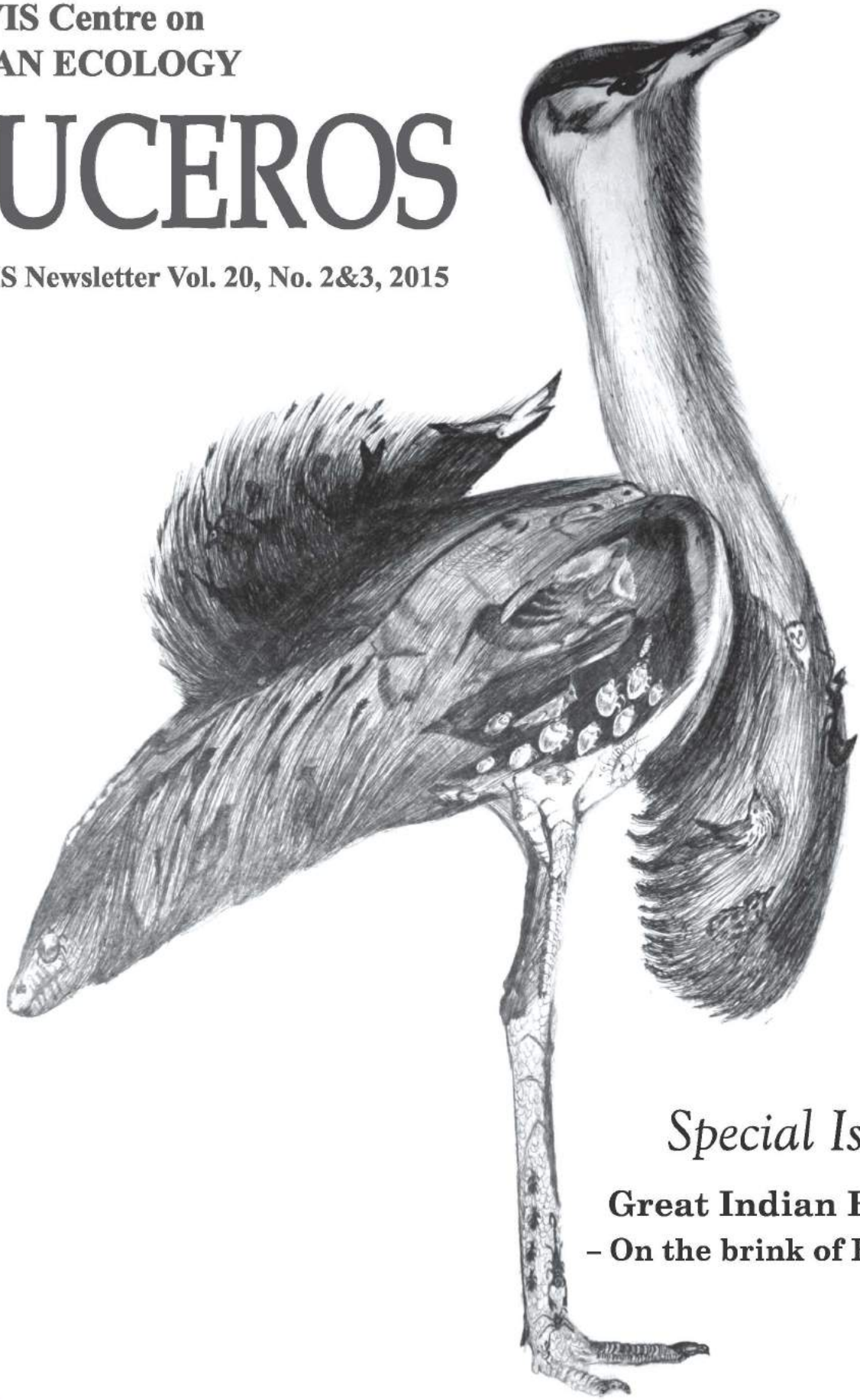
ENVIS Centre on
AVIAN ECOLOGY

BUCEROS

ENVIS Newsletter Vol. 20, No. 2&3, 2015



Special Issue

Great Indian Bustard
– On the brink of Extinction

Supported by the Ministry of Environment, Forest and Climate Change, Government of India

ABOUT ENVIS

ENVIS (Environmental Information System) is a network of subject-specific centres located in various institutions throughout India. The focal point of the present 66 ENVIS centres in India is at the Ministry of Environment, Forest and Climate Change, New Delhi, which further serves as the Regional Service Centre (RSC) for INFOTERRA, the global information network of the United Nations Environment Programme (UNEP) to cater to environment information needs in the South Asian subregion. The primary objective of all ENVIS centres is to collect, collate, store and disseminate environment related information to various user groups, including researchers, policy planners, and decision makers.

The ENVIS Centre at the Bombay Natural History Society was set up in June 1996 to serve as a source of information on Avian Ecology.

Objectives of the ENVIS Centre at BNHS

- To create a bibliographic database of published literature related to avian ecology study
- To publish and distribute BUCEROS newsletter on avian ecology to its members
- To create and upload databases on avian ecology on ENVIS website www.bnhsenvis.nic.in
- To reply to queries related to birds

BUCEROS
ENVIS Newsletter
Avian Ecology
Vol. 20, No. 2&3, 2015

Cover
Sketch of Great Indian Bustard *Ardeotis nigriceps* depicting 49 species of grassland ecosystem by the late Mr. Shankar Roopnar
Solapur, Maharashtra

Recommended Citation
Narwade, S., S. Dutta, D. Gadhvi, K. S. Abdul Samad, A. R. Rahmani and R. Manakadan (2015): Great Indian Bustard – on the brink of Extinction. *BUCEROS* 20(2&3): 1–44

Bombay Natural History Society,
Hornbill House, S.B. Singh Road,
Mumbai 400 001, Maharashtra, India.
Tel.: (91-22) 2282 1811
Fax: (91-22) 2283 7615
E-mail: bnhs@envis.nic.in

CONTENTS

EDITORIAL

Saving the Great Indian Bustard (GIB) is a very complex issue, but certainly not impossible. In fact, it is a barometer that will judge our collective success or failure. This magnificent bird once roamed vast grasslands and sand dunes of India, today it has lost its presence in most of its landscape and has become locally extinct from around 90% of its former range. Its population plummeted from 1,500–2,000 birds in areas of the late 1980s to less than 200 birds in a span of three decades. Its last and significant population (about 150 birds) is now confined to Thar Desert of Rajasthan, while the Kutch region of Gujarat and states of Maharashtra, Karnataka, Andhra Pradesh and Madhya Pradesh have residual populations.

Several factors are attributed to this decline that include mainly hunting, loss of habitat and changed land use pattern. However, the most recent threat is in the form of wind mills and power transmission lines. These have already taken a toll on half a dozen birds in the past few years. With each adult bird lost, the species is inching towards extinction.

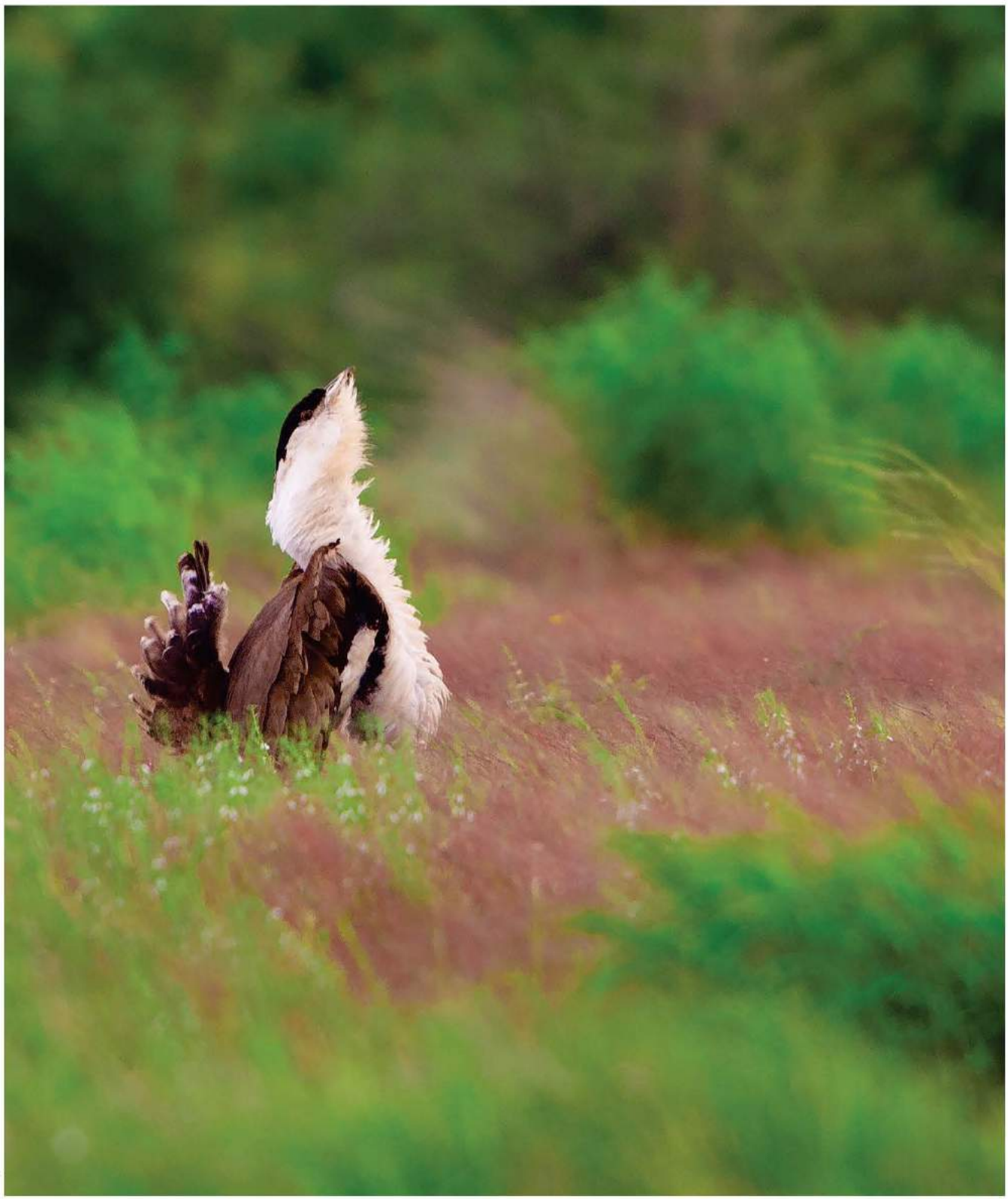
The recently launched GIB conservation programme by Wildlife Institute of India and supported by Ministry of Environment, Forest and Climate Change (MoEF&CC), Government of India, is probably the last chance for saving this species. While we continue to work on habitat improvement, captive breeding, and community education and spreading awareness, the following major interventions are required with absolute priority:

1. Incentivize people willing to help GIB. How and in what form it can be done needs to be looked into immediately. The last thing we want is people turning against the GIB. Needless to say we need to punish poachers and game hunters hard.
2. Issue specific office order from MoEFCC to Forest Advisory Committee (FAC), Environmental Appraisal Committees (EAC), and Standing Committee of National Board for Wildlife to consider the most important GIB presence and movement areas through Decision Support Tool before considering or granting clearance for any developmental activity, including wind mills, mining, solar plants, irrigation canals, and power plants.
3. A similar order also to be issued to state and regional level committees such as Regional FAC, State Boards for Wildlife (SBWL), State Environment Impact Assessment Authority (SEIAA), etc.
4. The Terms of Reference (ToR) issued by EACs for the proposed projects in GIB landscape must include a specific condition of using GIB distribution map as a part of EIA.
5. In GIB stronghold areas, all present transmission lines must be taken underground to avoid bird collision. The major areas are now thoroughly mapped and are available in the form of shape files.
6. A GIB friendly economic development blueprint needs to be developed with priority for the regions that are still holding populations of GIB.

This is our last chance to save this magnificent bird. It will be an absolute tragedy and shame if we lose this species, despite knowing well the problems associated with it and allowing the situation to spiral out of hand.

Deepak Apte, Ph.D.
Director

ABOUT BUSTARDS AND GRASSLANDS



Nayan Khanolkar

Grasslands are one of the most-neglected ecosystems, often treated as wastelands or pastures. However, they provide a wide range of ecosystem services and support numerous threatened species, including bustard species. Bustards are considered as flagship species of grasslands owing to their habitat association and charismatic nature. The larger species are considered 'extinction-prone' due to their slow life-history traits. There are 26 species of bustards in the world (Table 1).

Table 1: List of bustard species found in the world

Sr. No.	Species	Distribution	IUCN Status	Estimated Population (No. of individuals)	Clutch Size	Breeding Season
	Genus: *Lissotis*					
1.	Black-bellied Bustard *Lissotis melanogaster*	Sub-Saharan Africa	LC	Unknown	1–2	Rainfall dependent
2.	Hartlaub's Bustard *Lissotis hartlaubii*	Ethiopia, Kenya, Somalia, Sudan, Tanzania, and Uganda	LC	Unknown	1–3	January–June
	Genus: *Ardeotis*					
3.	Arabian Bustard *Ardeotis arabs*	Algeria, Burkina Faso, Cameroon, Chad, Ivory Coast, Djibouti, Eritrea, Ethiopia, Gambia, Ghana, Guinea-Bissau, Kenya, Mali, Mauritania, Morocco, Niger, Nigeria, Saudi Arabia, Senegal, Somalia, Sudan, and Yemen	NT	Unknown	1–2	Season linked to warmer periods in Palearctic fringes
4.	Australian bustard *Ardeotis australis*	Northern Australia, and southern New Guinea	LC	6,700–67,000	1–2	Rainfall dependent
5.	Kori Bustard *Ardeotis kori*	Africa	NT	Botwswana-Zimbabwe hold population of 5,000 individuals	1–3	According to rain. September–October in South Africa and December–August in East Africa
6.	Great Indian Bustard *Ardeotis nigriceps*	India and parts of Pakistan	CR	50–249	1 (rarely 2)	March–June in North India and August–October in Western Deccan and August–January in East Deccan
	Genus: *Neotis*					
7.	Nubian Bustard *Neotis nuba*	Burkina Faso, Cameroon, Chad, Mali, Mauritania, Niger, Nigeria, and Sudan	NT	Unknown	2	July–October
8.	Ludwig's Bustard *Neotis ludwigii*	Angola, Botswana, Lesotho, Namibia, and South Africa	EN	1,00,000–4,99,999	2	August–December
9.	Denham's Bustard or Stanley's Bustard *Neotis denhami*	Sub-Saharan Africa	NT	Unknown	1–2	Rainfall dependent
10.	Heuglin's Bustard *Neotis heuglinii*	Djibouti, Eritrea, Ethiopia, Kenya, and Somalia	LC	Unknown	2	Rainfall dependent and in tall grasses
	Genus: *Tetrax*					
11.	Little Bustard *Tetrax tetrax*	Southern Europe and in western, and central Asia	NT	Unknown	2–6	February–June
	Genus: *Houbaropsis*					
12.	Bengal Florican or Bengal Bustard *Houbaropsis bengalensis*	Tropical southern Asia	CR	250–999	1–2	March–June

Sr. No.	Species	Distribution	IUCN Status	Estimated Population (No. of individuals)	Clutch Size	Breeding Season
	Genus: *Sypheotides*					
13.	Lesser Florican *Sypheotides indicus*	Endemic to the Indian subcontinent	EN	1300	3–5	July–September
	Genus: *Lophotis*					
14.	Savile's Bustard *Lophotis savilei*	Burkina Faso, Cameroon, Chad, Ivory Coast, Gambia, Mali, Mauritania, Niger, Nigeria, Senegal, and Sudan	LC	Unknown	Unknown	Rainfall dependent
15.	Buff-crested Bustard *Lophotis gindiana*	Djibouti, Ethiopia, Kenya, Somalia, Sudan, Tanzania, and Uganda	LC	Unknown	1–2	March–June
16.	Red-crested Bustard or Red-crested Korhaan *Lophotis ruficrista*	Angola, Botswana, Mozambique, Namibia, South Africa, Swaziland, Zambia, and Zimbabwe	LC	Unknown	1–2	October–April chiefly October–November
17.	Great Bustard *Otis tarda*	Southern and Central Europe, and across temperate Asia	VU	Total population unknown. European Population 26,000–32,000	1–3	April–June
	Genus *Chlamydotis*					
18.	Houbara Bustard *Chlamydotis undulata*	Canary Islands and North Africa	VU	13,000–33,000	2–3	November–June chiefly March–May
19.	Asian Houbara (MacQueen's Bustard) *Chlamydotis macqueenii*	Desert and steppe regions of Asia, and east from the Sinai Peninsula extending across Kazakhstan east to Mongolia	VU	33,000–67,000	2–4	March–June
	Genus *Afrotis*					
20.	Southern Black Bustard *Afrotis afra*	Endemic to Southern Africa	VU	Unknown	1–2	August–October
21.	Northern Black Bustard (White-quilled Bustard) *Afrotis afraoides*	Angola, Botswana, Lesotho, Namibia, South Africa, and Zimbabwe	LC	Unknown	1–2	Most of the year chiefly in rainy season
	Genus *Eupodotis*					
22.	Blue Bustard or Blue Korhaan *Eupodotis caerulescens*	Lesotho and South Africa	NT	8,000–10,000	1–3	Rainfall dependent
23.	White-bellied Bustard or White-bellied Korhaan or Barrow's Bustard *Eupodotis senegalensis*	Sub-Saharan Africa	LC	Unknown	1–3	Rainfall dependent
24.	Little Brown Bustard *Heterotetrax humilis*	Ethiopia and Somalia	NT	Unknown	Usually 2, sometimes 3	April–August chiefly May–June
25.	Karoo Bustard or Karoo Korhaan *Heterotetrax vigorsii*	Lesotho, Namibia, and South Africa	LC	Unknown	Usually 1, Sometimes 2	August–March
26.	Rüppell's Bustard *Heterotetrax rueppelii*	south-western Africa in Angola and Namibia	LC	Unknown	1	Rainfall dependent chiefly September–February

IUCN Status: Critically Endangered (CR), Endangered (EN), Vulnerable (VU), Near Threatened (NT), Least Concern (LC)

Wet grasslands of *terai*, *shola* grasslands of the Western Ghats, and the dry grasslands of Deccan plateau hold most threatened species of wildlife such as Bengal Florican *Houbaropsis bengalensis*, Indian Rhinoceros *Rhinoceros unicornis*, Wild Buffalo *Bubalus arnee,* Swamp Deer *Cervus duvaucelii*, Nilgiri Tahr *Nilgiritragus hylocrius*, Great Indian Bustard *Ardeotis nigriceps*, Lesser Florican *Sypheotides indicus*, Blackbuck *Antilope cervicapra*, and Indian Grey Wolf *Canis lupus pallipes* (Rahmani 1997).

