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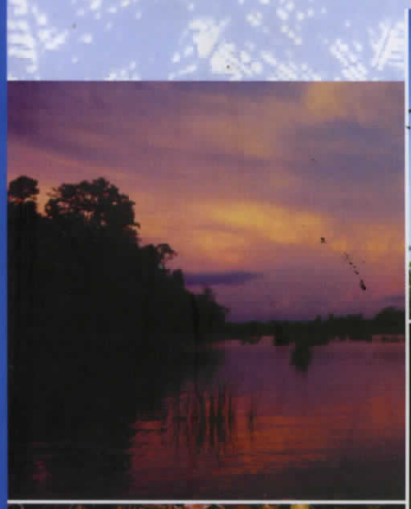
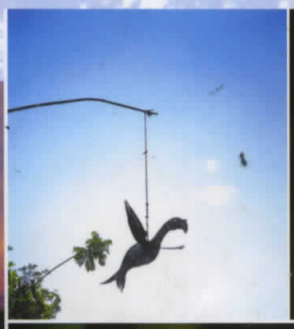
with financial support from Danida

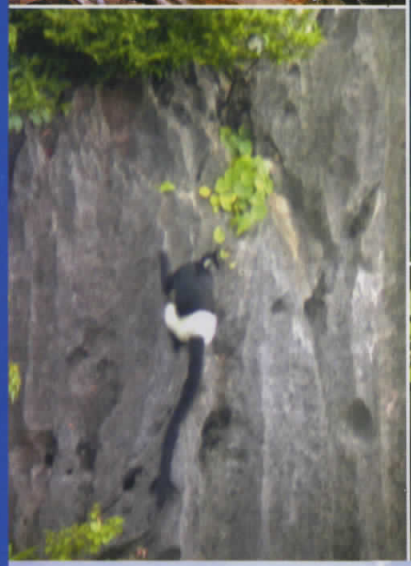
Directory of Important Bird Areas in Vietnam

KEY SITES FOR CONSERVATION






BirdLife INTERNATIONAL

VIỆN SINH THÁI VÀ TÀI NGUYÊN SINH VẬT

Danida

BirdLife International *in Indochina*
and the Institute of Ecology and Biological Resources
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Directory of Important Bird Areas in Vietnam

KEY SITES FOR CONSERVATION

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This publication is a technical output of the Danida-funded project *Improved conservation planning through institutional strengthening in Cambodia, Laos and Vietnam*.

Hanoi, November 2002

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Foreword

In recent years, Vietnam has captivated the world through the discovery of a remarkable series of new bird and mammal species. Sadly, however, as in many other regions of the world, rapid population growth and economic development are threatening the rich biodiversity for which Vietnam is so rightly famed. As a result, the need for accurate information on the country's biodiversity in a form accessible to decision makers becomes ever more urgent.

To address this need, the Research Institute of Ecology and Biological Resources and BirdLife International *in Indochina*, has undertaken the project *Improved Conservation Planning through Institutional Strengthening in Cambodia, Laos and Vietnam.* One of its main outputs of this project, which was supported by Danida (Danish International Development Assistance), has been the publication of the *Directory of Important Bird Areas in Vietnam.* The directory describes a network of Important Bird Areas (IBAs), the protection of which would go a long way towards the conservation of biodiversity and the wider environment in Vietnam. The directory draws attention to on-going conservation efforts at IBAs. The directory also highlights the need for continued and intensified conservation effort throughout the IBA network.

It is my hope that this directory will be of use for government agencies, donors and NGOs. On behalf of the Royal Danish Embassy, I warmly congratulate the Research Institute of Ecology and Biological Resources and BirdLife International *in Indochina* for their efforts.

Bjarne H. Sørensen
Ambassador of Denmark
Hanoi

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This directory is a technical output of the Danida-funded project *Improved conservation planning through institutional strengthening in Cambodia, Laos and Vietnam*. BirdLife International *in Indochina* and the Institute of Ecology and Biological Resources (IEBR) would like to take this opportunity to thank Danida and the Royal Danish Embassy, Hanoi, for their support.

The project *Improved conservation planning through institutional strengthening in Cambodia, Laos and Vietnam* was implemented by BirdLife International *in Indochina*. In Vietnam, the project was implemented in collaboration with IEBR. BirdLife would like to thank IEBR for their support, in particular Prof Vu Quang Con, director, Dr Le Xuan Canh, vice-director, and Dr Nguyen Cu, head of the zoological museum.

The Important Bird Area (IBA) programme in Vietnam is part of the global IBA programme, coordinated by BirdLife International. The editor wishes to thank Simba Chan, coordinator of the Asian IBA programme, Lincoln Fishpool, coordinator of the global IBA programme, Richard Grimmett, head of the BirdLife International Asia Division, and Jonathan Eames, programme manager of BirdLife International *in Indochina*, for their support and advice.

The directory is the result of the combined efforts of many people, some of whom worked voluntarily, all of whom worked beyond the call of duty. The editor would like to thank all of these contributors: Dr Nguyen Cu, Jonathan Eames, Neil Furey, Le Manh Hung, Ha Quy Quynh, Adam Seward, Le Trong Trai, Nguyen Duc Tu and Dr Corinthe Zekveld.

The information contained in the directory was compiled from published and unpublished literature, and communications with conservationists at government institutions, NGOs and protected areas, supplemented by a series of field surveys. The editor wishes to thank all those people who contributed information and, especially, the members of the field survey teams: Dr Pham Trong Anh, Dr Nguyen Cu, Le Trong Dat, Tran Thieu Du, Nguyen Dinh Dung, James Hardcastle, Le Manh Hung, Nguyen Viet Hung, Nguyen Cong Mao, Vu Hong Phuong, Tran Khac Phuc, Steven Swan, Pham Duc Tien, Vu Huu Trac, Nguyen Quang Truong, Nguyen Duc Tu, Cao Dang Viet and Nguyen Dinh Xuan.

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Conventions used

Conventions used

Bird names (common and scientific), sequence and species limits follow the *Annotated Checklist of the Birds of the Oriental Region*[1], except in the case of globally threatened, near-threatened and data deficient species, which follow *Threatened Birds of Asia*[2] and restricted-range species, which follow *Endemic Bird Areas of the World*[3]. Primate names (common and scientific) and species limits follow the *2000 IUCN Red List of Threatened Species*[4], while the sequence follows *The Mammals of the Indomalayan Region*[5]. Turtle names (common and scientific), sequence and species limits follow the *Photographic Guide to the Turtles of Thailand, Laos, Vietnam and Cambodia*[6]. Gymnosperm names, sequence and species limits follow *Flore du Cambodge, du Laos et du Vietnam*[7]. Ungulate names (common and scientific), sequence and species limits follow *The Mammals of the Indomalayan Region*[5].

Diacritical marks are omitted from Vietnamese names due to typographical limitations and the restricted understanding of international readers.

Locality names follow Department of Cartography 1:250,000 scale maps from a variety of dates.

Protected area names follow the *Sourcebook of Existing and Proposed Protected Areas in Vietnam*[8]. In cases where a protected area has been upgraded from nature reserve to national park status since the publication of the sourcebook, the new category is used.

Glossary of terms

Decreed protected area refers to a protected area whose establishment has been decreed by the government of Vietnam.

Endemic Bird Area (EBA) refers to an area supporting at least two restricted-range bird species. A restricted-range bird species is one with a global breeding range of less than 50,000 km^2.

Globally threatened species refers to a species listed as critical, endangered or vulnerable in the *2000 IUCN Red List of Threatened Species*[4]; the term excludes species listed as near threatened or data deficient.

Important Bird Area (IBA) refers to an internationally important area for bird conservation at the global, regional or national level, based upon standard, internationally recognised criteria

Management board refers to the staff of a protected area, comprising managers, forest guards, administrative staff and support staff.

Production forest refers to a management category of forest land, with the principal objective of supplying forestry products to meet domestic demand in combination with environmental protection.

Proposed protected area refers to a protected area whose establishment has not been decreed by the government of Vietnam. Some proposed protected areas have, however, been approved at the provincial and/or ministerial level.

Protection forest refers to a management category of forest land, with the principal objectives of watershed protection, soil erosion control, natural disaster amelioration, climate regulation and foreshore protection. Protection forests include watershed protection forests and coastal protection forests.

Ramsar site refers to a site designated under the Convention on Wetlands of International Importance (Ramsar Convention).

Special-use Forest refers to a management category of forest land with the principal objectives of biodiversity conservation, scientific research, protection of sites of historical and cultural importance, and

tourism development. Special-use Forests comprise national parks, nature reserves and cultural and historical sites.

Abbreviations and acronyms used

ACTMANG - Action for Mangrove Reforestation Japan
BTXL - Ban Thi-Xuan Lac
CITES - Convention on International Trade in Endangered Species
Danida - Danish International Development Assistance
EBA - Endemic Bird Area
FFI - Fauna & Flora International
FIPI - Forest Inventory and Planning Institute
FLMEC - Forests of the Lower Mekong Ecoregion Complex
FPD - Forest Protection Department
GDP - gross domestic product
GEF - Global Environment Facility
IBA - Important Bird Area
IEBR - Institute of Ecology and Biological Resources
IUCN - World Conservation Union
LGXM - Lo Go Xa Mat
MARD - Ministry of Agriculture and Rural Development
NGO - non-governmental organisation
NTFP - non-timber forest product
SA - Secondary Area
UMT - U Minh Thuong
UNDP - United Nations Development Programme
UNESCO - United Nations Educational, Scientific and Cultural Organisation
WWF - World Wide Fund for Nature

Disclaimer

The representation of geographical entities in this directory does not imply any expression on the part of the editor, BirdLife International, the Institute of Ecology and Biological Resources (IEBR) or Danida concerning the legal status of any country, territory or area, or concerning the delineation of its frontiers and boundaries. The opinions expressed within the directory are those of the editor, and do not necessarily reflect the opinions of BirdLife International, IEBR or Danida. The editor takes full responsibility for the accuracy of the information presented within the directory.

References

1. Inskipp, T., Lindsey, N. and Duckworth, W. (1996) *Annotated checklist of the birds of the Oriental Region*. Sandy, Bedfordshire: Oriental Bird Club.
2. BirdLife International (2001) *Threatened birds of Asia: the BirdLife International red data book*. Cambridge, U.K.: BirdLife International.
3. Stattersfield, A. J., Crosby, M. J., Long, A. J. and Wege, D. C. (1998) *Endemic bird areas of the world: priorities for biodiversity conservation*. Cambridge, UK: BirdLife International.
4. IUCN (2000) *2000 IUCN red list of threatened species*. Gland and Cambridge: IUCN.
5. Corbet, G. B. and Hill, J. E. (1992) *The mammals of the Indomalayan Region*. Oxford: Oxford University Press.
6. Stuart, B. L., van Dijk, P. P., and Hendrie, D. B. (2002) *Photographic guide to the turtles of Thailand, Laos, Vietnam and Cambodia*. Phnom Penh: Wildlife Conservation Society.
7. Nguyen Tien Hiep and Vidal, J. E. (1996) *Flore du Cambodge, du Laos et du Vietnam, volume 28: Gymnospermae*. Paris: Museum National d'Histoire Naturelle. (In French.)
8. BirdLife International and the Forest Inventory and Planning Institute (2001) *Sourcebook of existing and proposed protected areas in Vietnam*. Hanoi, Vietnam: BirdLife International Vietnam Programme and the Forest Inventory and Planning Institute.

Executive summary

As the human population and economy of Vietnam increase and develop, greater demands are being placed on the country's natural resources. Rational land-use planning will, therefore, be a pre-requisite for sustainable development in the 21st Century. If the full diversity of the country's natural habitats, communities and species is to be maintained, decision makers at all levels, donors, and NGOs must have access to accurate, up to date information regarding the conservation importance of sites. It is essential that such information is based on clear, objective and universally accepted criteria.

This directory is a contribution to conservation planning in Vietnam for the 21st Century. The directory uses birds as indicators to identify a set of internationally important sites for biodiversity conservation, termed Important Bird Areas (IBAs). IBAs are not only important for birds, but typically support a wide range of other important animal and plant species. Furthermore, many IBAs are also significant for human welfare and economic well being through protecting catchments, providing flood control or as a source of natural resources.

The global IBA programme, which began in Europe in 1985, is coordinated by BirdLife International. The IBA programme has proved to be a very cost-effective and flexible way of identifying and promoting coherent and organized action for priority sites for birds and biodiversity at the regional, national and local levels. Based on the work done to date, it is expected that the programme will identify approximately 14,000 IBAs worldwide. In Vietnam, the IBA programme is coordinated by BirdLife International *in Indochina*, in collaboration with the Institute of Ecology and Biological Resources, and with financial support from Danida.

A total of 63 IBAs were identified in Vietnam, covering a total area of 1,689,866 ha, or 5% of the total land area of the country. Vietnam's IBAs range in size from 2 to over 100,000 ha, with a mean size of 26,823 ha. IBAs were identified in 37 of Vietnam's 61 provinces and cities. The four provinces containing the greatest number of IBAs are Dak Lak, Lam Dong, Gia Lai and Quang Binh, which, together, contain 19 IBAs. These provinces should, therefore, be considered high priorities for conservation action.

Forty one IBAs contain examples of terrestrial forest ecosystems. All the major forest habitats in Vietnam are well represented within these IBAs, including lowland evergreen, montane evergreen, semi-evergreen, deciduous, limestone and coniferous forest. In addition, these IBAs include some of the most intact remaining examples of riverine forest in Vietnam, such as the Kon river in Kon Cha Rang IBA and the Srepok river in Yok Don IBA. Eight IBAs, contain examples of freshwater ecosystems, such as seasonally inundated grasslands, freshwater swamps and *Melaleuca* forest. Coastal ecosystems are represented at 14 IBAs. The natural habitats at these IBAs include intertidal mud and sand flats, mangroves and reedbeds.

One major gap in the coverage of the IBA network with regard to habitats is that no IBAs were identified in marine ecosystems. While IBAs may be identified on the basis of congregatory seabirds in the future, particularly in the Hoang Sa (Paracel) and Truong Sa (Spratly) islands, it is unlikely that Vietnam's IBA network will ever adequately represent the full range of marine biodiversity in the country, due to the low level of congruence between sites important for marine biodiversity and sites important for bird diversity.

Of the 72 globally threatened, near-threatened and data deficient bird species that occur in Vietnam, 51 species, or 71% of the total, are confirmed to regularly occur in significant numbers at at least one IBA. Of the 21 species that are not confirmed to regularly occur at any IBA, many are no longer believed to occur in Vietnam as anything other than vagrants, or are passage migrants or rare winter visitors that do not occur in significant numbers at any site.

Of the 23 restricted-range bird species that occur in Vietnam, 22 species, or 96% of the total, are confirmed to regularly occur in significant numbers at at least one IBA. The one restricted-range species not currently known to occur at an IBA is Ward's Trogon *Harpactes wardi*, which is known historically from Fan Si Pan IBA, and probably still occurs somewhere in the Hoang Lien mountains. Similarly, of the 212 biome-restricted bird species that occur in Vietnam, 201 species, or 95% of the total, are confirmed to regularly occur in significant numbers at at least one IBA.

A total of 18 IBAs regularly support greater than 1% of the Asian biogeographic of one or more congregatory waterbird species. Of these IBAs, 13 meet the criteria for designation as Wetlands of International Importance (Ramsar sites). To date, however, only one of these, Xuan Thuy IBA, has been designated as a Ramsar site, although proposals have been made for a number of others, including Tram Chim and Thai Thuy IBAs.

The IBA network is important not only for the conservation of birds but also for other taxonomic groups. For example, 85% of Vietnam's globally threatened, near-threatened and data deficient primate taxa are confirmed to

occur at at least one IBA. Similarly, the majority of Vietnam's globally threatened, near-threatened and data deficient turtle, crocodile, ungulate, elephant and gymnosperm taxa are confirmed to occur with the IBA network. Consequently, the conservation of the IBA network would make an important contribution to the conservation of many other taxonomic groups in Vietnam.

The IBA network corresponds very well with the results of international and regional conservation priority setting exercises: all of Vietnam's IBAs are located within the Indo-Burma Hotspot defined by Conservation International; 31 are situated within Endemic Bird Areas or Secondary Areas defined by BirdLife International; and 34 are situated within priority landscapes for biodiversity conservation in the Forests of the Lower Mekong Ecoregion Complex defined by WWF.

The list of IBAs presented in this directory is by no means exhaustive. Significant areas of Vietnam have received little or no recent ornithological study, most notably parts of northern Vietnam, the coastal zone of central Vietnam, lowland and lower montane areas in south-central Vietnam, and offshore islands. These regions should be considered priorities for ornithological survey.

The most widespread threat to biodiversity within Vietnam's IBA network is hunting, which was identified as a threat at 56 IBAs or 89% of the total. The next most widespread threats are selective logging/cutting, which was identified as a threat at 45 IBAs or 71% of the total, followed by agricultural intensification and expansion, which was identified as a threat at 42 IBAs or 67% of the total. Infrastructure development and/or the construction of dykes and dams, was identified as a threat to biodiversity at 27 IBAs, equivalent to 43% of the total. Regarding wetland IBAs, in addition to hunting and agricultural intensification, the most widespread threats are afforestation of intertidal mudflats with mangrove, unsustainable aquaculture development and disturbance to birds.

Twenty eight of Vietnam's IBAs, equivalent to 44% of the total, are partly or wholly included within decreed protected areas, while 18 of the remainder are partly or wholly included within proposed protected areas. In terms of area, 850,784 ha or 51% of the IBA network is included within decreed protected areas, and a further 465,670 ha or 28% is included within proposed protected areas. Therefore, expansion of the national protected areas network to include those sites currently proposed but not yet decreed by the central government, coupled with strengthened enforcement of protected area management regulations, would further the conservation of a large proportion of Vietnam's IBA network. However, a significant proportion of the IBA network is not included within protected areas. For many of these sites, alternative approaches to biodiversity conservation than protected area establishment may be appropriate. These approaches may include sustainable forest management within production forests and community-based conservation, such as the IBA Support Group model.

Excluding biodiversity surveys and the preparation of feasibility studies, to date there has been on-the-ground conservation action at 41 of Vietnam's IBAs, or 65% of the total. Of the remaining 22 IBAs, some are currently under the management of protection forest management boards, such as Bai Boi and Phuoc Binh IBAs, while others are under the management of forest enterprises, such as Truong Son, Ya Lop and Kon Plong. Although exploitation of natural resources and conversion of natural habitat are controlled to some extent at these IBAs, management objectives are not always compatible with biodiversity conservation.

The directory presents management recommendations for each IBA. The most common management recommendation is to control hunting, which is recommended at 37 IBAs, reflecting the widespread nature of this threat. Implementation of environmental awareness activities is recommended at 27 IBAs, strengthened implementation of protected area management regulations is recommended at 25, and further research, including environmental monitoring is recommended at 22. At wetland IBAs, two additional recommendations are commonly made: control expansion and/or intensification of aquaculture and prevent further afforestation of natural habitats with mangrove, *Melaleuca* and *Casuarina*. Finally, conducting Environmental Impact Assessments is recommended at 12 IBAs, reflecting the severe threat posed by infrastructure development at a significant proportion of IBAs.

The optimal conservation of Vietnam's IBA network will require an integrated effort from all organisations involved in natural resources management, including central government institutions, local authorities, and local communities, with support from donors and NGOs. Expanding and strengthening the national protected areas system will go a long way towards the conservation of the IBA network. However, a number of complimentary actions will also be essential, including the generation of local stakeholder support for IBA conservation, the pursuit of conservation objectives within other land-use designations, such as protection forest and production forest, and the development of innovative, community-based approaches to conservation. Of the highest importance, the objective of conserving the IBA network must be integrated into other sectors, particularly agriculture, fisheries and infrastructure, in order to mitigate the effects of incompatible development schemes that threaten to undermine conservation efforts at an increasing number of sites.

1. Background

1.1 Introduction

As the human population and economy of Vietnam increase and develop, greater demands are being placed on the country's natural resources. Rational land-use planning will, therefore, be a pre-requisite for sustainable development in the 21st Century. If the full diversity of the country's natural habitats, communities and species is to be maintained, decision makers at all levels, donors, and NGOs must have access to accurate, up to date information regarding the conservation importance of sites. It is essential that such information is based on clear, objective and universally accepted criteria.

This directory is a contribution to conservation planning in Vietnam for the 21st Century. The directory uses birds as indicators to identify a set of internationally important sites for biodiversity conservation. Birds are used because they are an important conservation focus in their own right, and because they have been shown to be effective indicators of biodiversity in other taxonomic groups, especially when used to define networks of priority sites for conservation[1,2].

1.2 Aim of the directory

The aim of this directory is to present information on a set of internationally important sites for the conservation of birds and biodiversity in Vietnam. The objectives of the directory are to:

- Present data on internationally important sites for the conservation of birds and other biodiversity in a standardised and clear format.
- Assist Vietnam to meet its obligations under the Convention on Biological Diversity and the Convention on Wetlands of International Importance by, in the first case, identifying candidate sites for inclusion within a representative system of protected areas, and, in the second case, identifying candidate sites for nomination as Ramsar sites.
- Inform decision makers at local, national and international levels of the biodiversity values of sites, to identify threats to biodiversity, and to recommend appropriate steps that can be taken to ensure their conservation.
- Identify clear priorities for conservation action, and to encourage government agencies, donors and NGOs to address them.
- Provide a centralised source of information for use in education, training and environmental awareness.
- Provide information on key sites for birds and biodiversity in a format that can be used by birdwatchers and thereby support the development of ecotourism in Vietnam.

1.3 General information on Vietnam

Location. The Socialist Republic of Vietnam is situated in mainland South-East Asia, on the eastern coast of the Indochinese Peninsula. Vietnam is a relatively narrow country, 525 km across at its widest point and 47 km across at its narrowest. Vietnam has a coastline of 3,260 km and a total continental land area of 330,363 km^2, and is bounded by the coordinates 8°30' to 23°22'N and 102°10' to 109°24'E. Vietnam borders the People's Republic of China to the north, and the Lao People's Democratic Republic and the Kingdom of Cambodia to the west[3].

Topography. Vietnam has a very diverse topography. The main lowland areas are two large alluvial plains in the Red River Delta in the north and the Mekong Delta in the south, connected by a narrow coastal plain. The main mountain ranges in the country are the Hoang Lien mountains, which contain Vietnam's highest peak, Mount Fan Si Pan (3,143 m asl), and the Annamite mountains (called *Truong Son* in Vietnamese). The northern Annamite mountains are a relatively narrow ridge running along the border with Laos. In central Vietnam, the Annamite mountains widen to form the Kon Tum plateau. After decreasing in elevation to the south of the Kon Tum plateau, the southern Annamite mountains rise again to form the Da Lat plateau. The Kon Tum and Da Lat plateaus, together with intervening low-lying areas, are collectively termed the Central Highlands.

