

Petition

Before the United States Fish and Wildlife Service United States Department of the Interior

January 27, 2025

Requesting Rulemaking to List the Southern Pig-Tailed Macaque (*Macaca nemestrina*) as a Threatened or Endangered Species Under the Endangered Species Act

Submitted by:

People for the Ethical Treatment of Animals
Lisa Jones-Engel, Ph.D.
Birutė Mary Galdikas, Ph.D.
Jane Goodall, Ph.D. DBE
Action for Primates
Born Free USA
Sarah Kite
Nedim C. Buyukmihci, V.M.D.
Angela Grimes
Liz Tyson, Ph.D.
Asia for Animals Macaque Coalition
Ecoflix
Ian Redmond, OBE, DSc, FLS
International Primate Protection League
Wildlife Alliance
Physicians Committee for Responsible Medicine
Michael Schillaci, Ph.D.
One Voice
Abolición Vivisección
Sam Shanee, Ph.D.
Gemunu de Silva
Northwest Animal Rights Network
Neotropical Primate Conservation
EMS Foundation
Tim Ajax
Rise for Animals
Wildlife Friends Foundation Thailand
Douc Langur Foundation
Fundacion Entropika
Angela Maldonado, Ph.D.
Animal Defenders International
World Animal Protection
Paula Pebsworth
Japan Anti-Vivisection Association
Animal Protection Denmark
Born Free Foundation
Mark Jones, BVSc, MSc (Stir), MSc (UL), MRCVS
Agustín Fuentes, Ph.D.
Animal Alliance of Canada
Anthony B. Rylands, Ph.D.
Russell Mittermeier, Ph.D.

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I. EXECUTIVE SUMMARY

Research analyzing wild populations of southern pig-tailed macaques “paints a concerning outlook for the long-term survival of this species.”¹ Data evidencing a population decline of at least fifty percent over the past thirty-three years (or three generations) led the International Union for Conservation of Nature (IUCN) to elevate the species’ status from “vulnerable” to “endangered” on the IUCN Red List of Threatened Species in 2022. Primatologists expect that the population will continue to decline if threats to the species are not addressed.

The Endangered Species Act (ESA) requires the U.S. Fish and Wildlife Service (FWS or “Service”) to list southern pig-tailed macaques as “endangered” or “threatened” if, throughout all or a significant part of their range, the species is in danger of extinction or is likely to become endangered within the foreseeable future. A single threatening factor can be sufficient to trigger listing status. But, here, the southern pig-tailed macaque is seriously threatened by multiple factors: (1) declining native habitats; (2) overutilization for scientific, commercial, and recreational purposes; (3) predation; and (4) inadequate regulatory mechanisms.

Records revealing high mean infant mortality dislodge the once-held perception that the southern pig-tailed macaque is adaptable to anthropogenic landscapes and less impacted by severe habitat disturbance and clear-cutting. As a species sensitive to these environmental transformations, as well as the threats posed by rampant trading (both legal and illegal), the outlook for the long-term survival of southern pig-tailed macaques is ominous.² Based on the petition herein, which summarizes, supplements, and incorporates by reference the IUCN’s detailed 2022 Assessment, the petitioners urge the Service to list the southern pig-tailed macaque as an endangered or threatened species under the ESA.

II. INTRODUCTION

A. Petitioners

People for the Ethical Treatment of Animals, Inc. (PETA) is a non-profit organization dedicated to protecting animals from abuse, neglect, and cruelty, and undertakes these efforts through public education, cruelty investigations, research, animal rescue, legislation, special events, celebrity involvement, protest campaigns, and lawsuits to enforce laws enacted to protect animals. Beginning in 1981 with an investigation that uncovered primates—including long-tailed macaques—suffering in a Maryland research facility, PETA has spent decades exposing abusive and deadly experiments on primates and persistently champions ending the use of animals in experiments. PETA scientists, having expertise in primatology, neuroscience, physiology, genetics, toxicology, animal welfare, and public health, work to change the paradigm of biomedical research by phasing out the use of animals in experiments and promoting the development and implementation of cutting-edge, human-relevant strategies in biomedical research and training. To further its work to end the importation of primates into the United States for experiments, PETA launched a campaign that persuaded major airlines to stop transporting

¹ N. Ruppert et al., *Macaca nemestrina*, THE IUCN RED LIST OF THREATENED SPECIES 1 (2022), <https://dx.doi.org/10.2305/IUCN.UK.2022-1.RLTS.T12555A215350982.en> [hereinafter “IUCN 2022 Assessment”] [Ex. 1].

² *Id.* at 2.

primates—including long-tailed macaques—into the United States for use in experiments. When the biomedical research community petitioned the Department of Transportation to take enforcement action against the airlines, PETA submitted extensive comments in opposition. In November 2022, PETA filed a shareholder resolution calling for one of the largest importers of primates (mostly long-tailed macaques) into the United States to provide transparent reports describing the species, country of origin, and number of primates it imports into the United States, and measures it takes to mitigate its impact on wild populations.³

Primatologist **Lisa Jones-Engel, Ph.D.**, has studied the interface between humans and long-tailed and pig-tailed macaques in Indonesia, Singapore, Cambodia, Thailand, Myanmar, and Bangladesh, as well as in the primate biomedical facilities of the United States since the 1980s. Her scientific career has included field studies, research in the laboratory setting (most recently, the Washington National Primate Research Center), and teaching assignments. She has authored over 100 peer-reviewed articles covering the fields of primatology, virology, epidemiology, microbiology, and conservation and co-authored the IUCN 2022 Assessment. Dr. Jones-Engel serves as a senior science advisor on primate experimentation with PETA’s Laboratory Investigations Department.

Primatologist **Birutė Mary Galdikas, Ph.D.**, has committed five decades to the conservation and study of primates in Indonesia. She is the world’s authority on orangutans. Her field site in Indonesia is home to wild populations of long-tailed and pig-tailed macaques who share the rainforest with the orangutans. The Orangutan Foundation International, founded by Dr. Galdikas, takes a holistic and comprehensive approach with multiple complementary strategies to combat the complex challenges of conserving and protecting animals and forests.

Dr. Jane Goodall, DBE, founder of the Jane Goodall Institute and United Nations Messenger of Peace, has been a global champion for animal welfare and conservation for decades. She travels the world to promote the protection of the environment and the welfare of people and animals.

Action for Primates is a United Kingdom-based project that advocates globally on behalf of non-human primates. Action for Primates recognizes that all animals, not just non-human primates, deserve respect and protection from harm by people.

Born Free USA is a leading wildlife charity that has worked for decades to end the exploitation of macaques, enhance the survival of threatened species in the wild, and protect natural habitats while respecting the needs and safeguarding the welfare of individual animals. The organization seeks to positively impact animals in the wild and protect their ecosystems in perpetuity for their intrinsic value and the critical roles they play within the natural world.

Sarah Kite is co-founder of Action for Primates. She has spent decades working to bring awareness of the international trade and use of non-human primates, in particular macaques, for the global research and toxicity testing industries.

³ See Alka Chandna, *Illegally Captured Primates Used in Animal Testing Pose Health and Investor Risks*, PROXYPREVIEW (Mar. 21, 2023), <https://www.proxypreview.org/all-contributor-articles/illegally-captured-primates-used-in-animal-testing-pose-health-and-investor-risks> [Ex. 5].

Dr. Nedim Buyukmihci is an Emeritus Professor of Veterinary Medicine at the School of Veterinary Medicine, University of California-Davis, and co-founder of Action for Primates. His decades of non-human animal advocacy have included working on behalf of a wide range of species, in particular macaques and other non-human primates. He has many years of experience co-managing sanctuaries, including sanctuaries for farmed animals and non-human primates, and a wildlife refuge.