Grasslands are a vital source of fodder for livestock of rural communities. Increasing human and livestock populations have been exerting huge pressures on the grasslands over the past 40–50 years, leaving them in smaller, fragmented and degraded patches. India's Protected Area system protects only a small section of arid grasslands [<1% are officially protected (Rodgers and Panwar 1988)]. Acute fodder shortages in drought-prone areas only add to their vulnerability.

Asif N. Khan

Buff-crested Bustard *Lophotis gindiana*
found in Africa
IUCN Status: Least Concern (LC)

Asad Rahmani

Kori Bustard *Ardeotis kori*
found in Africa
IUCN Status: Near Threatened (NT)

BUSTARDS OF THE INDIAN SUBCONTINENT

Four species of bustards are found in the Indian subcontinent, of which three are resident species. All the four bustard species are listed under Schedule I of the Indian Wildlife (Protection) Act, 1972 (with Amendment Act of 1993 and 2013, these species are listed under new Schedule 'VII') and National Wildlife Action Plan 2002–2016. As per the National Forestry Commission's recommendation No. 172, and the resolution passed by the IUCN in 2004 during the World Conservation Congress in Thailand, the Government of India should protect bustards as the flagship taxa for grassland flora and fauna through 'Project Bustards'. Therefore, the Ministry of Environment, Forest and Climate Change, under its centrally sponsored scheme, 'Integrated Development of Wildlife Habitats', has identified the Bengal Florican *Houbaropsis bengalensis*, Lesser Florican *Sypheotides indicus,* and Great Indian Bustard *Ardeotis nigriceps* for initiating recovery plans.

Bengal Florican *Houbaropsis bengalensis* – Less than 400 individuals now survive in the Indian subcontinent. It occurs in moist grasslands in the alluvial plains of north India. Once widely distributed, it is presently restricted to a few protected areas.

Lesser Florican *Sypheotides indicus* – Less than 1,300 birds now survive, with losses due to illegal hunting and uncontrolled habitat loss. It is endemic to the India subcontinent, and breeds in dry grasslands of the north-west region.

Nikhil Shinde

Bengal Florican *Houbaropsis bengalensis*
IUCN Status: Critically Endangered (CR)

Nirav Bhatt

Lesser Florican *Sypheotides indicus*
IUCN Status: Endangered (EN)

Asian Houbara (MacQueen's Bustard) ***Chlamydotis macqueenii*** – Its declining status has been restored through protection and captive breeding in Arabia. It is a winter visitor in western India, occurring in dry scrub and shares its habitat with the Great Indian Bustard in Rajasthan and Gujarat.

Nirav Bhatt

Asian Houbara *Chlamydotis macqueenii,* IUCN Status: Vulnerable (VU)

Great Indian Bustard ***Ardeotis nigriceps*** – It is endemic to the Indian subcontinent and was once a well-known game bird of the Indian plains. It resides in semi-arid open landscapes of India and Pakistan. Its population is rapidly decreasing with less than 300 birds left. There is no known breeding population outside India, and it has become locally extinct from around 90% of its former range. In the last three generations, about 75% decline has been observed in its population and the predicted extinction probability is very high, within the next three generations (Dutta *et al*. 2010). Human-induced threats to the species have increased and are likely to increase further.

Devesh Gadhvi

Great Indian Bustard *Ardeotis nigriceps,* IUCN Status: Critically Endangered (CR)

THE GREAT INDIAN BUSTARD AND ITS DECLINE

The Great Indian Bustard is among the largest of bustards with adult males reaching up to 122 cm in height. The female is comparatively smaller, i.e. 92 cm. Adult males may weigh up to 14.5 kg, while the females weigh between 3.5 to 6.75 kg. It is among the heaviest of flying birds.

The GIB was subject to indepth research under a conservation-oriented project by the BNHS in the 1980s with financial aid from US Fish and Wildlife Service routed through the Indian Government (Rahmani 1989). Under this project, GIB habitats were extensively surveyed throughout its known range and indepth knowledge of the population, distribution, ecology, behaviour, and other aspects of the species was obtained. Many protected areas for the GIB were declared or were designed on the recommendations of the project findings. The species was subject to monitoring studies at some sites under the Grassland Ecology Project (1991–1995) of the BNHS, again funded by the by US Fish and Wildlife Service (Rahmani 1997). Other than the BNHS, studies were also carried out by the Wildlife Institute of India (Dutta *et al.* 2010, 2013).

Ecology

Bustards generally favour semi-arid and arid undulating open landscapes of the plains with minimum visual obstruction. Habitat studies found that GIB typically uses areas dominated by short grasslands (30–50 cm) interspersed with isolated patches of tall grass (*c.* 75 cm) or shrubs and non-intensive dryland agriculture (Ali & Ripley 1987, Rahmani 1989). Its habitat requirements may vary with season and behaviour. In the non-breeding season, it is nomadic and vagrantly uses agro–grass–scrub landscapes. In the breeding season (summer and monsoon), it congregates in traditional undisturbed grasslands having short grass (30–50 cm) with isolated patches of tall grass or short scrub, which are preferred for nesting by hens and for displaying by males (usually at vantage points at high ground in undulating terrain) (Rahmani 1989, Dutta *et al.* 2010).

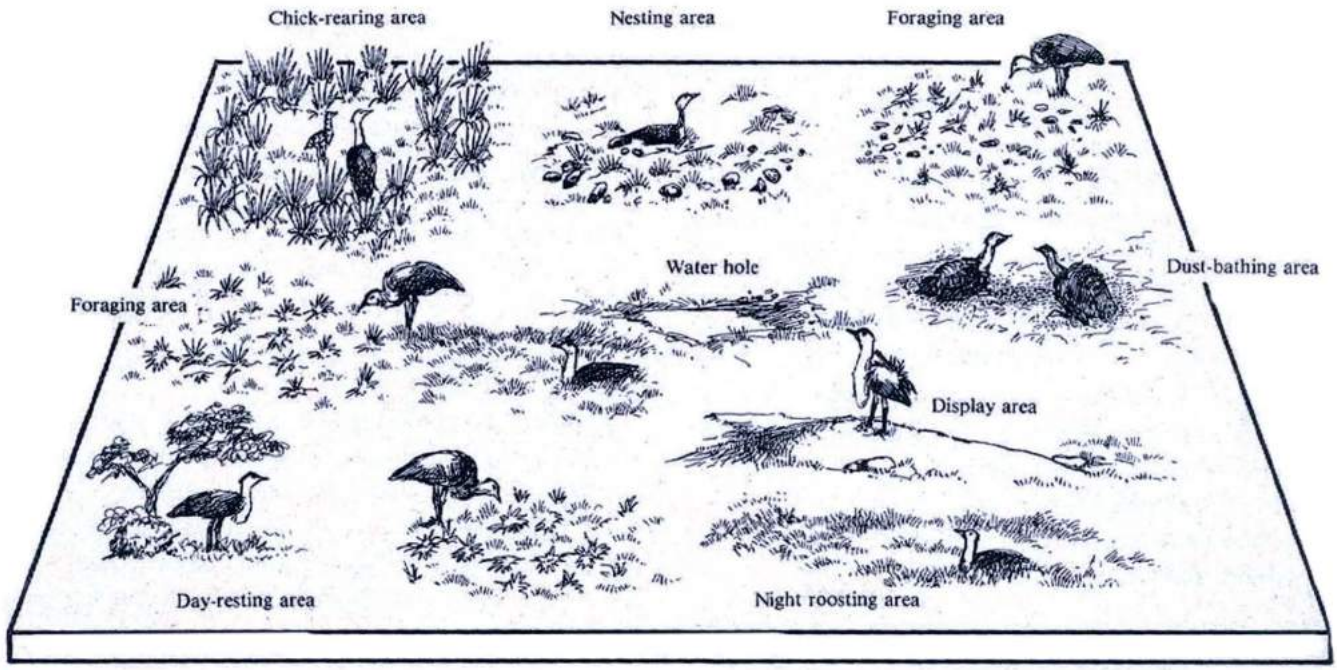


Fig. 1: Essential micro-habitats of GIB habitat [Source: GIB report, BNHS (1986)]

Devesh Gadhvi

Historically, flocks of 20–50 birds have been commonly observed, but the current usual flock size is only 2–3 birds

The GIB is a diurnal species, typically active in the early morning and evening. It is gregarious, usually forming sexually segregated flocks that dissociate during the breeding season. Flocking is more prominent during roosting (Rahmani and Manakadan 1986a,b). Historically flocks of 20–50 birds (Rahmani and Manakadan 1986a,b, Rahmani 1989) were common, but the current estimated flock size is only 2–3 birds (Dutta *et al*. unpublished data), due to the overall population decline.

The roosting, displaying, nesting, and foraging sites usually have short/medium grass with scattered patches of tall grass, while resting and chick rearing sites tend to be in tall grass patches (Rahmani 1989; also see Fig.1). The roosting sites are generally in bare areas, while resting sites are in isolated patches of taller grass (*c*. 75 cm) or among the light shade of an isolated shrub (Manakadan 1985, Rahmani and Manakadan 1988, Rahmani 1989, Dutta *et al.* 2010).

Sujit Narwade

Sujit Narwade

Undisturbed patches of semi-arid and arid habitats are essential for survival of GIB

Breeding

The breeding season of the bustard was described to be from October to March in southern India (Jerdon 1864) and July to August in north India (Hume and Marshall 1879). Summarizing the earlier records, Baker (1929) wrote that they breed in the cold season in south India, but over most of their haunts, after the rains break, from June to September. Odd eggs may be found in almost any month of the year, and the actual breeding season is very prolonged. Dharmakumarsinhji (1957), in the Kathiawar peninsula, found its breeding to extend from May to November. Ali and Ripley (1987) collating all the findings, summarise that the breeding season of the bustard is principally between March and September and locally also in other months. Intensive studies by the BNHS showed that the breeding season varies from area to area, but in a particular area the bustards nest during the same months every year, and finding a nest outside the normal nesting months is uncommon.

The GIB exhibits stark sexual dimorphism; males weighing double the females, and having prominent secondary sexual characters. Breeding males establish territories in an exploded-lek mating system, which females visit for mating (Manakadan 1985, Rahmani and Manakadan 1988, Rahmani 1989). During this time, males display elaborately from specific spots by inflating their gular pouch to produce deep resonant calls, cocking their tail, and occasionally engaging in highly ritualized territorial fights with intruding males.

The female typically lays a single egg (rarely two) in secluded open ground, and incubates for 30 days without any involvement from the male. The precocial chick fledges in about 75 days and follows its mother almost for a year (Manakadan 1985, Rahmani and Manakadan 1986a, Rahmani 1989, Manakadan and Rahmani 1993). Not much is known about the fledgling period and fledgling success, the young requires 2–3 years for maturity.

Nirav Bhatt

Two territorial males in display

Food and Feeding Habits

The species is omnivorous, feeding on crops such as millets, groundnut, and other legumes, insects, reptiles, and even small rodents (Bhushan and Rahmani 1992, Rahmani 1989). Being adapted to open dry areas, it drinks water as and when available, but more frequently during the hot summer (Rahmani 1989). Insects, mainly grasshoppers and beetles, are perhaps the most important animal constituents in the diet of the bustard. The habitats of the GIB, i.e. grassland and open scrubland are suitable for picking up insects during foraging. While walking, the bustard flushes various types of insects, among which Hymenoptera, Orthoptera, Coleoptera and Lepidoptera are generally eaten. In addition to insects, other organisms such as lizards and small snakes are also opportunistically eaten. Hume and Marshall (1878) reported the presence of a complete egg of quail (*Coturnix* sp.) in the stomach of a bustard. It has been observed that it is an opportunistic feeder and eats whatever is available in the area.

GIB has omnivorous and opportunistic feeding habits with seasonal changes in the diet

Historical distribution and population

Blanford in 1898 describes the distribution of Great Indian Bustard as "the plains of the Punjab between the Indus and the Jumna, also Eastern Sind, Kutch, Kattayawar, Rajputana, Gujarat, the Bombay Deccan, greater part of the Central Provinces, extending as far east as Sambalpur, the Hyderabad Territories, parts of the Madras Presidency and the Mysore State as far south as southern Mysore, and perhaps further south. Stragglers maybe found outside the area specified, as in western Sind, Meerut and Oudh, but the GIB is unknown in Bihar, Chota Nagpur, Orissa and Bengal, on the Malabar Coast and in Ceylon". During the 18th and 19th centuries, the GIB was one of the favourite game birds of British soldiers. 'Notes from the Oriental Sporting Magazine June 1828 to June 1833' published in *JBNHS* mentions a record killing of 961 bustards by Mr. Robert Mansfield, a British Officer in Ahmednagar district during 1809 and 1829. This shows that these birds were abundant in the district prior to the 19th century (Burton 1920). Hume and Marshal (1879) noted in their book, *Game Birds of India*, the use of noose traps for hunting the birds, and Simcox (1913) described trapping methods of female bustards by tribals.

Population during the 1980s and 1990s

The population of the GIB declined to around 1,500–2,000 birds by the 1980s. The population was distributed in pockets in six states (Rahmani 1989, Rahmani and Manakadan 1990b: see Table 2).

It still occurred in the Indian subcontinent in the Thar Desert in the northwest, and Deccan tableland of the Peninsula, which were once strongholds of the bird. But it had been extirpated from 90% of its former range and was principally confined to Rajasthan (100–150 birds), smaller populations (<50 birds) in Andhra Pradesh, Gujarat and Maharashtra, and less than 20 each in Madhya Pradesh and Karnataka. It has completely disappeared from Haryana, Punjab, Uttar Pradesh, Tamil Nadu, and Odisha (Rahmani and Manakadan 1990a,b). The Rajasthan and Kutch populations were probably shared with Sind in Pakistan. 15–20 bird sightings had been recorded annually in this area, where they were heavily poached (Khan *et al.* 2008).

The GIB was reported from five districts of Madhya Pradesh in the 1980s, from where they have not been sighted since the last three decades. The greatest reduction in the range of the bustard was in the northern states, i.e. Uttar Pradesh, Haryana and Punjab. Punjab and Haryana are semi-arid (average annual rainfall less than 700 mm), and hence, were suitable for the GIB, but owing to the development of irrigation facilities, the open scrublands, grasslands, and sandy areas were converted into croplands. These two states have now become the granary of India and practically no area is left for the bustard and other denizens of the grasslands. Similarly, the plains of Uttar Pradesh are now more or less occupied by crop fields, especially in the fertile northern belt from Saharanpur to Lucknow (where the bustards were earlier seen).

Population during the Current Century

Subsequently, there has been a further drastic reduction in the range occupancy of the GIB and its population was estimated around 300 birds comprising 8 populations in six states (Rahmani 2006, 2008, 2012, Dutta *et al.* 2010: see Table 2). Due to the drastic decline to the point of near-extinction, the species was listed as Critically Endangered by the IUCN in 2012.

Table 2. Decline of GIB since the 1980s

State and sites where species was recorded in the 1980s and/or currently	Estimated Population in 1980s	Estimated Population in 2015	Remarks
Andhra Pradesh: Rollapadu WLS and adjoining areas of Anantapur district	80–100	4–5	According to recent reports, there has been a further decline since 2010, e.g., only a total of a handful of birds are now seen in Nannaj and Rollapadu, and in Karnataka with breeding/nesting failures
Karnataka: Ranebennur WLS and Sirguppa tehsil of Bellary district	20–30	<15 (in Bellary; exinct in Ranebennur)	
Maharashtra: Solapur, Ahmednagar, Nasik and Chandrapur districts	*c.* 60	<15	
Madhya Pradesh: Karera Bustard Sanctuary, Shivpuri district and Gatigaon Bustard Sanctuary, Gwalior district	30–35	Locally extinct	
Gujarat: Abdasa tehsil of Kutch district	*c.* 50	25–30	
Rajasthan: Jaisalmer, Barmer, Bikaner, Ajmer, Pali and Tonk districts (and adjoining areas of Pakistan)	500	140±50	

(Source - Reports of BNHS, WII, TCF, SWAN)

Sujit Narwade

Can we spare some land for this species to feed and breed peacefully?

