



February 1, 2024

VIA OVERNIGHT MAIL AND EMAIL

IUCN Global Species Programme Red List Unit
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Pembroke Street, Cambridge CB2 3QZ
United Kingdom
Email: redlist@iucn.org

RE: Petition Challenging the Listing Status of Long-tailed Macaque (*Macaca fascicularis*)

To Whom It May Concern:

The National Association for Biomedical Research (“NABR”) hereby submits the enclosed petition to the IUCN outlining NABR’s scientific disagreements with the March 7, 2022, listing of Long-tailed macaque (*Macaca fascicularis*) as Endangered. NABR submits this petition on the basis of the IUCN Red List Categories and Criteria.

As contemplated by IUCN standards and guidelines, NABR engaged with the IUCN Primates Specialist Group in an attempt to resolve informally issues noted in the enclosed petition. However, as documented in the enclosed petition, those efforts were unsuccessful.

After completing an extensive review of available scientific information as summarized in the petition, NABR respectfully requests that the IUCN:

- (1) Undertake a new status assessment of *M. fascicularis* conducted by truly independent scientists not involved in advocacy roles for the target species;¹
- (2) Vacate the results of both the 2022 and 2020 assessments; and
- (3) Change the official Red List species status of *M. fascicularis* to its previous designation as a species of Least Concern.

Please contact at mbailey@nabr.org or by phone at (202) 857-0540 if you have any questions about this matter. Thank you for your consideration of the enclosed petition and this request.

Sincerely,

Matthew Bailey, President
National Association for Biomedical Research

Enclosure

¹ NABR is aware of submissions made by Dr. Hank Jenkins to the IUCN concerning apparent conflicts of interest of authors involved in prior species assessments. Such issues will be addressed by the IUCN in an appropriate forum.

PETITION CHALLENGING THE RED-LIST STATUS OF LONG-TAILED MACAQUE

This petition analyzes evidence presented by Hansen et al. (2022a) relevant to IUCN Criteria A3c/d that resulted in an Endangered classification of long-tailed macaque (LTM; *Macaca fascicularis*). Hansen et al. (2022a), as clarified by (Nijman et al. 2023), concluded that the global population of *M. fascicularis* likely will experience a reduction of $\geq 50\%$ over the next three generations, based on: (1) a decline in area of occupancy, extent of occurrence and/or quality of habitat; and (2) actual or potential levels of exploitation. As explained in more detail below, the best available evidence does not support this conclusion, nor do data from Hansen et al. (2022a) indicate that IUCN criteria for Endangered have been met.

1 | Summary of activities to date

On 15 June 2023, NABR submitted a draft petition to the IUCN (NABR 2023a) objecting to the classification of *M. fascicularis* as Endangered. Per IUCN protocols, 4 weeks were set aside for informal discussions to attempt to resolve the issues involved. The facilitator of these discussions was Dr. Kim Reuter, Deputy Chair of the IUCN Primate Specialist Group (PSG) and the PSG's Red List Coordinator. After a video conference with Dr. Reuter to discuss and clarify concerns raised in the draft petition, Dr. Reuter asked the lead assessor to provide a written response. Subsequently, Dr. Reuter communicated this response (Nijman et al. 2023) to NABR, along with recommendations of the PSG (PSG 2023). Dr. Reuter was cordial and professional throughout this process, and the informal review was completed within the prescribed timeframe. The written responses, however, were disappointing and, in the view of NABR, wholly inadequate to address the concerns raised.

A detailed reply to the Nijman et al. (2023) response was provided previously to the IUCN (NABR 2023b), so only some of the main points are summarized here. Overall, the original assessors summarily dismissed the serious concerns raised by NABR as nitpicking or wholly irrelevant. This was discouraging and alarming, as the draft petition documented many cases where data or author's conclusions had been misrepresented in the 2022 assessment. The following exchanges capture the tone of the response:

NABR comment: Hansen et al. (2022a) misrepresents conclusions and data contained in Nuttall et al. (2022) as supporting a declining trend.

Nijman et al. response: This assertion, even if correct, has no relevance to the outcome of the listing.

