CONSERVATION ALERT

What can save the Great Indian Bustard
Ardeotis nigriceps?

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Introduction
The Great Indian Bustard *Ardeotis nigriceps*—known to all Indian ornithologists by its initials—is in deep trouble. Its plight is now so great that bird tours may soon be touting it as a ‘last chance to see’ species. Advertisements of this type tend to make conservationists bridle, but sadly they are only likely to grow commoner over the next few decades. Of course some cases—the Slender-billed Curlew *Numenius tenuirostris* is (or was) one such—are so intractable, so seemingly hopeless, that the journey to see the species is perhaps more akin to paying one’s last respects, an attempt to capture something of the bird in memory, or as a digital still or perhaps moving image, before it is too late. But have we really got to this stage with the GIB? Is there really nothing to be done but twitch it and depart in sorrow? And anyway, how on earth did it come to this?

The answer to this last question is both simple and complex. Back in 1978, when the species was first listed as Endangered in what was then the highest category of threat in the old IUCN Red List system (King 1978–1979), a misunderstanding generated the scare that Arab dignitaries were coming to India to hunt it. This galvanised Indian conservationists and authorities into various kinds of action—Rajasthan declared the GIB its state bird in 1982 (see Vijayvargiya et al. 2013)—and, with the stimulus of Salim Ali, the Bombay Natural History Society’s ‘Project Bustard’ was born. This involved the study of the species and the advocacy and creation of a network of sanctuaries intended to secure its long-term survival: Karera and Ghatigaon in Madhya Pradesh, Lala in Gujarat, Nannaj in Maharashtra, Rollapadu in Andhra Pradesh and Ramdevra, Sorsan and Sonkhalia closed areas in Rajasthan, along with many other reserves in which the species was already present and which simply needed good management to keep it there (see BirdLife International 2001). Good management was not, however, forthcoming; and over the past 30 years, rather than witness the consolidation of the species in these reserves and a steady recovery in its numbers, the world has watched in dismay as population after population has dwindled to extinction or near-extinction: in Gujarat (Meena et al. 2005, Munjpara et al. 2011, Gadhavi et al. 2012, Tiwari 2014), Maharashtra (Patil et al. 2011a,b, Stanton 2014), Karnataka (Kumara & Raj 2007), Madhya Pradesh (Rahmani 2002, 2012, Santoshi 2014) and Andhra Pradesh (Rao & Javed 2005, Mathew 2007; see also BirdLife International 2015). Thus the simple way to account for the plight of the GIB is to blame it on
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the failure of any protected area to fulfil its obligations to the species.

Things get more complicated, of course, when we attempt to identify just which management bodies or institutions might bear what share of the responsibility for this failure. But in any case, while the shortcomings have been major, many and various, so too have the forces ranged against India’s grassland protected areas. Moreover, the GIB is one of those awkward species—large-bodied, low-density and wide-ranging—that is not readily amenable to conservation by means of protected areas alone (see Rahmani 2003). Inside national parks, sanctuaries and erstwhile ‘closed areas’ the problems include stress and predation by feral dogs (Plate 1; also Patil & Chindarkar 2012), scrub invasion of grassland, disturbance by cattle and people (Plate 2), and outright local hostility (driven by such things as the collateral explosion in numbers of crop-devouring Blackbuck and inappropriately large boundaries set for protected areas: Patil *et al.* 2011a, Pardeshi 2012, Rahmani 2012, Dutta *et al.* 2013). Outside protected areas most of the same factors apply, compounded by hunting for trophies and food, egg-theft, landscape disruption by industrial structures and infrastructural development (Plates 3 and 4), collision with powerlines (Plate 5; also Patil *et al.* 2011b), disturbance by unethical photographers, insensitive tourist ventures (light shows and loud music, as at Sam, immediately north of Desert National Park, Rajasthan), overstocking and overgrazing, land-use and land-rights arguments, and above all the intensification of agriculture with all its trappings—herbicides, pesticides, fertilisers, fencing, trenches, mechanisation and—for the

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**Plate 3.** GIB and windfarm, Naliya, Kutch, August 2011.