CONSERVATION ISSUES

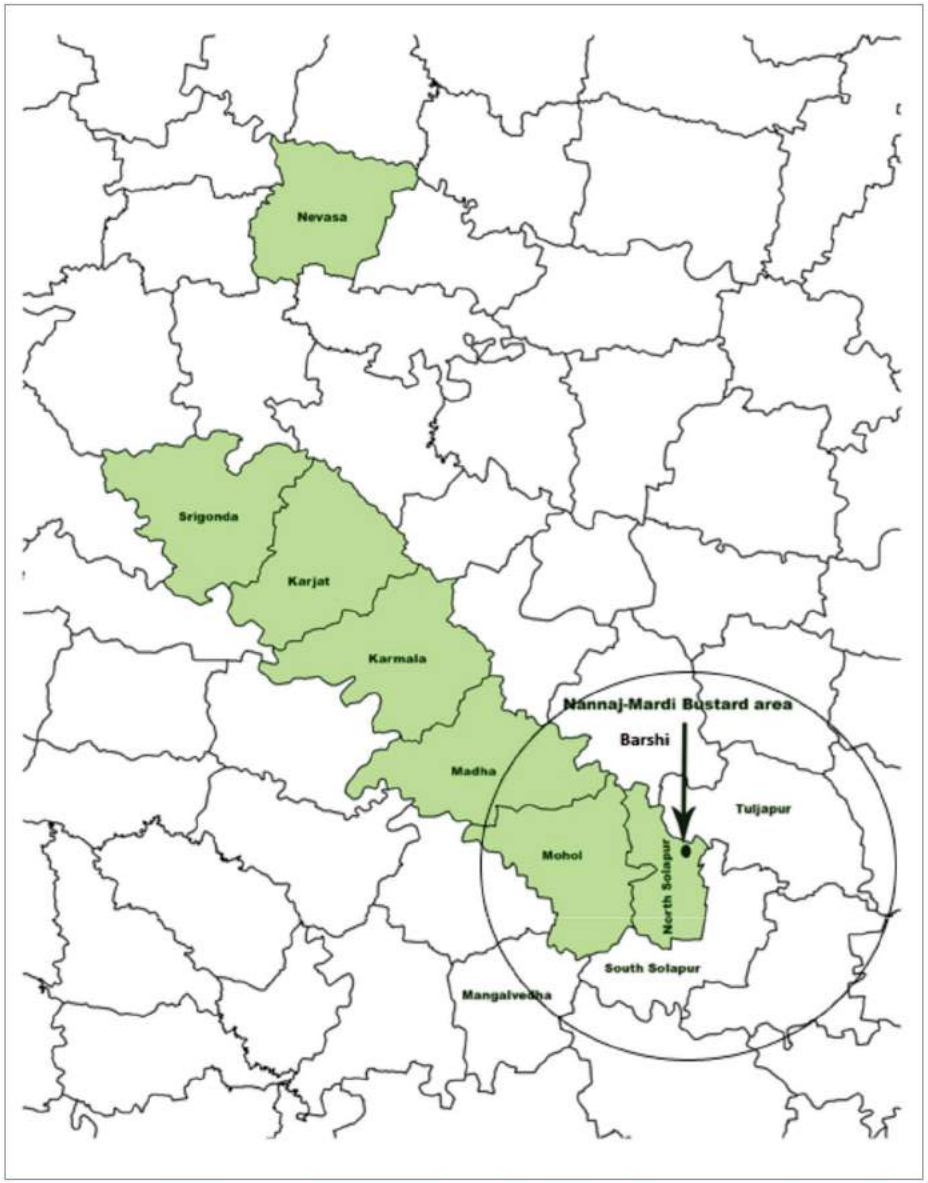
Issues of bustard sanctuaries and their existence in a human dominated landscape

In the middle of the last century, naturalists alerted the government regarding the need for conservation of grasslands and also on the decline of GIB (Tyabji 1952; Ali and Ripley 1987; Dharmakumarsinhji 1978). This resulted in establishment of eight bustard sanctuaries by state governments in the 1980s. Establishment of these Protected Areas (PAs) was believed to hold the best hope for saving the species (Rahmani 1989). Other than these large sanctuaries, some small conservation areas targeting lekking or nesting patches like in Sonkhaliya (17 km^2) in Rajasthan, Gaga–Bhatiya (2 km^2) and Lala–Naliya (17 km^2) in Gujarat, and Rollapadu (6 km^2) in Andhra Pradesh were also established.

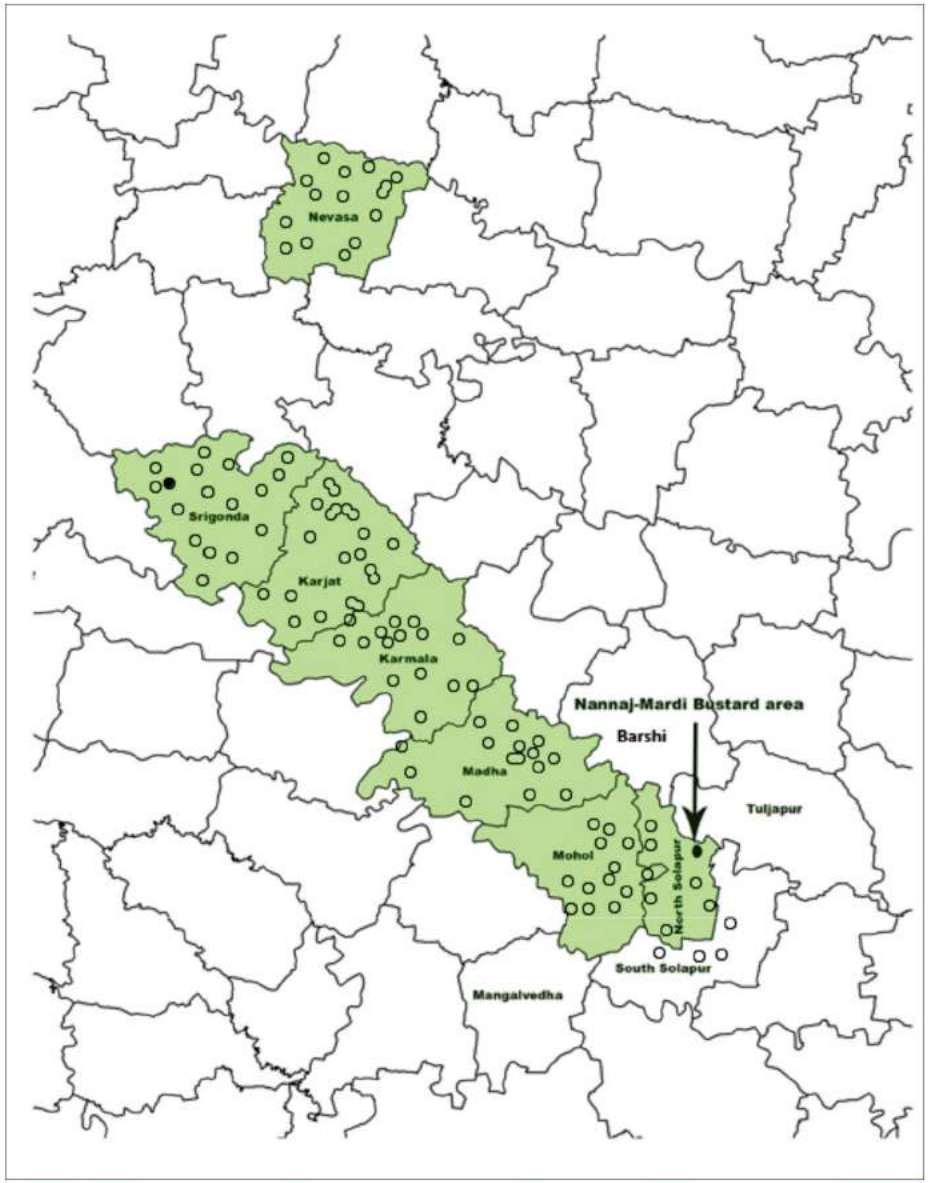
These GIB sanctuaries were notified with no clearcut demarcation of core and buffer areas and were spread across human dominated landscape. This resulted in conflict with local communities forcing the government to rationalize the boundaries of sanctuaries. For example, Karera Wildlife Sanctuary in Shivpuri district of Madhya Pradesh, India, was declared in 1981 to protect a population of the GIB. It had a spread of over 202 sq.km, of which as much as 146 sq.km was privately owned land. After the GIB became extinct in the area, due to public pressure, the National Board for Wildlife and the Government of Madhya Pradesh decided to denotify the Sanctuary. Another example is that of the GIB sanctuary in Maharashtra. This Sanctuary was spread across the 8,400 sq.kmwhich included 7 tehsils, a number of towns and 200 villages until 2011. The local pressure lead the government to rationalize the boundaries of the sanctuary. The final rationalization report of 2015 states the area of the sanctuary to be of 1,226 sq.km. Likewise, most/all of the bustard sanctuaries are located in a human-dominated landscape, and face a host of problem such as grazing, disturbance during breeding season, conversion of grasslands into crop fields, developmental projects, setting-up/increase in power transmission lines, wind mills, solar power plants, and other developments with land-use policy. Sanctuary faces opposition by locals due to loss of grazing lands, and/or crop depredations from wild herbivores like blackbuck that increase in numbers due to protection.

Samad Kottur

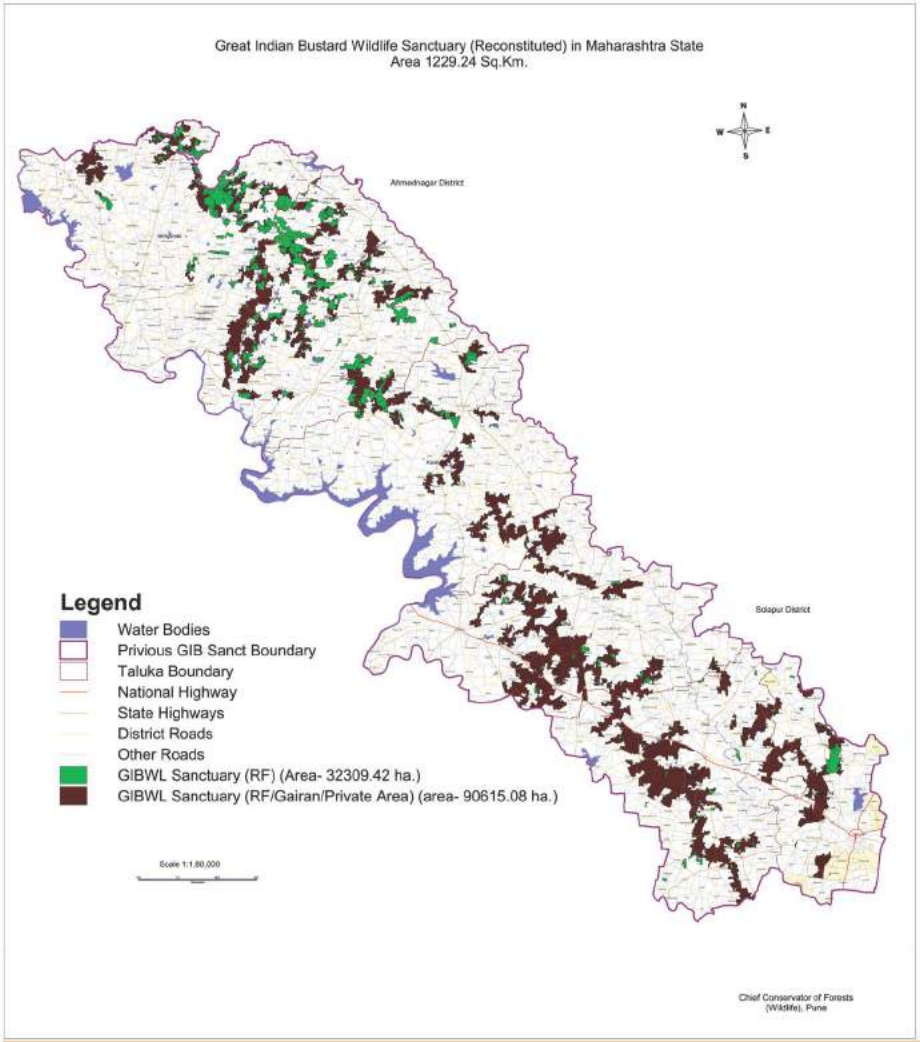
GIB lives in a highly human dominated landscape



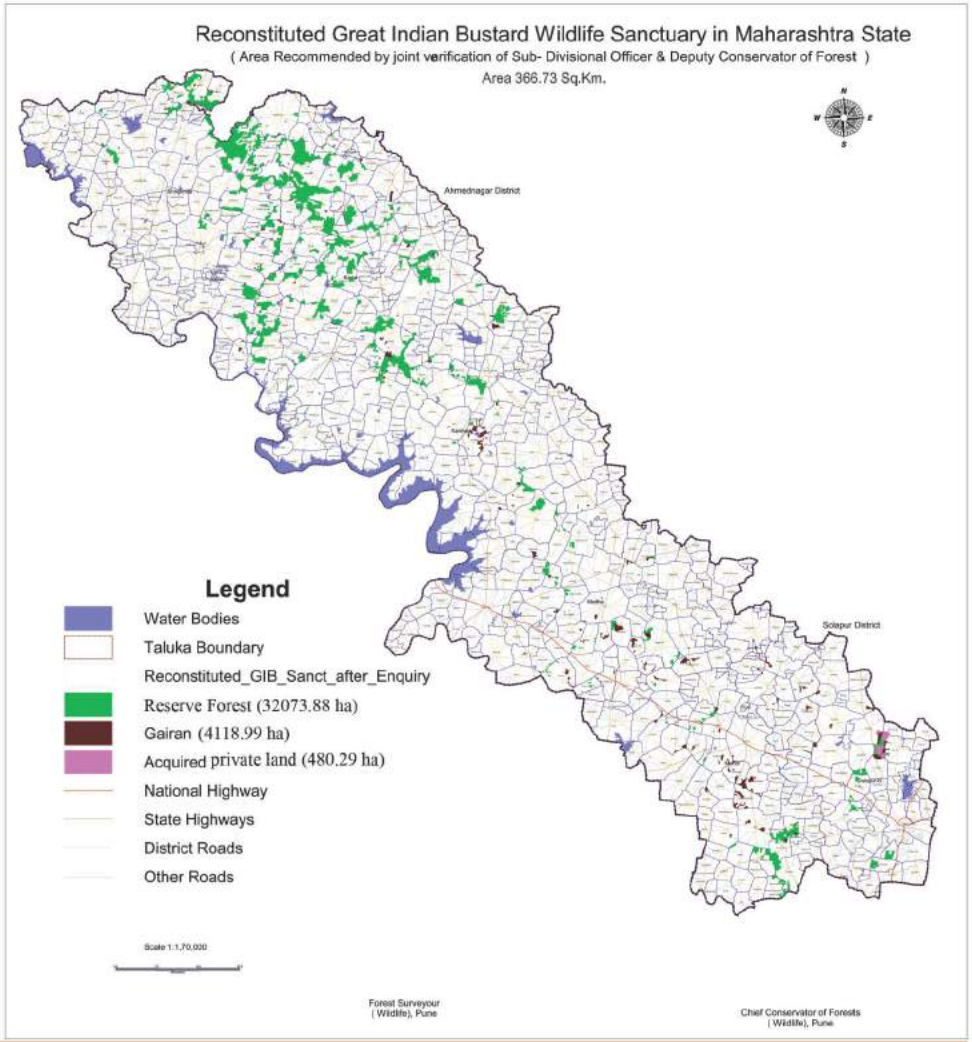
a) Area of GIB Sanctuary in 1980 and current GIB distribution range marked in circle



b) Small circles on map shows locations of proposed core areas of GIB sanctuary in 2008



c) The area of GIB sanctuary after first rationalization in 2011 (1, 229.24 sq.km.)



d) Current area under sanctuary after final notification of 2015 (366.73 sq.km.)

Source: Pune Wildlife Division, Maharashtra

Habitat Loss, Degradation and Hunting

Habitat degradation and loss, and hunting in some areas are the biggest threats to the survival of the Great Indian Bustard. These threats were prevalent in the past and have resulted in the disappearance of the species from about 90% of its range (Rahmani 1989). The threats not only prevail, but have increased manifold, e.g. conversion of grasslands to agriculture or for other uses, and change of marginal farming to intensive farming (Rahmani 2012). Historically, GIB was hunted as a game bird (Ali and Ripley 1987, Rahmani 1989) and continues to be hunted in neighburing Pakistan (Khan *et al.* 2008); some poaching still occurs in India, particularly in the Thar Desert. Low intensity poaching still persists within India, especially outside protected areas. Given the life history traits of GIB, this level of persecution is a threat to its extinction. Incidental collection of GIB eggs for consumption has been reported in some parts of Karnataka and Andhra Pradesh, which threatens the breeding success.

Conversion of grasslands to forest lands

Mismanagement by the Forest Department by planting trees in the last remaining grassland refuges or/and lack of proper management of the grassland habitat, along with increasing disturbances to the larger landscape, are further threats.

Collisions with wind turbines/power lines and Unethical Photography

Fatal collisions with wind turbines, high tension electric wires, other human structures and fast moving vehicles is a threat in the industrial development zones near bustard areas. Such deaths have been reported from Kutch (Gujarat), Solapur (Maharashtra), and Rollapadu (Andhra Pradesh). Unethical photography during the breeding season has often been a constant source of disturbance in recent years. Such instances have been reported from Naliya grasslands (Gujarat). Due to lack of legislative enforcement and protective measures in core breeding areas such direct threats to GIB population continue unrestricted.

