Annual report for 2024

Association Vahatra

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A MESSAGE FROM THE OUTGOING PRESIDENT OF VAHATRA, ACHILLE P. RASELIMANANA, PROFESSEUR TITULAIRE

Letter from the outgoing President

In 2005, after a long period of reflection and discussion on the future of the "Ecology Training Program" (ETP) of the WWF Madagascar country office in Antananarivo, designed to advance the capacity of Malagasy students in field biology and conservation science, the project coordinator, Steve Goodman, and the Biodiversity Program Manager of WWF, Achille Raselimanana, decided that the time had come to follow a new direction after more than ten years of existence, and for the program to be under the direction of an independent Malagasy organization. They shared this idea with a WWF ETP colleague (Malalarisoa Razafimpahanana) and two recent Ph.D. students (Marie Jeanne Raherilalao and Voahangy Soarimalala) that had recently completed their Ph.Ds. in the context of ETP, all were in agreement and together they created the Association Vahatra. The idea was to pick up on different programs of ETP, but to expand them under a Malagasy vision, rather than that of an international organization. While continuing the administrative process for the official formalization of the new organization, the ability of certain of these founding members of Vahatra was tested, specifically to lead a new research and capacity-building program. With a grant from the MacArthur Foundation and under the nick name, RAP GASY, not a musical group but standing for "Rapid Assessment Program" and "Gasy" coming from Malagasy, the necessary physical and financial means were made available and they inventoried and explored 19 sites of the western dry forests of Madagascar, many of which were poorly known or unknown at that time from the perspective of the local vertebrate biodiversity.

The Association Vahatra officially obtained its legal status in late 2006, a large-scale fund raising program was put in place with the help of the Field Museum of Natural History in Chicago, and in October 2007 the association officially opened its own office, having been able to purchase a property with an existing building a short distance from The University of Antananarivo. In order to properly lead the new project with his founding-member colleagues, Achille resigned from his position as Biodiversity Program Officer at WWF Madagascar that he held since July 1996. In July 2006, he was recruited as a Lecturer in the Faculty of Sciences, University of Antananarivo. His affiliation with that institution further strengthened the exchanges and collaboration between the Department of Animal Biology and Association Vahatra, not only in the training and supervision of students in fields related to conservation biology, but contributing new orientations in research with national graduate students. Indeed, if the ETP program was previously known largely as a project for field training of students, to familiarize them with biodiversity and inventory techniques, this vision evolved considerably under the new direction of Association Vahatra.

Association Vahatra created a scientific periodical, *Malagasy Nature* (see http://www.vahatra.mg/malagasynature.html) for which the 19th issue is about to be published, the journal has an ISSN number making it an international publication, and with the ambition of developing the capacity of young Malagasy scientists to publish the results of their research and to make reliable and up-to-date information available to the national and international scientific communities. The first issue of the journal in 2008 was dedicated to the results of the RAP GASY team mentioned above (see http://www.vahatra.mg/volume1.html). In 2011, we started a book publishing house with the intent of sharing information on biodiversity and natural history to different sectors of Malagasy society, as well as visiting naturalists, and this has become an objective in its own right. Since its creation, numerous books have been produced, including nine subject focused guides to Malagasy biodiversity, four ecotourism guides on the most visited protected areas on the island, and four other books, one of which contains a remarkable compilation of the natural history of Madagascar. The publication launch of each book is often done during an official ceremony and with local press coverage. These works constitute important references

and are currently used in various fields such as natural resource management, scientific research, teaching, ecotourism, etc.

As for the supervision and training of students, several hundred have already benefited from the support of Association Vahatra in different manners, ranging from technical, scientific, logistical, and financial aspects. Many of the students that have completed their higher degrees with Vahatra have developed their own professional career paths, and an important proportion retain active field research, management, and conservation aspects, as well as teaching. As an anecdote, one of the students of the 2007 class has already obtained his HDR (the highest university scientific degree in the European system) and is an eminent researcher at the Institut Pasteur of Madagascar, and several other students hold important positions within government organizations, non-governmental organizations, and international institutions.

One of the aspects that marks the visionary evolution and commitment of Association Vahatra over the past nearly 18 years is the broadening of its fields of intervention. For example, since the epidemic outbreak of Rift Valley disease on Madagascar in 2008, which is another important emerging disease, as well as other zoonotic diseases studied in a One Health context, the implications of Vahatra researchers in this rapidly evolving field of research have multiplied and diversified. The associated projects are flourishing with a range of national and international students, collaborators, and laboratories. In addition, with the financial support of various private donors and granting agencies, Vahatra is fully committed to the field of ecological restoration largely under the leadership of Jacquis Tahinarivony, who is now a permanent staff member of the association.

The achievements of Vahatra are numerous and encouraging, and in a wonderful sense, the future ambitions and projects are boundless. After holding the post of President of Vahatra since its official creation in 2007 and bringing new perspectives, the permanent staff members thought it was appropriate to pass the torch to a new president and the unanimous choice fell on the youngest founding member, Voahangy Soarimalala. She is dynamic and has the necessary capacity to move the organization forward. I invite you to wish her good luck in this mission that is close to our hearts, including the development and strengthening of national capacity for good management, long-term conservation of the world-unique Malagasy biodiversity, and for the well-being of humanity and nature.

Achille P. Raselimanana
Outgoing President, Association Vahatra

LONG-TERM GOALS

The long-term goals of Association Vahatra are to advance Malagasy scientists, in particular graduate students within the university system, as well as other members of the national conservation biology community, make substantial advances in understanding the island's unique biota, and to disseminate this information. Our sincere intent is to put in place an organization with a long-term future and broad vision. A critical aspect to mention is that we have created this vision largely based on the scientists and students working with the association, and, hence, distinctly Malagasy in perspective. This is in comparison, for example, to large international organizations that might not necessarily have the interests of Madagascar as their principal point of interest. This aspect is fundamental for the long-term strength of the association, since members are engaged and committed by conviction with respect to the study and conservation of their natural heritage.

The seed was planted for Association Vahatra over three decades ago in the context of a project organized by WWF-Madagascar, put in place by Olivier Langrand, Sheila O'Connor, and the late Martin Nicoll, and known as The Ecology Training Program (ETP). Steve Goodman and Achille Raselimanana were the coordinators of the project for well over a decade, during which time several generations of Malagasy graduate students finished their higher degrees within the national university system in animal and conservation biology. Many of these people are among the major actors in the current Malagasy conservation community and across different sectors. For example, some of these individuals are now responsible for the advancement of new generations of national field and conservation biologists in at least three different capacities: 1) lecturers and professors within the national university system, as well as private universities, 2) active scientific members of the Vahatra staff or eminent researchers, and 3) playing important roles and holding key positions in the non-governmental and governmental sectors and national research institutes, some of which have been recently established.

VAHATRA – PERMANENT STAFF

1. Professor Achille P. Raselimanana (raselimananaachille@gmail.com) – outgoing President of Vahatra and Professor, Mention Zoologie et Biodiversité Animale, Université d'Antananarivo. Founding member. Achille was in the first generation of ETP graduates (see above under Long-term Goals) and did his DEA and Ph.D. in the context of this program. In 2011, he presented his "Habilitation à Diriger des Recherches" (HDR) at the Université de La Réunion, which is the highest scientific degree in the French university system. Achille is a herpetologist with considerable experience in aspects ranging from field studies, classical taxonomy to molecular systematics. Before the creation of Association Vahatra, he held for nearly a decade the position of Biodiversity Program Officer for WWF-Madagascar. In 2018, Achille was named "Professeur titulaire" by the Ministère de l'Enseignement Supérieur et de la Recherche Scientifique. Association Vahatra places strong emphasis on capacity building and continues this tradition and the body of well-trained nationals continues to grow, and regularly advancing the dissemination of information to the scientific community and the Malagasy public in general. As President of Association Vahatra from 2006 to 2024, Achille lead the organization with a series of new advances, and now this task will be up to Voahangy Soarimalala, who has been elected by the permanent staff members (see opening message at the start of this annual report).
2. Dr. Marie Jeanne Raherilalao (jraherilalao@gmail.com) – Co-editor of the journal *Malagasy Nature* and books published by Vahatra and Professor, Mention Zoologie et Biodiversité Animale, Université d'Antananarivo. Founding member and General Secretary of Vahatra. Marie Jeanne did her Ph.D. associated with the ETP (see above text under Long-term Goals) and presented her HDR in 2021 at the Université d'Antananarivo. She works on bird ecology, biogeography, and systematics.
3. Dr. Voahangy Soarimalala (voahangysoarimalala@gmail.com) – Incoming President and Scientific Coordinator of Vahatra; Head Museum Curator, Mention Zoologie et Biodiversité Animale, Université d'Antananarivo; and Professor, Université de Fianarantsoa. Founding member. Voahangy did her DEA and Ph.D. in association with the ETP (see above text under Long-term Goals). Voahangy is a mammalogist with a particular interest in rodents and tenrecs.
4. Dr. Jacquis A. Tahinarivony (andonahary@yahoo.fr) – Botanist, Geographic Information Specialist, Geomaticien (discipline concerned with the collection, distribution, analysis, processing, presentation of geographic data), and responsible for the ecological restoration project at Ambohitantely (see below). Jacquis co-presented his Ph.D. at Université d'Antananarivo and Université de Genève (Switzerland) in late 2016. Since 2011, Jacquis joined the Vahatra field team on numerous field expeditions and recently has become a core member of the association.

5. Professor Steven M. Goodman (sgoodman@fieldmuseum.org) – Scientific Advisor and Vice President of Vahatra; co-editor of the journal *Malagasy Nature* and books produced by Vahatra; and Docteur Honoris Causa, Université d'Antananarivo. Founding member. Steve works on both mammals and birds. Steve plays a major role in the distribution and sales of books from Association Vahatra Press, including at national and international levels. He holds the post of MacArthur Field Biologist, Field Museum of Natural History, Chicago, and since several decades lives in Antananarivo for about 10 months per year.
6. Mrs. Sabrina Raharinirina (msraharinirina@gmail.com) – Financial & Administration Manager. Sabrina joined the association in October 2015. She is responsible for the general functioning of the office and financial affairs. Sabrina also plays an important role in the sales of Association Vahatra publications. Recently she has been following coursework at a well-known business school in Antananarivo and received an advance diploma in Management, Financial Management, and Leadership.
7. Mr. Rachel Razafindravao and known as "Ledada" – logistic coordinator. Ledada started working with the ETP some 33 years ago and transferred to Vahatra in October 2007 (see section below Person in Focus). He has helped organize logistics for hundreds of field missions to some of the remotest areas on Madagascar.
8. Mrs. Sandra Ratsirahaingotiana – domestic help. She has worked with Vahatra since May 2016.
9. Mr. Elisa Malaimbohitsy, Mr Ialy Tombosoa, and Mr Brucellin – guardians.

VAHATRA'S BOARD OF DIRECTORS

In order to provide needed guidance and counseling for the current and future Vahatra programs, a Board of Directors has been designated and includes the following individuals:

Malagasy nationals

1. Professor Daniel Rakotondravony – Retired Professor from the Mention Zoologie et Biodiversité Animale, Université d'Antananarivo.
2. Nanie Ratsifandrihamanana – Country Director, WWF-Madagascar.
3. Chantal Andrianarivo – Former Head of Research and Biodiversity, Madagascar National Parks, and also Technical Advisor at Indian Ocean Commission (Mauritius). She is now Regional Advisor for the United Nations associated with biosafety.
4. Professor Joelisoa Ratsirarison – Département des Eaux et Forêts de l'Ecole Supérieure des Sciences Agronomiques, Université d'Antananarivo and ex-Vice President of l'Université d'Antananarivo and in Charge of International Relations.
5. Professor Raoelina Andriambololona – Retired General Director of the Institut National des Sciences et Techniques Nucléaires (INSTN), Université d'Antananarivo, and Doyen of the Malagasy Academy.

Foreign members

1. Professor Jörg U. Ganzhorn – Retired professor, Tierökologie und Naturschutz, University of Hamburg.
2. Paul Goodman – Principal, Kingfisher Group and Allied District Properties.
3. Olivier Langrand – Executive Director, Critical Ecosystem Partnership Fund (CEPF).
4. Michael Polsky – President, Invenergy.
5. Sara Ruane – Curator of Herpetology, Field Museum of Natural History, Chicago.
6. Link Olson – Curator of Mammals, University of Alaska, Fairbanks.

STUDENTS

As capacity building for the next generations of field and conservation biologists is at the core of Association Vahatra activities, we collaborate directly with Malagasy students registered within the national university system. The students follow different types of higher diplomas: Licence Professionnelle, Master's II or Ph.D. degrees. The association continues to work with and support financially some graduate students and post-docs. In 2013, the Malagasy national university shifted from the classical French scheme to that of an Anglophone License-Masters-Doctorate (LMD) system. We also act as directors or committee members of a degree known as "Habilitation à Diriger des Recherches" (HDR), a diploma originally intended for individuals that would become directors of research institutes or university departments.