Climate. Vietnam has a tropical monsoon climate dominated by the south-west monsoon between May and September and by the north-east monsoon between October and April. Rainfall patterns in the Red River and Mekong Deltas are dominated by the south-west monsoon, while those in the central coastal region are dominated by the north-east monsoon. Parts of the Central Highlands, sheltered from the north-east monsoon by the Annamite mountains, have a markedly drier climate than other parts of the country. In general, the north of the country experiences higher seasonal variations in temperature than the south, although there are marked differences within these regions.

Population. The population of Vietnam is approximately 78 million, with an annual growth rate of 1.8%[4]. Around 80% of the population lives in rural areas[4]. At 235 people per km^2, the population density in Vietnam is high relative to other countries in South-East Asia[3,4]. However, the population of Vietnam is not evenly distributed but concentrated in the Red River and Mekong Delta regions, while many mountainous areas are sparsely populated[3]. The population density in the Mekong Delta is around 500 people per km^2, while that in the Red River Delta is nearly double, at around 1,000 people per km^2: a rural population density found nowhere else in South-East Asia apart from Java[5]. A total of 54 ethnic groups are recognised in Vietnam, of which the Kinh (also known as Viet) account for 87% of the total population[6].

Economics. Vietnam is currently undergoing an economic transition from a central-planned economy to a market-oriented economy. Vietnam's GDP growth has been rapid over the last decade, and annual per capita gross domestic product (GDP) is currently around US$350[4]. Vietnam's principal exports are petroleum, rice, marine products, coffee, rubber, coal and clothing[4]. Apart from the last, all of these exports are agriculture or natural resource based, and Vietnam is expected to be heavily dependent on exploitation of natural resources for some time[7].

Environment. A long period of economic development and population growth, preceded by a series of wars, has resulted in the over-exploitation of Vietnam's natural resources. Over the last five decades, natural forest cover has declined from 43 to 29% of the national land area[8], and much of the remaining forest has been degraded. Widespread deforestation has been accompanied by degradation of arable land, soil erosion, degradation of water catchments, diminished groundwater sources, and loss of biodiversity. Over the last decade, however, the government of Vietnam, with the support of donors and NGOs, has implemented a series of policies aimed at preventing and controlling pollution, improving environmental quality, and promoting the conservation and sustainable use of biodiversity and natural resources. These policies culminated in the formulation of the *National Strategy for Environment Protection 2001-2010*[9].

1.4 Biodiversity conservation in Vietnam

Biodiversity values. For a country of relatively small size, Vietnam supports relatively high levels of biodiversity. This can be largely attributed to the wide variation of latitude and altitude within the country, resulting in the development of a wide range of natural habitats. The Annamite mountains support a large number of endemic plants and animals, some of them only discovered in the last decade, such as Saola *Pseudoryx nghetinhensis*[10], Giant Muntjac *Megamuntiacus vuquangensis*[11], Annamite Muntjac *Muntiacus truongsonensis*[12] and Annamite Striped Rabbit *Nesolagus timminsi*[13]. Limestone karst areas in the north and centre of the country also support a number of endemic plants and animals, most notably several endemic primate taxa, such as Delacour's Langur *Trachypithecus delacouri* and Tonkin Snub-nosed Monkey *Rhinopithecus avunculus*. Lowland forest areas are also of significance for biodiversity conservation, as they support a range of endemic and globally threatened plants and animals, including one of only two remaining populations of Lesser One-horned Rhinoceros *Rhinoceros sondaicus* in the world[14].

Threats. In recent decades, Vietnam's biodiversity has become increasingly threatened. The *2000 IUCN Red List of Threatened Species* lists 245 global threatened species of plants and animals as occurring in Vietnam[15], while the *Red Data Book of Vietnam* lists 713 nationally threatened species of plants and animals[16,17]. The major immediate causes of biodiversity loss are over-exploitation and habitat loss.

There is a long tradition of natural resource use among many communities in Vietnam. While, in many instances, exploitation of natural resources for domestic consumption can be sustainable, opening up of Vietnam's economy to outside market forces in recent years, coupled with expansion of the transportation network, has resulted in a rapid expansion of the wildlife trade, and rapid declines in the populations of many plant and animal species, including turtles, bears, pangolins and valuable timber species.

Although wartime bombing, spraying of defoliants and mechanized land clearing resulted in the loss of significant areas of natural forest[18], the major causes of forest loss in Vietnam have been agricultural expansion, infrastructure development, commercial logging, over-exploitation of firewood and other forest products, and reliance on destructive forms of pioneer agriculture by some representatives of the ethnic minorities[19,20]. Regarding coastal and marine ecosystems, the pattern is similar, with aquaculture development, destructive fishing practices and afforestation leading to loss of natural habitats. Underlying all these threats are population growth, economic development, increasing demand for forest products, and increasing demand for export crops, such as coffee, rubber and cashew[20].

Conservation action. The government of Vietnam took the first official steps towards biodiversity conservation in the 1960s by issuing decrees establishing the country's first protected area and protecting several rare species, including Tiger *Panthera tigris* and Asian Elephant *Elephas maximus*[21]. During the 1980s, a concerted effort was made to build a scientific basis for conservation planning, and, in 1985, the *Vietnam National Conservation Strategy*

was published[22]. This strategy, together with the *Tropical Forestry Action Plan* published in 1991[23], became the basis of the *National Plan for Environment and Sustainable Development 1991-2000*, which set out government policy for conservation and prioritised action areas[24].

During the late 1980s and early 1990s, Vietnam became a signatory to a number of international conventions, including the World Heritage Convention in 1987[25], the Convention on Wetlands of International Importance (Ramsar Convention) in 1989[26], the Convention on Biological Diversity in 1993, and the Convention on International Trade in Endangered Species (CITES) in 1994[21]. Following the ratification of the Convention on Biological Diversity in 1994, the government of Vietnam prepared the *Biodiversity Action Plan for Vietnam*, which laid out a clear plan of action to conserve the nation's biodiversity[21].

In recent years, the government of Vietnam, with support from donors and NGOs, has continued its efforts to conserve the nation's biodiversity. Significant developments include the formulation of the *National Strategy for Environment Protection 2001-2010* and the accompanying *National Environmental Action Plan 2001-2005*[9], and the initiation of the *National Five Million Hectare Reforestation Programme 1998-2010*, which aims to restore forest cover to 1945 levels by the year 2010, preserve genetic resources and protect biodiversity[8]. The implementation of the *National Five Million Hectare Reforestation Programme* is being supported by a partnership of government institutions, bilateral and multilateral donor organisations and international NGOs, through the framework of the Forest Sector Support Programme[27].

The protected areas system. Since the 1960s, the government of Vietnam has been developing a system of protected areas[25]. While the institutional and legal arrangements for protected areas have yet to be finalised, the government of Vietnam has decreed the establishment of a large number of protected areas, and proposals have been made for the establishment of many others[26]. The majority of protected areas decreed to date are Special-use Forests, which mainly comprise terrestrial forest sites, although a number of wetland and marine sites are also included[25,26]. In addition, proposals have been formulated for systems of wetland and marine protected areas, and a small number of sites have been designated under international conventions[26]. In addition to protected areas, there are a number of other land-use designations in Vietnam that can also meet biodiversity conservation goals, including production forest and protection forest.

Production forests. Forests in Vietnam are classified into three management categories: production forests, protection forests and special-use forests[28]. Prior to the late 1990s, most production forests were under the management of forest enterprises charged with producing timber and other forest products. In recent years, as a result of declining timber stocks, many forest enterprises have significantly reduced or halted extractive activities, and shifted their management objectives towards plantation forestry or protection and rehabilitation of natural forest. With regard to those forest enterprises that continue to exploit natural forest, the government of Vietnam, with the support of donors, NGOs and commercial companies, has taken some initial steps towards introducing sustainable forest management to Vietnam, including the establishment of a National Working Group on Sustainable Forest Management. While sustainable forest management has yet to be introduced to any production forest in Vietnam, it has the potential to support the attainment of biodiversity conservation goals within these forests.

Protection forests. Protection forests are managed with the principal objectives of catchment protection, soil erosion control, natural disaster mitigation and climate regulation[28]. While they have an important role in maintaining and restoring natural habitat, particularly in mountainous areas, they do not have a specific biodiversity conservation role. In addition, enforcement of forest protection regulations is typically weaker in protection forests than other forest categories.

Special-use forests. Special-use forests are the only category of forest in Vietnam with the specific objective of biodiversity conservation[28]. Special-use forests are classified into three categories: national parks, nature reserves and cultural, historical and environmental sites[28]. Since the first special-use forest, Cuc Phuong, was established in 1962, the government of Vietnam has steadily expanded the system[26]. In 1997, the Ministry of Agriculture and Rural Development initiated a process to review and expand the system of special-use forests, to meet a national target of 2 million hectares by 2010[25]. This process was supported by a European Union-funded project implemented by BirdLife International and the Forest Inventory and Planning Institute, which conducted a review of the existing system[29] and prepared a draft revised list of special-use forests[26]. This list is awaiting submission to the government for approval[25]. As of September 2002, there were 121 Special-use Forests in Vietnam, comprising 21 national parks, 63 nature reserves and 37 cultural and historical sites, with a total area of 2,382,735 ha.

Vietnam's system of special-use forests is still evolving in terms of both coverage and institutional arrangements. Despite achievements in terms of representation and coverage, many challenges remain. Some challenges relate to funding, as existing sources of funding for special-use forests are both insufficient and inappropriate, with a focus on infrastructure development and reforestation, at the expense of conservation activities, such as community liaison, environmental education, and patrolling. Other challenges relate to existing management regulations, which

currently prohibit a number of potentially sustainable forms of natural resource use that might be used to generate incentives for local stakeholders to support protected area management. Fortunately, these challenges are being addressed by a number of initiatives, including the Danida-funded *Strengthening Protected Area Management in Vietnam Project*, currently being implemented by WWF and the Forest Protection Department, which has prepared a draft protected areas management strategy[30], and the National Conservation Fund, an innovative, national-level financing mechanism, which is currently being developed by the Department for Forestry Development, with support from the Global Environment Facility, as a component of the Forest Sector Development Project, under the framework of the Forest Sector Support Programme.

Marine protected areas. While, the system of special-use forests includes a few marine sites, marine habitats are currently under-represented within the national protected areas system. However, the Ministry of Fisheries has recently been assigned the responsibility for establishing and managing a system of marine protected areas[25], and the government has set a target to formally establish 15 marine protected areas by 2010[31].

Wetland protected areas. As with marine sites, although the system of special-use forests includes a number of wetland sites, wetland habitats are currently under-represented within the national protected areas system. Wetlands are not currently recognised as a distinct management category. However, the government has already identified 79 wetland sites of national importance, which may form the basis of a system of wetland protected areas. Responsibilities for the management of this system have yet to be clearly defined[25].

Other protected area designations. A small number of sites in Vietnam have been designated under international conventions. In 1988, Xuan Thuy in the Red River Delta was designated as the country's first Ramsar site[26]. To date, the site remains the only Ramsar site in Vietnam, although proposals have been made for other sites, including Tram Chim, Thai Thuy, Tam Giang-Cau Hai and the wetlands of Cat Tien[26]. Vietnam signed the World Heritage Convention in 1987, and there are currently four World Heritage Sites in Vietnam: Ha Long bay, the complex of Hue monuments, Hoi An ancient town and My Son sanctuary[26]. In 2000, Can Gio was designated as Vietnam's first Man and the Biosphere Reserve. In the following year, Cat Tien was also designated as a Man and the Biosphere Reserve, and proposals are currently being prepared to designate a number of other sites[25].

Community-based conservation. In addition to official protected areas, a small but growing number of sites in Vietnam are being managed with the objective of biodiversity conservation by local stakeholders. These include Ha Nam island, a coastal wetland, where a site-support group has been established with the support of BirdLife International; Trao reef, where a locally managed marine reserve has been established with the support of the International Marinelife Alliance; and Che Tao forest, where community-based forest protection groups have been established with the support of Fauna & Flora International.

1.5 The birds of Vietnam

Overview. Vietnam has one of the richest avifaunas of mainland South-East Asia. Figures for the total number of bird species recorded in the country range from 828[32] to 888[33]. It is not possible, however, to give a precise figure, as some species recorded historically may already be nationally extinct, for example Great-billed Heron *Ardea sumatrana*, Giant Ibis *Thaumantibis gigantea* and Black-necked Crane *Grus nigricollis*, while new species are still being added to the list[34]. The high bird species richness in Vietnam can be attributed to the wide latitudinal and elevational variation present within the country, which has led to the development of a wide range of habitat types.

History of ornithological research. Ornithological research in Vietnam can be divided into four periods. The first period began in the 1870s and continued until 1920. During this period significant, the first significant collection of Vietnamese birds was made by G. Tirant[35], who collected over 1,000 specimens in Cochinchina between 1875 and 1878[36]. Other important collections were made by R. Germain in Cochinchina[37], N. Kuroda[38] in Tonkin, and C. B. Kloss[39] on the Da Lat plateau. Among the birds discovered by Kloss were Collared Laughingthrush *Garrulax yersini* and Black-hooded Laughingthrush *G. milleti*[39]. Other, smaller collections were made by L Boutan[40] and Dr. J. Vassal, who discovered White-cheeked Laughingthrush *G. vassali*[41]. The most important academic study of the avifauna of Vietnam prepared during this period was *Les Oiseaux du Cambodge, du Laos, de l'Annam et du Tonkin* by E. Oustalet[42,43].

During the second period, which began in the late 1920s and continued until the outbreak of the Second World War, the major contribution to Vietnamese ornithology was made by J. Delacour and his colleagues P. Jabouille, P. Engelbach, A. David Beaulieu, J. C. Greenway and W. P. Lowe. Between 1923 and 1939, Delacour and his colleagues conducted six ornithological expeditions to Indochina[44], during which time they collected some 50,000 bird specimens, as well as extensive ecological and distributional data[35]. These collections stand as the most extensive collections of Indochinese birds to date, and formed the basis of the seminal work *Les Oiseaux de l'Indochine Française*[45]. Other important collections during this period were made by H. Stevens in Tonkin[46], the

Kelley-Roosevelts expedition, also in Tonkin[47], and B. Björkegren, who discovered Grey-crowned Crocias *Crocias langbianis*[48].

The third period began at the end of the Second World War and continued until 1988. The first part of this period was dominated by armed conflicts, and ornithological research was limited to observations made by a few, largely amateur, expatriate ornithologists resident in Vietnam, for example J. Brunel[49], P. Wildash[50] and W. Fisher[51]. However, the end of the Second Indochina War and the reunification of Vietnam in 1975, heralded a period of renewed ornithological study in Vietnam by Vietnamese scientists and their colleagues from other countries. The most significant ornithological research during this period was conducted by L. S. Stepanyan and his Vietnamese colleagues as part of a joint Russian-Vietnamese research programme in the Central Highlands, which resulted in the publication of *Birds of Vietnam, based on the Investigations of 1978-1990*[52]. The other major ornithological work produced during this period was *Birds of Vietnam* by Vo Quy[53,54], the first Vietnamese-language guide to the birds of Vietnam.

The fourth period of ornithological research in Vietnam began in April 1988, with the first of three expeditions by the International Council for Bird Preservation (now BirdLife International)[55]. In many parts of the country, these expeditions represented the first ornithological surveys since before the Second World War, and the expeditions successfully established the continued survival of a number of endemic bird species that had not been recorded for over half a century. Following these expeditions, BirdLife International established a country programme, which, together with its Vietnamese counterparts, conducted a series of expeditions throughout the country. Perhaps the most significant result of these expeditions was the discovery by J. C. Eames and his colleagues of three new bird species: Black-crowned Barwing *Actinodura sodangorum*[56], Golden-winged Laughingthrush *Garrulax ngoclinhensis*[57] and Chestnut-eared Laughingthrush *G. konkakinhensis*[58], proving that, despite a century of ornitholigical research, there are still discoveries to be made in the forests of Vietnam. During this period, *Chim Vietnam*, the first illustrated, Vietnamese-language guide to the birds of Vietnam, written by the country's leading ornithologists Nguyen Cu and Le Trong Trai, was published by BirdLife International[59].

Bird habitats and communities. A large proportion of Vietnam's bird species, including nearly all of the endemic species, are associated with forests. In terms of bird community composition, forests in Vietnam may be divided into five broad categories: evergreen forest, semi-evergreen forest, deciduous forest, limestone forest and coniferous forest. Of these, the most widespread is evergreen forest, accounting for around 64% of the total natural forest cover of Vietnam[29].

Evergreen forest occurs in areas with high year-round rainfall and a relatively short dry season, and is dominated by broadleaf tree species that remain in leaf throughout the year. Evergreen forest is the natural vegetation type in many lowland areas in northern and central Vietnam, and in most mountainous areas. Low elevations support a range of lowland evergreen forest formations, characterised by a high diversity of tree species, with no one family dominating. Typical members of the lowland evergreen forest bird community include Brown Hornbill *Anorrhinus tickelli*, Coral-billed Ground Cuckoo *Carpococcyx renauldi*, Ratchet-tailed Treepie *Temnurus temnurus*, and a number of endemic galliformes. At elevations around 1,000 m asl, lowland evergreen forest undergoes a transition to montane evergreen forest. Montane evergreen forest can be divided into lower montane evergreen forest, which is distributed at elevations up to c.1,700 m asl, and dominated by members of the Fagaceae, and Lauraceae families, and upper montane evergreen forest, which is distributed at elevations above c.1,700 m asl, and characterised by the presence of *Rhododendron* spp. The bird communities of lower and upper montane evergreen forest are fairly similar, with a high diversity of thrushes, nuthatches, babblers and warblers, although the bird community of upper montane evergreen forest is generally less species rich and includes several upper montane specialists, such as Chestnut-tailed Minla *Minla strigula*, Golden-breasted Fulvetta *Alcippe chrysotis* and Stripe-throated Yuhina *Yuhina gularis*. Montane evergreen forest also supports a number of endemic laughingthrushes.

Semi-evergreen forest, sometimes referred to as mixed deciduous forest, has a higher proportion of deciduous tree species than evergreen forest, and occurs in areas with greater seasonality. Semi-evergreen forest has a limited distribution in Vietnam and is largely restricted to parts of the Central Highlands and the lowlands of southern Vietnam. The bird community of semi-evergreen forest is very similar to that of lowland evergreen forest.

Deciduous forest, sometimes referred to as dry dipterocarp forest, is a low, open forest type, with an understorey dominated by grasses, and a canopy dominated by deciduous trees in the Dipterocarpaceae family. Deciduous forest is distributed in areas with an extended, pronounced dry season. In Vietnam, deciduous forest is confined to the Central Highlands and small parts of the coastal zone of south-central Vietnam. Bird species richness is markedly lower than in evergreen and semi-evergreen forest, due to the greater seasonality and the lack of a well developed understorey. The bird community is characterised by a high diversity of woodpeckers and parakeets, and the presence of such species as Rufous-winged Buzzard *Butastur liventer*, White-rumped Falcon *Polihierax insignis*, White-browed Fantail *Rhipidura aureola*, Small Minivet *Pericrocotus cinnamomeus* and Common Woodshrike *Tephrodornis pondicerianus*.

Limestone forest is essentially an evergreen forest formation developed on a limestone karst substrate. While the plant community of limestone forest is quite dissimilar to that of evergreen forest, the bird community is quite similar. There are, however, a few birds restricted to limestone forest, including Limestone Wren Babbler *Napothera crispifrons*, Streaked Wren Babbler *N. brevicaudata*, Sooty Babbler *Stachyris herbeti* and an undescribed taxon of *Phylloscopus* warbler[60]. The global ranges of the latter two taxa are restricted to limestone forest areas in central Vietnam and Laos[60,61].

Coniferous forest refers to forest dominated by conifers. There are also a number of mixed broadleaf and coniferous forest formations in Vietnam but the bird communities of these formations are similar enough to those of evergreen forest not to warrant separate consideration. In Vietnam, natural coniferous forest largely comprises *Pinus kesiya* forest, a fire-climax formation widespread on the Da Lat plateau. There also exist significant areas of pine plantation throughout the country, although these are of marginal importance for bird conservation. The bird community of natural coniferous forest is generally less species rich than that of other natural forest types, due to the relatively simple forest structure. However, this habitat supports a small suite of species not found in other forest types, such as Slender-billed Oriole *Oriolus tenuirostris*, Red Crossbill *Loxia curvirostra* and the endemic Vietnam Greenfinch *Carduelis monguilloti*.

Other terrestrial habitats in Vietnam include natural grassland, secondary grassland and scrub, agricultural land, and human settlements. Of these habitats, natural grassland is of the greatest significance for bird conservation. Natural grassland was once widely distributed in Vietnam, along rivers, around the borders of seasonal wetlands and in areas where edaphic conditions prevented the development of forest. However, this habitat has now been extensively converted to agricultural land and is restricted to a few remnants. Some members of the grassland bird community have adapted to secondary habitats but others are largely restricted to remaining areas of natural habitat, for example Bengal Florican *Houbaropsis bengalensis*, Rufous-rumped Grassbird *Graminicola bengalensis* and Jerdon's Bushchat *Saxicola jerdoni*, all of which must be considered on the verge of extinction in Vietnam.

In addition to terrestrial habitats, Vietnam supports a wide diversity of wetland habitats. Inland, freshwater wetlands include rivers, lakes and seasonally inundated grasslands. Slow-flowing, forested rivers support a distinctive community of birds, including River Lapwing *Vanellus duvaucelii*, Masked Finfoot *Heliopais personata* and White-winged Duck *Cairina scutulata*. However, these rivers have been a focus of human settlement throughout Vietnam, leading to the loss of this bird community from most areas, and the presumed national extinction of at least one breeding species: Black-bellied Tern *Sterna acuticauda*. Lakes are a potentially important habitat for migratory waterbird species, particularly ducks and other waterfowl species. In terms of habitat loss, lakes are one of the least threatened habitats in Vietnam, as, although there are few natural lakes, a large number of artificial lakes have been formed over recent decades following dam construction. Despite the presence of large areas of suitable habitat, the importance of lakes for migratory waterbirds is currently low, due to uncontrolled hunting at most sites. Seasonally inundated grasslands are an important habitat for a number of large waterbird species, including Sarus Crane *Grus antigone* and Painted Stork *Mycteria leucocephala*. Seasonally inundated grasslands were once widespread throughout the Mekong Delta but have now been reduced to small fragments, and even these are under continued threat of conversion to agriculture and aquaculture[62].

