IUCN Captive management guidelines support ex situ conservation of the Bengal florican *Houbaropsis bengalensis blandini*

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SUPPLEMENTARY TABLE 1 Demographic parameters for models of *Houbaropsis bengalensis blandini* captive breeding and release under four scenarios of programme quality (full range, below average, above average and best possible) and in situ conservation under two scenarios (current situation and future conservation), showing minimum (Min) and maximum (Max) values from which each programme iteration was sampled. Whether the parameter is restricted during the learning phase (Learn) is also shown (Y, yes; N, no; n/a: not applicable).

		Scenario of captive breeding programme quality							
		Full range		Below average		Above average		Best possible	
Parameter	Learn	Min	Max	Min	Max	Min	Max	Min	Max
Learning for husbandry	n/a	2	4	3	4	2	3	2	2
Proportionate adjustment of relevant parameters during learning period	n/a	0.6	1	0.6	0.8	0.8	1	0.85	1
Hatch rate of collected wild-laid eggs (with artificial incubation)	Y	0.5	0.75	0.5	0.6	0.55	0.75	0.6	0.75
Juvenile survival to year 1 of wild-laid captive-reared chicks	Y	0.45	0.85	0.45	0.7	0.7	0.85	0.75	0.85
Adult survival in captivity	Y	0.83	0.97	0.83	0.88	0.88	0.97	0.92	0.97
Age of male first breeding (years)	N	1	5	3	5	2	3	1	2
Age of female sexual maturity (years)	N	1	4	3	4	2	3	1	2
Learning lag (years) between first females reaching sexual maturity and breeding	N	1	7	4	7	1	4	1	2
After first breeding, subsequent annual probability that an adult females will again breed	Y	0.6	0.9	0.6	0.7	0.65	0.9	0.7	0.9

Clutches female^{-1} yr^{-1}, for first two years of breeding age	N	1	1	1	1	1	1	1	2
Mean clutches female^{-1} yr^{-1}, for subsequent breeding	N	1	3	1	1.3	1.15	3	1.3	3
Hatching rate of captive reared eggs (with artificial incubation)	Y	0.45	0.78	0.45	0.6	0.65	0.75	0.68	0.78
Survival of captive juvenile to 1 year old	Y	0.6	0.78	0.6	0.67	0.67	0.78	0.72	0.78
Prior to first stochastic adult event: annual probability of severe adult mortality event	N	0.05	0.167	0.125	0.167	0.1	0.167	0.05	0.1
First stochastic adult event: severe additive adult mortality	N	0.25	0.8	0.3	0.8	0.25	0.8	0.25	0.5
Prior to first stochastic adult event: annual probability of moderate adult mortality event	N	0.2	0.5	0.333	0.5	0.2	0.5	0.2	0.333
First stochastic adult event: severe additive adult mortality	N	0.1	0.2	0.15	0.2	0.1	0.15	0.1	0.15
After first stochastic adult event: annual probability of stochastic adult mortality	N	0.2	0.5	0.333	0.5	0.333	0.5	0.2	0.5
After first stochastic adult event: additive adult mortality	N	0.1	0.2	0.15	0.2	0.1	0.15	0.1	0.15
Annual probability of stochastic juvenile mortality	N	0.2	0.5	0.333	0.5	0.2	0.5	0.2	0.333
Additive chick or juvenile mortality	N	0.08	0.15	0.08	0.15	0.08	0.15	0.08	0.15
Annual probability of stochastic reduction in proportion of females breeding	N	0.1	0.333	0.25	0.333	0.1	0.333	0.1	0.2
Reduction in proportion of adult females breeding	N	0.15	0.2	0.15	0.2	0.15	0.2	0.15	0.2
Juvenile survival to release	N	0.45	0.88	0.45	0.66	0.58	0.88	0.75	0.88