The scientific members of Vahatra are also in contact with many other Malagasy students working in the national university system, often as secondary advisors and members of thesis and other types of mentoring committees. We make a dedicated effort to work with graduate students in universities outside of the capital city of Antananarivo, including the former provincial capitals of Antsiranana, Fianarantsoa, Mahajanga, Toamasina, and Toliara, as well as regional universities, such as Antsirabe. In addition, each year Vahatra scientists advise numerous Malagasy students on aspects of their research, access to literature based on the extensive library housed at our office, and other forms of mentorship. Furthermore, several Ph.D. candidates working with other institutions, some outside of Madagascar, request Vahatra scientists to be members of their graduate study committees. The office overlooks the University of Antananarivo and it is only a few minutes walking distance between the two.

Since Vahatra open its doors in late 2007, something approaching 2741 different student and research visitors not directly part of the association's mentoring program have visited the office to use the library facilities or consult with the scientific staff. (These figures are based on a sign-in notebook for arriving library users.) The Vahatra library, with respect to modern books on Madagascar and a range of aspects associated with its biodiversity and natural history, is one of the most extensive on the island and represents an important bibliographic resource. The individuals consulting these books in 2024 included mostly students from different university faculties (science, agronomy, veterinary medicine, etc.) of national and private universities, as well as Malagasy researchers, accessed hundreds of documents (books, reprints, theses, etc.). It is worth noting that over the past five years or so, fewer students are using the library facilities at Vahatra and this is most likely related with the reflex of "the new generation" searching for documents on the internet, rather than physically consulting them in libraries. Having said that, a number of students purchase books published by Association Vahatra (at special discounted prices) and, hence, their interest in printed books still remains. In any case, to facilitate access to on-line pdf documents, Association Vahatra together with a collaborating institution in India, has created an on-line source of close to 10,000 documents (see https://protectedareas.mg/document/list).

Given the mentoring techniques used during the training of graduate students based at Vahatra, we try to stimulate intellectual curiosity and inspire creative thinking. Hence, Malagasy students passing through the Vahatra program develop a clear vision of their professional objectives and the scientific process, which in turn results in good interviews for job positions and considerable success finding permanent jobs within the national governmental and nongovernmental sectors. In many cases, these posts are in domains related to biology and conservation, for example, university appointments, research institutes, working within NGOs, associated with the Madagascar National Parks, etc. Some of the former students hold or have held key posts, for example, in different managerial capacities, such as at UNESCO, mining companies, Ministry of Higher Education and Scientific Research, and Ministry of the Environment and Sustainable Development. Some students have taken different directions, such as creating their own organizations and are actively involved in the management and conservation of biodiversity in collaboration with local communities. Hence, taking a broad view, one of the mandates of the association, to advance science and conservation on Madagascar with focused mentorship of graduate students and conservation biologists, is indeed meeting the intended expectations. A good example of this is that numerous Vahatra graduates have obtained university appointments, providing an even greater means to advance capacity building for Malagasy field and conservation biologists.

In the section below is a listing of Malagasy graduate students having completed in 2024 their Licence Professionnelle, Master's II, Ph.D. or HDR degrees under the direction of Vahatra scientists or as committee members, as well as those currently in preparation. After receiving their higher degrees from the university, these generally well-trained young researchers are for the most part dynamic and with long-term visions, capable of designing and implementing research projects, and obtaining associated funding.

Graduate diplomas presented in 2024 or in preparation

As can be seen from the following lists, the scientific members of Vahatra are actively involved in the advancement of Malagasy graduate students. We consider this one of the hallmarks of the association's interventions to advance science on the island and prepare future generations. Further, we encourage students to publish the results of their scientific work (see below, "Scientific outputs of Vahatra during 2024") and take their rightful place in the international scientific community.

A) Master's and Ph.D. diplomas presented by student members of Association Vahatra and under the direction of Vahatra scientific members.

1. Faliarivola, F. M. F. 2024. Distribution altitudinale des oiseaux utilisant le sous-bois de la parcelle humide du Parc National d'Andohahela, Madagascar. Mémoire de Master, Mention Zoologie et Biologie Animale, Université d'Antananarivo.

2. Ranaivoson, T. N. 2024. Diversité, écologie, et démographie des micromammifères non-volants suivant un gradient de perturbation dans le Massif de Marojejy et les zones dégradées agonisante. Thèse de doctorat, Ecole Doctorale Science de la Vie et de l'Environnement, Spécialité Zoologie et Anthropologie Biologique, Université d'Antananarivo.
3. Rasoarimalala, M. S. 2024. Etude de la variation temporelle des populations de Tenrecidae de la Réserve Spéciale d'Ambohitantely, Ankazobe, Madagascar. Mémoire de Master, Mention Zoologie et Biologie Animale, Université d'Antananarivo.

B) Licence, Master, Ph.D., and HDR diplomas defended with implication of Vahatra scientists as a supervisor, lecture committee member or jury member.

1. Andriafanomezantsoa, V. J. R. 2024. Communautés aviaries dans le paysage agricole du Nord-est de Madagascar (Région SAVA) : cas des mosaïques des zones prédominantes autours du Parc National de Marojejy. Mémoire de Master, Mention Zoologie et Biodiversité Animale, Université d'Antananarivo.
2. Harison, H. M. 2024. Contribution à l'étude écologique des serpents dans la forêt sèche de Kirindy CNFEREF, Morondava, Madagascar. Mémoire de Master, Mention Zoologie et Biologie Animale, Université d'Antananarivo.
3. Mandimbihasina, A. R. 2024. Etude de la densité et génétiques des populations pour la conservation de la tortue à soc *Astrochelys yniphora* (Vaillant, 1885). Thèse de Doctorat, Ecole Doctorale Science de la Vie et de l'Environnement, Université d'Antananarivo.
4. Mihaminekena, H. T. 2024. Développement comportemental des jeunes lémuriens en forêt dégradée: Cas de *Prolemur simus* (Gray, 1871) d'Ambalafary. Thèse de Doctorat, Ecole Doctorale Science de la Vie et de l'Environnement, Université d'Antananarivo.
5. Rafaliarintsoa, H. Z. N. 2024. Ecologie spatiale de la tortue à grosse tête, *Erymnochelys madagascariensis*, réintroduite dans le lac Ravelobe, Nord-ouest de Madagascar. Mémoire de Master, Mention Zoologie et Biologie Animale, Université d'Antananarivo.
6. Rahelinirina, S. 2024. Compréhension et gestion de risque de maladies zoonotiques transmises par les rongeurs. Mémoires d'Habilitation à Diriger des Recherches, Université d'Antananarivo.
7. Raherinjatovo, H. 2024. Etude de la communauté herpétofaunique dans le Parc National de Makira, Nord-est de Madagascar. Mémoire de Master, Mention Zoologie et Biologie Animale, Université d'Antananarivo.
8. Rakotoarinivo, M. 2024. Taxonomie intégrée pour la conservation des palmiers (Arecaceae) de Madagascar. Mémoires d'Habilitation à Diriger des Recherches, Université d'Antananarivo.

9. Rakotomanga, S. E. 2024. Etude de la fluorescence et de son evolution chez le genre *Brookesia*. Mémoire de Master, Mention Zoologie et Biologie Animale, Université d'Antananarivo.
10. Ramaromilanto, B. 2024. Evolution diachronique staturo-pondérale et composition corporelle des enfants des écoles publiques (6 à 18 ans) du fokontany Vohibinany-Brickaville-Madagascar. Thèse de Doctorat, Ecole Doctorale Science de la Vie et de l'Environnement, Université d'Antananarivo.
11. Ramiandra, V. A. 2024. Analyses bioécologique, biogéographique et taxonomique intégrative du genre *Furcifer* Fitzinger, 1843 dans le nord-ouest de Madagascar. Thèse de Doctorat, Ecole Doctorale Ecosystèmes Naturels, Université de Mahajanga.

C) Master's and Ph.D. diplomas in preparation in direct collaboration with scientific members of the Association Vahatra and in most cases will be presented in 2025 or 2026.

1. Andriamanantena, F. Sécurité alimentaire et conservation de la biodiversité : Une analyse socio-économique des dynamiques d'exploitation des ressources dans les zones périphériques du PN de Zombitse-Vohibasia. Madagascar. Thèse de Doctorat, Ecole Doctorale Science de la Vie et de l'Environnement, Université d'Antananarivo.
2. Radovimiandrinifarany, H. T. R. Etude éco-biologique et lutte contre les rongeurs exotiques nuisibles dans la Commune Rurale d'Analavory Itasy, Madagascar. Thèse de Doctorat, Faculté des Sciences, Université d'Antananarivo.
3. Rakotoariasoa, F. E. Etude du déplacement des rongeurs et de la dispersion écologique de l'espèce introduite *Rattus rattus* (Muridae), étude de la communauté d'invertébrés dans les terriers dans le nord-est de Madagascar. Thèse de Doctorat, Ecole Doctorale Science de la Vie et de l'Environnement, Université d'Antananarivo.
4. Rakotoarimalala, F. M. Etude de la distribution spatiale et analyse structurale de la communauté des caméléons dans un système forestier fragmenté. Thèse de Doctorat, Ecole Doctorale Science de la Vie et de l'Environnement, Université d'Antananarivo.
5. Ravelotafita, S. S. O. Abondance relative et diversité biologique des micro-mammifères dans les zones forestières et les zones dégradées. Thèse de Doctorat, Ecole Doctorale Science de la Vie et de l'Environnement, Université d'Antananarivo.
6. Ravololoniaina, M. Analyses structurale et spatiale de la communauté des amphibiens utilisant des écosystèmes aquatiques et des habitats riverains dans la RS d'Ambohitantely, Madagascar. Mémoire de Master, Mention Zoologie et Biologie Animale, Université d'Antananarivo.
7. Razafimandimby, J. L. Structure de la communauté de petits mammifères du Parc National de Marojejy, Madagascar. Mémoire de Master, Mention Zoologie et Biologie Animale, Université d'Antananarivo.
8. Tolojanahary, H. J. Etude descriptive des profils écologiques des arbres menacés de la Réserve Spéciale d'Ambohitantely. Mémoire de Master, Mention Zoologie et Biologie Animale, Université d'Antananarivo.

VAHATRA MEMBERS AS REVIEWERS OF PAPERS SUBMITTED TO SCIENTIFIC JOURNALS

As an indication of the role Association Vahatra scientists play in the realm of published scientific papers, they served in 2024 as reviewers for papers submitted to the following international journals:

- *Acta Chiropterologica*
- *Biological Journal of the Linnean Society*
- *Biotropica*
- *Ecography*
- *Integrative Zoology*
- *Journal of Medical Entomology*
- *Journal of Natural History*
- *Malagasy Nature*
- *Mammalia*
- *National Geographic Magazine*
- *Peer J*
- *Plants, People, Planet*
- *PLOS One*
- *Science*
- *Tropical Zoology*
- *Zoological Journal of the Linnean Society*

MALAGASY NATURE

Our intention with the scientific journal *Malagasy Nature*, published by Association Vahatra and with free online download of articles, is to advance peer-reviewed papers at high scientific and technical standards and specifically for young researchers and graduate students from Madagascar and neighboring islands. *Malagasy Nature* has an International Standard