Angela Grimes is Chief Executive Officer of Born Free USA, a wildlife conservation and animal welfare organization. For the past decade, she has campaigned to ensure that long-tailed and pig-tailed macaques caught up in the wildlife, pet, or laboratory trade are provided with sanctuary.

Dr. Liz Tyson has worked in animal protection and conservation, focusing on primates, for twenty years. She currently works as Programs Director for Born Free USA and runs one of the largest long-tailed and pig-tailed macaque sanctuaries in the United States.

The Asia for Animals Macaque Coalition (MACC) was initiated in 2020 and is a working group of the Asia for Animals Coalition. MACC aims to collate and share information on the many welfare issues faced by macaques, as well as to facilitate networking and collaboration geared towards promoting respectful coexistence, alleviating their suffering, and protecting them at both the individual and species levels. MACC produced the 2022 Macaque Report: Indonesia's Unprotected Macaques.

Ecoflix is a not-for-profit media group that educates, inspires, and supports meaningful actions to deliver a tangible, measurable difference in saving animals and restoring the planet. Dr. Ian Redmond, Head of Conservation for Ecoflix, has spent decades raising awareness, through advocacy and research, about the trade in wildlife, including long-tailed and pig-tailed macaques.

Wildlife biologist and conservationist **Dr. Ian Redmond** has devoted decades to protecting primates and advocating for conservation. He currently chairs the Primate Working Group of the Species Survival Network, which brings together organizations and individuals to monitor the primate trade, publicize cases of illegal trade, and support efforts to repatriate confiscated live animals to the nearest suitable sanctuary to the point of origin.

Since 1973, under the leadership of its founder, Dr. Shirley McGreal, the **International Primate Protection League** has spent decades fighting to protect and save macaques worldwide. These significant efforts included fighting smugglers, exposing the fate of long-tailed and pig-tailed macaques in research labs, establishing a gibbon sanctuary, and much more.

For decades, **Wildlife Alliance** has worked with stakeholders around the globe to combat the illegal wildlife trade in long-tailed macaques and other species.

The **Physicians Committee for Responsible Medicine** aims to eliminate the exploitation and use of macaques in testing worldwide through lobbying, publishing research, training scientists, and attending and conducting scientific meetings.

Dr. Michael Schillaci is a Professor of Anthropology at the University of Toronto Scarborough. Dr. Schillaci has spent two decades studying macaque morphology, growth, hybridization, and evolution, including *Macaca fascicularis*, in addition to other macaque species. He has also examined the consequences of human-macaque interactions in Southeast Asia.

For roughly 30 years, **One Voice** has been fighting against experiments on animals. Concerning macaques in particular, OneVoice opposes their capture in the wild and that they are bred, transported, and used in experiments. One Voice investigates, petitions, goes to court, analyzes data, and advocates on their behalf. The organization is also a member of the macaque coalition at an international level in Asia for Animals.

Abolición Vivisección is a Spanish NGO born in 2021. Their activities started exposing the terrible conditions of the macaques imported and held in Camarney (Spain), the largest macaque farm for experimentation in Europe. Currently, their work focuses on raising awareness about the trafficking of macaques, the suffering of animals, and the futility of vivisection as a valid scientific method.

Dr. Sam Shanee is a conservation biologist/conservationist who has worked in Asia and South America for over 20 years. Because much of his work centers on the illegal wildlife trade and human-wildlife conflict resolution, he has observed first-hand the multiple threats both long-tailed and pig-tailed macaques face.

Gemunu de Silva co-founded Tracks Investigations, an ethical investigations agency providing investigative content to the animal protection sector worldwide. He has been an animal advocate for over 35 years and has worked on various global projects and campaigns. Most notably, the Royal Society for the Prevention of Cruelty to Animals awarded him a Special Investigation Award for his work investigating the international trade of primates for research in Vietnam, Cambodia, and Mauritius.

Northwest Animal Rights Network (NARN) is an animal rights organization based in the Pacific Northwest (PNW). NARN monitors the use of macaques in the PNW and campaigns for those used in research in facilities around the PNW.

Neotropical Primate Conservation has been using primates as “flagship species” for community conservation projects for decades ensuring long-term habitat protection for the flagship species and all wildlife that shares their habitats. Through this work, they help local communities strengthen their stewardship of nature and protect their traditional and cultural identities, benefiting humans and the environment.

The **EMS Foundation** is a not-for-profit organization based in South Africa that believes that there is a need to conserve and protect non-human primate populations living in the wild because of land transformation and persecution by humans, which result in the fragmentation of populations and decline in numbers. The existential crisis non-human primates find themselves in, whether they are taken from the wild or bred in captivity, is closely tied to the insatiable and ever-proliferating demand to own and kill rare and exotic wild animals.

Tim Ajax, Sanctuary Director of the **Oklahoma Primate Sanctuary**, has spent the last three decades working with captive non-human primates, including many species of macaques, such as long-tailed and pig-tailed macaques. Whether retired from research or rehomed from the exotic pet trade, he has worked tirelessly to provide high-quality care focusing on large enclosures where these intelligent primates can engage in normal behaviors.

Rise for Animals is a national animal rights organization on a mission to end animal experimentation. Their efforts to expose cruelty in laboratories, rescue animals, mobilize support, get laws passed, and advocate for innovative, humane, and effective research will end an outdated industry and free animals from cruelty. Founded as New England Anti-Vivisection Society, Rise for Animals has been working to free macaques and other non-human primates from biomedical research for decades. Ed Butler is the Executive Director at Rise for Animals. For over twenty years, he has worked on campaigns to save animals—including macaques.

Wildlife Friends Foundation Thailand (WFFT) is a registered foundation under Thai law that campaigns against all forms of animal abuse and exploitation in Thailand. WFFT actively seeks to combat the illegal wildlife trade in macaques and rescue animals living in poor conditions or exploited for human entertainment.

The **Doac Langur Foundation**, headed by Dr. Lois Lippold, focuses on exposing and mitigating the poaching, trapping, and illegal trade of primates from Southeast Asian forests.

Fundacion Entropika works closely with local stakeholders in South America in community-led projects, educational and social programs, capacity building and empowerment of civil society, enforcing environmental and primate welfare laws, and cooperative research.

Dr. Angela Maldonado, Director of Fundacion Entropika, is a primatologist, ecologist, and conservationist working for over 20 years in the Colombian Amazon. Her work focuses on fighting the illegal wildlife trade and helping local communities. She has received multiple awards in recognition of her dedication to conservation.

Animal Defenders International, headed by Jan Creamer, has worked for decades to expose the violence and death that is associated with the capture, transport, and use of long-tailed and pig-tailed macaques destined for use in experiments.

World Animal Protection and Lindsay Oliver, World Animal Protection's Executive Director, fight to keep animals in their natural habitat, where they belong.

Paula Pebsworth focuses on human-primate coexistence and is currently the Head Scientist on a project run by the National Center for Wildlife in the Kingdom of Saudi Arabia to reduce human-baboon conflict. She has worked in India on projects to reduce human-macaque conflict.

Yuichi Hasegawa is the Executive Director of the **Japan Anti-Vivisection Association**, which has worked for many years to eliminate the use of macaque monkeys, especially Japanese macaques, in experiments, entertainment, and culling.

Animal Protection Denmark is a non-profit association founded in 1875. The organization engages in animal welfare at national, European, and international levels through project collaboration and networking, involving political, fundraising, and communications work.

Born Free Foundation is a UK-based international wildlife protection charity that promotes compassionate conservation to enhance the survival of threatened species in the wild and protect natural habitats while respecting the needs and safeguarding the welfare of individual animals. The organization works closely with local communities to engage, empower, and enhance the lives of those who live alongside wildlife. As a leading wildlife charity, Born Free opposes the exploitation of wild animals in captivity and campaigns to keep them where they belong—in the wild.