**Plate 4.** GIB and the wrong kind of cranes, Warora, Chandrapur, Maharashtra, August 2009.

**Plate 5.** GIB under powerline between Jakhau and Lala villages, Abdasa, Kutch, Gujarat, September 2014.
A major drawback is that no-one knows the relative importance of the threats in this long list, so it is impossible with any confidence to prioritise actions to address them; failing to mitigate just one problem (such as dogs or powerlines) might render all other efforts and expense entirely worthless. Meanwhile, the latest evidence on numbers of birds remaining is seriously disquieting: 15 in Maharashtra (PSP pers. info.), 40 in Gujarat according to official sources but only half that number or less fide local experts (PSP pers. info.), and ‘155 ± 94’ in Rajasthan (Dutta et al. 2014). Across the Rajasthan border in Pakistan’s Cholistan a small and little-known population is reported to exist, but hunting looms as a major threat (Khan et al. 2008). In all, fewer than 200 birds may now survive on earth, scattered widely across an increasingly fragmented and hostile landscape. Moreover, there is depressingly little genetic variation in this remnant population (Ishtiaq et al. 2011). What then is to be done?

**Taxonomic revision?**

The most radical but straightforward means of removing the GIB from the Red List would be to lump it as a subspecies of Australian Bustard *A. australis*. The form *A. a. nigriceps* might still go extinct, but with national shame and scandal on a smaller scale. The genetic differences between the two taxa appear rather slight (Pitra et al. 2002), and such is their morphological similarity that it is something of a miracle they were not lumped in the great synthesis of the early twentieth century, when the rise of the subspecies as a taxonomic rank led to the fall, by more than half, in the number of bird species judged to exist in the world.

A recently published review of the world’s non-passerines (del Hoyo & Collar 2014) took the possible conspecificity of the two taxa sufficiently seriously to score their differences against the Tobias criteria (Tobias et al. 2010) for the phenotypic discrimination of species, under which a major character scores 3, medium 2 and minor 1, only three plumage characters can be counted (others can be scored but not counted, hence ‘ns’ = no score), and a threshold of 7 is set to allow species status. This exercise found that the GIB is very closely related to *A. australis* (these two sometimes separated in genus *Austrotis*, having a very different display from the two African *Ardeotis*), but differs in its larger size (bill, wing and especially tarsus all have effect sizes > 2) (2); all-black crown including eyebrow in male vs white eyebrow in *australis* (2); reduced white spotting on (consequently more obvious) black wingpanel (1); unbarred white neck of mature male producing a much brighter appearance vs narrowly dark-barred neck of mature male (all told, 30–50 mm) vs slightly blacker with longer (all told, 40–80 mm), whiter tips (ns[2]).

Astute readers might notice a mistake here: since only three plumage characters can be scored, the tally ought naturally to be made up of the three with the highest scores, but in this case the ‘reduced white spotting on the black wing-panel’ is scored and counted 1, whereas the undertail-coverts difference is scored but not counted 2. Readjusting the figures thus leaves the case for two species slightly firmer, but other scorers might take a less generous view of the strength of these various plumage distinctions.

We ourselves, however, do not seriously advocate any change in the taxonomic status of the GIB, but merely for interest’s sake we offer here a set of photographs (Plates 6–13) to indicate just how uncannily close the resemblance between the birds is; and clearly if the study of any species of bustard is likely to help inform the conservation of the GIB, the first candidate is *Ardeotis australis*—as the next section shows.

**Captive breeding?**

After a protracted gestation, two years ago a recovery plan for all three of India’s threatened bustards was published (Dutta et al. 2013). For the GIB the plan proposed five key measures:

(a) protection of core areas by making them inviolate of consumptive human use during breeding months (June–September); (b) landscape management plans that integrate livelihood concerns with conservation by encouraging compatible livelihoods and curtailing harmful infrastructure in priority areas; (c) population research and monitoring, and habitat research using biotelemetry across the range; (d) conservation breeding as a security policy; and (e) a liaison committee between Government and local communities for joint decision making on incentive driven pro-conservation use of private-public mixed ownership lands.

