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The Aspinall Foundation: 30 years of captive-breeding, reintroduction and conservation

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Summary

The UK-registered charity The Aspinall Foundation was founded in 1984, the vision of which has always been to contribute to global species conservation through integrating ex-situ and in-situ activities. The foundation's flagship project, the ongoing western lowland gorilla rescue and reintroduction programme, was initiated in 1987 in Congo, and was expanded to neighbouring Gabon in 1998. Two gorilla populations are now in the process of being re-established, both in new protected areas created specifically for the projects. Sixty gorillas have been released since 1996, with very encouraging post-release results. This model has been replicated in Indonesia, with the creation in 2010 of the Javan Primates Conservation Programme, involving the management of two primate rescue and rehabilitation centres in Java, and associated langur and gibbon release projects to reinforce and conserve small, isolated and threatened wild populations. Initial monitoring results from the first release of 13 Javan langurs in 2012 are again very encouraging, with 100% survival during the first six months post-release. The release stock for these projects has consisted primarily of rehabilitated wild-borns, with additional individuals provided from the captive-breeding populations at the Howletts and Port Lympne wild animal parks in Kent, UK. Following a different model, the foundation established a lemur conservation programme in Madagascar from 2008. Focussing primarily on saving the Critically Endangered greater bamboo lemur, but also working to conserve other threatened species such as crowned sifaka and black-and-white ruffed lemur, the programme has developed several participatory and community-based conservation activities which have helped remove the greater bamboo lemur from the list of the 25 most endangered primates in the world. As the foundation enters the 30th year of its existence, further practical contributions to global species conservation are planned or ongoing, for example with eastern black rhinoceros, Przewalski's horse, European bison and Scottish wildcat.

Introduction

In 1972 a symposium on breeding of endangered species in captivity was held at Gerald Durrell's Wildlife Conservation Trust in Jersey. To reflect on the contribution since then of zoos to endangered species conservation, a symposium entitled "Forty years of zoo-based conservation: The evolving role of zoos in global species conservation" was organised at Bristol Zoo Gardens on the 7 November 2013. Speakers included Miranda Stevenson OBE (Former Director, British & Irish Association of Zoos & Aquariums), Lee Durrell (Honorary Director, Durrell Wildlife Conservation Trust) and Ian Redmond (GRASP). I was honoured to also be invited to speak, and provide here a summary of my presentation about the work of The Aspinall Foundation over the past thirty years.

Founding the Foundation

Although the late John Aspinall created and financed the Howletts and Port Lympne zoological parks in Kent in 1959 and 1975 respectively, it was not until 1984 that The Aspinall Foundation was founded as a UK-registered charity (under the name of The Howletts and Port Lympne Foundation, and subsequently The John Aspinall Foundation), the vision of which has always been to contribute to global species conservation through integrating *ex situ* and *in situ* activities.

The following year an agreement was signed on the 24 May 1985 between the Foundation and the government of Indonesia to create the Sumatran rhino conservation project, to help save this highly endangered species from extinction (Aspinall 1985b; Nardelli 1985; Martin 1989; Fig. 1). By August 1985 a base-camp had been constructed in Sumatra in a forest area where the rhinos were doomed by the extension of logging activities, and on the 25 November the first Sumatran rhino was captured, to be named Torgamba (Nardelli 1986). Torgamba travelled to Howletts in 1986 (Nardelli 1986), and although he failed to breed during a decade in the UK before returning to Sumatra in 1998 (to the Sumatran Rhino Sanctuary in Way

Figure 1. John Aspinall with a Sumatran rhino at Port Lympne, UK. (Photo courtesy of Amos Courage)

Figure 2. Two eastern black rhinos sent to Africa in 2004. (Photo: The Aspinall Foundation)

Kambas National Park; Litchfield 1998, 1999, 2001), the captive-breeding programme initiated by John Aspinall was taken on by several American zoos from 1987 (Nardelli 1987; Aspinall 1990), finally resulting in a birth in captivity in 2001, in Cincinnati; the only previous captive-birth of the species being in Calcutta in 1889 (Litchfield 2001).

Rhinos have been one of the key focal groups for the Foundation's conservation efforts throughout its history. Realising that poaching was the single biggest threat to the survival of rhino species globally, the Foundation has repeatedly funded focussed efforts to uncover and disrupt international trade in rhino horn (e.g. Martin & Martin 1989, 2013; Vigne & Martin 1989, 2000, 2008; Martin 2001, 2004; Martin *et al.* 2010; Martin & Vigne 2013; Vigne 2013). Other rhino conservation work has also been supported (e.g. Hearn *et al.* 2000; Fyumagwa & Nyahongo 2010; see also below).

Returning wildlife to the wild

A key component of the Foundation's philosophy has been the reintroduction of species to protected areas whenever possible (Aspinall 1985a, 1987; Begg 1987). John Aspinall was very keen to support the IUCN's negotiations with Russian authorities in the early 1980s to reintroduce Przewalski's horses to the Altai plains of Mongolia (Aspinall 1985a), and soon became very active in pioneering the return of Przewalski's horses to China (Aspinall 1990; Lockyer 1992). This finally resulted in ten horses (five stallions and five mares) being sent to the Milu Ecological Centre near Beijing in November 1992 (Luff 1993; Lockyer 1996), from where they were moved to a semi-wild 100-ha enclosure in the Gansu Province with a view to full release into the Anxi Gobi Nature Reserve (Lockyer 1996, 1997), and in one mare being sent in 1996 to the Hustain Nuruu Steppe Reserve in Mongolia (Lockyer 1996), one of the first and most successful Przewalksi's horse reintroduction projects, established in 1994 (Boyd & King 2011).

Similarly, The Aspinall Foundation has sent several eastern black rhinoceros back to Africa. The first, a male, went to a semi-wild breeding programme at Addo National Park in South Africa in 1995 (White 1995; Aspinall 1996), apparently the first captive-bred rhino to be returned to Africa (White 2000). Having already sired at least two offspring at Addo, he was moved in October 2000 to Thabo Tholo, a 36,000 ha private reserve in northern province of South Africa, where he rapidly became the dominant male of his group and continued to sire more offspring (White 2001). Two female rhinos were subsequently also sent to Thabo Tholo in 2004 (Fig. 2), where both gave birth several times (Berry White, pers. comm.). Another two females went to the 140 ha Grumeti Park in Tanzania in June 2007 (Claire Lewis, in litt. 2007; Fyumagwa & Nyahongo 2010), and in June 2012 one male and two females joined the reintroduction programme in the Mkomazi Rhino Sanctuary, Tanzania (Fitzjohn 2013).

