

AFRICA

ANDREFANA DRY FORESTS

MADAGASCAR



Ankarafantsika National Park © IUCN / Frank Hawkins

WORLD HERITAGE NOMINATION – IUCN TECHNICAL EVALUATION

ANDREFANA DRY FORESTS (MADAGASCAR) – ID N° 494bis

IUCN RECOMMENDATION TO WORLD HERITAGE COMMITTEE: To approve the nomination as an extension under natural criteria (vii), (ix) and (x)

Key paragraphs of Operational Guidelines:

Paragraph 77: Nominated property meets World Heritage criteria.

Paragraph 78: Nominated property meets integrity requirements and protection and management requirements.

Background note: The proposed nomination is a serial extension under criteria (ix) and (x) of the Tsingy de Bemaraha World Heritage property in Madagascar, which was inscribed under natural criteria (vii) and (x) (originally (iii), (iv)) in 1990 at the 14th Session of the World Heritage Committee in Banff, Canada. The boundaries of the existing property were clarified and adopted at the 35th session of the World Heritage Committee in Paris in 2011.

1. DOCUMENTATION

a) Date nomination received by IUCN: February 2021

b) Additional information officially requested from and provided by the State Party: Following the session of the IUCN World Heritage Panel, a progress report was sent to the State Party on 28 January 2022. This letter advised on the status of the evaluation process and requested supplementary information, firstly on the legal status of the Menabe-Antimena protected area, and whether the State Party was in a position to strengthen protection and management of that protected area to the same level as the component parts in the proposed serial extension; and, secondly, whether there would be a willingness to include Menabe-Antimena as an additional component part to the existing World Heritage property, and if so, what the timeline would be for the submission of such a proposal with all the required elements, in conformity with the *Operational Guidelines*.

Supplementary information was provided on 25 February 2022 in which the State Party recognized the global significance of the Menabe centre of endemism and the potential for future inclusion of protected areas in this region as an additional component or components to this serial site, but noted a range of concerns relating to protection and management, integrity (including a deforestation rate of over 27% from 2000-2017) and boundaries for the protected areas and the need for further public consultations before moving forward. The State Party further noted that the necessary preparations for nominating protected areas from the Menabe-Antimena area would take several years and that it was reluctant to delay the rest of the nomination in the interim.

c) Additional literature consulted: IUCN's previous evaluation consulted a wide array of relevant reference material for the biology, ecology, protection and management as well as the comparative values of the existing property. Further references included:

Brinkmann, K., Noromiarilanto, F., Ratvonamana, R. Y., and A. Buerkert (2014). Deforestation processes in south-western Madagascar over the past 40 years: what can we learn from settlement characteristics? *Agriculture, Ecosystems and Environment*, 195, 231-243; Bullock, S. H., Mooney, H. A., and E. Medina (1995). *Seasonally dry tropical forests*. Cambridge, UK, Cambridge University Press; Gardner, C. J., Jasper, L. D., Eonintsoa, C., Duchene, J. J., and Z. G. Davies (2016). The impact of natural resource use on bird and reptile communities within multiple-use protected areas: evidence from sub-arid Southern Madagascar. *Biodiversity and Conservation*, 25(9), 1773-1793. doi:10.1007/s10531-016-1160-4; Janzen, D. H. (1988). Tropical dry forests: the most endangered major tropical ecosystem. In: E. O. Wilson (Ed.), *Biodiversity* (pp. 130-137). Washington, D.C., US, National Academy Press; Leigh Jr, E. G. (2018). Tropical seasonal forest. In: B. T. Fath (Ed.), *Encyclopedia of Ecology*. 2 ed., Vol. 2, pp. 684-691, Boston, Elsevier; Ler dau, M., Whitbeck, J., and H. M. Holbrook (1991). Tropical deciduous forest: death of a biome. *Trends in Ecology and Evolution*, 6, 201-202; Myers, N., Mittermeier, R. A., Mittermeier, C., da Fonseca, G., and J. Kents (2000). Biodiversity hotspots for conservation priorities. *Nature*, 403, 853-858; Patrut, A. et al. (2016). AMS radiocarbon dating of large za baobabs (*Adansonia za*) of Madagascar. *PLoS ONE*, 11(1); Patrut, A., et al. (2015). AMS radiocarbon dating of very large Grandidier's baobabs (*Adansonia grandidieri*). *Nuclear Instruments & Methods in Physics Research Section B-Beam Interactions with Materials and Atoms*, 361, 591-598; Rosenberger, A. L., et al. (2015). Giant subfossil lemur graveyard discovered, submerged, in Madagascar. *Journal of Human Evolution*, 81, 83-87; Terborgh, J. (1992). *Diversity and the tropical rain forest*. New York, Scientific American Library; Yoder, A. D., et al. (2016). Geogenetic patterns in mouse lemurs (genus *Microcebus*) reveal the ghosts of Madagascar's forests past. *Proceedings of the National Academy of Sciences of the United States of America*, 113(29), 8049-8056.

