17. Conservation of Herons

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It has been over 15 years since the publication of the Herons Handbook (Hancock and Kushlan 1984) and over 17 years since the establishment of the Heron Specialist Group, in cooperation with IUCN, BirdLife International (then the International Council for Bird Preservation) and Wetlands International (then the International Waterfowl Research Bureau) (Hafner et al. 1986a). Since these events, our knowledge of the world's herons and of their habitats and conservation needs has increased exponentially thanks to the enthusiastic commitment of a multinational group of professional biologists and heron conservationists. The many results of their investigations on all continents and over many specific regions, presented in the previous chapters, may now serve conservation purposes.

In this chapter representatives of the Group synthesise this knowledge in a condensed version of a global-scale conservation action plan. This plan outlines general and specific action required to maintain or enhance heron populations of concern throughout their present ranges. It represents the first complete assessment of existing knowledge of the global and regional conservation status of herons at species, subspecies and population levels. Not surprisingly there are taxa and regions for which data remain poor or non-existent. Gaps in our knowledge are emphasised in this chapter in order to challenge field biologists to fill major gaps in geographical coverage and to further understanding of heron biology and conservation needs in remote areas. The world's remaining wetlands, perhaps the most vulnerable and fragile of all habitats, are under ever-increasing threat from many sides. High consideration is therefore given to habitat and site conservation requirements without which species-conservation action would be futile.

Although this is the first compendium, it is anticipated that future research and conservation action will lead to periodic updating. Because conservation action must be built on ever-developing foundations of knowledge, the synthesis presented

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below may be viewed as one milestone along the road to successful conservation and management of heron populations and the habitats that sustain them.

Assessing and Presenting Conservation Status

For consistency and utility we use the IUCN's most recent threat categories (IUCN 1996), which are based on criteria developed by Mace and Lande (1991), Mace et al. (1992), Mace and Stuart (1994) and Collar et al. (1994). The categories are listed in Table 17.1 and the criteria for each category are listed in Appendix 17.1. These criteria were intended for assessment at a species level. Additionally, we found that lower taxa and non-taxon populations also require evaluation and categorisation. So we used these criteria to assess conservation status for each heron species and subspecies (Table 17.2) and for some non-taxon populations. In the section Taxon Conservation, these are presented according to their conservation status, from Critically Endangered (CR) to Lower Risk (LR), and not in taxonomic order (for the latter see Table 17.2).

In most cases, we found the IUCN categorisation to be accurate. However we have also categorised threats to species based on new knowledge and also categorised threats to subspecies and certain populations. These are listed as Heron Specialist Group (HSG) status in Table 17.2. HSG status follows the criteria of IUCN status except that populations at threat in an area not encompassing the range of a taxon (species or subspecies) is considered Regionally Endangered (REN) or Regionally Vulnerable (RVU). We also make use of the category Data Deficient (DD) (Table 17.2). Although none of the herons of the world has been listed by IUCN in this category, the HSG found it suitable in a number of cases for which information on the current population is lacking and for which immediate action required is data collection. Finally, to indicate data lapses, the HSG uses the following subcategory to complete categories such as Endangered (EN) or Vulnerable (VU): dd, hl, where dd indicates data deficiency and hl that habitat loss is clearly a major problem (Appendix 17.1.).

Taxonomic classification of the herons is by no means settled (see introduction). We intend Table 17.2 to be as useful as possible, so we have attempted to be comparable to other listings. Of course, total consistency among listings is not possible. For consistency with the rest of this book, we followed the species categorisation and taxonomy of Table 0.1 (from Hancock and Kushlan 1984). This differs somewhat from IUCN (1996).

For conservation purposes, it is useful to pay attention to various populations even if considered taxonomically dubious by some. For utility we followed subspecific categorisation of Rose and Scott (1997). The difference between the taxonomy of Hancock and Kushlan (1984) and other listings falls outside the scope of this work and is not discussed. Hancock (1990) emphasises the need for DNA to be carried out on a number of species to finally resolve the situation.

Notable differences among treatments are:

Ardea imperialis = *Ardea insignis* (IUCN 1996);
Egretta garzetta gularis = *Egretta gularis* (Rose and Scott 1997);
Egretta garzetta dimorpha = *Egretta dimorpha* (Rose and Scott 1997);
Butorides striatus virescens = *Butorides virescens* (Rose and Scott 1997);
Butorides striatus sundevalli = *Butorides sundevalli* (Rose and Scott 1997);

Table 17.1 Threat Categories used by IUCN and the Heron Specialist Group (from IUCN 1996).

Category	Definition
Extinct (EX)	A taxon is Extinct when there is no reasonable doubt that the last individual has died.
Extinct in the Wild (EW)	A taxon is Extinct in the Wild when it is known only to survive in cultivation, in captivity or as a naturalised population (or populations) well outside the past range. A taxon is presumed extinct in the wild when exhaustive surveys in known and/or expected habitat, at appropriate times (diurnal, seasonal, annual), throughout its historic range have failed to record an individual. Surveys should be over a time-frame appropriate to the taxon's life cycle and life form.
Critically Endangered (CR)	A taxon is Critically Endangered when it is facing an extremely high risk of extinction in the wild in the immediate future, as defined by any of the criteria (A to E) listed in Appendix 17.1.
Endangered (EN)	A taxon is Endangered when it is not Critically Endangered but is facing a very high risk of extinction in the wild in the near future, as defined by any of the criteria (A to E) in Appendix 17.1.
Vulnerable (VU)	A taxon is Vulnerable when it is not Critically Endangered or Endangered but is facing a high risk of extinction in the wild in the medium-term future, as defined by any of the criteria (A to D) in Appendix 17.1.
Lower Risk (LR)	A taxon is Lower Risk when it has been evaluated, does not satisfy the criteria for any of the categories Critically Endangered, Endangered or Vulnerable. Taxa included in the Lower Risk category can be separated into three subcategories:
1. Conservation dependent (cd)	Taxa which are the focus of a continuing taxon-specific conservation programme targeted towards the taxon in question, the cessation of which would result in the taxon qualifying for one of the threatened categories above within a period of five years.
2. Near threatened (nt)	Taxa which do not qualify for conservation dependent, but which are close to qualifying for Vulnerable.
3. Least concern (lc)	Taxa which do not qualify for conservation dependent or near threatened.
Data Deficient (DD)	A taxon is Data Deficient when there is inadequate information to make a direct, or indirect, assessment of its risk of extinction based on its distribution and/or population status. A taxon in this category may be well studied, and its biology well known, but appropriate data on abundance and/or distribution is lacking. Data Deficient is therefore not a category of threat or Lower Risk. Listing of taxa in this category indicates that more information is required and acknowledges the possibility that future research will show that threatened classification is appropriate. It is important to make positive use of whatever data are available. In many cases great care should be exercised in choosing between DD and threatened status. If the range of a taxon is suspected to be relatively circumscribed, if a considerable period of time has elapsed since the last record of the taxon, threatened status may well be justified.
Not Evaluated (NE)	A taxon is Not Evaluated when it is has not yet been assessed against the criteria.

Where there was uncertainty as to the correct classification for a population, the precautionary principle was adopted, recommending investigation to clarify the existing status towards a potential revision of the classification. This is particularly important for those taxa for which there are little or no data. As for all such categorisations, ours is data-dependent and we anticipate future revisions with the availability of new information.

Table 17.2 Conservation Status of Herons of the World. (Extinct taxa excluded)

Species	Subspecies	Distribution	IUCN 1996 Status[1,2]	HSG Status[1,2]
Syrigma sibilatrix	*S.s.sibilatrix*	South America		LR, lc
	S.s.fostersmithi	South America		LR, lc
Pilherodius pileatus		South America		DD
Ardea cinerea	*A.c.cinerea*	Europe, Africa, Asia		LR, lc
	A.c.rectirostris	Asia		LR, lc
	A.c.altirostris	Sumatra		VU
	A.c.monicae	Banc d'Arguin (Mauritania)		VU
	A.c.firasa	Madagascar		EN
Ardea herodias	*A.h.herodias*	North America		LR, lc
	A.h.fannini	North America		VU
	A.h.hyperonca	North America		LR, lc
	A.h.treganzai	North America		LR, lc
	A.h.wardi	North America		LR, lc
	A.h.santilucae	North America		LR, lc
	A.h.occidentalis	Caribbean		VU
	A.h.cognata	Galapagos		LR, lc
Ardea cocoi		South America		LR, lc
Ardea pacifica		Oceania		LR, lc
Ardea melanocephala		Africa		LR, lc
Ardea humbloti		Malagasy Subregion	VU	VU
Ardea imperialis		India, Bangladesh	EN	CR
Ardea sumatrana		Asia, Australia, New Guinea	LR, nt	LR, nt
Ardea goliath		Africa		LR, lc
		Asia		RVU
Ardea purpurea	*A.p.purpurea*	Europe and North Africa		RVU
		Africa		LR, lc
		Asia		LR, lc
	A.p.madagascariensis	Madagascar		VU
	A.p.bournei	Cape Verde Is.		CR
	A.p.manilensis	Asia		LR, lc
Egretta alba	*E.a.alba*	Europe and North Africa		RVU
		Africa		LR, lc
		Asia		LR, lc
	E.a.melanorhynchos	Tropical Africa		LR, lc
	E.a.modesta	Asia, Australia, Oceania		LR, lc
	E.a.maorianus	New Zealand		CR
	E.a.egretta	N. America, Neotropics		LR, lc
Egretta rufescens	*E.r.rufescens*	North America		VU
	E.r.colorata	Mexico		VU
	E.r.dickeyi	San Luis Is.		VU
Egretta picata		Asia, Oceania		LR, lc
Egretta vinaceigula		Africa	VU	EN
Egretta ardesiaca		Africa		LR, nt
Egretta tricolor	*E.t.tricolor*	NE Neotropics		LR, lc
	E.t.ruficollis	N. America, Neotropics		LR, lc
	E.t.trufimentum	Trinidad		DD
Egretta intermedia	*E.i.intermedia*	Asia		LR, lc
	E.i.brachyrhyncha	Africa		LR, lc

