WWF

REPORT

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Treasure Island:

New biodiversity on Madagascar (1999 - 2010)

WWF Madagascar & West Indian Ocean Programme Office

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Front cover photo: *Furcifer timoni* © Jörn Köhler

WWF is one of the world's largest and most experienced independent conservation organisations, with over 5 million supporters and a global Network active in more than 100 countries.

WWF's mission is to stop the degradation of the planet's natural environment and to build a future in which humans live in harmony with nature, by: conserving the world's biological diversity, ensuring that the use of renewable natural resources is sustainable, and promoting the reduction of pollution and wasteful consumption.

NOTE: The discoveries referred to in this report were not made by WWF, but by researchers and scientists from institutions spanning the globe. All scientists have given WWF authorisation to use their work for the compilation of this report and are supporting or have agreed with the purpose of this report.

Rainforest, Anjanharibe Sud Special Reserve, Andapa, Madagascar

EXECUTIVE SUMMARY

An amazing 615 new species discoveries have been made in the last decade on the island of Madagascar, located off the coast of the African continent in the Indian Ocean. The new finds comprise 385 plants, 42 invertebrates, 17 fish, 69 amphibians, 61 reptiles and 41 mammals.

Sahamalaza sportive lemur
(Lepilemur sahamalazensis)

Madagascar

Madagascar is the fourth largest island in the world; at 587,000 km² it is comparable to the size of France. Neither African nor Asian despite its proximity to Africa and its Asian influence[I], Madagascar separated from the African continent some 165 million years ago and from the Indian subcontinent 80 to 100 million years ago. This long isolation from neighbouring landmasses has allowed a unique array of plants and animals to evolve, including hundreds of endemics[II]. These characteristics have led some scientists to dub Madagascar the "eighth continent"[1].

The region boasts four ecoregions, critical landscapes of international biological importance. The eastern part of the island is covered by a narrow band of tropical rainforests that lead to steep hills and central highlands, with volcanic mountains rising to the north in the Tsaratanana Massif. The northwest coast forms a series of natural coves, with broad plains inland, while the southwest region consists of tropical dry forests, plateaus and deserts. Because of the island's localised red soils, Madagascar has also been called the "Great Red Island".

The newly discovered species are the latest additions to the already impressive array of biodiversity found in this globally-unique landscape, including a rich assemblage of mammals, birds, amphibians and fishes.

Madagascar is one of the greatest tropical wildernesses left on Earth and home to some of the most spectacular wildlife. The island is home to 5% of the world's plant and animal species[2], 250,000 species, of which more than 70% are endemic to Madagascar[3]. The wildlife of Madagascar includes aye-aye, various species of lemur, radiated tortoises, spider tortoises, marine turtles, flying fox, fossa, fanaloka, mongoose, tenrec, snakes, chameleons, crocodiles and frogs. All 50 known species of lemur are found only on this island[4]. The bird fauna includes some extraordinary bird species, such as the ground-rollers, cuckoo-rollers, and mesites, as well as seriously endangered species such as the Madagascar serpent-eagle (*Eutriorchis astur*, EN) and Madagascar fish-eagle (*Haliaeetus vociferoides*, CR), one of WWF's flagship species.

Madagascar has more than 5,000km of coastline with over 250 islands, some of the world's largest coral reef systems, and some of the most extensive mangrove areas in the Western Indian Ocean. These ecosystems provide essential services and livelihoods to the inhabitants of Madagascar. Whales, reef sharks, tuna and five of seven marine turtles in the world – all of which belong to WWF's priority species – live in Malagasy waters. Of the estimated 14,000 plants native to Madagascar[5], 90% are found nowhere else in the world[6], including six species of baobab, or bottle tree.

The habitats of Madagascar continue to face ever-growing threats, including unsustainable resource extraction including small-scale, and widespread clearance of

[I] Settlement of Madagascar happened between 200 and 500 A.D, when seafarers from southeast Asia (probably from Borneo or the southern Celebes) arrived by boat. The Malagasy language shares some 90% of its basic vocabulary with the Ma'anyan language from the region of the Barito River in southern Borneo.