d) Consultations: 6 desk reviews received. The mission was able to meet with Madagascar National Parks (administrative authority), national, regional and park staff, Ministry of Environment and Sustainable Development staff, local community members, co-management committee members, local authorities including mayors and buffer zone committee members, community monitoring teams, members of district and regional administrative authorities.

e) Field Visit: Frank Hawkins, 21 November to 1 December 2021

f) Date of IUCN approval of this report: April 2022

2. SUMMARY OF NATURAL VALUES

The proposed Dry Forests of Andrefana is a serial extension of the Tsingy de Bemaraha World Heritage property and consists of five protected areas including the National Parks of Ankarafantsika, Mikea and Tsimanampesotse, and the Special Reserves of Analamerana and Ankarana. The proposed component parts cover almost the full range of ecological and evolutionary variation within the western forests of Madagascar from north to south, including western dry forests and southwestern spiny forest-thicket, on a north-south continuum from dry to very dry vegetation types. These additional sites are of extreme importance for conservation as they cover centres of dry forest endemism in Madagascar, a Megadiversity Country, and in particular include unique evolutionary lineages (e.g., *Mesitornithiformes*, an order of birds which is 54 million years old) not found in any other World Heritage property.

The nominated serial extension is proposed for inscription under criterion (x) as a new criterion. With respect to criterion (ix), the proposed sites represent centres of endemism resulting from paleoclimatic changes in western Madagascar over millions of years, where changing rainfall patterns led to expansion and contraction of forest ecosystems. Vegetation expansion was also restricted by the physical barriers created by major rivers, which shifted their course over time, and further constrained by changing topography and hydrological systems. The resulting interfluvial centres of endemism are very marked and unique, each with its own, often higher-level (genus or higher) taxonomic representatives.

With respect to criterion (x), the additional component parts contain a spectacular array of endemic and threatened biodiversity, including taxa such as the baobabs, members of the *Didieraceae* succulent plant family, flame trees (*Delonix*), endemic species of lemur, two of the three members of the endemic Malagasy order of the *Mesitornithiformes*, an endemic genus (*Uratelornis*) in an endemic family of birds (*Brachypteraciidae*), and three of the four remaining terrestrial tortoises of Madagascar. The presence of endemic genera, and even families of vertebrates, many of them containing species that are highly threatened, in the proposed component parts is unique among dry forests of the world. The proposed serial

additions also include almost one thousand endemic species and sub-species of plants, 156 endemic reptiles, 57 endemic mammals and 34 endemic amphibians.

The Tsingy de Bemaraha World Heritage property was also inscribed under criterion (vii). The State Party notes that the proposed additions do not add further attributes under this criterion. However, the State Party also notes, and IUCN concurs, that future extensions including iconic baobab trees could indeed make further contributions to this criterion.