Dr. Mark Jones trained as a veterinarian at Liverpool University and worked for many years in fish health and disease control before spending five years traveling extensively and working on rescue and rehabilitation projects for primates, bears, birds, and reptiles in South America and Asia. He has master's degrees in both aquatic and wild animal health and several years of experience in the non-government animal protection sector. He joined the UK-based international wildlife charity Born Free in 2014, where he is currently Head of Policy, managing a team focused on promoting the adoption of progressive legislation and policy concerning wildlife conservation, management and trade, and the welfare of both free-living and captive wild animals, at international, national and local levels.

Dr. Agustín Fuentes is a Professor of Anthropology at Princeton University. Dr. Fuentes has conducted research across four continents and multiple species, spanning two million years of human and primate history. Dr. Fuentes has published 7 books, 17 edited volumes, and more than 200 peer-reviewed articles and chapters. Human-macaque interactions have been a focus of Dr. Fuentes' work for more than twenty-five years. He is a co-author of the main scholarly book on long-tailed macaques, and author or co-author of fifty articles and book chapters on long-tailed macaques. He is a member of the IUCN Species Survival Commission (SSC) Primate Specialist Group, the senior editor of the International Encyclopedia of Primatology, and one of the co-founders of the field of Ethnoprimatology. Dr. Fuentes is the co-founder of the Long-Tailed Macaque Project, which is a conservation collaboration and capacity-building project centered around human-long-tailed macaque interfaces in Southeast Asia.

Animal Alliance of Canada (AAC) is a federally incorporated non-profit organization fighting for the protection of all animals through advocacy, political action, rescue, and education. As a non-profit, AAC actively engages with elected representatives to influence them to pass sound animal and environmental protection laws.

Dr. Anthony B. Rylands has served as Deputy Chair of the IUCN SSC Primate Specialist Group since 1996 and has increasingly focused his work on the group's objectives—networking, coordinating, and publishing on themes that focus on the conservation of threatened primates worldwide, including long-tailed and southern pig-tailed macaques. From 1977 to 1982, Dr. Rylands carried out pioneer field studies of the behavior and ecology of marmosets and lion tamarins. From 1993 to 2017, he worked for Conservation International, first working with staff on the development of conservation strategies for the Amazon and Atlantic Forest and later acting as Senior Director for Conservation Biology. Currently, Dr. Rylands is the Primate Conservation

Director for Re:wild, a force multiplier that brings together Indigenous peoples, local communities, influential leaders, nongovernmental organizations, governments, companies, and the public to protect and rewild. Dr. Rylands maintains a taxonomic and conservation status database of over 700 primate species and subspecies, is the founding editor of *Neotropical Primates* and editor of the journal *Primate Conservation*, and has edited eighteen books and authored more than 350 articles and book chapters on protected areas and conservation, primate behavior, ecology, conservation, distributions, and taxonomy.

Dr. Russell Mittermeier is a renowned primatologist, conservationist, and biodiversity advocate who has dedicated his career to protecting the world’s most endangered species and habitats. He is well known for his extensive research on primates and his efforts to highlight their ecological importance and conservation needs. As a former President of Conservation International, current Chief Conservation Officer of Re:wild, and long-time Chair of the International Union for the Conservation of Nature, Species Survival Commission Primate Specialist Group, he is a key figure in global biodiversity initiatives; Dr. Mittermeier has been instrumental in promoting conservation strategies across the globe.

The petitioners submit this petition with an interest in ensuring the protection of southern pig-tailed macaques under the ESA.

B. Endangered Species Act

Congress enacted the ESA of 1973, 16 U.S.C. §§ 1531–1544, “to provide a means whereby the ecosystems upon which endangered species and threatened species depend may be conserved [and] to provide a program for the conservation of such endangered species and threatened species.” 16 U.S.C. § 1531(b). An “endangered species” means “any species which is in danger of extinction throughout all or a significant portion of its range.” *Id.* § 1532(6). A “threatened species” is one “which is likely to become an endangered species within the foreseeable future throughout all or a significant portion of its range.” *Id.* § 1532(20). Only those species listed as endangered or threatened receive the ESA’s protection. The FWS, through the authority delegated to it by the Secretary of the Interior (“Secretary”), must list a species if the species qualifies as endangered or threatened because of any one of the following factors:

- (A) the present or threatened destruction, modification, or curtailment of its habitat or range;
- (B) overutilization for commercial, recreational, scientific, or educational purposes;
- (C) disease or predation;
- (D) the inadequacy of existing regulatory mechanisms; or
- (E) other natural or manmade factors affecting its continued existence.

50 C.F.R. § 424.11(c); *see* 16 U.S.C. § 1533(a)(1); 50 C.F.R. § 402.01(b).

To prevent the Secretary from implementing the ESA haphazardly (i.e., “on the basis of speculation or surmise”), *Bennett v. Spear*, 520 U.S. 154, 176 (1997), the statute requires the listing determination to be made “solely on the basis of the best available scientific and commercial information regarding the species’ status.” 16 U.S.C. § 1533(b)(1)(A); 50 C.F.R. § 424.11(b).

Within ninety days after receiving a petition to list a species, the Secretary must determine “whether the petition presents substantial scientific or commercial information indicating that the petitioned action may be warranted.” 16 U.S.C. § 1533(b)(3)(A). In other words, there must be “credible scientific or commercial information in support of the petition’s claims such that a reasonable person conducting an impartial scientific review would conclude that the action proposed in the petition may be warranted.” 50 C.F.R. § 424.14(h)(i).

The “reasonable person” standard is a “lesser standard”; a petition does not need to contain “conclusive evidence of a high probability of species extinction to warrant further consideration of listing that species.” *Ctr. for Biological Diversity v. Morgenwreck*, 351 F. Supp. 2d 1137, 1141 (D. Colo. 2004). Rather, a petitioner must “simply show that the substantial information in the Petition demonstrates that listing of the species *may* be warranted.” *Id.* (emphasis added). As described in 50 C.F.R. section 424.14(d), whether a particular listing petition provides “substantial” information depends on:

- (1) Information on current population status and trends and estimates of current population sizes and distributions, both in captivity and the wild, if available;
- (2) Identification of the factors under [16 U.S.C. § 1533(a)(1)] that may affect the species and where these factors are acting upon the species;
- (3) Whether and to what extent any or all of the factors alone or in combination identified in [16 U.S.C. § 1533(a)(1)] may cause the species to be an endangered species or threatened species . . . and, if so, how high in magnitude and how imminent the threats to the species and its habitat are;
- (4) Information on adequacy of regulatory protections and effectiveness of conservation activities by States as well as other parties, that have been initiated or that are ongoing, that may protect the species or its habitat.

If the Secretary finds that substantial information exists then, within twelve months after receiving the petition, the Secretary must review the species status and determine whether the species should be listed. *See* 16 U.S.C. § 1533(b)(3)(B). If the finding demonstrates that the petition is not warranted, the listing process ends but the negative finding may be judicially reviewed. *See* 16 U.S.C. § 1533(b)(3)(C)(ii).

III. NATURAL HISTORY⁴

A. Common Name

The common names for *Macaca nemestrina* are Southern Pig-tailed Macaque, Pig-tailed Macaque, Sunda Pig-tailed Macaque, and Sundaland Pigtail Macaque.⁵ Throughout this petition, the species is referred to as “southern pig-tailed macaque.”