Devesh Gadhvi

Because of monocular vision, and inability to judge distance, GIB collides with high tension wires

Devesh Gadhvi

Upcoming wind energy projects across the bustard ranges pose a threat through collision of birds with wind turbines and power lines

Unnecessary publicity is the 'number one enemy' of the GIB in recent years, in some bustard areas. To avoid unnecessary rush of amateur photographers to photograph this Critically Endangered bird, specific locations of GIB should not be made public. Photography should not be allowed in GIB areas, especially during their breeding season. According to social media network, there are more than 20,000 wildlife photographers in Karnataka, and there is competition to procure good photos of the critically endangered species. In this mad race, they end up breaking ethical codes, impacting the general survival of the GIB.

Other issues

GIB conservation strategies have relied on legislation to secure traditional breeding areas by declaring small patches as Protected Areas (PAs) or by protecting vast areas with varied human land uses. However, the nomadic nature of GIB lessens the benefits of small PAs, which are also not viable in the long run (as in Rollapadu Wildife Sanctuary), while large reserves impact the locals by curbing their legitimate subsistence rights, resulting in loss of support for GIB conservation (as in Great Indian Bustard Wildlife Sanctuary, Maharashtra) (Rahmani 1989, Manakadan and Rahmani 1993, Dutta *et al.* 2010).

Owing to its biology, ecological requirements and ranging behaviour, compounded by the rapidly changing landscape of India, the Great Indian Bustard is a difficult species to protect. The present laws and regulations, mainly developed for the protection of forest and forest animals, are in variance with the legislative, administrative and social requirements for the protection of GIB. It has been repeatedly proved that the present method of developing a protected area has not worked for species like GIB, and the problems facing the species are increasing (Rahmani 2012). There is need to develop new paradigms for the conservation of species that live in large human-dominated, multiple-use landscapes. A landscape conservation strategy using the Conservation and Community Reserve concept that includes controlled traditional land uses with GIB-friendly infrastructural development is needed. The rate of decline of GIB populations also calls for immediate commencement of ex-situ conservation breeding programmes.

To cite some examples, due to government irrigation and housing policies, many typical bustard landscapes have been lost or are being degraded at an accelerated rate. With increased availability of water, agriculture has spread over the vast, former arid and semi-arid grasslands. The Indira Gandhi Nahar Project (IGNP) has caused drastic hydraulic changes and massive agricultural conversion in and around the Desert National Park, and similar is the case of Telugu Ganga Canal around Rollapadu. Due to land distribution policies and the ambiguity arising from segregated ownership between local communities, encroachment is a major problem in many bustard areas, especially in bustard sanctuaries of Maharashtra and Kutch. In many protected areas (e.g., Gaga-Bhatiya in Gujarat and Ranebennur in Karnataka), open grassland habitats have been transformed into scrubland or forests due to well-intentioned but ill-informed management practices by the state Forest Departments. Overgrazing on private and community lands has also led to degradation of some areas. It has been lately observed that along with the increasing native livestock population, semi-nomadic livestock from other areas (e.g., Kathiawadi livestock of Gujarat) are adding to the grazing pressure in the states of Maharashtra, Karnataka, and Andhra Pradesh. The increasing use of pesticides in agriculture is a major problem affecting the species in recent years.

Devesh Gadhvi

Rampant use of pesticides is resulting in probable breeding failure in GIB as well as lack of food resources such as beetles and grasshoppers

Sujit Narwade

Huge plantation drives run by government on grasslands in the1980s have resulted in loss of typical bustard landscapes, which need to be restored, especially in Deccan region

CONSERVATION INITIATIVES IN PLACE AND THOSE NEEDED

Ranjit Manakadan

It is the responsibility of every Indian to save the 'Indian' bustard from extinction

Legal Protection

The GIB is listed in Schedule I of the Indian Wildlife (Protection) Act, 1972 and there are severe penalties for hunting it; it has recently been listed as a priority species for conservation by the Government of India. The concept of Project Bustard, on the lines of Project Tiger was suggested by BNHS (Rahmani 2002a,b), and was adopted by IUCN during its World Congress in 2004. It is also listed in Appendix I of the Convention on International Trade in Endangered Species (CITES).

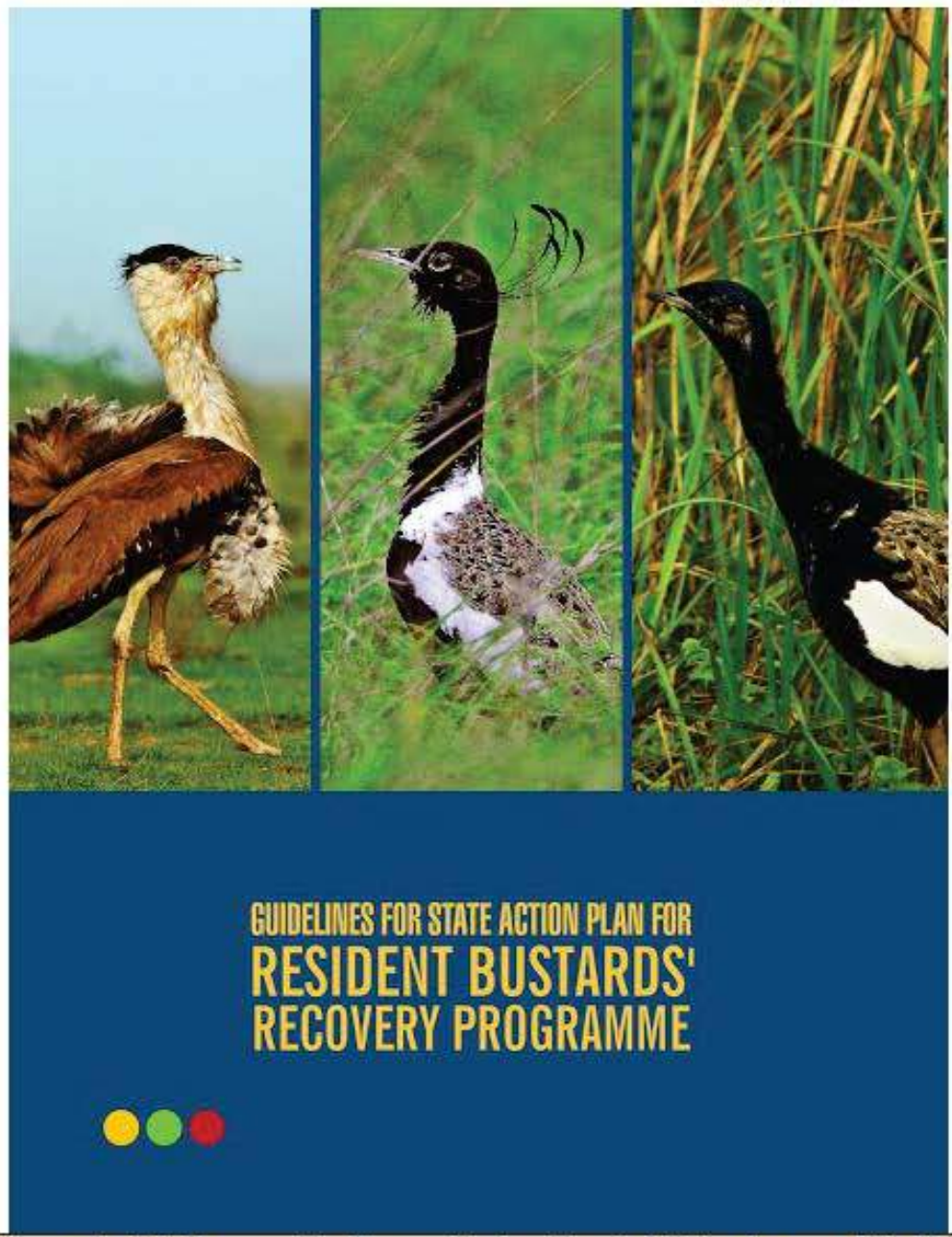
GIB Sanctuaries

From 1981 to 1988, BNHS carried out extensive surveys and studies investigating the status, distribution, and ecology of the GIB. These studies led to the formulation of a detailed conservation strategy for the species. These were instrumental in the formation of some specifically established grassland refuges for the GIB (Rahmani and Manakadan 1988; Rahmani 1989). The rehabilitation of grasslands in general under the Drought Prone Areas Programme of the 1980s and other such schemes had also benefited the GIB in some areas (Rahmani and Manakadan 1990b).

Need of a dedicated Species Recovery Plan (SRP) and Conservation Breeding Programme for the species

As discussed earlier, there has been a drastic decline in the GIB population to the point of near extinction, and the species was listed as Critically Endangered by the IUCN in 2012. Inspite of the in-situ conservation efforts undertaken to protect the species and its habitat, especially since the 1980s, the bird has continued to decline, and its population has come down to single digit figures in almost all the sites where it had still survived in the 1980s. The species has become extinct in Karera in Madhya Pradesh and probably also in Ranebennur in Karnataka. Currently, there appear to be three (or more) 'populations' left in India, the birds of north-western India (Rajasthan and Gujarat) and those that still occur in southern India in the states of Maharashtra, Andhra Pradesh and Karnataka. Hence, without a Conservation Breeding Programme (CBP) being taken up urgently, the species is likely to become extinct within a decade.

GIB SPECIES RECOVERY PLAN (SRP)



A Species Recovery Plan (SRP) for conservation of three resident bustard species, including GIB, was published by MoEFCC in 2013

In 2008, the Wildlife Institute of India (WII) started collaborative research on the GIB with BNHS. As part of a multi-species research project in Kutch, intensive ecological studies in Abdasa tehsil highlighted the conservation issues of the GIB, especially in the context of the socio-ecological nuances of the landscape (Dutta *et al.* 2010; Ishtiaq *et al.* 2011; Dutta 2012). The studies also highlighted the species, imminent extinction risk, low genetic diversity, and the need to reconsider conservation strategies for the species. These studies, along with the pioneering studies and the advocacy work undertaken by the BNHS helped upgrade the status of GIB as Critically Endangered (from Endangered) in the IUCN Red List.

In 2011, the Ministry of Environment, Forests and Climate Change (MoEFCC) set up a task force to develop national conservation plans for the GIB, Lesser Florican, and Bengal Florican. As a result of this, WII and BNHS, in collaboration with WWF, The Corbett Foundation (TCF), and Aranyak, developed "Guidelines for State Action Plans for Resident Bustards Recovery Programme" (Dutta *et al.* 2013) that was published by MoEFCC to guide conservation and management of bustards with a scientific approach. This National Recovery Plan advocated a multi-pronged landscape-level approach for saving the GIB (and also for the other bustard species) that involves:

a) Stringent protection and informed management of breeding enclosures,

b) Mitigation of threats and compatible livelihoods in adjoining non-breeding habitats, and

c) Establishment of captive population as insurance against extinction.

Detailed recommendations are given in Great Indian Bustard Recovery Plan (Dutta *et al.* 2013), and some of the salient points are:

Short and long term plans

1. In the short term plan, maintaining the existing populations of the GIB throughout its range is an important task.
2. In the medium to long term plan, land use practices and habitat conservation schemes that allow for GIB population growth and their range expansion should be promoted.

Development of policies

1. *National policy*: National policies and legislations that favour the conservation of the Great Indian Bustard as the flagship species of grassland habitats in India should be promoted.
2. *Interstate cooperation*: A framework for collaboration and information exchange at the governmental level is an essential issue. A policy should be developed to carry out coordinated national surveys to know the current status and population of GIB.
3. *Hunting*: GIB should remain in the Schedule I category, with complete restriction on hunting. Coordination between Forest and Police Departments is important to ensure booking of the culprits.
4. *Agricultural and Forestry policies*: Afforestation should be prevented in the bustard areas and conversion of grassland to cropland should not be allowed.
5. *Habitat policy*: Management and protection of breeding areas should be carried out, with an assessment of the key factors affecting breeding success. Non-protected areas also should have habitat policy as GIB uses farmland and grazing land for foraging. Establishment of core zones (complete protection in breeding season) within large buffer zones (where traditional agriculture and grazing should be allowed) is crucial.
6. *Grazing policy*: Traditional crop patterns and usage of grazing areas should be maintained.
7. *Monitoring Committee*: A monitoring committee consisting of scientists, forest officials and local leaders needs to be formed. This committee should be responsible for the overall functioning of the management activities in the bustard areas. Periodical meetings should be conducted for the assessment of the success or failure of the management policies implemented in various bustard areas.

Protection of breeding population

1. Disturbance at breeding and display sites should be prevented. Since breeding females are especially vulnerable to disturbance, activities that cause any interference should be minimised.
2. Special measures for the protection of breeding areas should be undertaken. Competent authorities and NGOs should be encouraged to take immediate action to manage the breeding areas of the bustards in protected as well as non-protected areas. In areas of good bustard population, temporary protection to the habitat during the breeding season should be adopted.

3. The ecology of core bustard populations in extensive agro-pastoral systems should be studied, giving priority to the analysis of those factors that may have an influence on breeding success. These should include the use of habitat and space, home range and dispersal patterns.
4. The seasonal changes in the quality of the habitat should be studied.
5. Alterations in the habitat should be prevented. Activities such as construction of new roads or highways, mining, irrigation and afforestation schemes should be prevented in important bustard areas to avoid fragmentation or isolation of bustard habitat.

Research

1. *Census*: Census methods for bustard count in different seasons, essential to study the population size and population trends should be standardized.
2. *Habitat study*: The effects of habitat protection measures, implementation of agri-environment regulations, etc., should be assessed. These studies should preferably be done at sites where the population has been well monitored for a number of years.
3. *Data analysis*: Comparative studies should be taken up of bustard populations in different Indian states with different kinds of problem factors. A comparative analysis of the population ecology and habitat use will be very useful.
4. *Study on seasonal movements*: The migration patterns of GIB are still poorly understood. Satellite telemetry is the best method to study the migratory route and seasonal movements.
5. *Networking*: A network of experts involving scientific institutes should be set up for coordinated bustard study.

Conservation breeding

1. Conservation (captive) breeding should be undertaken on an experimental basis.
2. Proper sites must be selected for captive breeding of GIB.
3. A captive breeding centre for the GIB should be set up at least in Rajasthan, with all required infrastructure.

Conservation awareness

1. Increasing awareness is the need of the hour to protect the GIB and its habitat. This conspicuous and majestic bird should be used as a flagship species for the protection of dry grasslands and scrub landscapes across India.
2. Efforts should be made to educate people on how the entire ecosystem depends on habitats like grasslands and scrublands, and also how the protection of GIB will help conserve such habitats.
3. Local people should be informed about the global status of the GIB and the need for its protection.
4. A positive attitude towards the GIB should be generated among the local people.
5. Media should be involved in campaigning to project the GIB as an outstanding feature of the Indian plains, and an invaluable asset of the Indian natural heritage.
6. Special training programmes should be conducted for forest staff working in bustard conservation practices.

STATE-WISE REVIEW OF GIB CONSERVATION ACTIVITIES

Thar Desert, Rajasthan

Activities undertaken by BNHS-India

BNHS is actively implementing various conservation actions necessary for the long-term conservation of the species. Some of the important actions implemented under the programme are:

1. *Anti-poaching capacity building programme*: BNHS was active participant of two workshops organised by Wildlife Conservation Trust (WCT) and Rajasthan State Forest Department (RSFD) on anti-poaching mechanisms.
2. Since, few bustards are found in areas owned by Indian Army, BNHS in collaboration ofWildlife Institute of India (WII) organized a sensitisation workshop on involvement of Southern Command, Jodhpur for conservation of GIB.
3. *Local livelihood leverage efforts*: As a prototype model, BNHS is exploring the idea of local community livelihood leverage project with RSFD through local crafts and other utility product making and selling.
4. BNHS is currently engaged in advocacy in the areas of developing decision support system in collaboration with WII to be given to central and state governments.
5. *Awareness programmes for Indian Army*: BNHS organized a seminar on GIB for the Southern Command.
6. Formulating a long-term programme for community awareness and education.

Activities undertaken by Wildlife Institute of India

A project 'Conserving Great Indian Bustard Landscapes through Scientific Understanding and Participatory Planning' was undertaken in western India in 2012. This project was jointly funded by WII, USFWS Assistance Awards, National Geographic Conservation Trust, Md. Bin Zayed Species Conservation Fund, Rajasthan Pollution Control Board, and Ravi Sankaran Inlaks Program. This project in Thar, prioritized conservation areas based on distribution and ranging patterns of birds, and facilitates scientific habitat management in these priority areas through the Forest Department. This project developed a scientific protocol for large-scale status assessment of GIB and its associated fauna and habitat.

Under this project, WII and Rajasthan Forest Department jointly conducted three annual cycles of status surveys in Thar (March 2014 & 2015) with the help of field ecologists, frontline staff, and trained student volunteers from universities across India. This exercise generated robust and spatially explicit information on GIB abundance, habitat, and threats, to guide site-specific management. Roughly 150 birds were found in two fragmented pockets – Sudasari-Sam-Harbour area in Desert National Park and Bhadariya-Ajasar-Pokhran area in Field Firing Range.

Activities characterizing threats such as mapping of power-lines and assessing potential nest predation using dummy nest experiments were undertaken. Based on these studies, the project recommended the following actions (some of which are being implemented by Rajasthan Forest Department): a) consolidate existing bustard breeding enclosures using predator-proof fencing, b) remove dogs, pigs, and other nest predators from breeding enclosures to improve GIB recruitment, c) establish new protection enclosures in priority conservation areas, d) curtail new wind-turbines and power-lines in GIB ranging areas and mark existing power-lines with 'bird diverters' to minimize bird collision risk, e) implement technology-aided patrolling to control poaching, and f) understand landscape-use patterns using satellite telemetry to strategize mitigation measures.