3. COMPARISONS WITH OTHER AREAS

The comparison provided in the nomination dossier between the Dry Forests of Andrefana and the two other tropical and sub-tropical dry forest World Heritage properties (Cerrado Protected Areas: Chapada dos Veadeiros and Emas National Parks in Brazil and the Area de Conservación Guanacaste in Costa Rica) is appropriate. The comparative analysis notes that the biodiversity and endemism of the proposed serial additions is comparable to these sites for plants, and superior for vertebrates, and that there is clearly no species overlap between them given the nominated property is separated from these other sites by oceans and continents. The presence of endemic genera, and even families of vertebrates, many of them containing highly threatened species, in the proposed serial additions is unique among tropical dry forests globally. The comparative analysis also correctly notes that the proposed additions are among the top dry forest ecosystems in the world in terms of biodiversity and endemism and that dry forests are underrepresented on the World Heritage List. However, IUCN notes that the comparative analysis would have been stronger if it had included some analysis of species composition in existing World Heritage dry forest sites to enable a more specific comparison to the nominated property.

IUCN, in collaboration with UNEP WCMC, has undertaken supplementary comparative analysis on the biodiversity values, concluding that the nominated property is clearly of global significance, based on the spatial analyses and literature review carried out, both with regards to criteria (ix) and (x).

Regarding criterion (ix), IUCN notes that the nominated property belongs to the biodiversity hotspot of Madagascar and the Indian Ocean Islands, and represents Madagascar's dry tropical and subtropical biomes, with western dry forests, southwestern dry forests and dry spiny thickets. It partially lies within the Malagasy Thorn Forest Udvardy Province which is not yet represented on the World Heritage List and that has been recognised as a gap on the List. It also partially overlaps with two terrestrial ecoregions that are not represented on the World Heritage List, the Madagascar spiny thickets and the Madagascar succulent woodlands. Moreover, the property is partially located in the South Malagasy spiny forests Endemic Bird Area, likewise identified as a gap on the World Heritage List.

Regarding criterion (x), IUCN notes that the faunal and floral biological diversity is very rich in the nominated property, especially considering that some component parts have been less intensively surveyed than others. All the component parts are distributed in centres of endemism found in the west of Madagascar. The nominated property also has a high proportion of endemic plant and animal species, including micro-endemics. It also hosts significant numbers of globally threatened species, including Critically Endangered mammals such as the Perrier's Sifaka, *Propithecus perrieri* (CR) and Mongoose Lemur, *Eulemur mongoz* (CR), and birds such as the Madagascar Fish-Eagle, *Haliaeetus vociferoides* (CR).

IUCN further notes that the nominated property overlaps with two Alliance for Zero Extinction sites, five Important Bird Areas and six Key Biodiversity Areas, which are not currently represented on the World Heritage List. The nominated property also partially overlaps with seven protected areas considered to be amongst the most irreplaceable in the world for mammal, bird and amphibian conservation. Furthermore, the Dry Forests of Madagascar, where some component parts of the nominated property are found, has been identified through regional gap studies as a possible priority for new nominations to the World Heritage List in Africa.

In conclusion, IUCN considers that the nomination has made a compelling case demonstrating global significance under biodiversity criteria. This single extension would close several important gaps on the World Heritage List.

4. INTEGRITY, PROTECTION AND MANAGEMENT

4.1. Protection

Madagascar benefits from an extensive legal framework for conservation and sustainable development, ranging from the Malagasy Constitution to numerous laws, including a protected areas law (COAP), decrees, ordonnances and national policies, which are listed in the nomination document and included in Annexes. National parks are fully owned by the Government of Madagascar, and managed by Madagascar National Parks, a private foundation recognized as acting in the public interest and operating under the supervision of Madagascar's Ministry for Environment and Sustainable Development (MEDD).