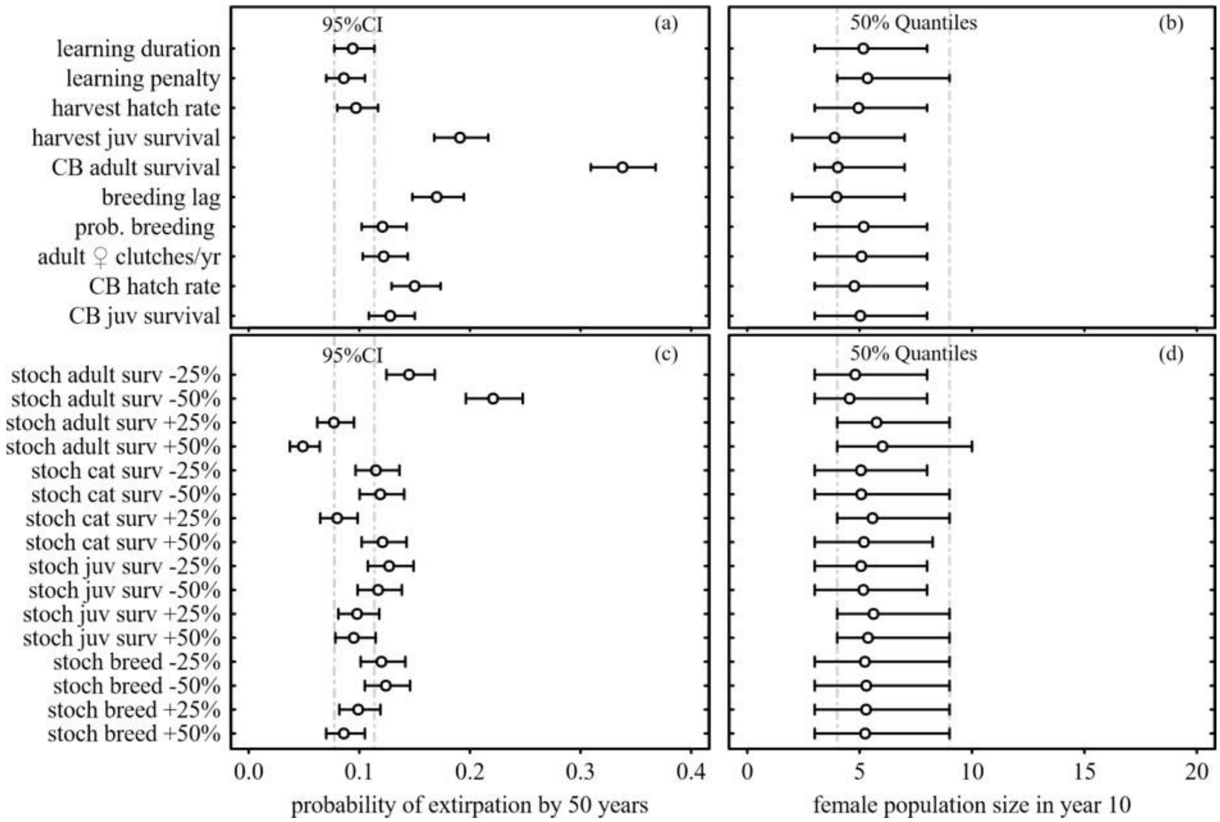
Juvenile survival post release to 1 year	N	0.1	0.3	0.1	0.3	0.1	0.3	0.1	0.3
		In situ conservation for wild and post-release							
		Current situation						Future situation	
Annual probability that an adult female will breed	n/a	0.33	0.8					0.33	0.8
Wild nest survival	n/a	0.4	0.7					0.6	0.7
Re-nesting rate after failure	n/a	0.1	0.5					0.1	0.5
Wild juvenile survival to 1 year	n/a	0.1	0.3					0.1	0.2
Adult survival	n/a	0.82	0.98					0.6	0.8

SUPPLEMENTARY TABLE 2 Evidence base used to estimate *H. bengalensis blandini* demographic parameters

Parameter	Evidence
Learning for husbandry	Estimates used are same as Dolman et al. (2015) owing to a lack of evidence to the contrary
Proportionate adjustment of relevant parameters during learning period	Estimates used are same as Dolman et al., (2015) owing to a lack of evidence to the contrary
Hatch rate of collected wild-laid eggs (with artificial incubation)	Estimates used are same as Dolman et al., (2015) owing to a lack of evidence to the contrary
Juvenile survival to year 1 of wild-laid captive-reared chicks	Estimates used are same as Dolman et al., (2015) owing to a lack of evidence to the contrary
Adult survival in captivity	Estimates used are same as Dolman et al., (2015) owing to a lack of evidence to the contrary (One male Bengal Florican kept in captivity in Cambodia in 2018 (for the purpose of rehabilitation) survived for three months at which time it was released to the wild (ACCB unpublished data)).
Age of male first breeding (years)	Male Little Bustard breed at age 2 years (Bretagnolle & Inchausti, 2005). Captive male Houbara and McQueens Bustards breed at 1–4 years (Dolman et al., 2015).
Age of female sexual maturity (years)	Female Little Bustard will start breeding after 1 year (Bretagnolle & Inchausti, 2005). Satellite telemetry data indicate that sub-adult females (n = 2) have similar home range size to adult females (n = 7) during the breeding season (Packman, 2011), so might also be breeding. Captive female Houbara and McQueens Bustards breed at 1–3 years (Dolman et al., 2015).
Learning lag (years) between first females reaching sexual maturity and breeding	Estimates used are same as Dolman et al., (2015) owing to a lack of evidence to the contrary.
After first breeding, subsequent annual probability that an adult females will again breed	Estimates used are same as Dolman et al., (2015) owing to a lack of evidence to the contrary
Clutches female^{-1} yr^{-1}, for first two years of breeding age	Estimates used are same as Dolman et al., (2015) owing to a lack of evidence to the contrary
Mean clutches female^{-1} yr^{-1}, for subsequent breeding	Estimates used are same as Dolman et al., (2015) owing to a lack of evidence to the contrary
Hatching rate of captive reared eggs (with artificial incubation)	Estimates used are same as Dolman et al., (2015) owing to a lack of evidence to the contrary