Sujit Narwade

Conservation awareness programmes are being conducted in remote areas of Thar Desert by BNHS

As a step forward, from generating conservation information to implementing conservation actions, WII is going to initiate the Endangered Species Recovery Project (2016–2021) with the support of national Compensatory Afforestation Fund Management and Planning Authority (CAMPA) funding that includes a project on 'Habitat Improvement and Conservation Breeding of Great Indian Bustard'. With the realization that multiple ownership, uses and threats in bustard landscapes necessitates collaborative efforts of various state and non-state agencies, this project aims at implementing the National Recovery Plans through collaboration with State Forest Departments and NGO partners such as BNHS and The Corbett Foundation.

Vikas Pisal

More than 50% population of GIB is found in the Thar Desert, which is the last hope for the recovery of this species

Gujarat

Activities under-taken by The Corbett Foundation (TCF)

Kutch Bustard Sanctuary, a mere 2 sq.km of protected area. Most of the GIB habitat outside this sanctuary has been lost by encroachment.

The GIB was not a rare species in Gujarat during the early 1960s, surviving in most of the *vidis* (private grasslands of former princely states) in Saurashtra and Kutch. As per the last GIB census conducted by the Government of Gujarat, there were about 48 birds in Kutch during 2007. Local birders and subject experts feel that the population may have dropped to around 30 birds now.

The Corbett Foundation (TCF) is one of the organizations working for the conservation of the GIB habitat in the Kutch region of Gujarat. In 1999, TCF established its Kutch Ecological Research Centre division at Tera village of Abdasa taluka. Since then, various activities like Rural Medical Outreach Programme, community welfare and livelihood programmes, cattle care and breed improvement programme, awareness programmes, and nature education camps have been conducted by the Foundation in about 30 villages of Abdasa taluka.

During 2010–12, through a detailed study, TCF identified 1,475 hectares of revenue land and 1,450 ha of forest land as prime bustard habitats. It was recommended that these areas be restored scientifically and merged together, so as to collectively provide a 15 times larger habitat than that of the existing Kutch GIB Sanctuary in Abdasa, Gujarat. A detailed report was published and circulated to the concerned authorities for further action, resulting in around 800 ha of land being identified and proposed to be added to the GIB Sanctuary, under the Forest Conservation Act by the Forest Department.

TCF observed that free ranging dogs were a serious threat to the species, especially for the chicks and eggs. Hence, in collaboration with the Kutch Forest Division, during 2014–15, TCF initiated Animal Birth Control Programme for dogs in GIB areas. Over 200 dogs were successfully spayed/neutered and vaccinated against rabies. Now, communities are aware about the positive side of the programme and are willing to support it. By the end of 2016, the aim is to neuter another 200 dogs and vaccinate them against rabies.

Kedar Gore

Increasing number of stray dogs in breeding sites is one of the major threats to all ground nesting birds, including GIB

Being a member of the Bustard Conservation Committee and State Wildlife Advisory Board, Gujarat, TCF has played a pivotal role in the development of State Level Bustard Recovery Plan. The Species Recovery Plan of GIB prepared by the joint efforts of Gujarat Forest Department and TCF is being followed for the management of GIB landscape. About 20 km^2 of area is now being restored / managed as per the guidelines suggested in the recovery plan.

Since last five years, TCF is running a GIB awareness campaign through which the message of GIB conservation has reached more than a lakh people. A video of a song on GIB in the local language was composed, which is now quite a hit among local students and villagers. In addition, a poster in the local language, a film on the GIB landscape, various sign boards, GIB pocket diaries, and various awareness materials in the local language have been developed by TCF for the awareness programme.

TCF has developed a game called 'GIB – My Friend' for kids. The game illustrates various threats being faced by GIB and also highlights the conservation measures required for GIB conservation. Thus, while playing, kids learn about the species and its conservation status. To add to this, TCF announced a scheme where this game can be purchased online at a nominal rate, and on purchase of each game, a similar game will also be donated to the village kids. This is how kids can get involved in GIB awareness programme.

TCF is working very closely with the Gujarat Forest Department in Kutch. Till date, over 50,000 patients and around 25,000 livestock have benefited from medical and cattle care programmes. It has introduced various skill training programmes, being sponsored by the Gujarat Forest Department, for the villagers living within the GIB's distribution range.

Nirav Bhatt

Great Indian bustard in it's natural habitat

Maharashtra

Activities under-taken by BNHS-India

Various activities for conservation of GIB were undertaken by BNHS in collaboration with Pune Wildlife Division, Government of Maharashtra as per the guidelines given under Species Recovery Plan (SRP) for GIB of the MoEFCC. Since 2011, intensive studies are being conducted in the Great Indian Bustard Sanctuary area in Solapur, and also in the entire Deccan Plateau of Maharashtra. Other studies/programmes carried out for GIB are:

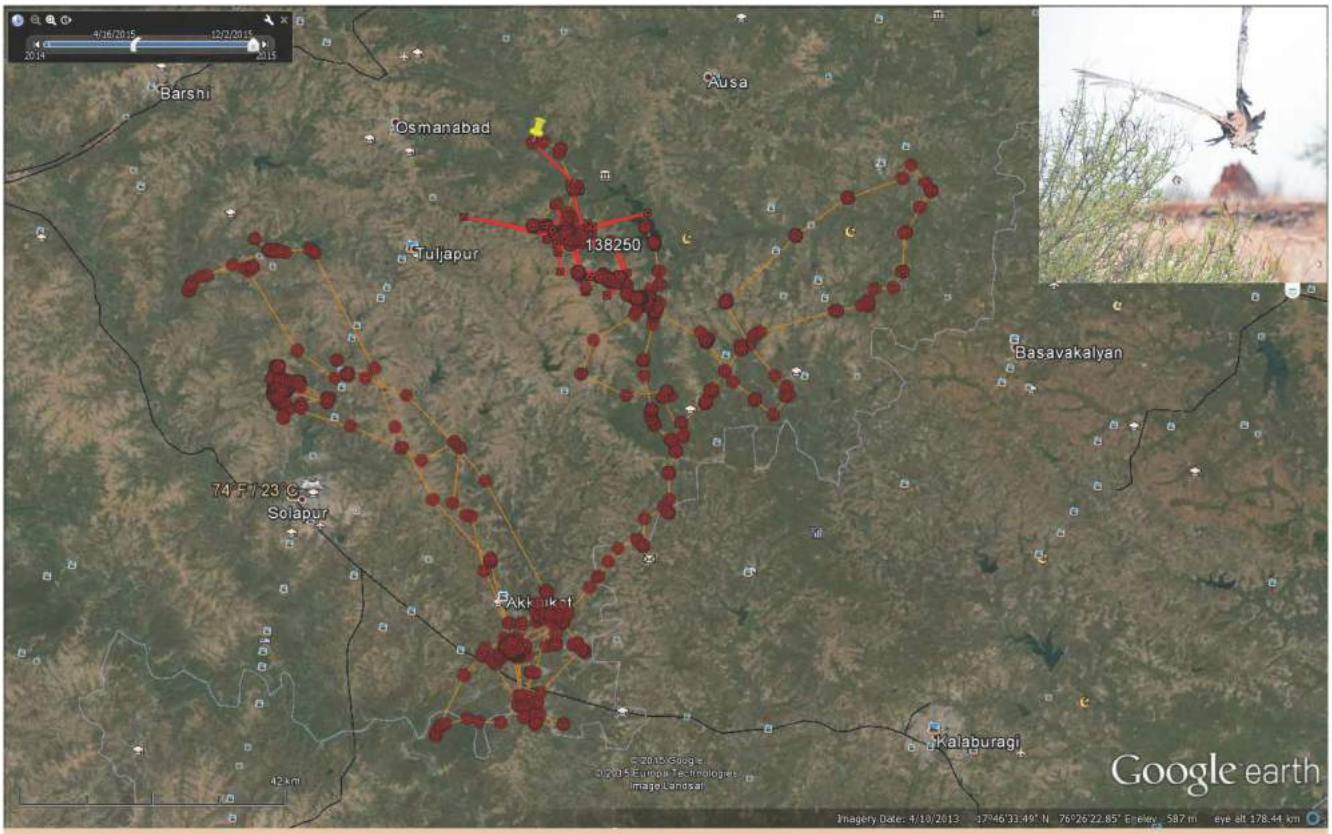
1. To understand conservation attitude of the local people, socio-economic surveys were carried out with the help of interns of Tata Institute of Social Science (TISS), in Osmanabad, Maharashtra.
2. A study on pesticide residues in birds and their food chain has also been initiated, with support of the Forest Department and in collaboration with National Food and Agriculture Research Institute (NAFARI), Pune. To reduce the use of chemical fertilizers and pesticides in GIB areas, training programmes for promotion of sustainable agriculture was organized for farmers in Solapur with the help of Watershed Organization (WOTR), Pune, and Krushi Certification Pvt. Ltd, Pune. Sampling of insects was taken to understand indirect impact of rampant use of pesticides and prey availability for GIB.
3. Newly added areas to the Great Indian Bustard Sanctuary are being surveyed to identify priority areas for grassland management. BNHS also provided inputs in the preparation of management plan for the GIB Sanctuary, Maharashtra (2016–2026). BNHS is organizing a series of workshops on 'Conservation of Wildlife in Deccan Plateau of Maharashtra'.
4. Since there was no proper information booklet on the GIB of the Great Indian Bustard Sanctuary, BNHS developed and released a short film on grassland and GIB in English and in the local language Marathi, under its awareness programme.
5. BNHS is organizing a series of workshops for the promotion of bustard-friendly agricultural practices at Solapur. This has resulted in gaining strong support of the local community in conservation practices as well as reducing chemical use in farmlands adjoining bustard areas.
6. Tracked movement of stray dogs in farmlands in marginal areas of the Sanctuary compartments, and found that dogs move in around 3–4 km radius area of it.
7. The GIB Sanctuary is spread across a large human dominated landscape in discontinuous patches. BNHS has been involved in conducting field surveys as well as stakeholder meetings for identification of Eco-Sensitive Zone (ESZ) for the GIB Sanctuary. Status survey of ground nesting birds and other grassland obligatory species has been initiated in drought prone areas of Maharashtra.

Balasaheb Lambture

Ten schools from core areas of GIB Sanctuary, Maharashtra, are enrolled under a one year nature education programme from 2016

Balasaheb Lambture

Around 60 farmers are associated with sustainable agricultural programme at GIB Sanctuary, Solapur, Maharashtra



Satellite transmitter study map (Source - Pune Wildlife Division and WII)

Tracking the movement of GIB in Nannaj by Wildlife Institute of India (WII)

The grasslands of Nannaj are breeding grounds for the GIB from April to October. The GIB is presumed to undertake movements after the breeding season as it is not seen in the breeding areas during this period. To effectively conserve the species, it is important to identify all the habitats and regions used by the bustards throughout the year. In order to understand this, a project funded by Maharashtra Forest Department, 'Tracking Great Indian Bustard Movements in Maharashtra' was undertaken by WII. The capture and fitting of satellite-transmitters, Platform Transmitter Terminal (PTT), on GIB in Nannaj to track their movements was carried out in April 2015. An adult male and a sub-adult male were tagged. A good amount of movement data was obtained on the sub-adult male, but the adult male (tagged in September 2015) was found dead within four days; succumbing to a leg injury, probably after colliding with high tension power lines.

The subadult GIB tagged in April 2015 was seen primarily within the bounds of the Sanctuary and the adjacent agricultural lands until the end of May. This bird was seen in various locations in October 2015 at a distance of 100 km to the north in Latur district, and Vijaypura south of the Sanctuary along the Karnataka border. The information generated from this bird revealed vast usage over ~7,000 sq. km area and identified movement paths that will help in prioritizing areas for identifying mitigating threats. This data is extremely crucial as it provides critical information about the movement of bustards in a huge landscape. It plays a key role in understanding the habitat requirements of this bird in various seasons.

Karnataka

Activities taken by Society for Wildlife and Nature

Once abundant in the eastern plains of Karnataka, the GIB was believed to be locally extinct in most of its former range, including Ranebennur Blackbuck Sanctuary, which was declared as a Wildlife Sanctuary in 1974 due to the past occurrence of the species. There have been no sightings of GIB from 1990 in the area.

In recent years, the Society for Wildlife and Nature (SWaN), a non-government organization, began surveys in monsoon 2006 for the Great Indian Bustard in the eastern districts of Karnataka including Bellary, Koppal, and Raichur. In 2006, the team sighted around nine individuals in a remote corner of Siruguppa in Bellary district. The NGO is continuing documentation of the birds in the area since the last 10 years. In 2016, the Karnataka Forest Department approached SWaN to take up a rapid survey of GIB to assess their status and distribution in the state. Accordingly, SWaN undertook a more than one month survey in March and April 2016. During the survey, around eight different individuals were photographed. The birds inhabit an area of 55 sq. km, which were under grasslands in the past but are now irrigated farmlands under private ownership. This rapid survey kindled hope for conservationists as it has revealed the presence of a breeding population that could be used for in-situ conservation of the species.

The following are the recommendations for conservation of GIB in Karnataka suggested by SWaN

1) Appoint a minimum eight local 'Friends of GIB' for monitoring the GIB and threats to its habitat. Identify potential areas which can be restored as GIB habitat.
2) Collaborate with the local NGOs such as SWaN for the research and documentation of the species.
3) Conduct awareness programmes for school students and youth groups on the importance of grasslands and wildlife.
4) Promote bustard friendly agricultural practices, such as organic and traditional crop farming.
5) Reduce usage of natural resources from grassland, incentives such as LPG cylinders and gobar gas plants can be provided.
6) As GIB is a landscape species, inter-departmental coordination is necessary between the police, administration, agriculture, irrigation, horticulture, and animal husbandry departments.

Samad Kottur

A small population of GIB is surviving in agricultural land in Bellary district, Karnataka

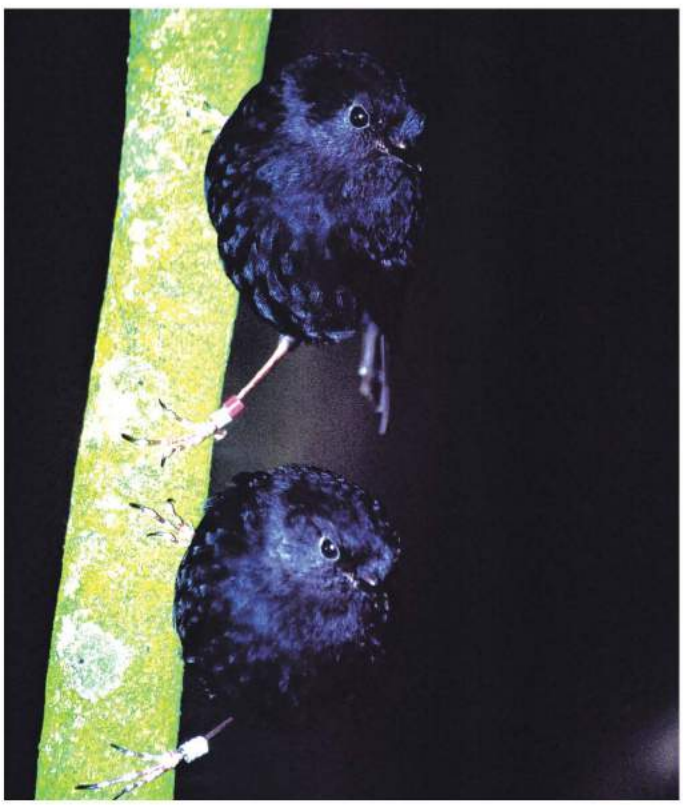
EXAMPLES OF BIRD SPECIES BROUGHT BACK FROM THE BRINK OF EXTINCTION

If there is a will, we can bring species back from the brink of extinction. Below are some of the examples which reveal how a population of few individuals can revive the species with special efforts (Information sourced from BirdLife International 2008).

(Photographs: https://www.flickr.com/groups/birdlife-international, except where mentioned)

Vibhu Prakash

1. **Vultures in India:** BNHS has led the movement of vulture conservation in India from the front. BNHS has been doing pioneering work in identifying the incidence and cause of their decline in India, scientific research on vulture populations, relentless advocacy work with multiple stakeholders to highlight the issue and successful Vulture Conservation Breeding Centres (VCBCs) of all threatened Gyps species at three locations. Our mission is to save vultures from extinction in India through an integrated approach of conservation breeding, research, monitoring, public awareness and advocacy for policy interventions. Experience of vulture conservation can be useful in conservation breeding of GIB in India. (www.bnhs.org 2017)



2. **Black Robin *Petroica traversi*:** It is endemic to the Chatham Islands (New Zealand). Following human settlement of the islands, the species declined rapidly as its forest habitat was lost and degraded, owing to predation by introduced rats and cats. In 1976, when the population had declined to just seven birds, the remaining individuals were relocated to nearby Mangere Island, and provided suitable habitat. By 1980, the numbers had fallen to five (three males and two females). Nest protection, supplementary feeding, and a cross-fostering programme (with the congeneric Tomtit *P. macrocephala*) were then established, and the population began to recover steadily. The population continued to rise; in 2011 a total population of 260 individuals was estimated (Houston *in litt.* 2011).

3. **Rarotonga Monarch (or Kakerori) *Pomarea dimidiata*:** It is endemic to the Pacific Island of Rarotonga (an island in the Cook Islands). A survey in 1987 estimated the population at 38 individuals, but was recorded to be declining (Robertson *et al.* 1994). A recovery plan was prepared in 1988, and implementation began later that year. Intensive control of predators (particularly black rats *Rattus rattus*) reduced adult mortality and increased nesting success. By 2000, the population on Rarotonga had reached 221 individuals, leading to its downlisting from Critically Endangered to Endangered on the IUCN Red List. By 2007 the population had increased to 314 birds; 271 on Rarotonga and 43 on Atiu (Robertson *et al.* 2009), and by August 2011 the population was estimated at *c.* 380 birds, including 69 yearlings (Robertson *et al.* 2011).