Coastal and marine wetlands include mangroves, intertidal mudflats and offshore islands. Mangroves are the natural vegetation type along a large proportion of the coastline of Vietnam, particularly in the coastal zones of the Red River and Mekong Deltas. However, as a result of wartime spraying of defoliants in the south of the country, unsustainable fuelwood collection, and widespread enclosure within aquacultural ponds, most areas of natural mangrove have been lost. While few bird species in Vietnam are restricted to mangrove, it is an important habitat for many migratory waterbirds and, in the Mekong Delta, supports a number of important waterbird colonies[63]. Intertidal mudflats have an uneven distribution along the coastline of Vietnam, being concentrated at the mouths of major rivers. They are one of the most important habitats for migratory waterbirds in Vietnam, as they provide important feeding areas for a range of waders, gulls and terns, including the globally threatened Spoon-billed Sandpiper *Eurynorhynchus pygmeus*, Spotted Greenshank *Tringa guttifer*, Saunders's Gull *Larus saundersi* and Black-faced Spoonbill *Platalea minor*. Unfortunately, these habitats are subjected to high levels of disturbance, due to shellfish collection and other human activities, and are threatened in many places by mangrove afforestation[64]. Larger, forested offshore islands, such as Con Son, support two forest species adapted to offshore islands: Pied Imperial Pigeon *Ducula bicolor* and Nicobar Pigeon *Caloenas nicobarica*. Smaller, rocky islands are important sites for breeding seabirds, such as terns and boobies, although there has been little ornithological study of these habitats in recent years.

Endemic bird areas. Endemic bird areas (EBAs) are areas to which at least two restricted-range bird species (species with a total global breeding range of less than 50,000 km^2) are entirely confined[61]. An analysis conducted by BirdLife International in 1998 identified three EBAs in Vietnam: the Annamese Lowlands, the Da Lat Plateau and the South Vietnamese Lowlands[61]. However, recent studies have revealed the presence of two others: the Kon Tum Plateau EBA[65] and the South-East Chinese Mountains EBA[66]. In addition, Vietnam contains part of the Fan Si

Pan and Northern Laos Secondary Area (an area that supports one or more restricted-range species but has less than two species entirely confined to it)[61].

The Annamese Lowlands EBA is situated in the lowlands of north-central Vietnam, and also includes a small area in central Laos. The natural vegetation of the EBA is lowland evergreen forest, with smaller areas of limestone forest, although a large proportion of the EBA has been deforested, and much of the remaining natural vegetation is highly fragmented. The Annamese Lowlands EBA supports nine restricted-range species, of which five are entirely confined to it: Annam Partridge *Arborophila merlini*, Imperial Pheasant *Lophura imperialis*, Vietnamese Pheasant *L. hatinhensis*, Edwards's Pheasant *L. edwardsi* and Sooty Babbler *Stachyris herbeti*[61]. There is, however, considerable debate over the taxonomic status of Annam Partridge[67], Imperial Pheasant[68] and Vietnamese Pheasant[68], and it is possible that none of them should be afforded the rank of species.

The Kon Tum Plateau EBA is situated in the northern Central Highlands, and also includes a small area in central Laos. The natural vegetation of the EBA comprises montane evergreen forest. The Kon Tum Plateau EBA supports nine restricted-range species, of which three are entirely confined to it: Black-crowned Barwing, Golden-winged Laughingthrush and Chestnut-eared Laughingthrush. All three of these species were only discovered in the late 1990s[56,57,58], making the Kon Tum Plateau the most recently identified EBA in Asia.

The Da Lat Plateau EBA is situated in the southern Central Highlands. The natural vegetation of the EBA is montane evergreen forest and coniferous forest. Eight restricted-range species occur in the EBA, all but one of which are found in montane evergreen forest[61]. Three restricted-range species are entirely confined to the EBA: Collared Laughingthrush, Grey-crowned Crocias and Vietnam Greenfinch. In addition, the EBA supports a number of endemic subspecies, for example a subspecies of Spot-breasted Laughingthrush *Garrulax merulinus annamensis*, some of which are treated as full species by certain authors[63].

The South Vietnamese Lowlands EBA is situated in the lowlands of south-central Vietnam, and also includes a small area in south-eastern Cambodia. The natural vegetation of the EBA comprises lowland evergreen forest and lowland semi-evergreen forest. Only three restricted-range species are found in the EBA, of which two are entirely confined to it: Orange-necked Partridge *Arborophila davidi* and Germain's Peacock Pheasant *Polyplectron germaini*[61]. Until recently, both species were considered to be endemic to Vietnam, although they have since been recorded in south-eastern Cambodia[69,70].

The South-East Chinese Mountains EBA[61] supports five restricted-range species, only one of which is known to occur in Vietnam: White-eared Night Heron *Gorsachius magnificus*[66]. Within Vietnam, there are recent, confirmed records of White-eared Night Heron from only a single site in the north of the country[66].

The Fan Si Pan and Northern Laos Secondary Area supports four restricted-range species, all of which are also known from other EBAs: Ward's Trogon *Harpactes wardi*, Red-winged Laughingthrush *Garrulax formosus*, Broad-billed Warbler *Tickellia hodgsoni* and Yellow-billed Nuthatch *Sitta solangiae*[61]. There have been no confirmed records of Ward's Trogon from Vietnam since historical times, although the species may still occur somewhere in the Hoang Lien mountains.

Threatened species. For a country of relatively small size, Vietnam supports a large number of threatened bird species. According to *Threatened Birds of Asia*, Vietnam supports 72 bird species of global conservation concern, comprising three critical, 12 endangered, 25 vulnerable, 31 near-threatened and one data deficient species[71]. The *Red Data Book of Vietnam* lists 83 bird taxa of national conservation concern, comprising 14 endangered, six vulnerable, 32 threatened and 31 rare taxa[16]. The *Red Data Book of Vietnam* draws attention to species that are widespread and common in other parts of the world but under particular threat within Vietnam, such as Great Cormorant *Phalacrocorax carbo*, Black-billed Magpie *Pica pica* and Collared Crow *Corvus torquatus*[16]. The major threats to bird diversity in Vietnam are habitat loss, uncontrolled use of pesticides, and over-exploitation, through hunting and collection for the pet trade.

1.6 The global IBA programme

The global Important Bird Area (IBA) programme is coordinated by BirdLife International, and aims to identify and protect a network of critical sites for the world's birds. The IBA programme began in Europe in 1985[72], and was adopted as a global initiative by BirdLife International at the 1994 World Conference. The IBA programme has proved to be a very cost-effective and flexible way of identifying and promoting coherent and organized action for priority sites for birds and biodiversity at the regional, national and local levels. To date IBAs have been identified for all countries in Europe[73], Africa[74] and the Middle East[75], and inventories are underway in Asia and the Americas and planned for the Pacific. Based on the work done to date, it is expected that the programme will identify approximately 14,000 IBAs worldwide. In Vietnam, the IBA programme is being coordinated by BirdLife

International *in Indochina*, in collaboration with the Institute of Ecology and Biological Resources of the National Centre for Natural Science and Technology, and with financial support from Danida.

References

1. Howard, P. C., Viskanic, P., Davenport, T. R. B., Kigenyi, F. W., Baltzer, M., Dickinson, C. J., Lwanga, J. S., Matthews, R. A. and Balmford, A. (1998) Complimentarity and the use of indicator groups for reserve selection in Uganda. *Nature* 396: 472-475.
2. Burgess, N. D., Rahbek, C., Larsen, F. W., Williams, P. and Balmford, A. (2002) How much of the vertebrate diversity of sub-Saharan Africa is catered for by recent conservation proposals?. *Biological Conservation* 107: 327-339.
3. Nguyen Trong Dieu (1995) *The geography of Vietnam*. Hanoi: The Gioi Publishers.
4. UNDP (1999) *Vietnam: development cooperation report 1998.* Hanoi: United Nations Development Programme.
5. Vu Tu Lap and Taillard, C. (1993) *An atlas of Vietnam.* Paris: Reclus.
6. Dang Nghiem Van, Chu Thai Son and Luu Hung (1993) *Ethnic minorities in Vietnam.* Hanoi: The Gioi Publishers.
7. The World Bank (1995) *Vietnam: environmental programme and policy priorities for a socialist economy in transition.* Washington, D.C.: The World Bank Agriculture and Environment Operations Division.
8. DFD (2001) *National five million hectare reforestation programme.* Hanoi: Department for Forestry Development, Ministry of Agriculture and Rural Development.
9. MOSTE (2000) *National strategy for environmental protection*. Hanoi: Ministry of Science, Technology and the Environment.
10. Vu Van Dung, Pham Mong Giao, Nguyen Ngoc Chinh, Do Tuoc, Arctander, P. and MacKinnon, J. (1993) A new species of living bovid from Vietnam. *Nature* 363: 443-445.
11. Do Tuoc, Vu Van Dung, Dawson, S., Arctander, P. and MacKinnon, J. (1994) *Introduction of a new large mammal species in Vietnam.* Technical Report. Hanoi, Vietnam: Ministry of Forestry. (In Vietnamese.)
12. Pham Mong Giao, Do Tuoc, Vu Van Dung, Wikramanayake, E. D., Amato, G., Arctander, P. and MacKinnon, J. (1998) Description of *Muntiacus truongsonensis*, a new species of muntjac (Artiodactyla: Muntiacidae) from central Vietnam, and its conservation significance. *Animal Conservation* 1: 61-68.
13. Averianov, A. O., Abramov, A. V., and Tikhonov, A. N. (2000) A new species of *Nesolagus* (Lagomorpha, Leporidae) from Vietnam with osteological description. *Contributions from the Zoological Institute, St. Petersburg, Russian Academy of Sciences* 3 (2000): 1-22.
14. Polet, G., Tran Van Mui, Nguyen Xuan Dang, Bui Huu Manh and Baltzer, M. (1999) The Javan Rhinos, *Rhinoceros sondaicus annamiticus*, of Cat Tien National Park, Vietnam: current status and management implications. *Pachyderm* 27: 34-48.
15. IUCN (2000) *2000 IUCN red list of threatened species*. Gland and Cambridge: IUCN.
16. Anon. (1992) *Red data book of Vietnam, volume 1: animals.* Hanoi: Science and Technics Publishing House. (In Vietnamese.)
17. Anon. (1996) *Red data book of Vietnam, volume 2: plants.* Hanoi: Science and Technics Publishing House. (In Vietnamese.)
18. Collins, M. ed. (1990) *The last rain forests: a world conservation atlas.* New York: Oxford University Press.
19. Baltzer, M. C., Nguyen Thi Dao and Shore, R. G. eds. (2001) *Towards a vision for biodiversity conservation in the Forests of the Lower Mekong Ecoregion Complex.* Hanoi: WWF Indochina Programme.
20. De Koninck, R. (1999) *Deforestation in Vietnam.* Ottawa: International Development Research Centre.
21. Government of SRV and GEF (1994) *Biodiversity action plan for Vietnam*. Hanoi: Government of the Socialist Republic of Vietnam and Global Environment Facility Project VIE/91/G31.
22. IUCN and WWF (1985) *Vietnam national conservation strategy*. Delhi: IUCN and WWF.
23. MOF (1991) *Vietnam forestry sector review tropical forestry action programme: main report*. Hanoi: Ministry of Forestry.
24. State Committee for Sciences (1991) *Vietnam national plan for environment and sustainable development.* Hanoi: State Committee for Sciences UNDP, SIDA, UNEP and IUCN.
25. Rambaldi, G., Bugna, S. and Geiger, M. (2001) Review of the protected area system of Vietnam. *ASEAN Biodiversity* October-December 2001: 43-51.
26. BirdLife International and the Forest Inventory and Planning Institute (2001) *Sourcebook of existing and proposed protected areas in Vietnam*. Hanoi, Vietnam: BirdLife International Vietnam Programme and the Forest Inventory and Planning Institute.
27. The Joint Formulation Team (2001) *The joint formulation of a donor-government partnership for a forest sector support programme (FSSP): a report for potential partner appraisal.* Hanoi: International Cooperation Department, Ministry of Agriculture and Rural Development.
28. Regulations on management of special-use forest, protection forest and production forest, attached to Decision No. 08/2001/QD-TTg of the Prime Minister, dated 11 January 2001.

29. Wege, D. C. Long, A. J., Mai Ky Vinh, Vu Van Dung and Eames, J. C. (1999). *Expanding the protected areas network in Vietnam for the 21st century: An analysis of the current system with recommendations for equitable expansion*. Hanoi: BirdLife International Vietnam Programme and the Forest Inventory and Planning Institute.
30. SPAM (2002) *Management strategy for a protected area system in Vietnam 2002-2010: Draft for discussion at the national workshop, Ha Long City, 26-27 June 2002*. Hanoi: Strengthening Protected Area Management in Vietnam Project.
31. NEA/MOSTE (2001) *Scientific rationale for marine protected area system planning*. Hanoi: National Environment Agency, Ministry of Science, Technology and Environment.
32. Vo Quy and Nguyen Cu (1995) *Checklist of the birds of Vietnam.* Hanoi: Agricultural Publishing House.
33. Inskipp, T. P. and Mlikovsky, J. (unpublished) Annotated checklist and bibliography of the birds of Indochina.
34. Tordoff, A. W. and Eames, J. C. (2001) New additions to the list of birds of Vietnam. *Oriental Bird Club Bulletin* 33: 37-38.
35. Tirant, G. (1879) Les oiseaux de la Basse Cochin-Chine. *Bulletin du Comite Agricole et Industriel de la Cochin-Chine* 3(1): 73-174. (In French).
36. Delacour, J. (1970) The contribution of Gilbert Tirant to Indochinese ornithology. *Nat. Hist. Bull. Siam Soc*. 23(3): 325-329.
37. Germain, R. and Oustalet, E. (1905) Catelogue des oiseaux de la Basse-Cochinchine. *Bull. Mensuel Soc. Nat. Acclimat. France* 52: 169-184. (In French.)
38. Kuroda, N. (1917) A collection of birds from Tonkin. *Annotates Zoologicae Japonenses* 9: 217-254.
39. Robinson, H. C. and Kloss, C. B. (1919) On birds from South Annam and Cochin China. *Ibis* 11(1):392-453, 565-625.
40. Ménégaux, A. (1907) Catelogue des oiseaux envoyés en 1906, du Tonkin et de l'Annam, pa M. Boutan. *Bull Mus. Nat. Hist. Nat. (Paris)* 1907: 6-16. (In French.)
41. Ogilvie-Grant, W. R. (1906) [Description of three new species of birds from Annam.] *Bull. Brit. Orn. Club* 19:12-14.
42. Oustalet, E. (1899) Les oiseaux du Cambodge, du Laos, de l'Annam et du Tonkin. *Nouv. Arch. Hist. Nat. Paris* 4(1): 221-296. (In French.)
43. Oustalet, E. (1903) Les oiseaux du Cambodge, du Laos, de l'Annam et du Tonkin (2e partie). *Nouv. Arch. Hist. Nat. Paris* 4(5): 1-94. (In French.)
44. Delacour, J. (1933) Dix ans d'explorations zoologiques en Indochine. *La Terre et la Vie* September 1993. (In French.)
45. Delacour, J. and Jabouille, P. (1931) *Les oiseaux de l'Indochine française*. 4 vols. Paris: Exposition Coloniale Internationale. (In French.)
46. Kinnear, N. B. (1929) On the birds collected by Mr. H. Stevens in Tonkin in 1923-24, with notes by the collector. *Ibis* 5(12): 107-150.
47. Bangs, O. and Van Tyne, J. (1931) Birds of the Kelley-Roosevelts expedition to French Indochina. *Publ. Field. Mus. Nat. Hist. (Zool. Ser.)* 18: 33-119.
48. Eames, J. C. and Ericson, P. G. P. (1996) The Björkegren expedition to French Indochina: a collection of birds from Vietnam and Cambodia. *Nat. Hist. Bull. Siam Soc.* 44: 75-111.
49. Brunel, J. (1978) Les oiseaux de la région du Lang-Bian, massif montagneux de la chaine annamitique. *L'Oiseaux* 48(1):53-68, 159-180.
50. Wildash, P. (1968) *Birds of South Vietnam.* Vermont: Tuttle and Rutland.
51. Fisher, W. (1974) Vorläufiger Abschlussbericht über Vogel-beobachtungen in Vietnam. *Beitr. Vogelk*. 20: 249-300.
52. Stepanyan, L. S. (1995) [*Birds of Vietnam, based on the investigations of 1978-1990.*] Moscow: Nauka. (In Russian.)
53. Vo Quy (1975) [*Birds of Vietnam*.] vol. 1. Hanoi: Science and Technics Publishing House. (In Vietnamese.)
54. Vo Quy (1981) [*Birds of Vietnam*.] vol. 2. Hanoi: Science and Technics Publishing House. (In Vietnamese.)
55. Robson, C. R., Eames, J. C., Wolstencroft, J. A., Nguyen Cu and Truong Van La (1989) Recent records of birds from Vietnam. *Forktail* 5: 71-97.
56. Eames, J. C., Le Trong Trai, Nguyen Cu and Eve, R. (1999b) New species of barwing Actinodura (Passeriformes: Sylviinae: Timaliini) from the western highlands of Vietnam. *Ibis* 141: 1-10.
57. Eames, J. C., Le Trong Trai and Nguyen Cu (1999a) A new species of laughingthrush (Passeriformes: Garrulacinae) from the western highlands of Vietnam. *Bull. B.O.C.* 119: 4-15.
58. Eames, J. C. and Eames, C. (2001) A new species of laughingthrush (Passeriformes: Garrulacinae) from the central highlands of Vietnam. *Bull. B.O.C.* 121(1): 10-23.
59. Nguyen Cu, Le Trong Trai and Phillipps, K. (2000) *Chim Vietnam.* Hanoi: BirdLife International Vietnam Programme.
60. Duckworth, J. W., Salter, R. E. and Khounboline, K. eds. (1999) *Wildlife in Lao P.D.R.: 1999 status report*. Vientiane: IUCN, Wildlife Conservation Society and the Centre for Protected Areas and Watershed Management.
61. Stattersfield, A. J., Crosby, M. J., Long, A. J. and Wege, D. C. (1998) *Endemic bird areas of the world: priorities for biodiversity conservation*. Cambridge, UK: BirdLife International.

62. Buckton, S. T., Nguyen Cu, Nguyen Duc Tu and Ha Quy Quynh (1999) *The conservation of key wetland sites in the Mekong Delta.* Hanoi: Birdlife International Vietnam Programme.
63. Robson, C. R. (2000) *A field guide to the birds of Thailand and South-East Asia*. Bangkok: Asia Books.
64. Pedersen, A. and Nguyen Huy Thang (1996) *The conservation of key coastal wetland sites in the Red River Delta*. Hanoi: BirdLife International Vietnam Programme.
65. Le Trong Trai, Richardson, W. J., Bui Dac Tuyen, Le Van Cham, Nguyen Huy Dung, Ha Van Hoach, Monastyrskii, A. L. and Eames, J. C. (1999) *An investment plan for Ngoc Linh Nature Reserve, Kon Tum province, Vietnam: a contribution to the management plan.* Hanoi: BirdLife International Vietnam Programme.
66. Le Trong Trai, Eames, J. C., Kuznetsov, A. N., Nguyen Van Sang, Bui Xuan Phuong and Monastyrskii, A. L. (2001) *A biodiversity survey of the Dong Phuc, Ban Thi-Xuan Lac and Sinh Long areas, Tuyen Quang and Bac Kan provinces, Vietnam*. Unpublished report to the Vietnam PARC Project, Na Hang/Ba Be Component.
67. Inskipp, T., Lindsey, N. and Duckworth, W. (1996) *An annotated checklist of the birds of the oriental region.* Sandy: Oriental Bird Club.
68. Garson, P. (2001) Pheasant taxonomy: a cunning way to remove species from the Red List! *OBC Bulletin* 33: 52.
69. Walston, J., Davidson, P. and Men Soriyun (2001) *A wildlife survey in southern Mondulkiri province, Cambodia.* Phnom Penh: Wildlife Conservation Society Cambodia Programme.
70. Davidson, P. and Goes, F. (2002) Five new species for Cambodia. *Cambodian Bird News* 9: 44-46.
71. BirdLife International (2001) *Threatened birds of Asia: the BirdLife International red data book.* Cambridge, U.K.: BirdLife International.
72. Grimmett, R. F. A. and Jones, T. A. (1989) *Important bird areas in Europe*. Cambridge, UK: International Council for Bird Preservation.
73. Heath, M. F. and Evans, M. I. eds. (2000) *Important bird areas in Europe: priority sites for conservation*. 2 vols. Cambridge, U.K.: BirdLife International.
74. Fishpool, L. D. C. and Evans, M. I. eds. (2001) *Important bird areas in Africa and associated islands: priority sites for conservation.* Newbury and Cambridge, U.K.: Pisces Publications and BirdLife International.
75. Evans, M. I. (1994) *Important bird areas in the Middle East.* Cambridge, U.K.: BirdLife International.

Plate 1: Habitats in Vietnam (1)

J. C. Eames

Lowland evergreen forest, Khe Net IBA (VN035). Lowland evergreen forest supports a rich bird community, including a number of endemic galliformes. However, lowland evergreen forest is perhaps the most threatened forest type in Vietnam, as large areas have been converted into agricultural land, while most remaining areas have been degraded and fragmented by commercial timber extraction.

J. C. Eames

Montane evergreen forest, Chu Yang Sin IBA (VN030). The bird communities of montane evergreen forest is characterised by a high diversity of thrushes, nuthatches, babblers and warblers, and the presence of a number of endemic laughingthrushes. This habitat is currently under a relatively low level of threat, as it occurs in areas that are marginal for agriculture. The biggest threat to this habitat in many areas is fire.

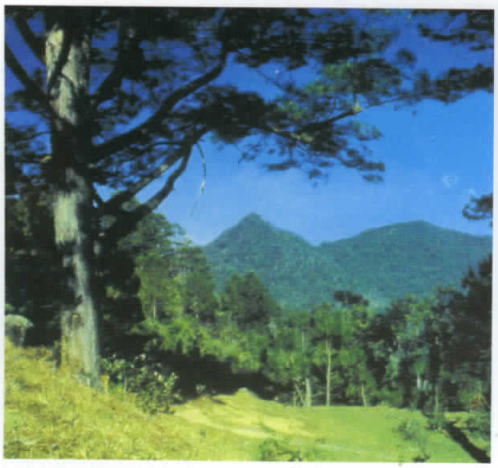
A. W. Tordoff

Semi-evergreen forest, A Yun Pa IBA (VN024). The bird community of semi-evergreen forest is very similar to that of lowland evergreen forest. Semi-evergreen forest has a limited distribution in Vietnam, and is largely restricted to parts of the Central Highlands and the lowlands of southern Vietnam.

J. C. Eames

Deciduous forest, Yok Don IBA (VN044). Deciduous forest is important for the conservation of a number of globally threatened and near-threatened species, including vultures and White-rumped Falcon *Polihierax insignis*. In Vietnam, deciduous forest is restricted to the Central Highlands and the lowlands of southern Vietnam. This habitat is under increasing threat of conversion to cash crops, such as coffee.

