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DEER SPECIALIST GROUP NEWS

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Editorial


Dear DSG members,

I would like to start this issue of our DSG Newsletter with a special thank you to my colleague, Dr. Bill McShea, who served as the Co-Chair of the IUCN/SSC Deer Specialist Group for nearly a decade. We worked closely together, and I found in Bill a wonderful, very collaborative and helpful partner who improved significantly the deer conservation network in Asia. I am going to miss him but I am sure that he will continue to be a part of our network as a qualified member, sharing his vast expertise and knowledge of Old-World deer species.

After a process of open applications for the Co-Chair position, I am pleased to inform you that Dr. Jon Paul Rodríguez has appointed Dr. Noam Werner as the new Co-Chair who will be responsible for Old-World deer species. Noam is based at the Tisch Family Zoological Gardens (the Biblical Zoo) in Jerusalem, Israel.
Noam has large experience and has been involved with deer conservation for many years. He is deeply involved with the re-introduction of the Mesopotamian fallow deer to the Jerusalem Hills, both in-situ and ex-situ, and he is also been serving as the Chair of the EAZA (European Association of Zoo and Aquaria) Deer Taxon Advisory Group (TAG). Noam has been leading several deer-research projects, overseeing the coordination of captive population management programs, developing regional collection plans, collaborating with in-situ projects, and providing expertise for various deer conservation projects.
I am very happy that we will be working in collaboration to improve and reinforce the DSG network, to integrate deer biology knowledge, and to be more effective in conservation and management guidelines.
We wish to acknowledge our supporting agencies: to Susana González *Comisión Sectorial de Investigación Cientifica (CSIC-UdelaR)*, and the Women in Science Award of the L'Oreal Foundation-UNESCO-MEC in Uruguay for her research and contribution to the advancement of scientific knowledge on Neotropical deer species.
We want to acknowledge to all who contribute in this edition, also we extent our thanks to all of you for being part of the DSG and we invite all to submit articles to the next issue to Dr. Patricia Black (black.patricia@gmail.com).

Our best wishes,
Susana and Noam
Susana González and Noam Werner Co-Chairs, Deer Specialist Group.

Reintroduction of Indian mouse deer (*Moschiola indica*) at Amrabad Tiger Reserve and Kinnerasani Wildlife Sanctuary, Telangana, India.

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The Telangana State Forest Department, Central Zoo Authority (CZA), Nehru Zoological Park (NZP), and CSIR-Centre for Cellular and Molecular Biology (CCMB) have joined hands to conduct the first ever planned reintroduction of the Indian spotted chevrotain (*Moschiola indica*), also known as the Indian mouse deer. On 17th July 2018, the first batch of eight individuals was released into the wild, and the total no of eight batches released into the wild is 72 individuals.This follows more than seven years of conservation breeding of the elusive species at a dedicated facility in the premises of NZP, Hyderabad, which increased the captive mouse deer population up to around 232 individuals by March, 2019. Release is done after several months of preparation at the newly built soft-release facility in Amrabad Tiger Reserve (16.260589°N; 78.691461°E) and Kinnerasani Wildlife Sanctuary (17.682764°N; 80.570782°E).

Zoos in India have transformed in the last three decades and have performed several roles; among them, the focus on conservation breeding of endangered species with scientific inputs is worthy of highlight. The Indian mouse deer conservationbreeding programme is a notable example of this aspect of Indian zoos. It has led to the documentation of unique breeding behaviours of the species hitherto unknown in other ruminant species. With the successful establishment of a captive population, a reintroduction programme was the logical outcome. So, in accordance with IUCN's guidelines for

reintroduction, an action plan for the reintroduction programme was prepared using inputs about its behaviour and breeding biology revealed from observations made during the conservationbreeding programme.

A suitable area for release was identified in the Mannanur Range of Amrabad Tiger Reserve, and Chatakonda range of Kinnerasani Wildlife Sanctuary Telangana - a large expanse of deciduous forest with dense understorey, a critical requirement for mouse deer survival. A soft-release facility was set up with three compartments of varying dimensions and composition to reflect the staggered conditioning regime recommended for the release of captive-bred mouse deer into the wild. The three stages,*viz*. Stabilization, Acclimatization and Pre-Release, could be simultaneously occupied by at most 8 mouse deer individuals each. Each batch would spend at least two weeks in each stage before proceeding to the next stage. The reintroduction programme includes continuous monitoring of the released population through camera trap surveys and molecular identificationin order to evaluate the establishment success and to inform future decisions.

Mouse deer belong to the basal ruminant family Tragulidae. Since tragulids occupy important ecological roles as seed dispersers by consuming fallen fruits and as prey for several small and large carnivores like martens, wild dogs, leopards, tigers and large birds of prey, their presence in native forest ecosystems is essential. Under the Indian Wildlife (Protection) Act, 1972 the mouse deer is accorded Schedule-I status, giving it maximum protection. Historically, it was present throughout the deciduous and evergreen forests of the Indian subcontinent, but extensivehabitat degradation, especially of the forest understorey, and hunting for bush meat, has significantly reduced its population size with local extinctions reported from several places. Despite its widespread distribution, its inherently low population density makes it highly vulnerable to the aforementioned threats. However, recent measures have reduced the threat of hunting in many areas making them conducive for re-establishment of the species.

Reintroductions of locally extinct chevrotain into the wild are not only recommended but are a necessary condition for the long-term survival of the species. Moreover, reintroductions with the aim of supplementing small populations may help in preventing further population decline and local

extinctions. The mouse deer reintroduction programme is also expected to produce a wealth of information about its behaviour in the wild, of which little is known, and the factors affecting its successful establishment. Furthermore, the program would go a long way in realizing the full potential of Indian zoos as agencies of wildlife conservation.

Figure 1. A view of mouse deer at conservation breeding programme, Nehru Zoological Park, Hyderabad. Photo Credits: Buddi Laxmi Narayana

Figure 2. a) An enriched mouse deer enclosure under the conservation breeding programme initiated by Nehru Zoological Park, Hyderabad; b) A pair of mouse deer using an artificial shelter in the enclosure. Photo Credits: Mushkam Sandeep

Figure 3. a) A mouse deer drinking water in the stabilization stage of the reintroduction programme; b) Camera trap image of one of the eight mouse deer which were released into the wild.