The proposed additions consist of five protected areas including the National Parks of Ankarafantsika, Mikea and Tsimanampesotse (IUCN Category II), and the Special Reserves of Analamerana and Ankarana (IUCN Category IV), each benefitting from its own management plan. Governance mechanisms in the buffer zone are strongly focused on sustainable development approaches with buffer zone management involving a range of community structures and organizations. Communities in buffer zones share in protected area revenues. Protected

area staff also enter into traditional agreements (Dinabe) with local communities to govern activities in the park and to provide penalties for infractions. National Parks are usually not inhabited, whilst rights to live in the forest and continue traditional hunting and gathering practices are recognized for Indigenous Peoples as is the case for the Mikea Indigenous Peoples in Mikea National Park.

IUCN considers that the protection status of the nominated property meets the requirements of the Operational Guidelines.

4.2 Boundaries

The boundaries of the proposed additions are congruent with the boundaries of existing protected areas which is appropriate in all cases, and the extensive proposed buffer zones provide substantial protection, and opportunities for co-management and positive engagement with local communities. The boundaries of all the component parts are clearly delineated as are the buffer zone boundaries. Each of the component parts is of sufficient size to ensure an adequate representation of biodiversity values under both biodiversity criteria and their long-term integrity.

With the proposed serial additions, almost all of Madagascar's western dry forest centres of endemism would be represented, with the important exception of the centre of endemism of Menabe-Antimena. The State Party recognizes in its nomination document that this area is the last remaining gap in this serial site, and that an additional component part or component parts from this region would not only complete the series of dry forest centres of endemism, but would contribute to all three criteria ((vii), (ix) and (x)). However, the State Party noted in supplementary information that the protected areas in the Menabe-Antimena centre of endemism do not yet meet the requirements for protection and management, and that further public consultation will be required as protected area status is upgraded. The nomination also notes that additional research is required to assess whether there are any extant mining concessions in the protected areas found in this centre of endemism to avoid having these concessions inadvertently incorporated into new protected areas as existing protected areas are upgraded. Nonetheless, the State Party acknowledges, and IUCN strongly concurs, that including a component part from the Menabe-Antimena centre of endemism as soon as feasible is desirable to further enhance the integrity of the nominated property.

IUCN considers that the boundaries of the nominated property and buffer zones meet the requirements of the Operational Guidelines.

4.3 Management

All of the proposed component parts have five-year management plans, which focus on four objectives: (1) conservation, (2) community level sustainable

development, (3) permanent funding for conservation and local community sustainable development and (4) effective management. These are integrated into a system-wide strategic management plan for Madagascar’s national protected areas system (“Plan Stratégique de Gestion du réseau d’Aires protégées” or PlanGRAP 2014-2024). The management plans for each of the proposed additions also specify the need to maintain the Outstanding Universal Value of the sites. Madagascar’s protected areas also benefit from extensive and standardized monitoring systems, with annual reviews of protected area management assessing threats and achievement of the strategic objectives listed above. In addition, the standardized monitoring software in use also gathers indicators for Outstanding Universal Value for each component part in a serial site.

Madagascar’s parks are formally managed by Madagascar National Parks (MNP), but increasingly moving to a shared governance system in partnership with local communities. This is achieved via two mechanisms: (1) Park Support and Orientation Committees (COSAPs), which represent local communities as well as broader stakeholder groups (civil society, municipal, private sector etc.) and provide funding for sustainable development activities, and (2) Local Park Committees (CLPs), which are formed for each local community, and which assist with surveillance and monitoring, and also participate in the process of prioritizing COSAP funding interventions. The high level of effectiveness of these structures was noted during IUCN’s field evaluation mission to several of the nominated component parts. As noted, protected area management bodies also enter into traditional agreements (Dinabe) with local communities to regulate activities in protected areas and provide agreed penalties for infractions. Thus, Madagascar is working towards a highly integrated sustainable development management approach with communities, and these mechanisms are often further integrated with regional sustainable development initiatives and projects. However, IUCN notes that there were some concerns arising from the field visits to the effect that youth and women were underrepresented in community management structures, something which would be important to address and strengthen as soon as practicable to ensure fully effective and representative management structures.