Other species sent back from the UK to their indigenous range include two ocelots to a conservation-breeding programme in the Cuixmala Bisophere Reserve, Mexico, in April 1994 (Whittaker 1994), one pair of clouded leopards sent to Phnom Tamao Wildlife Rescue Centre, Cambodia, in August 2006, and another female in January 2011 (N. Marx, unpubl. reports), six Javan ebony langurs and a Javan silvery gibbon to Indonesia in January 2013 (Wedana *et al.* 2013; see below), and, most famously, 21 western lowland gorillas to The Aspinall Foundation's gorilla reintroduction project in Gabon. The first two gorillas were sent from Howletts in 1999; one, Kwa Kwa, died soon after arrival, but the other, Kwam, was a member of the first gorilla group released in the Batéké Plateau

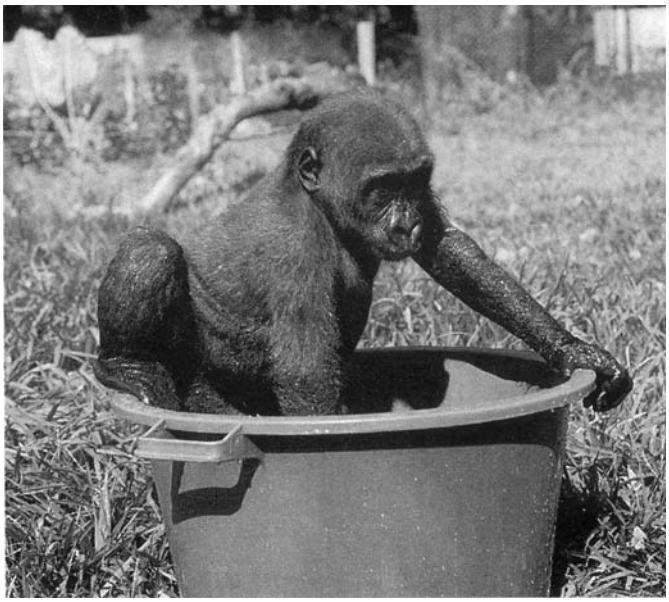

Figure 3. Yambo (Sid) in 1989, one of the first two orphan gorillas to arrive at The Aspinall Foundation's gorilla sanctuary in Brazzaville, Congo. (Photo: The Aspinall Foundation)

Figure 5. Yambo (Sid) in 2013. (Photo: The Aspinall Foundation)

National Park in 2001 (Pearson *et al.* 2007). Another six gorillas went to the Gabon project in 2003, three in 2008, and ten in 2013 (Pearson *et al.* 2007; King *et al.* 2012a; Bonnet 2013; Honey 2013; Ridges 2013).

Congo and Gabon gorilla projects

There is no doubt that the ongoing western lowland gorilla rescue and reintroduction programme (Figs. 3-5), initiated in 1987 in the Republic of Congo and expanded to the neighbouring Republic of Gabon in 1998 (King *et al.* 2009, 2012a), is the Foundation's flagship conservation project. The goal of the projects is to work with local partners for the conservation of endangered species in general, and of gorillas in particular, and they undertake several activities to achieve this:

Figure 4. Matoko and Likendzé, two orphan gorillas following confiscation in 2002. (Photo: Sinead Lynch)

1. Reduction in trade in orphan apes, through facilitation of law enforcement and through education / awareness-raising
2. Care / rehabilitation of confiscated apes
3. Reintroduction of gorillas to protected areas
4. Protected area conservation & management
5. International awareness-raising

The development of the project appeared to contribute to a major reduction in the trade in gorillas at a national level (King *et al.* 2005, 2009). The Aspinall Foundation built a sanctuary for orphaned gorillas in Brazzaville in 1987, which became functional in 1989, receiving an average of over ten orphan gorillas per year in the early years (Fig. 6). The impact of the orphanage project, probably combined with other conservation activities in the country, is illustrated by the reduction in arrival rates over the subsequent years, with only 17 gorillas received over the ten-year period from 1998 to 2007 (Fig. 6). This is attributed to the dual impact of facilitating law enforcement and raising awareness (King *et al.* 2009). However, an apparent mini-resurgence in the arrival rate of confiscated orphan gorillas in 2006 (Fig. 6), and simultaneously of confiscated chimpanzees (King *et al.* 2009), suggested that this aspect of the work required reinforcing. This observation led to a rapid increase in awareness-raising activities (Mathot & Puit 2008; King *et al.* 2009; Fig. 7), and eventually to the creation of the collaborative PALF project, aimed at facilitating the application of faunal laws.

The project also resulted in the rescue and repatriation of several bonobos. Endemic to the Democratic Republic of Congo (DRC), bonobos are hunted for the bush-meat trade, and orphans are often traded nationally or internationally. Some are smuggled across the Congo River for sale in the Republic of Congo (Congo), and indeed the first great ape ever to

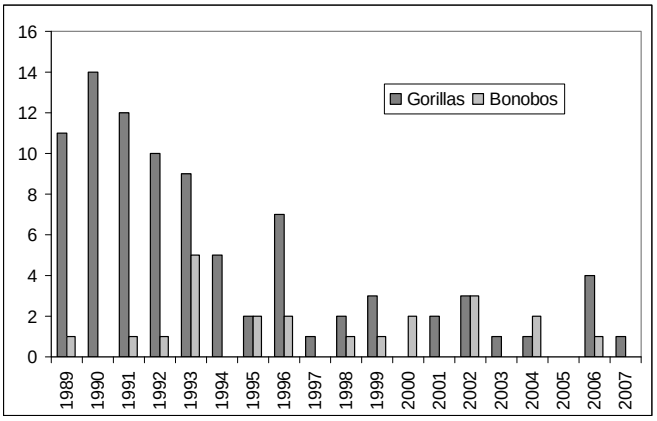

Figure 6. Arrival rates of gorillas and bonobos at the Congo gorilla project, May 1989 to Dec 2007. (Taken from King *et al.* 2009)

Figure 7. Awareness-raising amongst law enforcement officers in Brazzaville in 2007. (Photo: Marielle Puit)

Figure 8. The bonobo Max (left), the first ape to arrive at the Congo gorilla sanctuary in 1989, here in 2005 at the Lola ya Bonobo sanctuary following his repatriation to the DRC in 2004. (Photo: Tony King)

arrive at The Aspinall Foundation's sanctuary for orphan gorillas in Brazzaville was a bonobo: the well-known Max, in 1989 (King *et al.* 2005). Following the creation of a bonobo sanctuary near Kinshasa, the first repatriation of bonobos from Congo to DRC occurred in 2000, the first time that collaboration between the two neighbouring countries had resulted in the repatriation of an endemic animal (André 2000). This transfer of two bonobos was followed by the repatriation of two young females in January 2003, another young female in March 2004, and finally of a 17-year-old Max and two other males in April 2004 (King *et al.* 2005; Fig. 8).