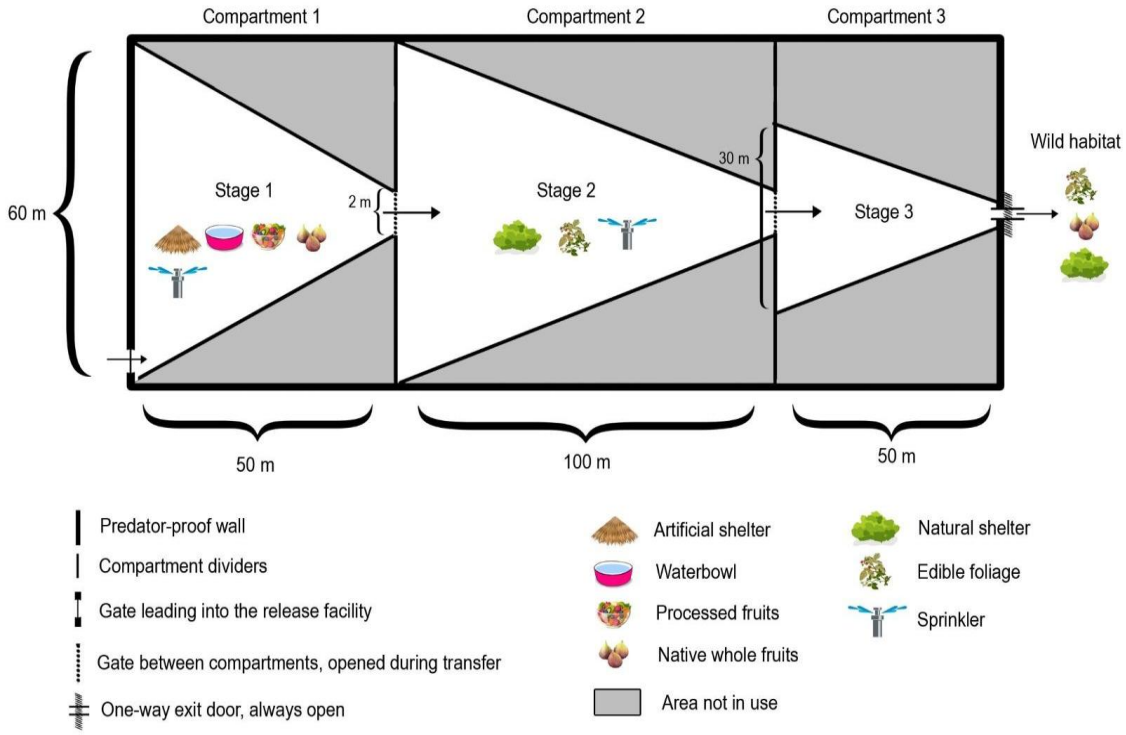

Figure 4. Design for the soft-release facility showing the three compartments and the features of each stage.

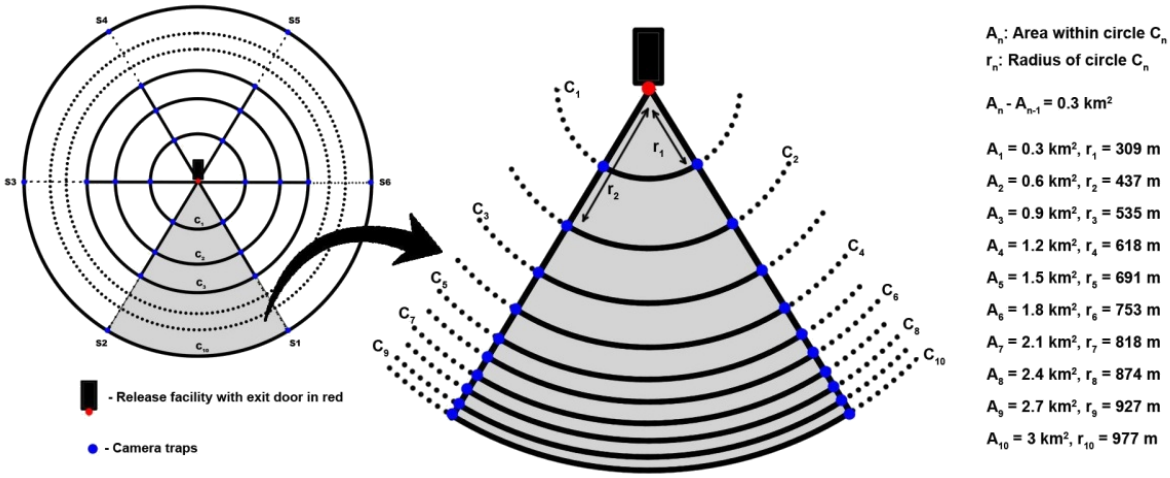

Figure 5. Illustration showing the camera trapping design. Left: Concentric circles C1-C10 with spokes S1-S6 and the soft-release facility in the centre; Centre: A sector of the outermost circle; Right: Distances from the exit door to each circle r1-r10.