Staffing for the proposed additions totals 162 and is supplemented by buffer zone management structures with local communities. However, IUCN notes that the total size of the nominated property is relatively large (734,298 ha in the nominated property, with an additional 838,035 ha in the buffer) and that many of the component parts are remote, with limited vehicular access. Ongoing monitoring of staffing levels is important to ensure they remain adequate.

IUCN notes that budgets seem to have remained stable or increased for most of the nominated component parts between 2016 and 2018, and the Foundation for Protected Areas and Biodiversity of Madagascar recently received a grant of USD 50m.

However, the nomination notes that there was a sharp drop in the budget of Mikea National Park. In addition, the budget figures provided in the nomination do not include the years of the Covid-19 pandemic, during which visitation will have dropped significantly, dramatically impacting park revenues. Funding levels are therefore a concern.

IUCN considers the management of the nominated property meets the requirements of the *Operational Guidelines*.

4.4 Community

The protected areas in the proposed serial additions all have communities in their buffer zones, ranging from a population of almost 40,000 around Ankarana to almost 400,000 for Mikea, and totalling almost 875,000 for all of the component parts. Access to natural resources in the buffer zone, sharing in protected area revenues and benefits from tourism are all of vital importance to these local communities. As noted above, local community-based committees assist with buffer zone management and provide input into park management and these mechanisms seem to be functioning effectively and in close partnership with MNP.

None of the nominated component parts are inhabited, with the exception of Mikea National Park. The Mikea people in Madagascar are the only self-identified indigenous peoples in the country, and have a nomadic, subsistence lifestyle, which is dependent on the maintenance of a healthy forest ecosystem. The Mikea’s rights to live in the park in Controlled Occupation Zones and to pursue a traditional subsistence lifestyle are recognized. The field evaluation met with Mikea people who support World Heritage status as a means to ensuring the maintenance of the forest ecosystem they depend on.

The nomination dossier states that the World Heritage nomination was strongly supported (near unanimous support) during the consultation process. The field evaluation mission confirmed that support for the nomination seemed strong, and that the hope was that inscription would spur interest in tourism. Madagascar is a global leader in integrating communities into protected area management and all of the nominated component parts have been in existence for many years so there does not appear to be any friction with local communities regarding the nomination.

4.5 Threats

The nomination provides a thorough and complete assessment of threats and acknowledges that all of Madagascar’s protected areas have suffered impacts, in some cases extensively. Significant impacts occurred between 1996 and 2006 and impacts continued up until about four years ago when threat mitigation has begun to yield results. Threats include widespread slash and burn agriculture, burning to renew pasture, agricultural intensification, charcoal

production, bushmeat hunting and the illegal wildlife trade, illegal logging and illegal mining. Invasive species, fire and habitat loss as well as climate change are also threatening integrity. The nomination also documents major threats to each component part, for example, major damage resulting from extensive illegal sapphire mining in Ankarana or burning for pasture in Ankarafantsika. The combination of these many factors led to high rates of deforestation – over 15% in several component parts. However, the nomination notes and the field evaluation mission confirmed that deforestation rates have plummeted between 2006-2016 thanks to effective management and increasingly good relations between MNP and communities, and that ecological restoration efforts are under way in many protected areas. Thus, there seems to be an active and successful effort to address threats, though of course this work, and the ecological restoration, must be maintained going forward.

Notwithstanding a legacy of threats and impact, IUCN considers in summary that the integrity requirements and protection and management requirements of the Operational Guidelines are met.

5. ADDITIONAL COMMENTS

5.1 Consideration in relation to serial properties

a) What is the justification for the serial approach?

The serial approach has been chosen as the nomination focuses on a number of geographically distinct, non-contiguous centres of endemism found in dry forests in western Madagascar which evolved in isolation in areas between major river systems. Therefore, IUCN considers that the serial approach of the nomination is appropriate.

b) Are the separate component parts of the nominated property functionally linked in relation to the requirements of the Operational Guidelines?