Table 17.2 *continued*

Species	Subspecies	Distribution Status[1,2]	IUCN 1996 Status[1,2]	HSG
Egretta intermedia	*E.i.plumifera*	SE Asia, Australia, New Guinea		LR, lc
Egretta novaehollandiae		Oceania		LR, lc
Egretta caerulea		N. & S. America		LR, lc
Egretta thula	*E.t.thula*	Neotropics		LR, lc
	E.t.brewsteri	North America		LR, lc
Egretta garzetta	*E.g.garzetta*	Africa, Europe, Asia		LR, lc
	E.g.nigripes	Java—New Guinea		LR, lc
	E.g.immaculata	Australasia		LR, lc
	E.g.gularis	W. Africa		LR, lc
	E.g.schistacea	NE Africa, SW Asia		DD
	E.g. dimorpha	Africa		DD
Egretta eulophotes		East Asia	EN	EN
Egretta sacra		Asia, Oceania		LR, lc
Bubulcus ibis	*B.i. ibis*	Africa, Europe, Asia, the Americas		LR, lc
	B.i.seychellarum	Seychelles		DD
	B.i.coromandus	Asia, Australasia, Oceania		LR, lc
Ardeola ralloides	*A.r.ralloides*	Europe and North Africa		RVU
		Africa		LR, lc
	A.r.palludivaga	Tropical Africa		LR, lc
Ardeola grayii	*A.g.grayii*	Southern Asia		LR, lc
	A.g.phillipsi	SE Asia		VU
Ardeola bacchus		Asia		LR, lc
Ardeola speciosa	*A.s.speciosa*	Greater Sundas		LR, lc
	A.s.continentalis	Mainland SE Asia		LR, lc
Ardeola idae		Malagasy Subregion	LR, nt	LR, nt
Ardeola rufiventris		Africa		LR, nt
Butorides striatus	*B.s.striatus*	N. Neotropics		DD
	B.s.anthonyi	N. America, Mexico		DD
	B.s.frazari	Baja—Mexico		DD
	B.s.bahamensis	Bahamas		DD
	B.s.maculatus	Caribbean		DD
	B.s.margaritophilus	Pearl Island		DD
	B.s.curacensis	Curacao Island		DD
	B.s. patens	Panama		DD
	B.s.robinsoni	Margarita Island		DD
	B.s.cyanurus	Central S. America		DD
	B.s.fuscicollis	Bolivia		DD
	B.s.brevipes	E. Africa, SW Asia		DD
	B.s.atricapillus	Africa		LR, lc
	B.s.rutenbergi	Madagascar		LR, lc
	B.s.rhizophorae	Comoro Islands		DD
	B.s.degens	Seychelles		EN
	B.s.crawfordi	Aldabra		LR, lc
	B.s.albolimbatus	Chagos Islands		VU
	B.s.didi	N. Maldive Islands		VU
	B.s.albidulus	S. Maldive Islands		VU
	B.s.chloriceps	Southern Asia		DD

Table 17.2 *continued*

Species	Subspecies	Distribution Status[1,2]	IUCN 1996 Status[1,2]	HSG
Butorides striatus	*B.s.spodiogaster*	Andaman Islands		DD
	B.s.amurensis	South-east Asia		DD
	B.s.abbotti	Malaysia		DD
	B.s.connectens	China		DD
	B.s.actophilus	South-east Asia		DD
	B.s.javanicus	Indonesia		DD
	B.s.moluccarum	Moluccas		DD
	B.s.solomonensis	Solomon Islands		DD
	B.s.papuensis	Northern New Guinea		DD
	B.s.macrorhynchus	Southern New Guinea		DD
	B.s.stagnatilis	North Australia		DD
	B.s.patruelis	Tahiti		VU
	B.s.rogersi	Southern Australia		DD
	B.s.virescens	The Americas		DD
	B.s.sundevalli	Neotropics		DD
Agami agami		South America	LR, nt	LR, nt
Nycticorax violaceus	*N.v.violaceus*	Central & N. America		LR, lc
	N.v.gravirostris	Socorro Islands		LR, lc
	N.v.caligínis	Colombia		LR, nt
	N.v.cayennensis	Neotropics		DD
	N.v.bancrofti	Baja—Mexico		DD
	N.v.pauper	Galapagos		DD
Nycticorax nycticorax	*N.n.nycticorax*	Europe and North Africa		RVU
		Africa		LR, lc
		Asia		LR, lc
	N.n.hoactli	Neotropics, N. America		LR, lc
	N.n.obscurus	S. Neotropics		LR, lc
	N.n.falklandicus	Falklands, Malvinas Is		LR, lc
Nycticorax caledonicus	*N.c.caledonicus*	New Caledonia		LR, lc
	N.c.manillensis	Philippines		LR, lc
	N.c.minahassae	Sulawesi		LR, lc
	N.c.pelewensis	Palau Island		DD
	N.c.mandibularis	Solomon Islands		DD
	N.c.hilli	Australia, New Guinea		DD
	N.c.cancrivorus	Bismarck Archipelago		DD
Nycticorax leuconotus		Africa		DD
Gorsachius magnificus		China	CR	CR
Gorsachius goisagi		Eastern Asia	VU	VU
Gorsachius melanolophus	*G.m.melanolophus*	Asia		LR, nt, dd, hl
	G.m.kutteri	Philippines		LR, nt, dd, hl
	G.m.rufolineatus	Palawan (Philippines)		VU, dd, hl
	G.m.minor	Nicobar Islands		LR, nt, dd, hl
Cochlearius cochlearius	*C.c.cochlearius*	N. Neotropics		DD
	C.c.zeledoni	W. Mexico		DD
	C.c.phillipsi	S. Mexico		DD
	C.c.ridgwayi	N. Central America		DD
	C.c.panamensis	S. Central America		DD
Tigrisoma mexicanum	*T.m.mexicanum*	N. Neotropics		LR, nt

Table 17.2 *continued*

Species	Subspecies	Distribution Status[1,2]	IUCN 1996 Status[1,2]	HSG
Tigrisoma mexicanum	*T.m.fremitus*	Sonora		DD
Tigrisoma fasciatum	*T.f.fasciatum*	S. Brazil, N. Argentina	LR, nt	LR, nt
	T.f.salmoni	W. Neotropics	LR, nt	LR, nt
	T.f. bolivianum	Argentina, Bolivia	LR, nt	LR, nt
	T.f.pallescens	NW Argentina	LR, nt	LR, nt
Tigrisoma lineatum	*T.l.lineatum*	N. Neotropics		DD
	T.l.marmoratum	S Neotropics		DD
Zonerodius heliosylus		PNG, New Britain	LR, nt	LR, nt
Tigriornis leucolophus		Africa		LR, lc
Zebrilus undulatus		South America	LR, nt	LR, nt
Ixobrychus involucris		South America		DD
Ixobrychus exilis	*I.e.exilis*	The Americas		LR, lc
	I.e.bogotensis	Colombia		DD
	I.e.pullus	Sonora		DD
	I.e.limoncochae	Ecuador		DD
	I.e.peruvianus	Peru		DD
Ixobrychus minutus	*I.m.minutus*	Europe and North Africa		RVU
		Asia		DD
	I.m.payesii	Tropical Africa		LR, lc
	I.m.podiceps	Madagascar		VU
	I.m. dubius	Australasia		VU
Ixobrychus sinensis		Asia, Seychelles, Oceania		LR, lc
Ixobrychus eurhythmus		Eastern Asia	LR, nt	DD
Ixobrychus cinnamomeus		Asia		LR, lc
Ixobrychus sturmii		Africa		LR, lc
Ixobrychus flavicollis	*I.f.flavicollis*	Asia		LR, lc
	I.f.gouldi	Australasia		LR, lc
	I.f.australis	Timor		DD
	I.f.woodfordi	Solomon Islands		DD
	I.f.pallidor	Rennell Islands		DD
	I.f.nesophilus	New Britain/New Ireland		DD
Botaurus pinnatus	*B.p.pinnatus*	Neotropics		DD
	B.p.caribaeus	Central America		DD
Botaurus lentiginosus		North America, Caribbean		LR, nt
Botaurus stellaris	*B.s.stellaris*	Europe and North Africa		RVU
		Asia		DD
	B.s.capensis	Southern Africa		CR
	B.s.orientalis	East Asia		LR, lc
Botaurus poiciloptilus		Oceania	EN	CR

[1] IUCN = Categorisation from IUCN 1996; HSG = Categorisation from the Heron Specialist Group.
[2] For abbreviations and explanation see Table and Appendix 17.1.

The knowledge base and conservation needs differ considerably among continents and regions. After a brief summary of the situation characterising each region, the status of herons and the conservation issues discussed in the previous chapters are reconsidered at a species by species and at subspecies and population levels to derive recommendations for conservation priority.

Regional Perspectives

Europe and North Africa

Reliable data on heron populations exist for most European countries and for the most important breeding areas of north Africa (Chapters 1 and 2). Major gaps in our knowledge concern Syria, Lebanon and Jordan in the east Mediterranean since the present status of herons in these countries is virtually unknown.

No European heron species is listed of important conservation concern by IUCN (Baillie and Groombridge 1996). This is entirely justified on a global scale. On a regional scale, BirdLife International considered five species (Purple Heron, Squacco Heron, Black-crowned Night Heron, Little Bittern and Eurasian Bittern) to belong to their SPEC Category 3 based on their being "not concentrated in Europe but with an unfavorable conservation status in Europe" (Tucker and Heath 1994). This statement is in agreement with the assessments made in Chapters 1 and 2, which underline the urgent need for regional and local action plans for these European populations of species that globally are not threatened.