Plate 2: Habitats in Vietnam (2)



J. C. Eames

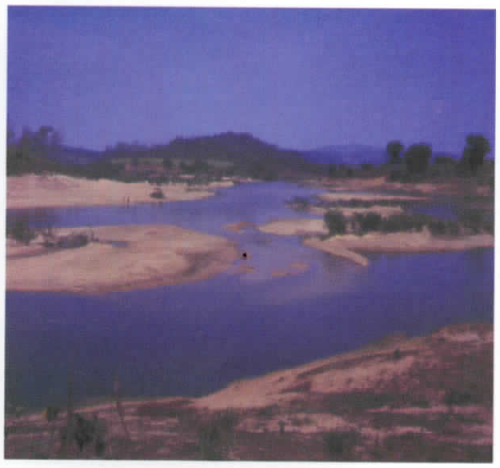
Coniferous forest, Lang Bian IBA (VN037). Although coniferous forest has a relatively low bird species richness, it supports a small suite of species not found in other forest types, such as Slender-billed Oriole *Oriolus tenuirostris*, Red Crossbill *Loxia curvirostra* and the endemic Vietnam Greenfinch *Carduelis monguilloti*. In Vietnam, natural coniferous forest is largely restricted to the Da Lat plateau, where it occurs as a fire-climax habitat.

J. C. Eames

Limestone forest, Phong Nha IBA (VN039). Although the bird community of limestone forest is quite similar to that of evergreen forest, a few bird species are restricted to this habitat, including Limestone Wren Babbler *Napothera crispifrons*, Sooty Babbler *Stachyris herbeti* and an undescribed taxon of *Phylloscopus* warbler. The global ranges of the latter two taxa are restricted to limestone forest areas in central Vietnam and Laos.

J. C. Eames

Kon river, Kon Cha Rang IBA (VN025). Slow-flowing, forested rivers are an important habitat for a number of globally threatened and near-threatened bird species, including Masked Finfoot *Heliopais personata*, White-winged Duck *Cairina scutulata* and Grey-headed and Lesser Fish Eagles *Ichthyophaga ichthaetus* and *I. humilis*. Some of the best remaining examples of this habitat in Vietnam are included within the IBA network.



A.W. Tordoff

Ba river, near A Yun Pa IBA (VN024). Wide, lowland rivers with sandbars support a distinct community of birds, including River Lapwing *Vanellus duvaucelii* and Wire-tailed Swallow *Hirundo smithii*. However, these rivers have been a focus of human settlement throughout Vietnam, leading to the loss of this bird community from most areas, and the presumed national extinction of at least one breeding species: Black-bellied Tern *Sterna acuticauda*.

Plate 3: Habitats in Vietnam (3)

A. Pedersen

Intertidal mudflat, Red River Delta. Intertidal mudflats are an important habitat for migratory waterbirds, including the globally threatened Spoon-billed Sandpiper *Eurynorhynchus pygmeus*, Spotted Greenshank *Tringa guttifer*, Saunders's Gull *Larus saundersi* and Black-faced Spoonbill *Platalea minor*. Unfortunately, these habitats are subjected to high levels of disturbance, and are threatened in many places by mangrove afforestation.

J. C. Eames

Freshwater swamp, Nam Cat Tien IBA (VN053). The bird community of freshwater swamps is characterised by the presence of jacanas and Purple Swamphen *Porphyrio porphyrio*. This habitat is also important for a number of large waterbird species. However, most areas of freshwater swamp in Vietnam have been converted to agricultural land or subjected to high levels of disturbance.

J. C. Eames

Seasonally inundated grassland, near Tram Chim IBA (VN006). Seasonally inundated grasslands are important for a number of large waterbird species, including Sarus Crane *Grus antigone*. This habitat was once widespread throughout the Mekong Delta but has now been reduced to small fragments, and even these are under continued threat of conversion, despite the fact that many have high acid potential and are marginal for agriculture.

J. C. Eames

Hon Trung island, Con Dao National Park. Rocky offshore islands are important sites for breeding seabirds, such as terns and boobies. Although there has been little ornithological study of offshore islands in recent years, it is possible that a number of them qualify as IBAs. Most importantly, it is possible that one may support a small breeding colony of the globally critical Chinese Crested Tern *Sterna bernsteini*.

Plate 4: Benefits of IBAs in Vietnam

A. Pedersen

Shellfish market, Red River Delta. Most coastal IBAs are an important source of marine products for local communities. Collection of shellfish from intertidal areas is often an important source of income for the most economically marginalised sections of society. However, afforestation of intertidal mudflats with mangrove is an increasing threat to the livelihoods of these people, as well as to the key habitat for migratory waterbirds.

J. C. Eames

Rattan collectors, Ke Go IBA (VN019). Most terrestrial forest IBAs are an important source of timber and non-timber forest products for local communities. Where the potential for sustainable use of these resources exists, there also exists the potential to generate incentives for local stakeholders to support conservation.

S. T. Buckton

Grass harvest, U Minh Thuong IBA (VN004). Freshwater wetland IBAs provide a number of benefits to local communities, including provision of natural resources, flood mitigation and prevention of saltwater intrusion. However, many freshwater wetlands in Vietnam are threatened by conversion to aquaculture or agriculture, which threatens to deprive local communities of the benefits they gain from these areas.

A. M. Seward

Ecotourism, Xuan Thuy IBA (VN017). The potential to develop ecotourism as a source of funding for conservation activities exists at many IBAs, although it has currently only been realised at a small number. However, ecotourism will only bring net benefits to the conservation of a site if the negative impacts, such as infrastructure development and disturbance to wildlife, are minimised. Tourism is currently a significant threat at a number of IBAs in Vietnam.

2. Methodology

2.1 What are IBAs?

Important Bird Areas (IBAs) are sites of international importance for bird conservation at the global, regional or national level, based upon standard, internationally recognised criteria. IBAs are not only important for birds, but typically support a wide range of other important animal and plant species. Furthermore, many IBAs are also significant for human welfare and economic well being through protecting catchments, providing flood control or as a source of natural resources.

IBAs are a practical tool for conservation but they are only one of a variety of approaches. The conservation needs of some bird species are not well addressed by the IBA approach, for example raptor species that occur at low densities over wide areas, or colonially nesting species that disperse widely during the non-breeding season. In addition, IBAs do not necessarily correspond to important areas for the conservation of other taxonomic groups, for example marine ecosystems are typically under-represented within IBAs. Consequently, IBAs should form part of an integrated approach to conservation that also includes landscape, habitat and species-based measures. Nevertheless, IBAs have proven to be a widely applicable and cost-effective means of identifying priorities and generating support for site-based conservation action.

In summary, IBAs are:

- Critical sites for the conservation of birds and biodiversity.
- Places of international importance.
- Practical targets for conservation action.
- Selected according to internationally recognised criteria.
- Used to both reinforce and compliment existing protected areas networks.
- Used as part of a wider approach to conservation.

2.2 Biological rationale

Protection of a network of sites that supports as wide a range as possible of species and natural habitats is one effective approach to conservation, and forms the basis of most protected area networks. Many species may be effectively conserved by this approach, because it is often possible to identify a relatively small set of sites that supports a wide range of species within a given country or region. When taken together, these sites form a network throughout the species' ranges, which may be considered as the minimum essential to ensure their survival.

In this directory, birds are used as the basis for such a network, and the individual sites are termed IBAs. Birds are used for a number of reasons. Firstly, they are an important conservation focus in their own right, as they perform ecological roles essential to the function of ecosystems, such as seed-dispersal and pollination, have high cultural significance in Vietnam and around the world, and have economic values, particularly as a basis for ecotourism, a growing industry in Vietnam. Secondly, as a group, birds have a number of features that make them suitable tools for conservation planning, as they contain high numbers of globally threatened and endemic species, have well understood distributions and habitat requirements, are possible to record and identify in the field, are good indicators of habitat condition and human disturbance, and can act as flagships for conservation. Studies in other countries have shown that birds can be a highly efficient means of setting conservation priorities in the absence of detailed data on other taxa[1,2]. Thus, although the IBA network in Vietnam is based on birds, its conservation would ensure the survival of a correspondingly large number of other taxonomic groups.

2.3 Criteria for IBA identification

In Europe, three categories of IBAs have been defined: globally important, regionally important, and nationally important[3]. During the initial phase of the IBA project in Vietnam, however, due to constraints of time, resources and information, only globally important IBAs were identified. In the future, when more detailed information becomes available, it may be desirable to identify regionally and/or nationally important IBAs. At that stage, additional criteria should be defined.

The criteria used to identify IBAs in Vietnam were the standard ones used to identify globally important IBAs in other countries (Table 1). In order to ensure consistency and comparability with other countries, the criteria were applied objectively and consistently. In some instances, it was necessary to interpret the criteria in a way that was relevant in the Vietnamese context. All such instances are explained in the accompanying notes.

Table 1: Summary of global IBA criteria

Category	Criterion	Notes
A1. Globally threatened species	The site regularly holds significant numbers of a globally threatened bird species, or other bird species of global conservation concern.	The site qualifies if it is known or thought to hold a population of a bird species categorised as critical, endangered, vulnerable, near threatened or data deficient.
A2. Restricted-range species	The site is known or thought to hold a significant component of the restricted-range bird species whose breeding distributions define an Endemic Bird Area (EBA) or Secondary Area (SA).	The site qualifies if it forms one of a set selected to ensure that, as far as possible, all restricted-range bird species of an EBA or SA are present in significant numbers within at least three sites.
A3. Biome-restricted assemblages	The site is known or thought to hold a significant component of the group of bird species whose distributions are largely or wholly confined to one biome.	The site qualifies if it forms one of a set selected to ensure that, as far as possible, all biome-restricted bird species are represented within at least three sites.
A4. Congregations	**(i)** The site is known or thought to hold, on a regular basis, ≥ 1% of a biogeographic population of a congregatory waterbird species.	This applies to waterfowl species as defined in *Waterfowl Population Estimates*[4]. Thresholds are set by combining flyway populations within Asia. For species lacking quantitative data, thresholds are set by estimating 1% of the Asian biogeographic population.
or	**(ii)** The site is known or thought to hold, on a regular basis, ≥ 1% of the global population of a congregatory seabird or terrestrial species.	This applies to terrestrial species and those seabird species not covered in *Waterfowl Population Estimates*[4]. Where quantitative data are lacking, numerical thresholds are set by estimating 1% of the global population.
or	**(iii)** The site is known or thought to hold, on a regular basis, ≥ 20,000 waterbirds or ≥ 10,000 pairs of seabirds of one or more species.	This is the Ramsar criterion for waterbirds, the use of which is discouraged wherever data are good enough to permit the use of (i) or (ii).
	(iv) The site is known or thought to exceed thresholds set for migratory species at bottleneck sites.	Thresholds are set regionally or inter-regionally, as appropriate.

Category A1: Globally threatened species

Criterion: The site regularly holds significant numbers of a globally threatened bird species, or other bird species of global conservation concern.

Notes

- This category refers to bird species classified as globally critical, endangered, vulnerable, near threatened or data deficient according to *Threatened Birds of Asia*[5]. The last two categories, although not strictly globally threatened, were considered to be of sufficient conservation concern to be used for the identification of globally important IBAs. However, in order to ensure compatibility with other countries in Asia, no Vietnamese IBAs were identified solely on the basis of the occurrence of near-threatened species.
- According to *Threatened Birds of Asia*, three critical, 12 endangered, 25 vulnerable, 31 near-threatened and one data deficient bird species occur in Vietnam[5].
- The words 'regular' and 'significant' in the definition of this criterion are intended to exclude sites which are not judged to be important for the conservation of that species. Sites qualified as IBAs if the species in question is only present seasonally, or even if it only occurs at longer intervals (for example, if suitable conditions themselves only occur at extended intervals, such as temporary wetlands). However, sites did not qualify if the species occurs only as a vagrant, occurs only marginally or is known only from historical records.
- Every site that regularly holds significant numbers of a globally critical or endangered bird species qualified as an IBA.
- In order to account for the fact that certain species are widespread and occur at a large number of sites in Vietnam, for example Siamese Fireback *Lophura diardi* and Brown Hornbill *Anorrhinus tickelli*, all sites that regularly hold significant numbers of a globally vulnerable, near-threatened or data deficient bird species did not necessarily qualify as IBAs. Where possible, however, each globally vulnerable, near-threatened and data deficient species was represented within at least three IBAs.

Category A2: Restricted-range species

Criterion: The site is known or thought to hold a significant component of a group of bird species whose breeding distributions define an Endemic Bird Area (EBA) or Secondary Area (SA).

Notes

- This category refers to restricted-range bird species, which are species with a total global breeding range of less than 50,000 km^2. Areas to which the global breeding ranges of two or more restricted-range species are entirely confined are termed Endemic Bird Areas (EBAs), while areas that support one or more restricted-range species but have less than two species entirely confined to them are termed Secondary Areas (SAs)[6].
- All or part of five EBAs lie within Vietnam: the Annamese Lowlands, the Da Lat Plateau, the South Vietnamese Lowlands[6], the Kon Tum Plateau[7] and the South-East Chinese Mountains[8]. In addition, Vietnam contains part of the Fan Si Pan and Northern Laos SA[6].
- Sites that only supported common and adaptable restricted-range species, which occur at many sites within the EBA or SA, did not necessarily qualify as IBAs. Where possible, however, each restricted-range species was represented within at least three IBAs.

Category A3: Biome-restricted assemblages

Criterion: The site is known or thought to hold a significant component of the group of bird species whose distributions are largely or wholly confined to one biome.

Notes

- This category applies to groups of bird species with largely shared distributions of greater than 50,000 km^2, which occur mostly or wholly within all or part of a particular biome, and are, therefore, of global importance.
- A biome may be defined as a major regional ecological community characterized by distinctive animal and plant species. No system of global biome classification has been found that can be adequately used as a basis for generating the bird species lists required to apply this criterion. Consequently, the biome classification used was one prepared specifically for the Asian IBA programme. As far as possible, this biome classification has been made consistent with those being used by IBA programmes in other regions of the world.
- Five biomes are represented in Vietnam: the Sino-Himalayan Temperate Forests (Biome 07), the Sino-Himalayan Subtropical Forests (Biome 08), the Indochinese Tropical Moist Forests (Biome 09), the Indo-Malayan Tropical Dry Zone (Biome 11) and the Indo-Gangetic Plains (Biome 12).
- As all biomes represented in Vietnam are altitudinally delineated, several biomes may be represented at any given site.
- It was not practical to select all sites that support biome-restricted bird species as IBAs. Instead, it was preferable to select a few sites that represent most of the species restricted to the biome, and then add additional sites until, wherever possible, each biome-restricted species was represented within at least three IBAs.
- In order to avoid selecting a large number of sites, each holding only a few biome-restricted species, only sites that met a threshold qualified as IBAs. For each biome, this threshold was set at 25% of the species restricted to that biome that occur in Vietnam. Therefore, the thresholds set for Vietnam were, 12 species restricted to Biome 07, 27 species restricted to Biome 08, eight species restricted to Biome 09, seven species restricted to Biome 11 and one species restricted to Biome 12.

Category A4: Congregations

A site may qualify if it meets <u>any</u> <u>one</u> of the four criteria listed below:

Criterion A4i: The site is known or thought to hold, on a regular basis, ≥1% of a biogeographic population of a congregatory waterbird species.

Criterion A4ii: The site is known or thought to hold, on a regular basis, ≥1% of the global population of a congregatory seabird or terrestrial species.

Criterion A4iii: The site is known or thought to hold, on a regular basis, ≥20,000 waterbirds or ≥10,000 pairs of seabirds of one or more species.

Criterion A4iv: The site is known or thought to exceed thresholds set for migratory species at bottleneck sites (a combined total of ≥20,000 migrating individuals of all raptor or crane species).

Notes

- This category applies to those species that are perceived to be particularly susceptible to threats because they congregate at specific sites when breeding or wintering or while on passage.
- The term 'waterbird' is used here in the same sense as the Ramsar Convention uses 'waterfowl', and covers the list of families as defined by Wetlands International in *Waterfowl Population Estimates*[4]. The term 'seabird' covers those families of seabird not covered by *Waterfowl Population Estimates*[4].
- The threshold for criterion A4i is 1% of the biogeographic population of a congregatory waterbird species. For Vietnam, the Asian biogeographic population was used. These thresholds were based on combined estimates of waterbird populations from different flyways within the Asia region. These population estimates were based upon those given in *Waterfowl Population Estimates*[4] and *Handbook of Birds of the World*[9,10], and additional information supplied by Wetlands International.
- The threshold for criterion A4ii is 1% of the global population of a congregatory seabird or terrestrial species. The thresholds used were based on population estimates given in *Handbook of Birds of the World*[9,10], thresholds used by IBA programmes in other regions of the world, and additional information supplied by seabird experts.
- There is an apparent logical inconsistency between criteria A4i (1% of the biogeographic population) and A4ii (1% of the global population). It was felt, however, that the alternative of using thresholds based on 1% of the global population of waterbirds would, as well as departing from the Ramsar criteria, have had insufficient biological justification because of the way many migratory waterbird species are distributed and split into well-defined, discrete flyway populations. Using thresholds based on 1% of the global population would have had the effect of over-emphasising regional waterbird endemics and under-emphasising widely distributed species, since, over much of their range, many species in the latter group may rarely occur at concentrations of >1%. For species that are regional endemics, the biogeographic and global populations are the same.
- Sites meeting criterion A4i or A4iii qualify as Ramsar Sites.
- Criterion A4iv covers sites over which migrants congregate, for example before gaining height in thermals. Although it is the airspace here that is important, conservation of the land beneath it may be necessary to protect the site from threats such as hunting and the construction of radio masts. Also included here are migratory stop-over sites which may not hold spectacular numbers at any one time yet, nevertheless, do so over a relatively short period due to the rapid turnover of birds on passage.

Criteria for defining IBA boundaries

In addition to the above criteria, an IBA should, as far as possible, meet the following three criteria:

1. Be different in character or habitat or ornithological importance from the surrounding area.

2. Exist as an actual or potential protected area, with or without buffer zones, or be an area which can be managed in some way for nature conservation.

3. Alone or with other sites, be a self-sufficient area, which provides all the requirements of the birds that it is important for during the time they are present.

Notes

- Where extensive areas of continuous habitat occur that are important for birds, only criteria 2 and 3 were used. In these cases, practical considerations of how best the site may be conserved were the most important consideration.
- IBAs were identified by the occurrence of *species*. However, IBA boundaries were defined by the extent of the *habitats* of these species, based upon known/inferred habitat requirements.
- Simple, conspicuous features, such as roads and rivers, were used to delimit IBA boundaries, while features such as watersheds and hilltops helped in places where there were no obvious changes in habitat. In the Vietnamese context, political boundaries and boundaries in land use or land ownership were the most important considerations, as these often represent boundaries in management.
- There are no fixed maximum or minimum sizes for IBAs; what is sensible from the biological point of view has to be balanced with what is practical for conservation. There is also no clear-cut way to treat cases where a number of small sites neighbour each other. In the Vietnamese context, however, whether or not these sites could be managed under a single management authority was often the most important consideration.
- The boundaries defined for Vietnamese IBAs often followed the boundaries of protected areas, forest enterprises or other land-use designations. However, IBA boundaries did not always follow protected area boundaries, because, in some cases, these included large areas of marginal habitat for key bird species, or excluded areas of important habitat that should have been included within the IBA.

2.4 Secondary criteria

In order to ensure consistency and comparability, the criteria used to identify IBAs in Vietnam were the standard global criteria used in other countries. However, while many sites met these criteria, it was only necessary to select a subset of these sites to ensure that each globally vulnerable, near threatened and data deficient species (category A1), restricted-range species (category A2) and biome-restricted species (category A3) was represented within at least three IBAs. Therefore, four secondary criteria were introduced to assist selection of IBAs from the large number of sites that met the global IBA criteria. While all Vietnamese IBAs were *identified* according to the global IBA criteria (A1, A2, A3 and A4), the *selection* of a representative network of IBAs also involved secondary criteria (S1, S2, S3 and S4). In addition to assisting IBA selection, the use of secondary criteria broadened the IBA concept beyond birds to other taxonomic groups.

The taxonomic groups used as the basis for the secondary criteria were groups with those characteristics that make birds suitable tools for conservation priority setting and planning. Such groups:

- Contain high numbers of globally threatened and/or endemic taxa.
- Have well understood distributions and habitat requirements.
- Are possible to record and identify in the field.
- Are good indicators for overall conservation importance of a site.
- Can act as flagships for conservation.

In Vietnam, the four groups with the above characteristics are primates; turtles and crocodiles; gymnosperms; and elephant and ungulates (Table 2).

Table 2: Secondary criteria used in Vietnam

Secondary category	Secondary criterion	Notes
S1. Globally threatened primate taxa	The site holds a viable population of a globally threatened primate taxon, or other taxon of global conservation concern.	The site qualifies if it is known or thought to hold a viable population of a primate taxon categorised as critical, endangered, vulnerable, near threatened or data deficient.
S2. Globally threatened turtle and crocodile taxa	The site holds a viable population of a globally threatened turtle or crocodile taxon, or other taxon of global conservation concern.	The site qualifies if it is known or thought to hold a viable population of turtle or crocodile taxon categorised as critical, endangered, vulnerable, near threatened or data deficient.
S3. Globally threatened gymnosperm taxa	The site holds a viable population of a globally threatened gymnosperm taxon, or other taxon of global conservation concern.	The site qualifies if it is known or thought to hold a viable population of a gymnosperm taxon categorised as critical, endangered, vulnerable, near threatened or data deficient.
S4. Globally threatened elephant and ungulate taxa	The site holds a viable population of a globally threatened elephant or ungulate taxon, or other taxon of global conservation concern.	The site qualifies if it is known or thought to hold a viable population of Asian Elephant or an ungulate taxon categorised as critical, endangered, vulnerable, near threatened or data deficient.

Secondary category S1: Globally threatened primate taxa

Secondary criterion S1: The site holds a viable population of a globally threatened primate taxon, or other taxon of global conservation concern.

Notes

- This category refers to primate taxa classified as globally critical, endangered, vulnerable, near threatened or data deficient according to the *2000 IUCN Red List of Threatened Species*[11]. The last two categories, although not strictly globally threatened, are considered to be of sufficient conservation concern to be used for the identification of IBAs.
- According to the *2000 IUCN Red List of Threatened Species*, three critical, four endangered, six vulnerable, two near-threatened and five data deficient primate taxa occur in Vietnam[11].
- The term 'viable population' is intended to exclude sites where the taxon in question occurs only as a relict population, occurs only marginally, or is known only from historical records. Sites that, by themselves, did not support sufficient suitable habitat to support a population of the taxon in question qualified if they formed part of a larger area of contiguous habitat that could.