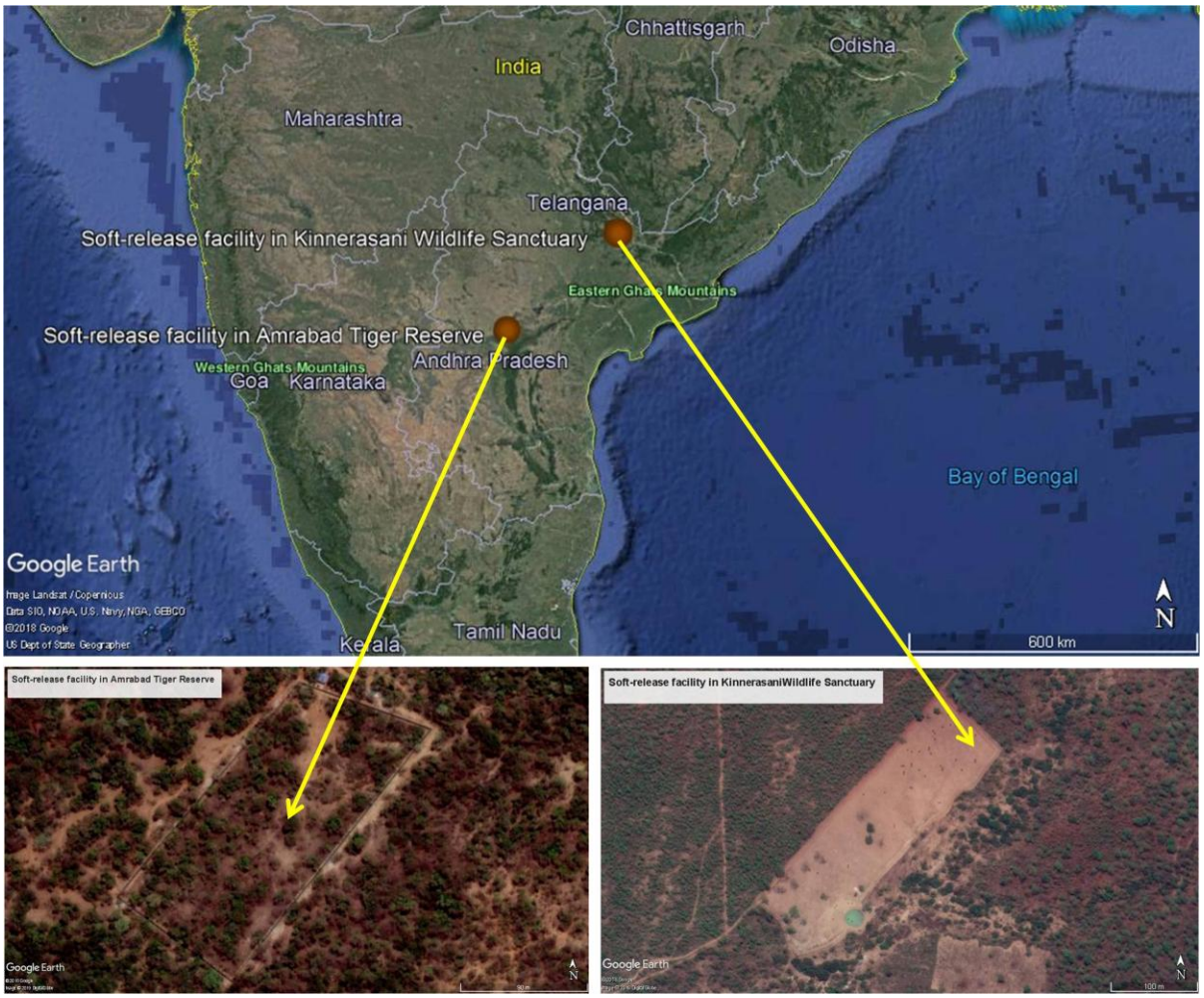

Figure 6. Map showing the soft-release facility in Amrabad Tiger Reserve (16.260589°N;78.691461°E) and Kinnerasani Wildlife Sanctuary (17.682764°N; 80.570782°E), Telangana, India.

Updates on the vulnerable marsh deer (*Blastocerus dichotomus*): new occurrence in wetlands of Southern Amazonia, Brazil

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Abstract

The marsh deer *Blastocerus dichotomus* is the largest Latin American species of deer, and one of the few examples for this group known to be restricted to wetlands. Historically, marsh deer occurred in several types of wetlands throughout South America. In Brazil, the highest concentrations occur in the Pantanal, with remaining populations distributed in the wetlands of the Bananal Island, Araguaia River, Guaporé River and remaining Paraná River floodplains. There are no recent records of its occurrence in the floodplains of the major rivers in Southern Amazon, especially Mato Grosso State. In this study, we recorded by camera-traps two marsh deer individuals and sighted one additional deer in the floodplain system of the Teles Pires River, mid-northern Mato Grosso, Brazil. These new records are located in an extensive region with no recent records for this species and indicate the persistence of a residual marsh deer population in the Teles Pires River floodplain system. The high concentration of environmental threats in these wetlands highlight the urgency of performing population assessments and identification of suitable habitat for marsh deer in this region, which would serve as a baseline tool for establishing corridors and promoting connectivity between the wetland patches along this river-plain system.

Key words: Marsh deer, distribution, Southern Amazon, Brazil

Resumen

El ciervo de los pantanos *Blastocerus dichotomus* es la especie de venado más grande de América Latina, y una de las pocas especies de venado conocidas por estar restringidas a los humedales. En Brasil, las concentraciones más grandes se encuentran en el Pantanal brasileño, con las poblaciones

restantes distribuidas en los humedales de la llha do Bananal, el río Araguaia, el río Guaporé y las tierras bajas del río Paraná. No hay registros recientes de su ocurrencia en las planicies aluviales de los grandes ríos de la Amazonía sur, entre los rios Juruena e Xingu, en el estado de Mato Grosso. En el presente estudio se registraron dos individuos con cámaras trampaen el sistema de llanuras de inundación del río Teles Pires, en el Rancho Paranatinga, municipio de Sorriso, en la mitad norte de Mato Grosso. Estos nuevos registros son importantes porque están ubicados en una extensa región sin datos actualizados en la parte norte del área de distribución histórica de la especie. El presente registro indica la persistencia de una población residual de ciervo de los pantanosen el sistema de humedales del río Teles Pires. Las amenazas ambientales en estos humedales señalan la urgenciade efectuar la evaluación de la población y la identificación de hábitats adecuados para los ciervos en la región como base para establecer corredores y promover la conectividad entre los parches de humedales a lo largo de este río.

Palabras clave: Ciervo de los pantanos, distribución, Amazonia meridional

Introduction

The marsh deer *Blastocerus dichotomus* is the largest Latin American species of deer, and one of the few species of deer known to be restricted to wetlands (Mauro et al. 1998). The species has morphological adaptations such as interdigital membranes, elongated hooves and relatively long limbs that enable it to move through these marshy and flooded shallow water landscapes (Tomas et al. 1997, Tomas et al. 2001).

Historically, marsh deer occurred in several types of wetland throughout Argentina, Bolivia, Brazil, Paraguay, and Peru (Duarte et al. 2016, Duarte et al. 2018). In Uruguay the species has probably been extinct since 1958 (González 1994), although oral records obtained in the Rocha department mention their presence until the early 1980s (Prigioni et al., 2019). In Brazil its original range covered the states of Mato Grosso, Mato Grosso do Sul, and Goiás, the southeast of Rondônia and the south of Pará and Tocantins, the south of Piauí and Maranhão, the west of Bahia and, in the region of the São Francisco River, the west of Minas Gerais and São Paulo, the extreme west of Paraná and the south and southwest of Rio Grande do Sul (Tomas et al., 1997).

The marsh deer's highest concentrations occur in the Brazilian Pantanal (states of Mato Grosso and Mato Grosso do Sul), which represent 88% of the total population of the species in Brazil (Duarte et al. 2018). The remaining 12% is distributed in the wetlands of the Bananal Island, the Araguaia River (states of Mato Grosso and Tocantins), from the Guaporé River (Rondônia state) to the remaining floodplains of the Paraná River, in the states of Mato Grosso do Sul, Paraná and São Paulo (Tomas et al. 1997, Duarte et al. 2018). Currently, the Brazilian marsh deer population is estimated at 25,000 mature individuals (Duarte et al. 2018).