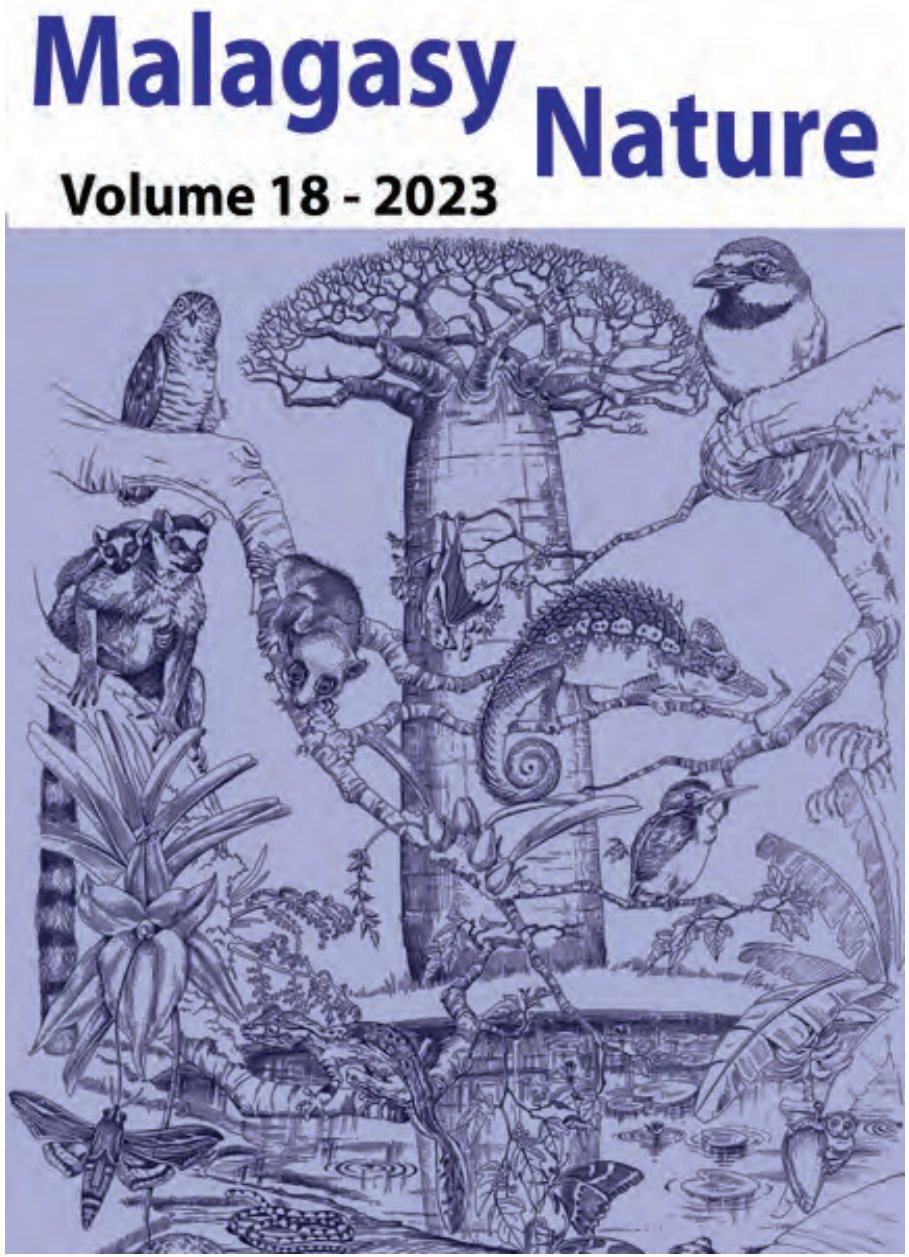
Serial Number (ISSN) status and, hence, considered an international scientific journal. Manuscripts in French or English are passed through an editorial team, involving a review process of international norms. An important difference compared to most scientific journals is that the editors of *Malagasy Nature* work closely with Malagasy or regional western Indian Ocean authors to help them understand the process of composing and writing scientific articles. In many cases, the first couple of publications of a young researcher pose considerable hurdles and the editors of *Malagasy Nature* provide the means for less experienced scientists to negotiate such problems.

Based on this approach, the journal plays an important role in regional capacity building, which in turn separates it from other international journals, which normally the editors, editorial committee, and manuscript reviewers are not readily available to help at the same levels with manuscript submission and revision. Further, given that article downloads for *Malagasy Nature* are free, this allows national and regional scientists to easily return information to the worldwide scientific world, and provides the means for conservation managers and other users to have easy access to reliable and updated information. All of these aspects together, provide professional advancement for the western Indian Ocean scientific community, specifically a certain sense of responsibility and for regional authors to understand the importance of invested efforts when producing scientific articles. For Malagasy students preparing their theses in the national university system, they are required to have published a certain number of scientific publications before they can finalize the thesis submission. An article published in or accepted by *Malagasy Nature* counts towards this quota.

As a further point of explication, several researchers preparing their theses submit articles to *Malagasy Nature*, as they understand that when needed or appropriate they will get assistance from the editorial team to improve their manuscripts. The on-line publication of the journal also guarantees the local availability of research results in the fields of ecology and biology conducted on Madagascar and neighboring islands, as compared to foreign scientific journals for which electronic files are often not readily downloadable or repatriated to Madagascar. All numbers published to date of *Malagasy Nature* are available online and with free access (http://www.vahatra.mg/malagasynaturefr.html).

Marie Jeanne Raherilalao and Steve Goodman are the co-editors of *Malagasy Nature* and several associated editors assist in different aspects with submitted manuscripts. Malalarisoa Razafimpahanana is responsible for the design and type-setting of each volume, as well as posting articles on the journal website. On average, at least one volume of the journal is published each year. The editorial board of *Malagasy Nature* is composed of both national and international scientists, from both the Anglophone and Francophone worlds, made up of the following individuals:

The most recent volume of the journal, number 18, was published in 2024 and is a series of unrelated scientific papers. The articles can be downloaded at http://www.vahatra.mg/volume18.html. Volume 18 includes the following papers:



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- **An appraisal of biodiversity conservation in the littoral zone of Sainte Luce, southeastern Madagascar** – Sam Hyde Roberts **pdf**
- **Les plantes patrimoniales, un outil pour la connaissance et la conservation de la flore du Sud-ouest Madagascar : Cas de l'aire protégée d'Amoron'i Onilahy (Région Atsimo-Andrefana, Sud-ouest Madagascar)** – Laurence Ramon, Assane H. Madjid, Michel B. Rajaonarivelo, Eliette G. Ramirasoa, Brillant V. Raoelison, Myria F. Rasoavolonjanahary & Peter B. Phillipson **pdf**
- **Documentation of a bamboo flowering event in the Ranomafana National Park and its impact on local forest ecology** – Steven M. Goodman, Tahiry Langrand, Voahangy Soarimalala & Soejatmi Dransfield **pdf**
- **Osteological measurements and sexual dimorphism of the Madagascar Pochard *Aythya innotata* (Anseriformes: Anatidae)** – Zafindratsaravelo B. Nomenjanahary, James P. Hansford, Karen E. Samonds & Steven M. Goodman **pdf**
- **Abbott's Booby on Assumption Island: A breeding mystery** – Anthony S. Cheke **pdf**
- **Aperçu de l'organisation sociale, la structure d'âge et le sex-ratio de *Mops leucostigma* (Chiroptera : Molossidae) dans la Station Forestière d'Ivoloina, Centre-est de Madagascar** – Lomeris J. Todilahy **pdf**

THE PUBLISHING HOUSE OF ASSOCIATION VAHATRA

The year 2011 marked an important advancement for Association Vahatra with the creation of its own publishing house, first focusing on a series entitled "Guides sur la diversité biologique de Madagascar" [Guides to the biological diversity of Madagascar]. For individuals that grew up over the past decades in, for example, North America, portions of Latin America or western Europe, information on regional plants and animals are readily available in field guide book format. These types of books, generally presented by taxonomic group (e.g. ferns, reptiles, birds, etc.) and region (e.g. east of the Mississippi, Peru, European Alps), revolutionized making information on biodiversity available and penetrable for members of various age and social groups in different parts of the world.

Such guides provide the means for individuals to become familiar with different plants and animals found in areas where they live or travel, and, most critically, integrating this familiarity into how they perceive the importance of the natural world. It is not an exaggeration to state that these types of guides have been important elements in the "greening" of different societal sectors in numerous countries. More recently, the availability of such

information has been advanced by an assortment of different online sites and smart phone applications, although for certain individuals there is a sort of satisfaction and practicality in the field to physically have such books in the hand. For Madagascar, which is so rich in biological diversity and being one of the world's principal tropical conservation priorities, the largely previous lack of such books created a considerable void, which Association Vahatra strongly believes needed to be filled.

Since 2011, nine books have been published in the Guides to the biological diversity of Madagascar series, which is edited by Marie Jeanne and Steve, and designed and typeset by Malalarisoa Razafimpahanana:

1. *Les chauves-souris de Madagascar* [The bats of Madagascar] by Steven M. Goodman, 2011, 129 pp.
2. *Les petits mammifères de Madagascar* [The small mammals of Madagascar] by Voahangy Soarimalala & Steven M. Goodman, 2011, 176 pp.
3. *Histoire naturelle des familles et sous-familles endémiques d'oiseaux de Madagascar* [The natural history of the families and subfamilies of endemic Malagasy birds] by Marie Jeanne Raherilalao & Steven M. Goodman, 2011, 146 pp.
4. *Les Carnivora de Madagascar* [The Carnivora of Madagascar] by Steven M. Goodman, 2012, 158 pp.
5. *Les animaux et écosystèmes de l'Holocène disparus de Madagascar* [The extinct Holocene animals and ecosystems of Madagascar] by Steven M. Goodman & William L. Jungers, 2013, 249 pp.
6. *Les amphibiens des zones arides de l'Ouest et du Sud de Madagascar* [The dry forest amphibians of western and southwestern of Madagascar] by Franco Andreone, Gonçalo M. Rosa & Achille P. Raselimanana, 2014, 180 pp.
7. *Les amphibiens du Nord de Madagascar* [The amphibians of northern Madagascar] by Franco Andreone, Angelica Crottini, Gonçalo M. Rosa, Andolalao Rakotoarison, Mark D. Scherz & Achille P. Raselimanana, 2018, 355 pp.
8. *Fourmis de Madagascar : Un guide pour les 62 genres / Ants of Madagascar: A guide to the 62 genera* (a bilingual French-English book) by Brian Fisher & Christian Peeters, 2019, 253 pp.
9. *Libellules et demoiselles de Madagascar et des Iles de l'Océan Indien occidentale / Dragonflies and damselflies of Madagascar and the western Indian Ocean Islands* (a bilingual French-English book) by K. D. Dijkstra & Callen Cohen, 2021, 194 pp.

The production of the first three books in the series was financed by a grant from the Critical Ecosystem Partnership Fund (CEPF). Subsequently, a series of generous gifts from the Ellis Goodman Family Foundation and Paul Goodman (just a coincidence and no family relation to Steve Goodman) allowed additional guides in the series to be published.

To date, other than free or at production costs diffusion of Association Vahatra Press books to Malagasy students and scientists, copies have been sold to people coming to the Vahatra office, at different fairs in Antananarivo, and through local and overseas booksellers. We are pleased with the interest these books have generated, which includes seeing Malagasy students and

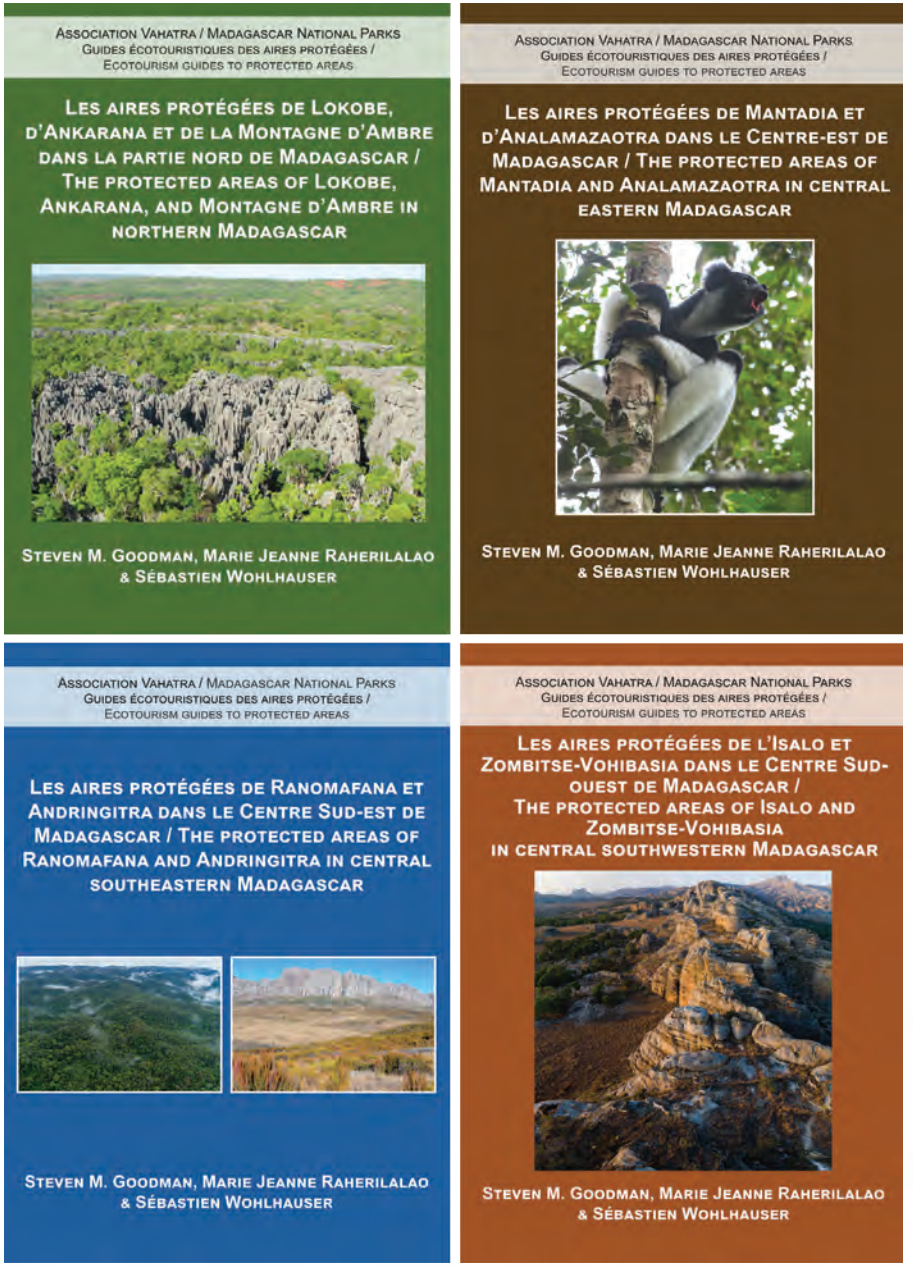
naturalists, as well as foreign tourists, carrying and consulting the books on trips to protected areas. Further, these books are important resources for national students and researchers, as well as reference works for university courses. For three titles, the printed stock was depleted in 2024 and we reprinted these books.