Asia

Asia (Chapters 3 and 4) supports the largest number of species, subspecies and populations of herons of the regions used in this book (see Figs 3.1 and 4.1). In spite of this, for the majority of Asian heron populations, there are no historical and few contemporary quantitative data and it has therefore not been possible to analyse population trends. As a result it is difficult for most of the species to assign them confidently to the relevant IUCN categories. It is clear that this continent hosts the two presently most critically endangered herons of the world, the Imperial Heron and the White-eared Night Heron, and several other vulnerable species.

Africa

For the majority of African heron populations, there are no historical or contemporary quantitative data, and it is therefore not possible to quantify population changes. The conservation of several species and subspecies on the African continent is in particular need of updated information on numbers, distribution and habitat use (Chapter 5 and Fig. 5.1). The Slaty Egret for instance is considered so vulnerable that one hesitates to initiate research activity, which could cause disturbance during breeding. Similarly, the Eurasian Bittern subspecies *capensis* is today considered endangered, with very low numbers, and almost certainly still declining due to shrinking and deteriorating habitats, and its intolerance of man. The Malagasy subregion, which includes the island complexes Seychelles, Aldabra, the Comores, Madagascar, Réunion, Mauritius and Rodrigues, supports fifteen species of heron, with five subspecies of *Butorides striatus* and two of *Bubulcus ibis*. Of these, two species and eight subspecies are endemic to the subregion.

Australasia and Oceania

The continent of Australia, the large islands of New Zealand and Papua New Guinea, and thousands of small islands scattered across the Pacific Ocean (Chapter 6) are important heron habitats. On the Australian continent the climate fluctuates from a period of extreme drought conditions to periods of extreme flooding and

because of the short-term nature of surveys which have been conducted, it is difficult to determine whether population fluctuations are merely a reflection of the climatic changes or of more serious ecological problems. Regulation of inland rivers for water supply and irrigation has significantly altered seasonal hydrological characteristics of wetlands, with detrimental affects on heron breeding; recent moves to provide environmental flows to mimic natural processes have important potential for a resurgence of breeding in the inland and needs to be pursued and monitored. Only the Cattle Egret has been extensively studied in Australia and New Zealand and research data on other heron species is fragmentary. Very little research has been carried out in the island countries. Herons are known to move between the island of Tasmania and the Australian mainland, between Australia and New Zealand, and between Australia and Papua New Guinea. In many areas of this extensive region data are too sparse to provide detailed accounts of populations and trends. Consequently several species in this region are categorised as Data Deficient.

North America

In contrast to the Neotropics, heron populations have been rather extensively studied in North America (Chapter 7). The situation is similar to Europe where intensive research programmes initiated decades ago in certain areas continue to form a basis of knowledge on which conservation action can be built. However, as is also the case in Europe, detailed information exists for important regions and sites whereas continental-scale or even national initiatives for coordinating long-term censuses of colonial herons usually fail. There is a continuous need for monitoring programmes in order to improve insight in status and trends.

South America

South America, with its numerous and diverse wetlands and extensive floodplain forests (see Fig. 8.1), supports a particularly rich heron fauna, with a high level of endemism (Chapter 8). This immense field of research remains largely underexploited. Data on the population status of species which form only small and dispersed colonies or which are solitary nesters are virtually impossible to obtain. This is particularly true for certain small, cryptic and secretive species of high conservation priority such as the Zigzag Heron. The scarcity of quantitative data on the heron fauna in general does not allow trends to be estimated, and even distribution ranges cannot be attributed confidently to most of the species. IUCN (1996) lists only three species under the category "Lower risk: near threatened". South America hosts some of the least known herons of the world. To acquire more knowledge is at present a major concern, and also a challenge in view of inaccessible areas to cover such as the huge Amazon and ParanaBasins.

Taxon Conservation

In this section we synthesise the conservation status and needs of various heron taxa, following the IUCN categorisation for species and that of the Heron Specialist Group. Table 17.2 provides the categorisation for all taxa. Below we discuss certain taxa and populations.

Extinct taxa

According to IUCN (1996), the following taxa are considered extinct (Category EX): Mauritius Night Heron (*Nycticorax mauritianus*) on Mauritius by 1700; Rodrigues Night Heron (*Nycticorax megacephalus*) on Rodrigues Island in 1761; unidentified Night Heron (*Nycticorax* sp.) on Réunion Island by 1700 and Black-backed Bittern (*Ixobrychus novaezelandiae*) in New Zealand by 1900.

Species of conservation concern (listed in order of conservation status)

White-eared Night Heron *(Gorsachius magnificus) IUCN and HSG Category Critically Endangered (CR).* The White-eared Night Heron is the most threatened Heron species in the world; it is currently only known to occur in south-western China. There have been only a handful of sightings since 1980. Three sightings in the wild in Guangxi, on a survey with funds from the Oriental Bird Club, included one in degraded habitat (Zhou 1996). In May 1998, during a survey by Kadoorie Farm & Botanic Garden (KFBG), a conservation charity based in Hong Kong, a juvenile caged bird was recorded in a market in the town of Nanning, Guangxi (Lee 1999). This bird was reared to adulthood by Prof. Zhou Fang of Guangxi University, and

White-eared Night Heron.The most threatened heron in the world. The juvenile bird pictured here was found in May 1998 on a market in south-western China. Photo: Lee Kwok-Shing, Kadoorie Farm and Botanic Garden.

subsequently, following quarantine, released in the Da Ming Shan Nature Reserve. The finding prompted KFBG to fund a twelve-month survey of both markets and potential habitats in Guangxi by Professor Zhou in collaboration with the Guangxi Forestry Department. As of July 1999, one breeding site had been confirmed in Fusui County; several old nests were found high in the forest canopy, one of which contained a dead sub-adult bird which had apparently died there of injuries sustained elsewhere. Another live sub-adult was found in a market in Shajing Town, a suburb of Nanning. KFBG plans further study and conservation action following completion of the present survey, having established a good working relationship with the Guangxi Forestry Department. In neighbouring Guangdong province, two specimens have been recently reported by Professor Gao Yu-ren, one from Shixing County, northern Guangdong, killed by a hunter and the second a specimen being sold in Chee Hing County.

There are no recent records from Hainan, Anhui, Zhejiang or Fujian Provinces, where it was formerly recorded (La Touche 1934, Cheng 1987). In view of the precariousness of the species, it should be the highest global priority for heron conservation. The species was classified as Critically Endangered by Collar et al. (1994).

Conservation action: immediate conservation action for the White-eared Night Heron is critical. The current KFBG surveys will provide a basis for this, but current efforts are restricted by the limited expertise available in southern China.

Besides locating the breeding and roosting sites of the species, conservation activity must include: nest site protection, creation of awareness among local human communities, creation of incentives to protect the species, data gathering during breeding including that on reproductive success and causes of failure, on dispersal and on wintering. Radio-tracking of known birds might be considered. However, in view of the vulnerability of the species and the possibility of research activity reducing breeding success if not carefully planned (Chapter 9), access to breeding sites by experienced heron biologists must only be decided if preliminary surveys reveal a situation judged relatively safe for this kind of work.

Other urgent actions are assessment of habitat requirements and habitat inventories, and important area inventories during breeding, migration and wintering. Finally, if sexually mature individuals exist in captivity, captive breeding should be considered immediately.

Understanding of the ecology of this species is presently insufficient to provide guidance for its efficient conservation. Surveys must be combined with collection of data on the ecology of the species to provide an account of its ecological requirements as a basis for conservation action. There, the primary objective must be to establish its habitat preferences and requirements. This sort of information can only be collected through detailed studies throughout the year. It will be necessary to monitor the species' seasonal presence to assess to what extent it migrates, as the results will influence identification of priority sites and habitats for protection. It will be important to clarify the annual movements of birds with regard to protection of suitable sites throughout their range.

The data may serve to create and enhance understanding and awareness of conservation in areas that support this species. It is of concern that the most recent records of this species include birds captured for human consumption. Although the degree to which this sort of activity may affect populations is unknown, an effort

should be made to discourage capture of White-eared Night Herons. Awareness is therefore an important conservation issue. Because the area from which recent records derive supports a low standard of living, it is unlikely that there exists any significant degree of consideration of the environment per se. Therefore promotion of conservation awareness should be included as a fundamental component of any conservation project for this species. As a cautionary note, it should be remembered that rarity of species is sometimes viewed as an attractive feature among Chinese consumers. The market birds recorded so far have been on sale for quite low prices (US$6 or less), no higher than those of commoner species. If recognised as rare, the price and demand for the bird might increase. Thus there may be a risk attached to publicising the rarity of the species without engendering a conservation ethic towards it.

Little information is currently available on the status of natural and semi-natural habitats in the area where this species has been recorded in recent years. The forest in the region is threatened by clearance for agriculture (as can be said for most forest throughout east and south-east Asia). Hunting is rife throughout its range. Consequently, site protection combined with enforcement of protection of the species must be considered.

Conservation action for the White-eared Night Heron is designed initially to compile data to enable the design and implementation of suitable conservation action plans. It is particularly important that project design be an ongoing process and that the relationship between design and action be iterative. Eventually, captive breeding may become necessary to prevent extinction.

Imperial Heron *(Ardea imperialis) IUCN Category Endangered (EN); HSG Category Critically Endangered (CR).* Although it is apparently widespread in suitable habitat over a fairly large area in Asia, its solitary habit and large size mean that population densities are never likely to be high. The species seems to have disappeared from Nepal, and this combined with the paucity of records since 1980 suggest that the species is uncommon where it occurs. Classified as Endangered by Collar et al. (1994), there is today no justification for a population estimate of over 250 mature individuals. This scarcity when combined with the known degree of habitat destruction and degradation over this species' range justifies classification as Critically Endangered (CR). Therefore, until further information becomes available, any site that supports more than two individuals should be considered to support more than 1% of the world population.