In these regions, marsh deer survive at extreme risk in many floodplains of the great rivers and their tributaries within the limits of their historical distribution, constituting, for the most part, relictual populations (Pinder & Seal 1995), and there is the immediate possibility of local extinctions.

The species is classified in the category "Vulnerable - VU", especially due to loss of habitat from hydroelectric dams (Duarte et al. 2018). Hydropower dams resulted in the flooding of critical marsh deer habitat (Pinder 1995, Tiepolo et al. 2004), and contributed to a decrease in the survival rates of marsh deer (Wemmer 1998).

Although the marsh deer distribution originally included the Southern Amazonian forest (Cabrera 1961, Jungius 1976), there are no recent records of its occurrence in the floodplains of the great rivers of this region. In this context, especially in Mato Grosso state, there is a lack of information about the distribution of marsh deer. (Duarte et al., 2012, Duarte et al., 2018).

Here, we present new reports of marsh deer occurrence in a poorly known region for this species in Mato Grosso state, Brazil. Our results confirm the existence of a residual marsh deer population in the floodplain system of the upper Teles Pires River.

Material and Methods

Study area

The recorded individuals were detected during a pilot mammal survey conducted in a private reserved area (Reserva Legal) of the Paranatinga Ranch, in the municipality of Sorriso, mid- northern Mato Grosso state (11°54’ 48, 01” S; 55°43’58, 01” W). The area where the records were taken (Figure 1), is part of the floodplain system of the upper course of the Teles Pires River. It is a mosaic of depositional environments, locally presenting oxbow lakes and the deposition of a series of undulating 'ridges' and 'scrolls'. The area is part of a system of floodplains bordering the meandering section of the river subject to periodic floods.

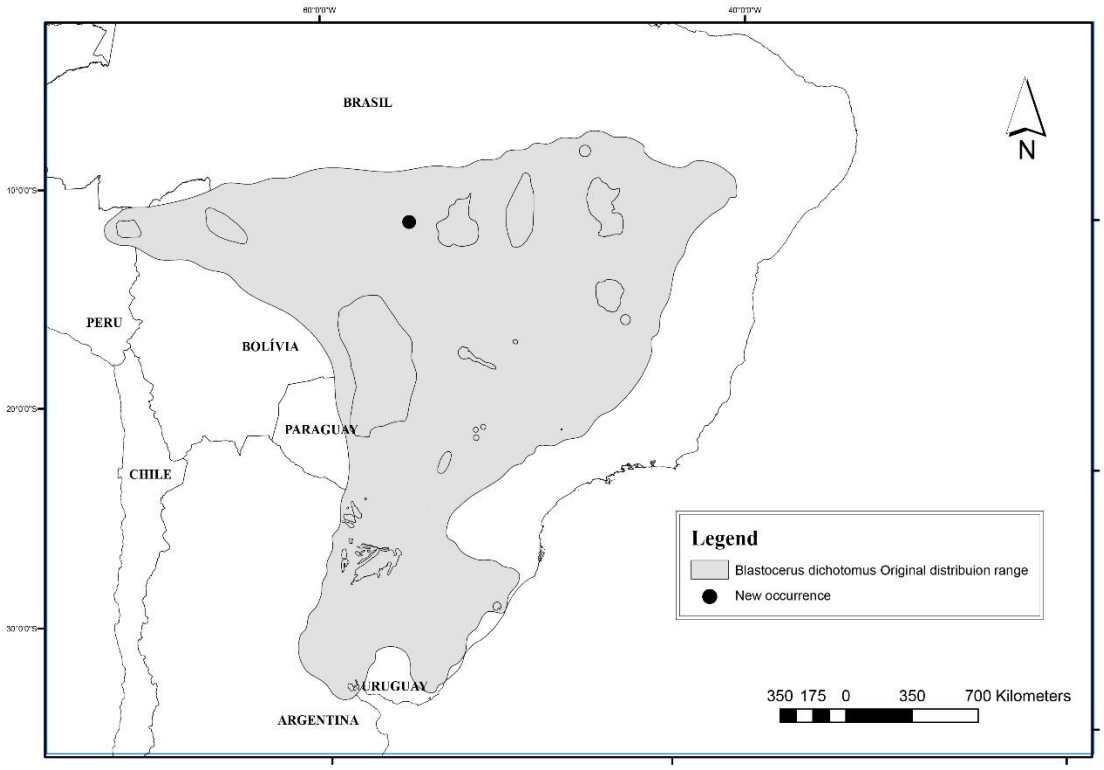

Figure 1. Map showing the historic distribution of Blastocerus dichotomus (adapted from Duarte et al. 2016), with the new occurrence (black circle). The smaller polygons within the hypothetical original occurrence area indicate the current distribution of the species.

The landscape in this locality is a mosaic of terrains, some of which flood and others which do not flood. The latter are higher elongated strips and pockets of alluvial forest at the height of ca. 340 m, containing seasonal forests, including the bacaba palm (Oenocarpus bacaba) and the inajá palm (Maximiliana maripa). Large areas of shrubby savannah occur in raised areas (ca. 313 m), with grasslands at the lower levels (ca. 306 m). These grasslands were flooded during part of the

observation period, March 2019 (Figure 2A), with abundant aquatic macrophytes, which are interspersed with dense and low savanna patches on slightly higher terrain. Flooded grasslands connect with smaller sparse patches of soaked grass on the wooded savannah (Figure 2B). (Mauritiella aculeata), pimenteira (Licania parvifolia), and murici (Byrsonima sp.) (Figure2B).

Figure 2. (A) Flooded savanna; (B) Patch of soaked grass on the wooded savannah, both typical habitat of marsh deer in the study area; (C) Female marsh deer recorded by camera trap; (D) Female marsh deer recorded by sighting (Photo by G. Wolf.); (E) Male marsh deer recorded by camera trap; (F) Marsh deer tracks in mud.

The flooding grasslands, where the marsh deer were recorded, are locally characterized by an herbaceous component, dominated by native grasses, and shrubs, marked by the presence of buritirana clumps

The study area was initially selected based on prior information of marsh deer occurrence. Subsequently, a rapid field survey confirmed the presence of the species through fresh tracks (Figure 2F). Based on this evidence, three Bushnell Trophy Cam HD traps were installed near the location of the footprints.