Laudable as these measures may be, most of them present significant challenges. Protecting ‘core areas’ is particularly difficult when so few of them can be identified with confidence and when ‘protection’, by only addressing ‘human use’, omits...
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such culturally inflammatory interventions as dog culling (without which all GIB chicks seem destined to be eaten in the egg or before they can fly). Integrative landscape management plans are certainly vital but require rapid, single-minded development if they are to deliver the benefits on time. Population research and monitoring will help, but ‘biotelemetry across the range’ is now a fantasy, as the only area left where such work would have a shred of relevance is Rajasthan, and even then the movements of two or three satellite-tagged individuals (whose behaviour may be determined by age, sex and individual circumstance) cannot be expected to provide a dependable guide for the management of the species as a whole. A liaison committee will also help, but again speed is of the essence, and as of April 2015 it still had not come into being.

This leaves ‘conservation breeding’. The 2013 recovery plan indicated the urgent need for ‘a workshop involving national and international experts... to formulate the breeding plan in a scientific & professional way’, thereby revealing that a decision on *ex situ* management had already been taken. In reality, the workshop in question, held in Delhi in January 2014, served as a ballot on the issue among invitees, and resulted in a unanimous vote in favour, if only as an insurance measure against total extinction. Indian conservationists had espoused this option (e.g. Rajput 2008, Dutta et al. 2010) well before they knew of the work to captive-breed and reintroduce the Australian Bustard into the state of Victoria in the 1970s and 1980s (White 2012). This project never got to the reintroduction stage because, before it could, the Australian Bustard recolonised Victoria naturally; but it successfully bred a number of chicks (115 eggs laid in the decade 1973–1982, 78 of them fertile, 64 artificially incubated and hatched, and 47 of the resulting offspring alive in 1982), and naturally therefore offered India a shaft of hope that the GIB could follow a similar *ex situ* trajectory towards salvation.

However, a model of population growth over a 50-year time-frame, constructed from a comprehensive review of captive breeding and wild demography of other close or fairly close relatives of the GIB (Dolman et al., in press), is not encouraging. This model incorporates estimates of stochastic risk, allows for four tiers of breeding programme quality (‘best possible’, ‘above average’, ‘full range’, and ‘below average’), and assesses the ‘counterfactual’ scenario (projecting the effects on the population if *in situ* efforts are pursued without *ex situ* intervention). Results indicate that only if ‘best possible’ performance...
occurs in every aspect of *ex situ* management might it be feasible to achieve a permanent population of 20 breeding females with a releasable surplus of juveniles, and this requires the collection of essentially all eggs laid in the wild over an extended period into the future, thereby seriously compromising the chances of wild productivity. Crucially, however, the release and re-establishment of free-living adult offspring from these captive females also requires effective *in situ* conservation measures to have been implemented. Indeed, the counterfactual scenario (with no eggs removed for captive breeding) demonstrates that effective conservation measures over the first ten years of the 50-year time-frame result in more free-living adults by years 30-40 than can be achieved by *ex situ* intervention, however high the quality.

On this evidence, therefore, *in situ* conservation appears to offer the GIB a better chance of avoiding extinction than captive breeding. Whatever side one takes in this case, however, and whatever the outcome of the debate, it is blindingly obvious that this *in situ* conservation cannot wait another year. It cannot wait until the complex machinery of local and national government has decided on how and where to build the *ex situ* facilities. It has to start now, and its impact has to be immediate.

**Practical measures in Rajasthan**

Wherever populations of GIB remain, national authorities, state governments and NGOs should be urgently conferring and agreeing on emergency packages of direct actions to secure the birds’ habitats and increase their numbers. A valiant stand is being made by the Corbett Foundation in westernmost Gujarat with a remnant population of 11 birds in Abdasa district (K. Gore verbally 2014; see Gadhavi undated), and it deserves every encouragement. However, the one place remaining on the planet where the best (still small, but reasonable) chance remains of securing a population in perpetuity is Rajasthan, focused on the Thar landscape around Desert National Park (DNP), where a ‘population of 100–125 birds exists in Jaisalmer, Barmer and Bikaner districts’ (Rahmani 2012). In December 2014, we spent several days together as members of the IUCN Bustard Group in order to identify practical measures which can be implemented within a short time-frame for the immediate benefit of the GIB in the state.