Each of the component parts represents a distinct and critically important centre of endemism in the dry forests of western Madagascar, each of which includes unique and ancient evolutionary lineages not found in any other World Heritage property. Thus, each component part has a vital role to play in telling the story of the evolution of these dry forest ecosystems. Therefore, IUCN considers that the separate component parts are clearly functionally linked. IUCN notes however, that the Menabe-Antimena area represents an important gap to be expeditiously filled in order to complete the fully ecological and evolutionally story of these forests.

c) Is there an effective overall management framework for all the component parts of the nominated property?

Each of the protected areas of the serial property of the Dry Forests of Andrefana has a five-year management plan, and as a result of the standardized nature of Madagascar National Parks (MNP) planning

tools, and to ensure consistency, management plans for each component part have been developed with the same structure and follow the PlanGRAP strategy (see section 4.3). These plans must contribute to the PlanGRAP objectives, which include ensuring “the maintenance of the criteria of Outstanding Universal Value expressed through criteria (vii), (ix) and (x) in compliance with the principle of participation of local communities and sustainable development”. Each development plan and the PlanGRAP are the result of a long process of consultation, negotiation and analysis in each protected area—and across the network—following an assessment with the MIRADI and IEG tools used throughout the MNP network to qualify and quantify indicators of good management. Thus, there is a high degree of integration built into management planning in Malagasy protected areas. However, there does not appear to be a separate document specifically addressing coordinated management of the six component parts (including the Tsingy de Bemaraha). In IUCN’s view, the current arrangements appear nonetheless sufficient in the near term, particularly as Outstanding Universal Value is explicitly addressed in MNP planning. However, a separate integrated management plan for what would become a large, geographically spread serial site would benefit more integrated, harmonized and effective management of the whole property.

6. APPLICATION OF CRITERIA

Criterion (ix): Ecosystems/communities and ecological/biological processes

The proposed component parts represent centres of endemism resulting from paleoclimatic changes in western Madagascar over millions of years, where changing rainfall patterns led to expansion and contraction of forest ecosystems. Vegetation expansion and evolution was also restricted by the physical barriers created by major rivers, which shifted their course over time, and further constrained by changing topography and hydrological systems. The resulting interfluvial centres of endemism are very marked and unique, each with its own, often higher-level (genus or higher) taxonomic representatives. This proposed extension greatly expands the coverage of these centres of endemism on a north-to-south continuum of increasing aridity and therefore significantly enhances the values found in the original Tsingy de Bemaraha World Heritage property.

IUCN considers that the nominated property meets this criterion.

Criterion (x): Biodiversity and threatened species

The proposed component parts contain a spectacular array of endemic and threatened biodiversity, including taxa such as the baobabs, members of the *Didieraceae* family, flame trees (*Delonix*), endemic species of lemur, and three of the four remaining terrestrial tortoises of Madagascar. The presence of

endemic genera, and even families of vertebrates, many of them containing species that are highly threatened, in the proposed component parts is unique among dry forests of the world. The proposed serial additions also include almost one thousand endemic species and sub-species of plants, 156 endemic reptiles, 57 endemic mammals and 34 endemic amphibians.

IUCN considers that the nominated property meets this criterion.