B. Taxonomy

Kingdom	Animalia
Phylum	Chordata
Class	Mammalia
Order	Primates
Family	Cercopithecidae
Genus	<i>Macaca</i>
Species	<i>nemestrina</i>

Table 1. Taxonomy of *Macaca nemestrina*.⁶

C. Description

With a tail that has a pig-like appearance—short (i.e., 5–10 inches in length) and held semi-erect—southern pig-tailed macaques are light-brown in color but have darker hair on top of their heads and back.⁷ Females measure between 15–19 inches in length and 10–13 pounds in weight.⁸ Males measure between 20–23 inches in length, weigh between 12–26 pounds, and have mane-like hair framing their faces.⁹ Fruits, supplemented by leaves, buds, flowers, and invertebrates comprise the majority of their diet.¹⁰ The species is quadrupedal and generally remains on the ground except for when foraging and sleeping in trees.¹¹

D. Habitat

Southern pig-tailed macaques live in Southeast Asia’s dense tropical rainforests and occupy swamp, coastal, montane, and lowland forests.¹² Population densities are highest in primary forests, but the species also lives in secondary forests and agricultural areas (e.g., oil palm

⁴ Refer to the IUCN 2022 Assessment [Ex. 1], pages 1, 6–7, for detailed notes on the species’ natural history.

⁵ IUCN Assessment, *supra* note 1, at 1; *Macaca nemestrina*, INTEGRATED TAXONOMIC INFO. SYS., https://www.itis.gov/servlet/SingleRpt/SingleRpt?search_topic=TSN&search_value=573021#null (last visited Mar. 31, 2023) [hereinafter “ITIS Report”] [Ex. 3].

⁶ ITIS Report, *supra* note 5.

⁷ K. Clare Quinlan, *Southern Pig-Tailed Macaque*, NEW ENGLAND PRIMATE CONSERVANCY (July 2022), <https://neprimateconservancy.org/southern-pig-tailed-macaque/> [Ex. 4].

⁸ *Id.*

⁹ *Id.*

¹⁰ *Id.*; IUCN 2022 Assessment, *supra* note 1, at 7.

¹¹ Quinlan, *supra* note 7; *see* IUCN 2022 Assessment, *supra* note 1, at 7 (citing Ruppert et al. 2018 [Ex. 5]).

¹² Quinlan, *supra* note 7; IUCN 2022 Assessment, *supra* note 1, at 6.

plantations).¹³ The species' habitat-elevation threshold is 1,900 m. above sea level but they are "best adapted to lowland and hill dipterocarp forests up to 900 m (Crockett and Wilson, 1980, Yanuar et al. 2009) and prefer dry forested grounds on the foot of hills and slopes (Bersacola et al. 2019)."¹⁴

IV. GEOGRAPHIC RANGE¹⁵

Southern pig-tailed macaques are native to Brunei Darussalam, Indonesia (Kalimantan, Sumatra), Malaysia (Peninsular Malaysia, Sabah, Sarawak), and Thailand.¹⁶ Although the overall geographic area with reported presence of the species is large, the area occupied by the species is small in comparison.¹⁷

For example, calculations for Peninsular Malaysia show that of the 131,600 km² available land area, only approximately half of it constitutes potential *Macaca nemestrina* habitat, with ca 68,000 km² lying in natural habitat sites such as primary and secondary forest (of which some lies above the 1,900 m elevation threshold beyond which the habitat is not suitable for this species), and ca 2,000 km² lying in oil palm plantations adjacent to forest (i.e., area calculated as a 500 m buffer zone from the forest edge into the plantation that macaques can potentially use to forage; B. Galea and N. Ruppert, unpublished data).¹⁸

¹³ Quinlan, *supra* note 7.

¹⁴ IUCN 2022 Assessment, *supra* note 1, at 6 (citing Crockett and Wilson 1980, Yanuar et al. 2009 [Ex. 6], Bersacola et al 2019).

¹⁵ Refer to the IUCN 2022 Assessment [Ex. 1], pages 3–4, for detailed notes on the species' geographic range.

¹⁶ IUCN 2022 Assessment, *supra* note 1, at 3 (citing Groves 2001, Roos et al. 2014 [Ex. 7]).

¹⁷ *Id.*

¹⁸ *Id.*



Figure 1. Southern pig-tailed macaque distribution map.¹⁹

V. POPULATION STATUS AND TRENDS²⁰

The IUCN documents a decreasing population trend.²¹ Obtaining current, conclusive, population-size estimates has been fraught with difficulty given the challenges of encountering and counting wild macaques in the dense rainforest environment.²² However, it is estimated that, between 1957 and 1975, the species’ population in Peninsular Malaysia declined 43.7% (from 80,000 individuals to 45,000).²³ Further population decline has likely occurred given the magnitude and rate of forest conversion to other land use forms since 1975.²⁴ Across the broader distribution range, the IUCN suspects that the population decreased by at least fifty percent between 1989 and 2022 and that the rate will not improve in the next three generations (from 2022 to 2055),²⁵ based on the following:

- 1) ongoing habitat degradation across [the species’] range from 2001 to 2020 (e.g., 29% of tree cover loss in Malaysia; 16% to 41%

¹⁹ *Distribution Map*, IUCN (2022), https://www.iucnredlist.org/api/v4/assessments/215350982/distribution_map/jpg [Ex. 8].

²⁰ Refer to the IUCN 2022 Assessment [Ex. 1], pages 5–6, for detailed notes on the species’ population status and trends.

²¹ IUCN 2022 Assessment, *supra* note 1, at 6; *Southern Pig-Tailed Macaque*, IUCN, <https://www.iucnredlist.org/species/12555/215350982> (last visited Mar. 31, 2023) [Ex. 9].

²² See IUCN 2022 Assessment, *supra* note 1, at 5 (citing Bernstein 1967) (stating that there are “no conclusive reports about the current overall estimated population size of this species within their distribution range”).

²³ *Id.* (citing IUCN SSC 1982 [Ex. 10]).

²⁴ *Id.*

²⁵ *Id.*

tree cover loss across its range in Indonesia; Global Forest Watch 2022) which will certainly continue into the future;

2) evidence of local extirpation in former habitat sites (Holzner et al. 2021b);

3) evidence from the Pasoh Forest Reserve that highly degraded areas had a 10% decline in macaque site occupancy [between 2013 and 2017] (Holzner et al. 2021b); and

[4] a mean infant mortality rate of 66% (ranging from 30% to 100%) over an 8-year period (2014–2021) in/near oil palm plantations which already constitute a not-insignificant portion of the species’ potential habitat [(A. Holzner and N. Ruppert, unpublished data)].²⁶

These threats are in addition to other threats (discussed below), including trade, human-wildlife conflicts, and potential hybridization.

VI. THREATS²⁷

Although this species is common in some parts of its range, the population size has been severely reduced in many other places due to habitat loss and degradation, capture for the increased demand for use in biomedical research, the pet trade, and subsistence hunting.²⁸ All of the statutory listing factors described in 16 U.S.C. § 1533(a)(1) threaten the species. While many of the factors are threats independent of other factors (e.g., overutilization), the severity is exacerbated when the factors work in combination (e.g., overutilization and inadequate regulatory mechanisms).

A. Present or Threatened Destruction, Modification, or Curtailment of Habitat or Range

Habitat loss and fragmentation in many parts of the southern pig-tailed macaque’s range presents a serious threat. Natural forces (e.g., forest fires and droughts) and human activity (e.g., clear felling conducted to “expand monocultures, such as oil palm plantations, durian and rubber, for mining activities and urban and industrial expansion,” and selective logging for timber extraction) threaten permanent loss to the species’ prime habitat in lowland tropical rainforest.²⁹ Malaysia

²⁶ *Id.* at 5, 6 (citing Global Forest Watch 2022, Holzner et al. 2021b [Ex. 11], Zainol et al. 2018 [Ex. 12]; *see also Malaysia*, GLOBAL FOREST WATCH, <https://www.globalforestwatch.org/> (last visited Mar. 30, 2023) (click on “Dashboard” and select Malaysia) (“From 2001 to 2021, Malaysia lost 8.67Mha of tree cover, equivalent to a 29% decrease in tree cover since 2000.”); *Indonesia*, GLOBAL FOREST WATCH, <https://www.globalforestwatch.org/> (last visited Mar. 30, 2023) (click on “Dashboard” and select Indonesia (Kalimantan) and Indonesia (Sumatera) (indicating 17% to 42% tree cover loss across these regions from 2001 to 2021).