Secondary category S2: Globally threatened turtle and crocodile taxa

Secondary criterion S2: The site holds a viable population of a globally threatened turtle or crocodile taxon, or other taxon of global conservation concern.

Notes

- This category refers to turtle and crocodile taxa classified as globally critical, endangered, vulnerable, near threatened or data deficient according to the *2000 IUCN Red List of Threatened Species*[11]. The last two categories, although not strictly globally threatened, are considered to be of sufficient conservation concern to be used for the identification of IBAs.
- According to the *2000 IUCN Red List of Threatened Species*, one critical crocodile taxon and six critical, 12 endangered, six vulnerable and one near-threatened turtle taxa occur in Vietnam[11].
- The term 'viable population' is intended to exclude sites where the taxon in question occurs only as a relict population, occurs only marginally, or is known only from historical records. Sites that, by themselves, did not support sufficient suitable habitat to support a population of the taxon in question qualified if they formed part of a larger area of contiguous habitat that could.

Secondary category S3: Globally threatened gymnosperm taxa

Secondary criterion S3: The site holds a viable population of a globally threatened gymnosperm taxon, or other taxon of global conservation concern.

Notes

- This category refers to gymnosperm taxa classified as globally critical, endangered, vulnerable, near threatened or data deficient according to the *2000 IUCN Red List of Threatened Species*[11]. The last two categories, although not strictly globally threatened, are considered to be of sufficient conservation concern to be used for the identification of IBAs.
- According to the *2000 IUCN Red List of Threatened Species*, one endangered, 11 vulnerable, four near-threatened and two data deficient gymnosperm taxa occur in Vietnam[11].
- The term 'viable population' is intended to exclude sites where the taxon in question occurs only as a relict population, occurs only marginally, or is known only from historical records. Sites that, by themselves, did not support sufficient suitable habitat to support a population of the taxon in question qualified if they formed part of a larger area of contiguous habitat that could.

Secondary category S4: Globally threatened elephant and ungulate taxa

Secondary criterion S4: The site holds a viable population of a globally threatened elephant or ungulate taxon, or other taxon of global conservation concern.

Notes

- This category refers to Asian Elephant *Elephas maximus* and ungulate taxa classified as globally critical, endangered, vulnerable, near threatened or data deficient according to the *2000 IUCN Red List of Threatened Species*[11]. The last two categories, although not strictly globally threatened, are considered to be of sufficient conservation concern to be used for the identification of IBAs.
- According to the *2000 IUCN Red List of Threatened Species*, one endangered elephant taxon and two critical, four endangered, three vulnerable, one near-threatened and two data deficient ungulate taxa occur in Vietnam[11].
- The term 'viable population' is intended to exclude sites where the taxon in question occurs only as a relict population, occurs only marginally, or is known only from historical records. Sites that, by themselves, did not support sufficient suitable habitat to support a population of the taxon in question qualified if they formed part of a larger area of contiguous habitat that could.

2.5 Selection of IBAs

In Vietnam, a large number of sites qualify under the global IBA criteria (see Appendix 6). For example, the category A1 species Great Hornbill *Buceros bicornis* has been recorded at at least 30 sites, while the category A2 species Grey-faced Tit Babbler *Macronous kelleyi* has been recorded at at least 16 sites. Therefore, it was necessary to select a representative network of IBAs that, as far as possible, covered all category A1, A2, A3 and A4 species occurring in the country.

The first stage was to prepare a candidate list of sites, using the global IBA criteria. This candidate list was based on a review of all published and unpublished literature on birds in Vietnam, as well as correspondence with conservationists familiar with the sites in question.

The next stage was to prepare a list of bird species for each candidate site, based on a review of all published and unpublished literature. Due to the fact that the status and distribution of many bird species were considered to have changed significantly since historical times, only recent records were used. 'Recent' records were taken to be all records since April 1988, which was the date of the first ornithological survey in Vietnam by the International Council for Bird Preservation (now BirdLife International). Records were classified as confirmed or unconfirmed. 'Confirmed' records were taken to be sight records by a reliable observer, positive identifications of calls, and specimen records of known provenance. 'Unconfirmed' records were taken to be sight records by a reliable observer where the observer had noted uncertainty about the record, and published anecdotal reports from local people. All other records were discounted. No attempt was made to predict the occurrence of bird species at sites, based on known distributions and habitat requirements, although it is recognised that, by so doing, the bird species lists for many sites were not comprehensive.

After the bird species lists had been prepared, a series of field surveys were conducted at those candidate sites for which no recent bird data were available, or for which the available data were incomplete. These surveys focused on sites predicted to support populations of category A1, A2, A3 and A4 species that were under-represented among the candidate sites for which data were available. In particular, these field surveys concentrated on the northern mountainous region, the coastal zone of northern and central Vietnam, and the Annamese Lowlands and South Vietnamese Lowlands EBAs.

The final stage was to select, from the list of candidate sites, a network of IBAs that, as far as possible, covered all category A1, A2, A3 and A4 species. While IBAs were identified using objective, quantitative criteria, a pragmatic approach was taken to IBA selection. Thus, when selecting IBAs, the national protected areas network was used as a basis, and priority was given to sites already decreed as protected areas. However, it was necessary to identify a number of additional sites, comprising both proposed protected areas and sites that were previously not on the conservation agenda.

Selection of IBAs began with all sites that qualified under category A4. The criteria in this category are relatively straightforward to apply, and the sites selected overlap little with sites selected under categories A2 and A3, although there was some overlap with category A1. In order to apply the criteria in category A4, it was necessary to have quantitative data on congregatory species. Where such data were not available, these criteria were not applied, although it is recognised that, by so doing, a number of sites that may have qualified under this category were not selected. A total of 17 IBAs were selected under this category, all wetland sites in the Mekong and Red River Deltas.

Next, sites were selected under category A1. First, all sites that regularly hold significant numbers of a globally critical or endangered bird species were selected. Nine such sites had already been selected under category A4, and an additional 18 sites were selected. Then, additional sites were selected under category A1 until, as far as possible, each globally vulnerable, near-threatened and data deficient species was represented at at least three sites. When selecting these sites, preference was given to sites that met one or more of secondary criteria S1, S2, S3 and S4. This ensured that, as far as possible, the IBAs selected were also of conservation importance for other taxonomic groups. An additional 18 sites were selected in this manner, bringing the total number of IBAs selected to 53.

Next, additional sites were selected under category A2 until, as far as possible, each restricted range species was represented at at least three sites. Only two additional sites were required: Van Ban (IBA 58) for Broad-billed Warbler *Tickellia hodgsoni* and Kon Ka Kinh (IBA 20) for Chestnut-eared Laughingthrush *Garrulax konkakinhensis*.

Finally, additional sites were selected under category A3, until each biome-restricted species was represented at at least three sites. When selecting these sites, preference was given to sites that met one or more of secondary criteria S1, S2, S3 and S4. An additional eight sites were selected in this way, bringing the total number of IBAs in Vietnam to 63.

References

1. Howard, P. C., Viskanic, P., Davenport, T. R. B., Kigenyi, F. W., Baltzer, M., Dickinson, C. J., Lwanga, J. S., Matthews, R. A. and Balmford, A. (1998) Complimentarity and the use of indicator groups for reserve selection in Uganda. *Nature* 396: 472-475.
2. Burgess, N. D., Rahbek, C., Larsen, F. W., Williams, P. and Balmford, A. (2002) How much of the vertebrate diversity of sub-Saharan Africa is catered for by recent conservation proposals?. *Biological Conservation* 107: 327-339.
3. Grimmett, R. F. A. and Jones, T. A. (1989) *Important bird areas in Europe*. Cambridge, UK: International Council for Bird Preservation.
4. Rose, P. M. and Scott, D. A. (1997) *Waterfowl population estimates. Second edition.* Wageningen: Wetlands International.

5. BirdLife International (2001) *Threatened birds of Asia: the BirdLife International red data book.* Cambridge, U.K.: BirdLife International.
6. Stattersfield, A. J., Crosby, M. J., Long, A. J. and Wege, D. C. (1998) *Endemic bird areas of the world: priorities for biodiversity conservation*. Cambridge, UK: BirdLife International.
7. Le Trong Trai, Richardson, W. J., Bui Dac Tuyen, Le Van Cham, Nguyen Huy Dung, Ha Van Hoach, Monastyrskii, A. L. and Eames, J. C. (1999) *An investment plan for Ngoc Linh Nature Reserve, Kon Tum province, Vietnam: a contribution to the management plan.* Hanoi: BirdLife International Vietnam Programme.
8. Le Trong Trai, Eames, J. C., Kuznetsov, A. N., Nguyen Van Sang, Bui Xuan Phuong and Monastyrskii, A. L. (2001) *A biodiversity survey of the Dong Phuc, Ban Thi-Xuan Lac and Sinh Long areas, Tuyen Quang and Bac Kan provinces, Vietnam*. Unpublished report to the Vietnam PARC Project, Na Hang/Ba Be Component.
9. del Hoyo, J., Elliott, A. and Sargatal, J. eds. (1992) *Handbook of birds of the world,* vol. 1. Barcelona: Lynx Edicions.
10. del Hoyo, J., Elliott, A. and Sargatal, J. eds. (1996) *Handbook of birds of the world,* vol. 3. Barcelona: Lynx Edicions.
11. IUCN (2000) *2000 IUCN red list of threatened species*. Gland and Cambridge: IUCN.

Plate 5: Threatened bird species in Vietnam

J. C. Eames

Pale-capped Pigeon *Columba punicea*. This is one of 72 globally threatened, near-threatened and data deficient bird species that occur in Vietnam. Of these species, 34, or 47% of the total, are confirmed to regularly occur in significant numbers at at least three IBAs, while 51 species, or 71% of the total, are confirmed to regularly occur in significant numbers at at least one.

J. C. Eames

Bengal Florican *Houbaropsis bengalensis*. This globally endangered species is severely threatened by the conversion of seasonally inundated grasslands to agriculture and aquaculture. There are confirmed recent records of this species from only two sites in Vietnam, Ha Tien and Tram Chim IBAs (VN003 and VN006), and the species should be considered on the verge of national extinction.

Doan Hong

Sarus Crane *Grus antigone*. This globally vulnerable species breeds in northern and eastern Cambodia and spends the non-breeding season at a number of sites in Cambodia and the Mekong Delta region of Vietnam, including Kien Luong and Tram Chim IBAs (VN005 and VN006). Together, these sites form an international network, which must be conserved as a whole, if the conservation needs of this species are to be met.

J. C. Eames

Masked Finfoot *Heliopais personata*. In Vietnam, this globally vulnerable species is restricted to slow-flowing, forested rivers, and is only known from two sites: Kon Cha Rang and Yok Don IBAs (VN025 and VN044). This species is threatened by hunting, disturbance caused by fishing, and habitat loss, in the form of clearance of forest and dam construction.

Plate 6: Restricted-range bird species in Vietnam (1)

J. C. Eames

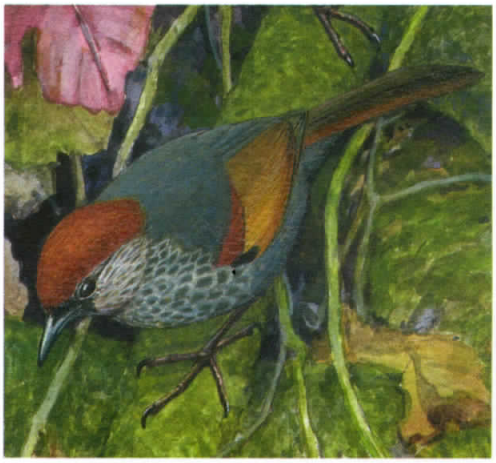
Black-hooded Laughingthrush *Garrulax milleti*. This is one of 23 restricted-range species that occur in Vietnam. Of these species, 12, or 52% of the total, are confirmed to regularly occur in significant numbers at at least three IBAs, while 22 species, or 96% of the total, are confirmed to regularly occur in significant numbers at at least one.

C. Eames

Chestnut-eared Laughingthrush *Garrulax konkakinhensis* (below). This species was discovered in 1998 at Kon Ka Kinh IBA (VN020). It has since been recorded at Kon Plong IBA (VN049) and provisionally recorded at a single site in central Laos. Chestnut-eared Laughingthrush is one of three restricted-species with a global range confined to the Kon Tum Plateau Endemic Bird Area (EBA).

K. Kamolphalin

Black-crowned Barwing *Actinodura sodangorum*. This species was discovered in 1996, at Ngoc Linh IBA (VN043). It has since been recorded at Lo Xo IBA (VN046) and at a single site in central Laos. The global range of Black-crowned Barwing is confined to the Kon Tum Plateau EBA.



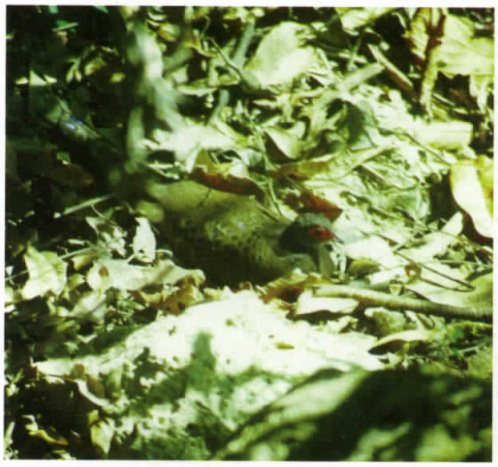
K. Kamolphalin

Golden-winged Laughingthrush *Garrulax ngoclinhensis*. This is the third restricted-range species confined to the Kon Tum Plateau EBA. The species was discovered in 1996, becoming, together with Black-crowned Barwing, the first new species to be discovered in mainland South-East Asia for 30 years, and proving that, despite a century of ornithological research, there are still discoveries to be made in the forests of Vietnam.

Plate 7: Restricted-range bird species in Vietnam (2)

J. C. Eames

Edwards's Pheasant *Lophura edwardsi*. This is one of five species whose global ranges are confined to the Annamese Lowlands EBA. After ornithological surveys of the Annamese Lowlands during the early 1990s failed to locate the species, it was feared that it might have gone extinct, as a result of habitat degradation and loss. However, the species was rediscovered in 1996, at Phong Dien and Dakrong IBAs (VN021 and VN031).



M. Tentij

Germain's Peacock Pheasant *Polyplectron germaini*. This is one of two species confined to the South Vietnamese Lowlands EBA, the other being Orange-necked Partridge *Arborophila davidi*. Until recently, both species were considered to be endemic to Vietnam, although they have since been recorded in eastern Cambodia.

H. Gronvold

Grey-crowned Crocias *Crocias langbianis*. This is one of three species whose global ranges are confined to the Da Lat Plateau EBA. The species is restricted to lower montane evergreen forest, and is currently only known to occur at two sites: Chu Yang Sin and Tuyen Lam IBAs (VN030 and VN048). In addition, Lang Bian IBA (IBA 037) was given as an historical collecting locality for the species. However, there are no recent records from this site.

H. Gronvold

Ward's Trogon *Harpactes wardi*. This is one of the four restricted-range species that occur in the Fan Si Pan and Northern Laos Secondary Area. Ward's Trogon is the only restricted-range species known to occur in Vietnam of which there have been no recent, confirmed records. It is probable, however, that the species still occurs somewhere in the Hoang Lien mountains.

Plate 8: Biome restricted and congregatory bird species in Vietnam

J. C. Eames

Bar-bellied Pitta *Pitta elliotii*. This is one of 212 biome-restricted bird species that occur in Vietnam. Of these species, 150, or 71% of the total, are confirmed to regularly occur in significant numbers at at least three IBAs, while 201 species, or 95% of the total, are confirmed to regularly occur in significant numbers at at least one.

A. Thorburn

Temminck's Tragopan *Tragopan temminckii*. This is one of 47 species restricted to the Sino-Himalayan Temperate Forests (Biome 07) that occur in Vietnam. In Vietnam, the species is only known to occur at high elevations in the Hoang Lien mountains, from where there are two recent records: a confirmed record from Che Tao IBA (VN018) and an unconfirmed record from Fan Si Pan IBA (VN057).

S. T. Buckton

Little Cormorant *Phalacrocorax niger*. Seventeen of Vietnam's IBAs qualify under criterion A4i: the site is known or thought to hold, on a regular basis, ≥ 1% of a biogeographic population of a congregatory waterbird species. Of these IBAs, two qualify due to the presence of ≥ 1% of the biogeographic population of Little Cormorant: U Minh Thuong and Ca Mau IBAs (VN004 and VN011).

J. C. Eames

Black-faced Spoonbill *Platalea minor*. Only three IBAs in Vietnam qualify under criterion A4iii: the site is known or thought to hold, on a regular basis, ≥ 20,000 waterbirds or ≥ 10,000 pairs of seabirds of one or more species. These sites are Xuan Thuy and Nghia Hung IBAs (VN017 and VN012) in the coastal zone of the Red River Delta, and Binh Dai IBA (VN062) in the coastal zone of the Mekong Delta.

3. Results

3.1 The IBA network in Vietnam

A total of 63 IBAs were selected in Vietnam; a detailed site account for each is given in Chapter 4. Fifty eight IBAs (92% of the total) qualified under two or more categories, although only one IBA, Ban Thi Xuan Lac (VN029), qualified under all four. Sixty two IBAs (98%) qualified under category A1, emphasising the significance of the IBA network for the conservation of globally threatened species. The one IBA that did not qualify under category A1, Sinh Long (VN028), qualified under category A3, due to the presence of a number of biome-restricted species known from few other sites in Vietnam (Table 3).

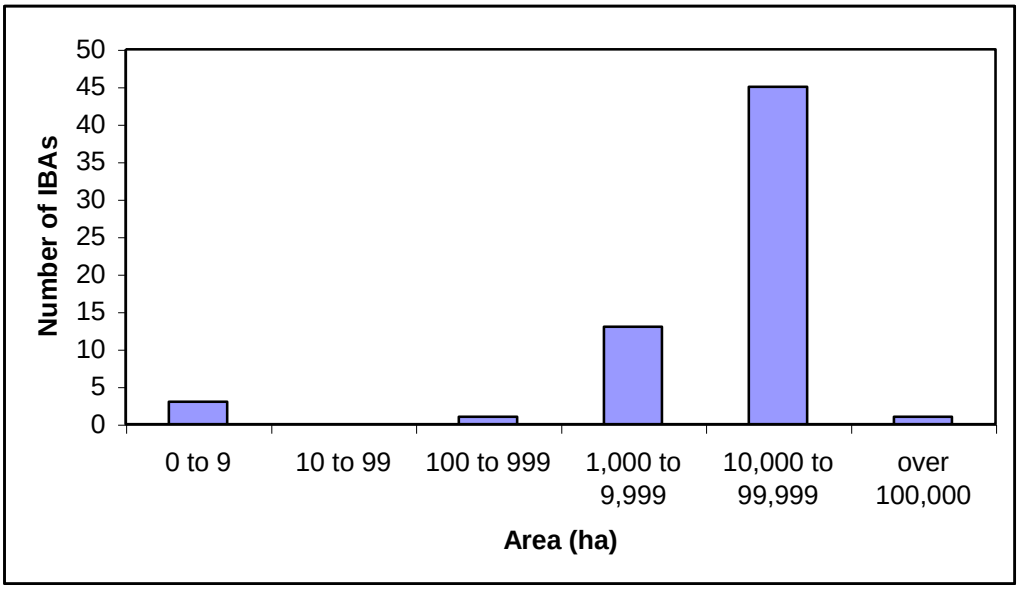
Table 3: The number of IBAs in each category

Category	No. of IBAs	No. of IBAs in this category alone
A1 Globally threatened species	62	5
A2 Restricted-range species	33	0
A3 Biome-restricted species	40	1
A4 Congregations	18	0

3.2 Coverage of the IBA network

Size. The 63 IBAs in Vietnam cover a total area of 1,689,866 ha, equivalent to 5% of the total land area of the country. Vietnam's IBAs range in size from 2 to over 100,000 ha, although most are in the range from 10,000 to 99,999 ha. The mean IBA size is 26,823 ha, while the median size is 22,200 ha. The relative lack of very large IBAs in Vietnam (only 10 IBAs are larger than 50,000 ha and only one is larger than 100,000 ha) reflects several factors, including the fragmented nature of natural habitats in the country and the selection criterion that, wherever possible, IBAs should be areas that can be managed as a single unit. The relative lack of small IBAs (only four IBAs are smaller than 1,000 ha) reflects the selection criterion that IBAs should be self-sufficient areas, which provide all the requirements for the birds they are important for during the time they are present. All four IBAs smaller than 1,000 ha are bird sanctuaries in the Mekong Delta (Figure 1).

Figure 1: Distribution of IBAs by size class



Provinces. IBAs were selected in 37 of Vietnam's 61 provinces and cities (Map 1). The provinces containing the greatest number of IBAs are Dak Lak, Lam Dong, Gia Lai and Quang Binh. Together, these four provinces contain 19 IBAs (30%) (Table 4). These provinces should, therefore, be considered high priorities for conservation action. It is notable that three of the four provinces with the highest number of IBAs are located in the Central Highlands, where there are large areas of natural habitat, and three Endemic Bird Areas (EBAs). The fourth province, Quang Binh, is located in the Annamese Lowlands EBA.

Table 4: The provinces with the highest number of IBAs

Province	No. of IBAs
Dak Lak	6
Lam Dong	5
Gia Lai	4
Quang Binh	4
Ca Mau	3
Kien Giang	3
Kon Tum	3
Tuyen Quang	3

There remain twenty four provinces and cities in which IBAs have not been selected to date. These provinces and cities are concentrated in the Red River and Mekong Deltas but also include a significant number in north-eastern Vietnam. This distribution reflects partly the relatively limited extent of natural habitats in these regions, and partly the relatively low level of ornithological survey they have received. With further surveys, it may be possible to identify a number of additional IBAs in these regions. Many of these IBAs would be identified in north-eastern Vietnam, where significant areas of unsurveyed natural habitat remain. However, it may also be possible to identify a number of additional IBAs within the heavily populated Red River and Mekong Delta provinces, many of which support bird sanctuaries: waterbird breeding colonies and communal roosts within anthropogenic landscapes, many of which are under informal forms of protection.

Habitats. Forty one IBAs (65%) contain examples of terrestrial forest ecosystems. All the major forest habitats in Vietnam are well represented within these IBAs, including lowland evergreen, montane evergreen, semi-evergreen, deciduous, limestone and coniferous forest (Map 3). In addition, these IBAs include some of the most intact remaining examples of riverine forest in Vietnam, such as the Kon river in Kon Cha Rang IBA (VN025) and the Srepok river in Yok Don IBA (VN044).