NABR comment: Data cited by Hansen et al. (2022a) are often misquoted, and do not provide actual evidence of species declines compared to past evaluations.

Nijman et al. response: This assertion, even if correct, has no relevance to the outcome of the listing.

NABR comment: Given that the 40% decline identified is not supported by actual data, there is no basis for projecting a steeper decline in the future.

Nijman et al. response: This assertion, even if correct, has no relevance to the outcome of the listing. The assessment is not based on a past decline of 40% but on a projected future decline of 50% based on decline in area of occupancy and current exploitation levels.

The last response, in particular, is astonishing. If population declines are irrelevant, why did the authors spend so much time arguing for them in the 2022 assessment, often citing

a population decrease to 3 million that has no empirical basis? And where did the 50% value for projected future declines come from, if not “a little more than 40%”?

1.1 | Actual trend data

Nuttall et al. (2022) was a key reference cited in the 2022 assessment and one of the few cited documents providing trend data, which merits closer scrutiny. Nuttall et al. collected abundance data for 7 years (2010 to 2020, inclusive) for 11 wildlife species from a wildlife sanctuary in Cambodia. Data were presented graphically, and the statistical significance of trends was assessed by bootstrap resampling. Nuttall et al. (2022, p. 11) stated “We found that gibbon, douc, PT macaque, LT macaque, langur, and peafowl showed stable or increasing population trends.” Species (including the LT macaque) were considered stable if bootstrap resampling did not consistently show a positive or negative trend. In contrast, despite having only 7 data points, almost half (5 of 11) of the species monitored by Nuttall et al. showed significantly declining trends. Here is our exchange with the assessors regarding Nuttall’s analysis:

NABR comment: Nuttall et al. (2022) concludes the trend was stable with no significant decline. Hansen et al. (2022a) selectively used the first and last points of the highly variable time series presented by Nuttall et al. (2022) to claim a 50% decline.

Nijman et al. response: We were in contact with Matt Nuttall from WCS last year who said that the decline was indeed 50% but that they were not able to statistically call it a ‘decline over a decade’ as the paper was investigating, due to an outlier population estimate from 2018.

This response shows a disturbing lack of understanding of the basic principles of statistical analysis. It is never acceptable to ignore inconvenient data points simply because they are inconsistent with a preconceived hypothesis. In this case, the offending data point was the highest point estimate, and it occurred near the end of the time series—not the result one expects from an endangered species in steep decline. Applying a Bayesian estimate, NABR reviewers found that, with a 90% probability, the real rate of change lies between a 30% increase and a 60% decline.

Given the actual highly variable data and conclusions presented by Nuttall et al., an objective, unbiased assessment might have made either of the following statements:

- (1) “Nuttall et al. stated that LTM had a stable trend in the study area over 10 years.”
- (2) “Although the trend line for LTM plotted by Nuttall et al. implied a ~30% decline (our estimate based on digitizing the published figure), bootstrap resampling showed that the trend did not statistically differ from zero.”

Instead, what Hansen et al. (2022a, p. 7) chose to do was to compare the first and last data points only and make the following statement: “Furthermore, in an area that is regularly monitored in Cambodia, populations have declined by 50% over the last ten years (Nuttall et al. 2022).” It is also worth noting how Nuttall himself characterized this dataset when asked about it by a writer for *Science* (Normile 2023, p. 470): “Nuttall says the study did generate the two data points used by IUCN assessors. But considering other observations, he says the study ‘says the species are stable,’ while suggesting ‘a shallow decline.’”

NABR comment: Brotcorne et al. (2011) is not referenced in Hansen et al. (2022a) and shows increasing trends.