²⁷ Refer to the IUCN 2022 Assessment [Ex. 1], pages 1, 8–10, for detailed notes on threats to the species.

²⁸ IUCN 2022 Assessment, *supra* note 1, at 5.

²⁹ *Id.* at 8 (citing Global Forest Watch 2020, Global Forest Watch 2022, Meijaard et al. 2007, ASMC 2022).

reported the following loss in primary forest and tree cover between 2009 and 2019; the breakdown evidences a significant uptick in loss in more recent years.

Primary Forest Loss		Tree Cover Loss	
2002–2009	2010–2019	2002–2009	2010–2019
M ha (%)		M ha (%)	
-98 (-6.2%)	-1.65 (-11.0%)	-0.47 (-1.6%)	-4.84 (-16.9%)

Table 2. Primary forest and tree cover loss in Malaysia 2002–2019.³⁰

Between 2013 and 2017, the species “experienced a 10% decline in local site occupancy in heavily disturbed and clear-cut forest sites.”³¹

The spread of African oil palm (*Elaeis guinees*) has been identified as the greatest threat to the populations in Indonesia and Malaysia.

From 1967 to 2000, the area under oil palm cultivation [in Indonesia and Malaysia] increased from less than 2000 km² to more than 30,000 km². In 2011, 83,000 km² were planted with oil palm, including 20,000 km² in Peninsular Malaysia, 24,000 km² on Borneo, and 39,000 km² in Sumatra (Koh et al. 2011). In 2013, this number had grown to 116,000 km² (71,000 km² in Indonesia and 45,000 km² in Malaysia; Vijay et al. 2016), and the area planted with oil palm continues to increase rapidly (Meijaard and Sheil 2013). The establishment of oil palm monocultures does not only lead to loss of biodiversity but also contributes to habitat fragmentation and environmental pollution through chemical fertilizers or pesticide runoffs (reviewed in Fitzherbert et al. 2008), which directly affects *M. nemestrina*, who frequently uses plantations for short foraging bouts (Holzner et al. 2019, 2021a), and may thus get in direct and prolonged contact with dangerous chemicals, such as paraquat, which is a reportedly harmful herbicide (CDC 2018) still commonly used in Peninsular Malaysia (N. Ruppert, pers. obs.).³²

The southern pig-tailed macaque’s heavy dependence on intact forests “confirm[s] previous doubts on their ability to permanently persist in highly disturbed habitats.”³³ Southern pig-tailed macaques frequently use oil palm plantations as a foraging ground but exclusively choose mature trees in the forest as the place for sleeping and conducting most social behaviors (e.g., grooming).³⁴ Notably, “no populations are reported that thrive in oil palm plantations far from natural forests.”³⁵

³⁰ Rhet A Butler, *Rainforest Information*, MONGABAY (Aug. 14, 2020), <https://rainforests.mongabay.com/> [Ex. 13].

³¹ IUCN 2022 Assessment, *supra* note 1, at 8 (citing Holzner et al. 2021b [Ex. 11]).

³² *Id.* (citing Koh et al. 2011 [Ex. 14], Vijay et al. 2016 [Ex. 15]; Meijaard and Sheil 2013 [Ex. 16], Fitzherbert et al. 2008 [Ex.17]; Holzner et al. 2019 [Ex. 18], Holzner et al. 2021a [Ex. 11]; CDC 2018 [Ex. 19]).

³³ *See id.* at 7 (citing Caldecott 1986).

³⁴ *See id.* 7 (citing Ruppert et al. 2018 [Ex. 5]).

³⁵ *See id.* (citing A. Holzner and N. Ruppert, unpublished data).

Furthermore, the infant mortality rate averages sixty-six percent in oil palm plantation habitats, confirming the unsuitability of this habitat for the species.³⁶

B. Overutilization

Overutilization for scientific, commercial, and recreational purposes threatens the species. Between 53 and 136 individual southern pig-tailed macaques were exported annually from 2013–2018.³⁷ In 2017 and 2018, Indonesia led exportation and the United States led importation.³⁸ Southern pig-tailed macaques are bred (locally and internationally) in colonies for biomedical and behavioral research.³⁹ Specifically, they are sought for use in HIV/AIDS and other infectious disease research.⁴⁰

Commercially, farmers exploit the species for coconut harvesting. Juvenile southern pig-tailed macaques begin “commerce training” at one or two years of age after farmers remove them from the wild.⁴¹ While “extraction from the wild to meet the demand for coconut harvesting is perhaps the least documented,” primatologists estimate that farmers in southern Thailand alone keep several thousand pig-tailed macaques (southern and northern pig-tailed macaques) for coconut harvesting.⁴² The use of southern pig-tailed macaques in the coconut-plucking industry occurs in all range countries.⁴³

Domestic trade for pets and entertainment and the influence of social media platforms further threaten the species.⁴⁴ As examples, in venues in Thailand, southern pig-tailed macaques perform “circus-like tricks” (e.g., ride bicycles, shoot basketballs, and perform push-ups), for paying customers.⁴⁵ In Indonesia, “1,274 individuals were offered for sale on Facebook in 2020/21 alone.”⁴⁶ Malaysia has been a hot spot for illegal online pet trading.⁴⁷ An online search conducted in 2017/2018 of social media platforms in Malaysia showed consumer demand dictating a market

³⁶ See *id.* at 6–7 (citing A. Holzner and N. Ruppert, unpublished data).

³⁷ *CITES Trade Database*, CITES (2022), <https://trade.cites.org/> (last visited Apr. 3, 2023) (comparing gross imports and gross exports of live *Macaca nemestrina* from 2013–2018 for “all countries”). The IUCN 2022 Assessment cited to the *CITES Trade Database* (2022) as reporting “approximately 50–150 individuals exported per year between 2013–2020.” IUCN 2022 Assessment, *supra* note 1, at 8.

³⁸ See IUCN 2022 Assessment, *supra* note 1, at 8; *CITES Trade Database*, *supra* note 37. Data describing the United States’ importing numbers after 2018 does not appear in the *CITES Trade Database*. See *CITES Trade Database*, *supra* note 37.

³⁹ IUCN 2022 Assessment, *supra* note 1, at 8 (citing Sari et al. 2013 [Ex. 20]); see also *Primate Experimentation in Australia*, HUMAN RSCH. AUSTRALIA (Oct. 1, 2019), <https://www.humanresearch.org.au/primate-experimentation-in-australia/> [Ex. 21]; *Nonhuman Primate Resources*, ORIP 2 (2023), https://orip.nih.gov/sites/default/files/ORIP_Nonhuman_Primate_Resources_Fact_Sheet.pdf [Ex. 22] (describing the breeding colonies maintained in the United States).

⁴⁰ IUCN 2022 Assessment, *supra* note 1, at 9 (citing as examples, Ha et al. 2000 [Ex. 23], Lee et al. 2021 [Ex. 24], Ritter et al 2013 [Ex. 25]).

⁴¹ Devan Schowe et al., *Assessing the Welfare of Coconut-Harvesting Macaques in Thailand*, 242 APPLIED ANIMAL BEHAVIOR SCI. 2 (2021) <https://www.sciencedirect.com/science/article/pii/S0168159121002021> [Ex. 26].

⁴² *Id.*

⁴³ IUCN 2022 Assessment, *supra* note 1, at 9 (citing as an example, Bangkok Post 2015 [Ex. 27]).