[II] Endemic refers to a species that is exclusively native to a specific place and found nowhere else. For example, the kiwi is a bird endemic to New Zealand.

615 SPECIES DISCOVERED SINCE 1999 ON MADAGASCAR

habitats, primarily for firewood and charcoal production. Secondary threats are caused by subsistence agriculture, livestock grazing, and invasive species. Analysis of aerial photographs indicates that forest cover decreased by almost 40% from the 1950s to c. 2000, with a reduction in 'core forest'[III] of almost 80%. During the rainy season Madagascar seems to be bleeding. Every year, millions of tons of laterite are washed away by streams and rivers from the highlands that are suffering from erosion as a result of deforestation. The sediments then smother the sensitive reefs of the Indian Ocean and the Mozambique Channel. This forest destruction and degradation threaten thousands of species with extinction[7]. Experts now predict that Madagascar has already lost 90 per cent of its original forest cover[8].

For the unique species of the island, loss of vital habitat is a disaster and the increased access to species has also exacerbated the international trade in Madagascar's wildlife. Today, many animals and plants are threatened, with rosewood, tortoises, chameleons, geckos and snakes the most targeted by traffickers. Since 1995, only 4 Madagascar chameleon species are permitted to be exported from Madagascar and this moratorium is still in place today. Despite this, smugglers continue to flout the law.

Despite Madagascar's rich biodiversity, it is one of the world's poorest nations. Poverty and the environment are inextricably linked, with the environmental degradation in Madagascar threatening the livelihoods of Madagascar's 20million inhabitants.

WWF has been active on the island for 47 years, working with local communities to protect Madagascar's unique biodiversity.

WWF seeks to conserve and sustainably manage the biodiversity and ecosystems in Madagascar and the Western Indian Ocean (WIO) region by 2050. Through appropriate legal and political frameworks at local, regional and national level, and by prioritising sustainable livelihoods, WWF aims to promote the whole region as a model for conservation of key ecosystems, habitats and species already by 2025.

Calumma tarzan, a new chameleon species described in 2010. Scientists dedicated the species to the fictional forest man "Tarzan" in the hope that this famous name will promote awareness and conservation of this highly threatened new species and its habitats.

[III] Greater than 1 km from the forest edge.

WWF's conservation strategy for the upcoming five years (2012-2016) is organised under three priority approaches and seven objectives:

1 Conserving biodiversity

Objective 1: Priority terrestrial and marine landscapes
Activities focus on ten landscapes representative of the local biodiversity. They include the protection of biodiversity, especially by supporting Madagascar's National Parks System; the sustainable management of natural resources, particularly through community management and promotion of improved agricultural practices; and the restoration of natural resources through involvement of local stakeholders and partners. The goal is to link conservation with the improvement of local people's livelihoods.

Objective 2: Endemic species and migratory marine species
By improving the knowledge on endangered species such as Madagascar's tortoises and marine turtles, and ensuring that appropriate management measures are put in place, WWF aims to ensure better enforcement of the Convention on International Trade of Endangered Species of flora and fauna (CITES).

2 Promoting sustainable use

Objective 3: Sustainable fishing
Coastal and marine ecosystems of the WIO region are home to a very rich biodiversity and play a key role for the local – and global – economy and culture (tuna fishing is a good example). To promote sustainable fishing, WWF is building the local stakeholders' capacities to manage traditional and artisanal fishing, and help the islands' authorities manage tuna fishing. WWF also supports a model of sustainable shrimp ecobusiness.

Objective 4: Sustainable energy
Together with key actors of the Atsimo Andrefana region, in the south west of Madagascar, WWF is implementing a management plan for sustainable fuel wood. The conservation organization is also running pilot projects to show that energy efficiency and renewable energy sources are ecologically and economically pertinent, in accordance with its global policy on mitigating the effects of climate change.

Boophis lilianae male and female in amplexus. The species was newly described in 2008.

3 Creating the appropriate conditions

Objective 5: Integrate conservation into sectoral policies
Extractive industries, land use planning, biofuels and energy are the main sectors where WWF is active to promote policies which fully integrate environmental aspects and good practices within industrial companies, and ensure net environmental and social gains for local people.