The University of Chicago Press is responsible for the distribution of Vahatra books (see http://www.press.uchicago.edu/ucp/books/publisher/pu3431914_3431915.html) largely in the New World and Natural History Book Service (NHBS) (https://www.nhbs.com/publisher/vahatra) in the UK and Europe, which also include the *Atlas of selected vertebrates of Madagascar* published in late 2013, and *Les aires protégées terrestres de Madagascar : leur histoire, description et biote / The terrestrial protected areas of Madagascar: Their history, description, and biota* released in March 2018. Further, many of these books are available from Amazon in Europe and North America.

The ecotourism guide series published by Association Vahatra in collaboration with Madagascar National Parks

The extraordinary levels of animal and plant species diversity on Madagascar, including high levels of endemism, well known to naturalists, biologists, and conservation interested tourists, as is the heavy burden of anthropogenic pressures, making the island one of the world's most critical biodiversity "hotspots". Association Vahatra is of the view that one important way to advance worldwide attention to the island's protected areas system is through dissemination of information on the sites.

About 5% of the incoming foreign currency to Madagascar, at least before the COVID-crisis, was associated with tourism; hence, an important infusion into the national economy. With this aspect in mind and looking for a means to advance further ecotourism on the island, Association Vahatra started a new book series called Guides écotouristiques des aires protégées / Ecotourism guides to protected areas and published in collaboration with Madagascar National Parks. At least in part, by augmenting the amount of information and scientific reliability available to both foreign and national tourists visiting protected areas in a series of simple pocket books, our hope is that this will increase interest in these sites, which in turn will augment the number of visitors. Further, this will help to advance the local socioeconomics around the protected areas, as well as the national economy. Finally, books



in the series are important to help local guides update their knowledge on the protected areas they work, a sort of retooling. Thanks to the generous donations of several private individuals, we have secured funding for the first four books in the series. At the first stage of this project, we will produce four bilingual (French/English) books before the end of 2024, each covering well-visited protected areas. These sites are part of standard tourist circuits, in close vicinity to national roads, and with advanced local infrastructure (guides, hotels, and restaurants). All of the protected areas covered are under the management of Madagascar National Parks, who is a direct collaborator in this project. The first four books include the following sites:

1. Northern set of protected areas (Lokobe, Ankarana, Montagne d'Ambre) – published in 2022,
2. Central east set of protected areas (Analamazaotra and Mantadia) – published in 2022,
3. Southeastern set of protected areas (Ranomafana and Andringitra) – published in 2023,
4. Southwestern set of protected areas (Isalo and Zombitse-Vohibasia) – published in 2024.

We hope in 2025 to start working on a book for the sites of Marojejy and Anjanaharibe-Sud in the northeast and this will most likely be the last book in the series, having covered all of the major protected areas visited my tourists.

VAHATRA'S ECOLOGICAL RESTORATION PROJECT AT AMBOHITANTELY – AN UPDATE

The Ambohitantely Special Reserve, located a few hours' drive from Antananarivo, contains one of the last remaining montane humid forests in the Central Highlands of Madagascar and this was a forest type once widespread across this vast geographic zone. Such montane forests are now among the most endangered vegetation formations on the island. A few decades ago, the Ambohitantely protected area, managed by Madagascar National Parks (MNP), comprised about 90 distinct forest fragments, ranging from tiny parcels of less than one-tenth hectares to blocks exceeding 1,200 hectares, separated by grasslands. This configuration of natural forest in a sea of grassland habitat provided an ideal setting for studying the relationship between species richness within a forest block and its surface area, with research focusing on birds, small mammals, and amphibians.

Over the past decades, however, the forest cover within the protected area has been severely reduced, primarily due to fires that spread across the grasslands. These fires are often intentionally set to renew grazing lands for cattle, or triggered naturally by lightning strikes, or initiated as acts of defiance often directed against the state. For several decades, scientific members of Vahatra, all field biologists specializing in terrestrial vertebrates, have worked in this protected area and witnessed the progressive loss of natural forest habitat. Recognizing the urgency of the situation, we decided that immediate action was necessary to preserve what remains of the natural forests of Ambohitantely and one of the last montane forest remnants.

Since the launch of this project in July 2021, numerous successes have been achieved despite significant challenges, including those related to fire prevention within the intervention zone, as well as technical and financial constraints. To overcome these difficulties, the team has consistently shared project progress and achievements with its partners, while inviting stakeholders to visit the site and observe our activities firsthand.

Convinced by the approaches and management methods employed, the principle donor at the first stages of the project, Rädda Regnskog or Save the Rainforest (Sweden), has continued its unwavering support. This December, Association Vahatra signed a 4th funding agreement with this organization to sustain the project's activities.

Impressed by the quality of results achieved and the project's long-term goals, the Critical Ecosystem Partnership Fund (CEPF) has also provided two additional grants to strengthen initiatives in Ambohitantely. The first, through the Franklinia Foundation, focuses on protecting 19 threatened tree species within the Special Reserve, while the second supports the dissemination of best practices in ecological restoration to Malagasy institutions. This ongoing commitment to progress, coupled with continuous improvement of techniques and approaches, has also garnered support from other partners, such as the Hempel Foundation, Madagascar Classical Collection, and friends of the Vahatra Association (Paul Goodman, Joyce Chelberg, and Art Sussman), who have provided financial assistance in 2024.

Firebreaks

Located on a *tampoketsa*, that is to say a vast relatively flat plateau of sorts, Ambohitantely remains highly threatened by recurrent fires. To protect the forest relics and ongoing restoration plots, the monitoring system is reinforced each year, particularly during the fire season (June to when the rains start normally in late November or early December). Firebreak maintenance has thus become a regular activity, regarded as the most effective solution to prevent the spread of fires from outside into the Special Reserve forests. This strategy is complemented by surveillance operations jointly conducted by local communities of villagers and the project team.

Every fire outbreak identified in the surrounding area is immediately reported by the observer (local community members and Madagascar National Parks or Vahatra staff members), allowing the team to quickly organize and contain the fire. Between August and November 2024, the Vahatra team coordinated at least six firefighting interventions, three of which were classified as intense. During the fifth incident, the fire breached the firebreak due to strong winds but was narrowly brought under control thanks to the combined efforts of local communities and the project's dedicated partners.

In 2024, no fires affected the forests within Vahatra's intervention zone, despite an increase in threats during the dry season. All available equipment was mobilized, and the local communities, benefiting from the ecological restoration project, have become more responsible and better organized to respond effectively to fires in the area.

Biological station

Over the past couple of years, under the guidance of Achille Raselimanana and Jacquis Tahinarivony, a modest and functional field station building was constructed at the site by a team composed primarily of local workers. The station was officially inaugurated on 20 December 2022. This new facility provides significantly improved logistics for scientists working in the protected area, supporting various ongoing Vahatra research projects, the ecological restoration project (detailed below), and the storage of equipment between visits.

The station comprises three main rooms: a kitchen and dining area with a set of bunk beds, a laboratory, and a dormitory with two sets of bunk beds. The facility has a solar installation which provides all of the electrical needs

of the station, including water pumping from a lower water source to storage tanks next to the station. The adjacent camping area with lean-to shelters was refurbished in 2024 to accommodate at least 10 tents. Furthermore, a new sanitary block including three toilets and three showers was completed and became operational at the end of this year. To expand the station's capacity, a 9 x 4 m chalet was installed in 2024, which serves multiple purposes, such as a dining hall, meeting room, or workspace for research and different pedagogic groups. The chalet is equipped with folding tables and about 30 folding chairs, making the space adaptable for various uses and ensuring its practicality for a range of activities. Another key component of Vahatra's capacity-building program is the promotion of knowledge-sharing and skill development. This occurs not only during field schools but also through the organization of in-situ workshops with civil society organizations. The new chalet is an excellent space to hold different sorts of meetings.

In addition to improving research infrastructure, the station plays a vital role in generating income opportunities for local communities. This includes purchasing local food products and employing individuals as cooks, forest guides, porters, helpers, camp managers, field assistants, and for data monitoring. These economic incentives encourage local engagement in forest conservation efforts, which is essential for the long-term preservation of the remaining forests in collaboration with local communities and Madagascar National Parks.

Moreover, it is evident, at least in Madagascar, that the presence of biological stations, along with students and researchers, deters illicit activities in surrounding forests. In the coming year, additional infrastructure upgrades and modifications will be implemented to further enhance the station's functionality and provide better facilities for visiting researchers.

Arboretum

The biological station was originally surrounded by secondary grasslands and groves of introduced pine trees. This landscape was redesigned to optimize reforestation initiatives, combat invasive species, and enhance the surrounding spaces. As part of this effort, a portion of the available funding was used for the creation of an arboretum around the biological station.

Since May 2024, all pine trees in the area have been removed, and local communities have undertaken clearing, cleaning, and hole-digging activities associated with establishing the arboretum. In June, the team

began planting forest species grown in our nurseries to be transplanted at the site. Between June and August 2024, 3,500 seedlings have been transferred to the arboretum. These plantings include 42 native tree species from Ambohitantely, eight of which are classified as threatened and are among the target species of the project funded by the Franklinia Foundation and CEPF. Monitoring conducted in mid-December of the trees planted in the arboretum revealed a survival rate of 96%, which is very high, challenging certain preconceptions about the slow growth of Madagascar's native species.

Once the arboretum has been properly established, visitors to Ambohitantely will have the opportunity to learn about the species studied by Vahatra, observe our planting methods, appreciate the processes and results of our activities, and discover the names of the plants present on-site. The expansion of the arboretum continued in December 2024, bringing its total area to 2.5 hectares.

Reforestation and ecological restoration

The Ambohitantely protected area has been the subject of grassland bush fires for many decades, with the forest edge continually regressing and reducing the natural forest cover. To deal with this situation, Association Vahatra, through the efforts largely of Jacquis Tahinarivony and in collaboration with local people, have invested considerably in advancing a reforestation project at the site, with the ultimate goal of something approaching ecological restoration. More specifically, to extend the native forest surface area of the protected area and filling in gaps between existing separated forest parcels. The different aspects of this work are presented here.

Choice of planted tree species

The selection of species used in our project has evolved over time and, at least in part associated with the availability of seeds collected from the forest. This year, support from the Franklinia Foundation and CEPF has enabled the integration of 19 threatened tree species into our ecological restoration efforts, alongside the rehabilitation of their natural habitat. Currently, Vahatra's nursery center is cultivating 59 species, all originating from the remaining forests of Ambohitantely. Among the newly introduced species is *Evodia* sp. of the family Rutaceae (*fatraina* in Malagasy), which was the subject of intensive exploitation in 2022 for its bark, a key resource in essential oil production.

Tree nursery

To date, Association Vahatra has established approximately 1,420 m² (or 153,000 ft²) of tree nursery growing beds, divided into three sections:

- **Section A** consists of eight growing beds, two germination boxes, and a compost pit. Each growing bed measures 10 x 1.2 m, with a capacity of about 1,000 seeded pots. This section served as the initial nursery at the start of the project.
- **Section B** includes 12 growing beds and five germination boxes. Each bed accommodates up to 1,750 pots, with the largest beds measuring 15 x 1.2 m.
- **Section C** features four growing beds, each measuring 10 x 1.2 m, with a combined capacity of 4,000 pots. This section is primarily dedicated to cultivating plants intended to grow into large forest trees.

These three sections are exposed to varying levels of sunlight and shading systems to optimize seedling quality and growth. While Sections A and B are used for nurturing seedlings, Section C is designated for the treatment of plants ready for transplantation. To ensure an efficient production flow, nursery staff routinely displaced potted plants to a different Section based on their growth stages. The nursery operates year-round, including during the dry season, producing an estimated 36,000 seedlings every six months, with an annual production capacity of up to 80,000 seedlings.

