated area was linked with the Hin Namno karst reserve in Lao PDR.

Criterion (ii): Ecological processes

The nomination document does not justify inscription under this criterion but given that the area is not well researched it is not possible to argue for inscription under this criterion at present.

Criterion (iii): Superlative natural phenomena, scenic beauty

Phong Nha is certainly a very large and spectacular cave system and is clearly of great significance at the national level. However, some of the claims made about size in the nomination are not accurate, and even if they were, size alone would not merit inscription. As noted above, even at the regional level, and given present knowledge, Phong Nha does not rival other caves in the region in terms of size or other significant characteristics.

But on turning to the site as a whole, the Nature Reserve is a superlative and distinctive example of mature karst. IUCN cannot identify other precisely comparable sites in the South-east Asian region. Taking the striking surface topography of the dissected plateau, the springs and rivers, the steadily developing quality of the forest and the striking beauty of the caves, all of which is based in the geomorphic and geological complexity of the site, it is a site of regional significance. IUCN considers that the nominated area does not have the necessary superlative features to warrant inscription under criterion (iii).

Criterion (iv): Biodiversity and threatened species

The nomination includes examples of the now rare tall lowland forest, which has almost disappeared from other countries in the region.

Although knowledge of the area is still limited, the number of identified species, in itself, is comparable with other South-east Asian rain forest, and in fact, better researched areas show even much greater diversity. However, more recent data made available (Timmins et al, in prep.) deals much more fully with the fauna and its status, particularly in relation to mammals and birds. It vividly demonstrates the impact of continuing and more intensive research. One problem is that this report included the Ke Bang area, and there are some difficulties in comparability - but bats and many of the larger mammals do not respect human boundary lines, and so many of the reported species probably do occur in Phong Nha. The currently known extent of endangered, or threatened species is detailed in the Table below.

	Listed in nomination document	Further species listed by Timmins *et al*	Total species
Mammals (excl. bats)	26	4	30
Bats	-	11	11
Birds	12	10	22
Reptiles and Amphibians	11	-	11

Table 1 - Species listed in the Red Books as vulnerable, rare, threatened or endangered, or otherwise very rare (hence recognised as data deficient)

Thus, the nominated area (and neighbouring lands) continue to support at least 73 important species, several of which are endemic to the limestone massif of which Phong Nha is part. In particular, it includes the total world population of François' Langur. However, the Nature Reserve is too small to provide adequately for protection of biodiversity, particularly of larger species such as the tiger, and so the moves to establish the larger Phong Nha/Ke Bang National Park must be seen as an urgent requirement. Similarly, the proposed trans-boundary integration with Hin Namno karst reserve of Laos, which will cover the whole of the Limestone plateau, is vital and urgent.

IUCN considers that the nominated area does not by itself meet World Heritage criterion (iv). However, if the area were to include the larger Phong Nha/Ke Bang National Park then this revised area would have strong potential for World Heritage under criterion (iv). The further addition of the Hin Namno Karst reserve, and other significant areas, in Lao PDR would also considerably enhance the status of this area as World Heritage.

7. RECOMMENDATION FROM THE TWENTY-THIRD ORDINARY SESSION OF THE BUREAU: JULY, 1999

At its twenty-third ordinary session, the Bureau noted that the nominated area has potential value as a World Heritage site under criteria (i) and (iv) on the condition that it was expanded to include the larger Phong Nha/Ke Bang National Park with an associated fully integrated management structure. The Bureau decided to **defer** a decision on the site, pending review of the possibility of expanding the boundaries of the site as proposed. It is also strongly recommended that there be discussions with the Lao PDR State Party with a view to further expanding the boundaries of the site, at a later stage, to include the Hin Namno Karst reserve of Lao PDR and any other relevant areas.

On 4 September, the Vietnam National Commission for UNESCO notified the World Heritage Centre of the State Party's intention to expand the nominated area to include the larger Phong Nha-Ke Bang National Park and establish a fully integrated management structure for the site.