Objective 6: Implement sound environmental governance
Responsible participation of key actors in all sectors is needed to implement sound environmental governance. In 2012-2016, WWF will continue to work closely with its partners at the State level. WWF will also build capacities in the civil society and local organizations through environmental education and information.

Objective 7: Adapt to climate change
In Madagascar and WIO islands, communities living close to natural resources already feel the effects of climate change in their daily life. To ensure a better understanding of this phenomenon, protect the people and ecosystems and develop effective adaptation measures, WWF is providing specific training and information to the region's stakeholders.

Such is the uniqueness of the remarkable species and habitats on Madagascar that even today hundreds of new species continue to be newly discovered, having never before been encountered.

TREASURE ISLAND

The significance of the flora and fauna of Madagascar is not only their diversity, but also their remarkable endemism. The high level of species unique to Madagascar resulted from tens of millions of years of isolation from the African mainland and from people, who only arrived 2,000 years ago. The islands have an astounding eight plant families, five bird families, and five primate families that live nowhere else on Earth.

Madagascar and the Indian Ocean Islands Diversity and Endemism

Taxonomic Group	Species	Endemic Species	Percent Endemism
Plants	13,000	11,600	89
Mammals	155	144	92
Birds	310	181	58
Reptiles	384	367	95
Amphibians	235	229	99
Freshwater fish	164	97	59
Invertebrates	5,800	4,988	86

Sources: Conservation International, 2000. Ecosystem Profile: Madagascar Ecosystem of the Madagascar & Indian Ocean Islands Biodiversity Hotspot; Goodman, SM. and Benstead, JP. (Eds.). 2003. The Natural History of Madagascar. Chicago: University of Chicago Press; Andreone F. (Editor), 2008. A Conservation Strategy for the Amphibians of Madagascar - Monografie XLV. Museo Regionale di Scienze Naturali, Torino.

Beach on Nosy Be Island, Madagascar

NEW WONDERS FROM THE "EIGHTH CONTINENT"

A closer look at the new species...

A simply staggering number of new lemur species have been described from Madagascar over the past 11 years. In total, 28 new lemur species join the ranks of the island's known mammals. Many of these endemic new species have been recently described as new based largely on increased sampling efforts and more rigorous DNA analysis.

Among the list of new lemurs are new species of mouse lemurs, the world's tiniest primates. For example Berthe's Mouse Lemur (*Microcebus berthae*), discovered in 2000, is the smallest of the mouse lemurs and the smallest primate in the world with an average body length of 92 millimetres (3.6 in) and weight of around 30g, it is found in the Kirindy Mitea National Park in Western Madagascar. In 1992 there were only two known mouse lemur species. This number has since jumped to 15 thanks to the dedication of scientists with at least nine discovered in the last decade. There is also incredible diversity among single species: one study by scientists examined 70 mouse lemurs with varying coat colours and from different types of forest locations and revealed that they were in fact all the same species[9].

The land of lemurs

The name lemur comes from the Latin word lemures, which means 'spirits of the night' or 'ghosts'. Ironically, today all lemurs are in danger of vanishing, such is the extent of forest loss on the island. 17 lemur species became extinct after the arrival of the human settlers to the island approximately 2,000 years ago[10,11,12].

Lemur taxonomy is controversial, and not all experts agree, particularly with the recent increase in the number of recognized species[13,14,15]. According to some experts there are currently 99 recognised species or subspecies of living lemur, divided into five families and 15 genera[16]. In contrast, other experts have labeled this as 'taxonomic inflation'[17], instead preferring a total closer to 50 species[18].

Randriansoli's sportive lemur *(Lepilemur randriansoli)*

Of the 50 various species of lemurs, 6 are critically endangered, 17 are endangered and 14 are considered vulnerable[19]. 5 lemur species are among the 25 most threatened primate in the world: *Prolemur simus*, *Propithecus candidus*, *Eulemur cinereiceps*, *Lepilemur septentrionalis*, *Eulemur flavifrons*[20].

Sahamalaza sportive lemur *(Lepilemur sahamalazensis)*

Among the other new mammal finds are seven bats, three rodents and three threatened shrews: *Microgale jenkinsae* (EN), *Microgale jobihely* (EN) and *Microgale nasoloi* (VU).