Results and Discussion

During the first period of camera trapping, the cameras remained active 24 hours a day for 14 consecutive days (March 9-23, 2029), totaling an effort of 1008 hours. As results of the camera trapping survey, we obtained 20 pictures of Brazilian tapir, *Tapirus terrestris*, three of red brocket deer, *Mazama americana*, and five of marsh deer. In the latter case, all were apparently from the same female individual (Figure 2C). These records of marsh deer were obtained in the daytime period, in an "isolated" semi-flooded grassland patch in a woody savanna matrix. This 300 x 70 m patch connects with more extensive open areas through corridors of herbaceous vegetation or shallow brush. The finding of tracks elsewhere in the area indicates that the animals use denser savanna habitats and not just the grasslands.

During the second period of camera trapping (June 23-29, 2019), totaling an effort of 144 hours, we obtained 10 images of tapir, one of jaguar, *Panthera onca*, and three images of male marsh deer (Figure 2E) at the coordinates 11 ° 53 '42.4 "S, 55 ° 41' 40.7". These records were obtained from a 2000 x 1000 m patch of shrubby savannah-grassland habitat, not flooded during the sampling period. The records of marsh deer were obtained during the day (two pictures), and at night (one picture).

An additional record was obtained by direct observation of a mature female crossing the Teles Pires River on March 19, 2019, at 12:00 noon (Figure 2D) at the coordinates 11 ° 53'35.27 "S, 55 ° 41 '06.29 "W, about 5 km north of the former locality. The animal sighted swam between the floodplain of the left bank of the river, almost totally drained by mining activity, and the wetlands of the right bank, subject to a low level of anthropic disturbance.

The present records are within the limits of the historical marsh deer distribution (Figure 1), in a region with suspected occurrence for the species (Autuori 1972). However, these records are important because they are located in an extensive region with no recent data on the northern portion of the historical range. The floodplain where the records were obtained, as well as other wetlands along the river-plain system of the Teles Pires and Verde Rivers (the latter a tributary of the left bank of the Teles Pires River), are immersed in an array of mechanized croplands, which reach the boundaries of the waterlogged terrain.

In addition to the consequences of land-use pressure on both banks of this floodplain-river system, the wetlands directly suffer strong threats, especially from mining (locally, clay exploration for the ceramic industry), fish farming, permanent flooding by hydroelectric power, hunting and fire. The loss of these floodplain environments compromises the possibility of the long-term survival of deer populations (Charity et al., 1989). Habitat loss--of extreme importance--, in addition to hunting, is of great importance to the conservation of the marsh deer (Duarte et al., 2012). The latter is practiced intensely in the region, and together with habitat loss, is a factor that could drive the local extinction of this residual subpopulation.

The Amazon River basin includes marsh deer populations mainly associated with the Tocantins, Araguaia, Xingu, Guaporé, and Juruena River systems (Márquez et al. 2006). The present marsh deer records in this region, considered as a gap in consistent data, confirms the persistence of a residual population in the floodplain system of the Teles Pires River, in its upper course, between the Juruena River basin to the west, and the Xingu basin to the east.

The concentration of threats in these wetlands require an urgent population assessment for this species, besides the identification and mapping of suitable habitat. This data can be used as a baseline for the characterization and protection of the movement corridors in the Southern Amazon, and for the planning of connectivity between the wetland patches, aimed at the conservation of the biodiversity of these wetlands, especially its remnant marsh deer population.

Acknowledgements

We would like to thank Marcos R. Teixeira for the information that triggered this investigation, and Gustavo Wolf for ceding one of the marsh deer records presented here. We also thank Antonio M. Esquivel for his help with the distribution map of the new marsh deer occurrence. Thanks also to S. Gonzalez, Lucas G. da Silva e José L. Franco for their reviews and valuable comments.

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The One Plan Approach and Regional Collection Planning by the EAZA Deer TAG

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In recent years there is a growing understanding that in-situ and ex-situ conservation strategies complement each other and that in many cases both would be needed in order to guarantee the future of threatened species (Redford et al 2011). This understanding has led to increased efforts by both the in-situ and ex-situ conservation communities to strengthen the collaboration between them, a collaboration that is more and more evident in the reciprocal flow of information and a greater recognition of the mutual and complementary needs. When the IUCN/SSC and the zoo and aquarium community are involved a structured strategy, the One Plan Approach (OPA), has been created in order to better identify the measures that that might be needed to protect species (Byers et al 2013, IUCN/SSC 2014).

Given the recency of this strategical shift, it will take some time to fully implement it, but one of the first uses of the OPA idea has been done by regional zoo associations when creating their regional collection plans. Much of the collaborative conservation work (e.g. population management programs) within the larger regional zoo associations is overseen by Taxon Advisory Groups (TAG), which are similar to IUCN/SSC specialist groups in that they, like many SGs, focus on specific groups of taxa. One of the tasks of the TAGs is to produce a Regional

Collection Plan (RCP), which recommends to the member institutions which species they should keep, why they should keep them, and how intensively these species should be managed, and, for the European Association of Zoos and Aquaria (EAZA) TAGs, the process of preparing their RCPs follows the IUCN/SSC's Guidelines on the Use of Ex Situ Management for Species Conservation (IUCN/SSC 2014).

Recently, the EAZA Deer TAG completed its RCP revision process, several years after it was last updated and for the first time since the incorporation of the OPA into the EAZA conservation framework. The EAZA Deer TAG, like the IUCN/SSC Deer Specialist Group, is responsible for all deer, musk-deer and chevrotain species and, prior to the revision of its RCP, the TAG had overseen 12 formal population management programs (i.e. approved by the EAZA) and several more TAG-approved, low-intensity management programs. In preparation for this latest RCP revision process the TAG had identified 38 species and subspecies that would be discussed in detail. Most of these were selected because they are already kept by EAZA member zoos, and a few others were selected because preliminary data suggested that they might potentially have conservation roles. Unfortunately, due to current European Union veterinary regulations, EAZA's possibility of contributing to the conservation of the rest of the species under the remit of the Deer TAG, namely those that are not currently kept by EAZA member zoos, is unlikely but, nevertheless, they were discussed briefly, individually or as species groups, in case circumstances change in the near future.