In their response to this comment, Nijman et al. indicate that they are well aware of the status of LTMs on Bali and have been for several decades. If that is the case, why

was this example of increasing trends (published in 2011) excluded from their 2022 assessment? Is it too complicated to explain, as it runs counter to their argument? Nijman et al. went on to say, “The fact that some populations are increasing does not change the fact that the species in general is declining across its range.” Certainly, we agree that a species that is otherwise in general decline might nevertheless be increasing in places (and vice versa!). The problem here is that although a group of primate biologists has been making the claim at least since Eudey (2008) that LTMs are in widespread decline, these claims are supported by virtually no actual data. Reports from Thailand provide another example of increasing trends ignored by Hansen et al.; Malaivijitnond and Hamada (2008) don’t present any trend data but infer that the population of LTM in Thailand increased 5 to 10-fold over 15 years because of conversion to habitats where LTMs thrive. Given the extreme paucity of trend data, and the efforts by the assessors to distort what one of the few sources of data reported, what are readers of the 2022 assessment to make of the omission of studies that put the status of LTMs in a more favorable light?

1.2 | Generation length

In response to the NABR comment that using maximum longevity from a captive individual inflated the estimated generation length, with the consequence that the estimated declines were computed over too many years, Nijman et al. responded that, “The current listing is robust, and we do not believe that a shortened GL will affect the listing.” In fact, as documented in detail below [section 2.4], the current listing is NOT robust to the issue of generation length, and if Hansen et al. (2022a) had used published longevity for a wild LTM population, their own projected annual rates of future decline would not support an Endangered listing under the IUCN decline criterion.

1.3 | Self review

NABR comment: Hansen et al. (2022a) is biased given its selective use of data. The paper is drafted to support listing as opposed to represent an unbiased analysis. It is not, in our opinion, a credible analysis.

Nijman et al. response: The assessment is conservative and we included a diverse array of assessors to ensure understanding of the complexity of the species. It is robust and was deemed such by the IUCN SSC PSG and the IUCN RL.

Dr. Reuter is the only reviewer listed for the 2022 assessment, and she indicated in an email to us that she has reviewed “hundreds” of IUCN assessments over a remarkably short period, which suggests most of her reviews must be perfunctory rather than substantive. Furthermore, as the facilitator of the informal discussions and Deputy Chair of the PSG, she is far from a disinterested party in this dispute. NABR considers it essential to have a truly independent group of scientists review the 2022 assessment and, ideally, completely reassess it.

2 | Flaws in the 2022 assessment

IUCN guidelines for petitions objecting to Red List determinations primarily focus on empirical data and analyses of those data:

In its deliberations, the SPC evaluates the strength of evidence for or against the listing being petitioned, based only on the data relevant to the listing of the taxon under the IUCN Red List Categories and Criteria, and associated guidelines.

For the assessment under consideration here, empirical data are scarce, and quantitative analyses of data by the assessors are practically non-existent. Of necessity, therefore, we slightly broaden the perspective in evaluating the 2022 IUCN assessment of LTMs to critique the inferential approach and repeatability of the findings.

2.1 | Unsupported claims of population decline

Eudey (2008) wrote a paper, “The crab-eating macaque (*Macaca fascicularis*) widespread and rapidly declining,” that, despite its title, contained no actual documentation of population decline. This established a precedent that has continued through to the present. During that time, IUCN status changed from least concern to vulnerable to endangered, all in the absence of empirical data documenting any declines at the species level. The 2022 Hansen et al. assessment is merely the latest entry in this campaign.

2.2 | Lack of a rigorous, systematic, approach

The long-tailed macaque is broadly distributed across diverse habitats in Southeast Asia and surrounding areas. Numerous subspecies have been recognized by various authors, but the current assessment is for the native range of the entire species. By any standards, this is a complicated and challenging species to assess, so it is essential to have a systematic way of reviewing data for all major geographic areas and integrating all of this into an overall assessment. Unfortunately, Hansen et al. (2022a) make no attempt to do that, apart from describing the geographic range and plotting it on a map. In the rest of the assessment, bits of data, personal communications, and declarations are made haphazardly with no real attempt to integrate them into a coherent picture of the species’ overall status. Below, this issue is discussed with respect to two key themes.

2.2.1 | Exploitation

It is well established, in the 2022 assessment and elsewhere, that at least three major sources of exploitation could affect LTM status: harvest for bushmeat, harassment or removals for conflicts with humans, and removals for biomedical research. Missing from the 2022 assessment are two crucial pieces of information, without which no firm conclusions can be drawn:

- (1) What are the rates of these removals, by geographic area and integrated up to the species level?
- (2) How do these rates compare with exploitation rates that would be consistent with the long-term viability of LTMs?