4. **Seychelles Magpie-robin *Copsychus sechellarum*:** It was originally present on at least eight islands in the Seychelles but in 1965 only 12–15 birds remained on Frégate (Gaymer *et al.* 1969). In 1994, following eradication of introduced cats, a recovery programme was initiated, involving habitat creation, supplementary feeding, nest defence, provision of nest boxes, and translocations to other islands. In 2008, 20 birds were translocated to Denis and within six months there were at least two successful breeding attempts on the island. In early 2009, the total population on the five islands was estimated at *c.* 200 individuals (Anon. 2009).

5. **California Condor *Gymnogyps californianus*:** It had declined to just nine individuals in the wild in 1985 owing to poisoning from ingestion of lead ammunition in carcasses, plus other threats. The last birds were taken into captivity in 1987 and a captive-breeding programme was initiated. In 1992, the first bird was released in wild. After overcoming some initial difficulties, the programme has now led to a population of 151 birds in the wild. Much work is required before the population can be regarded as self-sustaining. The species certainly would have been disappeared if intensive interventions had not been undertaken.

6. **Asian Crested Ibis *Nipponia nippon*:** Historically it nested in the Russian Far East, Japan, and China; and was a non-breeding visitor to North Korea, South Korea, and Taiwan (China), but is now extinct in almost all of its former range (Birdlife International 2001). In May 1981, following three years of nationwide surveys in China – a population of only seven birds (four adults and three chicks) were found in the wild and in the same year the last five wild birds in Japan were captured and taken into captivity (Ding Changqing 2010). Since the discovery of nesting birds in 1981, emergency regulations have been enacted to prohibit logging, the use of agrochemicals in rice fields and the use of firearms for hunting, and nest-sites patrolling and guarding during the breeding season. Besides, rice fields are maintained as feeding–sites in winter. The most recent population estimate is of *c.* 500 wild individuals in 2006, all in Shaanxi province in central mainland China (Su Unshan 2007).

7. **Lear's Macaw *Anodorhynchus leari*:** It is known from just two colonies in northeast Bahia, Brazil. It was known to science for 150 years as a bird in trade before a wild population was found in 1978. In 1983, the global population was estimated to number just 60 birds (Yamashita 1987). There has also been a genuine increase as a result of intensive conservation measures, including infiltration of trading networks and improved surveillance at breeding sites, comprehensive monitoring, guarding and protection of the Toca Velha–Serra Branca cliffs, planting of palm seedlings, a corn replacement scheme for farmers, and an education and awareness programme (Reynolds 1997, IBAMA 1998, Snyder *et al.* 2000, Gilardi 2001, Holmer 2007, W. Wittkoff *in litt.* 2007, A. Roos *in litt.* 2012).

8. **White-headed Duck *Oxyura leucocephala*:** By 1970s, the Spanish population of White-headed Duck *Oxyura leucocephala* was close to extinction. However, following the prohibition of hunting at its stronghold lagoon and various habitat measures, the population began to recover and spread, and now numbers *c.* 2,500 individuals.

9. **Mauritius Parakeet *Psittacula eques*:** By 1986, the Mauritius Parakeet *Psittacula eques* had been reduced to fewer than a dozen birds, including just three females, owing to habitat destruction and the impacts of invasive species. However, captive breeding and release control of invasive predators, provision of artificial nest cavities, and brood manipulations increased the wild population to 343 birds by 2007, leading to its downlisting from Critically Endangered to Endangered in IUCN red list. This spectacular recovery demonstrates what can be achieved through sustained conservation action informed by in-depth research.

10. **Bermuda Petrel *Pterodroma cahow*:** The Endangered Bermuda Petrel *Pterodroma cahow* was thought to be extinct for almost three centuries before a small population was discovered nesting on a group of four tiny rocky islets in Bermuda in 1951. An intensive recovery programme involving provision of artificial nest burrows raised the population from 18 pairs when rediscovered to 70 pairs in 2003, but then heavy seas during a severe hurricane destroyed many of the nesting burrows. In 2004, 14 chicks were translocated to Nonsuch Island, which is larger, higher, and therefore safer. In 2008, the first translocated chicks returned to the island and by 2014, there were 29 adults returning to breed.

11. **Yellow-eared Parrot *Ognorhynchus icterotis*:** It was once common in the Andes of Ecuador and Colombia, but declined owing to unsustainable exploitation of the Quindío wax palm *Ceroxylon quindiuense* on which it is dependent for roosting, nesting, and feeding. However, a highly successful publicity campaign backed by the Catholic Church has engendered considerable public support. In combination, with active protection measures such as installing nest boxes, protecting palm seedlings and planting trees, this has led to the parrot population increasing to over 800 birds.

In addition to these species, there have been several other spectacular recoveries of highly threatened species, including the Pink Pigeon *Nesoenas mayeri* of Mauritius, and Campbell Island Teal *Anas nesiotis* of New Zealand. The Pink Pigeon population was 10 wild individuals which has increased to a present population of *c.* 350–450 birds. There were formerly fewer than 50 mature individuals of Campbell Island Teal, endemic to Campbell Island Group, but increased to 100–200 adults after a captive breeding progamme, and have been reintroduced on Campbell Island following a successful eradication of Norway Rats in 2001.

References and Select Bibliography

Adam, R. M. (1873): Notes on the birds of the Sambhur Lake and its vicinity. *Stray Feathers* 1: 361–404.

Aitken, A. B. (1912): The Great Indian Bustard (*Eupodotis edwardsii*). *J. Bombay Nat. Hist. Soc.* 21(4): 1334.

Ali, S. (1927): The Moghul emperors of India as naturalists and sportsmen. Part 2. *J. Bombay Nat. Hist. Soc.* 32(1): 34–63.

Ali, S. (1940): The birds of Bahawalpur (Punjab). *J. Bombay Nat. Hist. Soc.* 42(4): 704–747.

Ali, S. (1945): *The Birds of Kutch*. Bombay: Oxford University Press. Pp. 175.

Ali, S. (1961): Our national bird. *Newsletter for Birdwatchers* 1(4): 3–4.

Ali, S. (1962): National bird. *Newsletter for Birdwatchers* 1(6): 4.

Ali, S. (1962): Great Indian Bustard. *Newsletter for Birdwatchers* 2(10): 12–13.

Ali, S. (1970): The Great Indian Bustard *Choriotis nigriceps* (Vigors). Pp. 58–62. In: C. W. Holloway, ed. *Papers and Proceedings, IUCN Eleventh Technical Meeting, II: Third Session: Survival Service Commission "Problems of Threatened Species"*. Morges, Switzerland: International Union for Conservation of Nature and Natural Resources (IUCN Publ. N.S. no.18).

Ali, S. Md. (1981): The Great Indian Bustard. *Tiger paper* 8(4): 9–11.

Ali, S. & A. R. Rahmani (1981–82): *The Great Indian Bustard*: Annual Report 1, Bombay Natural History Society, Bombay. Pp. 153.

Ali, S. & H. Whistler (1934): The Hyderabad State Ornithological survey. *J. Bombay Nat. Hist. Soc.* 37(2): 425–454.

Ali, S. & H. Whistler (1939–1940): The birds of central India. *J. Bombay Nat. Hist. Soc.* 41: (1) 82–106, (3) 470–488.

Ali, S. & H. Whistler (1942–1943): The birds of Mysore. *J. Bombay Nat. Hist. Soc.* 43: (2) 130–147, (3) 318–341, (4) 573–595; 44: (1) 9–26, (2) 206–220.

Ali, S. & S. D. Ripley (1987): Pp. 188–191. In: *Handbook of the birds of India and Pakistan together with those of Bangladesh, Nepal, Bhutan and Sri Lanka*. Volume 2. 2nd. Ed. Oxford University Press., Delhi.

Ali, S., J. C. Daniel, A. R. Rahmani & R. Manakadan (1984): *Strategy for conservation of bustards in Maharashtra*. Techn. Rep. no.3/84. Pp. 10.

Ali, S., J. C. Daniel, A. R. Rahmani, B. Bhushan & E. D'Cunha (1985): *Threat to the Karera Bustard Sanctuary: recommendations for conservation*. Techn. Rep. no.6/85. Pp. 23.

Allen, G. O. (1919): The Great Indian Bustard (*Eupodotis edwardsii*) in Mirzapur, U. P. *J. Bombay Nat. Hist. Soc.* 26 (2): 673.

Ara, J. (1982): Sanctuary for the Great Indian Bustard. *Newsletter for Birdwatchers* 22(3–4): 16.

Baker, E. C. S. (1921): *Game birds of India, Burma and Ceylon*. Volume 2. Bombay Natural History Society, Bombay. Pp. 164–185.

Baker, E. C. S. (1929): *Choriotis nigriceps*. The Great Indian Bustard. Pp. 64–66. In: *The fauna of British India, including Ceylon and Burma. Birds*. Volume 6. 2nd ed. London: Taylor and Francis.

Baker, H. R. & C. M. Inglis (1930): *The birds of southern India including Madras, Malabar, Travancore, Cochin, Coorg and Mysore*. Government Press, Madras. Pp. i–xxxiii, 1–504.

Ball, V. (1876): Notes on some birds collected in Sambalpur in Orissa. *Stray Feathers* 4: 231–237.

Ball, V. (1878): From the Ganges to the Godaveri. On the distribution of birds, so far as it is present known, throughout the hilly region which extends from the Rajmehal Hills to the Godaveri valley. *Stray Feathers* 7: 191–235.

Barnes, H. E. (1886): Birds' nesting in Rajpootana. *J. Bombay Nat. Hist. Soc.* 1(2): 38–62.

Barnes, H. E. (1888–1891): Nesting in western India. *J. Bombay Nat. Hist. Soc.* 3: (4) 205–224; 4: (1) 1–21, (2) 83–98, (4) 237–255; 5: (1) 1–19, (2) 97–116, (4) 315–337; 6: (1) 1–25, (2) 129–153, (3) 285–317.

Beveridge, A. S. (1922): *The Babur-nama in English*. Volume 2. Luzac & co. London. Pp. 542.

Bhatia, H. M. (1986): Ecological study of the Great Indian Bustard. *Indian Forester* 112: 908–913.

Bhushan, B. & A. R. Rahmani (1992): Food and feeding behaviour of the Great Indian Bustard *Ardeotis nigriceps* (Vigors). *J. Bombay Nat. Hist. Soc.* 89(1): 27–40.

Bidawat, G. S. (1986): Some recent observations on captive breeding of the Great Indian Bustard in Jodhpur Zoo. *Zoo's Print*. 1(10): 1–3

Bidwat, G. S. & S. Walker (1986): The Great Indian Bustard–a report on captive breeding efforts. *Zoo's Print* 1(1): 11–14

Bindra, P. S. (2009): On the brink. *Tehelka Magazine* 6 (16).

BirdLife International (2009): *Ardeotis nigriceps*. In: IUCN 2009. IUCN Red List of Threatened Species. Downloaded on 14 February 2010.

Blanford, W. T. (1898): *Eupodotis edwardsi*. The Great Indian Bustard. Pp. 195-196. In: *Fauna of British India including Ceylon and Burma, Birds*: Vol. 4. London: Taylor and Francis.

Bradbeer, P. (1987): List of bird species seen in Maharashtra (mainly the Pune area) from March 21st 1986 to March 16th 1987. Unpublished.

Brown, J. M. (1887): *Shikar sketches*. Hurst and Blackett. Pp. 53–54.

Bulkley, H. (1894): Eggs of the Bustard. *J. Bombay Nat. Hist. Soc.* 9(2): 228.

Burton, R. W. (1920): Notes from the Oriental Sporting Magazine June 1828 to June 1833. *J. Bombay Nat. Hist. Soc.* 26(1): 1047–1048.

Burton, R. W. (1953): The Great Indian Bustard. *J. Bombay Nat. Hist. Soc.* 51(2): 506.

Butler, E. A. (1875–1877): Notes on the avifauna of Mount Aboo and northern Guzerat. *Stray Feathers* 3: 437–500; 4: 1–41; 5: 207–235.

Butler, E. A. (1878): My last notes on the avifauna of Sind. *Stray Feathers* 7: 173–191.

Butler, E. A. (1881): A tentative catalogue of the birds of Deccan and south Mahratta country. *Stray Feathers* 9: 367–442.

Butler, F. W. (1879): The Great Indian Bustard. *Stray Feathers* 8: 490–491.

Carter, J. R. (1912): Bustard in Kathiawar. *J. Bombay Nat. Hist. Soc.* 21(4): 1333–1334.

Chandra, J. (1990): Unique Karera Great Indian Bustard Sanctuary. *Tiger paper* 27(1): 16–20.

Combreau, O., F. Launay & M. Al Bowardi (1999): Outward migration of Houbara Bustards from two breeding areas in Kazakhstan. *Condor* 101: 159–164.

D'Abreu, E. A. (1935): A list of the birds of the Central Provinces. *J. Bombay Nat. Hist. Soc.* 38(1): 95–116.

Dangre, B. J. (1966): The Great Indian Bustard in Ahmednagar area. *Newsletter for Birdwatchers* 6(11): 9.

Davidson, C. S. & C. E. Wendon (1878): A contribution to the avifauna of the Deccan. *Stray Feathers* 7: 68–95.

Deeks, E. P. (1935): Occurrence of the Great Indian Bustard (*Choriotis nigriceps*) near Saugor. *J. Bombay Nat. Hist. Soc.* 37(4): 956.

Dharmakumarsinhji, K. S. (1953): The Great Indian Bustard. *J. Bombay Nat. Hist. Soc.* 51(3): 740.

Dharmakumarsinhji, K. S. (1957): Ecological study of the Great Indian Bustard *Ardeotis nigriceps* (Vigors) (Aves: Otididae) in Kathiawar Peninsula, western India. *J. Zool. Soc. India* 9: 140–152.

Dharmakumarsinhji, K. S. (1960): On the eggs of the Great Indian Bustard [*Choriotis nigriceps* (Vigors)]. *J. Bombay Nat. Hist. Soc.* 57(3): 663–665.

Dharmakumarsinhji, K. S. (1962b): Display, posturing and behaviour of the Great Indian Bustard *Choriotis nigriceps* (Vigors). *Proceedings of Second All–India Congress of Zoology 1962*: 1–11.

Dharmakumarsinhji, K. S. (1978): The changing wildlife of Kathiawar. *J. Bombay Nat. Hist. Soc.* 75(3): 632–650.

Dharmakumarsinhji, K. S. (1985): Antelope and gazelle as buffers to bustards. *Bustard Studies* 3:139–140.

Dutta, S. (2012): Ecology and conservation of the Great Indian Bustard (*Ardeotis nigriceps*) in Kachchh, India with reference to resource selection in an agro-pastoral landscape. Thesis submitted to Forest Research Institute, Dehradun.

Dutta, S., A. R. Rahmani & Y. V. Jhala (2010): Running out of time? The great Indian bustard *Ardeotis nigriceps* status, viability, and conservation strategies. *European Journal of Wildlife Research* 57: 615–625.

Dutta, S., A. R. Rahmani, P. Gautam, R. Kasambe, S. Narwade, G. Narayan & Y. V. Jhala (2013): *Guidelines for Preparation of State Action Plan for Resident Bustards' Recovery Programme*. Submitted to the Ministry of Environment, Forests and Climate Change (MoEFCC), Government of India. New Delhi.

Editors (1952): Editorial comment. *J. Bombay Nat. Hist. Soc.* 5(1).

Elliot, W. (1880): Notes on the Indian Bustard (*Eupodotis edwardsii*) with special reference to its gular pouch. *Proc. Zool. Soc. London* 1880: 486–489.

Fairbank, S. B. (1876): List of birds collected in the vicinity of Khandala, Mahabaleshwar, and Belgaw along the Sahyadri Mountains; and near Ahmednagar in the Dakhan. *Stray Feathers* 4: 210–268.

Falzone, C. K. (1992): First Observations of Chick Carrying Behavior by the Buff-Crested Bustard. *The Wilson Bulletin* 104(1): 190–192.

Fenton, L. L. (1884): *Gazetteer of the Bombay Presidency*, Vol. 22. Dharwad district. Bombay.

Fisher, C. T. (1981): Specimens of extinct, endangered or rare birds in the Merseyside County Museums, Liverpool. *Bull. Br. Orn. Club* 101: 276–285.

Fooks, H. (1911): The European Bustard (*Otis tarda*) in northern India. *J. Bombay Nat. Hist. Soc.* 20(4):1153–1154.

Fraser, T. G. (1881): *Records of sports and military life in western India.* London: Allen and Co. Pp. 289.

Frost, J. (1854): *The Pictorial Family Encyclopaedia of History, Biography and Travels*. Miller Orton and Mulligan. Pp. 95–96.

Ganguli, U. (1975): *A guide to the birds of the Delhi area.* New Delhi: Indian Council of Agricultural Research. Pp. 301.

Garde, P. (1993): On the sighting of the Great Indian Bustard near Nagpur. *J. Ecol. Soc.* 6: 47–50.

Goriup, P. D. & H. Vardhan (eds.) (1983): *Bustards in decline*. Jaipur: Tourism & Wildlife Society of India. Pp. 388.

Gray, J. E. & G. R. Gray (1846): Edward's Bustard. *Eupodotis luconiensis.* Pp. 130. In: *Catalogue of the specimens and drawings of Mammalia and birds of Nepal and Thibet,* presented by B. H. Hodgson, Esq. to the British Museum. London: British Museum.

