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EUROPEAN *EX SITU* PROGRAMMES FOR LARGER NEW WORLD MONKEYS

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Abstract

Captive breeding programmes for primates can support the conservation of *in situ* populations of endangered species. European zoos, organised in the European Association of Zoos and Aquaria, keep almost 4000 of the larger Neotropical primates in their collections. Most of the species are managed in cooperative breeding programmes of various sizes. We report the current state of the European captive breeding programmes for these species and discuss the role assigned to each concerning the conservation of primates *in situ*. European zoos are successfully breeding most species currently kept under their care and are able to make an important contribution to the captive breeding of other, more endangered primate species, if requested by range countries. Many zoos that keep larger Neotropical primates provide financial or technical support to *in situ* conservation projects.

Keywords: captive breeding, zoos, EAZA, Larger New World Monkey TAG, conservation

Introduction

Modern zoos play an important role in the conservation of species and habitats, and large conservation organisations such as the International Union for Conservation of Nature (IUCN) recognize that *ex situ* management is one option that can contribute to the conservation of threatened species (IUCN SSC 2014). While zoos are important financial contributors to nature conservation, they can also support conservation initiatives through technical assistance, research projects and educational programmes. It is important that international authorities, governments and conservationists are aware of the wide array of support that modern zoos can provide to nature conservation activities. *Ex situ* populations of animals are important for their educational and research roles, and can furthermore serve to reinstate or reinforce wild populations. However, intensive management is necessary to guarantee their demographic and genetic health. Different regional zoo associations have set up *ex situ* programmes (Mũnoz Lora et al. 2020) and here we describe the organisation of such programmes and the status of larger Neotropical primates in European zoos.

Organisation of *Ex Situ* Programmes in European Zoos

The captive breeding programmes in European zoos are coordinated by the European Association of Zoos and Aquaria (EAZA) and are named EAZA *Ex Situ* Programmes (EEPs). At this moment, more than 400 taxa are managed in an EEPs of both vertebrates and invertebrates. In January 2018 EAZA implemented a new Population Management Structure, guided by the One Plan Approach to species conservation planning (Byers et al. 2013) and the IUCN Species Survival Commission (SSC) Guidelines on the Use of *Ex Situ* Management for Species Conservation (IUCN SSC 2014). The main participants of the EEPs are EAZA members, but in specific cases non-EAZA zoos (including those from other regions) and even private breeders can be approved for participation, provided that they meet the EAZA standards and their participation is important for the EEP. The EEP Committee is responsible for the functioning and development of the EEPs and long-term animal collection planning. An extensive Population Management Manual has been developed by EAZA (EAZA 2022), and is constantly being updated. Each taxonomic group of animals is overseen by a Taxon Advisory Group (TAG), consisting of a Chair and one or more Vice Chair(s) and a core group of experts and studbook keepers. Experts from in- and outside EAZA can be invited as advisors. Considering the large number of Neotropical primate species kept in European zoos, it has been decided to manage the EEPs for the callitrichids in the Callitrichid TAG and all other species in a Larger New World Monkey TAG. Here we focus only on the species managed in the latter. The main tasks of the TAG are the development and implementation of the Regional Collection Plan (RCP) for the EAZA region and assisting EEP coordinators in the development of their programmes. In the RCP, the TAG determines which species are recommended for management under an EEP. The most recent RCP for the Larger New World Monkey TAG was published in 2007 (Vermeer 2007). When compiling the RCP, the TAG has to find a balance between the needs of the species, their availability in