DNP itself has been invaded and degraded to the point where the southern two-thirds or more hold little or no wildlife of importance—certainly no GIBs—and might better be denotified. Villagers in the northern sector of the park, where GIBs still
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... occur, have made it clear that they would welcome relocation to any denotified areas in the south. Meanwhile, most records of GIB in Rajasthan now emanate from an arc of largely unprotected land in the west of the state that extends from the northern sector of DNP south-west of Jaisalmer in a 200 km loop north and east around the city to the towns of Ramdevra and Pokhran, where the Indian Army has a field firing range which, since entry is strictly prohibited, serves as an unintended ‘sanctuary’ for the species, with 26 birds recorded there in May 2014 (see Figure 1). Some connectivity...
is presumed to exist with populations reportedly in adjacent Cholistan in Pakistan, but the degree to which the species occupies the area between Cholistan and Jaisalmer is not known.

We envisage a three-tier approach to nursing the GIB in Rajasthan back to population health. The top tier with the most intensive management focuses on DNP itself. The second tier involves the ‘GIB arc’ outlined above. The third tier is concerned with what we might call buffer zone interventions and more general initiatives. Some of these proposals echo the recommendations already published by Vijayvargiya et al. (2013).

Desert National Park
1. Work with communities around the park boundaries to foster their esteem of the park for the water it supplies, the (limited) grazing it permits, and the tourist benefits it can accrue under an equitable model of shared revenues, but also to promote local and state pride in a unique habitat and its species.
2. With staff recruited from local communities, establish a desert ecology tourism with sound-proof watchtower hides, guides and powerful telescopes, to control and minimise disturbance levels while engendering maximum public support, including GIB ‘family picnics’ around the park as a means of engaging local communities in park conservation.
3. Restrict the volume and behaviour of traffic on the road through the newly defined park, as appropriate.
4. Negotiate with tourist camps at Sam, on the northern edge of the park, to promote responsible disturbance-free and trash-free...
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tourism, to reduce both the current music sound levels and the waste that supports unnaturally high levels of dogs and corvids.

5. Take all necessary steps to eliminate the threat from corvids (possibly significant nest predators) for at least five years.

6. Establish two or three $2 \times 2$ km circular predator-proof exclosures (GIB ‘maternity wards’) within the new park limits, preventing access to dogs, foxes, monitors, pigs and desert cats, and take all legal and ethical measures necessary to reduce numbers of these predators throughout the park.

7. Disallow the construction of new powerlines and turbines within 50 km of all prime GIB areas in and around DNP boundaries (the current law specifies no constructions within 10 km of a protected area).

8. Support park staff with better training, uniforms, equipment (binoculars, telescopes, GPS, tents, sleeping bags, food, etc.), and reward and motivate them with hard duty allowances similar to those paid in tiger reserves.

9. Transfer land belonging to the Revenue Department (i.e. all land not owned by local communities) to the direct control of the park authorities so that they can be managed appropriately and speedily without other approval.

10. Relocate villagers, but only with their full and free assent (as noted above, already offered), and redefine DNP boundaries, creating strong local pro-park attitudes and leaving a far more manageable population of GIB within the new park limits.

**GIB arc**

11. Plot all sites at which GIBs have been recorded in the past five years in the area between DNP and Bikaner, and include all land within 20 km of the sites as a means of better defining and in due course managing the ‘GIB arc’ polygon.

12. Survey this arc intensively to confirm its importance and to document all appropriate GIB habitat from the borders of DNP to the Pakistan border and north to Bikaner.

13. Inventory and map all potentially protectable natural grassland sites within the arc, detailing their size, their stakeholders and other relevant factors (anthropogenic influences), assessing their possible connectability, planning their optimal management and implementing this within two years (with an immediate stop on their being planted with *Acacia tortilis*, a current misguided practice).

14. Remain on full alert for unanticipated problems that may emerge particularly in higher-risk areas within the GIB arc and seek immediate means to provide solutions.

15. Establish the arc within a year as a locally administered ‘Conservation Reserve’ or ‘Community Reserve’ under Indian law, with a view to financing, retaining and promoting traditional agriculture throughout, aiming at organic and fence-free farming with sustainable livestock levels.