The global importance of Madagascar's lemurs

According to renowned primatologist, herpetologist and biological anthropologist Russell A. Mittermeier in *The Eighth Continent*, although Madagascar "is only one of 92 countries with wild primate populations, it is alone responsible for 21 percent (14 of 65) of all primate genera and 36 percent (five of 14) of all primate families, making it the single highest priority" for primate conservation. "Madagascar is so important for primates that primatologists divide the world into four major regions: the whole of South and Central America, all of southern and southeast Asia, mainland Africa, and Madagascar, which ranks as a full-fledged region all by itself."

Source: Tyson, Peter and Russell A. Mittermeier. *The Eighth Continent: Life, Death, and Discovery in the Lost World of Madagascar*. Morrow, William & Co, 2000.

Antafia sportive lemur *(Lepilemur aeeclis)*

A gecko that thinks it's a tree

(UROPLATUS PIETSCHMANNI)

It's easy to see why this species eluded scientists until now. The amazing Cork Bark Leaf-Tailed Gecko (*Uroplatus pietschmanni*) was discovered in 2003 by scientists in the east coast rainforest of Madagascar, in Toamasina province, at an altitude of some 1000m[21]. The 13cm-long species likes to climb thick branches, corkbark, and sturdy broadleafed plants, and has perfect camouflage. *U. pietschmanni* is much less common than most other varieties and little is known about its range and distribution in its natural habitat, although scientists believe the species is endemic to Amboasary Gara in central East-Madagascar.

All leaf-tailed geckos except *U. lineatus* are limited to primary, undisturbed rainforests and therefore are especially prone to habitat destruction. As of 2004 the genus *Uroplatus* has in its entirety been placed on Appendix 2 of CITES (Convention for International Trade in Endangered Species); this makes it the most heavily protected gecko genus by international law. The species has made its way into the pet trade in limited numbers, because their unique camouflage make them attractive display animals. On average, nearly 100 have been exported annually for trade purposes since 2004[22], with 262 being exported in the peak year of 2005[23].

Uroplatus pietschmanni

Uroplatus pietschmanni

61
NEW REPTILES HAVE BEEN DISCOVERED ON MADAGASCAR SINCE 1999

An uber orb-weaver

(NEPHILA KOMACI)

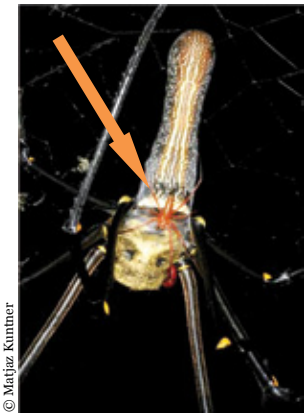
Komac's golden orb spider (*Nephila komaci*) described from Madagascar in 2009 is one of the largest web spinning species known[24]. *Nephila* are renowned for being the largest web-spinning spiders, making huge webs of golden silk, often greater than 1m in diameter. It is the first species of *Nephila* to be described since 1879 and it is the largest *Nephila* to date. Orb-weaving spiders exhibit extreme sexual size dimorphism: a female of the new species has a body length of 39.7mm and a male has a body length of 8.7mm! The females large size helps it avoid being eaten by predators.

Although the web of this new species has not been seen, it is likely to be the largest. More than 41,000 spider species are known with about 400–500 added each year, but new giant golden orb-weavers are extremely rare. Only three specimens of the new species have been found in the past decade.

Scientists recently also reported the discovery of the largest ever spider webs made by a new species of *Caerostris* spider, which is currently being formally described by experts[25].

Madagascar has 459 species of spider, with 390 (84%) being endemic to the island[26].

Although often perceived as insignificant, invertebrates play very important roles in ecology, such as in nutrient recycling, soil formation and quality, and as food for many predators. They are therefore essential to all animal life on Madagascar.