Following the selection of species for discussion, and still before the RCP revision workshop, a thorough status assessment, both in-situ and ex-situ, and a risk assessment for every species

were carried out, which is the first step in the IUCN/SSC Guidelines on the Use of Ex Situ Management for Species Conservation. The results of these assessments, which were primarily done by an EAZA population biologist, would fill the first part of each Species Assessment Sheet, which would later be reviewed by the TAG's species program coordinators and/or by more colleagues from the TAG, the species range countries, other zoo associations and the Deer Specialist Group, who could all add data and complete the relevant information.

In early June 2019 the RCP revision workshop took place at Tierpark Berlin, Germany, for two full days. The workshop was attended by 20 people who represented various stakeholders including the EAZA Office, current and past TAG members (program coordinators), IUCN/SSC Deer Specialist Group members (including the Co-Chair, Susana Gonzalez), IUCN/SSC Conservation Planning Specialist Groups, the academy, and the private/non-EAZA sector, which all contributed to a diverse discussion that was the main tool for completing Steps 2-4 of the IUCN/SSC Guidelines on the Use of Ex Situ Management for Species Conservation. In Step 5, the final one, a decision about which ex-situ roles and activities (if any) to retain for each species was made, and an RCP category was assigned respectively. The RCP categories that are used by the EAZA (see Table 1) represent, among and within them, a continuum of management levels, starting from various types of monitoring, in which there is no proactive management, through various degrees of proactive population management under the title of EAZA Ex-situ Programme (EEP), including the most intensive management level that comprises genetic and demographic analyses and annual transfer recommendations.

Table 1. EAZA RCP categories that have been assigned to various species in the Deer TAG RCP and their respective descriptions.

CATEGORY	**DESCRIPTION**
EEP	EAZA *Ex situ* Programme. The taxon needs proactive management by EAZA to fulfil its specified *ex situ* roles. This includes programmes that require proactive management to phase out the taxon or replace it with one or more other taxa. The proactive management must not necessarily include managing a population in the EAZA region (e.g. can involve activities by EAZA staff to help manage an *ex situ* population/programme in a range state). EAZA can be the lead partner in the *ex situ* programme, or can be a participating partner in a collaboration lead by others (e.g. range state governments, NGOs, other zoo association, etc.) *For new EEPs or old EEPs, ESBs or Mon-Ps transferring to the new EEP format for the first time, an EEP application form should be completed specifying the characteristics of the EEP.*
MON-T REPLw	The TAG will monitor the replacement of this taxon with one or more other taxa (specify which).
MON-T Phase out	The TAG will monitor the recommended disappearance of this taxon from EAZA collections.
MON-T DNO	The taxon is currently not present in EAZA collections and is not recommended to be obtained in EAZA collections. Its presence/absence will be monitored by the TAG.
MON-T	The taxon is present in EAZA collections and while there is no specific role for the taxon (with associated management), there is also no active recommendation to replace or phase out the taxon. The TAG will monitor the numbers of this taxon in EAZA collections.

After the completion of the workshop 18 species and subspecies were preliminarily assigned EEP programs, i.e. proactive management (see Table 2). These 18 species represent most regions of the world, including south-east, east, south, central and west Asia, Europe and South America, diverse habitats, and all taxonomic groups that the TAG is responsible for (i.e. deer, musk-deer and chevrotains).

Table 2. List of species that preliminarily were assigned an EEP in the RCP and their respective expected conservation roles. The EEP status of the different species is pending approval of the EAZA EEP Committee.

Common name species *(Scientific name)*	**IUCN Red List** (species level)	**Direct Conservation role(s) recommended for *ex situ* management**	**Indirect Conservation role(s) recommended for *ex situ* management**	**Non-conservation role(s) recommended for *ex situ* programme**	**RCP category ***
Tufted deer *(Elaphodus cephalophus)*	NT	**Insurance, Research**	N/A	**Education**	EEP
White-lipped deer *(Cervus albirostris)*	VU	**Insurance**	N/A	**Education**	EEP
Visayan spotted deer *(Rusa alfredi)*	EN	**Insurance. Source,** Education, Technical assistance	**Fundraising**	**Education**	EEP
Bawean deer *(Axis kuhlii)*	CR	**Insurance**	**Fundraising**	N/A	EEP
Hog deer (*Axis porcinus*)	EN	Insurance	**Fundraising, Expertise**	**Education**	EEP
Burmese brow antlered deer *(Rucervus eldii thamin)*	EN	Insurance, Source	**Fundraising, Technical support**	N/A	EEP
Barasingha deer *(Rucervus duvaucelii)*	VU	**Insurance**	N/A	**Education**	EEP
Sambar *(Rusa unicolor)*	VU	**Insurance (*Malayan subspecies*)**	N/A	**Exhibit**	EEP
Indochinese sika deer *(Cervus nippon pseudaxis)*	LC	**Insurance, Source**	N/A	N/A	EEP

Formosan sika deer *(Cervus nippon taiouanus)*	LC	**Insurance**	N/A	N/A	EEP
Large antlered muntjac *(Muntiacus vuquangensis)*	CR	Rescue, Research	**Technical support, Fundraising**	N/A	EEP
Lesser chevrotain *(Tragulus kanchil, T. javanicus, T. williamsoni)*	LC/DD/DD	N/A	**Fundraising**	**Husbandry, Education**	EEP
Balabac chevrotain *(Tragulus nigricans)*	EN	**Insurance**	**Fundraising**	**Education**	EEP
Forest reindeer *(Rangifer tarandus fennicus)*	VU	**Insurance, Source**	**Education**	N/A	EEP
Bactrian wapiti *(Cervus hanglu bactrianus)*	VU	**Insurance**	**Model species**	N/A	EEP
Mesopotamian fallow deer *(Dama mesopotamica)*	EN	**Insurance, Source (Israel)**	N/A	**Education**	EEP
Siberian musk deer *(Moschus moschiferus)*	VU	**Insurance**	N/A	N/A	EEP
Chilean pudu *(Pudu puda)*	NT	**Insurance**	N/A	**Exhibit, Education**	EEP

All 12 species and subspecies that had formal programs before the RCP revision retained their status and 6 others (some had TAG-approved program previously), were assigned new EEP programs. Out of the 18 taxa, all but 1 are either threatened or Near Threatened and in need

of an insurance population, and, in several cases, also a source population that will provide animals for reintroduction. One unique case among the 18 recommended EEPs is that of the Critically Endangered large-antlered muntjac (*Muntiacus vuquangensis*). While other EEPs were assigned to species that are already being kept by EAZA member zoos and have a standard structure of management, the large-antlered muntjac is not kept by EAZA member zoos or by any other zoo around the world. Nevertheless, the situation of the species in the wild is dire, and the establishment of an ex-situ population is recommended as an urgent conservation need for the species and, therefore, the TAG decided to create an EEP that will focus on communicating with stakeholders in the range countries and try to accommodate their needs, for example, by providing technical support or funding. The decisions received during the RCP revision workshop still need to go through an approval process by the EAZA EEP Committee, and once approved, hopefully before the end of 2019, will become formal and published for all EAZA members to use.