Gorilla reintroduction

The Aspinall Foundation's gorilla reintroduction programme in Congo and Gabon aims to re-establish viable, self-sustaining populations of the Critically Endangered western lowland gorilla within the former range of the species (King *et al.* 2009, 2012a). The programme is located in the south-eastern edge of the species range, in the Batéké Plateau region, the first major wilderness area from which the species has been extirpated. Sixty gorillas have been released to two protected areas between 1996 and 2013, thirty in the Lesio-Louna Reserve in Congo, and thirty in the Batéké Plateau National Park in Gabon (Table 1; Fig. 8). Fifty of the released gorillas are wild-born orphans confiscated by the respective government authorities, and ten are hand-reared captive-borns, nine of which originated from the captive-breeding programme at Howletts and Port Lympne (Pearson *et al.* 2007; King *et al.* 2012a), the tenth was born to confiscated orphans in the pre-release phase of the Congo project (King *et al.* 2005, 2006, 2012a).

Since the publication of the IUCN guidelines for primate reintroductions (IUCN 2002), and subsequent similar guidelines for great apes (Beck *et al.* 2007) and conservation translocations in general (IUCN/SSC 2013), all transfer and release proposals and evaluations have been modelled on these guidelines (e.g. King *et al.* 2006; Pearson *et al.* 2007; King and Courage 2013). Thorough planning goes into each proposed transfer or release, and risks are identified and minimised.

Assessing reintroduction success

Reintroduction success can be evaluated through various measures, but three population-level variables are particularly relevant across taxa and sites: 1) survival of the release stock; 2) reproduction of the release stock and their offspring; and 3) persistence of

Table 1. Gorilla groups released in the Lesio-Louna Reserve, Congo, and the Batéké Plateau National Park, Gabon, 1996 to 2013 (updated from King *et al.* 2012a).

Group	Date	Males	Females	Total	Ages at release
Congo					
Yambo	Apr 1996	2	1	3	8.1 – 9.1
Kola	May 1996	3	0	3	6.6 – 7.6
Kabo	Dec 1998	3	4	7	5.2 – 8.7
Djeke	Jun 2001	4	5	9	2.3 – 6.5
Likendze	Oct 2006	0	3	3	5.9 – 7.5
Tanga	May 2010	0	1	1	6.3
Kingoue	Oct 2013	3	1	4	6.3 – 7.7
Gabon					
Marco	Jan 2001	8	9	17	1.1 – 6.4
Kwibi	Aug 2004	4	5	9	1.9 – 6.2
Oudiki	Jul 2012	1	3	4	3.6 – 6.0
Total		**28**	**32**	**60**	**1.1 – 9.1**

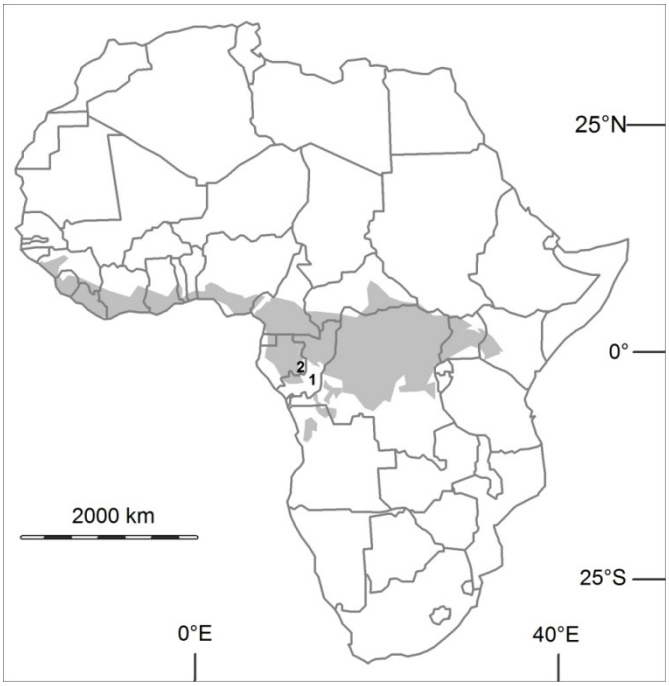

Figure 9. Location of the two western gorilla reintroduction sites in the Lesio-Louna Reserve, Congo (1) and the Batéké Plateau National Park, Gabon (2). (Taken from King *et al.* in press)

the reintroduced populations (usually measured as a future probability using population viability modelling). Post-release monitoring is therefore critical for collecting the information necessary to evaluate reintroduction success (King *et al.* 2012a, in press). Most post-release monitoring of the released gorillas has been undertaken by local trackers, on boat and on foot, recording daily to weekly locations, group composition, and general health indicators (King *et al.* 2006, 2012a; Pearson *et al.* 2007). Behavioural studies using scan and focal sampling has been selective; it is difficult or impossible for truly reintroduced gorillas, but can be used during early stages of the reintroduction process (King *et al.* 2003). Radio-collaring has so far been unsuccessful with gorillas, but camera-traps are being increasingly used as a monitoring tool in the Gabon reintroduction site, and subcutaneous implants are also being trialled.

Post-release monitoring results are very encouraging in terms of evaluating reintroduction success. An analysis to the end of 2008 of post-release survival of the first 51 gorillas released (from 1996 to 2006), published by King *et al.* (2012a) in the International Journal of Primatology, found 98% survival in the first year post-release, overall annual survival of 97% (similar to wild gorilla populations), and that most (6 of 8) deaths or disappearances occurred between one and three years post-release. There were no noticeable differences between survival rates between the two sites (Congo and Gabon), between males and females, or between wild-borns and captive-borns (Table 2). The largest difference in survival rates appeared to be related to project experience, with gorillas released in the earliest years of the reintroduction (pre-2000) showing slightly lower survival than those released in subsequent years (Table 2), suggesting that the project staff have learnt from experience to improve release strategies and consequently post-release survival (King *et al.* 2012a).

Considering reproduction of the release stock, the first birth to reintroduced gorillas occurred in 2004 (King 2004; Fig. 10), was followed by several more in 2006 and 2007 (King & Courage 2007; Pearson & King 2008), and by the end of 2013 over 25 births had been recorded across the two projects. Annual birth rates are similar to those of wild gorilla populations (King *et al.* 2012). Reproduction rate now exceeds the rate of loss of founder members, meaning that both reintroduced populations are increasing in size.

Table 2. Annual post-release survival rates for all gorillas released to the Bateke Plateau between 1996 and 2006, as at June 2008, taken from King *et al.* 2012a ([a]the cumulative total of years released of each individual gorilla).