Imperial Herons appear dependent upon mature trees associated with wetlands (rivers, marshes and lakes) and large forest rivers (see Inskipp and Inskipp 1991), a habitat complex which is threatened throughout the region. To date, nothing is known of the ecology of this species.

Conservation action: the species is little known and the primary conservation objectives should be to identify its habitat preferences and to assess whether or not migration or seasonal movements occur. Information on movements and distribution throughout the year may help designation of priority sites for protection over a wide range.

The most urgent recommendations are: to approach the governments of India and Bangladesh to address the potential for legal protection of the species and sites upon which it depends; to provide an accurate assessment of the current distribution and

numbers of Imperial Herons; to study the habitat requirements for different aspects of the species life cycle; to establish a baseline for population monitoring in the long term. This kind of work should lead to recommendation of a preliminary list of sites for protection and to identification of areas of potential suitable habitat.

Australian Bittern *(Botaurus poiciloptilus) IUCN Category Endangered (EN); HSG Category Critically Endangered (CR).* This species is very poorly known. The current population is estimated to be not more than 10 000 individuals. Following the Ramsar criteria, any site supporting more than 100 individuals therefore qualifies for designation as a Ramsar site. In Australia, it occurs in Queensland, New South Wales, Victoria and Tasmania. It also occurs in New Zealand, New Caledonia and the Loyalty Islands. The species has been nominated in Victoria under the Flora and Fauna Guarantee Act because it is in a demonstrable state of decline and prone to future threats which are likely to result in extinction; only one record of breeding has been reported in Victoria since 1970 (O'Brien, pers. comm.). Precise information on the populations occurring at individual sites is virtually non-existent. The Heron Specialist Group raises conservation status of the species into the category Critically Endangered (CR, Table 17.2.).

Conservation action: in view of these considerations it is most urgent to: clarify the distribution and population of the species; identify the most important sites for its conservation; create awareness and provide information to local people; implement strict protection of the species and sites on which it depends; and establish a baseline for a comprehensive monitoring programme.

Swinhoe's Egret *(Egretta eulophotes) IUCN and HSG Category Endangered (EN).* The total known population is estimated at 1800–2500 birds, therefore any site which supports more than 20 birds is eligible for Ramsar status. The breeding population is concentrated on a small number of islands in the Yellow Sea. None of the colonies numbers more than 1000 mature individuals. In addition, known stopover sites are limited and threatened. Consequently, the species is likely to be vulnerable to a variety of anthropogenic influences. It is classified as Endangered (Criteria C1; C2a) by Collar et al. (1994), who consider that the main threats to the survival of this species are wetland reclamation and coastal development at breeding and wintering sites, particularly an airport being built on Yongjong Island which will destroy the most important feeding area for the South Korean breeding population.

Although this species has been considered to be one of the most severely threatened in the world, as a consequence of the discovery of a number of breeding colonies on islands in the Yellow Sea in the 1980s (Chapter 4) the population appears to be today fairly robust and stable. The Swinhoe's Egret is now one of the better known Asian heron species. In spite of this, it is clear that this stability needs direct conservation action, supported by pertinent legislation. Chapter 4 gives the most recent figures available for non-breeding individuals. This information is presented to provide a clear account of the differing importance of sites as indicated by the numbers of birds that have been recorded. It must be recognised that many of the sites are stopover sites on migration and may at any one time only support a very small number of birds. However, such sites may have a high turnover during migration and consequently data from a single count may give an inaccurate picture of the true importance of the site.

Birds disperse widely from the breeding grounds, travelling southwards along the coasts of the People's Republic of China, South Korea and Japan; then the majority of the population travels south to the Philippines, sometimes stopping over in Taiwan. A smaller proportion of the population passes through coastal Indo-China to Peninsular Malaysia and Singapore, possibly continuing to Sumatra.

Conservation action: based on the information available we recommend: to encourage the relevant governments to protect the known breeding, stopover and wintering sites; to support surveys designed to clarify the distribution and relative value of breeding and non-breeding sites; and to promote and support studies into the ecology of the species on the breeding grounds and staging and wintering sites.

Increased access and observer coverage in coastal areas of mainland China, North Korea, and South Korea, combined with increasing ease of exchange of data, have greatly improved our knowledge of the location and size of breeding colonies. However, there remain a number of potentially suitable sites in the Yellow Sea and along the coast of Russia north from Vladivostok. A colony discovered in 1998 is located near Vladivostok 600 km north of the previously known breeding range (Chapter 4).

Finally, a sufficient number of active breeding colonies have been located since the mid-1980s to enable establishment of a comprehensive monitoring programme which would accurately indicate population trends, and a long-term monitoring programme should be initiated.

Slaty Egret *(Egretta vinaceigula) IUCN Category Vulnerable (VU); HSG Category Endangered (EN).* The small, localised population is poorly known, largely confined to the swamps and floodplains of the major river systems in Zambia, northern Botswana and the eastern Caprivi, Namibia. Flood regulation has already caused it to disappear from one part of the Kafue Flats in Zambia and the population is threatened by a variety of proposed actions, such as plans to harness the waters of the Okavango Delta. Plans to clear the area of tsetse fly may also seriously affect the ecology of the entire area. The proposed development of a rice-growing project in the eastern Caprivi may markedly alter the functioning of the Zambezi floodplain; and the impact of tourism and livestock industries, together with the constant reduction of potential breeding sites by reed-cutting and fires, are all likely to have serious and negative effects on the remaining Slaty Egret population (Chapter 5). In view of this situation of serious concern the Heron Specialist Group raises the species into the category Endangered (Table 17.2).

Conservation action: it is most important to carry out quantitative surveys to achieve legal protection of all sites supporting 1% of the world population (i.e., 50–100 birds, Rose and Scott 1997) at any time, and to continue to identify and monitor risks to the long-term survival of the species.

The first action needed is a comprehensive survey, to enable a suitable response to be given to the importance of different sites, in response to the various development proposals. Secondly, an assessment is needed of the current level of legal protection of sites which support this species, and of the existing capacity for implementation of legal protection.

There is little information on the factors limiting population size, apart from general assumptions relating to habitat availability. It is therefore recommended in

terms of site protection to study the ecological requirements of the species through all aspects of its life cycle, including monitoring of nesting success. However, in view of the vulnerability of the species and the possibility of research activity causing disturbance at the nest site (Chapter 9), the possibilities of studying breeding parameters must be carefully evaluated.

Reddish Egret *(Egretta rufescens) HSG Category Globally Vulnerable (VU).* This species has a restricted geographical range in southern North America, West Indies and northern coast of Venezuela and Columbia. It exploits exclusively coastal wetland areas, a vulnerable habitat which is increasingly subject to disturbance and degradation by human activity (Chapter 7). Many of these areas are threatened by housing and industrial development. Changing the hydrology through building dikes and thus altering the natural functioning of a coastal wetland reduces the food supply for these birds. Estuaries are also much exposed to environmental contamination.

Conservation action: with only 6000–10 000 adults, this population is in need of a continuous monitoring programme. The results of surveys must be used to re-evaluate the list of priority areas and sites during the breeding season, during migration and in winter. Protection and policies promoting wise use of these coastal wetlands are critical.

Japanese Night Heron *(Gorsachius goisagi) IUCN and HSG Category Vulnerable (VU).* The Atlas of breeding birds in Japan shows only six confirmed, fourteen probable and one possible breeding site (Wild Bird Society of Japan, 1978) combined with anecdotal accounts of a recent decline. The only records of this species outside the breeding season refer to isolated observations. Even if the species is relatively widespread, data are insufficient to properly address its conservation requirements.

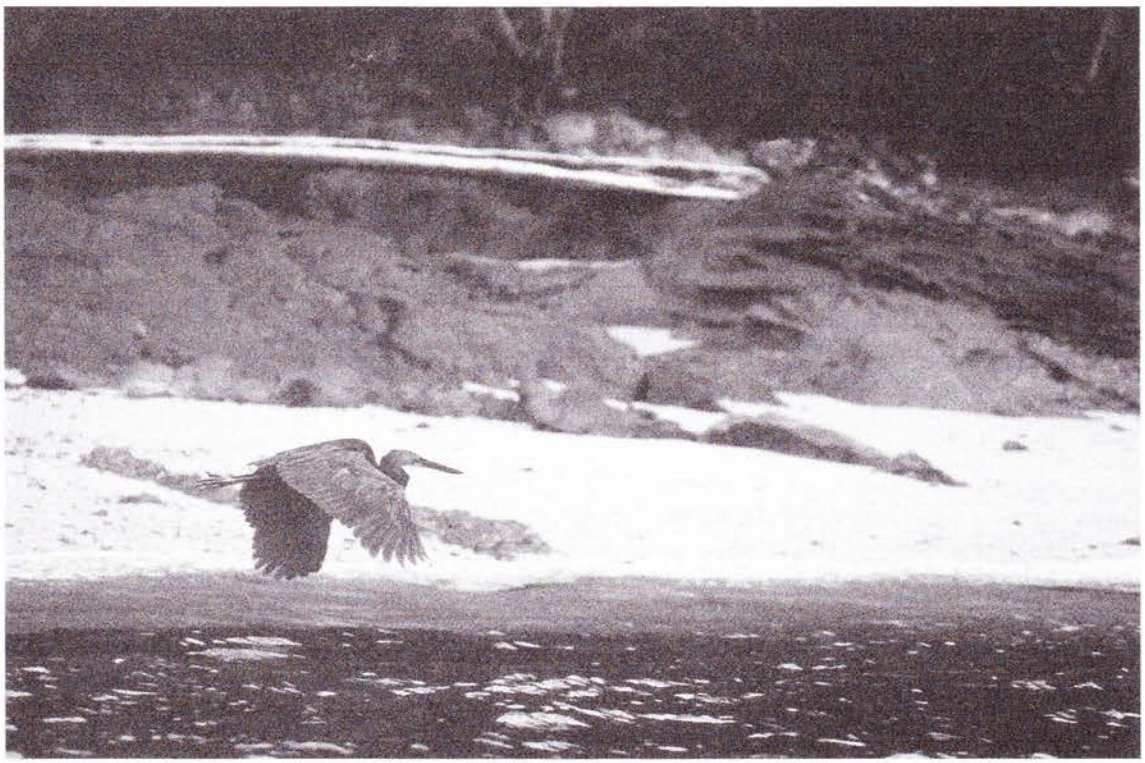
Conservation action: the most urgent conservation action at present is: to clarify the current distribution of this species during and outside the breeding season and to provide a population estimate as a basis for monitoring. Such basic data must lead to ecological studies into habitat requirements and assessment of the viability of existing forest to sustain the populations. This information must be fed into the conservation strategy to ensure protection and address potential for habitat protection and management. Habitat protection is most important. The WBSJ Atlas provides a sound basis for establishment of a network of forest reserves for this species in Japan. The six confirmed and fourteen probable breeding sites should be surveyed to re-confirm presence and provide them with legal protection. The species should be accorded full protection in Japanese legislation.