Eight IBAs (13%) are located in freshwater ecosystems. The natural habitats at these IBAs mainly comprise seasonally inundated grasslands, freshwater swamps and *Melaleuca* forest, although this category also includes three bird sanctuaries, which provide roosting and nesting areas for waterbirds that feed in freshwater wetlands in the wider area. All eight freshwater IBAs are located in the Mekong Delta, and represent some of the most significant remaining examples of the natural ecosystems that once dominated the delta: Tram Chim and Lang Sen IBAs (VN006 and VN007) support the most significant remaining examples of the Plain of Reeds grasslands; Kien Luong and Ha Tien IBAs (VN005 and VN003) support the most significant remaining examples of the Ha Tien plain grasslands; while U Minh Thuong IBA (VN004) supports one of the most significant remaining examples of the U Minh *Melaleuca* forests.

Coastal ecosystems are represented at 14 IBAs (22%). The natural habitats at these IBAs include intertidal mud and sand flats, mangroves and reedbeds. Six of these IBAs are situated in the coastal zone of the Red River Delta, while five are located in the coastal zone of the Mekong Delta. One IBA is located near the mouths of the Dong Nai, Sai Gon and Vam Co rivers, while two are located in the coastal zone of Quang Ninh province, to the north of the Red River Delta. It is notable that the IBA network does not include any sites in the coastal zone of central Vietnam. While this may be partly attributable to disparities in survey effort, the main reason is probably the absence of major estuaries in central Vietnam, and, consequently, the relatively limited area of intertidal habitats suitable for migratory waterbirds. Detailed surveys of coastal lagoons in central Vietnam may, however, reveal a number of IBAs not yet identified.

Category A1 species. According to *Threatened Birds of Asia*[1], a total of 72 globally threatened, near-threatened and data deficient bird species occur in Vietnam. Thirty four of these species (47%) are confirmed to regularly occur in significant numbers at at least three IBAs, while 51 species (71%) are confirmed to regularly occur in significant numbers at at least one IBA (Table 5, Appendix 2). Of the 21 species that are not confirmed to regularly occur at any IBA, many are no longer believed to occur in Vietnam as anything other than vagrants, or are passage migrants or rare winter visitors that do not occur in significant numbers at any site.

Table 5: Coverage of category A1 species within IBAs

Threat category	Total no. of species in Vietnam	No. of IBAs that regularly support a significant population		
		≥3	1-2	0
Critical	3	0	2	1
Endangered	12	3	7	2
Vulnerable	25	10	6	9
Near threatened	29	20	2	9
Data deficient	1	1	0	0
Total	72	34	17	21

Note: the figures in the table exclude IBAs where the species is unconfirmed, or where the species is not confirmed to regularly occur in significant numbers.

The IBA network in Vietnam includes all sites where globally critical and endangered bird species are confirmed to regularly occur in significant numbers. However, no globally critical species and only three globally endangered species are confirmed to occur at at least three IBAs: Spotted Greenshank *Tringa guttifer*, Black-faced Spoonbill *Platalea minor* and Collared Laughingthrush *Garrulax yersini* (Table 6). In addition, both Edwards's Pheasant *Lophura edwardsi* and White-winged Duck *Cairina scutulata* are known to occur at at least three IBAs, although some of these IBAs are not confirmed to regularly support significant numbers. None of the three globally critical and endangered species not confirmed to regularly occur in significant numbers at any IBA (Slender-billed Vulture *Gyps tenuirostris*, Scaly-sided Merganser *Mergus squamatus* and Greater Adjutant *Leptoptilos dubius*) are likely to regularly occur in significant numbers at any site in Vietnam.

Table 6: Coverage of globally critical and endangered bird species within IBAs

Species	No. of IBAs
Critical	
White-rumped Vulture *Gyps bengalensis*	2
Slender-billed Vulture *G. tenuirostris*	0
White-shouldered Ibis *Pseudibis davisoni*	2
Endangered	
Orange-necked Partridge *Arborophila davidi*	2
Edwards's Pheasant *Lophura edwardsi*	2
Vietnamese Pheasant *L. hatinhensis*	2
White-winged Duck *Cairina scutulata*	1
Scaly-sided Merganser *Mergus squamatus*	0
Bengal Florican *Houbaropsis bengalensis*	2
Spotted Greenshank *Tringa guttifer*	4
White-eared Night Heron *Gorsachius magnificus*	1
Black-faced Spoonbill *Platalea minor*	6
Greater Adjutant *Leptoptilos dubius*	0
Collared Laughingthrush *Garrulax yersini*	6
Grey-crowned Crocias *Crocias langbianis*	2

Note: the figures in the table exclude IBAs where the species is unconfirmed, or where the species is not confirmed to regularly occur in significant numbers.

Category A2 species. Of the 23 restricted-range bird species that occur in Vietnam[2], 12 species (52%) are confirmed to regularly occur at at least three IBAs, while 22 species (96%) are confirmed to regularly occur at at least one (Table 7, Appendix 3). Only one restricted-range species is not currently known from any IBA: Ward's Trogon *Harpactes wardi*. This species is known historically from Fan Si Pan IBA (VN057)[3], and probably still occurs somewhere in the Hoang Lien mountains.

Table 7: Coverage of category A2 species within IBAs

Endemic bird area (EBA) / secondary area (SA) / all Vietnam	Total no. of species in Vietnam	No. of IBAs that regularly support a significant population		
		≥3	1-2	0
South-East Chinese Mountains EBA	1	0	1	0
Annamese Lowlands EBA	9	6	3	0
South Vietnamese Lowlands EBA	3	2	1	0
Da Lat Plateau EBA	8	6	2	0
Kon Tum Plateau EBA	9	5	4	0
Fan Si Pan and Northern Laos SA	4	1	2	1
All Vietnam	23	12	10	1

Notes: the figures in the table exclude IBAs where the species is unconfirmed, or where the species is not confirmed to regularly occur in significant numbers. The combined figures for all EBAs and SAs in Vietnam are not equal to those for Vietnam as a whole, because some restricted-range species occur in more than one EBA.

Category A3 species. Of the 212 biome-restricted bird species that occur in Vietnam, 150 species (71%) are confirmed to regularly occur at at least three IBAs, while 201 species (95%) are confirmed to regularly occur at at least one (Table 8, Appendix 4). The coverage of the Indochinese Tropical Moist Forests (Biome 09) and the Indo-Malayan Tropical Dry Zone (Biome 11) within Vietnam's IBA network is very good, with 93 and 85% respectively of the total number of biome-restricted species being represented at at least three IBAs. Most of the biome-restricted species that are not represented at at least three IBAs are species restricted to the Sino-Himalayan Temperate Forests (Biome 07) or the Sino-Himalayan Subtropical Forests (Biome 08), reflecting the relatively limited distribution of many of these species in Vietnam, and the relatively small number of montane forest sites in northern Vietnam for which recent bird data are available. Finally, the Indo-Gangetic Plains (Biome 12) only has marginal occurrence in Vietnam. However, the lack of sites that regularly support significant numbers of species restricted to this biome (Bengal Florican *Houbaropsis bengalensis*, Jerdon's Bushchat *Saxicola jerdoni* and Rufous-rumped Grassbird *Graminicola bengalensis*) reflects the high level of threat to natural grassland habitats and associated bird communities in Vietnam.

Table 8: Coverage of category A3 species within IBAs

Biome	Total no. of species in Vietnam	No. of IBAs that regularly support a significant population		
		≥3	1-2	0
07 - Sino-Himalayan Temperate Forests	47	17	28	2
08 - Sino-Himalayan Subtropical Forests	106	83	20	3
09 - Indochinese Tropical Moist Forests	30	28	1	1
11 - Indo-Malayan Tropical Dry Zone	26	22	1	3
12 - Indo-Gangetic Plains	3	0	1	2
Total	212	150	51	11

Note: the figures in the table exclude IBAs where the species is unconfirmed, or where the species is not confirmed to regularly occur in significant numbers.

Category A4 species. A total of 27 congregatory waterbird species meet criterion A4i (Table 9, Appendix 5). Fifteen of these species (56%) meet criterion A4i at only one IBA, while only three species (Spotted Redshank *Tringa erythropus*, Saunders's Gull *Larus saundersi* and Black-faced Spoonbill) meet criterion A4i at at least three IBAs. With the exception of a handful of wetland sites in the Mekong and Red River Deltas, quantitative data on waterbird numbers collected over an extended period are not available for most IBAs. In most cases, quantitative data are limited to the results of a small number of brief surveys, often made during the same time of year. Therefore, a number of congregations of waterbird species exceeding the 1% population threshold may have been overlooked during previous surveys, particularly those where the congregation is restricted to a certain time of year.

The IBAs at which the greatest number of congregatory waterbird species meet criterion A4i are Xuan Thuy IBA (VN017) with nine and U Minh Thuong IBA (VN004) with eight. Both of these IBAs have been the focus of regular ornithological study for extended periods. In the future, it may be possible to identify a number of additional IBAs under criterion A4i, particularly in the coastal zones of the Mekong and Red River Deltas, in the coastal zone of central Vietnam, and at bird sanctuaries throughout the country.

Table 9: Coverage of criterion A4i species within IBAs

Species	No. of IBAs	IBA code(s)
Garganey *Anas querquedula*	1	VN006
Common Teal *A. crecca*	1	VN006
Sarus Crane *Grus antigone*	2	VN005, VN006
Purple Swamphen *Porphyrio porphyrio*	1	VN004
Black-tailed Godwit *Limosa limosa*	2	VN017, VN062
Eurasian Curlew *Numenius arquata*	2	VN002, VN017
Spotted Redshank *Tringa erythropus*	3	VN012, VN015, VN017
Spotted Greenshank *T. guttifer*	1	VN017
Grey-tailed Tattler *Heteroscelus brevipes*	1	VN017
Asian Dowitcher *Limnodromus semipalmatus*	2	VN002, VN017
Dunlin *Calidris alpina*	1	VN017
Bronze-winged Jacana *Metopidius indicus*	1	VN004
Kentish Plover *Charadrius alexandrinus*	1	VN062
Lesser Sand Plover *C. mongolus*	1	VN012
Greater Sand Plover *C. leschenaulti*	2	VN062, VN063
Oriental Pratincole *Glareola maldivarum*	1	VN004
Saunders's Gull *Larus saundersi*	4	VN012, VN014, VN015, VN017
Little Cormorant *Phalacrocorax niger*	2	VN004, VN011
Indian Cormorant *P. fuscicollis*	1	VN008
Chinese Egret *Egretta eulophotes*	2	VN001, VN002
Purple Heron *Ardea purpurea*	1	VN004
Great Egret *Casmerodius albus*	2	VN004, VN062
Black-crowned Night Heron *Nycticorax nycticorax*	2	VN009, VN010
White-eared Night Heron *Gorsachius magnificus*	1	VN029
Glossy Ibis *Plegadis falcinellis*	1	VN004
Black-faced Spoonbill *Platalea minor*	6	VN012, VN013, VN014, VN015, VN017, VN060
Painted Stork *Mycteria leucocephala*	1	VN004

Under the Convention on Wetlands of International Importance (Ramsar Convention), Vietnam has a commitment to "include wetland conservation considerations within its national land-use planning, and to formulate and implement this planning so as to promote, as far as possible, the wise use of wetlands in its territory". In addition, Vietnam has a commitment to designate wetlands meeting the Ramsar criteria as Wetlands of International Importance (Ramsar sites). Wetlands meeting the Ramsar criteria include those that:

- Contain a representative, rare or unique example of a natural or near-natural wetland found within the appropriate biogeographic region.
- Support vulnerable, endangered or critical species, or threatened ecological communities.
- Regularly support greater than 1% of the population of one or more species or subspecies of waterbird.

Table 10: IBAs that qualify as Ramsar sites

IBA code	IBA name
VN001	Dat Mui
VN002	Bai Boi
VN004	U Minh Thuong
VN005	Kien Luong
VN006	Tram Chim
VN012	Nghia Hung
VN013	Tien Hai
VN014	Thai Thuy
VN015	Tien Lang
VN017	Xuan Thuy
VN060	Ha Nam
VN062	Binh Dai
VN063	Ba Tri

Thirteen of Vietnam's IBAs meet the above criteria, and, therefore, qualify as Ramsar sites. To date, however, only one of these, Xuan Thuy IBA (VN017), has been designated as a Ramsar site, although proposals have been made for a number of others, including Tram Chim and Thai Thuy IBAs (VN006 and VN014).

Secondary category taxa. According to the *2000 IUCN Red List of Threatened Species*, three critical, four endangered, six vulnerable, two near-threatened and five data deficient primate taxa occur in Vietnam[4]. Seventeen of these taxa (85%) are confirmed to occur within Vietnam's IBA network, and there are unconfirmed records of one other (Table 11). This indicates a significant degree of congruence between important sites for the conservation of bird species and important sites for the conservation of primate taxa. Consequently, the conservation of the IBA network would make an important contribution to the conservation of primate taxa in Vietnam.

Table 11: Coverage of category S1 taxa within IBAs

Taxon	Scientific name	Status	No. of IBAs	
			Confirmed	Unconfirmed
Northern Slow Loris	*Nycticebus bengalensis*	DD	3	8
Pygmy Loris	*N. pygmaeus*	VU	5	5
Northern Pigtail Macaque	*Macaca leonina*	VU	12	3
Assamese Macaque	*M. assamensis*	VU	4	5
Rhesus Macaque	*M. mulatta*	NT	7	12
Long-tailed Macaque	*M. fascicularis*	NT	8	3
Stump-tailed Macaque	*M. arctoides*	VU	15	12
Francois's Langur	*Trachypithecus francoisi francoisi*	VU	0	3
Hatinh Langur	*T. f. hatinhensis*	EN	3	0
Wulsin's Black Langur	*T. f. ebenus*	DD	0	0
Tonkin Hooded Black Langur	*T. poliocephalus poliocephalus*	CR	0	0
Delacour's Langur	*T. delacouri*	CR	1	0
Silver Langur	*T. villosus*	DD	5	2
Red-shanked Douc	*Pygathrix nemaeus nemaeus*	EN	4	6
Grey-shanked Douc	*P. n. cinerea*	DD	3	0
Black-shanked Douc	*P. nigripes*	EN	2	3
Tonkin Snub-nosed Monkey	*Rhinopithecus avunculus*	CR	2	0
Black Gibbon	*Nomascus concolor*	EN	3	0
White-cheeked Gibbon	*N. leucogenys*	DD	2	3
Buff-cheeked Gibbon	*N. gabriellae*	VU	10	3

Notes: CR = critical, EN = endangered, VU = vulnerable, NT = near threatened, DD = data deficient, as per the *2000 IUCN Red List of Threatened Species*[4]. The figures in the table exclude IBAs where the taxon was only identified to the genus level, or where the taxon is believed to be locally extinct.

According to the *2000 IUCN Red List of Threatened Species*, one critical crocodile taxon and six critical, 12 endangered, seven vulnerable and one near-threatened turtle taxa occur in Vietnam[4]. Nineteen of these taxa (70%) are confirmed to occur within Vietnam's IBA network, while there are unconfirmed records of one other (Table 12). Therefore, the conservation of the IBA network would make a significant contribution to the conservation of crocodile and turtle taxa in Vietnam.

Table 12: Coverage of category S2 taxa within IBAs

Taxon	Scientific name	Status	No. of IBAs	
			Confirmed	Unconfirmed
Siamese Crocodile	*Crocodylus siamensis*	CR	1*	2
Big-headed Turtle	*Platysternon megacephalum*	EN	4	8
Mangrove Terrapin	*Batagur baska*	CR	0	0
Asian Box Turtle	*Cuora amboinensis*	VU	1	4
Indochinese Box Turtle	*C. galbinifrons*	CR	3	4
Chinese Three-striped Box Turtle	*C. trifasciata*	CR	1	4
Asian Leaf Turtle	*Cyclemys dentata*	NT	2	1
Black-breasted Leaf Turtle	*Geoemyda spengleri*	EN	2	4
Giant Asian Pond Turtle	*Heosemys grandis*	VU	0	2
Yellow-headed Temple Turtle	*Hieremys annandalii*	EN	1	1
Malayan Snail-eating Turtle	*Malayemys subtrijuga*	VU	1	1
Vietnamese Pond Turtle	*Mauremys annamensis*	CR	0	0
Asian Yellow Pond Turtle	*M. mutica*	EN	1	0
Chinese Stripe-necked Turtle	*Ocadia sinensis*	EN	1	2
Keeled Box Turtle	*Pyxidea mouhotii*	EN	4	5
Four-eyed Turtle	*Sacalia quadriocellata*	EN	3	0
Black Marsh Turtle	*Siebenrockiella crassicollis*	VU	1	0
Elongated Tortoise	*Indotestudo elongata*	EN	3	6
Asian Giant Tortoise	*Manouria emys*	EN	0	0
Impressed Tortoise	*M. impressa*	VU	3	3
Asiatic Softshell Turtle	*Amyda cartilaginea*	VU	6	3
Wattle-necked Softshell Turtle	*Palea steindachneri*	EN	2	5
Asian Giant Softshell Turtle	*Pelochelys cantorii*	EN	0	0
Chinese Softshell Turtle	*Pelodiscus sinensis*	VU	2	4
Softshell turtle species	*Rafetus swinhoei*	CR	0	0
Green Sea Turtle	*Chelonia mydas*	EN	0	0
Hawksbill Sea Turtle	*Eretmochelys imbricata*	CR	0	0

Notes: CR = critical, EN = endangered, VU = vulnerable, NT = near threatened, as per the *2000 IUCN Red List of Threatened Species*[4]; * = reintroduced population. The figures in the table exclude IBAs where the taxon was only identified to the genus level, or where the taxon is believed to be locally extinct.

According to the *2000 IUCN Red List of Threatened Species*, one endangered, 11 vulnerable, four near-threatened and two data deficient gymnosperm taxa occur in Vietnam[4]. Thirteen of these taxa (72%) are confirmed to occur within Vietnam's IBA network, and there is an unconfirmed record of one other (Table 13). Therefore, the conservation of the IBA network would make a significant contribution to the conservation of gymnosperm taxa in Vietnam.

Table 13: Coverage of category S3 taxa within IBAs

Taxon	Status	No. of IBAs	
		Confirmed	Unconfirmed
Pinus krempfii	VU	3	1
P. merkusii	VU	3	1
P. wangii	EN	1	0
P. dalatensis	VU	4	2
P. fenzeliana	NT	0	0
Pseudotsuga brevifolia	VU	0	0
Keteleeria fortunei	NT	0	0
Cunninghamia konishii	VU	0	0
Taiwania cryptomerioides	VU	1	0
Calocedrus macrolepis	VU	2	1
Fokienia hodginsii	NT	10	4
Cupressus torulosa	NT	0	1
Podocarpus neriifolius	DD	13	3
Cephalotaxus mannii	VU	4	1
Amentotaxus argotaenia var. *argotaenia*	VU	3	1
A. yunnanensis	VU	1	1
A. poilanei	VU	2	0
Taxus wallichiana	DD	1	0

Notes: EN = endangered, VU = vulnerable, NT = near threatened, DD = data deficient, as per the *2000 IUCN Red List of Threatened Species*[4]. The figures in the table exclude IBAs where the taxon was only identified to the genus level.

According to the *2000 IUCN Red List of Threatened Species*, one endangered elephant taxon and two critical, four endangered, three vulnerable, one near-threatened and two data deficient ungulate taxa occur in Vietnam[4]. Seven of these taxa (58%) are confirmed to occur at at least one IBA, while there are unconfirmed records of a two others (Table 14). Most significantly, the IBA network includes the only site in Vietnam confirmed to support a population of Lesser One-horned Rhinoceros *Rhinoceros sondaicus*, and three sites confirmed to support Saola *Pseudoryx nghetinhensis*, a species endemic to the Annamite mountains of Vietnam and Laos. Consequently, conservation of the IBA network would make a significant contribution to the conservation of elephant and ungulate taxa in Vietnam.

Table 14: Coverage of category S4 taxa within IBAs

Taxon	Scientific name	Status	No. of IBAs	
			Confirmed	Unconfirmed
Asian Elephant	*Elephas maximus*	EN	4	4
Lesser One-horned Rhinoceros	*Rhinoceros sondaicus*	CR	1	1
Indochinese Warty Pig	*Sus bucculentus*	DD	0	1
Chinese Forest Musk Deer	*Moschus berezovskii*	NT	0	0
Brow-antlered Deer	*Cervus eldii*	VU	1	1
'Indochinese' Hog Deer	*Axis porcinus annamiticus*	DD	0	1
Kouprey	*Bos sauveli*	CR	0	0
Gaur	*B. gaurus*	VU	11	7
Banteng	*B. javanicus*	EN	6	1
Wild Water Buffalo	*Bubalus arnee*	EN	0	0
Southern Serow	*Naemorhedus sumatraensis*	VU	15	13
Saola	*Pseudoryx nghetinhensis*	EN	3	3

Notes: CR = critical, EN = endangered, VU = vulnerable, NT = near threatened, DD = data deficient, as per the *2000 IUCN Red List of Threatened Species*[4]. The figures in the table exclude IBAs where the taxon is only identified to the genus level or where the taxon is believed to be locally extinct.

Conservation priority setting exercises. The IBA network corresponds very well with the results of international and regional conservation priority setting exercises. All IBAs in Vietnam are located within the Indo-Burma Hotspot defined by Conservation International[5]. This hotspot comprises all of Vietnam, Cambodia Laos, Burma and Thailand, and parts of Nepal, India, Bhutan and south-west China, and highlights the global importance of this region for biodiversity conservation.

Table 15: The number of IBAs situated within each EBA/SA

EBA/SA	No. of IBAs
Annamese Lowlands	11
Da Lat Plateau	6
South Vietnamese Lowlands	5
Kon Tum Plateau	5
Fan Si Pan and Northern Laos	3
South-East Chinese Mountains	1

Thirty one IBAs (49%) are situated within EBAs or SAs defined by BirdLife International[2] (Map 6). The Annamese Lowlands EBA contains the largest number of IBAs, with 11 (Table 15). The occurrence of a relatively large number of IBAs within this EBA can be partly explained by the lack of congruence among the distributions of the restricted-range species confined to this EBA: Vietnamese Pheasant *Lophura hatinhensis* is restricted to the north of the EBA, Sooty Babbler *Stachyris herbeti* is restricted to limestone areas in the centre of the EBA, while Annam Partridge *Arborophila merlini* and Edwards's Pheasant are restricted to the south of the EBA. Therefore, for the Annamese Lowlands EBA, it was necessary to select a larger number of IBAs, in order to ensure representation of all restricted-range species.

Thirty one of the 41 terrestrial forest IBAs are situated within EBAs or SAs, equivalent to 76% of the total. Of the 10 terrestrial forest IBAs not situated within EBAs or SAs, five are deciduous and semi-evergreen forest sites in the Central Highlands, selected primarily on the basis of the presence of globally threatened species not well represented elsewhere, and five are montane evergreen forest sites in northern Vietnam, selected primarily on the basis of the large number of biome restricted-species they support.