	Total released	Total years[a]	Died or disappeared	Annual survival
Male	24	126.3	4	0.968
Female	27	153.9	4	0.974
Wild-born	43	248.7	7	0.972
Captive-born	8	31.5	1	0.968
Release pre-2000	13	73.3	4	0.947
Post-2000	38	227.6	4	0.983
Total	51	280.2	8	0.971

Figure 10. Téké (right), born in April 2004, the first infant born to reintroduced gorillas, here with his probable father Makoua on the bank of the Lefini River, Congo, in June 2005. (Photo: Tony King)

The probability of population persistence was measured by King *et al.* (in press; currently available online in the journal Oryx) using the freely-available Vortex population viability modelling software, who concluded: "The results of the population viability analysis suggested that the reintroduced gorilla populations have a reasonable chance of persistence (>90% over 200 years), but illustrated that reinforcement of the populations could significantly improve probabilities of population persistence and retention of genetic diversity. Equally, catastrophic events could have significant negative impacts." However, the model results should be interpreted with care, as sensitivity testing of the model showed that small changes to the input values of some specific key parameters could have major impacts on the model predictions, particularly those for annual birth rates, for the number of lethal equivalents, and for female annual mortality rates, especially for adults (King *et al.* in press). Importantly, the original cause of population decline at the two reintroduction sites (hunting) has been removed through collaborative protected area management projects (King 2008; King *et al.* 2012a). However, long-term population and site management will surely need to be maintained to allow population persistence.

Overall success indicators

We have looked above at three key measures of reintroduction success from the perspective of re-establishing extirpated populations. However a wider spread of success indicators are worth considering when looking at the overall impact of the reintroduction projects, as specified by King & Courage (2008):

- Indicator 1: High post-release survival of released individuals.
- Indicator 2: Successful adaptation of released individuals to release site.
- Indicator 3: Exhibition of social and other behaviours similar to those observed in wild populations.
- Indicator 4: Reproduction within the re-introduced populations.
- Indicator 5: Long-term persistence of the re-introduced populations.
- Indicator 6: Improved legal status of the release sites.
- Indicator 7: Effective management of the release sites leading to ecosystem recovery.

Indicators 1, 4 and 5 have been discussed above. Indicator 2 (successful adaptation of released individuals to release site) can be broadly assessed by measuring individual survival rates, but can also

Figure 11. Promotion of community reforestation projects around the Lesio-Louna Reserve, Congo. (Photos: The Aspinall Foundation)

Figure 12. Monitoring team in the Lesio-Louna Reserve, Congo. (Photo: Tony King)

Figure 13. Some of the large mammals of the Batéké Plateau National Park, Gabon. (Camera-trap photos by Philipp Henschel; plate taken from Pearson *et al.* 2007).

include other more specific measures such as the adoption of feeding habits similar to wild gorillas in a similar habitat. At the Congo reintroduction site over 100 local plant species have been identified as forming part of the diet of the released gorillas (Cousins 2002), a diversity similar to that of wild gorillas (King *et al.* 2012a). Indicator 3 (exhibition of social and other behaviours similar to those observed in wild populations) can be assessed by considering ranging patterns, inter-group interactions and transfer behaviours, again, all of which appear similar in the reintroduced populations to those observed in wild populations (King 2004; King & Chamberlan 2007a, 2008; King *et al.* 2012a).

The final two success indicators relate to the impact on the reintroduction sites themselves. In this case, two new protected areas were created to facilitate the reintroduction (the Lesio-Louna Reserve in Congo and the Batéké Plateau National Park in Gabon), and both sites benefit from collaborative protected area management projects with fairly standard objectives in addition to the rather unique one of gorilla reintroduction (King *et al.* 2009; Figs. 11, 12), as specified in the Presidential decree creating the Lesio-Louna Reserve:

- to assure the reintroduction of orphan gorillas;
- to protect the gorillas and the ecosystem of the reserve;
- to organise and promote education, training, outreach, and biodiversity research;
- to promote and develop tourism;
- to organise, with local community participation, an integrated system of natural resource protection in the reserve.

Standard wildlife monitoring methods suggest that indigenous wildlife other than the released gorillas are also recovering due to the presence of the protected area management projects (King 2008), and the sites support a diverse mixture of savannah and forest fauna and flora (Fig. 13; Dowsett-Lemaire 2001; Stone *et al.* 2006; Walters *et al.* 2006, 2011; King & Chamberlan 2007b, 2013; Kitchener *et al.* 2008; Vande weghe, J. P. 2008; Bout *et al.* 2010; King & Dallimer 2010; King 2011; van der Maesen & Walters 2011; Zimkus & Larson 2013), including two new beetle species described from the Lesio-Louna (Limbourg 2011).

Figure 14. Javan silvery gibbon female and infant in July 2013 at The Aspinall Foundation's primate rehabilitation centre in West Java, Indonesia. (Photo: Made Wedana)

Javan Primates Conservation Programme

The gorilla projects model was later replicated in Indonesia, with the creation in 2010 of the Javan Primates Conservation Programme (Wedana *et al.* 2013; Fig. 14). The Aspinall Foundation Indonesia Programme currently manages two primate rescue and rehabilitation centres in Java, a primary one in West Java and a smaller one in East Java specifically for the eastern subspecies of Javan ebony langur. Associated langur and gibbon release projects are being undertaken to reinforce and conserve small, isolated and threatened wild populations. In East Java, an isolated population of Vulnerable Javan ebony langurs in Coban Tulun Protected Forest is being reinforced, with the first release of 13 langurs implemented in September 2012 (Wedana *et al.* 2013). In West Java, reinforcements are planned for the isolated populations of the Endangered Javan silvery gibbon and the Endangered Javan grizzled langur in the Mt Tilu Nature Reserve. As with the Gabon gorilla reintroduction project, the release stock for these projects will consist primarily of rehabilitated wild-borns, with additional individuals provided from the captive-breeding populations at Howletts and Port Lympne (Wedana *et al.* 2013).

Madagascar programme

Following a different model, the Foundation established a lemur conservation programme in Madagascar from 2008. According to the eminent primatologist and conservationist Dr Russell Mittermeier, "Madagascar is without a doubt the world's highest primate conservation priority". Often referred to as the world's eighth continent, the island of Madagascar is located 400 km off the east coast of southern Africa, has been isolated from Africa for 160-180 million years and from

Figure 15. A lowland streaked tenrec, one of the multitude of endemic species found only in Madagascar. (Photo: Laingo Rakotonirina)

India for 90 million years, and most species occurring there are found nowhere else on earth (Fig. 15). A remarkable 105 lemur taxa are currently recognised, all endemic to Madagascar.