Migration occurs through the Ryukyu Islands and there appears to be a regular wintering population in Taiwan (Chapter 4). Protection of remaining forested areas in these two areas would contribute significantly to the viability of the existing populations of this species.

Malagasy Heron *(Ardea humbloti) IUCN and HSG Category Vulnerable (VU).* This species is still present in relatively strong numbers in parts of north-west Madagascar, where it has a patchy distribution. Possibly it breeds also on the Comoro islands (Collar et al. 1994). According to Rose and Scott (1997) the total

population is now below 5000 individuals, a situation already suspected by Collar et al. (1994). The species is threatened by hunting and nest predation by locals and by conversion of natural wetlands to rice agriculture (Chapter 5).

Conservation action: there are a clear suite of problems, mainly related to habitat destruction and degradation, which affect the survival of a number of waterbird species and endemic subspecies in the Malagasy subregion, particularly on Madagascar. We are aware that much has been done in Madagascar by International and National Conservation Institutions such as the World Wide Fund For Nature, the Jersey Wildlife Preservation Trust, and others. It is therefore possible that actions which we propose here will already be being undertaken. A first stage in the conservation strategy for herons in this region must involve liaison with conservation organisations active in the Malagasy subregion, to establish an accurate overview of the current state of conservation. Rigorous protection of the known nest sites is essential. The success of this may depend on efficient wardening combined with awareness campaigns. Surveys to update information on distribution and numbers must form part of the strategy. However, surveys are likely to be constrained by logistical problems and must not take precedence over site protection and wardening.



Sumatran Heron. This species is in need of surveys to clarify its status and distribution. Photo: Alan OwYong.

Sumatran Heron *(Ardea sumatrana) IUCN and HSG Category Lower Risk (LR), Subcategory near threatened (nt).* This species seems to have disappeared from mainland south-east Asia (except parts of Indo-China) in the last 50 years. Due to an apparent significant range reduction, the existing population of the Sumatran Heron has been split into two discrete geographic areas. One involves scattered records in coastal Indo-China and islands off the south-west coast of Thailand, with a probably isolated sub-population in the Andaman islands. The other occurs through much of Indonesia, south to the northern coasts of Australia. There is little current information on the size of these sub-populations, mainly due to a combination of low observer coverage and difficulty of access. The species appears to be dependent upon mature woodland and fairly extensive coastline or wetlands, which are threatened throughout the regions.

Conservation action: the primary conservation aim must be to clarify the population size and status and its distribution. The most appropriate approach involves provision of financial and technical support to wetland surveys for a better coverage of suitable areas. In Asia, the project could be linked to conservation action for the Malayan Night Heron (see below).

Black Heron *(Egretta ardesiaca) African and Madagascar populations HSG Category Lower Risk (LR), Subcategory near threatened (nt).* Although the world population may appear secure, the species cannot be considered common anywhere in Africa and there is suspicion that it is declining. The population in Madagascar, where it was formerly common and widespread has severely declined over the past 30 years (Chapter 5).

Conservation action: in Africa we recommend a survey programme to establish the current situation and compare this with historic data where available. The survey method and data must be used to establish a basis for long-term monitoring, so that if there is a real decline in the overall population, this can be recognised and appropriate action developed. In Madagascar where colony sites disappeared or declined dramatically due to excessive disturbance by man (Chapter 5), the remaining wetlands in the west of the country are the last stronghold of the island. They deserve priority for protection since they are also the strongholds for the globally threatened Malagasy Heron.

Malagasy Pond Heron *(Ardeola idae) IUCN and HSG Category Lower Risk (LR), Subcategory near threatened (nt).* The population size of this endemic species to Madagascar is presently estimated at less than 10 000 individuals (Rose and Scott 1997). There has been a sharp decline over the last 50 years, possibly related to competition with the more recently established Squacco Heron which seems to exploit rice fields as feeding grounds more successfully (Hancock and Kushlan 1984). The Malagasy Pond Heron is threatened by conversion of natural feeding areas for rice-growing.

Conservation action: there are several very active conservation organisations in Madagascar and inventories of important sites to this species certainly exist. These organisations collaborate with the governmental departments in order to create awareness and achieve site protection. This seems indeed the most urgent and efficient conservation action to recommend.

Rufous-bellied Heron *(Ardeola rufiventris) Africa HSG Category Lower Risk (LR), Subcategory near threatened (nt).* Local and uncommon. Breeding is apparently sporadic, in response to fluctuating water levels (Chapter 5). To date, we have very poor data on populations.

Conservation action: the species may well be of higher conservation concern than stated here. However, in order to attribute a new status confidently, it is urgent to update a baseline population estimate and distribution map from all available information and carry out surveys to improve knowledge on the current population and identify priority sites for conservation. After this initial phase the data should be used as a baseline for long-term population monitoring and a tool enabling a quick response to concerns identified through future assessment of trends. Further, in collaboration with universities and other institutions, ecological studies should be envisaged to test the hypothesis that the species depends for breeding upon the availability of feeding habitat, as a product of varying water levels. There is a need to achieve a better understanding of this relationship, to help understand population trends and, in certain protected areas, to take appropriate management action.

Agami Heron *(Agamia agami) IUCN and HSG Category Lower Risk (LR), Subcategory near threatened (nt).* This little-known and shy South American heron is confined to forested freshwater wetlands where it nests solitarily or in very small mixed species nest groups (Chapter 8). Few scattered records do not allow clarification of the range and virtually nothing is known on population sizes or trends. Deforestation and damming of rivers may well be a major threat.

Conservation action: habitat conservation programmes should be established to protect areas where the species has been recorded. Research could be initiated in these areas as a second step towards conservation. Data on ecological requirements and factors influencing breeding success would be helpful, although the study of this solitary species in this type of habitat will be difficult. In addition the work will no doubt be constrained by considerable logistical problems. As with any other vulnerable species, research activity must avoid disturbance and priority must be given to protection.

Fasciated Tiger Heron *(Tigrisoma fasciatum) IUCN and HSG Category Lower Risk (LR), Subcategory near threatened (nt).* This species which occurs in South and Central America is very little known and seems to occupy stream-edge forests, a vulnerable habitat (Chapter 8).

Conservation action: improved knowledge on the distribution and habitat use by the species is most urgent before developing proposals for their conservation. A higher threat status may well be justified.

New Guinea Tiger Heron *(Zonerodius heliosylus) IUCN and HSG Category Lower Risk (LR), Subcategory near threatened (nt).* There are no population data for this species, which is confined to parts of Indonesia and Papua New Guinea (Chapters 4 and 6). The sum total of recent information amounts to less than 30 confirmed sightings in the last 15 years. Only one nest has ever been described and the species is only known to be relatively easy to see at one site. Throughout its range, its apparently

preferred habitat is under extreme pressure from logging, clear-fell and pollution, as well as increased turbidity as a consequence of mining activities in the catchment. This Heron is suspected to favour broad, heavily forested lowland rivers.

Conservation action: the most urgent action recommended is to clarify the current distribution and provide a population estimate as a basis for monitoring; and to carry out ecological studies into the habitat requirements of the species.

Proposals should be put forward to protect remaining forested lowland rivers, with concern for this species included as part justification. New information may well justify raising the species into a higher threat category.

Zigzag Heron *(Zebrilus undulatus) IUCN and HSG Category Lower Risk (LR), Subcategory near threatened (nt).* The situation of this species which occurs in northern South America is identical to that of the Fasciated Tiger Heron.

Schrenk's Bittern *(Ixobrychus eurhythmus) IUCN Category Lower Risk (LR), Subcategory near threatened (nt); HSG Category Data Deficient (DD).* The species may have a high population within a restricted breeding distribution. Records from the wintering grounds almost exclusively involve isolated individuals, with rarely more than ten sightings per year from any one site. This species, which is probably declining, has never really been considered rare or particularly vulnerable. This is probably because the bird occurs (as do most of the Asiatic *Ixobrychus* species), frequently in open wet grassland and rice fields and is easy to see; consequently, the overall impression is that it is not uncommon. However, records in recent years show that although widespread, it appears never to occur in high densities and is actually considered an occasional visitor through most of its range.

Conservation action: it is most urgent to clarify the range and location of sites of importance for this species outside the breeding season, and to establish a more precise estimate of breeding populations. Although existing data suggest that the main non-breeding distribution is in the Philippines, there are annual records from various sites and habitats throughout south-east Asia. Surveys of sites are necessary where the species is known to occur to identify the main non-breeding distribution more accurately. The current breeding distribution is fairly well known (Chapter 4), but more information must be collected, particularly in far eastern Russia, which may hold the main breeding population. The results of investigations will provide useful arguments for site protection including hunting control.