Grimmett, R., C. Inskipp & T. Inskipp (1998): *Birds of the Indian subcontinent.* London: A. & C. Black/Christopher Helm. Pp. 1–888

Girdlestone, M. A. (1911): Uncommon birds in the United Provinces. *J. Bombay Nat. Hist. Soc.* 21(1): 274–275.

Gupta, P. D. (1970): The Great Indian Bustard, *Choriotis nigriceps* (Vigors), a vanishing species in India and some suggestions for its preservation. *IUCN Ist Techn. Mtg.*, New Delhi 2(6): 63–67.

Gupta, P. D. (1974): Stomach contents of the Great Indian Bustard. *J. Bombay Nat. Hist. Soc.* 71(2): 303–304.

Gupta, P. D. (1976a): A new species of the *Mediorhynchus* (Acanthocephala: Gigantorhynchidae) from the Great Indian Bustard, *Choriotis nigriceps* (Vigors). *J. Bombay Nat. Hist. Soc.* 73(1): 182–183.

Gupta, P. D. (1976b): A new species of Cestode of the genus *Schistometra* (Cestoda: Davaineidae: Idiogenine) from the Great Indian Bustard, *Choriotis nigriceps* (Vigors). *J. Bombay Nat. Hist. Soc.* 73(1): 183–186.

Gupta, P. D. (1986): The Great Indian Bustard *Choriotis nigriceps*. In: *Wildlife wealth of India*, Bangkok: Tecpress Services: 309–313.

Habib, B. (2004): Nannaj the Bustard land! *Mistnet* 5(1&2): 6–7.

Hallager, S. L. (1994): Drinking methods in two species of bustards. *The Wilson Bulletin* 106(4): 763–764.

Hamilton, D. (1892): *Records of sport in southern India.* London: John Bole and Sons. Pp. 346

Heath, R. H. (1905): Notes on the "Houbara". *J. Bombay Nat. Hist. Soc.* 16: 372–373.

Hewetson, C. E. (1956): Observations on the bird life of Madhya Pradesh. *J. Bombay Nat. Hist. Soc.* 53: 595–645.

Holmes, D. A. & J. O. Wright (1968–1969): The birds of Sind. *J. Bombay Nat. Hist. Soc.* 65: 533–556; 66: 8–30.

Hume, A. O. (1872–1873): Contributions to the ornithology of India—Sindh. *Stray Feathers* 1: 44–50, 91–289.

Hume, A. O. (1890): *The nests and eggs of the birds of India.* 3. R H Porter. Pp. 375–378.

Hume, A. O. & C. H. T. Marshal (1879): The Great Indian Bustard. *The Game birds of India, Burmah and Ceylon* 1: 6–15

Irby, L. H. (1861): Notes on birds observed in Oudh and Kumaon. *Ibis* 3: 217–251.

Ishtiaq, F., S. Dutta, B. Yumnam & Y. V. Jhala (2011): Low genetic diversity in the endangered Great India Bustard (Ardeotis nigriceps) across India and implications for conservation. *Conservation Genetics*.12(3): 857–863

Islam, M. Z. & A. R. Rahmani (2004): Great Indian Bustard Sanctuary, Maharashtra. In: *Important Bird Areas in India: Priority sites for conservation.* Indian Bird Conservation Network, BNHS and BirdLife International (UK). Pp. 706–707.

Jeganathan, P. (2008): A tale of two birds. *Hornbill* (Oct-Dec): 42–48

Jerdon, T. C. (1839–1840): Catalogue of the birds of the peninsula of India, arranged according to the modern system of classification; with brief notes on their habits and geographical distribution, and description of new, doubtful and imperfectly described species. *Madras J. Lit. Sci.* 10: 60–91, 234–269; 11: 1–38, 207–239; 12: 1–15, 193–227.

Jerdon, T. C. (1864): *The birds of India.* Volume 3. George Wyman & Co. Pp. 607–611.

Johnsgard, P. A. (1991): *Bustards, hemipodes and sandgrouse, birds of dry places*. Oxford: Oxford University Press. Pp. 320

Jones, R. T. (1912): Tameness of Great Indian Bustard (*Eupodotis edwardsii*). *J. Bombay Nat. Hist. Soc.* 21(4): 1333.

Joshua, J., V. Gokula & S. F. W. Sunderraj (2005): Territorial fighting behaviour of Great Indian Bustard *Ardeotis nigriceps*. *J. Bombay Nat. Hist. Soc.* 102(1): 114–115

Karpowicz, Z. J. & P. D. Goriup (1985): Occurrence of the Great Indian Bustard in the Okha Rann (Gujarat). *Bustard Studies* 3: 133–137.

Kasambe, R., A. Pimplapure, G. Thosar & M. S. R. Shad (2007): Sighting records of Great Indian Bustards *Ardeotis nigriceps* in Vidarbha. *Newsletter for Birdwatchers* 46(6): 88–89.

Khan, A. A., I. Khaliq, M. J. I. Choudhry, A. Farooq & N. Hussain (2008): Status, threats and conservation of the Great Indian Bustard *Ardeotis nigriceps* (Vigors) in Pakistan. *Current Science* 95(8): 1079–1082.

Khetan, A. K. & H. Vardhan (1985): Bustard conservation in India: a case study. *Bustard Studies* 3: 119–121.

Koelz, W. (1940): Notes on the winter birds of the lower Punjab. *Pap. Michigan Acad. Sci.* 25: 323–356.

Kottur, A. S. (2012): The Great Indian Bustard in Bellary District. *Panda (WWF - India Special Issue)*: 20–21.

Krishna, M. B. (1993): The Birds of Bangalore. *Sanctuary Asia* 13(4): 59–62

Kulkarni, B. S. (1979): Birdwatcher: The Great Indian Bustard. *Hornbill* 10(Jan-Mar): 20–21.

Kulkarni, B. S. (1981): Ecology and behaviour of Great Indian Bustard (family Otididae). *J. Bombay Nat. Hist. Soc.* 78: 375–377.

Kumara, H. N. & V. V. M. Raj (2007): The Great Indian Bustard *Ardeotis nigriceps*: Are they Disappearing in Karnataka? *J. Bombay Nat. Hist. Soc.* 104(2): 211

Kurhade, S. M. & S. D. Jagtap (1998): Status of Great Indian Bustard, *Ardeotis nigriceps*, in and around Ahmednagar District. *Pavo* 36(1&2): 122

Lal, R. (1993): Bustards and floricans: bird conservation in India. *Witwatersrand Bird Club News* 160: 9–10.

Lavkumar, K. S. (1963): The Great Indian Bustard. *Newsletter for Birdwatchers* 3(1): 3–4.

Leigh, C. (1924): The southern range of the Great Indian Bustard (*Eupodites edwardsii*). *J. Bombay Nat. Hist. Soc.* 30: 225.

Lloyd, J. H. (1873): On the birds of the province of Kattiawar, western India. *Ibis* 3(3): 397–421.

Lowther, E. H. N. (1949): *A bird photographer in India*. London: Oxford University Press. Pp. 150.

Lt.Gen. S., B. (2009): Eat custard, spare the bustard. *Hornbill* (Jan-Mar): 38–40.

Manakadan, R. (1985): The ecology of the Great Indian Bustard *Choriotis nigriceps* habitat. M.Sc. dissertation, Bombay University.

Manakadan, R. (1988): Bringing up Ramu. *Hornbill* 1(Jan-Mar): 15–19.

Manakadan, R. & A. R. Rahmani (1989): Rollapadu Wildlife Sanctuary with special reference to the Great Indian Bustard *Ardeotis nigriceps* (Vigors). *J. Bombay Nat. Hist. Soc.* 86: 368–380.

Manakadan, R. & A. R. Rahmani (1990): Growth and development of a captive Great Indian Bustard chick. *Avicultural Magazine* 96: 133–140.

Manakadan, R. & A. R. Rahmani (1993): A decade of conservation of the Great Indian Bustard at Rollapadu Wildlife Sanctuary. In: *Bird conservation, strategies for the 90s & beyond.* Bangalore: OSI, Pp. 1–3.

Meena, R. L., J. G. Bava & R. S. Jadeja (2005): The unique habitat of Great Indian Bustard (GIB) in Kachchh: protection and management. *The Indian Forester* 131(12): 1554–1558.

Morales, M. B., F. Jiguet & B. Arroyo (2001): "Exploded leks: What bustards can teach us". *Ardeola* 48(1): 85–98.

Mukherjee, A. K. (1974): Some examples of recent faunal impoverishment and regression. Pp. 330–368. In: M. S. Mani, ed. *Ecology and biogeography in India.* The Hague: Dr W. Junk Publishers.

Nair, P. T. (1974): The Peacock Cult in Asia. *Asian Folklore Studies* 33(2): 93–170.

Nalavade, S. B. (1991): Sighting of the Great Indian Bustard *Ardeotis nigriceps* Vigors near Pune, Maharashtra. *J. Bombay Nat. Hist. Soc.* 88: 283.

Narwade, S. S. (2010): A 25 year long struggle ends in a success story. *Care4nature* (May): 19.

Narwade, S. S. & K. M. Fartade (2008): Nannaj Bustard Area (an IBA) – In great need of local community support. *Mistnet* 9(4): 10–12.

Narwade, S. S., D. Varier & T. Nakashe (2011): Workshop on Conservation of critically endangered Great Indian Bustard *Ardeotis nigriceps* through involvement of local people at Solapur, Maharashtra. *BUCEROS* 16(1): 6–9.

National Board of Wildlife (2015): Minutes of the 32nd Meeting of the Standing Committee of National Board for Wildlife held on 21st January 2015 at Indira Paryavaran Bhawan, Jor Bag Road, New Delhi. Available at: http://www.moef.nic.in/sites/default/files/MINUTES%20OF%2032%20MEETING%20OF%20STANDING%20COMMITTEE%20OF%20NBWL%20HELD%20ON%2021.01.2015%20-3-.pdf

National Board of Wildlife (2015): Minutes of 33rd meeting of standing committee of National Board of Wildlife (NBWL) held in March 2015. Available at: http://www.moef.nic.in/sites/default/files/Minutes%20of%2033%20meeting%20of%20S.C%20of%20NBWL%20held%20on%2014.03.2015.pdf

National Board of Wildlife (2015): Minutes of the 36th Meeting of the Standing Committee of National Board for Wildlife (NBWL) held on 4th November, 2015.

National Wildlife Action Plan (2002): The National Wildlife Action Plan 2002–2016. A document of action plan by National Board of Wildlife, Ministry of Environment and Forests and Climate Change (MoEFCC). Available at: http://forest.and.nic.in/ActsNRules%5CNational%20Wild%20life%20Action%20Plan%20-%202002.pdf

Neginhal, S. G. (1976): At a bustard breed. *Newsletter for Birdwatchers* 16(8): 6–9.

Neginhal, S. G. (1980): Ecological impact of afforestation at the Ranibennur Blackbuck Sanctuary. *J. Bombay Nat. Hist. Soc.* 75: 1254–1258.

Neginhal, S. G. (1999): Birding recollections. *Newsletter for Birdwatchers* 39(6): 87.

Nichols, E. G. (1943–1945): Occurrence of birds in Madura district. *J. Bombay Nat. Hist. Soc.* 44: 387–407, 574–584; 45: 122–132.

Nurse, C. G. (1900): Sport and natural history in north Gujarat. *J. Bombay Nat. Hist. Soc.* 13: 337–342.

Oates, E. W. (1898): *A manual of the game birds of India. Part 1.* A J Combridge & Co. Pp. 399–404.

Oates, E. W. (1902): *Catalogue of the collection of eggs in the British Museum.* London: Trustees of the British Museum. Pp. i–xx, 1–400

Phythian–Adams, E. G. (1940): Small game-shooting in Mysore. *J. Bombay Nat. Hist. Soc.* 41: 594–603.

Phythian–Adams, E. G. (1953):Mysore State. Pp. 78-81. In: *The preservation of wildlife in India.* A compilation by Lt Col R. W. Burton. The Bangalore press, Mysore road.

Pimplapure, A. (2001). *Ecological study of some upland birds in Vidarbha with special reference to Great Indian Bustard, Lesser Florican and Jerdon's Courser.* Final Report. Vidarbha Nature and Human Science Centre, Nagpur. Pp. 1–53.

Pinglay, P. (2010): *Concern over plans to downgrade Indian national park.* BBC News, Karera bird sanctuary, Madhya Pradesh. Available at: http://news.bbc.co.uk/2/hi/south_asia/10221681.stm

Pinjarkar, V. (2011): *SC clears denotification of GIB sanctuary.* The Times of India newspaper. Available at: http://timesofindia.indiatimes.com/city/nagpur/SC-clears-denotification-of-GIB-sanctuary/articleshow/9350669.cms?referral=PM

Pittie, A. (1995): A birding trip to Rollapadu Bustard Sanctuary. *Mayura* 10: 5–9.

Prakash, I. (1978): Human-animal interactions in the Rajasthan Desert. *J. Bombay Nat. Hist. Soc.* 75 (Suppl.): 1259–1261.

Prakash, I. & P. K. Ghosh (1963a): Bustard habitat in Rajasthan desert. *Newsletter for Birdwatchers* 3(8): 10–11.

Prakash, I. & P. K. Ghosh (1963b): Great Indian Bustard breeding in Rajasthan desert. *Newsletter for Birdwatchers* 3(9): 3–4.

Prakash, I. & P. K. Ghosh (1963c): The Great Indian Bustard in Rajasthan desert. *Newsletter for Birdwatchers* 3(4): 4.

Raha, B. & V. Prakash (2001): Occurrence of Great Indian Bustard *Ardeotis nigriceps* at Hosur, Nashik district, Maharashtra. *J. Bombay Nat. Hist. Soc.* 98 (1): 110–111

Rahmani, A. R. (1984a): Return of the Great Indian Bustard. *Hornbill* 3(Jul-Sept): 7–14.

Rahmani, A. R. (1984b): Strategy for conservation of bustards in Maharashtra. Bombay Nat. Hist. Soc. Tech. Breed 3/84: 10 Pp.

Rahmani, A. R. (1985a): Indian bustards. *Newsletter for Birdwatchers* 25(5 & 6): 11–13.

Rahmani, A. R. (1985b): *Study of ecology of certain endangered species of wildlife and their habitats.* Project No. 8851-658-04. The Great Indian Bustard in Gujarat. Technical report #7/85. Bombay: BNHS.

Rahmani, A.R. (1985c): Colour-banding in the Great Indian Bustard. *Hornbill* 1(Jan-Mar): 23–27.

Rahmani, A.R. (1985d): The Great Indian Bustard. *Sanctuary Asia* 5(2): 114–125.

Rahmani, A. R. (1986): *The Great Indian Bustard in Rajasthan.* Technical Report No. 11. Bombay: BNHS. Pp. 34.

Rahmani, A. R. (1987): Protection for the Great Indian Bustard. *Oryx* 21: 174–179.

Rahmani, A. R. (1988a): The conservation of the Great Indian Bustard *Ardeotis nigriceps* (Vigors) in the Karera Bustard Sanctuary. *Biol. Conserv.* 46: 135–144.

Rahmani, A. R. (1988b) Grassland birds of the Indian subcontinent: a review. Pp.187–204. In: P. D. Goriup (ed.) *Ecology and conservation of grassland birds*. Cambridge, UK: International Council for Bird Preservation (Techn. Publ. 7).

Rahmani, A. R. (1989): *The Great Indian Bustard.* Final Report. Bombay: BNHS. Pp. 234.

Rahmani, A. R. (1990): Habitat management for the conservation of the Great Indian Bustard *Choriotis nigriceps*. Pp. 633–634. In: Daniel, J. C. & J. S. Serrao (Eds.) *Conservation in developing countries: Problems and prospects*. Bombay Natural History Society.

Rahmani, A. R. (1991): Flocking behaviour of a resident population of the Great Indian bustard *Ardeotis nigriceps* (Vigors). *Revue d'Ecologie (Terre et la Vie)* 46(1): 53–64.

Rahmani, A. R. (1992): *Threatened fauna of the Indian grasslands.* Pp. 143-150. In: Singh, K.P., Singh, J.S. (Eds.) *Tropical ecosystems: ecology and management*. New Delhi: Wiley Eastern.

Rahmani, A. R. (1993): Project Bustard: last chance to save the Great Indian Bustard. Pp. 73–75. In: *Bird conservation, strategies for the 90s & beyond*, Bangalore: OSI.

Rahmani, A. R. (1994): *Status of the Great Indian Bustard in Madhya Pradesh*. Bombay: Bombay Natural History Society and Centre of Wildlife and Ornithology. Report No. BR 138. Pp. 10.

Rahmani, A.R. (1995a): Conservation of the Houbara and Great Indian Bustards. Pp. 19-20. In: L. Vijayan (ed.), *Avian Conservation in India*. SACON, Coimbatore.

Rahmani, A. R. (1995b): Status and conservation of the Great Indian Bustard in the Thar Desert. *Newsletter for Birdwatchers* 35: 64–65.

Rahmani, A. R. (1996): The numbers game: Forty Bustards in Karera. *Sanctuary Asia* 16(4): 67–69.

Rahmani, A. R. (1997): Great Indian Bustard in Ranibennur. *Newsletter for Birdwatchers* 37: 44–45.

Rahmani, A. R. (1998a): The uncertain future of the Desert National Park in Rajasthan, India. *Envir. Conserv.* 16(3): 237–244.

Rahmani, A. R. (2001a): Great Indian Bustard – An appeal. *Mistnet* 2(4): 1–3.

Rahmani, A. R. (2001b): The Godawan Saga: Great Indian Bustards in Decline. *Sanctuary Asia* 21(1): 24–29.