Greater bamboo lemur project

The primary focus of The Aspinall Foundation's Madagascar Programme is saving the Critically Endangered greater bamboo lemur (King & Chamberlan 2010; Fig. 16). Considered one of the most endangered species globally, the greater bamboo lemur has a specialist diet consisting almost exclusively of large-culmed bamboos, and has an unexplained immunity to the high cyanide levels found in some Malagasy bamboos. The project identified five objectives necessary to ensure the survival of the greater bamboo lemur (King *et al.* 2013a), which can be summarised as:

1. Improve communication & collaboration
2. Distribution & abundance surveys (find more lemurs)
3. Conserve all known rainforest corridor sites (protected areas)
4. Conserve isolated, non-protected, sites for population persistence & potential role in reintroductions/reinforcements
5. Save individuals from sites with no future

Prior to the project only 60 individual greater bamboo lemurs were known in the wild, from 11 sites (Wright *et*

Figure 16. A greater bamboo lemur at the newly-discovered Sahavola site in eastern Madagascar. (Photo: Hery Andrianiantefana)

Figure 17. A crowned sifaka in dry deciduous forest in western Madagascar. (Photo: Tony King)

al. 2008). In three years of collaborative surveys across much of eastern Madagascar we more than doubled the number of known sites for the species (Ravaloharimanitra *et al.* 2011; Rakotonirina *et al.* 2011). The project rapidly developed small-scale community-based conservation activities at most of the newly discovered sites (King *et al.* 2013a). The project currently finances 25 local community rangers in nine teams in and around the Ankeniheny-Zahamena rainforest corridor, and six rangers in three teams at the Vohibe site at the confluence of the Mangoro and Nosivolo rivers. Six local community associations (COBAs) are supported to conserve the greater bamboo lemur sites, and three community-managed sites have so far been legally recognised. Research and education programmes have been implemented across the sites to aid their conservation. Further details can be found in a number of publications (Rakotonirina *et al.* 2011, 2013; Ravaloharimanitra *et al.* 2011, 2013a, 2013b; Chamberlan 2012; Olson *et al.* 2012, 2013; Ravaloharimanitra & King 2012; Andrianandrasana *et al.* 2013; Chamberlan *et al.* 2013; King *et al.* 2013a, 2013b, 2013d; Rajaonson & King 2013).

The project now protects over 400 greater bamboo lemurs (>50% of known population) at ten sites, with 50+ babies born in 2012. The immediate crisis has been averted, with the species being removed in 2012 from the 25 most endangered primates list for the first time in a decade. However the community-based support must continue to ensure the remarkable successes of recent years are not wasted.

Crowned sifaka project

The model of the greater bamboo lemur conservation project was repeated from 2009 for the Endangered and little-known crowned sifaka in the dry western central region of Madagascar (King *et al.* 2012b; Fig. 17). Collaborative surveys in 2010 doubled the number of known sites for the species, and found interesting melanistic sifaka populations (Rakotonirina *et al.* in press). Conservation activities have subsequently been initiated at several of the newly-discovered sites.

Black-and-white ruffed lemur project

In 2011 a new project was initiated in Madagascar, focussing on conservation of the Critically Endangered black-and-white ruffed lemur, one of the highest priority conservation challenges in Madagascar. The project developed a slightly different model to that of the previous lemur projects, promoting more integration of *in situ* and *ex situ* conservation efforts (King *et al.* 2013c), with the following objectives:

1. Contribute to collaborative species plan (improved communication & coordination)
2. Support site protection projects for each of the three “sub-species”
3. Long-term population monitoring at priority sites (including other Critically Endangered lemurs: indri, diademed sifaka etc)
4. Help maintain viable captive and semi-wild populations of each “subspecies”, incorporating Malagasy captive lemurs in global breeding programmes where appropriate
5. Develop the management of captive populations to contribute directly to species conservation goals

Progress has been made in the first three of these objectives, for example through discovering new populations south of the known range of the species (Rakotonirina *et al.* 2013), and initiating population monitoring and community-based conservation activities at selected sites in the Ankeniheny-Zahamena rainforest corridor and the Andriantantely lowland forest (King *et al.* 2013a, 2013d). The implementation

Table 3. Priority lemur species for integrating *in situ* and *ex situ* conservation. (Table simplified from Schwitzer *et al*. 2013)

	IUCN Red list status	Region	Approximate captive population
Northern and western priority species			
Perrier's sifaka	CR	north	0
Blue-eyed black lemur	CR	north-west	75
Sahamalaza Sportive Lemur	CR	north-west	0
Madame Berthe's mouse lemur	CR	west	0
Mongoose lemur	CR	west	110
Eastern priority species			
White-collared brown lemur	CR	south-east	12
Greater bamboo lemur	CR	east	20
Lake Alaotra gentle lemur	CR	east	70
Black-and-white ruffed lemur	CR	east	800 (incl. 54 of *V. v. subcincta*)
Red ruffed lemur	CR	north-east	600
Silky sifaka	CR	north-east	0
Sibree's dwarf lemur	CR	east	0
Kalambatritra sportive lemur	EN	south-east	0
Aye-aye	EN	widespread	50

of the final two objectives remains under discussion at a species level (King *et al*. 2013c), and also as one of several threatened lemur species considered as priorities for integrating *in situ* and *ex situ* conservation planning at a global level (Schwitzer *et al*. 2013; Table 3).

Conclusions

The increased integration of *ex situ* and *in situ* conservation planning is a challenge (Fa *et al.* 2013; Lacy 2013; Traylor-Holzer *et al.* 2013). Never-the-less, as The Aspinall Foundation enters the 30th year of its existence, we hope to make further practical contributions to species conservation wherever possible, for example with European bison and Scottish wildcat, and will continue to search for innovative ways to help save species, populations and habitats the world over.

Acknowledgements

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References

André, C. 2000. Bonobo Nursery, sanctuary of the Democratic Republic of Congo. *Gorilla Gazette* 14 (1): 25-27.

Andrianandrasana, Z.A., Rasolofoharivelo, T., Chamberlan, C., Ratsimbazafy, J. & King, T. 2013. Etude préliminaire de *Prolemur simus* (Ramaimbangy) dans la forêt de basse altitude de Vohibe, bassin versant Nosivolo, Madagascar, et implications pour sa conservation. *Lemur News* 17: 43-49.

Aspinall, J. 1985a. Editorial. *HELP: Friends of Howletts and Port Lympne Newsletter* 7: 1.

Aspinall, J. 1985b. Comment. *HELP: Friends of Howletts and Port Lympne Newsletter* 7: 33.

Aspinall, J. 1987. Editorial: The Brazzaville orphanage. *HELP: Friends of Howletts and Port Lympne Newsletter* 9: 4-5.

Aspinall, J. 1990. Editorial. *HELP: Friends of Howletts and Port Lympne Newsletter* 12: 4-5.

Aspinall, J. 1996. African diary. *HELP: Friends of Howletts and Port Lympne Newsletter* 18: 28-31.