captivity, the institutional wishes of EAZA members, the husbandry requirements of a species and the capacity in zoos (enclosure space, staff, etc.). Ideally, we would have EEPs for all species that are in need of *ex situ* management. However, the current species' presence in zoos should be seen in an historical context and reflects the species that were obtained in the past through animal dealers. In many cases these are non-endangered species. However, keeping non-endangered species can also be beneficial for conservation (e.g., for research and education), and for species that are currently considered to be "safe" that could become endangered in the near future. An important condition to decide the initiation of an EEP for a certain species is the availability of sufficient animals to manage a demographically and genetically viable population (Ballou et al. 2010). In most cases, these animals need to be available in captivity outside range countries, as import from range countries is often impossible. There are exceptions, such as the EEP of the buff-headed capuchin monkey (*Sapajus xanthosternos*). This species was not present in zoos outside Brazil and an *ex situ* population was created in Europe with the cooperation of the Brazilian government. The TAG has implemented a nonbreeding policy for the population of non-endangered capuchins in EAZA zoos, in order to provide more space for the critically endangered buff-headed capuchin monkeys. Following the example of the buff-headed capuchin monkey EEP, EAZA zoos would be available to initiate or participate in international breeding programmes for endangered species that are in need of a well-managed *ex situ* breeding programme that are not yet present in European zoos. Space in zoos is restricted, but populations of non-endangered species could be phased-out by nonbreeding policies to create space for endangered species. Most endangered Neotropical primate species are no less attractive than the species currently kept in European zoos, so visitors will hardly see the difference. Many visitors would, however, appreciate the efforts of zoos for wildlife conservation through captive breeding. Zoos and rescue centres in range countries often keep endangered primates that for some reason cannot be returned to the wild, and such individuals could be very suitable for cooperative captive breeding programmes.

Roles of EAZA *Ex Situ* Programmes

As mentioned, there are various ways that keeping non-endangered species in zoos can serve nature conservation. The different roles that can be assigned to an EEP are direct conservation (insurance population for future restoration or reinforcement, rescue, research, training, education) and indirect conservation (providing knowledge, education, lobbying, fundraising) (EAZA 2022). With close to one billion visitors annually, zoos can have a huge impact on people's attitudes towards nature and environmental protection, and the conservation status of the presented species is hardly an issue for this role. Non-endangered species can serve as models for research that can help the conservation of endangered species. A good example is that the extensive experience with keeping non-endangered callitrichids in zoos has served as a guide for the initiation of captive breeding programmes for endangered species such as *Callithrix aurita* and *Oedipomidas leucopus*. The non-endangered species can also serve as ambassadors for their wild counterparts, resulting in the initiation of or support for conservation projects for endangered species. After receiving a breeding group of coppery titi monkeys (*Plecturocebus cupreus*), La Vallée des Singes primate park in France initiated Proyecto Mono Tocón, for the conservation of the critically endangered San Martín titi monkey (*Plecturocebus oenanthe*) in Peru (Bóveda-Penalba et al. 2009; Vermeer and Shanee 2020). This project exists thanks to the financial support of coppery titi EEP participants and resulted in several other conservation initiatives for this species in Peru.

Table 1. Examples of some conservation programmes supported by EAZA zoos.

Species	Country	Conservation Partners
Sapajus xanthosternos	Brazil	Universidade Federal de Mato Grosso, UNIMONTES and others
Ateles fusciceps	Ecuador	Proyecto Washu
Ateles fusciceps	Colombia	Neotropical Primate Conservation
Ateles hybridus	Venezuela	Spider Monkey Conservation Project
Ateles geoffroyi	Nicaragua	Paco Pacífio
Ateles geoffroyi	Belize	Wildtracks USA, International Tropical Conservation Fund
Ateles paniscus	French Guiana	Kwata
Lagothrix lagothricha	Peru	Ikama
Lagothrix flavicauda	Peru	ONG Ucumari, Neotropical Primate Conservation
Plecturocebus oenanthe	Peru	Proyecto Mono Tocón

Current State of Larger New World Monkeys Populations in EAZA Zoos

Muriquis, Brachyteles *spp.*
There are no captive muriquis outside Brazil and very few in Brazilian zoos or other institutions. Although muriquis in European zoos could be great ambassadors of the Atlantic forest, it doesn't seem to be realistic to export animals to Europe unless captive breeding in Brazil becomes very successful and space is needed for surplus animals.

Woolly monkeys, Lagothrix *spp.*
Woolly monkeys have proven to be very difficult to keep in captivity. As the population in Europe has dropped to less than 35 individuals, most of them being subspecific hybrids, there has been a decision to discontinue the existing EEP. Zoos are urged not to import new animals from South America and to focus on spider monkeys as the representative of the large atelids.

Spider monkeys, Ateles *spp.*
Spider monkeys are relatively easy to keep in captivity. The large population of almost 250 Colombian black spider monkeys (*Ateles fusciceps rufiventris*) is managed in an EEP that was initiated in 1995. This population has shown steady growth since the arrival of the first registered animals in the early 1960's. At least 35 founder animals contributed to the EEP population and 25 years of management resulted in a current retained gene diversity of 97% (Ballou et al. 2010). Genetic tests of this population are underway; there is some concern that hybridisation with other species has taken place, although it is also possible that some of the wild born founders originated from a region where introgression with *A. hybridus* is known to occur (Ruiz-García et al. 2006).