American Bittern *(Botaurus lentiginosus) North America, Caribbean populations HSG Category Lower Risk (LR), Subcategory near threatened (nt).* Although still widespread in North and Central America, the species has specific habitat requirements similar to those which characterise the Eurasian Bittern (Chapter 7). Because these shallow marshland habitats with vegetation cover and grasslands are generally threatened by reclamation for agriculture, urbanisation and other development projects, the species deserves conservation attention. It is thought to decline in the North–Central states (Chapter 7), and del Hoyo et al. (1992) consider it endangered in the states of Illinois, Indiana and Ohio, and of special conservation concern in others.

Conservation action: the overriding issue for this species is the lack of information on population status, given the difficulty of censusing its numbers over large areas. Data are needed to strengthen arguments for conservation. It would be useful to identify and designate in selected states the most important areas for bitterns, and undertake yearly sample counts during the breeding season to investigate trends in numbers. The only way to obtain information is to count the singing (booming) males (Koskimies and Tyler 1997, Kayser et al. 1998). The list of priority sites resulting from this monitoring may serve to promote statutory protection. Surveys of breeding habitat and management practices (see under Purple Heron and Eurasian Bittern) are equally important.

Subspecies and populations of conservation concern (listed according to their conservation status)

Purple Heron *(Ardea purpurea bournei) HSG Category Critically Globally Endangered (CR).* This subspecies is endemic to the island of Santiago, Cape Verde Islands and there is evidence that the population has declined significantly since its discovery in 1951, from an estimated 75 pairs to a recent population estimate of 20 pairs (Hazavoet 1992).

Unlike the majority of heron taxa and other Purple Heron populations, this subspecies appears independent of wetlands; it nests in trees and forages on arid hillsides during the breeding season. There is no information on foraging habitat outside the breeding season, but it is suspected to use isolated, dry river valleys (Hazavoet 1992).

However, it is possible to implement conservation action that will ensure that it has the best possible chance of survival.

Conservation action: the proposed conservation action is to develop management and protection strategies for this subspecies on the Cape Verde Islands, through characterisation of current habitat use, assessment of the area of suitable habitat available and establishment of protected sites.

The main habitat survey priority must involve survey of all suitable trees on the island (these are very limited in number and therefore this is not as impractical as it sounds) and identification of foraging habitat and site use. Population monitoring is essential. The two known colonies are located near villages (Hazavoet 1992) and it appears that they can be counted without risk of disturbance (although this must be confirmed). It is clear that the current population must be protected from hunting, disturbance and habitat destruction.

Great White Egret *(Egretta alba maorianus) HSG Category Critically Globally Endangered (CR).* Endemic to New Zealand, population currently estimated at 100–200 birds (Chapter 6). The viability of such a low population is uncertain and will be critically dependent upon environmental and anthropogenic influences.

Conservation action: the colony and surrounding feeding areas are looked after by the Department of Conservation Te Papa Atawhai. Research efforts need to be extended for the current emphasis on breeding success to include seasonal migration habits.

Eurasian Bittern *(Botaurus stellaris capensis) HSG Category Critically Globally Endangered (CR).* This subspecies is confined to southern Africa; it is in serious

decline due to loss of wetland habitat and its intolerance of human activity. As such it is now exceedingly rare or extinct over much of its former range, and it may be only in Zambia and perhaps in the poorly known eastern Angola wetlands that it survives in any numbers. In South Africa it breeds only in Natal and Transvaal, with a total population of probably less than 100 individuals. There appears to be little doubt that the entire population is in serious decline and endangered (Chapter 5). Last minute information (October 1998) suggests that the Bangweulu swamps in Zambia do still hold a sizeable population.

Conservation action: there is limited information on habitat preference, but Brook (1984) proposes protection of "large reed and bullrush beds in big swamps". Surveys of "booming" Bitterns are recommended in order to obtain information on the current distribution. This will help define the important areas and sites. Further action should then focus on habitat protection.

Grey Heron *(Ardea cinerea firasa) HSG Category Globally Endangered (EN).* The taxonomic status of Grey Herons in the Comores and Aldabra is uncertain and this subspecies is presently considered endemic to Madagascar, where it is threatened by human activity and habitat modification (Chapter 5).

Conservation action: as the threats are clearly recognised, site protection combined with awareness campaigns must be a priority. Wardening of breeding colonies should be envisaged and conservation priority directed to all sites which support 1% or more of the population i.e., 50–60 individuals.

Green-backed Heron *(Butorides striatus degens) HSG Category Globally Endangered (EN).* This subspecies is endemic to the Seychelles, where it is becoming rare and endangered as mangrove, the only habitat used for nesting, is increasingly destroyed (Chapter 5).

Conservation action: the mangrove of the Seychelles represents an extremely vulnerable habitat and conservation must focus on protection of the remaining areas.

Grey Heron *(Ardea cinerea altirostris) HSG Category Globally Vulnerable (VU).* This population was not recognised as a subspecies by Hancock and Kushlan (1984) and its taxonomic status needs confirmation. It is restricted to the island of Sumatra, in the Greater Sundas (Voous and van Marle 1988) where it occurs over a restricted range in habitats which are under threat. Information on water bird populations on the island is sparse and it is not currently possible to provide a population estimate greater than 700 mature individuals.

Conservation action: surveys covering the known or suspected distribution of the Grey Heron in Sumatra are needed to improve knowledge on the taxonomic status, the distribution and the abundance of these birds on the island. If the results suggest that there is a real cause for concern, then a more intensive conservation strategy should be prepared.

Grey Heron *(Ardea cinerea monicae) HSG Category Globally Vulnerable (VU).* This small population (up to 8000 individuals) is confined to the Banc d'Arguin in

Mauritania and subject to considerable fluctuations of numbers of breeding birds. Recent aerial surveys revealed 4188 incubating birds in 1997 (Hafner et al. 1998b), and only 1067 in 1998 (Pineau and Hafner, unpubl. data). There is no evidence of a decline since the censuses in 1984–85 by Campredon (1987) who counted 2400 occupied nests.

Conservation action: the breeding islands are extremely difficult to access and they are part of the Banc d'Arguin National Park, which has strict regulations. Similarly, the feeding areas are very extensive and human population is so low that there is practically no disturbance to these birds. The Station Biologique de la Tour du Valat in France collaborates with the National Park and the aerial surveys will be continued in the long term.

Great Blue Heron *(Ardea herodias occidentalis) HSG Category Globally Vulnerable (VU).* This population is found in southern Florida and the Caribbean. It is a typically dimorphic population with a limited range, largely confined to estuarine habitats of southern Florida and nearby islands of the West Indies (Chapter 7).

Conservation action: the status of the species is little known outside of southern Florida, and surveys need to be conducted to determine its range and population sizes. Within southern Florida, there are indications that habitat conditions are deteriorating in large parts of its habitat, despite much of it being in national parks and refuges. The breeding success of the population may largely depend on artificial food sources. The population requires close monitoring of size, distribution, and productivity. Restoration of the estuary, especially the birds' natural food base, is required.

Great Blue Heron *(Ardea herodias fannini) HSG Category Globally Vulnerable (VU).* This population is confined to the northeast Pacific coast of North America.

Conservation action: The population has been surveyed around the Strait of Georgia since 1989 and the largest colonies have been protected from destruction and disturbance by humans. Studies into the sudden increase in Bald Eagles and subsequent predation on herons are required. Close monitoring of the heron population is also required.

Purple Heron *(Ardea purpurea madagascariensis) HSG Category Globally Vulnerable (VU).* This small population is endemic to Madagascar and depends on freshwater lakes and rivers.

Conservation action: in view of the continuing pressure on these habitats in Madagascar, there is a need for constant monitoring of the population and the state of wetlands. Conservation organisations, which are active in Madagascar, need continuous support.

Indian Pond Heron *(Ardeola grayii phillipsi) HSG Category Globally Vulnerable (VU).* The apparent area of occupancy, the Maldives (Rose and Scott 1997) is restricted and exposed to pressure from tourism. This subspecies is therefore vulnerable to habitat degradation.

Conservation action: in the short term, the most important action must be to establish the current size of the population, together with an assessment of habitat availability and the degree of threat to breeding and foraging habitats. There appears to be some degree of capture and sale of wildlife in towns in the Maldives (anecdotal information) and capture of herons should be discouraged. Promotion of conservation awareness should be included as a fundamental component of a conservation project.

The following four subspecies of the Green-backed Heron are considered HSG Category Globally Vulnerable because of their restricted range on offshore islands which exposes them to natural and/or anthropogenic habitat degradation.

Green-backed Heron *(Butorides striatus albolimbatus) HSG Category Globally Vulnerable (VU).* According to Rose and Scott (1997) this bird is now restricted to the Chagos Islands (unless the distribution on the Chagos and Maldives given by Hancock and Kushlan 1984 is more accurate).

Green-backed Heron *(Butorides striatus didi) HSG Category Globally Vulnerable (VU).* Apparently restricted to the northern Maldive Islands (Rose and Scott 1997).

Green-backed Heron *(Butorides striatus patruelis) HSG Category Globally Vulnerable (VU).* It is restricted to Tahiti and has declined over the last twenty years and is now considered rare.

Green-backed Heron *(Butorides striatus albidulus) HSG Category Globally Vulnerable (VU).* Apparently restricted to the southern Maldive Islands (Rose and Scott 1997).

Conservation action: in view of the increasing pressure on these islands by mass tourism, action must be based on a recent assessment of the current distribution to help define the important areas and sites. Habitat requirements must be assessed during breeding as well as outside the breeding season. This is particularly important in terms of site protection. The four subspecies of the Green-backed Heron exploit coastal wetlands; parts of these are seasonal and sometimes ephemeral but nevertheless important in the bird's life cycle. This may render difficult the definition of the boundaries of protected areas but it is necessary to take even temporary wetlands into account. The data collected should form the basis for a priority list of areas and sites for full protection.