The 2022 assessment does not attempt a comprehensive treatment of #1, relying instead on bits of data, personal communications, and professional judgment from a few geographic areas. More importantly, there is no indication in the assessment that the authors even considered Question 2 to be relevant. That is a serious flaw, as many species can experience exploitation and remain viable. At a minimum, a rough idea of the capacity of LTM to withstand exploitation could have been made based on the species’ vital rates and documented high rates of increase under favorable conditions, but no such analyses were undertaken.

2.2.2 | Area of occupancy

Even if population declines cannot be reliably documented, an Endangered status under the IUCN could still be justified based on the assessors’ claim that the species is projected to experience a 50% decline in area of occupancy over the next 3 generations.

Area of occupancy is the key metric as, per the 2022 assessment, the extent of occurrence of the species still covers at least 11 countries and many millions of square kilometers.

What is clear from the information presented by Hansen et al. (2022a) and others is that distributional patterns of LTMs have changed in recent decades. As native habitats have been logged or otherwise degraded, the species has shifted to secondary forests and agricultural and other anthropogenically modified habitats. These areas “feature habitat similar to the coastal and riverside vegetation the animals have long occupied” (Normile 2023, p. 470). By all accounts, in these modified habitats, LTMs are highly productive and even “hyperabundant,” with densities at least twice the long-term norm (Moore et al. 2023). The species is most successful in, and shows a preference for, disturbed habitats (Kemp and Burnett 2003); it thrives in close association with humans, both in agriculture and urban areas, achieving densities up to 1600/km² (Hansen et al. 2022a); and populations grow rapidly when introduced to new habitats such as Tinjil Island (Leeson et al. 2004).

Given these well-established facts, any rigorous assessment of the magnitude of decline (if any) in the area of occupancy would have to consider the net effects of losses in the primary habitat and gains in the secondary habitat. Remarkably, the 2022 assessors don’t even attempt to conduct such analysis, which raises serious questions about their ability to predict occupancy trends into the future. Instead, the 2022 assessors repeatedly dismiss the importance of LTM’s presence in secondary habitats, viewing it as a risk factor because it increases human-macaque conflicts.

An alternative view is that the hyperabundance of LTMs in extensive secondary or modified habitats means that the species could not possibly be at risk of extinction. That, in fact, is the opinion of other independent researchers. According to Matthew Luskin, a coauthor of the Moore et al. (2023) study and an ecologist at the University of Queensland, “The data ‘clearly show’ the macaque is not yet globally endangered.” William Laurance, an ecologist at James Cook University, says that the IUCN “is off base here” and is “being alarmist and not basing its decisions on good data” (quotations from Normile 2023 p. 470). Hilborn and Smith (2023) reviewed available empirical information and concluded that the probability of extinction of *M. fascicularis* is “very low.”

2.3 | Misrepresentation of data

See NABR 2023a,b and sections 1.1 and 2.5 for numerous examples of this.

2.4 | Generation length

Under IUCN Criterion A, of equal importance to the magnitude of the decline is the time period over which it is estimated (3 generations). For this criterion to be meaningful, decline and generation length (GL) should be measured for the same or comparable populations. That was not the case in Hansen et al. (2022a). They reported a GL of 13.9 years for *M. fascicularis* but did not explain where the estimate came from or how it was calculated. The assessment included Pacifici et al. (2013) in the references, and the Appendix to Pacifici et al. provides a GL estimate for LTM of 13.9 years, which agrees with the value used in the assessment. The method used by Pacifici (Equation 1 in their paper) is one of the methods that are approved by the IUCN:

$$GL = R_{\text{span}} * z + AFR,$$

where AFR is age at first reproduction, R_{span} is the reproductive lifespan (difference between maximum longevity and AFR), and z is a taxon-specific constant (0.29 in this case). The data used by Pacifici were AFR = 3.9 and longevity = 38.5 (reported in days but converted here to years), which leads to $R_{\text{span}} = 34.6$ and $GL = 13.9$.