7. RECOMMENDATIONS

IUCN recommends that the World Heritage Committee adopts the following draft decision:

The World Heritage Committee,

1. Having examined Documents WHC/22/45.COM/8B and WHC/22/45.COM/INF.8B2,
2. Recalling decisions **CONF.004/13** and **35 COM 8D** adopted at its 14th (Banff, 1990) and 35th (UNESCO, Paris, 2011) sessions respectively,
3. Approves the significant boundary modification of the **Tsingy de Bemaraha Strict Nature Reserve, Madagascar**, to become **Andrefana Dry Forests, Madagascar**, on the World Heritage List, on the basis of criteria (vii), (ix) and (x);
4. Takes note of the following Statement of Outstanding Universal Value:

Brief synthesis

The Andrefana Dry Forests serial property involves four national parks – Ankarafantsika, Mikea, Tsingy de Bemaraha and Tsimanampesotse – and two special reserves – Analamerana and Ankarana. The property represents centres of endemism in the dry tropical and subtropical biomes of Madagascar with its western dry forests and south-western dry thorny forests and thickets that have evolved in isolation on a large, massive island separated from all other land for tens of millions of years. The parks and reserves comprising the property provide a continuum of dry to arid forest formations from north to south, including almost all of the dry forest centres of endemism in western Madagascar. These centres of endemism evolved in isolation as a result of geographic barriers formed by major river systems, and as a result of paleoclimatic changes over millions of years, where changing rainfall patterns led to expansion and contraction of forest ecosystems. The property represents and conserves globally unique ecosystems, habitats and species. Madagascar's long isolation has contributed to the development of a natural laboratory of evolution marked by exceptional biological diversity, one of the highest rates of endemism in the world, and a large number of ancient lineages that have disappeared elsewhere, such as the endemic order of mesites which are about 54 million years old. The Andrefana Dry Forests are essential for the protection of the

island's endemic ecosystems and biodiversity, as well as the diversity of evolutionary, ecological and biogeographic systems that have developed in Madagascar.

Criterion (vii)

The Tsingy de Bemaraha Strict Nature Reserve, which has since become a National Park, represents rare or highly remarkable geological phenomena of exceptional beauty. It presents impressive geological elements including karstic scenery with a highly dissected limestone massif, crossed by a deep river gorge, which is the spectacular expression of a stage of evolution of the earth in the form of a "forest of sharp stones" with high limestone pinnacles rising up to 100 metres, forming veritable cathedrals, offering a grandiose, spectacular natural landscape. Further, "the Tsingy" of the limestone plateau forms an unusual feature of outstanding beauty, unique in the world, universally recognized by the effect created by the shades of forest green on metallic reflections of the grey karst "bristles". While not adding additional attributes, the other five component parts of this serial property contribute to the overall natural beauty of the property.

Criterion (ix)

The palaeoclimatic oscillations of the last few million years have had a profound effect on the landscapes and the evolution of the fauna and flora of Madagascar. The Andrefana Dry Forests are a complex product of this process. They have retreated during dry periods; they have expanded during wet periods but with variations deeply linked to the relief with its hydrological network. The centres of endemism that are home to many endemic species and higher taxa are the "interfluves" of the great rivers that have their sources on the highest peaks of Madagascar. The centres of endemism on the western slopes were refugia that captured parts of the hydrological system, allowing animal and plant populations to survive in isolation during dry periods. The Andrefana Dry Forests are distributed over all but one of the western endemic centres. Namely from south to north in the serial property, the endemism centres of Karimbola (Tsimanampesotse National Park), Mikea (Mikea National Park), Melaky (Bemaraha National Park), Sofia (Ankarafantsika National Park), Ankarana (Ankarana Special Reserve) and Vohimarina (Analamerana Special Reserve).

Criterion (x)

Madagascar's different forest types are home to 80% of its endemic species, and the dry forests make a major contribution to this richness. The dry forests are clearly distinct from the humid forests of Madagascar with flagship groups entirely restricted to dry formations such as baobabs, most members of the family Didiereaceae, flamboyant trees, mammals, birds, reptiles, amphibians, tortoises and more than half of the scorpions. Important species also include the Perrier's Sifaka, and the Mongoose Lemur, the Madagascar Fish Eagle and the Western Woolly Lemur. Within the orders and families endemic to Madagascar, many genera and species are found only in dry forests or thorny thickets. Even more notable are

the ancient orders of fauna that are endemic to the island, such as the two endemic birds of Mikea, named after a centre of endemism and a cultural group. The presence of endemic genera, and even families of vertebrates, many of them containing species that are highly threatened, in the component parts added in 2022 is unique among dry forests of the world. The additions also include almost one thousand endemic species and sub-species of plants, 156 endemic reptiles, 57 endemic mammals and 34 endemic amphibians.