Beck, B., Walkup, K., Rodrigues, M., Unwin, S., Travis, D. & Stoinski, T. 2007. *Best Practice Guidelines for the Re-introduction of Great Apes*. SSC Primate Specialist Group of the World Conservation Union, Gland, Switzerland. 48 pp.

Begg, T. 1987. Foreign projects. *HELP: Friends of Howletts and Port Lympne Newsletter* 9: 10-11.

Bonnet, M. 2013. Release of the Oudiki group (four juvenile western lowland gorillas) in the Batéké Plateau National Park, Gabon, July 2012. *Wild Conservation* 1: 58-62.

Bout, N., Born, C. & Spohr, C. 2010. Evidence that the spotted hyena is present in the rainforest-savannah mosaic of south-east Gabon. *Mammalian Biology* 75: 170-179.

Boyd, L. & King, S. R. B. 2011. *Equus ferus*. In: IUCN 2013. IUCN Red List of Threatened Species. Version 2013.2. <www.iucnredlist.org>.

Chamberlan, C. 2012. Sauver *Prolemur simus* – 3000 cahiers scolaires "Godroka" distribués autour du CAZ. *Lemur News* 16: 26.

Chamberlan, C., Ranaivosoa, L., Ravaloharimanitra, M., Randrianarimanana, H.L., Randriahaingo, H.N.T., Roullet, D. & King, T. 2013. Distribution of school reconstruction materials following Cyclone Giovanna to local communities working to conserve greater bamboo lemurs in and around the Ankeniheny-Zahamena Corridor, eastern Madagascar. *Lemur News* 17: 2-4.

Cousins, D. 2002. Natural plant foods utilized by gorillas in the former Brazzaville Orphanage and the Lesio-Louna Reserve. *International Zoo News* 49(4): 210-218.

Dowsett-Lemaire, F. 2001. Congo. In: Fishpool, L. D. C. & Evans, M. I. (eds). *Important bird areas in Africa and associated islands*, pp. 191-198. Cambridge, UK: Pisces & BirdLife Int.

Fa, J. E., Harrop, S., Oldfield, S. & Pritchard, D. 2013. The need to balance *ex situ* and *in situ* conservation. *WAZA Magazine* 14: 15-18.

Fitzjohn, T. 2013. Progress report on three eastern black rhinoceroses translocated from Port Lympne, UK, to Mkomazi Rhino Sanctuary, Tanzania. *Wild Conservation* 1: 66-68.

Fyumagwa, R. D. & Nyahongo, J. W. 2010. Black rhino conservation in Tanzania: translocation efforts and further challenges. *Pachyderm* 47: 59-65.

Hearn, M. E., Loutit, B. D. & Uri-Khob, S. 2000. The black rhinoceros of north-western Namibia (*Diceros bicornis bicornis*): the role of density-dependence and its management implications. *Namibia Scientific Society Journal* 48: 11-39.

Honey, D. 2013. The transfer of Kibi (a 21.3-year-old female western lowland gorilla) from Howletts, UK, to Gabon, September 2013. *Wild Conservation* 1: 49-52.

IUCN 2002. IUCN *Guidelines for Nonhuman Primate Re-introductions*. IUCN/SSC Re-introduction Specialist Group, Gland, Switzerland.

IUCN/SSC 2013. *Guidelines for Reintroductions and Other Conservation Translocations. Version 1.0*. IUCN Species Survival Commission, Gland, Switzerland. viiii + 57 pp.

King, T. 2004. Reintroduced western gorillas reproduce for the first time. *Oryx* 38 (3): 251-252.

King, T. 2008. Detectability and conservation of De Brazza's monkey (*Cercopithecus neglectus*) in the Lesio-Louna and south-west Lefini Reserves, Bateke Plateau, Republic of Congo. *Primate Conservation* 23: 39-44.

King, T. 2011. The birds of the Lesio-Louna and Lefini Reserves, Batéké Plateau, Republic of Congo. *Malimbus* 33: 1-41.

King, T. & Chamberlan, C. 2007a. Orphan gorilla management and reintroduction: progress and perspectives. *Gorilla Journal* 34: 21-25.

King, T. & Chamberlan, C. 2007b. First records for Congo-Brazzaville of Miombo Pied Barbet *Tricholaema frontata*, Yellow-fronted Tinkerbird *Pogoniulus chrysoconus* and Sladen's Barbet *Gymnobucco sladeni*. *Bulletin of the African Bird Club* 14 (2): 193-199.

King, T. & Chamberlan, C. 2008. Dispersal and reproduction in reintroduced western gorillas (*Gorilla g. gorilla*). *Primate Eye* 96: 301 (abstract #842).

King, T. & Chamberlan, C. 2010. Conserving the Critically Endangered greater bamboo lemur. *Oryx* 44 (2): 167.

King, T. & Chamberlan, C. 2013. Where does the savannah fauna of the Batéké Plateau come from? *Wild Conservation* 1: 10-16.

King, T. & Courage, A. 2007. Reintroduced western gorillas reproduce again. *Oryx* 41 (1): 14.

King, T. & Courage, A. 2008. Western gorilla re-introduction to the Batéké Plateau region of Congo and Gabon. In: Soorae, P. S. (ed.) *Global re-introduction perspectives: re-*

introduction case-studies from around the globe. IUCN/SSC Re-introduction Specialist Group, Abu Dhabi, UAE. Pp. 217-220.

King, T. & Courage, A. 2013. Summary of the proposal to reinforce the reintroduced gorilla population in Gabon. *Wild Conservation* 1: 1-9.

King, T. & Dallimer, M. 2010. The fruit bats (Chiroptera: Pteropodidae) of the Lesio-Louna Reserve, Bateke Plateau, Republic of Congo. *Mammalia* 74: 63-69.

King, T., Boyen, E. & Muilerman, S. 2003. Variation in reliability of measuring behaviours of reintroduced orphan gorillas. *International Zoo News* 50 (5): 288-297.

King, T., Chamberlan, C. & Courage, A. 2005. Rehabilitation of orphan gorillas and bonobos in the Congo. *International Zoo News* 52(4): 198-209.

King, T., Chamberlan, C. & Courage A. 2006. *Gorilla reintroduction, Republic of Congo*. A report for the PASA/IUCN African Primate Reintroduction Workshop, 20-22 April 2006, Apeldoorn, Netherlands, 17 pp.

King, T., Chamberlan, C., Pearson, L. & Courage, A. 2009. Gorilla sanctuaries and conservation in Congo and Gabon. *International Zoo News* 56 (6): 342-352.

King, T., Chamberlan, C. & Courage, A. 2012a. Assessing initial reintroduction success in long-lived primates by quantifying survival, reproduction and dispersal parameters: western lowland gorillas (*Gorilla gorilla gorilla*) in Congo and Gabon. *International Journal of Primatology* 33 (1): 134-149.