Overall, the recent regional collection planning process of the EAZA Deer TAG has been very constructive. The contact between the DSG and the EAZA Deer TAG, which has been maintained for several years by mutual memberships and personal acquaintances, has proven useful and allowed better implementation of the OPA in the process. The more background data there is, the better the OPA will work, and the more useful the RCP will be, and the contacts between the organizations have been imperative for getting this necessary data. Because of the on-going strong collaboration between the DSG and the TAG and the

implementation of the OPA in the current RCP process, we hope that the current version of RCP would help to advance deer conservation better around the world.

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News from the 9th International Deer Biology Congress

David Hewitt, Randy DeYoung, Jim Heffelfinger, and Kurt Vercauteren, Congress Organizers

During August 5-10, 2018, 194 deer biologists from 18 countries gathered in Estes Park, Colorado, USA for the 9th International Deer Biology Congress. Participants gave 7 plenary talks, 138 oral presentations, and 27 posters on deer ecology and management from around the world. Estes Park was a great venue with stunning mountain views, complex deer management issues, and the potential to see 4 deer species (elk, moose, mule deer, and white-tailed deer).

The Congress opened with a session on the ecology and management of white-tailed deer, mule deer, and elk, the 3 most prominent deer species in North America. Later sessions provided similar overviews of management challenges for deer in other parts of the world, including Asia, Latin America, and Europe. A topic featured in both Plenary and Special sessions was chronic wasting disease. This cervid-specific disease was first recognized in a research facility 75 km from the meeting site and the disease has been known in deer populations in the area for nearly 40 years. Migration and other large-scale movements was another featured topic at the Congress. Scientists from Europe and

the western United States shared their findings on the importance of landscape connectivity for deer to thrive in mountainous regions.

Endangered and threatened deer species were the subject of several presentations because of good attendance of scientists from Asia and South and Central America. On the other end of the deer population and management spectrum, over-abundant deer in Japan, North America, and Europe were also the topic of many presentations.

The learning and interaction went outside the lecture halls on Wednesday, August 8th. Participants spent a day in the field touring Rocky Mountain National Park and discussing deer management and ecology with federal and state biologists.

The meeting was held at the family-friendly YMCA of the Rockies and many participants brought their families. The venue was intimate, fostering close interaction amongst Congress participants and many late night conversations around a campfire, underneath the clear starry skies of the Rocky Mountains.

The IDBC Scientific Steering Committee selected Croatia as the site of the 10th International Deer Biology Congress. Dean Konjevik will be the Congress organizer. The date has yet to be decided but as the meeting details are determined, they will be posted at https://www.deerbiologycongress.org/. Check the website and make every effort to attend the next IDBC. Croatia is a beautiful country and the 10th Congress promises to be the best yet!

Reintroduction of Persian fallow deer in Israel

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The Persian fallow (*Dama mesopotamica*) was considered extinct until a small population of around 25 individuals was found in Iran in 1956. These Iranian areas were then protected and the deer began to increase. A few deer were captured in 1965, released into an enclosure and allowed to reproduce. Some of these deer were then re-introduced into different areas in Iran. Individuals also were captured and sent to Germany to establish an *ex situ* population. Deer from both the Iranian and German programs were sent to Israel and bred. Four reintroduction programs were later initiated.

Five Persian fallow deer were released into the wild this year by the Jerusalem Biblical Zoo. The deer were released into the hills of Jerusalem on February 25, 2019. This is one of Israel's four re-introduction sites, the Judean Mountain site, which has been estimated at 50 mature individuals and increasing.

http://www.globaltimes.cn/content/1140169.shtml

New observatories built for observing Corsican red deer

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The Corsican red deer (*Cervus elephas corsicanus*) is a dwarf subspecies of red deer endemic to the islands of Corsica and Sardinia. It went extinct on the island of Corsica in the 1970's. After protection on the island of Sardinia and the establishment of a captive breeding population, it was re-introduced to Corsica in 1998. By 2007 the population had reached 250 mature individuals and it was listed as Near Threatened by the IUCN.

Recently, three identical observation towers for viewing of Corsican red deer in the Regional Natural Park of Corsica, which covers 40% of the island, have been built to allow for public viewing of the deer. The towers, built by Orma Architecture have been designed with vertical wooden slats to permit panoramic views of the landscape without disturbing the deer. These natural wood towers are designed to resemble the natural vegetation and blend into the landscape while providing an optimal viewing experience for the visitors.

For further details visit the link below:
https://www.dezeen.com/2019/02/26/corsican-deer-observatories-orma-architettura-mountain-viewpoint/?utm_medium=email&utm_campaign=Daily%20Dezeen&utm_content=Daily%20Dezeen+CID_a96397f3b3c89c45b222d3cb15406205&utm_source=Dezeen%20Mail&utm_term=Trio%20of%20deer%20observatories%20by%20Orma%20Architettura%20nestle%20within%20Corsican%20mountains

First Phillipine spotted deer of year born

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The first Phillipine spotted deer (*Rusa alfredi*) of the year was born on January 10 at the Newquay Zoo in the UK. The Newquay Zoo already has 3 other individuals of this species, the mother, father and brother of this newborn female. This species, endemic to the Phillipines, is classified as EN by the IUCN; it is estimated that there are less than 2500 mature individuals left in the wild. It is currently found only on the islands of Panay and Negros, and its populations are decreasing due to the threats of habitat degradation, sport and subsistence hunting and live capture for the pet trade. *Ex situ* conservation is being done in several European zoos as well as in the Phillipines.

For further details visit the link below:

http://www.newquayvoice.co.uk/news/5/article/7095/

Chilean huemul affected by life threatening foot disease

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The huemul (*Hippocamellus bisulcus*) is the only South American deer listed as Endangered by the IUCN. Found in Patagonia in Argentina and Chile, it is characterized by steadily decreasing numbers in spite of protection programs. There are a maximum of 1500 mature individuals in highly fragmented populations. Habitat loss, poaching and disease are major problems.