The problem with the GL estimate used in Hansen et al. (2022a) is that the value of longevity of 38.5 years (derived from the AnAge database) is for a single captive LTM male. For mammals (as well as many other taxa), longevity in captivity is consistently greater than in the wild (Tidiere et al. 2016), which means that using captive data consistently overestimates GL and consequently leads to predictable overestimates of extinction risk under IUCN criterion A. Pacifici et al. (2013, p. 90) acknowledged this potential bias but discounted its importance, saying that “we believe that these biases will probably influence only a limited number of large-bodied species.”

But *M. fasciculatus* is one of those species, and for such species, the consequences of this bias can be substantial. Nijman et al. (2023) and other IUCN reviewers (PSG 2023) dismiss generation length as of trivial importance, but these statements are easily refutable. Tidiere et al. (2016) reported an estimated maximum longevity of *M. fascicularis* in the wild of 22 years (based on data from Van Noordwijk and van Schaik 1999) - vastly shorter than the captive value used to estimate GL in this species. Using this wild longevity value, R_{span} becomes a more credible 18.1 years rather than 34.6 years, and GL drops to 9.1. This means that the appropriate 3-generation interval for calculating the decline criterion is 27.4 years rather than 41.7. Making this adjustment avoids the problem of a mismatch between a decline measured for the wild population and an artificially-inflated generation length that doesn't apply to any real population.

As noted above, NABR reviewers do not agree that actual data support Hansen et al.'s (2022) claim of a past 3-generation decline of 40% in *M. fascicularis*. However, if that were the case, it would imply an annual decline of $\lambda = -0.012 = -1.2\%$ (obtained by solving the equation $(1-\lambda)^{41.7} = 0.6$). Across 27.4 years rather than 41.7, that annual rate of decline would produce a total decline of only 28.2% ($0.988^{27.4} = 0.718$). Similarly, the 50% projected future decline (which would imply an annual decline of 1.6%) would shrink to 36.5% when projected using a GL that is more meaningful for the wild population being assessed. Neither of these adjusted decline rates are extreme enough to justify IUCN classification as Endangered.

The data on wild longevity in *M. fascicularis* were published in the journal *Primates* over 25 years ago (Van Noordwijk and van Schaik 1999) and could have been acknowledged by Nijman et al. (2023) or used in Hansen et al. (2022a) at a minimum for comparison purposes. Given the sensitivity and importance of GL to calculating extinction risk, IUCN assessments should make use of published literature for wild populations, when available, to estimate GL. Doing so will provide a more accurate portrayal of actual risks faced by species in nature.

2.5 | Lack of objectivity

One should be able to expect that IUCN status assessments are objective evaluations of a species' status, recognizing, of course, that scientists are human and complete objectivity can be difficult or impossible to achieve. An objective assessment would start with an open mind regarding the species' actual status and would begin by reviewing and summarizing the relevant empirical data and comparing them to each of the 5 IUCN listing criteria. Strengths and weaknesses of the empirical data, together with relevant caveats, should be discussed.

The 2022 assessment falls far short of this standard. The stated rationale (first sentence of the Justification) was that in 2008 a primate biologist proposed that *Macaca fascicularis* “urgently needed to be considered more vulnerable.” Rather than an objective

evaluation of the merits of this claim, the 2022 assessment reads like an advocacy piece designed to turn this proposition into reality (with Eudey being listed as a contributor to the assessment, even though she died in 2015). The 2022 assessment is littered with provocative terms (“persecution”, “ominously”, “skyrocketed”, “alarming”, “insidious”) designed more to inflame than illuminate. It also contains many value-laden imperatives (“we cannot ignore”, “must be confronted”, “the research industry needs to become accountable”, “we must recognize”, “we must acknowledge”) that go way beyond statements of fact or scientific conclusions. This type of language, common in advocacy publications, has no place in a scientific document.