King, T., Rakotonirina, L.H.F., Rakotoarisoa, A.H., Ravaloharimanitra, M. & Chamberlan, C. 2012b. Projet Tsibahaka: Conserving the crowned sifaka *Propithecus coronatus*. *Lemur News* 16: 32-34.

King, T., Chamberlan, C., Ravaloharimanitra, M. & Rasolofoharivelo, T. 2013a. Saving the Critically Endangered greater bamboo lemur *Prolemur simus*. *Wild Conservation* 1: 17-24.

King, T., Randrianarimanana, H. L. L., Rakotonirina, L. H. F., Mihaminekena, T. H., Andrianandrasana, Z. A., Ratolojanahary, M., Randriahaingo, H. N. T., Ratolojanahary, T., Rafalimandimby, J., Bonaventure, A., Rajaonson, A., Ravaloharimanitra, M., Rasolofoharivelo, M. T., Dolch, R. & Ratsimbazafy, J. H. 2013b. Large-culmed bamboos in Madagascar: Distribution and field identification of the primary food sources of the Critically Endangered greater bamboo lemur *Prolemur simus*. *Primate Conservation* 27: 33-53.

King, T., Rasolofoharivelo, T. & Chamberlan, C. 2013c. Conserving the Critically Endangered black-and-white ruffed lemur *Varecia variegata* through integrating *ex situ* and *in situ* efforts. *Wild Conservation* 1: 25-30.

King, T., Ravaloharimanitra, M., Randrianarimanana, H.L.L., Rasolofoharivelo, M.T. & Chamberlan, C. 2013d. Community-based conservation of critically endangered lemurs at the Sakalava and Ranomainty sites within the Ankeniheny-Zahamena rainforest corridor, eastern Madagascar. *Lemur News* 17: 63-70.

King, T., Chamberlan, C. & Courage, A. In press. Assessing reintroduction success in long-lived primates through population viability analysis: western lowland gorillas (*Gorilla gorilla gorilla*) in Central Africa. *Oryx* in press.

Kitchener, A. C., Maisels, F. Pearson, L. & Aczel, P. 2008. A golden mole (Family Chrysochloridae) from savanna woodland in the Batéké Plateau, Gabon. *Afrotherian Conservation* 6: 5-6.

Lacy, R. C. 2013. Achieving true sustainability of zoo populations. *Zoo Biology* 32: 19-26.

Limbourg, P. 2011. Contribution to the knowledge of the Afrotropical Rutelinae (Coleoptera, Scarabaeoidea, Melolonthidae). *Bulletin SRBE/KVBE* 147: 155-172.

Litchfield, P. 1998. Torgamba's journey home. *HELP: Friends of Howletts and Port Lympne Newsletter* 20: 25-26.

Litchfield, P. 1999. Way Kambas revisited. *HELP: Friends of Howletts and Port Lympne Newsletter* 21: 26-27.

Litchfield, P. 2001. A visit to Indonesia. *HELP: Friends of Howletts and Port Lympne Newsletter* 23: 26-27.

Lockyer, M. 1992. Update on the Przewalski horse reintroduction to China. *HELP: Friends of Howletts and Port Lympne Newsletter* 14: 16.

Lockyer, M. 1996. A steppe in the right direction. *HELP: Friends of Howletts and Port Lympne Newsletter* 18: 36-37.

Lockyer, M. 1997. The three Rs. *HELP: Friends of Howletts and Port Lympne Newsletter* 19: 38.

Luff, A. 1993. Port Lympne rhinos and hoofstock. *HELP: Friends of Howletts and Port Lympne Newsletter* 15: 14.

Martin, E. B. 1989. Report on the trade in rhino products in Eastern Asia and India. *Pachyderm* 11: 13-22.

Martin, E. 2001. What strategies are effective for Nepal's rhino conservation: a recent case study. *Pachyderm* 31: 42-51.

Martin, E. 2004. Rhino poaching in Nepal during an insurgency. *Pachyderm* 36: 87-98.

Martin, E. B. & Martin, C. B. 1989. The Taiwanese connection—a new peril for rhinos. *Oryx* 23 (2): 76-81.

Martin, E. & Martin, C. 2013. The decline in Cambodia's ivory trade. *TRAFFIC Bulletin* 25 (2): 43-45.

Martin, E. & Vigne, L. 2013. Lagos, Nigeria: One of the largest retail centres for illegal ivory surveyed to date. *TRAFFIC Bulletin* 25 (1): 35-40.

Martin, E., Talukdar, B. K. & Vigne, L. 2010. Rhino poaching in Assam: challenges and opportunities. *Pachyderm* 46: 25-34.

Mathot, L. & Puit, M. 2008. Educational activities in the Republic of Congo. *Gorilla Journal* 36: 20-22.

Nardelli, F. 1985. The Sumatran rhinoceros project. *HELP: Friends of Howletts and Port Lympne Newsletter* 7: 4-8.

Nardelli, F. 1986. The Sumatran rhino project. *HELP: Friends of Howletts and Port Lympne Newsletter* 8: 20-23.

Nardelli, F. 1987. "So near and yet so far...": A report on the Sumatran rhinoceros captive-breeding and conservation operation. *HELP: Friends of Howletts and Port Lympne Newsletter* 9: 38-42.

Olson, E. R., Marsh, R. A., Bovard, B. N., Randrianarimanana, H. L. L., Ravaloharimanitra, M., Ratsimbazafy, J. H. & King, T. 2012. Arboreal camera trapping for the Critically Endangered greater bamboo lemur *Prolemur simus*. *Oryx* 46: 593-597.

Olson, E. R., Marsh, R. A., Bovard, B. N., Randrianarimanana, H. L. L., Ravaloharimanitra, M., Ratsimbazafy, J. H. & King, T. 2013. Habitat preferences of the critically endangered greater bamboo lemur (*Prolemur simus*) and densities of one of its primary food sources, Madagascar giant bamboo (*Cathariostachys madagascariensis*), in sites with different degrees of anthropogenic and natural disturbance. *International Journal of Primatology* 34: 486-499.

Pearson, L. & King, T. 2008. Reproduction in a second population of reintroduced western gorillas. *Oryx* 42 (1): 14.

Pearson, L., Aczel, P., Mahé, S., Courage, A. & King, T. 2007. *Gorilla reintroduction to the Batéké Plateau National Park, Gabon: An analysis of the preparations and initial results with reference to the IUCN guidelines for the re-introduction of Great Apes.* PPG-Gabon / The Aspinall Foundation, Franceville, Gabon. 70 pp.

Rajaonson, A. & King, T. 2013. Brown lemur (*Eulemur fulvus*) in the lowland forest of Vohitrambo, south of the Nosivolo River, eastern Madagascar. *Lemur News* 17: 12-14.