**GIB general**

16. GPS-map every transmission and distribution powerline in the arc and its buffer zone (see below), including to the Cholistan border, and within four years mark them all with the most effective bird flight diverters recently developed and tested on bustards in Europe.

17. Liaise with powerline companies and government to exclude any further powerlines within the arc and to restrict them to the least important parts of the buffer zone.

18. Liaise with turbine companies and government over plans for windfarms, prohibit them in the arc and restrict them to the least important parts of the buffer zone.

19. Liaise with government over planned roads, road improvements and other technological developments (solar panels, etc.) to seek to minimise their effects on GIB in both arc and buffer zone.

20. Run a long-term awareness programme in all local communities in the arc, to harness local goodwill, demonstrate the genuine benefits of traditional agriculture, and, by developing a local intelligence network, prevent poaching and other anti-bustard behaviour.

21. Map all areas within 50 km of the edges of the GIB arc, assess them for risks from powerlines and wind turbines, and include them in conservation planning and strategies as GIB-sensitive areas.

22. Determine how and where to establish no-risk flight corridors between the arc and the Cholistan border (and the Army field firing range at Pokhran), including promoting the idea of an Indo-Pakistan Peace Park in the Thar landscape covering key GIB areas.

23. Run a long-term state pride campaign targeting all levels of society, and involving an annual GIB festival and the designation of famous GIB ‘ambassadors’, e.g. Bollywood stars, cricketers from Rajasthan and other ‘Great Indians’.

24. Maintain a high media profile for GIB conservation through newspaper and television stories, including a film for national distribution.
25. Produce a multi-lingual book on the GIB as a means of engaging local civic, religious, political and commercial leaders, civil servants and academics.

26. Liaise with army personnel to promote the conservation and management of the GIB in and around restricted areas.

27. Close down illegal but lucrative ‘poaching tourism’ operations (clandestine organised hunting parties) run by certain hotels at least in the Jaisalmer area.

28. Broker an agreement between Police and Forest Department, as far as possible involving also the Army, on joint patrolling of the buffer zone.

29. Establish a volunteer warden programme modelled on ones operating in tiger reserves elsewhere in India, to monitor and patrol the entire buffer zone as directed by park/police staff.

30. Monitor all GIB populations in Rajasthan on a permanent basis, using DNP as a base, and establish a biological research programme on the species to understand how it responds to this package of management measures.

**SMART work**

Repeated calls from conservationists for the Indian government to restart a nationwide ‘Project Bustard’ (Rahmani 2002, 2012, Singh et al. undated, Tiwari 2014; including a motion at the IUCN World Congress 2004) have met with silence. This is particularly ironic given that Project Tiger and Project Elephant, conducted with such vigour and dedication, concern species which range far beyond India’s national borders, whereas the GIB, with the proud words ‘Great Indian’ in its name, is almost entirely confined to the country and can only be saved in India, by Indians. All the same, a big top-down effort may not be the best way forward. The GIB, because of the nature of its ecological requirements, is ultimately going to be saved by communities, not by committees.

We acknowledge there are several significant obstacles to the success of this package, including India’s declared policy on energy self-sufficiency which targets the Thar region as its highest priority, and Rajasthan’s position at the edge of the GIB’s range, such that semi-desert habitat may represent a suboptimal environment (2014 saw a year-long drought in the state). But there is no alternative. The big need, as Rahmani (2012) concluded, is for ‘A landscape conservation strategy using Conservation and Community Reserve concept that includes controlled traditional land uses with GIB-friendly infrastructural development’. Our 30-point plan—other points will doubtless be added over time—precisely meets this need, which reflects key measure (b) in the official recovery plan (Dutta et al. 2013); and by seeking to protect a ‘core area’ and committing to a research and monitoring programme it also meets key measures (a) and (c) in that plan. It can be converted to funding proposals in various combinations, and we hope it is or can easily be made, in management-speak terms, SMART enough (Specific, Measurable, Achievable, Relevant and Time-bound) to give the GIB a real prospect of survival. Work by the Corbett Foundation in westernmost Kutch is pointing the way. The days of ‘last chance to see’ have not arrived just yet.

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Plate 1. Male Great Indian Bustards *Ardeotis nigriceps*, Kutch, Gujarat, 1 August 2010.