Rahmani, A. R. (2002a): The deteriorating status of the Indian Bustard *Ardeotis nigriceps*. *Oriental Bird Club Bulletin* 35: 45–48.

Rahmani, A. R. (2002b): *Protection of Nannaj Bustard area Solapur, Maharashtra*. Report Funded by IBCN, Mumbai, BNHS, 2002, 9 Pp. + 8 plates.

Rahmani, A. R. (2008): Need for Project Bustard. *Hornbill* (Oct-Dec): 138–146.

Rahmani, A. R. (2012). *Threatened Birds of India–Their Conservation Requirements*. Indian Bird Conservation Network: Bombay Natural History Society, Royal Society for the Protection of Birds and BirdLife International. Oxford University Press. Pp. xvi + 864.

Rahmani, A. R. & R. G. Soni (1997): Avifaunal changes in the Indian Thar Desert. *Journal of Arid Environments* 36: 687–703.

Rahmani, A. R. & R. Manakadan. (1985): Present status of the Great Indian Bustard. *Bustard Studies* 3: 123–131.

Rahmani, A. R. & R. Manakadan (1986a): Study of ecology of certain endangered species of wildlife and their habitats. *The Great Indian Bustard.* Annual Report - 3. Bombay: BNHS. Pp. 50.

Rahmani, A. R. & R. Manakadan (1986b): Movement and flock composition of the Great Indian Bustard *Ardeotis nigriceps* (Vigors) at Nanaj, Solapur District, Maharashtra, India. *J. Bombay Nat. Hist. Soc.* 83(1): 17–31.

Rahmani, A. R. & R. Manakadan (1987): Interspecific behaviour of the Great Indian Bustard *Ardeotis nigriceps* (Vigors). *J. Bombay Nat. Hist. Soc.* 84(2): 317–331.

Rahmani, A. R. & R. Manakadan (1988): *Bustard Sanctuaries of India*. Technical Report 13, BNHS. Pp. 40

Rahmani, A. R. & R. Manakadan (1989): Return of the Great Indian Bustard in Maharashtra. *J. Ecol. Soc.* 2: 19–29.

Rahmani, A. R. & R. Manakadan (1990a): The Great Indian Bustard *Ardeotis nigriceps* in Andhra Pradesh. *Mayura* 7 & 8: 20–23.

Rahmani, A. R. & R. Manakadan (1990b): The past and present distribution of the Great Indian Bustard *Ardeotis nigriceps* (Vigors) in India. *J. Bombay Nat. Hist. Soc.* 87: 175–194.

Rahmani, A. R. & M. Kalra (2005): *Conservation and Education and Population Assessment of the Great Indian Bustard in Rajasthan and Maharashtra*, Final Report Funded by: The Royal Netherlands Embassy, New Delhi. Pp. 54 + 34 plates + 38 Pp. press clippings + 21 plates publicity material.

Rahmani, A. R., Kasambe, R., Narwade, S. S., Patil, P. & Khan, N. I. (2014): *Threatened Birds of Maharashtra*. Indian Bird Conservation Network, Bombay Natural History Society, Royal Society for Protection of Birds, and BirdLife International, Oxford University Press. Pp. Xii+224.

Rajput, A. S. D. (2008): The Great Indian Bustard (*Ardeotis nigriceps*) on the verge of extinction. *Current Science* 95(9): 1108–1109.

Ramanjulu, B. V. (1966): The Great Indian Bustard in Gujarat State. *Peacock* 3: 161–164.

Rao, K. J. M. (1995a): Rollapadu Wildlife Sanctuary in Andhra Pradesh State—a success story in conservation of an endangered species. *Mayura* 12: 45–49.

Rao, K. T. & S. M. M. Javed (2005): The Great Indian Bustard *Ardeotis nigriceps* (Vigors) in and around the Rollapadu Wildlife Sanctuary Andhra Pradesh. *Zoo's Print* 20(11): 2053–2058.

Rao, R. J. (1994): Conservation Status of Great Indian Bustard in Madhya Pradesh, India. *J. Ecol. Soc.* 7: 29–30.

Rasmussen, P. C. & J. C. Anderton (2012): *Birds of South Asia: The Ripley Guide. Volume 2*. Smithsonian Institution & Lynx Edicions. Pp. 1–683.

Rayment, G. M. (1894): *Eupodotis edwardsii*. *J. Bombay Nat. Hist. Soc.* 9(1): 107.

Reddy, S. (2001): A healing touch to an endangered bird–The Great Indian Bustard: A case study of Rollapadu Sanctuary. *Tiger Paper* 28(1): 28–30.

Rego, L. H. A. (1980): A note on the survey of the Great Indian Bustard (*Choriotis nigriceps*). *J. Bombay Nat. Hist. Soc.* 77 (1): 138–139.

Ripley, S. D. (1952): Vanishing and extinct bird species of India. *J. Bombay Nat. Hist. Soc.* 50(4): 902–904.

Roberts, T. J. (1991–1992): *The birds of Pakistan*. Karachi: Oxford University Press. xli + Pp. 598 + 23 plates.

Russell, C. E. M. (1900): *Bullet and shot in Indian forest, plain and hill*. W. Thacker and Co, London. Pp. 381–382.

Samad, K. S. A. (2006): Great Indian Bustard rediscovered in Bellary district. *Mistnet* 7(3): 15–16.

Sankhala, K. S. (1977): Captive breeding, reintroduction and nature protection: the Indian experience. *Zoo Yearbook* 17: 98–101.

Sankhala, K. S. (1986): Destination desert. *Sanctuary Asia* 6 (1): 40–49.

Sawarkar, V. B., E. Bharucha, A. R. Rahmani & Y. L. P. Rao (2008). *Report of the committee on rationalization of Great Indian Bustard Sanctuary in Maharashtra State*, Government of Maharashtra Revenue and Forest Department.

Seddon, P. J., F. Launay, F., Y. van Heezik, Y. & M. al Bowardi (1999): Methods for live trapping Houbara Bustards. *J. Field Orn.* 70: 169–181.

Sekhar, N. U. (1998): Ecological status of the Desert National Park—past and present. *Tigerpaper* 35(2): 14–18.

Sharma, R. D. (1996): Flora and fauna of Bustard Sanctuary Karera. *Cheetal* 35(1–2): 55–58.

Shivrajkumar, Y. S. (1962): The Great Indian Bustard [*Choriotis nigriceps* (Vigors)] at the nest. *J. Bombay Nat. Hist. Soc.* 59(1): 287.

Shukla, R. K. (1980): Vanishing glory of Shivpuri district: The Great Indian Bustard. *Cheetal* 21(4): 36–39.

Simcox, A. H. A. (1913): The Great Indian Bustard (*Eupoditis edwardsii*). *J. Bombay Nat. Hist. Soc.* 22(1): 202.

Singh, B. (1997): Cranes and Bustard. *Newsletter for Birdwatchers* 37: 47.

Singh, P. (1963): The Great Indian Bustard in Rajasthan. *Newsletter for Birdwatchers* 3(6): 4–5.

Spillett, J. J. (1968): A report on wildlife surveys in south and west India, November–December 1966. *J. Bombay Nat. Hist. Soc.* 65: 1–46.

Stoliczka, F. (1872): Notice of the mammals and birds inhabiting Kachh. *J. Asiatic Soc. Bengal* 41: 21–25.

Sykes, W.H. (1832): Catalogue of Birds of the Rasorial, Grallatorial and Natatorial Orders, observed in the Dukhun. *Proc. Zool. Soc. London. Part* 2: 155.

The Corbett Foundation (2012): *The Last Call to Save Indian Bustard in Kutch, Gujarat, India*. Final report. Available at: http://www.corbettfoundation.org/GIB_report_FINAL_Oct2012_FINAL.pdf

Thosar, G., R. Ladkhedkar, A. Pimplapure & R. Kasambe (2003): Status and conservation of Great Indian Bustards in Vidarbha. *Mistnet* 8(3): 10–11.

Ticehurst, C. B. (1922–1924): The birds of Sind. *Ibis* 11 (4): 526–572, 605–662; (5): 1–43, 235–275, 438–474, 645–666; (6): 110–146, 495–518.

Tostems, C. A. (1881): Letter about Great Indian Bustard. *Stray Feathers* 10: 167–168.

Tyabji, F. H. B. (1952): The Great Indian Bustard. *J. Bombay Nat. Hist. Soc.* 5(1): 276–277.

Vanak, A. T., A. V. Belsare & M. E. Gompper (2007): *Survey of Disease Prevalence in Free-Ranging Domestic Dogs and Possible Spill-Over Risk for Wildlife – A Case Study from the Great Indian Bustard Sanctuary, Maharashtra - India.* Final report submitted to the Rufford Small Grants Foundation, UK. Pp. 1–13.

Varghese, A. O., V. B. Sawarkar, Y. L. P. Rao & A. K. Joshi (2015): Habitat Suitability Assessment of *Ardeotis nigriceps* (Vigors) in Great Indian Bustard Sanctuary, Maharashtra (India) Using Remote Sensing and GIS. *Journal of the Indian Society of Remote Sensing*. Pp. 1-9. published online: http://dx.doi.org/10.1007/s12524-015-0486-9

Vardhan, H. (1980): Why Great Indian Bustard? *Cheetal* 21(4): 9–11.

Vardhan, H. (1985): A report on the status of bustards in India. *Bustard Studies* 3: 113–117.

Vijayarajji (1926): An albino bustard (*Eupoditis edwardsii*). *J. Bombay Nat. Hist. Soc.* 31(2): 526.

Vijayarajji, M. (1943): The Great Indian Bustard [*Choriotis nigriceps* (Vigors)] breeding in Kutch. *J. Bombay Nat. Hist. Soc.* 43(4): 660.

Vincent, J. (1966–1971): *Red Data Book, 2: Aves*. Morges, Switzerland: International Union for Conservation of Nature and Natural Resources.

Whistler, H. (1919): Some birds of Ludhiana district, Punjab. *J. Bombay Nat. Hist. Soc.* 26(2): 585–598.

Wilson, F. (1879): The Great Indian Bustard. *Stray Feathers* 8: 490.

Yadav, R. N. (1981): International symposium on bustards. *Tigerpaper* 8(2): 4–5.

Yealland, J. J. (1971): A visit to north-western India. *Avicult. Mag.* 77: 136–145.

Yuvraj of Jasdan (1947): The status of the Pied-crested Cuckoo and Great Indian Bustard in Jasdan State. *J. Bombay Nat. Hist. Soc.* 46(4): 722.

Literature cited on bird species recovery plan available on the BirdLife International website

birdlife.org/datazone/sowb/casestudy/262

birdlife.org/datazone/sowb/casestudy/267

BirdLife International (2008): Over ten years, action by BirdLife Partners and others prevented the extinction of 16 bird species. Presented as part of the BirdLife State of the world's birds website. Available at: http://datazone.birdlife.org/sowb/casestudy/over-ten-years-action-by-birdlife-partners-and-others-prevented-the-extinction-of-16-bird-species. Checked: 15/11/2015.

Aikman, H., A. Davis, C. Miskelly, S. O'Connor & G. Taylor (2001): *Chatham Islands threatened birds: recovery and management plans*. Wellington, New Zealand: Department of Conservation.

Anon. (2009): Endangered Seychelles magpie-robin relocation brings hope for the species survival. Available at: http://www.wildlifeextra.com/go/news/magpie-robin.html. (Accessed: 22/3/2012).

Barbosa, A. E. A. (2010): *Relatório final do projeto: monitoramento do status populacional da Arara-azul-de-lear (Anodorhynchus leari*: Bonaparte, 1856). CEMAVE, Cabedelo.

BirdLife International (2001): *Threatened birds of Asia: the BirdLife International Red Data Book*. Cambridge, UK: BirdLife International.

Butler, D. & D. Merton (1992): *The Black Robin: saving the world's most endangered bird*. Auckland, New Zealand: Oxford University Press.

Changqing D. (2010): Crested Ibis. *Chinese Birds* 1(2): 156–162.

Chikatsuji, K. (2007): Ibis and Man—bringing them back together. *BirdLife International Asia* 6(2): 2–3.

Gaymer, R., R. A. A. Blackman, P. G. Dawson, M. Penny & C. M. Penny (1969): The endemic birds of Seychelles. *Ibis* 111: 157–176.

Gilardi, J. (2001): Good news from the land of Lear's. *PsittaScene* 13: 2–4.

Holmer, S. (2007): Lear's Macaw making a remarkable comeback in protected reserve. *AFA Watchbird* 34(2): 8.

IBAMA (1998): Brazil reports that the endangered Lear's macaw is threatened by illegal bird collectors. *Press Release*. http://www.worldtwitch.com/learseng.html on 14 July 1998.

Jones, C. G. (2010): Back from the brink: the Echo Parakeet story. *PsittaScene* 22(3): 3–5.

Reynolds, M. (1997): Lear's macaw—next in line for extinction? *PsittaScene* 9: 1–2.

Robertson, H. A., J. R. Hay, E. K. Saul & G. V. McCormack (1994): Recovery of the Kakerori: an endangered forest bird of the Cook Islands. *Conserv. Biol.* 8: 1078–1086.

Robertson, H. A., I. Karika, G. Matearíki, L. Nia & E. K. Saul (2009): *Long-term management of Kakerori (Pomarea dimidiata) in the Cook Islands*. Wellington, New Zealand: Department of Conservation.

Robertson, H., L. Adams & S. Cockburn (2011): *Status of Kakerori (Pomarea dimidiata) on Rarotonga, Cook Islands, in August 2011*. Report to the Takitumu Conservation Area Project, and the Te Ipukarea Society as part of the project "Sustainable management of Rarotonga Flycatcher and Its Habitat". Department of Conservation, Wellington, New Zealand.

Snyder, N., P. McGowan, J. Gilardi & A. Grajal (2000): *Parrots: status survey and conservation action plan 2000–2004*. Gland, Switzerland and Cambridge, UK: International Union for Conservation of Nature and Natural Resources.

Su Unshan (2007): Crested Ibis *Nipponia nippon* conservation in Shaanxi Province, China. *The Babbler: BirdLife in Indochina*: 2–3.

Su Unshan (2007): Ibis protection project in China. *BirdLife International Asia* 6(1): 2.

Thorsen, M. & C. Jones (1998): The conservation status of Echo Parakeet *Psittacula eques* of Mauritius. *Bulletin of the African Bird Club* 5: 122–126.

Yamashita, C. (1987): Field observations and comments on the Lear's Macaw (*Anodorhynchus leari*), a highly endangered species from northeastern Brazil. *The Wilson Bulletin* 99: 280–282.

Xiao-Ping, Y., C. Xiu-Yun, L. Xia, C. Wen-Gui & S. Liang (2009): Return of the Crested Ibis *Nipponia nippon*: a reintroduction programme in Shaanxi province, China. *Birding ASIA* 11: 80–82.

User Forum

Different facilities for users on www.bnhsenvis.nic.in website are as follows:

- More than 17,000 bibliographical references on Indian birds.
- Access to informative databases developed by the Centre. Databases include Endemic birds of India, Threatened birds of India, Important Bird Areas (IBAs), Birds in CITES, Marine birds of India, and others.
- List of other ENVIS Centres on various subject areas for navigating through information on different subjects related to environment.
- Link to the websites and journals pertaining to Avian Ecology.
- Kid's Centre aimed towards schooling children provides interesting facts on birds.
- All issues of BUCEROS, the Centre's newsletter, can be downloaded in PDF format.
- Informative Powerpoint presentations on birds available for download.
- Glossary has more than 300 ornithological terms explained.
- Online query facility for users.
- Contacts of eminent experts in ornithological studies.

Request for Articles and Literature

1) You are welcome to contribute articles, photographs pertaining to avian ecology, to our newsletter.
2) To strengthen our databases we would request you to send us literature, which is not available on our website.

Feedback and Queries

You can send your feedback pertaining to our website and BUCEROS newsletter via email or through our website. Any queries related to avian ecology can also be sent to bnhs@envis.nic.in.

Registered with the Registrar of Newspapers under No. MAHENG/2002/9451 ISSN 0972-1037

BOMBAY NATURAL HISTORY SOCIETY

Founded in 1883 for the study of natural history, the Bombay Natural History Society (BNHS) is now one of the premier research and conservation organisations in the country. The Society publishes a journal, the *Journal of the Bombay Natural History Society*, devoted to natural history and also has a popular publication, *Hornbill*, for the layman. It has also published a number of books on wildlife and nature. Its library has a large collection of books and scientific journals on wildlife and the environment. The Society's invaluable collection of bird, mammal, reptile, amphibian and insect specimens has been recognised as a National Heritage Collection.

Membership of the Society is open to individuals and institutions within India and abroad. For more details, please write to:

Membership Officer
Bombay Natural History Society,
Hornbill House,
Shaheed Bhagat Singh Road,
Mumbai 400 001. India.
Email: bnhsmembership@gmail.com
Tel: (91-22) 2282 1811

BUCEROS is an ENVIS (Environmental Information System) newsletter published thrice a year by the ENVIS Centre at the BNHS, sponsored by the Ministry of Environment, Forest and Climate Change, New Delhi.

The Centre collects, collates, stores, and disseminates information on Avian Ecology.

Address for correspondence

Project Coordinator
ENVIS Centre,
Bombay Natural History Society,
Hornbill House, Shaheed Bhagat Singh Road,
Mumbai 400 001. India.

Tel: (91-22) 22821811
Fax: (91-22) 22837615
Email: bnhs@envis.nic.in
Website: www.bnhsenvis.nic.in

Printed by Parth Enterprise, Goregaon, Mumbai 400 063
Published by the Honorary Secretary for the Bombay Natural History Society, Hornbill House,
Shaheed Bhagat Singh Road, Mumbai 400 001.