⁴⁴ See IUCN 2022 Assessment, *supra* note 1, at 9.

⁴⁵ Nanchanok Wongsamuth, *Pay Coconuts, Get Monkeys*, BANGKOK POST (Sept. 6, 2015), <https://www.bangkokpost.com/thailand/special-reports/681936/paycoconuts-get-monkeys> [Ex. 27].

⁴⁶ IUCN 2022 Assessment, *supra* note 1, at 9 (citing “Anonymous, unpublished results”).

⁴⁷ See *id.* (citing Zainol et al. 2018 [Ex. 12]).

price of \$98 for a southern pig-tailed macaque—which was less than the range for the most frequently traded species (i.e., the dusky leaf monkey price ranged from \$129 to \$195) but more than the \$61 price for the slow loris, another frequently traded species.⁴⁸

C. Disease or Predation

Humans hunt and kill southern pig-tailed macaques for research, medicinal purposes, and food.⁴⁹ Human-wildlife conflict and the negative public perception of the species as “crop pests” have been described as “quite severe.”⁵⁰ For example, between 2015 and 2020, the southern pig-tailed macaque repeatedly placed among the top five most complained about wildlife species to the Department of Wildlife and National Parks (DWNP) Peninsular Malaysia.⁵¹

D. Inadequacy of Existing Regulatory Mechanisms

This species is listed under Convention on International Trade in Endangered Species (CITES) Appendix II and thus is monitored and requires permits for international trade of live specimens and parts.⁵² Only an export permit or re-export certificate is required; an import permit is not needed unless required by national law.⁵³ The IUCN 2022 Assessment acknowledges the protections already conferred in the species’ geographic range.

Brunei. The species is not protected but export is not allowed pursuant to the Brunei Wildlife Act 1978, updated 1984.⁵⁴

Indonesia. Although *Macaca nemestrina* is not listed as a protected species, the species is also not featured on the wildlife capture quota list.⁵⁵ Thus, “its capture from the wild is not

⁴⁸ Muhammad Zaki Zainol et al., *Assessment of Illegal Online Primate Trade in Malaysia*, SCH. OF BIOLOGICAL SCIS. (August 2018), https://www.researchgate.net/publication/327933004_Assessment_of_illegal_online_primate_trade_in_Malaysia [Ex. 12].

⁴⁹ Kayla Ayers & Candace Vanderpoel, *Macaca nemestrina*, ANIMAL DIVERSITY (2009), https://animaldiversity.org/accounts/Macaca_nemestrina/ [Ex. 28].

⁵⁰ IUCN 2022 Assessment, *supra* note 1, at 8.

⁵¹ *See, e.g.*, 2015 Annual Report 2015, PERHILITAN 166 (2015), https://www.wildlife.gov.my/images/stories/penerbitan/laporan_tahunan/%5BSOFTCOPY%5DPERHILITAN-annual-report-2015.pdf [Ex. 29] (reporting 320 annual complaints); 2016 Annual Report, PERHILITAN (2016), at Appendix D, <https://www.wildlife.gov.my/images/document/penerbitan/laporantahunan/LP2016%20-%2020022018.pdf> [Ex. 30] (reporting 330 annual complaints); 2017 Annual Report, PERHILITAN 182 (2017), <https://www.wildlife.gov.my/images/document/penerbitan/laporantahunan/LT2017.pdf> [Ex. 31] (reporting 320 annual complaints); 2020 Annual Report, PERHILITAN 153 (2020), <https://www.wildlife.gov.my/images/document/penerbitan/laporantahunan/LT2020.pdf> [Ex. 32] (reporting 363 annual complaints).

⁵² *Macaca nemestrina*, CITES, <https://cites.org/eng/taxonomy/term/1139> (last visited Mar. 22, 2023) [Ex. 33]; *Appendices*, CITES (Feb. 23, 2023), <https://cites.org/eng/app/appendices.php> [Ex. 34] (explaining that, when a species is included in Appendix II, “all parts and derivatives thereof are also included in the same Appendix); *How CITES Works*, CITES, <https://cites.org/eng/disc/how.php> (last visited Mar. 22, 2023) [Ex. 35].

⁵³ *How CITES Works*, *supra* note 52.

⁵⁴ IUCN 2022 Assessment, *supra* note 1, at 9.

⁵⁵ *Id.* (citing MOEF 2018 [Ex. 36], KLHK 2021); *see also* Malene F. Hansen et al., *Conservation of Long-Tailed Macaques: Implications of the Updated IUCN Status and the CoVID-19 Pandemic*, 35 PRIMATE CONSERVATION 5 (2021), https://www.researchgate.net/profile/Malene-Friis-Hansen-2/publication/349338354_Conservation_of_Long-tailed_Macaques_Implications_of_the_Updated_IUCN_Status_and_the_CoVID-19_Pandemic/links/602b825392851c4ed5752da6/Conservation-of-Long-tailed-Macaques-Implications-of-the-Updated-IUCN-Status-

allowed.”⁵⁶ Nonetheless, the rampant online pet trade of this species suggests that the zero harvest quota lacks stringent enforcement.⁵⁷

Malaysia. The species receives “protected” status—meaning a license is required for hunting, keeping, or trading—in Peninsular Malaysia under the Wildlife Conservation Act of 2010 (Act 716), in Sabah under the Wildlife Conservation Enactment of 1997 (Act 6 of 1997), and in Sarawak under the Wildlife Protection Ordinance of 1998.⁵⁸ The Wildlife Conservation Act of 2010 carves out subsistence hunting of the species by indigenous Malaysians in Peninsular Malaysia from the requirement.⁵⁹

Thailand. The southern pig-tailed macaque is not specifically listed on the Wild Animal Preservation and Protection Act, B.E. 2562 (2019), but the species “is given the general protection of wildlife, which restricts hunting and capture in all protected areas and forest lands.”⁶⁰

Yet, although *Macaca nemestrina* has been listed in CITES Appendix II since 1977,⁶¹ the population has declined and is now considered endangered by the IUCN based on the levels of exploitation driven, in part, by trade. CITES’ regulations have not adequately controlled the species trade.

E. Other Factors

Hybridization with other primates threatens the genetic integrity of the species. Hybridization with *Macaca fascicularis* has been observed in Sepilok, Sabah, and other parts of Malaysia.⁶² And, where the southern pig-tailed macaque’s range overlaps with *Macaca leonine* at the Surat Thani-Krabi depression, hybridization is expected.⁶³

VII. CONCLUSION

The petitioners urge the Service to list the southern pig-tailed macaque (*Macaca nemestrina*) as an “endangered” or “threatened” species under the ESA. The species has experienced catastrophic population decline for decades, and primatologists expect this decline to continue without mitigating action. Southern pig-tailed macaques continue to lose significant portions of their habitat across their range, and this loss has been associated with “lower site occupancy, higher

and-the-CoVID-19-Pandemic.pdf [Ex. 37] (“Since 2016, the quota for wild-caught macaques in Indonesia has been zero . . .”).

⁵⁶ IUCN 2022 Assessment, *supra* note 1, at 9.

⁵⁷ *See id.* at 8.

⁵⁸ *Id.* at 9.

⁵⁹ *Id.* (referring to Schedule 6 of the Wildlife Conservation Act of 2010 and citing Lappan and Ruppert 2019 [Ex. 38]).

⁶⁰ *Id.*

⁶¹ *Taxon: Macaca nemestrina (Animalia)*, CITES, <https://cites.application.developpement-durable.gouv.fr/viewtaxon.do?id=2570> [Ex. 39] (last visited Mar. 31, 2023).

⁶² IUCN 2022 Assessment, *supra* note 1, at 1 (citing Gilhooly et al. 2021 [Ex. 40], N. Ruppert (pers. obs.)).