A huemul deer in Chilean Patagonia. Credit: Alejandro Vila/Wildlife Conservation Society

Recently 24 cases of foot disease were reported in Chilean huemul in the Bernardo O'Higgins National Park where huemul are protected. The disease causes pain, swelling, and partial or complete loss of the hoof, which can lead to death. The affected animals have difficulty in moving and foraging, and thus are susceptible to starvation and predation. Death occurred in 40% of affected deer. The disease appears to be caused by parapoxvirus which now poses another threat to this iconic species. Parapoxvirus, identified from DNA samples, is related to bovine viruses and probably was introduced with livestock, which were introduced into the Huemules Valley in 1991 and only removed in 2004. Most of the

affected deer were found in this valley, although 6 sick deer were found in the Bernardo and Katraska Valleys between 2008 and 2010. These valleys are more isolated and have never had cattle. The study concluded that better monitoring of the population, with collection of samples and rapid delivery to laboratories could lead to faster identification of problems and solutions to help the huemul. It requires collaboration between academic institutions NGOs and government agencies. The study was reported in the April 17th issue of PLoS ONE.

For further details visit the link below:
https://m.phys.org/news/2019-04-life-threatening-foot-disease-endangered-huemul.html

Climate change produces population crash in Arctic caribou

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Wild caribou (*Rangifer tarundus*) populations have decreased by more than half, from almost 5 million animals to 2.1 million, in northern Canada and Alaska, in the last two decades. Some herds have decreased by more than 90%.

These drastic changes indicate that recovery would be very difficult. Weather patterns and vegetation changes are responsible for these declines. These data come from a report at the American Geophysical Research Union meeting. The changing conditions include increased drought, warmer temperatures and more rain. These produce a change in vegetation, where the caribou's preferred food—lichen—are covered by taller vegetation, and an increase in the number of insects, which can irritate the caribou sufficiently to interfere with their foraging time and efficiency. Rain is also a problem because it frequently falls on snowy ground, then freezes and forms a layer which the caribou can't penetrate in order to reach their food. These changes due to Arctic warming are another factor that underscores the importance of addressing global warming.

For further details visit the link below:

https://www.bbc.com/news/science-environment-46516033

obituary

Colin Groves (1942–2017)

Evolutionary biologist who brought taxonomy to life.

Taxonomy allows us to manage and investigate the bewildering complexity of the living world. Most of us take a sound taxonomy for granted, but thankfully a few generous souls work to make sure the taxonomic house is kept in good order. Colin Groves was an old-school whole-animal biologist who gave taxonomy, and its implications for conservation, the attention it deserves. In doing so he furthered not only his own research agenda, but also the research agendas of many others.

Groves, who died on 30 November 2017, conducted much of his fieldwork in museums poring over seldom-accessed skeletal collections. His method was to assemble as large and as geographically diverse a sample as possible of a mammalian taxon in order to critically evaluate the case for lumping or splitting a particular species.

Groves' taxonomic and geographic scope was broad, and the list of groups he investigated reads like the inventory of a major zoo — he contributed to major revisions of the taxonomies of primates and ungulates, and he worked on mammals from Asia, Africa and Australia. He also made influential, and characteristically iconoclastic, contributions to several debates about human evolutionary history.

Groves was born on 24 June 1942 in Enfield, an outer suburb of London. As a teenager, he would visit what is now the Natural History Museum. His father was a travel agent, so even as a youngster Groves was no stranger to overseas travel. He went to a boarding school, Lancing College, where his interests in natural history and art were encouraged. Groves wanted to study zoology at university, but his father pushed for a degree in linguistics; they compromised on anthropology at University College London.

Groves focused on biological anthropology and for his postgraduate research he decided to work with John Napier, then the doyen of British primatology and human evolution research, in the Unit of Primatology and Human Evolution at the Royal Free Hospital Medical School in London. Napier suggested that gorilla taxonomy was in need of care and attention, so Groves used multivariate methods to characterize variation among

Credit: Australian National University

more than 700 gorilla crania. After the award of his PhD in 1966, Groves taught at the University of California, Berkeley, then at the London branch of the Smithsonian Institution's Primate Biology Program, which Napier opened in 1969, and after that at Cambridge University.

Groves was appointed to his first, and only, faculty position at the Australian National University (ANU) in 1973. The following year he moved to Canberra to join ANU's School of General Studies. As it turned out, Australia and the ANU suited Groves to a tee. In an interview not long before his death, he said that, at the ANU, "I can work on what I want, I can dress how I want and I can teach what I want. I thought I'd come over for three or four years and see how I like it, and I'm still here." He rose through the academic ranks, and while doing so he found the time and space to write seminal books and papers on pure and applied taxonomy, as well as making important contributions to taxonomic theory.

His 1989 book *A Theory of Primate and Human Evolution* tackled many of the thorniest issues in palaeoanthropology, and offered solutions that were far from mainstream. Groves argued that heterochrony and centrifugal speciation played major roles in the evolutionary change he observed within what we now call the hominin clade. He was an early and ardent advocate for cladistic methods, and together with Czech colleague Vratislav Mazák, proposed the recognition of a new species, *Homo ergaster*. More recently he worked tirelessly to debunk the more irrational interpretations of *Homo floresiensis* from Flores that have been doing the rounds.

Although primates, and especially apes, were the focus of Groves' research, his interests were unusually, and perhaps even uniquely, eclectic. Asses, bandicoots, deer, elephants, gazelles, horses, pigs and rhinoceroses attracted his attention at one time or another. Groves was particularly respected for his thoughtful and scholarly reviews of ape taxonomy, and just a few weeks before he died he was a co-author on a paper that presented cogent evidence for a second species of orangutan on the island of Sumatra. His wide interests made his opinions especially valuable.

Groves was a scholar who wore his encyclopaedic erudition lightly. He was particularly helpful to students and seemingly never tired of answering the hundreds of enquiries that came his way. When I was editing an encyclopaedia of human evolution, he was my go-to source for any question involving nomenclature. If I sent him a question during the evening, a considered and helpful reply would nearly always be waiting in my inbox the next morning.

Groves was particularly interested in endangered species, and in many ways he was one himself. In an era when universities are ever more 'corporate', I cannot imagine a department hiring a taxonomist, especially one whose interests are metaphorically, and literally, all over the map. His many colleagues miss him already, and biology will lament the eventual extinction of researchers and scholars with the breadth of interest that Groves displayed. ❐

Bernard Wood

CASHP, George Washington University, Washington DC, USA. He first met Colin Groves in 1966 as an undergraduate attending a course given by John Napier. Groves spoke to the class about his gorilla research.

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