The red-faced spider monkey (*Ateles paniscus*) has never been common in EAZA zoos and the population has never thrived. The situation changed somewhat in 2006, when GaiaZoo and La Vallée des Singes were requested to accommodate six females from a closed rescue centre in French Guiana. Guyana Zoo (in French Guiana) is an EAZA member and occasionally receives abandoned or confiscated spider monkeys that are also integrated in the EEP. Currently there are 45 living red-faced spider monkeys managed in the EEP. Despite the addition of the wild born animals, of which several are unfortunately unsuitable for breeding due to behavioural or physical problems, there is still very little growth of the population. However, considering that almost 50% of the population is less than 10 years old, one can expect that the population will increase in the near future.

In 2000, the EEP for the brown spider monkey (*Ateles hybridus*) was initiated. A growing population of approximately 70 animals in the EAZA region descends from 16 founder animals. Considering that 25% of the population is less than 4 years old, further growth of the population can be expected. Recently the last two viable breeding males from the USA were received, and both have already bred and bring with them viable new bloodlines to the population. Despite the small population, 92% of gene diversity has been preserved and imports of new founders from other regions should not be impossible.

The difficulties we have with the management of spider monkeys are mostly the same for all three species: although the sex ratio at birth is female-biased, there is a surplus of males for which it is difficult to find a place in other zoos. This is of course normal for a species that lives in groups with generally more females than males. Keeping more than one adult male in a group is recommended but not always possible; other males are kept in bachelor groups.

The RCP defines the role of these EEPs as a "conservation/insurance population". The maximum size of the populations, mainly based on space availability, has been defined at 250 individuals for *Ateles fusciceps rufiventris*, 100 individuals for *A. paniscus* and 150 individuals for *A. hybridus*, meaning that breeding now needs to be restricted for the Colombian black spider monkeys. Zoos keeping spider monkeys support conservation projects for spider monkeys in Colombia, Venezuela, Ecuador, Peru and Nicaragua (Table 1).

Ateles fusciceps fusciceps and *A. marginatus* are not present in EAZA, while *A. chamek* and *A. belzebuth* have always been rare in European zoos and are being phased out slowly. Less than 45 *A. geoffroyi* (different subspecies) remain in European zoos; the population is not viable, so it has been decided to phase them out. Suitable individuals have already been or will be transferred to regions with a breeding programme (USA and Australia).

Howler monkeys, Alouatta *spp.*
Only three species of howler monkeys are present in EAZA zoos, *Alouatta macconnelli*, *A. seniculus* and *A. caraya*. Considering that the populations of the Guianan red howler monkey (*A. macconnelli*) and the Colombian red howler monkey (*A. seniculus*) are small and not viable, that both are of Least Concern and that space for howler monkeys in zoos is limited, it has been decided that breeding of these species should be restricted to keeping a stable population for husbandry research purposes. The black and gold howler monkey (*A. caraya*) has priority and a breeding programme for that species was initiated in 1995. Black and gold howler monkeys are not very difficult to keep and can live up to 30 years in captivity. The population is based on 20 founder animals and has grown to 130 individuals. Gene diversity is 93%; with strict genetic management, population growth to 200 animals and the addition of one new founder each 20 years, the genetic health of the population would be guaranteed. Black and gold howler monkeys are also kept in

zoos in range countries and the USA, and obtaining new (captive born) founders should not be a problem. The role of the species in the RCP is defined as "education". The TAG would like to focus on more endangered howler monkey species, but these are not available in sufficient numbers to start a viable insurance population.

Capuchin monkeys, Cebus *spp. and* Sapajus *spp.*
More than 750 capuchin monkeys live in EAZA zoos, but unfortunately most have little direct conservation value, as they are (sub)specific hybrids or belong to non-endangered taxa. As representatives of the capuchins, the TAG decided in the RCP to focus on two species, the critically endangered *Sapajus xanthosternos* and the vulnerable *Cebus imitator*. All other capuchins should be phased out, but considering that they may live more than 50 years (Hakeem et al. 1996), this will take some time.