⁶³ *Id.* at 1, 5 (citing Malaivijitnond et al. 2012 [Ex. 41]).

infant mortality, and local extirpation.”⁶⁴ Additional threats from the current levels of trade for scientific, commercial, and recreational purposes, and a general lack of protection (despite the laws in several habitat countries), are contributing to the species’ disappearance. As a major importer of the species for experimentation, the United States adds pressure to the stressed population. The FWS has the authority and obligation to act swiftly and add the southern pig-tailed macaque to the list of animals protected under the ESA.

⁶⁴ *See id.* at 5.

VIII. ADDENDUM

On April 12, 2023, petitioners submitted a petition (“2023 Petition”) urging FWS to list *Macaca nemestrina* (southern pig-tailed macaques) as an endangered or threatened species under the ESA.⁶⁵ Sections I through VII of the 2023 Petition are reproduced herein, and the 2023 Petition is incorporated by reference.⁶⁶ The Petitioners hereby supplement the 2023 Petition with the information in this Addendum. The Addendum includes new information that became available after FWS received the 2023 Petition that the Service did not previously consider in its 90-day determination—information that directly addresses comments raised in FWS’s 90-Day Finding Petition Review.⁶⁷

A recent study provided new evidence linking the use of oil palm plantations with a decline in infant survivorship in a wild population of southern pig-tailed macaques.⁶⁸ Researchers attributed the causal relationship to the “immediate threats through predation and intragroup aggression, as well as potential indirect risks stemming from exposure to harmful chemicals.”⁶⁹ Specifically, the study reported that southern pig-tailed macaques living in a mixed forest-oil palm habitat showed high infant mortality (57%); spending more than three hours a day in the plantation made infants three times more likely to die.⁷⁰ The study group’s exceptionally high infant mortality may have led to declining group sizes and, the researchers warned, ultimately threaten the population’s long-term survival.⁷¹

Deforestation and Habitat Fragmentation

Infant survivorship is a “critical factor for the persistence of primate populations;” it is crucial for determining individual fitness and maintaining population viability.⁷² A study published in January 2024 in *Current Biology* linked the conversion of natural forest habitats to agricultural landscapes with heightened infant mortality in southern pig-tailed macaques, finding that “prolonged periods of time spent in the plantation during infancy significantly reduced the likelihood of infants surviving beyond the first year of life.”⁷³ Researchers collected data on two groups of wild southern pig-tailed macaques who inhabited a mixed forest-oil palm plantation habitat in Peninsular Malaysia.⁷⁴

Longitudinal data revealed that 57% of all infants born during the study period (2014–2023) died before the age of 1 year, far

⁶⁵ See *Petition*, ECOS (Apr. 12, 2023), https://ecosphere-documents-production-public.s3.amazonaws.com/sams/public_docs/petition/4094.pdf (exhibits omitted) [hereinafter “2023 Petition”] [Ex. 42].

⁶⁶ The schedule of petitioners included in the 2023 Petition has been updated herein. See *supra* Section II.A.

⁶⁷ See generally 50 C.F.R. § 424.14(h)(iii) (“Where the prior review resulted in a final agency action, a petitioned action generally would not be considered to present substantial scientific and commercial information indicating that the action may be warranted unless the petition provides new information not previously considered.”).

⁶⁸ See generally Anna Holzner et al., *Agricultural Habitat Use Affects Infant Survivorship in an Endangered Macaque Species*, 34 *CURRENT BIOLOGY* 410 (2024) [Ex. 43].

⁶⁹ See *id.* at 412.

⁷⁰ See *id.* at 410, 411.

⁷¹ *Id.* at 412.

⁷² *Id.* at 410.

⁷³ *Id.* at 410, 412.

⁷⁴ *Id.* at 410.

exceeding mortality rates reported for other wild primates. Importantly, prolonged time spent in the plantation during infancy decreased the likelihood of infant survival by 3-fold, likely caused by increased exposure to the threats inherent to this environment. Further, mortality risk was elevated for infants born to primiparous mothers and predicted by prolonged maternal interbirth intervals, suggesting potential long-term effects attributed to the uptake and/or accumulation of pesticides in mothers' bodies. Indeed, existing literature reports that pesticides may cross the placental barrier, thus impacting fetal development during pregnancy.⁷⁵

Figure 2 illustrates the effects of plantation exposure on infant survival through a graphical abstract.

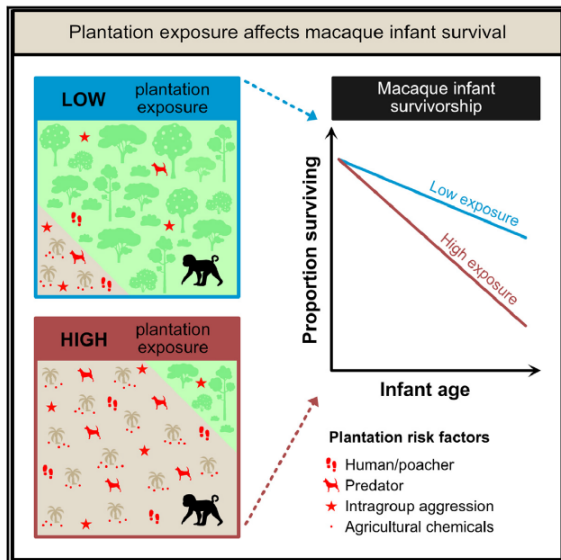


Figure 2. The effects of plantation exposure on southern pig-tailed macaque infant survival.⁷⁶

The researchers explained that “the time spent in the oil palm plantation during infancy is an important predictor of infant survival [because] this variable reflects the overall level of exposure to threats potentially encountered in this habitat.”⁷⁷ For example, as a highly terrestrial species, infant southern pig-tailed macaques are susceptible to humans and ground predators; encounters with humans and feral dogs in the plantation were five to ten times higher than in the adjacent

⁷⁵ *Id.* (internal citations omitted). “Infants experienced more than a 3-fold higher risk of death . . . when visiting the plantation more than 2.9h/day (i.e., more than average), compared with periods when they were less exposed to the plantation.” *Id.* at 411. “[I]nfant mortality rates documented for other macaque populations did not typically exceed 30% both in undisturbed forests . . . and anthropogenic environments.” *Id.* at 412.

⁷⁶ *Id.* (report cover page).

⁷⁷ *Id.* at 412.

primary forest.⁷⁸ Also, the rate of intragroup aggression displayed by the southern pig-tailed macaques in the plantation was nearly two times the rate in the forest.⁷⁹

A high infant mortality rate directly reduces the number of southern pig-tailed macaques who survive to adulthood, leading to a slower population growth or decline. As forest clearing for plantations is occurring and increasing within the southern pig-tailed macaque's range and is likely to increase over time (e.g., 29% tree cover loss in Malaysia, and 16% to 41% tree cover loss across the species' range in Indonesia, from 2001 to 2020),⁸⁰ the study's documented link between time spent in oil palm plantations and high infant mortality evidences a substantial negative effect that seriously threatens population viability.

⁷⁸ *Id.* at 411, 412.

⁷⁹ *Id.* at 411.

⁸⁰ *See supra* Sections V, VI.A.