Thirty four IBAs (54%) are situated within priority landscapes for biodiversity conservation in the Forests of the Lower Mekong Ecoregion Complex (FLMEC), as defined by WWF[6]. Of the 29 IBAs not situated within these priority landscapes, 26 are located outside of the FLMEC, in coastal areas or in northern Vietnam. Therefore, 92% of the IBAs located within the FLMEC are included within priority landscapes, revealing good congruence between these two approaches to conservation priority setting. The priority landscapes with the highest number of IBAs are CA1 - Central Annamites with eight, SA3 - Southern Annamites Main Montane Block with six, and DF4 - Eastern Plains Dry Forests with five (Map 5).

3.3 Gaps in coverage

The list of IBAs presented in this directory is by no means exhaustive. Significant areas of Vietnam have received little or no recent ornithological study, most notably parts of northern Vietnam, the coastal zone of central Vietnam, and lowland and lower montane areas in south-central Vietnam. Even within the IBA network, survey coverage is incomplete. At only 16 IBAs is survey coverage considered to be high, with all key bird species that regularly occur believed to be recorded and data available on their status and distribution at the site. At 31 IBAs, survey coverage is considered to be medium, with most key bird species that regularly occur believed to be recorded but data on their status and distribution incomplete or unavailable. At the remaining 16 IBAs, survey coverage is considered to be low, with the lists of key bird species believed to be incomplete. Therefore, the actual coverage of the IBA network, in terms of bird species, may be greater than currently known.

There exist in Vietnam a number of sites that almost certainly qualify as IBAs but for which insufficient reliable ornithological data were available at the time of publication for inclusion in this directory. While it is not possible to present a comprehensive list of all sites that may qualify as IBAs, a list of those sites considered most likely to qualify is presented in Table 16. These sites should be considered priorities for ornithological survey, in order to clarify their importance for bird conservation, evaluate current and potential threats to biodiversity, and formulate recommendations for conservation action.

Table 16: Sites predicted to meet the IBA criteria

Site	Province	IBA criteria
Bu Gia Map Nature Reserve	Binh Phuoc	A1, A2 (South Vietnamese Lowlands EBA, particularly Orange-necked Partridge *Arborophila davidi* and Germain's Peacock Pheasant *Polyplectron germaini*)
Con Dao archipelago	Ba Ria-Vung Tau	A1 (Nicobar Pigeon *Caloenas nicobarica*); A4ii (potentially several congregatory seabird species)
Nam Dong, A Luoi, Huong Thuy and Huong Tra districts	Thua Thien Hue	A1, A2 (Annamese Lowlands EBA, particularly Edwards's Pheasant *Lophura edwardsi*)
Sa Thay district	Kon Tum	A1 (White-rumped Vulture *Gyps bengalensis*, Red-headed Vulture *Sarcogyps calvus* and White-winged Duck *Cairina scutulata*); A2 (Germain's Peacock Pheasant)
Truong Sa (Spratly) archipelago	Khanh Hoa	A4ii (potentially several congregatory seabird species)

Habitats. One major gap in the coverage of the IBA network with regard to habitats is that no IBAs were identified in marine ecosystems. A few sites in Vietnam, for example Hon Trung island in Con Dao National Park, are known to support breeding colonies of seabirds, although none are known to exceed the 1% thresholds set for congregatory seabirds. While IBAs may be identified for breeding seabirds in the future, particularly in the Hoang Sa (Paracel) and Truong Sa (Spratly) islands, it is unlikely that Vietnam's IBA network will ever adequately represent the full range of marine biodiversity in the country, due to the low level of congruence between sites important for marine biodiversity and sites important for bird diversity.

Bird species. Twenty one category A1 species, one category A2 species and 11 category A3 species recorded in Vietnam are not confirmed to regularly occur at any IBA (Table 17). Many of these species are unlikely to regularly occur in significant numbers at any site in Vietnam, either because they no longer occur in Vietnam as anything other than vagrants, or because they are passage migrants or rare winter visitors. Included in this latter group are Greater Spotted Eagle *Aquila clanga* and Imperial Eagle *A. heliaca*, two widely dispersed species, which occur at very low densities throughout their ranges. Conservation of the IBA network would not adequately meet the conservation needs of species such as these.

There are a number of species that may regularly occur in significant numbers at one or more sites in Vietnam, but for which such sites have not yet been identified. Future surveys to identify sites for these species should concentrate on montane forest in the Hoang Lien mountains (for Ward's Trogon, Long-billed Thrush *Zoothera rubrocanus*, Golden Bush Robin *Tarsiger chrysaeus* and Black-tailed Crake *Porzana bicolor*), inland wetlands in northern Vietnam (for Ferruginous Duck *Aythya nyroca*, Baer's Pochard *A. baeri* and Scaly-sided Merganser), grassland habitats, particularly those associated with rivers and other freshwater wetlands, in northern Vietnam (for Jerdon's Bushchat *Saxicola jerdoni* and Rufous-rumped Grassbird *Graminicola bengalensis*), anthropogenic habitats in central and southern Vietnam (for Rain Quail *Coturnix coromandelica* and Java Sparrow *Lonchura oryzivora*), lowland forest and lower montane forest in southern Vietnam (for Swinhoe's Minivet *Pericrocotus swinhoei*), and offshore, forested islands (for Nicobar Pigeon *Caloenas nicobarica*).

Table 17: Category A1, A2 and A3 species not confirmed to regularly occur in significant numbers at any IBA

Species	IBA criteria	Notes
Rain Quail *Coturnix coromandelica*	A3	The species occurs in anthropogenic habitats, which are poorly represented within the IBA network. Furthermore, the habitats of this species are seldom the focus of ornithological study and, therefore, the species may have gone unrecorded to date at a number of IBAs.
Ferruginous Duck *Aythya nyroca*	A1	The species is thought to have historically been an uncommon winter visitor to northern Vietnam, although there are no recent records[3]. It is possible that the species still occurs, as there has been little recent ornithological study of inland wetlands in northern Vietnam.
Baer's Pochard *A. baeri*	A1	The species is a very rare winter visitor to the Red River Delta and there are recent confirmed records from Xuan Thuy IBA (VN017)[3]. The species is not, however, known to regularly occur in significant numbers at any site in Vietnam.
Scaly-sided Merganser *Mergus squamatus*	A1	While there are historical records of this species from inland wetlands in northern Vietnam[7], there are no recent records[3]. However, this may, in part, reflect a lack of recent ornithological study of inland wetlands in northern Vietnam.
Bamboo Woodpecker *Gecinulus viridis*	A3	There are sight records from Chu Prong, Sinh Long and Cat Loc IBAs (VN023, VN028 and VN052). However, given that these records are from significantly outside the known range of this species[8], they are treated here as unconfirmed.
Ward's Trogon *Harpactes wardi*	A1, A2	While there are historical records from Fan Si Pan IBA (VN057), there are no recent, confirmed records[3]. It is probable, however, that the species still occurs somewhere in the Hoang Lien mountains.
Nicobar Pigeon *Caloenas nicobarica*	A1	Historically, the species was collected on the Con Dao islands[7] and reported to occur on Phu Quoc island[9]. There are no recent confirmed records of the species from either site, although this may, in part, reflect a lack of recent ornithological study.
Corncrake *Crex crex*	A1	The species is known only from a single market record in the Mekong Delta[3]. It is unlikely that the species is anything other than a vagrant in Vietnam[3].
Black-tailed Crake *Porzana bicolor*	A3	The species is a rare to scarce resident in north-western Vietnam[8]. Although there are no recent confirmed records at any IBAs, it is possible that the species may have gone unrecorded at a number of them.
Band-bellied Crake *P. paykullii*	A1	The species is a rare to scarce passage migrant in north-eastern and southern Vietnam[8]. It is unlikely that any site regularly supports a significant population of this species.
Indian Skimmer *Rynchops albicollis*	A1	There are no recent records of this species from Cambodia, Laos and Vietnam, and it is almost certainly extinct in these countries.
Relict Gull *Larus relictus*	A1	To date, there have been only two records of this species from Vietnam, both from the Gulf of Tonkin[3]. The species is not known to regularly occur in significant numbers at any site.
Black-bellied Tern *Sterna acuticauda*	A1	The species is a vagrant in central Vietnam[8], and is not known to regularly occur in significant numbers at any site.
Slender-billed Vulture *Gyps tenuirostris*	A1	Historically, the species occurred in central and southern Vietnam[7]. Although there are no recent confirmed records, it is possible that the species still occurs as a vagrant or rare non-breeding visitor at a number of IBAs in western Dak Lak province.
Cinereous Vulture *Aegypius monachus*	A1	There are no confirmed records of this species from Vietnam, although it seems likely that it occurs as a vagrant or very rare winter visitor[3]. It is highly unlikely that any site regularly supports a significant population.
Pallid Harrier *Circus macrourus*	A1	There are no confirmed records of this species from Vietnam, although it may occur as a vagrant to north-eastern Vietnam. It is unlikely that any site regularly supports a significant population.
Greater Spotted Eagle *Aquila clanga*	A1	The species is rare passage migrant through northern Vietnam, with recent confirmed records from several sites, including Fan Si Pan IBA (VN057). The species is also a rare winter visitor to the Mekong Delta, being recorded in small numbers at both U Minh Thuong and Tram Chim IBAs (VN004 and VN006). However, it is unlikely that either site regularly supports a significant population.
Imperial Eagle *A. heliaca*	A1	The species is a very rare winter visitor to north-eastern Vietnam, with a few records from Thai Thuy, Tam Dao and Cuc Phuong IBAs (VN014, VN032 and VN034). However, it is unlikely that any of these sites regularly supports a significant population.
Milky Stork *Mycteria cinerea*	A1	Historically, the species occurred, and may have bred, in the Mekong Delta[3]. However, there are no recent confirmed records, and, if the species still occurs, it is unlikely to be anything other than a vagrant[3].
Greater Adjutant *Leptoptilos dubius*	A1	The most recent confirmed record of this species is of a single bird at Tram Chim IBA (VN006) in 1992[3]. Although, the species may still occur as a very rare non-breeding visitor, it is unlikely that any site regularly supports a significant population.

Species	IBA criteria	Notes
Fairy Pitta *Pitta nympha*	A1, A3	The species is a rare passage migrant through Vietnam, and there are recent confirmed records from a number of sites, including Xuan Thuy, Tam Dao and Nam Cat Tien IBAs (VN017, VN032 and VN053)[3]. It is unlikely, however, that any site regularly supports a significant population.
Swinhoe's Minivet *Pericrocotus cantonensis*	A3	The species is an uncommon winter visitor to parts of mainland South-East Asia[8]. Although there are historical records of the species from central and southern Vietnam[3], no site is currently known to regularly support a significant population. However, this may, in part, reflect gaps in survey coverage, particularly of forested areas in the lowlands and hills of southern Vietnam.
Japanese Paradise-flycatcher *Terpsiphone atrocaudata*	A1	The species is a rare passage migrant through Vietnam, with recent records from a number of sites, including Nghia Hung and Fan Si Pan IBAs (VN012 and VN057). It is unlikely that any site regularly supports a significant population.
Long-billed Thrush *Zoothera rubrocanus*	A3	While there is a historical record from Fan Si Pan IBA (VN057), there are no recent, confirmed records[3]. It is probable, however, that the species still occurs somewhere in the Hoang Lien mountains.
Chinese Thrush *Turdus mupinensis*	A3	The species is a vagrant to north-eastern Vietnam[8], and it is unlikely that any site regularly supports a significant population.
Golden Bush Robin *Tarsiger chrysaeus*	A3	There are historical records of the species from north-western Vietnam but no recent confirmed records[10]. It is possible that the species still occurs at a number of sites in the Hoang Lien mountains but has been overlooked by recent surveys.
Jerdon's Bushchat *Saxicola jerdoni*	A3	There are historical records of the species from northern Vietnam[7] but no recent confirmed records[3]. It is possible that the species still occurs at a number of sites in northern Vietnam, particularly as the species occurs in non-forest habitats, which are seldom the focus of ornithological study.
Manchurian Reed Warbler *Acrocephalus tangorum*	A1	The species has been recorded at a few sites in Vietnam, including Xuan Thuy IBA (VN017) but none of these sites is thought to regularly support a significant population. However, due to the species's furtive habits and similarity with congeners, it is possible that it may have been overlooked at some sites[1].
Rufous-rumped Grassbird *Graminicola bengalensis*	A1, A3	Historically, the species occurred as resident in north-eastern Vietnam[11]. However, there have been no recent confirmed records.
Java Sparrow *Lonchura oryzivora*	A3	The species was formerly introduced in central and southern Vietnam[8]. The current status of the species in Vietnam is not known, particularly as it occurs in anthropogenic habitats, which are seldom the focus of ornithological study.

Secondary category taxa. Three category S1 taxa, eight category S2 taxa, five category S3 taxa and five category S4 taxa listed as occurring in Vietnam in the *2000 IUCN Red List of Threatened Species*[4] are not confirmed to occur at any IBA (Table 18). Some of these taxa may not occur in Vietnam, while other taxa have restricted distributions in Vietnam and occur at sites that do not qualify as IBAs. In addition to the taxa listed in Table 16, Black Gibbon *Hylobates concolor*, which is treated as a single species in the *2000 IUCN Red List of Threatened Species*[4], is treated as two separate species by some authorities[12]. While the western species is confirmed to occur at three IBAs, the eastern species is only known from two sites in Vietnam, neither of which are thought to qualify as IBAs.

Regarding secondary category taxa, the major gap in coverage of the IBA network are forest areas in north-eastern Vietnam, which are important for the conservation of Francois's Langur *Trachypithecus francoisi francoisi*, Tonkin Hooded Black Langur *T. poliocephalus poliocephalus*, *Pseudotsuga brevifolia*, *Cupressus torulosa* and Chinese Forest Musk Deer *Moschus berezovskii*. Few forest areas in north-eastern Vietnam are thought to qualify as IBAs, although this may, in part, reflect the relatively low level of ornithological study of these areas. Therefore, forest areas in north-eastern Vietnam should be considered a priority for future surveys to identify IBAs, in order to increase the coverage of other taxonomic groups within the IBA network.

Table 18: Category S1, S2, S3 and S4 taxa not confirmed to occur at any IBA

Taxon	IBA criteria	Notes
Francois's Langur *Trachypithecus francoisi francoisi*	S1	The taxon occurs in small, fragmented populations in north-eastern Vietnam. Several of the sites confirmed to still support the taxon, for example Ba Be National Park, are not thought to qualify as IBAs. There are, however, unconfirmed records from Ban Bung, Sinh Long and Ban Thi-Xuan Lac IBAs (VN027, VN028 and VN029), one or more of which may still support a population of this taxon.
Wulsin's Black Langur *T. f. ebenus*	S1	The all-black form of langur that occurs at Phong Nha IBA (VN039) has been assigned to Wulsin's Black Langur by some authors[13]. However, the precise taxonomic affinities of this form are currently undetermined, and, therefore, the occurrence of Wulsin's Black Langur within the IBA network should be considered unconfirmed.

Taxon	IBA criteria	Notes
Tonkin Hooded Black Langur *T. poliocephalus poliocephalus*	S1	The global range of this taxon is restricted to Cat Ba National Park, which is not thought to qualify as an IBA.
Mangrove Terrapin *Batagur baska*	S2	There are no recent confirmed records of the species from Vietnam. The species formerly occurred in the Mekong Delta but is now believed to be extinct there[14].
Giant Asian Pond Turtle *Heosemys grandis*	S2	The species is very localised in Vietnam, as a result of over-exploitation and habitat loss. There are unconfirmed records of this species from Chu Prong and Nam Cat Tien IBAs (VN023 and VN053).
Vietnamese Pond Turtle *Mauremys annamensis*	S2	The global range of this species is restricted to a small area in central Vietnam[14]. The species is poorly known but it is believed to be very localised with a very small population, as a result of over-exploitation and habitat loss.
Asian Giant Tortoise *Manouria emys*	S2	The precise status of this species is unclear, as it is not listed as occurring in Vietnam in the *Photographic Guide to the Turtles of Thailand, Laos, Vietnam and Cambodia*[14].
Asian Giant Softshell Turtle *Pelochelys cantorii*	S2	The species formerly occurred throughout lowland areas in Vietnam but is now probably absent from most of its range within the country[14].
Softshell turtle species *Rafetus swinhoei*	S2	A form of softshell turtle *Rafetus* sp. occurs in the Red River Delta region. However, the taxonomic affinities of this form is currently unclear, as some authorities do not assign it to *R. swinhoei*. The form is not known to occur at any IBA.
Green Sea Turtle *Chelonia mydas*	S2	No IBAs in Vietnam contain suitable nesting habitat for this marine species.
Hawksbill Sea Turtle *Eretmochelys imbricata*	S2	No IBAs in Vietnam contain suitable nesting habitat for this marine species.
Pinus fenzeliana	S3	The precise status of this species is unclear, as it is not listed as occurring in Vietnam in *Flore du Cambodge, du Laos et du Vietnam*[15].
Pseudotsuga brevifolia	S3	The species is only known to occur at a few sites in north-eastern Vietnam, including Kim Hy and Thang Hen proposed nature reserves[16,17], none of which are thought to qualify as IBAs.
Keteleeria fortunei	S3	The precise status of this species is unclear, as it is not listed as occurring in Vietnam in *Flore du Cambodge, du Laos et du Vietnam*[15].
Cunninghamia konishii	S3	This species is only known from two sites in Vietnam: Pu Hoat and Xuan Lien proposed nature reserves[18,19]. Neither of these sites was selected as an IBA.
Cupressus torulosa	S3	The species has a very limited distribution in Vietnam[15]. There is an unconfirmed record from Du Gia IBA (VN055).
Indochinese Warty Pig *Sus bucculentus*	S4	There are very few records of this recently rediscovered taxon from Vietnam, which may largely reflect the difficulty of assigning pig *Sus* sp. records to species. There is an unconfirmed record from Pu Mat IBA (VN042)[20], and the species is likely to occur at a number of other IBAs in Vietnam where it is currently unrecorded.
Chinese Forest Musk Deer *Moschus berezovskii*	S4	The species occurs at a few sites in north-eastern Vietnam[21], none of which are thought to qualify as IBAs.
'Indochinese' Hog Deer *Axis porcinus annamiticus*	S4	The taxon has undergone a severe decline in Indochina and there are currently no sites where it is confirmed to occur. However, there is an unconfirmed record from Kon Cha Rang IBA (VN025)[22].
Kouprey *Bos sauveli*	S4	There have been no recent confirmed records of this species from Vietnam[23], and it is probably extinct nationally, if not globally.
Wild Water Buffalo *Bubalus arnee*	S4	There have been no recent confirmed records of this species from Vietnam[23], and it is possibly extinct nationally.

3.4 Threats to biodiversity and conservation action

Threats. Threats to biodiversity at Vietnam's IBAs were grouped into 20 categories (Figure 2). The most widespread threat to biodiversity within the IBA network is hunting, which was identified as a threat at 56 IBAs (89%) and as a severe threat at 20 IBAs (32%). The factors underlying hunting include a tradition of natural resource use among many communities, opening up of previously remote areas to outside market forces through road construction, and increasing demand from the wildlife trade. Species in high demand from the wildlife trade, such as turtles, bears and pangolins, are more threatened than those species mainly targeted for domestic consumption, such as wild pigs and muntjacs. Bird species particularly threatened by hunting include large-bodied, congregatory species, such as hornbills and green pigeons, ground-dwelling birds susceptible to snaring, such as galliformes, and species in demand in the wildlife trade, such as mynas and parakeets.

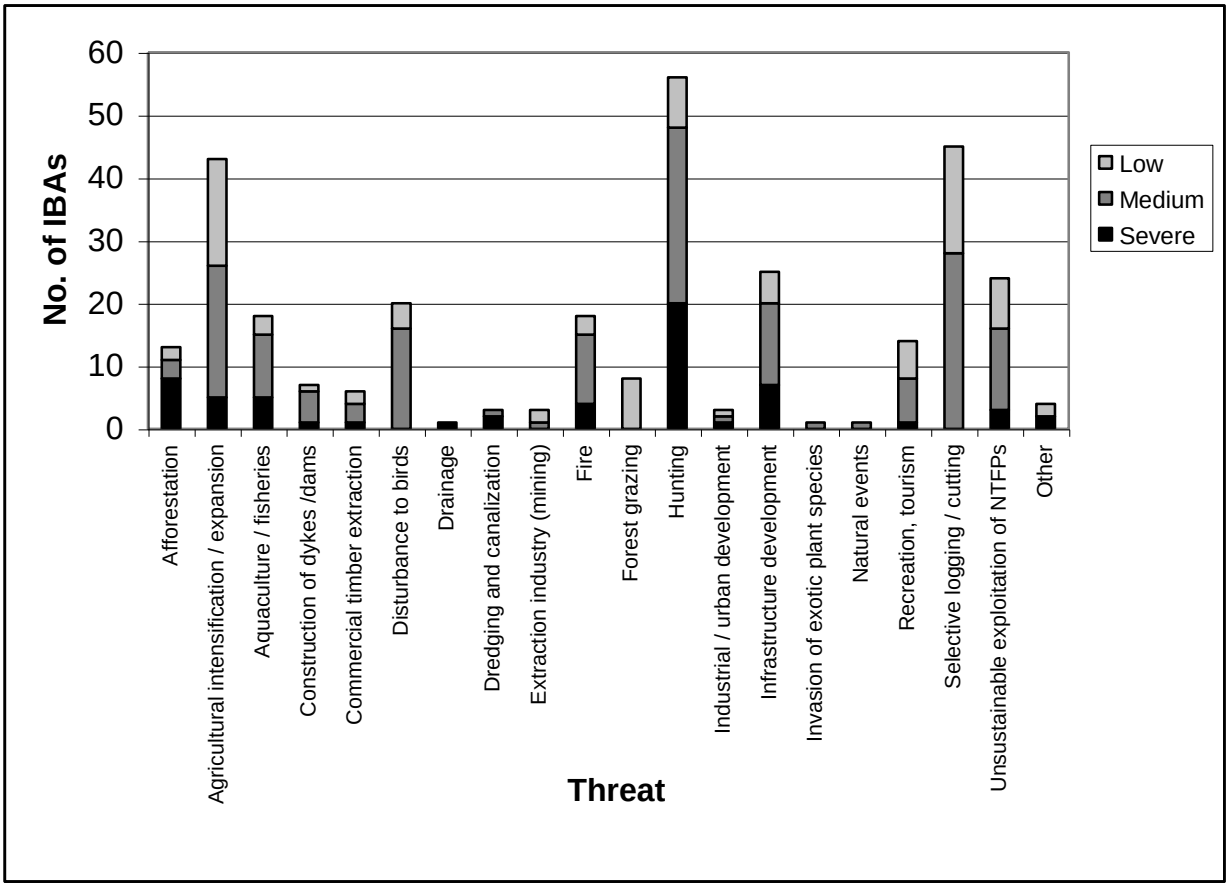
The next most widespread threat to biodiversity within the IBA network is small-scale, selective logging/cutting, which was identified as a threat at 45 IBAs or 71% of the total. However, selective logging/cutting was not identified as a severe threat at any IBA, illustrating the fact that this practice tends to result in habitat degradation, not habitat loss *per se*; although it may facilitate habitat loss through, for example, increasing the susceptibility of

forest to burning. The next most widespread threat to biodiversity is agricultural intensification/expansion. This was identified as a threat at 43 IBAs (68%) and as a severe threat at five IBAs (8%). The IBAs where agricultural intensification/expansion is a severe threat include Ha Tien, Kien Luong and Lang Sen IBAs (VN003, VN005 and VN007); these IBAs all support extensive areas of seasonally inundated grassland, which is under severe threat of conversion to agricultural land.