The EEP for the white-throated capuchin (*Cebus imitator*) was initiated in 2005. Although we know that at least a part of the population originates from Central America, it is not clear if all animals in the population are pure *C. imitator* and genetic studies should teach us more about this situation. Space for capuchins in European zoos is limited and needs to be reserved for more endangered taxa, therefore the RCP recommends to restrict breeding to keep the population at approximately 100 individuals.

The European population of buff-headed capuchin monkeys (*Sapajus xanthosternos*) was created in 1990, when Mulhouse Zoo (France) received the first animals from the Rio de Janeiro Primate Centre. In 2000 an EEP was initiated, as numbers were growing quickly and genetic management was necessary. Animals living in Brazilian institutions are registered in the studbook, though not actively managed through the EEP. The European population has increased in 30 years to almost 220 individuals, and because of space problems breeding restrictions are instated. The population is genetically very healthy and in the future new bloodlines from Brazilian institutions could be added. The main difficulties of the programme are the fast growth of the population and the highly skewed sex ratio at birth, causing a surplus of males. Since the beginning of the programme, European zoos that keep buff-headed capuchin monkeys provide vital financial support to fieldwork in Brazil (Table 1).

Uakaris, Cacajao *spp. and bearded saki monkeys,* Chiropotes *spp.*
Although some uakaris survived in the past for more than 30 years in European zoos, they have always been rare and nowadays none are present. There are currently a few reddish-brown saki monkeys (*Chiropotes sagulatus*), but breeding results are sporadic. The RCP states that the species should be monitored and that a small population could be kept for husbandry research.

Saki monkeys, Pithecia *spp.*
Only one species of *Pithecia* is present in European zoos, the white-faced saki monkey (*Pithecia pithecia*). As with some other taxa, European zoos would be happy to use their extensive and successful experiences for the *ex situ* programme of another, endangered species, if sufficient animals would be available. At this moment, the saki monkeys in zoos mainly have an educational value, which is also very important. The EEP for the white-faced saki monkey was initiated in 1995. The species is doing very well in European zoos and the population has grown to more than 300 individuals. As space is limited, breeding is currently controlled to avoid a further growth of the population. Captive saki monkeys can live very long, the oldest living animal is 37 years old. Although the species can live in the wild in larger groups (Thompson 2016), in zoos they are kept usually in pairs as adults of the same sex do not accept the presence of another. Sex ratio is skewed towards males, which is a problem as it is not easy to keep white-faced saki monkeys in large bachelor groups.

Titi monkeys, Plecturocebus *spp.*
The coppery titi monkey (*Plecturocebus cupreus*) is the only species of titi monkeys kept in European zoos. As with some other taxa, European zoos would be very interested in focussing on an endangered species, such as one of the Atlantic Forest titi monkeys (*Callicebus* spp.), if requested by the authorities of the range country. The EEP for the coppery titi monkey was established in 2002, when 28 individuals were received from the successful colony of the California National Primate Research Center – UC Davis (CNPRC). Unfortunately, some of the animals are hybrids of *P. cupreus* and *P. discolor* (Hoyos et al. 2016). The population has developed slowly to a total of 115 animals. A total of 259 births have been reported, but neonatal mortality (<30 days) was 32%. This mortality was partly caused by poor parental behaviour. The oldest recorded animal lived almost 35 years (captive born). In the RCP the primary roles of this EEP have been defined as education and husbandry research.

The EEP has adopted Proyecto Mono Tocón as its conservation project and the participants of the EEP are the main financial contributors to this project. Proyecto Mono Tocón has been initiated by La Vallée des Singes (France) for the conservation of the critically endangered *Plecturocebus oenanthe*, endemic to a small part of Peru. The attractive (non-endangered) coppery titi monkey is a perfect ambassador for its endangered Peruvian cousin.

Night monkeys, Aotus *spp.*
The studbook for night monkeys was initiated in 2000. The animals in European zoos were separated in two populations, based on karyotype or phenotype, *Aotus griseimembra* and *A. azarae boliviensis*. However, as there is only a limited interest for night monkeys in European

Table 2. Current population size of larger Neotropical primates in EAZA zoos, with the RCP population goals and roles.