Heavy local rains pose significant erosion risks to the nursery. To address this challenge, a new system of elevated or aerial nurseries has been implemented, housed within shaded areas. This raised germination system is designed for species with small seeds or seeds shorter than 1 cm, such as *Pterophylla* spp. (Cunoniaceae), *Polyscias* spp. (Araliaceae), various species of Asteraceae, and others.

Three local individuals from communities surrounding the protected area are employed as full-time nursery staff and are considered permanent project employees. These nursery workers are supported by a considerable number of community members during potting, pot arrangement, and seedling reclassification activities. They have also received training in seed collection, sorting, and treatment and are now skilled in identifying threatened tree species in Ambohitantely, the focus of the Franklinia/CEPF conservation project.

Compost

The soils surrounding the forested areas of Ambohitantely have suffered significant degradation, primarily due to repeated fires that burn organic matter, followed by nutrient leaching associated by heavy seasonal rainfall. To address this issue and promote the rapid growth of planted trees, a composting process has been implemented. The compost is primarily made from various types of plant debris processed through a grinding machine, mixed with organic fertilizer (cow dung), and watered monthly, particularly during the dry season, to accelerate decomposition. Each compost pit produces up to 48 m^3 (1,700 ft^3) of compost every five to six months.

With the addition of 10 new pits in 2024, the project now operates 29 functional compost pits, producing up to 2,780 m^3 (98,175 ft^3) of compost annually. The use of compost significantly improves the survival rate of transplanted plants and fosters considerable growth. Additionally, compost

production has become a valuable source of economic opportunities for local communities. Since June 2024, with the acquisition of new funding to support ecological restoration efforts, the composting initiative has provided a range of sub-activities for local communities, engaging an average of 80 women and 30 men each month.

Restoration efforts

The Vahatra intervention zone includes 335 hectares in the southern section of the Ambohitantely Special Reserve, primarily adjacent the core forested area. Approximately 120 hectares (36%) remain as relatively intact montane forest, while 64% consists of degraded or secondary formations. Through GIS technology coupled with ground verification, 81 hectares of degraded areas have been identified as suitable for active ecological restoration, with an additional 134 hectares designated for assisted passive regeneration. The effectiveness of these restoration strategies depends largely on controlling threats, particularly fire.

1. **Identification and treatment of new plots**
   - Restoration plots 10 and 11 were identified, studied, and treated, covering 7.59 and 5.62 hectares, respectively.
   - Plot 9 was expanded, tripling its area from 2023 to reach 13.20 hectares.
2. **Plant maintenance and monitoring**
   - Trees in plots 1, 2, 5, 6, and 9 were maintained, ensuring survival rates above 90% and supporting healthy growth.
   - Maintenance continued for *Dodonaea* (Sapindaceae) and *Maesa lanceolata* (Primulaceae) planted along the external boundary of the intervention zone.
3. **Insect control**
   - A continuous battle against pest insects was carried out through mechanical and manual methods, primarily led by women. No chemical pesticides are employed in any manner in the context of this project.

4. **Tree planting results**
   - Over 36,000 individuals representing 48 species (including nine threatened species) were planted in 2024.
   - Survival assessments in August 2024 indicated an average survival rate of 90.2%.

As mentioned above, one outstanding achievement of this project in 2024 was the establishment of an arboretum, which forms a part of the active restoration initiative. Despite launching in June, a period typically considered unsuitable for planting due to the dry season, this effort marked a significant milestone.

Assisted passive regeneration

This approach focuses on removing invasive species that hinder natural seed regeneration. It involves manual and notably physical methods, employing machetes and axes, in a cyclical process over the calendar year to clear unwanted vegetation. In 2024, 35 hectares were treated using passive

regeneration, primarily targeting the invasive fern *Dicranopteris linearis* (Gleicheniaceae). Additionally, all 335 hectares of the Vahatra intervention zone were cleared of introduced pine trees, including a 2-hectare area around the biological station, which is now being developed into an arboretum.

Active ecological restoration

Using GIS technology, the 81-hectare zone designated for active restoration was divided into 11 plots based on topographical features. To date, eight plots have been the focus of Vahatra's interventions, progressing through phased and seasonal operations. Key activities include digging deep planting holes (size can vary from 50 x 50 x 50 cm to 80 x 80 x 80 cm depending on the quality of the topsoil), and several months before transplantation filling the holes with organic compost. A matrix system of color-coded stakes ensures accurate placement of tree species during planting and following a predesignated matrix. Subsequent steps involve planting, silvicultural maintenance, and monitoring tree health and growth.

Restoration activities adhere to IUCN principles and guidelines for ecological restoration within protected areas and align with conservation objectives set by the Ministry of Environment and Sustainable Development and Madagascar National Parks. Vahatra continually refines its methods by building on lessons learned and best practices since the project's inception.

Assisted passive restoration

Efforts continued in plots 3, 7, and 8, with each plot undergoing three annual interventions aimed at eradicating invasive ferns that inhibit the establishment and growth of desired species based on the soil seed bank. These labor-intensive activities, requiring machetes and physical effort due to challenging terrain, are carried out exclusively by men.

Monitoring planted trees

A monitoring team evaluates the success of restoration activities. Local community members and students from the University of Antananarivo conduct regular assessments of every tree planted since 2021. Data collected is analyzed by a monitoring coordinator, enabling evaluation of results, identification of areas for improvement, and refinement of intervention techniques.

Survival rates remain consistently high, ranging from 90% to 92% since a given tree was planted in the plots. Monitoring revealed that some trees planted in January 2022 have already reached 2 meters in height, while trees planted in plot 9 in January 2024 have grown to 0.8 meters. This ongoing monitoring ensures the project remains adaptive, evidence-based, and aligned with long-term restoration goals.

Broad overview

The concept of ecological restoration, established in the first phase of the project, remains the guiding aspect of the tree-planting interventions of Vahatra at Ambohitantely. The major achievements in 2024 include an increase in production of young plants within the nursery center for transplanting, as well as augmenting the surface areas of the restoration plots. The care this project takes to correctly plant trees, specifically the use of compost to increase survival and growth rates, and monitoring the individual trees through time is what separates our work from all other reforestation projects we are familiar with on Madagascar.

FIELD SCHOOLS IN THE MANTADIA NATIONAL PARK

During 2024, Association Vahatra held two different field schools in the Mantadia National Park, about a four-hour drive from Antananarivo, and at a forest camp site. During the first outing in March (rainy season), six Master's and PhD students from Mention Zoologie et Biodiversité Animale, two individuals each from local conservation organizations including Mad Dog Initiative and Ecovision, two people working for Madagascar National Parks, and five locals coming from surrounding communities. During second outing in October (dry season), nine Master's and one PhD students from Mention Zoologie et Biodiversité Animale, two individuals from Madagascar National Parks, and four local people took part. Also, for the Master's students that joined the second trip, they had largely completed their coursework and close to deciding the subject for their research memoirs. During the two field schools, the participants were divided in several rotating groups, presented by different specialists, including those on plants (with an emphasis on measuring aspects of vegetation structure and species diversity), reptiles and amphibians, birds, small mammals, and

Photo by Mike Muizebelt.

bats; for the different animal groups there was a focus on aspects of ecology, capture, manipulation, identification, and zoonotic disease research.

Field school activities included a standard inventory of two different forested zones, within the national park, one in a relatively undisturbed section and the other in a mixture of heavily disturbed and regenerating forest. The two areas are contiguous and provide a setting to understand the possible dynamics of forest animals adapting to different levels of human disturbance. Hence, we were able to simultaneously use the field schools to conduct a research project, and these aspects were part of the experience for the students.

This style of field school serves several different important functions. Firstly, introducing the students to real hands-on activities outside of a largely theoretical classroom context, and allowing them to understand different aspects of conducting field research for a variety of organisms. This constitutes a major step for their graduate studies by helping them to decide on the subject and group they will focus on. Secondly, on the side of Vahatra, field schools act as an important filtering process for the young Master's students to be invited to conduct their studies under the direction of a Vahatra scientist. After spending some extended time with a group of students in a field school setting, based on their level of interest, curiosity, and intellectual capacity, it is evident which are the best candidates to receive the mentorship of Vahatra scientists.

After the field school in October, the eight mid-term Master's students were asked to pick a subject and research topic for their memoirs and to write a research proposition, including a detailed budget. With the help of a Vahatra scientist these proposals were notably edited and refined. Thanks to several generous donations, we were able to raise the needed funds to cover the Master's research of a good proportion of these students. The submitted proposals have been evaluated and scored by the four Vahatra vertebrate scientists and the results of who will obtain subvention funds will be made known in early 2025.

STEVE GOODMAN IS NAMED FELLOW TO THE WORLD ACADEMY OF SCIENCES

In late 2024, it was made known that Steve Goodman had been elected as a Fellow to The World Academy of Sciences or TWAS, which is a program unit within the United Nations Educational, Scientific and Cultural Organization (UNESCO). Scientists working on Madagascar were notably underrepresented in TWAS and before the election of Steve, included only Prof. Raoelina Andriambololona and Prof. Jonah Ratsimbazafy. In the text associated with Steve's nomination, it was mentioned this was based on his important contributions to zoology and conservation science on the island, as well as large-scale advancement of Malagasy graduate students and scientists.

VOAHANGY SOARIMALALA ORGANIZES A ONE HEALTH WORKSHOP IN SAMBAVA ASSOCIATED WITH RESEARCH AT MAROJEJY

A one-day workshop was held in Sambava (SAVA Region) on 13 June 2024 associated with progress of the Duke University project in collaboration with Association Vahatra entitled "Land use project in the SAVA Region and challenges to global health". This workshop was jointly prepared by the Vahatra team and the Duke Lemur Center (DLC) in Sambava. During

the workshop, 33 participants took part. In addition to members of Vahatra, DLC, and Duke University, other participating individuals included the Regional Director of Environment and Sustainable Development SAVA, a representative of the One Health focal point team of the Ministry of Environment and Sustainable Development, representatives of the Regional Director of Health SAVA, Madagascar National Parks (MNP) Marojejy team, medical doctors from the district hospitals of Andapa and Sambava, mayors and local chiefs of the villages Mandena, Sarahandrano, and Andatsakala (intervention sites of the project), and representatives of the local population of these villages. Also, during the passage of Duke University colleagues in Antananarivo, several made presentations at the university.

The principal objective of the workshop was to share the results of the research conducted in the context of the Duke-Marojejy project since its inception and to gather the opinions and perceptions of local officials and populations. A series of presentations were given by the Vahatra and Duke University teams, explaining the results of the research on small mammals, domestic animals, and humans.

At the end of the workshop, recommendations emerged from various points raised by participants. It is clear that the project is considered very important for the improvement of human health in the SAVA Region, as well as for the management of the Marojejy National Park. Local officials expressed their desire to extend the project activities to other villages. The park manager requested permission to use the collected data for the improvement of protected area management in the context of controlling the use of natural resources, and in the same sense, the researchers requested the collaboration of MNP managers for strengthening conservation activities, specifically to limit the frequency of non-tourist visitors in the park and the management of harmful rodent species, in order to reduce the zoonotic risk.

The results of analyses in humans within the research framework of this project revealed that certain bacteria and parasites found in small mammals and domestic animals can be transferred to humans and in certain cases there

Photo by Charlie Nunn.

is evidence of such transfers. Certain of these diseases can lead to serious or even fatal complications. With this aspect in mind, a doctor present at the workshop sounded the alarm to sensitize participants, especially mayors and village chiefs, to encourage the population to seek medical interventions at the first signs of some form of sickness, to prevent the worsening of their health condition. Further, the doctor mentioned it is strongly recommended to promote vaccination in order to prevent certain avoidable diseases and complications, such as polio, for example, which remains a serious problem in portions of Madagascar.

FULBRIGHT U.S. SCHOLAR AWARD – TEACHING AND RESEARCH AT THE UNIVERSITY OF ANTANANARIVO

During the 2023-2024 Malagasy academic year, Steve Goodman was the recipient of a US Fulbright Scholar Award to work with students and researchers at The University of Antananarivo. Activities included different seminars mostly intended for graduate students and some young faculty members on 1) how to use bibliographic resources, 2) how to write scientific papers, and 3) how to configure and compose grants to funding agencies. Further Steve work with 10 different students and scientists on a one-to-one basis helping them to edit scientific papers for submission to academic journals.

STEVE GOODMAN RECEIVES PRIZE AS ONE OF THE HEROES OF MALAGASY BIODIVERSITY

On 31 May and associated with The International Day of Biodiversity, the Minister of the Environment and Sustainable Development, Max Fontaine, presented awards to several individuals, mostly scientists and conservation biologists, for their contribution over the years to advancing conservation on Madagascar. Steve Goodman was one of the recipients of the award, along with a range of different colleagues and collaborators, including Jonah Ratsimbazafy of GERP, Lily-Arison Rene de Roland of The Peregrine Fund (Madagascar), and Richard Lewis of the Durrell Wildlife Conservation Trust.