Infrastructure development and/or the construction of dykes and dams, was identified as a threat to biodiversity at 27 IBAs, equivalent to 43% of the total. These threats are particularly serious because not only does the construction of roads, dams and other infrastructure lead to direct loss of habitat but these developments can also facilitate human settlement and access to forest areas, which, in turn, can lead to increased pressure on natural resources.

Regarding wetland IBAs, in addition to hunting and agricultural intensification, the most widespread threats are afforestation, aquaculture/fisheries and disturbance to birds, which affect 13 (21%), 19 (30%) and 21 (33%) IBAs respectively. Afforestation of intertidal mudflats with mangrove and aquaculture development are the major threats to biodiversity at many coastal IBAs, as they result in loss of habitat for migratory waterbirds.

Figure 2: Threats to IBAs in Vietnam



Conservation action. Following the *Sourcebook of Existing and Proposed Protected Areas in Vietnam*[24], 28 of Vietnam's IBAs (44%) are partly or wholly included within decreed protected areas. Of the remaining IBAs, 18 are partly or wholly included within proposed protected areas (Map 4). In terms of area, 850,784 ha (51%) of Vietnam's IBA network is included within decreed protected areas, and a further 465,670 ha (28%) is included within proposed protected areas. Therefore, expansion of the national protected areas network to include those sites currently proposed but not yet decreed by the central government, coupled with strengthened enforcement of protected area management regulations, would further the conservation of a large proportion of Vietnam's IBA network. However, a significant proportion of the IBA network is not included within decreed or proposed protected areas. For many of these sites, alternative approaches to biodiversity conservation than protected area establishment may be appropriate. These approaches may include sustainable forest management within production forests and community-based conservation.

Excluding biodiversity surveys and the preparation of feasibility studies, to date there has been on-the-ground conservation action at 41 of Vietnam's IBAs (65%). Of the remaining 22 sites, some are currently under the management of protection forest management boards, such as Bai Boi and Phuoc Binh IBAs (VN001 and VN038), while others are under the management of forest enterprises, such as Truong Son, Ya Lop and Kon Plong (VN041,

VN047 and VN049). Although exploitation of natural resources and conversion of natural habitat are controlled to some extent at these IBAs, management objectives are not always compatible with biodiversity conservation.

In the IBA site accounts, management recommendations are presented for each IBA. The most common management recommendation is to control hunting, which is recommended at 37 IBAs (59%). This reflects the fact that hunting is the most widespread threat currently affecting the IBA network. Implementation of environmental awareness activities is recommended at 27 IBAs (43%), strengthened implementation of protected area management regulations is recommended at 25 IBAs (40%) and further research, including environmental monitoring, is recommended at 22 IBAs (35%). At wetland IBAs, two additional recommendations are commonly made: control expansion and/or intensification of aquaculture (at 10 IBAs) and prevent further afforestation of natural habitats with mangrove, *Melaleuca* and *Casuarina* (at eight IBAs). Finally, conducting Environmental Impact Assessments for planned infrastructure development is recommended at 12 IBAs (19%), reflecting the threat posed by infrastructure development at a significant proportion of IBAs.

The optimal conservation of Vietnam's IBA network will require an integrated effort from all organisations involved in natural resources management, including central government institutions, local authorities, and local communities, with support from donors and NGOs. Expanding and strengthening the national protected areas system will go a long way towards the conservation of the IBA network. However, a number of complimentary actions will also be essential, including the generation of local stakeholder support for IBA conservation, the pursuit of conservation objectives within other land-use designations, such as protection forest and production forest, and the development of innovative, community-based approaches to conservation. Of the highest importance, the objective of conserving the IBA network must be integrated into other sectors, particularly agriculture, fisheries and infrastructure, in order to mitigate the effects of incompatible development schemes that threaten to undermine conservation efforts at an increasing number of sites.

References

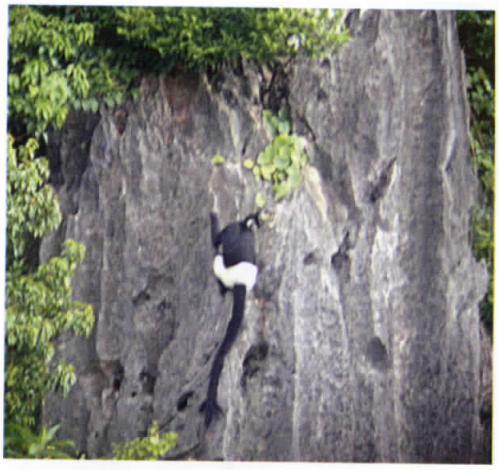
1. BirdLife International (2001) *Threatened birds of Asia: the BirdLife International red data book*. Cambridge, U.K.: BirdLife International.
2. Stattersfield, A. J., Crosby, M. J., Long, A. J. and Wege, D. C. (1998) *Endemic bird areas of the world: priorities for biodiversity conservation*. Cambridge, UK: BirdLife International.
3. Eames, J. C. and Tordoff, A. W. (in prep.) Recent records and a conservation status review of some threatened and near-threatened bird species in Vietnam.
4. IUCN (2000) *2000 IUCN Red list of threatened species*. Gland and Cambridge: IUCN.
5. Mittermeier, R. A., Myers, N., Thomsen, G. A. B., Da Fonseca and Olivieri, S. (1998) Biodiversity hotspots and major tropical wilderness areas: approaches to setting conservation priorities. *Conservation Biology* 12: 516-520
6. Baltzer, M. C., Nguyen Thi Dao and Shore, R. G. eds. (2001) *Towards a vision for biodiversity conservation in the Forests of the Lower Mekong Ecoregion Complex.* Hanoi: WWF Indochina Programme.
7. Delacour, J. and Jabouille, P. (1931) *Les oiseaux de l'Indochine française*. 4 vols. Paris: Exposition Coloniale Internationale. (In French.)
8. Robson, C. R. (2000) *A field guide to the birds of Thailand and South-East Asia*. Bangkok: Asia Books.
9. Tirant, G. (1879) Les oiseaux de la Basse Cochin-Chine. *Bulletin du Comite Agricole et Industriel de la Cochin-Chine* 3(1): 73-174. (In French.)
10. Delacour, J. (1930) On the birds collected during the fifth expedition to French Indochina. *Ibis* 6: 564-599.
11. Delacour, J. and Jabouille, P. (1935) Oiseaux rares de l'Indochine. *L'Oiseau R.f.O.* 5:150. (In French.)
12. Geissmann, T., Nguyen Xuan Dang, Lormée, N. and Momberg, F. (2000) *Vietnam primate conservation status review 2000. Part 1: gibbons.* Hanoi: Fauna & Flora International, Indochina Programme.
13. Pham Nhat and Nguyen Xuan Dang (2000) *Field guide to the key mammal species of Phong Nha-Ke Bang*. Hanoi: Fauna & Flora International, Indochina Programme.
14. Stuart, B. L., van Dijk, P. P., and Hendrie, D. B. (2002) *Photographic guide to the turtles of Thailand, Laos, Vietnam and Cambodia*. Phnom Penh: Wildlife Conservation Society.
15. Nguyen Tien Hiep and Vidal, J. E. (1996) *Flore du Cambodge, du Laos et du Vietnam, volume 28: Gymnospermae*. Paris: Museum National d'Histoire Naturelle. (In French.)
16. Phan Ke Loc, Nguyen Tien Hiep and Averyanov, L. V. (1999) [Is there any news about limestone karst flora in Cao Bang province?] Pp 32-41 in: Le Sau ed. [*Protection and sustainable development of forest and biodiversity in limestone areas of Vietnam*.] Hanoi: Forest Inventory and Planning Institute. (In Vietnamese.)
17. Tordoff, A. W., Vu Van Dung, Le Van Cham, Tran Quang Ngoc and Dang Thang Long (2000) *A rapid field survey of five sites in Bac Kan, Cao Bang and Quang Ninh provinces: a review of the Northern Indochina Subtropical Forests Ecoregion*. Hanoi: BirdLife International Vietnam Programme and the Forest Inventory and Planning Institute. (In English and Vietnamese.)
18. Osborn, T., Fanning, E. and Grindley, M. (2000) *Pu Hoat proposed nature reserve: biodiversity survey and conservation evaluation*. London: Society for Environmental Education.

19. Le Trong Trai, Le Van Cham, Bui Dac Tuyen, Tran Hieu Minh, Tran Quang Ngoc, Nguyen Van Sang, Monastyrskii, A. L. and Eames, J. C. (1999) *A feasibility study for the establishment of Xuan Lien Nature Reserve, Thanh Hoa province*. Hanoi: BirdLife International Vietnam Programme and the Forest Inventory and Planning Institute.
20. Grieser Johns, A. ed. (2000) *Pu Mat: a biodiversity survey of a Vietnamese protected area*. Vinh: Social Forestry and Nature Conservation in Nghe An Province.
21. Dang Ngoc Can and Nguyen Xuan Dang (1999) [Some biological and ecological characteristics of Musk Deer (*Moschus berezovskii* Flerov,1929) in Vietnam.] Pp 42-47 in: Le Sau ed. [*Protection and sustainable development of forest and biodiversity in limestone areas of Vietnam*.] Hanoi: Forest Inventory and Planning Institute. (In Vietnamese.)
22. Anon. (1999) [*Investment plan for Kon Cha Rang Nature Reserve, Gia Lai province*.] Hanoi: Forest Inventory and Planning Institute. (In Vietnamese.)
23. Duckworth, J. W. and Hedges, S. (2002) *Tracking Tigers: a review of the status of Tiger, Asian Elephant, Gaur and Banteng in Vietnam, Lao, Cambodia and Yunnan (China), with recommendations for future conservation action.* Hanoi: WWF Indochina Programme.
24. BirdLife International and the Forest Inventory and Planning Institute (2001) *Sourcebook of existing and proposed protected areas in Vietnam*. Hanoi, Vietnam: BirdLife International Vietnam Programme and the Forest Inventory and Planning Institute.

Plate 9: Secondary criteria groups

A. W. Tordoff

Saola *Pseudoryx nghetinhensis*, Truong Son IBA (VN041). This is one of 12 globally threatened, near-threatened and data deficient elephant and ungulate taxa that occur in Vietnam. Eight of these taxa, or 67% of the total, are confirmed to occur at at least one IBA, while there is an unconfirmed record of a ninth. Of the taxa that do not occur in the IBA network, two may be extinct in Vietnam: Kouprey *Bos sauveli* and Wild Water Buffalo *Bubalus arnee*.



A. W. Tordoff

Delacour's Langur *Trachypithecus delacouri*, Van Long proposed nature reserve. This is one of 20 globally threatened, near-threatened and data deficient primate taxa that occur in Vietnam. Of these, 17 taxa, or 85% of the total, are confirmed to occur at at least one IBA, while there are unconfirmed records of one other.

D. Hendrie

Black-breasted Leaf Turtle *Geoemyda spengleri*. This is one of 27 globally threatened and near-threatened crocodile and turtle taxa that occur in Vietnam. Of these, 19 taxa, or 70% of the total, are confirmed to occur at at least one IBA, while there are unconfirmed records of one other.

FFI Vietnam Programme/Aljos Farjon

Taiwania cryptomerioides, Van Ban IBA (VN058). This is one of 18 globally threatened, near-threatened and data deficient gymnosperm taxa that occur in Vietnam. Thirteen of these taxa, or 72% of the total, are confirmed to occur at at least one IBA, while there is an unconfirmed record of one other.

Plate 10: Threats to IBAs in Vietnam (1)

Nguyen Cu

Mnong shifting cultivators, Chu Yang Sin IBA (VN030). Shifting cultivation, as practiced by many ethnic minority communities, is a rotational system, involving periodic returns to land that was previously cultivated then left fallow for a number of years. However, a number of communities still practice destructive forms of pioneer shifting cultivation, which involves clearance of natural forest.

J. C. Eames

Dam on the Dak Ken stream, Yok Don IBA (VN044). Infrastructure development, including the construction of dykes and dams, was identified as a threat to biodiversity at 27 IBAs, equivalent to 43% of the total. The dam shown in the photograph was constructed on the same stretch of the Dak Ken stream that the globally vulnerable Masked Finfoot *Heliopais personata* was recorded on in 1997.

J. C. Eames

Forest fire, Phu Quoc National Park. Fire was identified as a threat to biodiversity at 18 IBAs, equivalent to 39% of the total. Many fires are associated with shifting cultivation, due to the widespread use of fire to clear vegetation prior to planting. On the Da Lat plateau, fire is a particular problem as it promotes the spread of fire-climax pine forest at the expense of montane evergreen forest, which is the more important habitat for restricted-range species.

N. M. Furey

Coffee shop, Hanoi. Clearance of forest for cash crops, including tea, cashew, rubber and, most of all, coffee, has been a major cause of natural forest loss in Vietnam over the last decade. This process has been particularly rapid in parts of the Central Highlands, where it has been compounded by high rates of in-migration.

Plate 11: Threats to IBAs in Vietnam (2)

J. C. Eames

Logging truck, Khe Net IBA (VN035). Although many forest areas, and most areas of lowland evergreen forest, were the focus of commercial logging operations in the past, in recent years, many forest enterprises have significantly reduced or halted extractive activities, and shifted their management objectives towards forest protection and reforestation. However, deforestation due to commercial logging continues to be a threat at six IBAs.

J. C. Eames

Wildlife trader, Ho Chi Minh City. While exploitation of natural resources for domestic consumption can, in many instances, be sustainable, opening up of Vietnam's economy to outside market forces in recent years, coupled with expansion of the transportation network, has resulted in a rapid expansion of the wildlife trade, and rapid declines in the populations of many plant and animal species, including turtles, bears, pangolins and valuable timber species.

Frontier - Vietnam

Hunter, Huong Son Forest Enterprise. Hunting was identified as a threat to biodiversity at 56 IBAs, equivalent to 89% of the total. Consequently, hunting was identified as the most widespread threat within the IBA network. The hunter shown in the photograph is pictured with a Stump-tailed Macaque *Macaca arctoides*.

A. W. Tordoff

Alexandrine Parakeet *Psittacula eupatria*, bird market, Hanoi. There has been a steady but noticeable expansion in the trade in captive birds in recent years. This trend is likely to continue as a result of the expansion of the middle class in Vietnamese society. Without effective measures to change attitudes, the trade in captive birds is likely to become a serious threat to populations of wild birds, particularly mynas, laughingthrushes and parakeets.

Plate 12: Conservation actions in IBAs in Vietnam

J. C. Eames

Biodiversity survey, Ke Go IBA (VN019). Biodiversity surveys are an important means of identifying priorities for conservation action. As a result of over a decade of surveys by Vietnamese scientists and their colleagues at international NGOs, most key sites for biodiversity conservation in Vietnam have already been identified. The focus must now shift to on-the-ground conservation action at these sites.

J. C. Eames

Forest guards, Nam Cat Tien IBA (VN053). In terms of area, 50% of Vietnam's IBA network is included within decreed protected areas. A further 28% is included within proposed protected areas. The formal establishment of these proposed protected areas, and the effective enforcement of management regulations throughout the protected areas system as a whole, are, therefore, high priorities for the conservation of Vietnam's IBAs.

A. W. Tordoff

Site support group, Ha Nam IBA (VN060). While protected areas can be a very effective approach to conservation in certain circumstances, a small but growing number of sites in Vietnam are being managed with the objective of biodiversity conservation by local stakeholders. These include Ha Nam IBA, a coastal wetland, where a site-support group has been established with the support of BirdLife International.

J. C. Eames

Conservation awareness campaign, Ke Go IBA (VN019). A low level of appreciation of the values of biodiversity at all levels, coupled with a lack of awareness of practical action that can be taken to conserve it, is a major obstacle to the conservation efforts in Vietnam. However, an increasing number of organisations are working to raise awareness of biodiversity conservation issues, and, thereby, create a more conducive environment for conservation.

4. Site accounts

This chapter presents site accounts for each of the 63 IBAs selected in Vietnam. Site accounts are arranged in the order that the IBAs were entered onto Vietnam's IBA database; a full list can be found in the Table of Contents. Each site account contains the following sections:

4.1 Heading

IBA code. A unique code is given for each IBA. Codes for Vietnamese IBAs are prefixed with the letters VN, and comprise VN001 to VN063 inclusive.

IBA name. The name of the IBA is given. In cases where the IBA boundaries coincide with those of a protected area, the protected area name given in the *Sourcebook of Existing and Proposed Protected Areas in Vietnam*[1] is used. In cases where the IBA includes only part of a protected area or parts of two protected areas, a name based on a prominent geographical feature or a protected area sector is used. In cases where the IBA does not include part of a protected area, the most widely used name for the site is used, often this is the name given in technical reports about the site in question.

Criteria. The IBA criteria that the site qualifies under are listed.

Province. The province(s) or city in which the IBA is located is/are listed.

PA status. For IBAs that are partly or wholly included within a decreed protected area, following the *Sourcebook of Existing and Proposed Protected Areas in Vietnam*[1], the protected area category is given. In cases where the protected area has been upgraded from nature reserve to national park since the publication of the sourcebook, the new category is used.

Latitude and longitude. The coordinates of the central point of the IBA are given, to the nearest minute.

Area. The area of the IBA is given in hectares. For some IBAs, the precise boundaries have not yet been defined, and the area given is only approximate; such cases are indicated in the general description.

Altitude range. The approximate altitudinal range of the IBA is given in metres above sea level. The approximate range is derived from Department of Cartography 1:250,000 topographical maps.

EBA/SA. For IBAs situated within an Endemic Bird Area (EBA) or Secondary Area (SA), the name of the EBA or SA is given.

Priority landscape. For IBAs situated within priority landscapes for biodiversity conservation in the Forests of the Lower Mekong Ecoregion Complex (FLMEC), as defined by WWF[2], the name of the priority landscape is given.

4.2 General description

The general description contains summary information on location, boundaries, topography, vegetation, ecology and current management of the IBA. Not all this information is available for every IBA; where information is lacking, this is indicated. The information is compiled from a number of sources, referenced in the text.

4.3 Bird fauna

Key features. The key features of the bird fauna of the IBA are briefly summarised. This section concentrates on the significance of the site for bird conservation, in particular the reasons why the site was selected as an IBA, but also includes features of the bird fauna of national or regional significance that did not contribute to the site's selection as an IBA.

Species table. The species table lists all category A1 (globally threatened), category A2 (restricted-range) and category A4 (congregatory) bird species recorded at the IBA since April 1988. For each species, the common and scientific names are given, together with the IBA criteria that the species meets, the global threat status of the species according to *Threatened Birds of Asia*[3], and the number of other IBAs at which the species is confirmed to regularly occur in significant numbers. In addition, a brief summary of the evidence on which each species's occurrence at the IBA is based is given in the notes section. In every case, the source(s) of information is/are given.

Finally, species whose occurrence at the IBA is unconfirmed are placed in square brackets [ ], while species confirmed to occur but not regularly in significant numbers are marked with a sword †.

Biome-restricted species. If the site qualifies as an IBA under criterion A3 (biome-restricted species), a brief summary of the biome-restricted species at the site is given. Because, for many IBAs, the number of biome-restricted species is very large, the full list is given in Appendix 4, not in the site account.

4.4 Secondary criteria

The secondary category taxa (primates, crocodiles, turtles, gymnosperms, elephant and ungulates) of which the IBA is believed to hold a viable population are listed, together with the global threat status according to the *2000 IUCN Red List of Threatened Species*[4]. Taxa whose occurrence at the IBA is unconfirmed are placed in square brackets [ ], while taxa believed to be possibly extinct at the IBA are marked with an asterisk *. Information on secondary category taxa was compiled from published and unpublished literature, supplemented by communications with scientists. Where there was considered to be any degree of uncertainty over the occurrence of a taxon, it is listed as unconfirmed. In every case, the source(s) of information is/are given. For many IBAs, comprehensive information on one or more groups of secondary category taxa was not available. Therefore, the lists of secondary category taxa should not be considered comprehensive.

4.5 Threats to biodiversity

The main threats to biodiversity at the IBA are briefly summarised, including both current threats and potential future threats. Threats to biodiversity were grouped into 20 categories, and those threats that apply to the IBA are presented in a table. Each threat is marked with three, two or one dots, according to whether it is rated as severe, medium or low respectively. Severe threats are ones that, if not mitigated, are predicted to cause the loss of key elements of biodiversity from the IBA within the next five years, including the eradication of one or more category A1, A2, A3 or A4 bird species. Medium threats are ones that, if not mitigated, are predicted to cause the loss of key elements of biodiversity from the IBA within the next 20 years, including the eradication of one or more category A1, A2, A3 or A4 bird species. Low threats are ones that, if not mitigated, are predicted to cause a significant decline in but not loss of key elements of biodiversity at the IBA within the next 20 years, including a significant decline in the population size or distribution of one or more category A1, A2, A3 or A4 bird species.

4.6 Conservation actions

Past, on-going and planned conservation actions at the IBA are briefly summarised, including preparation of feasibility studies, establishment of protected areas, capacity building for protected area staff, environmental awareness programmes and community-based conservation initiatives.

4.7 Recommendations

Management recommendations for each IBA are presented. Where these recommendations are based on ones made in technical reports about the site in question, the source is given. In other cases, the recommendations are based on a review of all available literature and communications with scientists and protected area managers.

References

1. BirdLife International and the Forest Inventory and Planning Institute (2001) *Sourcebook of existing and proposed protected areas in Vietnam*. Hanoi, Vietnam: BirdLife International Vietnam Programme and the Forest Inventory and Planning Institute.
2. Baltzer, M. C., Nguyen Thi Dao and Shore, R. G. eds. (2001) *Towards a vision for biodiversity conservation in the Forests of the Lower Mekong Ecoregion Complex.* Hanoi: WWF Indochina Programme.
3. BirdLife International (2001) *Threatened birds of Asia: the BirdLife International red data book*. Cambridge, U.K.: BirdLife International.
4. IUCN (2000) *2000 IUCN red list of threatened species*. Gland and Cambridge: IUCN.