Due to space constraints, we examine just one instance in detail. In the draft petition, NABR (2023a) objected to the statement in Hansen et al. that “both price and demand for *M. fascicularis* as a trade commodity has skyrocketed during the Covid-19 pandemic, relative to the already regular and heavy pre-pandemic capture and trade (Hansen et al. 2021, 2022b).” In response, Nijman et al. (2023) simply stated “our statement is valid and robustly supported.” However, neither of the documents cited to support the “skyrocketed” claim contain any post-Covid data. Hansen et al. (2021) only analyzed data through 2019; Hansen et al. (2022b) also present no post-Covid data, but the authors speculate about post-Covid developments. This is the kind of “evidence” used to support the 2022 IUCN classification of Endangered. The only actual Covid-relevant data presented by Nijman et al. (2023) are identical to the data NABR obtained from the Centers for Disease Control and Prevention (CDC), and these data show that total imports of LTM to the U.S. peaked in 2019 and declined in the subsequent three post-covid years (CDC 2022).

2.6 | Expert opinion

Compared to physics or even chemistry, biology is a messy science, and this is particularly true in efforts, such as IUCN status assessments, where fundamental ecological and evolutionary principles are applied to real-world problems in conservation and management. In such endeavors, it is inevitable that researchers draw on professional judgment to some extent. However, in the 2022 assessment, empirical data are so scant that the authors’ conclusions depend almost entirely on their own opinions. Because of the many potential pitfalls of relying on professional judgment, best practices have been developed for how to elicit expert judgment using rigorous methods that account for variation among experts, especially in the absence of independent data (Burgman 2016, O’Hagan 2019). The effects of groupthink (or group polarization) and confirmation bias can be very strong when relying on opinions internal to a group (Kahneman et al. 2011, 2021). There is no evidence any of these dangers were considered by Hansen et al.

2.7 | Repeatability

A bedrock principle of the scientific method is that researchers must provide enough detailed information so that independent scientists can replicate key experiments and/or reach the same conclusions when confronted with the same data. The 2022 assessment of the status of *M. fascicularis* falls far short of this standard. Actual data are so skimpy that the bulk of the assessment hinges on opinions by a group of authors whose independence and credibility have been called into question (Jenkins 2023). The key finding – a projected 50% future decline – is supported by no quantitative analysis whatsoever, so it is impossible to know where the 50% value came from (why not 72%? or

17%?) - except that this conveniently is the value required to produce an Endangered classification. Given the flimsy empirical foundation and largely incoherent structure of the Hansen et al. (2022a) report, there is no reasonable expectation that presented with this same information, independent groups of scientists would reach similar conclusions.

3 | Summary

The major conclusions from the above analyses are the following:

- a. The 2022 IUCN assessment is seriously flawed in numerous ways;
- b. The Endangered determination applies to the entire species, but the assessment makes no attempt to comprehensively evaluate status throughout the extensive geographic distribution, nor to integrate key metrics up to the species level;
- c. Claimed past population declines are not supported by actual data;
- d. In projecting a future decline in the area of occupancy, the assessors make no attempt to estimate the net effects of losses in primary habitat and substantial (and well-documented) gains in secondary habitat;
- e. Assessors provide no evidence that current or projected rates of exploitation are either unsustainable or a cause for the inferred reductions;
- f. If published estimates of wild longevity had been used to estimate GL instead of data for one captive male, even the assessors' own estimated annual rates of past and future declines would not support an Endangered classification;
- g. The 2022 assessment is filled with inflammatory and value-laden language that calls into question the objectivity of the authors; and
- h. The Endangered classification, based on a projected future 50% decline, is based on no quantitative analysis whatsoever, depends entirely on the personal judgment of the authors, and cannot be expected to be repeatable by independent groups of assessors.

For all of these reasons, NABR respectfully requests that the IUCN take the following actions:

- (1) Undertake a new status assessment of *M. fascicularis* conducted by truly independent scientists not involved in advocacy roles for the target species;
- (2) Until completion of a new status assessment, vacate the results of both the 2022 and 2020 assessments because the 2020 assessment exhibits the same misuse of data identified in the 2022 assessment; and
- (3) Revise the official Red List species status of *M. fascicularis* to its previous designation as a species of Least Concern until a new status assessment is completed by independent scientists.

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