This photo shows the extreme difference in size of female and male orb-weaving spiders (*Nephila pilipes* shown)

This photo shows a giant golden orb-web exceeding 1 metre in diameter

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NEW INVERTEBRATES HAVE BEEN DISCOVERED ON MADAGASCAR SINCE 1999

A rhapsody of colours from Madagascar

(LIOPHIDIUM PATTONI)

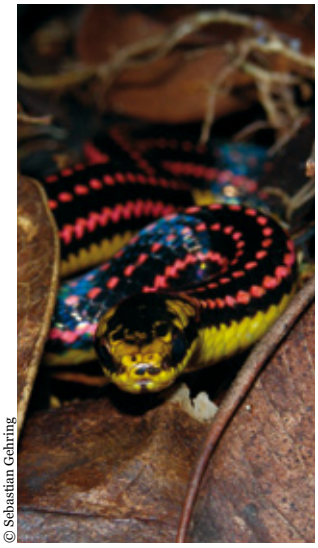
This exceptionally-coloured new snake species was discovered in 2010 at the western side of the Makira plateau, within the newly created Makira National Park, province of Mahajanga, in the North East of Madagascar[27]. Originally found at 1,009m above sea level, *Liophidium pattoni* can be easily distinguished from all other *Liophidium* species and any other species of Madagascar snakes by its unique colour pattern. The 41cm-long species has an overall black dorsal side with four pink-red horizontal stripes, fading into blue-grey. In addition, the snake has a bright yellow underbelly.

The snake is known to eat lizards and hunts through the rainforest searching for small ground-living animals.

Despite being found in a protected area, the area of rainforest the species was found in had been recently fragmented due to human activities. Two further specimens were discovered in Masoala National Park, a UNESCO World Heritage Site. Both Masoala and Makira National Park's are currently experiencing an upsurge in illegal logging for precious rosewood destined for markets in China[28].

Scientists believe the species may be widespread throughout the eastern coast of Madagascar, spanning a wide altitudinal range from sea-level to 1,100m in the Makira Plateau, and occurring in very different environments from warm lowlands to relatively cool mountain rainforests.

The species is one of 61 reptiles discovered over the last 11 years.



Liophidium pattoni

Liophidium pattoni

A self-destructive palm tree

(TAHINA SPECTSBILIS)

An extraordinary 385 new plant species, spanning a broad range of families, have been discovered on Madagascar since 1999. This number includes 39 new Aloe species of flowering succulent plants, 10 new species from the pepper family, six new species of coffee and eight new palm trees.

Undoubtedly the most exciting discovery in the world of palms in the new millennium is the Tahina Palm (*Tahina spectabilis*), described in 2008, and found quite by accident by a cashew-grower, Xavier Metz[29]. This magnificent and massive fan palm flowers only once in its life, with a totally spectacular, giant, whitish inflorescence that forms from the centre of the crown. After fruiting, the palm dies and collapses.

The new genus is unrelated to any other of the 170 plus palms of Madagascar and is most closely related to three genera in south and south-east Asia.

This species and genus of palm numbers fewer than 100 individuals found only in Analalava district, a small area of northwestern Madagascar, where it grows in low, seasonally dry forest or scrubland that may be flooded during the rainy season, at the foot of heavily eroded limestone hills.

The palm is very rare and efforts with the aim to protect its natural habitat have been initiated and are now managed by discoverers Xavier Metz and John Dransfield. Soon after the publication of the species, seeds were disseminated throughout the palm grower community, raising money for its conservation by the local villagers, and it has become a highly prized ornamental plant. Any profits resulting from the sale of the seeds distributed under this conservation programme will go to their community. The funds are destined towards village development, such as a pump for the village well, and aim at keeping cattle and fire away from the palms.

© John Dransfield

Tahina spectabilis

385
NEW PLANTS HAVE BEEN DISCOVERED ON MADAGASCAR SINCE 1999

A remarkable colour-changing lizard

(PHELSUMA BORAI)

In 2009, scientists discovered a new species of gecko with some remarkable transforming abilities[30]. The new species, known from a single specimen, has a greyish-brown ground colouration resembling the bark of trees, which scientists believe provides the species with effective camouflage to escape from birds and other predators and is perhaps one reason why the species has not been discovered earlier. However, *Phelsuma borai* can quickly change its colour, which in this extent is unusual for the *Phelsuma* genus and allows the species to switch from a subtle brown to a colourful bright blue during courtship.