Taxon	Red list status	Population size	RCP goal	RCP Roles
Lagothrix lagothricha ssp.	Vulnerable	35	≤ 35	Education, husbandry research
Ateles fusciceps rufiventris	Vulnerable	240	250	Conservation, education
Ateles paniscus	Vulnerable	45	100	Conservation, education
Ateles hybridus	Critically Endangered	70	150	Conservation, education
Ateles geoffroyi ssp.	Endangered	45	Replace	None
Ateles chamek	Endangered	6	Replace	None
Alouatta caraya	Near Threatened	130	200	Education
Alouatta macconnelli	Least Concern	6	≤30	Husbandry research
Alouatta seniculus	Least Concern	35		
Cebus imitator	Vulnerable	110	100	Education
Cebus spp.	Least Concern	45	Replace	None
Sapajus xanthosternos	Critically Endangered	220	250	Conservation, education
Sapajus spp.	Least Concern	>375	Replace	None
Chiropotes sagulatus	Least Concern	15	50	Education, husbandry research
Pithecia pithecia	Least Concern	300	300	Education
Plecturocebus cupreus	Least Concern	112	150	Education, husbandry research
Aotus griseimembra	Vulnerable	85	150	Conservation, education
Aotus spp.	Least Concern	60	Replace	None
Saimiri b. boliviensis	Least Concern	800	800	Education
Saimiri b. peruviensis	Least Concern	250	250	Education
Saimiri sciureus	Least Concern	500	750	Education
Saimiri spp.	Least Concern	>100	Replace	None
TOTAL		**>3500**	**≤3570**	

zoos (partly because there are few zoos with nocturnal houses) and not enough space for two viable populations of this interesting primate, it was decided in 2017 to give priority to the grey-handed night monkey (*A. griseimembra*), that is listed as Vulnerable and has the largest captive population. The current population of this species includes almost 100 individuals, with a balanced sex ratio. Work is underway to genetically test all animals, as night monkeys are difficult to identify by phenotype only and hybridisation is known to exist in captivity. In the past years, approximately ten births have been recorded annually, but the population remains more or less stable due to equal mortality numbers. The oldest recorded animal in the population lived an estimated 36 years (wild born). The roles for this population are defined in the RCP as conservation (insurance population) and education (the only nocturnal Neotropical primate genus).

Squirrel monkeys, Saimiri *spp.*

Squirrel monkey are popular animals in zoos, as they are very active and can live in large groups. In EAZA zoos, *Saimiri boliviensis boliviensis*, *S. b. peruviensis* and *S. sciureus* are managed in separate EEPs. None of these taxa are endangered in the wild, therefore their roles have been defined in the RCP as education. The TAG would be very interested in the initiation of an EEP for the red-backed squirrel monkey (*S. oerstedii*), if requested by range countries.

The EEP for the two subspecies of *Saimiri boliviensis* was initiated in 2001 when it had become clear that the population in European zoos was threatened due to a lack of breeding and that genetic management was necessary to maintain its viability. The EEP population of the black-headed *S. b. boliviensis* is very large, with approximately 800 individuals. The main challenge now is to limit population growth, as there is limited space in zoos. Projections show that, without breeding restrictions, the population could grow to more than 1500 in less than 20 years. The population has a healthy genetic diversity, but strict breeding recommendations are necessary to keep the population viable. While the nominate subspecies has been kept for a long period in European zoos, the population of the Peruvian squirrel monkey *S. b. peruviensis* was only founded in 1998, when La Vallée des Singes primate park (France) imported a group of 51 animals from the USA. Since then the European population has increased to more than 250 animals, with a healthy genetic diversity.

The EEP of the Guianan squirrel monkey (*Saimiri sciureus*) was initiated in 2007. European zoos imported a considerable number of wild caught squirrel monkeys from Guyana and Suriname in the early 1990's, which are the basis of the current managed population that has grown to more than 500 individuals. The populations of other common squirrel monkeys, of unknown origin and possibly belonging to other species (*S. cassiquiarensis*, *S. macrodon*) have not been mixed with the Guianan squirrel monkeys and will be phased out. Squirrel monkeys are popular in zoos, but with a total of 1660 individuals the maximum capacity in European zoos has almost been reached and growth is being restricted. A separately managed population of *S. b. boliviensis* with animals originating from European zoos has already been set up in Australia. For a species living in large groups with often only one adult male and a large number of females, a male surplus is a logical result. Fortunately, males can be kept very well in bachelor groups.