IX. REFERENCES (EXHIBITS)

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- Ex. 9 *Southern Pig-Tailed Macaque*, IUCN, <https://www.iucnredlist.org/species/12555/215350982> (last visited Mar. 31, 2023).
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XI. APPENDIX – Petitioners’ Contact Information and Signatures



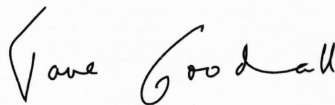
Lori Kettler, General Counsel
Regina Lazarus, Senior Counsel
The PETA Foundation
On behalf of People for the Ethical Treatment of Animals
501 Front Street, Norfolk, VA 23510
757-622-7382



Lisa Jones-Engel, Ph.D.
Senior Science Advisor, Primate Experimentation
Laboratory Investigations Department
People for the Ethical Treatment of Animals
501 Front Street, Norfolk, VA 23510
206-372-6190
LisaJE@peta.org



Birutė Mary Galdikas, Ph.D., President
Orangutan Foundation International
824 Wellesley Avenue, Los Angeles, California 90049
drbirute@gmail.com



Jane Goodall, Ph.D., DBE
Founder - Jane Goodall Institute
& UN Messenger of Peace
1120 20th St. NW #520s, Washington, DC 20036
(703) 682-9220
www.janegoodall.org



Action for Primates
United Kingdom
<https://actionforprimates.org/>
info@actionforprimates.org



Born Free USA
8737 Colesville Road, Suite 715, Silver Spring, MD 20910
301-448-1407
info@bornfreeusa.org



Sarah Kite, Co-Founder
Action for Primates
United Kingdom
sarah@actionforprimates.org



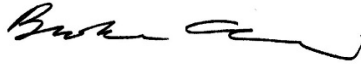
Nedim C. Buyukmihci, V.M.D.
Action for Primates
United Kingdom
ned@actionforprimates.org



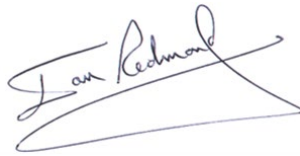
Angela Grimes, Chief Executive Officer
Born Free USA
8737 Colesville Road, Suite 715, Silver Spring, MD 20910
301-448-1407
angela@bornfreeusa.org



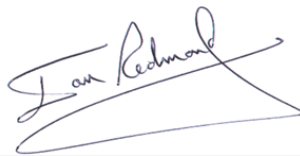
Liz Tyson, Ph.D., Programs Director
Born Free USA
8737 Colesville Road, Suite 715, Silver Spring, MD 20910
301-448-1407
Liz@bornfreeusa.org



Asia for Animals Macaque Coalition
Brook Aldrich, Deputy Coordinator
<https://www.macaqucoalition.com/>
+44 7873138469
macaques@asiaforanimals.com



Ecoflix
Ian Redmond, OBE, DSc, FLS, Head of Conservation
24730 Long Valley Road, Hidden Hills, LA, CA 91302 USA
Ian.Redmond@ecoflix.com



Ian Redmond, OBE, DSc, FLS
24730 Long Valley Road, Hidden Hills, LA, CA 91302 USA
Ian.Redmond@ecoflix.com



International Primate Protection League
Sam Shancee, Ph.D., Board Representative
Deborah D. Misotti, Ph.D., Chief Executive Officer
P.O. Box 766, Summerville, SC 29484
843-871-2280
info@ippl.org



Wildlife Alliance
Amy Van Nice, Director of Development/Environmental Education Technical Advisor
House 9AB, Street 21, Phnom Penh, Cambodia
(+855) 23 211 604
vannice@wildlifealliance.org



Physicians Committee for Responsible Medicine
Neal D. Barnard, MD, President
5100 Wisconsin Ave., NW, Suite 400, Washington, DC 20016-4131
202-686-2210



Michael Schillaci, Ph.D.
Department of Anthropology, University of Toronto Scarborough
1265 Military Trail, Toronto, Ontario, Canada M1C3H5
416-287-7328
michael.schillaci@utoronto.ca



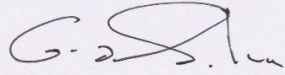
One Voice
Virgile Delâtre, Director
BP 41, 67065 Strasbourg Cedex – France
+33 (0)6 80 35 70 18
virgile.delatre@one-voice.fr



Abolición Vivisección
Pablo Fernández, Ph.D.
<https://www.abolicion-viviseccion.org/>
info@abolicion-viviseccion.org



Sam Shanee, Ph.D.
#373 Jr Andalucia, Moyobamba, San Martin Peru, 22001
+51 994440546
sam@neoprimate.org



Gemunu de Silva, Co-founder and Executive Director
Tracks Investigations
Suite 255, 94 London Road, Oxford, OX3 9FN, UK
+ 44 7837014359
gem@tracksinvestigations.org



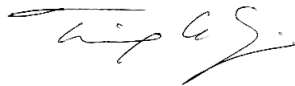
Northwest Animal Rights Network
Rachel Bjork, Board President
1037 NE 65th St., #174, Seattle, WA
rachel@narn.org
206-334-3742



Neotropical Primate Conservation
Sam Shinee, PhD, Projects Director
Windrush, Looe Hill, Seaton, Torpoint, Cornwall, England, PL11 3JQ
+44 01503250827
sam@neoprimate.org



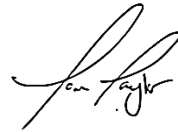
EMS Foundation
Michele Pickover, Executive Director
megan@emsfoundation.org.za
<https://emsfoundation.org.za/>



Tim Ajax, Sanctuary Director
Oklahoma Primate Sanctuary
PO Box 134, Newcastle, OK 73065
405-387-4354
tim@okprimates.org



Rise for Animals
Ed Butler, Executive Director
6 Liberty Sq PMB 91098, Boston, MA 02109
(617) 523-6020
humans@riseforanimals.org



Wildlife Friends Foundation Thailand
Thomas Taylor, Project Director
Tom.taylor@wfft.org
+66-86-3402273



Douc Langur Foundation
Lois K Lippold Ph.D., President
858-277-2710
foundation@douclangur.org



Fundacion Entropika
Angela Maldonado, Ph.D., Director
Calle 18 # 7B – 23, Leticia, Amazonas, Colombia
+57 310 651 74 98
info@entropika.org



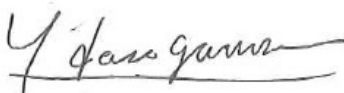
Animal Defenders International
Jan Creamer, President
Vox Studios North, 1 Durham Street, London SE11 5JH, UK
+44 (0)207 630 3340
www.ad-international.org



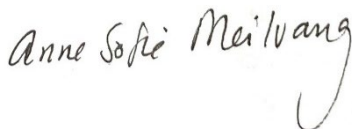
World Animal Protection
Lindsay Oliver, Executive Director
3rd Floor 535 8th Avenue, New York, NY 10018
323-538-0079
lindsayoliver@worldanimalprotection.us



Paula Pebsworth
236 Emporia Blvd., San Antonio, TX 78209
paula.pebsworth@gmail.com



Japan Anti-Vivisection Association (JAVA)
Seiou #703 29-31 Sakuragaoka-cho, Shibuya-ku, Tokyo 150-0031 JAPAN
81 (3) 5456-9311
java@java-animal.org



Dyrenes Beskyttelse/ Animal Protection Denmark
Anne Sofie Meilvang, Biologist and Project Leader for International Projects
Buddingevej 308, 2860 Søborg, Denmark
+4581880370
asm@dyrenesbeskyttelse.dk



Born Free Foundation
2nd Floor, Frazer House, 14 Carfax, Horsham, West Sussex, RH12 1ER
+44 (0)1403 240 170
info@bornfree.org.uk



Dr. Mark Jones, BVSc, MSc (Stir), MSc (UL), MRCVS
Head of Policy
Born Free Foundation
markj@bornfree.org.uk



Agustín Fuentes, Ph.D.
Professor of Anthropology
Princeton University
afuentes2@Princeton.edu



Animal Alliance of Canada
#101 – 221 Broadview Avenue, Toronto, ON M4M 2G3
416-462-9541



Anthony B. Rylands, Ph.D.
Deputy Chair, IUCN SSC Primate Specialist Group
Washington DC
arylands@rewild.org



Russell A. Mittermeier, Ph.D.
Chair of the IUCN SSC Primate Specialist Group
Washington, DC
rmittermeier@rewild.org