CURRENT VAHATRA PROJECTS AND GRANTS

Duke University/National Institute of Health and the National Science Foundation – land use in the SAVA Region and global health challenges

This project is associated with grants awarded to Duke University, with Dr. Charles Nunn as the Principal Investigator, and that started in 2019 with financing from the Ecology and Evolution of Infectious Diseases (EEID) program, a joint initiative between the National Institute of Health and the National Science Foundation (NSF). This large-scale project aims to understand the linkages between diseases circulating in the foothills of

the Marojejy Massif in northeastern Madagascar across a habitat mosaic of native forest, agricultural areas, and near villages where endemic and introduced (including domestic) animals may act as reservoirs and the source of transmission. Association Vahatra is one of the many collaborating organizations and our contribution is associated with the capture of bats, endemic and introduced small mammals, and collecting the needed samples for the zoonotic disease analyses. After 11 field sessions, which included a considerable effort for the multi-disciplinary team, the field studies for the first phase ended in late 2021. An extension was received from the granting agencies for some follow-up work at two of the study sites, which took place in early 2022.

Subsequently, additional funding was received from NSF (EEID program) and the project enters into a new phase of four years. Dr. Toky Randriamoria, a post-doc at Vahatra, is responsible for the field sampling and seconded by Voahangy and Steve. Further, an assistant, Rianja Nantenaina Randriamifidisoa, was engaged to reinforce the group, together with numerous local collaborators from northern Madagascar and villages neighboring Marojejy. A Ph.D. student, Fanasina Rakotoarisoa, was engaged to study the ecology of rodents, specifically aspects of their home ranges and the invertebrates in their nesting holes. Numerous other specialists in different research domains and from different institutions in the USA, France (La Réunion), Israel, and Singapore, are studying multiple facets of local circulating zoonotic diseases and parasites, and using a range of different advance techniques, including molecular, network analyses, and modeling tools. This research project aims to study novel methods to predict disease spread, particularly different infectious diseases being important human health concerns on Madagascar.

Save the Rainforest Sweden (Rädda Regnskog) project at Ambohitantely

The Réserve Spéciale d'Ambohitantely is one of the last remnant Central Highland montane forests on the island and it is of high priority to conserve. This fragile and vulnerable relict forest is home to a relatively rich and unique biodiversity ranging from plants, invertebrates, and vertebrates. Since 2007, Association Vahatra has organized at the site regular research missions, field schools in the form of ecological and biological training for students, as well as for conservation agents and managers.

Over the past decades, the anthropogenic pressures of largely human-set grassland fires in the Central Highlands, which enter and burn portions of the remaining natural forest, the number of forest parcels at Ambohitantely and their surface areas have been dramatically reduced or completely disappeared. In a collaborative project between Association Vahatra and Madagascar National Parks, the organization responsible for the management of the protected area, and with funding from Save the Rainforest Sweden, we have taken steps to try to conserve Ambohitantely and with the active involvement of local villagers. In 2024, Save the Rainforest Sweden provided additional funding for phase 3 of the project for a 12-month period. The Ambohitantely project is discussed in detail in an earlier section of this report.

Franklinia/Critical Ecosystem Partnership Fund (CEPF)

This project under the grant title, "Protecting threatened trees through ecological restoration at Ambohitantely" is financed by funds from the

Franklinia Foundation and administered by CEPF. The project is in collaboration with Madagascar National Parks and villagers living around the protected area. The principal aspects for 19 species of trees that occur at Ambohitantely are:

1. **Gather scientific data on threatened tree species** and more specifically obtaining a comprehensive understanding of the ecological characteristics and requirements of these 19 tree species within the protected area.
2. **Conservation of target tree species**, and implementing tangible actions to protect and preserve populations of focal species, including growing young trees from seed in the nursery and planting them in ecological restoration parcels.
3. **Involving neighboring community members** in the protection and conservation of threatened trees, which involves raising local awareness and actively engaging local communities in safeguarding threatened trees by educating them about their ecological importance and encouraging their participation in conservation efforts.

Critical Ecosystem Partnership Fund (CEPF)

Over the past years Association Vahatra has advanced on different aspects of growing and planting trees geared for forest ecological restoration, including the development of several very efficient techniques. This two year project aims at the dissemination of information on forest ecological restoration and monitoring in the Central Highlands of Madagascar and ameliorating silviculture techniques. Starting in early 2025, two field schools will be held at Ambohitantely, each for four days at the site, will be held for individuals working for a range of different civil society organizations on Madagascar involved in reforestation and forest ecological restoration, with the aims of sharing aspects that they have developed associated with their projects and also demonstrating to them Association Vahatra techniques at the site. The third field school, a day-visit to the site for non-governmental and governmental organizations interested in a general manner in reforestation and based in Antananarivo or the general Ambohitantely area, will be to explain Vahatra ecological restoration activities in the protected area. The fourth field school will be based on a small group of individuals chosen from the first two field schools, who demonstrated keen interest in ecological restoration and monitoring and they will take part in a full-scale biological inventory of Ambohitantely and the local forest restoration sites. Also, a seminar will be held to discuss aspects of ecological monitoring and problems associated with the control of invasive species.

Hempel Foundation in collaboration with the Foundation pour les Aires Protégées et la Biodiversité de Madagascar (FAPBM)

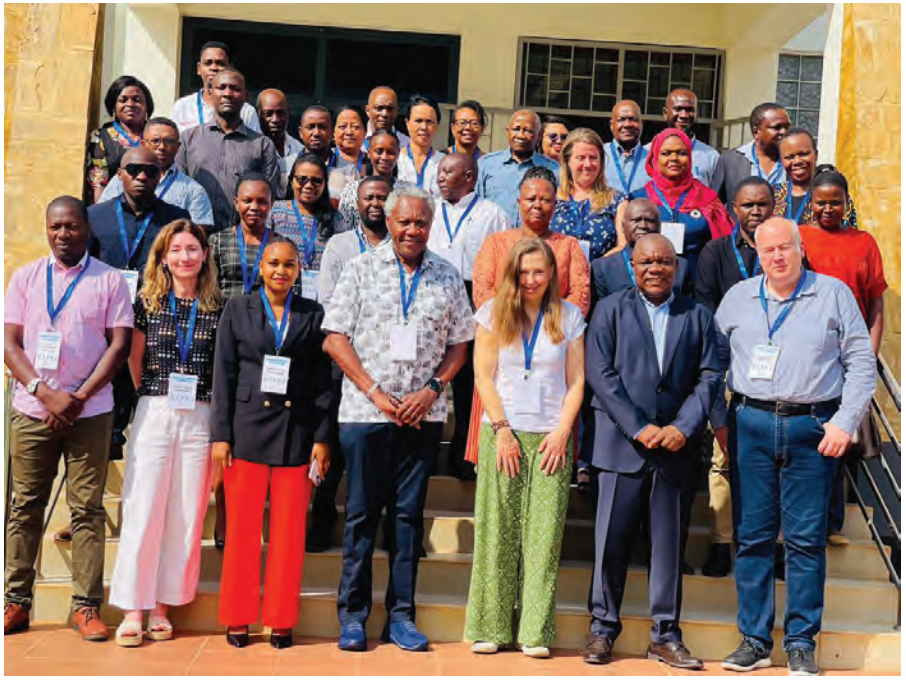
The intent of this one-year project is to improve infrastructure associated with Vahatra's ecological restoration activities at Ambohitantely. In very specific terms, this includes: 1) maintenance and construction of new composting pits, 2) installation of an automatic watering system in the nursery, 3) installation of permanent monitoring plots, 4) construction of germination boxes, 5) installation of new ecological restoration plot, and 6) refurbishing of dormitory for local workers and different needed furniture.

Developing effective rodent control strategies to reduce disease risk in ecologically and culturally diverse rural landscapes financed by Global Challenges Research Fund (GCRF), United Kingdom Research and Innovation (UKRI)

This project, named REDROZ (Reduce Rodent Zoonosis), aims at reducing the risk of rodent-borne infections in Africa, including Madagascar, by increasing knowledge and expertise needed to develop holistic rodent management applicable for local conditions and at the community level. Research is designed to answer whether sustainable community-based rodent management can reduce risks of disease transmission and improve overall human health and well-being. Multidisciplinary activities conducted in Tanzania and Madagascar, focus on three rodent-borne infections (leptospirosis, plague, and rickettsiosis) and proceed in two different stages. First, we fill-in knowledge gaps, and deepening our collaborations with communities and stakeholders, allowing us to co-develop rodent control that are holistically evaluated in the second stage. We are developing a spatially realistic modelling tool to explore likely responses of rodent populations and rodent-borne infections to localized rodent control. Analyses of rich archived datasets and new experimental trials are being used to parameterize models and test output.

On Madagascar, the study is in collaboration with Institut Pasteur de Madagascar (IPM) and Association Vahatra. A student from The University

of Antananarivo, Todisoa Radovimiandrinifarany, is integrated in the project in the context of his Ph.D. research, and three students from The University of Fianarantsoa have taken part in the fieldwork in the context of capacity building. The project focuses on work in 12 villages within Analavory/ Miarinarivo commune (Central Highlands to the west of Antananarivo), where villages act as experimental replicates, providing the means to test how rodent movements and the prevalence of rodent-borne infections are impacted by control. We use a range of qualitative and quantitative social science techniques to produce a deeper understanding of community practices, behavior, and understanding around relevant issues of health, hygiene, and pest management, and work with stakeholders from health, agriculture, and environment spheres to understand their perceptions, policies, and support services. After three years of funding by UKRI, a new four-year phase of the project will commence shortly and with funding from the Wellcome Trust.



In 2024, in addition to the rodent trapping, other activities focused on people surveys, including their perception on the effectiveness of rodent control techniques. Two workshops were also organized, one held in Antananarivo, involving the participation of several One Health stakeholders from the Ministry of Health, the Ministry of Environment and Sustainable Development, and the Ministry of Agriculture and Livestock, as well as researchers from national institutions working on rodent control. The objectives of the workshops were to present and discuss ongoing research results and rodent management, to strengthen multisectoral collaborations, develop plans to improve communication between stakeholders, and launch the rodent management toolkits.

Additionally, a meeting was held with the Tanzanian team in Morogoro, Tanzania, to share experiences. Finally, a workshop session took place in Analavory with the participation of mayors, local chiefs, community agents, and heads of local governmental health clinics. Also hospitals at the level of communes and local communities were informed about the continuation of the project for four more years.

SCARIA (Towards sustainable community-based mitigation of rodent issues in African cities)

Rodents are implicated in an estimated 400 million worldwide annual zoonotic infections, and associated with massive crop and food stock destruction, thus representing a major threat to both health and food security. Farmers following an Ecologically Based Rodent Management (EBRM) system have made progress in rural tropical areas, especially through field trials and associated with new monitoring techniques. This management scheme relies on a good knowledge of the biology of pest rodents and community-based sustainable modifications of the environment in order to decrease rodent populations. However, large gaps in knowledge remain about urban rodents that are abundant and highly deleterious to the lives of millions of city inhabitants, especially in poor and rapidly expanding settings. Accordingly, on the basis of recent scientific studies and WHO expert syntheses, there is an urgent need for interventional research on rodent-associated issues in cities, especially in developing countries.

SCARIA is a sustainability science project that explicitly aims at addressing such challenges via pathways to sustainable, community-based

mitigation of rodent impacts in four African countries (Benin, Ethiopia, Niger, and Madagascar), specifically focusing on city slum settings. To achieve this, a panel of academics, public services, social enterprises, local NGOs, associations, and governmental representatives pursue two main objectives: 1) to build and animate multi-stakeholder local working groups in four urban living labs who rely on both scientific and local knowledge to formalize an urban EBRM adapted approach to each local socio-economic, cultural, and environmental context; 2) to produce baseline data (cartography, rodent diversity, mobility, and spatial distribution; zoonotic pathogens in rodents and humans; socio-economic impacts of rodents; project perception by the inhabitants) in all four pilot countries and at designated sites to provide socio-environmental proxies for future urban EBRM implementation and evaluation. For Madagascar, Voahangy Soarimalala, Steve Goodman, and student assistant from Institut des Sciences et Techniques de l'Environnement, Université de Fianarantsoa, are involve on this project in collaboration with Institut Pasteur de Madagascar team.

A 2024 workshop session organized by Vahatra and Institut Pasteur de Madagascar took place in Ankasina, Antananarivo, the local intervention site of the project, with the participation of community heads, community agents, and different local villager associations. The objective of the meeting was for the Ankasina people to better understand the goals of the project and to take physical actions to control rodents. This was also done in collaboration with official leaders, association members, and the population that participated in the different project activities, including rodent trapping.