Discussion

More than 3500 larger Neotropical primates live in EAZA zoos, most of them managed by EEPs. The first EEPs were initiated in 1985 and have developed to professionally managed breeding programmes, with a focus on a good demographic and genetic health of the populations (Ballou et al. 2010). Natural social behaviour and individual characters are other important factors that are considered when managing a population and transferring animals between groups. The Regional Collection Plan is an important tool to manage the populations of Larger New World Monkeys in EAZA zoos. When adhering to the recommendations of the RCP, zoos should consider liberating space not only for recommended species but also for new species that may be in need of captive management. Providing optimal care is an important goal of the TAG and the compilation of Best Practice Guidelines is a useful tool to help zoos take good care of their animals.

Ex situ breeding programmes can play an important role in the conservation of endangered primates. Captive populations may serve as insurance populations for possible reintroductions, *ex situ* research can help researchers in the field, and education may change people's consumption of products that can be harmful for nature (such as non-certified palm oil, coffee, soy and tropical hardwood). Zoos also provide financial or technical support to conservation projects: in the past 5 years EAZA zoos have supported many *in situ* conservation or research projects for Larger New World Monkeys (Table 1).

The EAZA Larger New World Monkey TAG is eager to cooperate with zoos, authorities and conservation organisations worldwide to further support the conservation of Neotropical primates.

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References

Ballou, J.D., Lees, C., Faust, L.J., Long, S., Lynch, C., Bingaman Lackey, L. and Foose, T.J. 2010. Demographic and Genetic Management of Captive Populations. In: *Wild Mammals in Captivity: Principles and Techniques for Zoo Management*. 2nd ed., D. G. Kleiman, K. V. Thompson and C. Kirk Baer (eds.), pp.219–252. The University of Chicago Press, Chicago and London.

Bóveda-Penalba, A.J., Vermeer, J., Rodrigo. F. and Guerra-Vásquez, F. 2009. Preliminary report on the distribution of *Callicebus oenanthe* on the eastern feet of the Andes. *Int. J. Primatol.* 30(3): 467–480.

Byers, O., Lees, C., Wilcken, J. and Schwitzer, C. 2013. The One Plan Approach: the philosophy and implementation of CBSG's approach to integrated species conservation planning. *WAZA News Magazine* 14: 2–5.

EAZA. 2022. EAZA population management manual: standards, procedures and guidelines for population management within EAZA. European Association of Zoos and Aquaria, Amsterdam, the Netherlands.

Hakeem, A., Sandoval, R. G., Jones, M. and Allman, J. 1996. Brain and life span in primates. In: *Handbook of the Psychology of Aging*, 4th edition. J. E. Birren and K. W. Schaie (eds.), pp.78–104. Academic Press, San Diego, USA.

Hoyos, M., Bloor, P., Defler, T.R., Vermeer, J., Röhe, F. and Pires Farias, I. 2016. Phylogenetic relationships within the *Callicebus cupreus* species group (Pitheciidae: Primates): biogeographic and taxonomic implications. *Mol. Phylogenet. Evol.* 102: 208–219.

IUCN/SSC. 2014. Guidelines on the use of ex Ssitu management for species conservation. Version 2.0. IUCN Species Survival Commission, Gland, Switzerland.

Muñoz Lora, M. L., Gómez Cadenas, K., Falla Beltrán, A. C. and Soto Calderón, I. D. 2020. Trends in the use of studbooks in captive breeding programs of Neotropical primates. *Neotrop. Primates* 26(1): 30–40.

Ruiz-Garcia, M., Parra, A., Romero-Aleán, N., Escobar-Armel, P. and Shostell, J. M. 2006. Genetic characterization and phylogenetic relationships between the *Ateles* species (Atelidae, Primates) by means of DNA microsatellite markers and craniometric data. *Primate Report* 73: 3–47.

Thompson, C. L. 2016. To pair or not to pair: sources of social variability with white-faced saki monkeys

(*Pithecia pithecia*) as a case study. *Am. J. Primatol.* 78(5): 561–572.

Vermeer, J. and Shanee, S. 2020. *Plecturocebus oenanthe*. The IUCN Red List of Threatened Species 2020. Website: https://www.iucnredlist.org/species/3553/17975319. Accessed 31 December 2022.

Vermeer, J. 2017. Regional collection plan for the larger New World monkeys, 2nd edition. European Association of Zoos and Aquaria.