Malayan Night Heron *(Gorsachius melanolophus rufolineatus) HSG Category Globally Vulnerable (VU).* The Malayan Night Heron is little-known throughout its range, in spite of its wide distribution and apparent local abundance. This is mainly due to its nocturnal habits and preference for dense humid forest. All recognised populations of this species are insufficiently known to propose detailed conservation action (Chapter 4). Recent records from Sumatra and Peninsular Malaysia suggest that these areas may also support resident populations, while it is not known whether the apparently healthy populations recently located in Cambodia, Laos, Thailand and Vietnam are sedentary or migratory.

Conservation action: the first aim must be to clarify the distribution and status of the species as a whole, particularly in areas where there appear to be small, isolated, resident populations threatened by logging. This is definitely the case of the race *G. m. rufolineatus* of Palawan in the Philippines (Chapter 4), where it appears essential to protect all the remaining forested areas. However, *G. m. melanolophus, G. m. kutteri,* and *G.m. minor* also qualify for subcategory dd, hl: data deficient but clearly suffering from habitat loss (Table 17.2).

Little Bittern *(Ixobrychus minutus podiceps) HSG Category Globally Vulnerable (VU).* This subspecies is endemic to Madagascar, consequently subject to all the threats and pressures affecting wetlands on the island (Chapter 5).

Conservation action: the subspecies seems to occur only in few scattered localities (Chapter 5). These need absolute conservation priority and continued monitoring of the population must be envisaged.

Little Bittern *(Ixobrychus minutus dubius) HSG Category Globally Vulnerable (VU).* This subspecies has been declared rare and vulnerable in Australia.

Conservation action: Recent information on known or suspected distribution may be used to establish a priority list of areas and sites for protection.

Yellow-crowned Night Heron *(Nycticorax violaceus caliginis) Colombia population HSG Category Globally Lower Risk (LR), Subcategory near threatened (nt).* Very little known, this subpopulation comprises apparently less than 10 000 individuals but reliability of data is low (Rose and Scott 1997). In such a case it is difficult to choose between category DD and others. However, *N. v. caliginis* is largely confined to coastal habitat which is generally more threatened by human activity than inland wetlands. Because only small numbers have been reported, the HSG attributes presently the status Lower Risk, near threatened (Table 17.2).

Conservation action: as a first step, a regional population and distribution estimate is essential as a basis for developing a conservation strategy.

Bare-throated Tiger Heron *(Tigrisoma mexicanum mexicanum) Northern Neotropic population HSG Category Globally Lower Risk (LR), Subcategory near threatened (nt).* The race is reported for the Gulf of Urabá and for Rio Atrato in north western Colombia. To date, the gulf is to our knowledge unprotected, faces urban expansion, settlement of river margins and discharge of domestic sewage. The river is poorly known and partially protected only. Livestock grazing, deforestation and developing agriculture threaten the habitat.

Conservation action: the most urgent action is to assess the status of this subpopulation, especially along the shorelines of the gulf.

Goliath Heron *(Ardea goliath) South Asian and South-west Asian populations HSG Category Regionally Vulnerable (RVU).* The south Asian and south-west Asian populations of the Goliath Heron may be a coastal extension of the main African population. There is no evidence to suggest that these populations were ever large. Due to their small size (Chapter 3) they are vulnerable to degradation of coastal

habitats. However, the main African population is considered to be of least concern (subcategory lc, Table 17.2).

Conservation action: despite the healthy status of the species as a whole, these regional populations are of conservation concern. They should be assessed continuously in collaboration with other ongoing wetland surveys.

Purple Heron *(Ardea purpurea purpurea) European and North African populations HSG Category Regionally Vulnerable (RVU).* Numbers have declined between 1970 and 1990 throughout Europe and the species is a rare breeding bird in North Africa (Chapters 1 and 2).

Conservation action: in several countries breeding populations have been monitored during many years. Without these surveys the decline would have gone unnoticed and they should be continued. In southern France nest sites have become a limiting factor due to various management practices including commercial exploitation of reed (Chapter 9). Assessments of seasonal and annual variation of the physical characteristics of wetlands are essential to understand the impact of management practices on the local population size and colony distribution. Certain indicators of wetland quality for this species, such as the extent of flooded habitat and emergent vegetation (nest sites), may be obtained from aerial surveys. The possibilities of using GIS and satellite imagery to monitor physical characteristics of reed beds (size, inundated versus dry, commercial exploitation of reed, etc.) is presently being investigated and if successful this method may be used for large scale monitoring programmes.

Breeding populations in Europe are presumably regulated by winter survival but there is a lack of information on numbers and distribution in the main African wintering areas. Such information is badly needed since there are such heavy pressures to exploit wetlands through damming of river systems for hydropower and irrigation purposes (Chapter 5). The possibility of collecting information on the availability of aquatic habitats using large-scale satellite techniques is presently being investigated. A network of collaborators in the African wintering (European winter) areas must be established in order to clarify the present range and location of the most important wintering sites. As a second step data collection on habitat use and factors limiting survival may be envisaged.

Great White Egret *(Egretta alba alba) European populations HSG Category Regionally Vulnerable (RVU).* Tucker and Heath (1994) consider the Great White Egret, Grey Heron, Little Egret, and Cattle Egret secure at the European scale. Regarding the three latter species, Chapters 1 and 2 confirm this statement. In contrast, the Great White Egret should be considered of conservation concern. It is indeed difficult to accept the status "secure" for this species if one compares it with the status of the Black-crowned Night Heron, considered vulnerable by Tucker and Heath (1994).

Rose and Scott (1997) give for the Mediterranean/Black Sea wintering population 7000-17 000 individuals (no estimates of numbers of breeding birds). According to the most up-to-date information (Chapters 1 and 2), this species is localised in Europe (no breeding records in North Africa), although it has been expanding in a westerly direction in recent years.

Conservation action: despite this apparently favourable development the Great White Egret deserves continued monitoring effort, particularly in the Eastern Mediterranean, the Black Sea regions and Russia where the strongholds of the population are and where the status "apparently secure" needs to be reconfirmed.

Squacco Heron *(Ardeola ralloides ralloides) European and North African populations HSG Category Regionally Vulnerable (RVU).* It is patchily distributed and particularly in south-west Europe and in North Africa, the small local populations (Chapter 2) are quite susceptible to local extirpation from catastrophic events. The greatest threat is loss and deterioration of freshwater habitat for feeding and wet woodland for nesting (Hafner and Didner 1997). The largest Squacco Heron populations of western Europe today use rice fields. Changes in agricultural practice could have a negative impact on prey populations.

Conservation action: monitor the breeding populations in the major breeding areas of western Europe (Italy, southern France and Spain), in particular the availability and quality of nest sites, and promote conservation and management of wet woodlands, the preferred breeding habitat; synthesise existing data on habitat use and feeding ecology across the major rice production areas in the Mediterranean region to prepare management proposals for environmentally sensitive agricultural practices. Continue to assess the importance of rice fields versus natural/seminatural habitats through field observations.

Like the Purple Heron, the Squacco Heron is a long-distance migrant, although in recent years it is seen in increasing numbers in winter in Morocco and in Egypt (Hafner and Didner 1997). Most however will migrate to the northern tropics of Africa and project links must be made for Squacco Heron/Purple Heron in order to assess the present major wintering areas.

Black-crowned Night Heron *(Nycticorax nycticorax nycticorax) Europe HSG Category Regionally Vulnerable (RVU).* Although it is present in 22 European countries, locally in rather impressive numbers, the distribution is patchy, especially in the western Mediterranean (Chapters 1 and 2). The largest, apparently stable breeding population is in northern Italy (31% of the European population). This species has similar habitat requirements (freshwater dependency) as the Purple Heron and the Squacco Heron. The major European and North African nesting areas of Squacco Herons are also the most important ones for Black-crowned Night Herons, where the two species nest in mixed colonies.

Conservation action: a very large proportion of the European breeding population of Black-crowned Night Herons is sustained by rice fields. Changes in agricultural practices could therefore affect the European population very seriously. Consequently the conservation strategy outlined for the Squacco Heron is also recommended on behalf of the Black-crowned Night Heron, and project links must be established through international collaboration.

Little Bittern *(Ixobrychus minutus minutus) European and North African populations HSG Category Regionally Vulnerable (RVU).* The species has strongly decreased both in population size and range between 1970 and 1990 in most European countries and the overall decrease in Europe in range was between 20 and 50%, withdrawing from

Little Bittern. This species has strongly decreased in most European countries. Its wintering areas are virtually unknown. Photo: Jean François Hellio and Nicolas van Ingen.

west to east (Marion 1997c). The southern rim of the Mediterranean has two important known breeding areas, the Nile Delta and the wetlands of the El Kala National Park in north-east Algeria (Chapter 2).

This species, which is highly dependent on freshwater areas, is extremely difficult to study. Furthermore it is most likely that the decline in European numbers is largely due to high mortality of birds during migration or when wintering in Africa. The decline seems largely to have occurred since the 1970s, over a period which covers severe drought conditions in African staging and wintering areas; through desertification the drought caused the loss of formerly important staging areas which increased the length of the Sahara crossing (Marion 1997c).

Conservation action: efforts in Europe and North Africa should concentrate on maintaining favourable breeding habitat over large areas to ensure that sufficient habitat exists, should conditions in Africa again improve. The aims of the strategy are: to assure availability of suitable breeding habitat in as many areas as possible by protecting wet scrubland and reedbelts, both in the known strongholds of the

species and in areas where it has disappeared. In addition, efforts should be made to identify the most important wintering areas. The distribution in winter of this species remains a major gap in our knowledge.