BEPREP Project

BEPREP (Best Practices for Biodiversity Recovery and Public Health Interventions) aims to elucidate the role of undisturbed and restored biodiversity in mitigating threats to health security from zoonotic and vector-borne diseases along the infect-shed-spill-spread cascade, in order to identify best practices of nature restoration, including rewilding. The design of this research project, funded by the European Commission, is to identify and characterize these aspects in natural forest, degraded, and restored habitats, using live-capture traps to examine the presence and population dynamics of small mammals. Research designed for Africa, including Madagascar, includes the collection of biological samples from

possible small mammal reservoirs and invertebrate vectors to characterize novel and established pathogen networks. The traits and interactions of pathogens, vectors, and reservoirs that contribute to increased disease risk and spread to test if ecosystem restoration by rewilding can recover biodiversity and mitigate disease risk (e.g., by reducing population size of introduced rodent reservoirs). Study sites on Madagascar are Ankafobe and Ambohitantely Special Reserve in the Central Highlands (both montane humid forest fragments), and Ankarabolava and Agnakatrika in the southeast (both lowland moist evergreen forest fragments). A Ph.D. student from the University of Antananarivo, Salohy Ravelotafita, is integrated in this project in the context of her thesis. In 2024, two sessions of small mammal and mosquito trapping were conducted at the four sites.

MEETINGS AND CONFERENCES IN 2024 ATTENDED BY ASSOCIATION VAHATRA

In October, two individuals from Association Vahatra attended the 13th Oppenheimer Scientific Conference held in Midrand, South Africa. This meeting included hundreds of individuals coming from different parts of Africa and elsewhere in the world. Lovanomenjanahary (Lova) Marline, who was the winner of the Jennifer Ward Oppenheimer Research Grant from the Oppenheimer Foundation in 2023, made a presentation entitled "Bryophytes of the high mountains of Madagascar: A comparative analysis of diversity and distribution patterns", which summarized the results of her work to date associated with the Oppenheimer grant. Steve Goodman was also an invited speaker to the conference and gave a presentation on "Patterns of natural and human-induced ecological change on Madagascar through recent geological time."

Steve Goodman made two different presentation at the "American Corner" at the Université d'Antananarivo, a language training center organized by the US Embassy in Madagascar for Malagasy students studying English. These relatively informal presentations made by native American English speakers are intended to be informative with regards to the subject presented, as well as pedagogic with reference to language training. On both occasions, Steve made presentations on Malagasy biodiversity.

PERSON IN FOCUS

Rachel ("Ledada") Razafindravao

Over more than 30 years, Ledada (his nickname) has worked with at first WWF Madagascar and then Association Vahatra to organize logistics and in particular food during literally hundreds of field missions around the island. Anyone that has been with us during one of these field trips appreciates the quality of his field cuisine. One person that attended one of the inventories some years back at a remote site remarked, "He is able to produce excellent meals in the middle of nowhere and with remarkably few ingredients".

Ledada was born in early 1966 in Antsiranana and then at an early age returned to the family's native village of Mandritsara in the northeast, where he spent his younger years. For some time he worked as the ticket handler on a taxi-brousse (bush taxi) moving between Antananarivo and Mandritsara. Through some rather interesting circumstances, he was engaged by Olivier Langrand in 1993 to prepare food at his field camp at Ambohitantely. Subsequently, in 1995 he was hired by the Ecology Training Program of WWF (see above under Long-term Goals) and then continued with Association Vahatra after that organization was created. He is married and has a daughter of 23 years old.

Not only the quality of the food he serves is remarkable, but also the quantity. For example, during a six-week mission composed of a minimum of 20 individuals to the Marojejy Massif in northeastern Madagascar, at five sites along a continuous transect from 480 to 1875 m, the following was consumed (all carried up the mountain by porters): about 600 kg (1300 lbs.) of rice, about 70 kg (155 lbs.) of different types of beans, 100 chickens, 40 kg (88 lbs.) of dried meat (biltong prepared before the mission), and about 1260 liters of rice water (*rano vola*); all cooked on wood fires. Now if you multiply this by the hundreds of missions Ledada has taken part in, he is probably close to a place in the Guinness Book of World Records!

In all seriousness, we often discuss the work of scientists and their remarkable discoveries, but Ledada and the local people engaged to work with him, are the unsung heroes of this fieldwork and our hats off to him.

WITH A SPECIAL THANKS

We would like to give a special thanks to a number of individuals that have financially supported different Vahatra projects in 2024, including the advancement of Malagasy graduate students and a range of other activities, such as the "Ecotourism guides to protected areas" series. The list is ordered alphabetically by family name:

- Joyce Chelberg
- Ellis Goodman Family Foundation
- Paul Goodman
- Gail & Bob Loveman
- Steve MacLellan
- Charlie Nunn
- Madagascar Classic Collection
- Michael & Tanya Polsky
- Abigail Ross
- Bob & Charlene Shaw
- Jai Shekhawat
- Cheryl & John Susman
- Tom Will

ACTIVITIES OF VAHATRA SCIENTISTS DURING 2024

Members of the Vahatra scientific staff were involved in a variety of undertakings, which are summarized below by month. Our intention is not to be exhaustive with these details, but to present a range of the different activities members are involved.

January

Over the month, Achille was busy with teaching, exams, and supervision of memoirs and theses of graduate students. He was also a jury member of one Master's and one Ph.D. students, and also led the meeting of a university thesis monitoring committee of the "Equipe d'Accueil Zoologie et Anthropobiologique" of the "Ecole Doctorale-Science de la Vie et de l'Environnement". Jeanne worked on a manuscript concerning a bird inventory carried out in late 2023 in the Andrafiamena-Andavakoera protected area, which will be the subject of an upcoming monograph in *Malagasy Nature*. She was also busy with teaching duties at the university, and worked closely with a Ph.D. student on a research proposal to study wetland birds in the Comoros. Voahangy was occupied with teaching and collaborating on a Belmont Forum proposal for a One Health project in the SAVA Region. Jacquis dedicated much of his time to developing projects focused on the ecological restoration of the Ambohitantely Special Reserve. He was supported by Sabrina, who managed the financial and administrative aspects, and Steve contributed his expertise of scientific rigor, both in the substance and structure of project proposals, as well as in discussions with donor representatives. Steve made two presentations to visiting American students associated with the School for International Training. In the latter days of the month, all of the permanent staff of Vahatra, as well as current and past students, went out to Ambohitantely to take part in tree planting.

February

Achille travelled to South Africa with the Director of the Ambohitantely Special Reserve to follow-up with colleagues at the University of Free State on discussions concerning different collaborations associated with research and the possible installation of a meteorological station in this reserve, as well as different aspects associated with fire control. He was a jury member for the degree presentations of Vahatra students (two Master's and one Ph.D.). Jeanne supervised the Master's thesis of Vahatra student, which was presented at the end of the month. Voahangy was busy on permit and logistic preparation for the upcoming field school in Mantadia and the field work associated on BEPREP project. She continued to be involved with the Belmont Forum proposal. She was also occupied supervising students preparing their Master's defenses. Jacquis continued to dedicate much of his time to aspects associated with the ecological restoration project at Ambohitantely. Steve was a jury member for an HDR presentation made at the University of Antananarivo and gave a series of seminars to Master's students at the same university on the use of bibliographic resources.

March

Achille spent some of his time teaching, preparing scientific articles, and supervising students working on their Master's memoirs. Jeanne was largely involved in reviewing a number of manuscripts for the conference proceedings of the "Ecole doctorale en Sciences de la Vie et de

l'Environnement", which was held in 2023 at the University of Antananarivo. She took part in a meeting organize by WWF as a member of its advisory committee. In the first portion of the month, Voahangy spent time teaching in Fianarantsoa and helping to manage the REDROZ project database. Jacquis continued to dedicate much of his time to developing projects focused on the ecological restoration of the Ambohitantely Special Reserve. In early March, Steve attended a conference organized in Antananarivo by Kew Gardens and their collaborators associated with grassland ecology. During the second half of the month, Vahatra scientific members took part in a field school in the Mantadia National Park.

April

Achille continued his teaching activities and made a quick visit to Ambohitantely with Jacquis and other Vahatra members to assess advances with the forest ecological restoration project. Achille went to Mahajanga based on an invitation of the Ecole Doctorale des Ecosystèmes Naturels (EDEN) to sit as a thesis examiner. Jeanne continued to review papers of the conference proceedings of the "Ecole Doctorale", and worked with a student to finalize her Master's memoir on a species of freshwater turtle. She also gave courses at the University of Antananarivo and spent considerable time editing a report on the late 2023 multidisciplinary survey of the Andrafiamena-Andavakoera protected area. The first two weeks of the month, Voahangy traveled to Agnakatrika-Ankarabolava protected area in the southeast of Madagascar for fieldwork in the context of BEPREP project and helped supervise a PhD student involved in the project. Jacquis continued to dedicate much of his time to the Ambohitantely ecological restoration project. Steve attended a meeting in Nairobi organized by UNESCO to present a case why a threatened World Heritage site known as Ala Atsinanana should be removed from the "endangered" list.

May

Achille spent a portion of the month reading manuscripts as a reviewer and author, and preparing and organizing exams at the University of Antananarivo. Jeanne continued editing the report of Andrafiamena-Andavakoara, and spent time on giving exams and their grading. Voahangy was busy organizing fieldwork in the context of REDROZ project. She attended a workshop of Directory Committee of the BIOCOM (UNESCO) project. Jacquis continued to dedicate much of his time to developing projects focused on the ecological restoration of the Ambohitantely Special Reserve. Together with Jacquis, Steve traveled to Ambohitantely for a guided tour of the Vahatra project with a group that has given a kind donation for Vahatra work there. Steve, Jacquis, and Sabrina advanced on a grant proposal for Ambohitantely to be used as a demonstration site for organizations working on Madagascar in the fields of reforestation and ecological restoration. Steve spent a portion of the month visiting European museums to measure specimens collected in Madagascar for different research projects. At the end of the month, Steve gave a lecture in Antananarivo to a group of professional ecotourism guides.

June

As part of a new construction project at Ambohitantely, including a building with showers and toilets next to the biological station, Achille, Jacquis, and Steve made a visit to Ambohitantely to supervise the advances, as well as to accompany visitors from the Abigail Foundation. Achille was a jury member of a Ph.D. defense presented at the University of Antananarivo. In the context of the BIOCOM project, Jeanne and Jacquis worked on an ecological monitoring guide for the Andohahela National Park. Voahangy attended the workshop of the Man and Biosphere committee held in Antananarivo and she organized a workshop on One Health in Sambava, particularly associated with the Duke project at Marojejy. Jacquis gave a course at the University of Antananarivo for Master's students enrolled in a variety of programs and departments. Vahatra hosted a visit of KOICA (Korea International Cooperation Agency) associated with an extension of the current BIOCOM project that they have financed. In the first portion of the month, Steve served as the guide for a group of USA high school students to northern Madagascar, principally focusing on them discovering the wonders of Malagasy biodiversity. At the end of the month and before departing for his northern summer visit to the Field Museum in Chicago, Steve gave a lecture to a group of professional ecotourism guides.

July

Achille spent a good portion of the month teaching and evaluating two Ph.D. theses, as well as serving as a jury member of a Ph.D. defense at the Institute Pasteur of Madagascar. During July, August, and September, Jeanne

invested considerable time on different documents, such as reports, flyers, and ecological monitoring guides for work at Marojejy in 2020 and 2021 and Andohahela in 2022 associated with the BIOCOM project. Voahangy was occupied a portion of the month in the context of the SCARIA project (mentioned above) preparing and leading the workshop in Ankasina, Antananarivo, associated with rodent control in an urban environment; academic activities at the University of Fianarantsoa; and evaluation of documents submitted to the UNESCO committee overseeing Man and the Biosphere sites. Jacquis continued to teach biostatistics at the University of Antananarivo for Master's students in different programs and departments. Steve spent a good portion of the month writing and editing contributions for an upcoming monograph associated with the late 2023 inventory of the Andrafiamena-Andavakoera protected area that will be published in *Malagasy Nature*. He also was rather occupied ordering a range of different field equipment for upcoming Vahatra field projects in Madagascar.

August

During the month, Achille concentrated his efforts on writing and editing a number of scientific papers, including a contribution for the forthcoming Andrafiamena-Andavakoera monograph. He was a jury member of a Master's defense at the University of Antananarivo. Voahangy traveled to northeastern Madagascar, specifically the area around Marojejy, for fieldwork and team supervision, as well as completing teaching responsibilities at the University of Fianarantsoa and preparing the REDROZ workshop. Jacquis intensified his efforts in Ambohitantely to monitor fires around the reserve, as this period of the year is notably dry and conducive to grassland fires. Together with his local team, he conducted six fire suppression operations over three months, successfully preserving ecosystems and preventing fires from encroaching into the remaining forest of the reserve. During the month Steve continued to work with specimens at the Field Museum and in particular those associated with work at Andrafiamena-Andavakoera, as well as working on writing and editing manuscripts for the monograph on this site that will be published next year. He also made an on-line presentation associated with the visit of the head of the Global Environment Fund to Madagascar.