Integrity

The size of the serial property and its buffer zone, the strict protection status of its component parts, and the north-south continuum they provide, ensure a strong basis for its Outstanding Universal Value. The size of the northern reserves is relatively small but they are set in a local geographical context and their integrity is enhanced by the dry forests of the Andrafiarena-Andavakoera Reserve (IUCN category V) which links the two reserves. The Andrefana Dry Forests serial property includes all the elements necessary for the inclusion of key aspects of the processes essential for the long-term conservation of the ecosystems and the biological diversity they contain. Its component parts represent a series of unique centres of micro-endemism. Each of the property's component parts has pursued a distinct but circumscribed history through the paleoclimatic oscillations of the Quaternary and earlier periods; this history, set in geological time, has had a determining impact on the groups of flora and fauna observed today and has directed evolution in many groups. Each nominated area contains those habitats that maintain the maximum animal and plant diversity that are characteristic of the centres of endemism in which biodiversity is embedded.

The component parts have in the past suffered impacts related to slash and burn agriculture, burning to renew pasture, agricultural intensification, charcoal production, bushmeat hunting and illegal wildlife trade, illegal logging and illegal mining. Invasive species, fire and habitat loss as well as climate change are continuing to threaten the integrity. However, effective management and restoration efforts have been successful in addressing threats, with deforestation rates having plummeted between 2006 and 2016. Nevertheless, these efforts, including ecological restoration, must be maintained.

Protection and management requirements

The Andrefana Dry Forests form a serial property including the Tsingy de Bemaraha Strict Nature Reserve, which was inscribed on the World Heritage List in 1990, and extended in 2022 to include the two Special Reserves of Ankarana and Analamerana and

the three National Parks of Ankarafantsika, Mikea and Tsimanampesotse. The six protected areas in this serial property are managed by the Government of Madagascar with Madagascar National Parks. They are officially protected by their respective creation decrees but also by a legal measures starting with the Constitution of the Fourth Republic of Madagascar which underpins the management and conservation of biodiversity at the country level. The network is managed in accordance with the Strategic Plan, which presents the guidelines for the integrated management of properties. These guidelines are set out in the Development and Management Plans of each of the six protected areas and are complemented by a monitoring and evaluation system based on standardised tools, including tools using innovative technologies facilitating the maintenance of the Outstanding Universal Value. The plan is divided into four strategic axes which should ensure (1) conservation, (2) development and sustainable support of communities and stakeholders in conservation, (3) financial sustainability of conservation activities and development of the riparian communities, and (4) effective management of the property.

Fire is one of the major pressures facing the Andrefana Dry Forests. Mitigation and monitoring measures based on key indicators are in place to address the pressures identified in the property. It should be recalled that primary forests, even extremely dry ones, are less susceptible to fire than degraded forests and have a much higher resilience.

4. Commends the State Party for its very thorough nomination dossier and also commends its extensive work in integrating local communities into protected area management and ensuring benefit sharing, while noting the need to strengthen wherever possible the full participation by women and youth in community management structures;

5. Strongly encourages the State Party to consider a future addition of suitable component parts of the Menabe-Antimena center of endemism as soon as the identified preparatory measures in compliance with the *Operational Guidelines* are complete, including by increasing the State Party's restoration efforts within Menabe-Antimena, given past degradation and deforestation;

6. Recommends the State Party consider the development of a standalone integrated management plan for the extended property to support more integrated, harmonized and effective management, and to monitor whether staffing levels continue to be adequate for the management of the serial property, and to increase these resources further as necessary.

Map 1: Location of the nominated property