Eurasian Bittern *(Botaurus stellaris stellaris) European and North African populations HSG Category Regionally Vulnerable (RVU).* As for the previous species, a notable decrease has been reported from 1970–1990 across Europe (Chapter 1). In North Africa the species is extremely rare and confined to the few pockets of favourable freshwater areas (Chapter 2). Russia holds 10 000 to 30 000 pairs, about 75% of the

Eurasian Bittern. This species has declined over much of its range.

European population (Koskimies and Tyler 1997). The Eurasian Bittern is less common in western and northern European countries, where high densities of this bird are restricted to the rare extensive reed beds.

Conservation action: In general the Eurasian Bittern is confined to large wetlands dominated by Phragmites reedbeds. Therefore a project link is recommended with the strategy developed for the conservation of nesting habitat of the Purple Heron. The large scale monitoring of Phragmites beds aimed to inform local, national and international conservation organizations, development agencies and decision makers will be a valuable contribution to the conservation of the two species.

Conclusions

The HSG has made use of the meticulous work organised by the IUCN (Mace and Lande 1991, Mace et al. 1992, Mace and Stuart 1994, Baillie and Groombridge 1996), BirdLife International (Collar et al. 1992, 1994, Tucker and Heath 1994) and Wetlands International (Rose and Scott 1994, 1997) evaluations. Of the 60 heron species recognised by Hancock and Kushlan (1984), IUCN 1996 attributes a global threat status to 14 of them (Table 17.2). The HSG proposes few additions or amendments to the list at present. It should be noted that in spite of the large amount of information accumulated, there is still a significant lack of data. This prevents us in a number of cases from attributing confidently a global threat status to a species. The Malayan Night Heron is a good example. It has a wide distribution, is locally abundant and therefore considered safe. However, one subpopulation in particular (island of Palawan in the Philippines) is clearly threatened because mature forest, to which it is apparently restricted, is disappearing at an alarming rate as a result of logging. Although the IUCN 1996 criteria are intended for assessment at a species level, we recognised throughout this chapter that there are threatened subspecies and populations within species considered safe, and added therefore 20 taxa which, according to our database, qualify for global threat categories: Critically Endangered (CR), Endangered (EN) or Vulnerable (VU) (Table 17.2). In addition, we consider 7 other taxa threatened at regional level.

The amount of information obtained over the past 30 years and synthesised here leads to concrete proposals for conservation action for a relatively small proportion of the taxa. Gaps in our knowledge must challenge field biologists, and during the years to come the HSG will certainly not decrease its activity. The collaboration by the international conservation organisations, as well as by national and local institutions, will be essential, as will the continued collaboration by members and correspondents of the HSG. The complete Heron Conservation Action Plan will necessarily be a separate document. This plan is being prepared with a five-year horizon in mind, 2001–2005. Priority for application of recommendations during these five years will be given to the globally-threatened taxa. An action plan must be a life document, subject to constant updating when new information comes in. During the period 2001–2005 the HSG will also be working, together with its partners, toward the next five-year plan 2006–2010. Today too many taxa suspected as threatened are listed under DD, Data Deficient. To declare a species, subspecies, race or population globally or regionally threatened is a responsibility which must rely on solid data.

Appendix 17.1 Criteria for Critically Endangered, Endangered and Vulnerable Species (IUCN 1996).

Critically Endangered (CR)
A taxon is Critically Endangered when it is facing an extremely high risk of extinction in the wild in the immediate future, as defined by any of the following criteria (A to E):

A. Population reduction in the form of either of the following:
1. An observed, estimated, inferred or suspected reduction of at least 80% over the last 10 years or three generations, whichever is the longer, based on (and specifying) any of the following:
   a. Direct observation
   b. An index of abundance appropriate for the taxon
   c. A decline in area of occupancy, extent of occurrence and/or quality of habitat
   d. Actual or potential levels of exploitation
   e. The effects of introduced taxa, hybridisation, pathogens, pollutants, competitors or parasites.
2. A reduction of at least 80%, projected or suspected to be met within the next ten years or three generations, whichever is the longer, based on (and specifying) any of b, c or e above.

B. Extent of occurrence estimated to be less than 100 km^2 or area of occupancy estimated to be less than 10 km^2, and estimates indicating any two of the following :
1. Severely fragmented or known to exist at only a single location.
2. Continuing decline, observed, inferred or projected, in any of the following:
   a. Extent of occurrence
   b. Area of occupancy
   c. Area, extent and/or quality of habitat
   d. Number of locations or subpopulations
   e. Number of mature individuals.
3. Extreme fluctuations in any of the following:
   a. Extent of occurrence
   b. Area of occupancy
   c. Number of locations or subpopulations
   d. Number of mature individuals.

C. Population estimated to number less than 250 mature individuals and either:
1. An estimated continuing decline of at least 25% within 3 years or one generation, whichever is longer, or
2. A continuing decline, observed, projected, or inferred, in numbers of mature individuals and population structure in the form of either:
   a. Severely fragmented (i.e. no subpopulation estimated to contain more than 50 mature individuals)
   b. All individuals are in a single subpopulation.

D. Population estimated to number less than 50 mature individuals.

E. Quantitative analysis showing the probability of extinction in the wild is at least 50% within 10 years or 3 generations, whichever is the longer.

Endangered (EN)
A taxon is Endangered when it is not Critically Endangered but is facing a very high risk of extinction in the wild in the near future, as defined by any of the following criteria (A to E):

A. Population reduction in the form of either of the following:
   1. An observed, estimated, inferred or suspected reduction of at least 50% over the last 10 years or three generations, whichever is the longer, based on (and specifying) any of the following:
      a. Direct observation
      b. An index of abundance appropriate for the taxon
      c. A decline in area of occupancy, extent of occurrence and/or quality of habitat
      d. Actual or potential levels of exploitation
      e. The effects of introduced taxa, hybridisation, pathogens, pollutants, competitors or parasites.
   2. A reduction of at least 50%, projected or suspected to be met within the next ten years or three generations, whichever is the longer, based on (and specifying) any of b, c or e above.

B. Extent of occurrence estimated to be less than 5000 km^2 or area of occupancy estimated to be less than 500 km^2, and estimates indicating any two of the following:
   1. Severely fragmented or known to exist at no more than five locations.
   2. Continuing decline, inferred, observed or projected, in any of the following:
      a. Extent of occurrence
      b. Area of occupancy
      c. Area, extent and/or quality of habitat
      d. Number of locations or subpopulations
      e. Number of mature individuals.
   3. Extreme fluctuations in any of the following:
      a. Extent of occurrence
      b. Area of occupancy
      c. Number of locations or subpopulations
      d. Number of mature individuals.

C. Population estimated to number less than 2500 mature individuals and either:
   1. An estimated continuing decline of at least 20% within 5 years or 2 generations, whichever is longer, or
   2. A continuing decline, observed, projected or inferred, in numbers of mature individuals and population structure in the form of either:
      a. Severely fragmented (i.e. no subpopulation estimated to contain more than 250 mature individuals)
      b. All individuals are in a single subpopulation.

D. Population estimated to number less than 250 mature individuals.

E. Quantitative analysis showing the probability of extinction in the wild is at least 20% within 20 years or 5 generations, whichever is the longer.

Vulnerable (VU)
A taxon is Vulnerable when it is not Critically Endangered or Endangered but is facing a high risk of extinction in the wild in the medium-term future, as defined by any of the following criteria (A to E):

A. Population reduction in the form of either of the following:
1. An observed, estimated, inferred or suspected reduction of at least 20% over the last 10 years or three generations, whichever is the longer, based on (and specifying) any of the following:
   a. Direct observation
   b. An index of abundance appropriate for the taxon
   c. A decline in area of occupancy, extent of occurrence and/or quality of habitat
   d. Actual or potential levels of exploitation
   e. The effects of introduced taxa, hybridisation, pathogens, pollutants, competitors or parasites.
2. A reduction of at least 20%, projected or suspected to be met within the next ten years or three generations, whichever is the longer, based on (and specifying) any of b, c or e above.

B. Extent of occurrence estimated to be less than 20 000 km^2 or area of occupancy estimated to be less than 2000 km^2, and estimates indicating any two of the following:
1. Severely fragmented or known to exist at no more than ten locations.
2. Continuing decline, inferred, observed or projected, in any of the following:
   a. Extent of occurrence
   b. Area of occupancy
   c. Area, extent and/or quality of habitat
   d. Number of locations or subpopulations
   e. Number or mature individuals.
3. Extreme fluctuations in any of the following:
   a. Extent of occurrence
   b. Area of occupancy
   c. Number of locations or subpopulations
   d. Number or mature individuals.

C. Population estimated to number less than 10 000 mature individuals and either:
1. An estimated continuing decline of at least 10% within 10 years or 3 generations, whichever is longer, or
2. A continuing decline, observed, projected or inferred, in numbers of mature individuals and population structure in the form of either:

a. Severely fragmented (i.e. no subpopulation estimated to contain more than 1000 mature individuals)
b. All individuals are in a single subpopulation.

D. Population very small or restricted in the form of either of the following:
1. Population estimated to number less than 1000 mature individuals.
2. Population is characterised by an acute restriction in its area of occupancy (typically less than 100 km^2) or in the number of locations (typically less than 5). Such a taxon would thus be prone to the effects of human activities (or stochastic events whose impact is increased by human activities) within a very short period of time in an unforeseeable future, and is thus capable of becoming Critically Endangered or even Extinct in a very short period.

E. Quantitative analysis showing the probability of extinction in the wild is at least 10% within 100 years.

Additional Subcategory (HSG)
dd, hl: when there is a lack of information on the distribution and the number of individuals belonging to a species, subspecies or a population but when there is nevertheless evidence that the taxa are threatened by habitat loss. This category applies to species which depend upon habitat which is particularly threatened, e.g. tropical forest, mangroves.