September

Achille worked on two articles concerning the description of new species of reptiles. He also conducted with Jacquis and Ledada a reconnaissance mission to the Makira National Park in northeastern Madagascar for an upcoming large-scale biological inventory in this protected area. Jeanne advanced on a manuscript concerning the birds of Andrafiamena-Andavakoera, and participated as a reviewer and a jury member of a Master's presentation. Voahangy was busy preparing an upcoming field school at Mantadia for Malagasy graduate students at the University of Antananarivo and conducted a different field school for students from the Institut des Sciences et Techniques de l'Environnement, University of Fianarantsoa, in the Maromizaha forest. She attended the REDROZ workshop held in Antananarivo. Jacquis allocated part of his time to a reconnaissance mission in Makira. For the balance of the month, he analyzed biological and spatial data to produce maps for the upcoming monograph on Andrafiamena-Andavakoera. Steve returned to Madagascar in the middle of the month and had several meetings as a member of the local committee for the August 2025 International Primatological Society annual conference to be held in Antananarivo.

October

Achille and Marie Jeanne spent a portion of the month preparing and then correcting exams given at the University of Antananarivo. Achille also worked on different scientific articles. From mid to late October, the scientific members of Vahatra held a field school in the Mantadia National Park, with the participation of mid-Master degree students from the Zoology and Animal Biology Department, the University of Antananarivo (see earlier section in annual report). Voahangy attended a workshop and evaluation project in Sambava in the context of the BIOCOM project as Scientific Committee member. She also worked diligently on several different requests for the exportation of samples associated with different zoonotic disease projects and she also took part in some field exercises and trials associated with a Wellcome Trust grant on rodent control. Jacquis carried on at Ambohitantely, in collaboration with local communities and a few staff members from Madagascar National Parks, with public forums on Vahatra activities at the site. He also supervised a student from Vahatra and the Plant Ecology Department, University of Antananarivo, work on threatened tree species at Ambohitantely. Together, they spent over 15 days in the forest identifying, marking, and collecting descriptive data on these target species to establish a long-term monitoring system. In the first portion of the month, Steve took part in the Oppenheimer Research Conference in Midrand, South Africa, were he was invited to make a plenary presentation on "Patterns of natural and human-induced ecological change on Madagascar through recent geological time."

November

In the first portion of the month, Voahangy traveled to Tanzania in the context of the REDROZ project for discussions and to share experiences with other project members. All of the Vahatra scientists, with the exception of Steve who was recovering from an operation, as well as other scientists and students, left in the middle of the month for six weeks to conduct a multi-disciplinary biological inventory of the northern Makira Forest. At the end of the month, Steve travelled to the USA to recover a large quantity of field equipment for different Vahatra projects.

December

The biological exploration of the Makira Forest went well and after many weeks of intensive fieldwork and a long road trip, the group arrived back in Antananarivo the third week of the month. Steve and Voahangy attended a workshop organized by the Institute Pasteur of Madagascar on zoonotic diseases and Steve presented a plenary lecture on the evolution of Malagasy mammals and the importance to study endemic mammals, rather than the strong focus on introduced mammals. After the return from Makira, Jacquis went to Ambohitantely to oversee different activities, including phenological monitoring of threatened tree species, seedling production, the planting plan for the 2025 rainy season, and preparations for four field schools that will take place at the site in early 2025 for Malagasy researchers and organizations working on aspects of reforestation and ecological restoration of forest ecosystems.

NEW SPECIES DESCRIBED IN 2024 WITH IMPLICATION OF VAHATRA SCIENTISTS

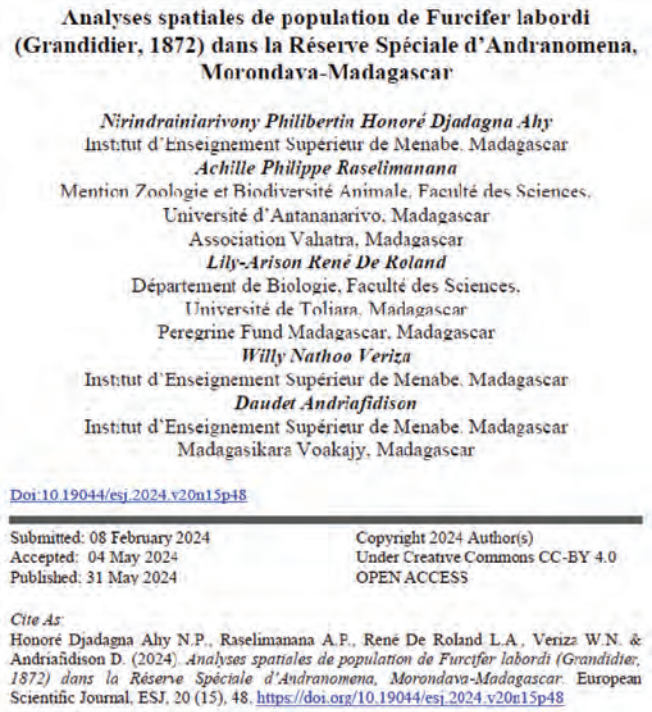
One of the direct results of the biological inventories conducted by Vahatra and associated collection of specimens, is the discovery of species previously unknown to science. In 2024, Vahatra scientists were involved in the descriptions of the following new species from Madagascar.

1. Five species of frogs: *Gephyromantis fiharimpe, G. matsilo, G. oelkrugi*, *G. portonae*, and *Platypelis saikamavo* – see Vences, M., Köhler, J., Scherz, M. D., Hutter, C. R., Maheritafika, H. M. R., Rafanoharana, J. M., Raherinjatovo, H., Rakotoarison, A., Andreone, F., **Raselimanana, A. P.** & Glaw, F. 2024. Four new species of forest-dwelling mantellid frogs from Madagascar allied to *Gephyromantis moseri* (Amphibia, Anura). *Spixiana*, 46 (2): 297-319 and Rakotoarison, A., Vences, M., Andreone, F., Crottini, A., Glaw, F., Scherz, M. D. & **Raselimanana, A. P.** 2024. A new species of colorful *Platypelis* (Amphibia: Microhylidae) from the Tsaratanàna and Bemanevika Massifs in northern Madagascar. *Zootaxa*, 5501 (1): 171-180.
2. Three species of lizard: *Lygodactylus herilalai*, *L. morii*, and *L. schwitzeri* – see Vences, M., Multzsch, M., Zerbe, M., Gippner, S., Andreone, F., Crottini, A., Glaw, F., Köhler, J., Rakotomanga, S., Rasamison, S. & **Raselimanana, A. P.** 2024. Taxonomizing a truly morphologically cryptic complex of dwarf geckos from Madagascar: Molecular evidence for new species-level lineages within the *Lygodactylus tolampyae* complex. *Zootaxa*, 5468 (3): 416-448.

SCIENTIFIC OUTPUTS OF VAHATRA DURING 2024

The year 2024 was a productive one for Vahatra scientists and students concerning scientific publications. Below we present a list of articles and books published during the year, including manuscripts in press and submitted. Names in bold are those of Vahatra scientific members, including post-docs, and those in italics are current or past Malagasy student members associated with work they conducted while at Vahatra.

1. Aguillon, S., Le Minter, G., Castex, C., Duchet, A., Lebarbenchon, C., Turpin, M., Hoarau, A. O. G., Toty, C., Joffrin, L., Tortosa, P., Mavingui, P., **Goodman, S. M., &** Dietrich, M. 2024. Landing on a small tropical island: Wide in-situ diversification of an urban-dwelling bat. *Global Ecology and Conservation*, 52: e03030.
2. Ahy, N. P. H. D., **Raselimanana, A. P.**, Rene de Roland, L.-A., Veriza, W. N. & Andriafidison, D. 2024. Analyse spatiale de population de *Furcifer labordi* dans la Reserve Spéciale d'Andranomena, Morondava-Madagascar. *European Scientific Journal*, 20 (15), 48. https://doi.org/10.19044/esj.2024.v20n15p48.



Analyses spatiales de population de Furcifer labordi (Grandidier, 1872) dans la Réserve Spéciale d'Andranomena, Morondava-Madagascar

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3. Andriamamonjy, M. H., Rakotomavo, Z., Geizer, L. & **Marline, L**. Submitted. Trends and variation of PM2.5 in Antananarivo in the capital city of Madagascar. *Aerosol and Air Quality Research*.
4. Barrett, T. M., Titcomb, G. C., Janko, M. M., Pender, M., Kauffman, K., Solis, A., **Randriamoria, T.**, Young, H. S., Mucha, P. J., Moody, J., Kramer, R. A., **Soarimalala, V**. & Nunn, C. L. 2024. Disentangling social, environmental, and zoonotic transmission pathways of a gastrointestinal protozoan (*Blastocystis* spp.) in northeast Madagascar. *American Journal of Biological Anthropology*, 185(3), e25030. https://doi.org/10.1002/ajpa.25030
5. Boluda, C. G. & **Tahinarivony, J. A.** In press. *Cyanotis natalia*, a new species of Commelinaceae from Madagascar with turion-like shoots. *Candollea*.
6. Carcauzon, V., Herrera, J., Kauffman, K., Baudino, F., Wickenkamp, N., **Randriamoria, T**., **Soarimalala, V**., **Goodman, S. M.**, Nunn, C., Lebarbenchon,

PLOS NEGLECTED TROPICAL DISEASES

RESEARCH ARTICLE

Astroviruses in terrestrial Malagasy mammals

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C. & Tortosa, P. 2024. Astroviruses in terrestrial Malagasy mammals. *PLOS Neglected Tropical Diseases*, 18(6): e0012263.

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9. **Goodman, S. M.**, Rocamora, G., Caceres, S., Cozette, J., Yahaya, I. & Tatayah, V. 2024. *Tenrec ecaudatus*. *CABI Compendium*, 67916749.
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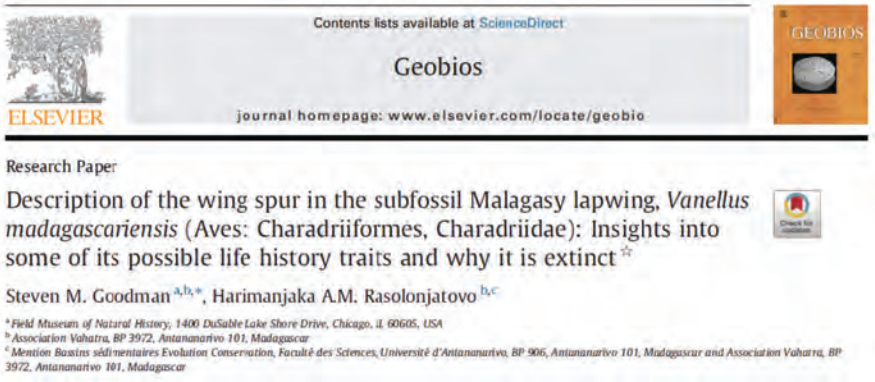
11. **Goodman, S. M.** & **Tahinarivony, J. A.** (eds.). In press. A floral and faunal inventory of the Andrafiamena-Andavakoera Protected Area of northern Madagascar. *Malagasy Nature*.
12. **Goodman, S. M.** & Fisher B. L. In press. Species new to science described from Andrafiamena-Andavakoera since 1988. In A floral and faunal inventory of the Andrafiamena-Andavakoera Protected Area of northern Madagascar, eds. S. M. Goodman & J. A. Tahinarivony. *Malagasy Nature*.



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Research Paper

Description of the wing spur in the subfossil Malagasy lapwing, *Vanellus madagascariensis* (Aves: Charadriiformes, Charadriidae): Insights into some of its possible life history traits and why it is extinct ☆

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13. **Goodman, S. M.** & **Soarimalala, V.** In press. The non-primate and non-volant mammals of the Andrafiamena-Andavakoera Protected Area. In A floral and faunal inventory of the Andrafiamena-Andavakoera Protected Area of northern Madagascar, eds. S. M. Goodman & J. A. Tahinarivony. *Malagasy Nature*.
14. **Goodman, S. M.**, Razafindranosy, L. V. & Cleasman, A. In press. The bats of Andrafiamena-Andavakoera Protected Area. In A floral and faunal inventory of the Andrafiamena-Andavakoera Protected Area of northern Madagascar, eds. S. M. Goodman & J. A. Tahinarivony. *Malagasy Nature*.
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Article

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Taxonomizing a truly morphologically cryptic complex of dwarf geckos from Madagascar: molecular evidence for new species-level lineages within the *Lygodactylus tolampyae* complex

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