Survival of captive juvenile to 1 year old	Estimates used are same as Dolman et al., (2015) owing to a lack of evidence to the contrary
Prior to first stochastic adult event: annual probability of severe adult mortality event	Estimates used are same as Dolman et al., (2015) owing to a lack of evidence to the contrary
First stochastic adult event: severe additive adult mortality	Estimates used are same as Dolman et al., (2015) owing to a lack of evidence to the contrary
Prior to first stochastic adult event: annual probability of moderate adult mortality event	Estimates used are same as Dolman et al., (2015) owing to a lack of evidence to the contrary
First stochastic adult event: severe additive adult mortality	Estimates used are same as Dolman et al., (2015) owing to a lack of evidence to the contrary
After first stochastic adult event: annual probability of stochastic adult mortality	Estimates used are same as Dolman et al., (2015) owing to a lack of evidence to the contrary
After first stochastic adult event: additive adult mortality	Estimates used are same as Dolman et al., (2015) owing to a lack of evidence to the contrary
Annual probability of stochastic juvenile mortality	Estimates used are same as Dolman et al., (2015) owing to a lack of evidence to the contrary
Additive chick or juvenile mortality	Estimates used are same as Dolman et al., (2015) owing to a lack of evidence to the contrary
Annual probability of stochastic reduction in proportion of females breeding	Estimates used are same as Dolman et al., (2015) owing to a lack of evidence to the contrary
Reduction in proportion of adult females breeding	Estimates used are same as Dolman et al., (2015) owing to a lack of evidence to the contrary
Juvenile survival to release	Estimates used are same as Dolman et al., (2015) owing to a lack of evidence to the contrary
Juvenile survival post release to 1 year	Estimates used are same as Dolman et al., (2015) owing to a lack of evidence to the contrary
Annual probability that an adult female will breed	2–6 of 6 radio tagged female Bengal Florican nested (Gray et al., 2009); 17 of 22 radio-tagged female Little Bustard nested (Lapiedra et al., 2011).
Wild nest survival	For n = 63 Bengal Florican nests monitored between 2008 and 2018 in a well-protected grassland survival rate was 63%, although success rates appear to be higher in recent years (WCS unpublished data). Survival rates unknown in other areas so lower estimate used by Dolman et al., (2015) also used here; future nest

	survival rates assumed to be higher because birds (if still present) will be restricted to well-protected areas.
Re-nesting rate after failure	Satellite telemetry data and bi-model pattern of nest dates suggest Bengal Floricans can nest twice per year (Packman, 2011). Rates unknown, so data from Dolman et al., (2015) used for current situation; since evidence is equivocal on whether second nest is due to failure of the first; contra Dolman et al., (2015) we see no reason to assert that re-nesting rates would change under future scenarios.
Wild juvenile survival to 1 year	No Bengal Florican data. Data from Dolman et al., (2015) used, although with less optimistic future estimate owing to impact of power lines.
Adult survival	In absence of power lines, data from Cambodia indicate annual adult survival rate of Bengal Florican is 89.9% (95% CI 82.2–97.6%); this is expected to decline in the future owing to power line collisions (Mahood et al., 2016).



SUPPLEMENTARY FIG. 1 Sensitivity of (a) mean extirpation probability and (b) geometric mean numbers of adult females, to aspects of captive-breeding performance, under the 'best possible' programme quality scenario substituting each parameter in turn with a value drawn from the 'full-range' scenario. Error bars represent 95% limits for extirpation probability and upper and lower quartiles for numbers of females in year 10; vertical dashed lines show the 95% intervals or 50% quartiles of 1,000 iterations prior to sensitivity analysis. Sensitivity to stochastic parameters was examined for the 'best possible' scenario, by varying the magnitude of impacts on survival or breeding by ±25%. Captive populations are established by initial harvest of 10 eggs yr^{-1} for 5 years.

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