Rakotonirina, L., Rajaonson, A., Ratolojanahary, T., Rafalimandimby, J., Fanomezantsoa, P., Ramahefasoa, B., Rasolofoharivelo, T., Ravaloharimanitra, M., Ratsimbazafy, J., Dolch, R. & King, T. 2011. New distributional records and conservation implications for the critically endangered greater bamboo lemur *Prolemur simus*. *Folia Primatologica* 82(2): 118-129.

Rakotonirina, L. H. F., Rajaonson, A., Ratolojanahary, J. H., Missirli, J. M., Razafy Fara, L., Raholijaona, Andriamanajaranirina, M. & King, T. 2013. Southern range extensions for the critically endangered black-and-white ruffed lemur *Varecia variegata* and greater bamboo lemur *Prolemur simus*. *Primate Conservation* 26: 49-55.

Rakotonirina, L.H.F., Randriantsara, F., Rakotoarisoa, A.H., Rakotondrabe, R., Razafindramanana, J., Ratsimbazafy, J. & King, T. In press. A preliminary assessment of sifaka (*Propithecus* spp.) distribution, chromatic variation and conservation in central Madagascar. *Primate Conservation* in press.

Ravaloharimanitra, M. & King, T. 2012. First community-managed reserve for greater bamboo lemurs inaugurated. *Lemur News* 16: 26.

Ravaloharimanitra, M., Ratolojanahary, T., Rafalimandimby, J., Rajaonson, A., Rakotonirina, L., Rasolofoharivelo, T., Ndriamiary, J.N., Andriambololona, J., Nasoavina, C., Fanomezantsoa, P., Rakotoarisoa, J.C., Youssouf, Ratsimbazafy, J., Dolch, R. & King, T. 2011. Gathering local knowledge in Madagascar results in a major increase in the known range and number of sites for critically endangered greater bamboo lemurs (*Prolemur simus*). *International Journal of Primatology* 32 (3): 776-792.

Ravaloharimanitra, M., Ranaivosoa, L., Chamberlan, C. & King, T. 2013a. Sensibilisation à la conservation de *Prolemur simus* dans le District de Brickaville. *Lemur News* 17: 6-8.

Ravaloharimanitra, M., Ranaivosoa, L., Mihaminekena, T.H., Chamberlan, C. & King, T. 2013b. Conservation communautaire de *Prolemur simus* à Ambalafary, District de Brickaville, Madagascar. *Lemur News* 17: 54-57.

Ridges, P. 2013. The transfer of Djala's group (nine western lowland gorillas) from Port Lympne, UK, to Gabon, June 2013. *Wild Conservation* 1: 43-48.

Schwitzer, C., King, T., Robsomanitrandrasana, E., Chamberlan, C. & Rasolofoharivelo, T. 2013. Integrating *ex situ* and *in situ* conservation of lemurs. In: Schwitzer, C., Mittermeier, R.A., Davies, N., Johnson, S., Ratsimbazafy, J., Razafindramanana, J., Louis Jr., E. E. & Rajaobelina, S. (Eds). *Lemurs of Madagascar: A Strategy for their Conservation 2013-2016*. IUCN/SSC Primate Specialist Group, Bristol Conservation and Science Foundation, and Conservation International, Bristol, UK. Pp. 146-152.

Stone, D., Walters, G. & Ghogue, J-P. 2006. *Memecylon batekeanum*, a new species from southeastern Gabon, and a note on the circumscription of *Memecylon* sect. Mouririoidea (Melastomataceae). *Novon* 16: 276-280.

Traylor-Holzer, K., Leus, K. & McGowan, P. 2013. Integrating assessment of *ex situ* management options into species conservation planning. *WAZA Magazine* 14: 6-9.

van der Maesen, J. & Walters, G. M. 2011. Novitates gabonenses 77: A new *Eriosema* (Leguminosae-Papilionoideae) from Gabon and adjacent Congo. *Plant Ecology and Evolution* 144 (1): 101-105.

Vande weghe, J. P. 2008. *Les Plateaux Batéké : Aux confins de la forêt et de la savane.* Wildlife Conservation Society, Libreville, Gabon. 272 pp.

Vigne, L. 2013. Lao traders threaten Africa's elephants and rhinos. *Swara* (October-December 2013): 38-42.

Vigne, L. & Martin, E. B. 1989. Taiwan: the greatest threat to the survival of Africa's rhinos. *Pachyderm* 11: 23-25.

Vigne, L. & Martin, E. 2000. Price for rhino horn increases in Yemen. *Pachyderm* 28: 91-100.

Vigne, L. & Martin, E. 2008. Yemen's attitudes towards rhino horn and jambiyas. *Pachyderm* 44: 45-53.

Walters, G., Bradley, A. & Niangadouma, R. 2006. Floristics of Gabon's Batéké Plateaux: Guineo-Congolian plants on Kalahari Sands. In: Ghazanfar, S. A. & Beentje, H. J. (eds). *Taxonomy and ecology of African plants, their conservation and sustainable use*, pp. 259-266. Royal Botanic Gardens, Kew.

Walters, G., Dauby, G., Stévart, T., Dessein, S., Niangadouma, R. & Lachenaud, O. 2011. Novitates Gabonenses 80. Additions and corrections to the flora of Gabon. *Edinburgh Journal of Botany* 68 (3): 423-442.

Wedana, M., Kurniawan, I., Arsan, Z., Wawandono, N.B., Courage, A. & King, T. 2013. Reinforcing the isolated Javan langur population in the Coban Talun Protected Forest, East Java, Indonesia. *Wild Conservation* 1: 31-39.

White, B. 1995. Black rhino breeding exchange. *HELP: Friends of Howletts and Port Lympne Newsletter* 17: 39-41.

White, B. 2000. Rhinos. *HELP: Friends of Howletts and Port Lympne Newsletter* 22: 21-23.

White, B. 2001. Rhinos. *HELP: Friends of Howletts and Port Lympne Newsletter* 23: 18-20.

Whittaker, T. 1994. Ocelots to Mexico. *HELP: Friends of Howletts and Port Lympne Newsletter* 16: 36-37.

Wright, P. C., Johnson, S. E., Irwin, M. T., Jacobs, R., Schlichting, P., Lehman, S., Louis Jr., E. E., Arrigo-Nelson, S. J., Raharison, J.-L., Rafalirarison, R. R., Razafindratsita, V., Ratsimbazafy, J., Ratelolahy, F. J., Dolch, R. & Tan, C. 2008. The crisis of the Critically Endangered greater bamboo lemur (*Prolemur simus*). *Primate Conservation* 23: 5-17.

Zimkus, B. M. & Larson, J.G. 2013. Assessment of the amphibians of Batéké Plateau National Park, Gabon, including results of chytrid pathogen tests. *Salamandra* 49 (3): 159-170.