The species was discovered during a survey in the Tsingy de Bemaraha National Park, a deciduous dry forest on a karstic limestone massif in western Madagascar. This bizarre limestone massif with steep slopes and sharp needle-like peaks has revealed a remarkable number of new species of amphibians and reptiles in recent years and its herpetofauna is still far from being sufficiently known according to scientists.

There are currently 27 recognised *Phelsuma* species in Madagascar[31].

Phelsuma borai

Phelsuma borai

A new threatened species of edible yam

(DIOSCOREA ORANGEANA)

Dioscorea orangeana, newly described in 2009, is a threatened species of edible yam from northern Madagascar[32]. Its appearance is uncharacteristic of Madagascar yams in that the species has several lobes instead of just one, making the species look like udders on a cow.

Like all the edible yams known from the Antsiranana region, favoured species are heavily exploited. The conservation and sustainable use of *D. orangeana* are matters of concern, because its distribution is restricted to such a small area - 1.7 km² of deciduous forest, on sand, up to 100m above sea level. Scientists are now urgently looking for *D. orangeana* in similar forests in the far north of Madagascar, which is botanically poorly explored.

In the meantime, the authors suggest that *D. orangeana* should be Red Listed as Critically Endangered, since it is heavily harvested and growing in the Forêt d'Orangea near Diego Suarez, an unprotected habitat. The nearest protected area is at least 20km away. *D. orangeana* was named by Kew botanist Paul Wilkin with colleagues from France and Madagascar, the scientific name referring to the forest in which it occurs (Forêt d'Orangea).

Dioscorea orangeana

A 'Glam rock' chameleon

(FURCIFER TIMONI)

Intensive herpetological fieldwork and taxonomic revisions during the past 15 years have led to a strong increase in the number of chameleon species. During recent field work scientists discovered a colourful and highly distinct species of chameleon, *Furcifer timoni*, in the isolated rainforests of the Montagne d'Ambre massif 850m above sea level, in northern Madagascar[33].

Officially described in 2009, both males and females of the species are very striking, appearing to sport vibrant 'glam rock' make-up. According to scientists, the discovery of this distinctive new *Furcifer* species was very surprising since this area has been repeatedly and intensively surveyed for reptiles over many years.

In total, 11 new chameleon species have been described since 1999.

Furcifer timoni (female)

Furcifer timoni (male)

A bright yellow frog with 'measles'

(BOOPHIS BOTTAE)

The new frog species, *Boophis bottae*, occurs in the eastern rainforest belt of Madagascar from Andasibe south to Ranomafana, at 800-1,000m above sea level[34]. The species lives along streams, and also at the edge of rainforest, where it was originally found near a bridge on the road between the National Road 2 and the Andasibe village, central-eastern Madagascar. This endemic species is already threatened by habitat loss and is declining due to destruction of its forest habitat due to subsistence agriculture, timber extraction, charcoal manufacture, invasive spread of eucalyptus, livestock grazing, and expanding human settlements.

The species is one of 69 amphibians discovered over the last 11 years.

The global importance of Madagascar's amphibian species is paramount especially because of the group's extreme diversity on the island. A recent study based on DNA sequences of 2,850 specimens sampled from over 170 localities, revealed that there are twice as many amphibian species than previously thought - from the currently described 244 species to a minimum of 373, but possibly as many as 465[35]. Amphibians are in decline worldwide and on Madagascar the results of the survey suggests that current habitat destruction may be affecting more species than previously thought.

Scientists are now stressing the need for integrated taxonomic surveys as a basis for prioritising conservation efforts within Madagascar.

Boophis bottae

Boophis bottae

69
NEW AMPHIBIANS HAVE BEEN DISCOVERED ON MADAGASCAR SINCE 1999

A blue-lipped fish

(PARETROPLUS TSIMOLY)

The new fish species, Lamena "blue lips" (*Paretroplus tsimoly*), was described by scientists in 2001[36]. Measuring 25cm in length, the species is extraordinary in that mature individuals of the species possess prominent blue lips. The native name for the fish is Lamena, which means "red one" in the local Malagasy dialect, on account of the bright red fins and edging on the eyes. The body of this species is brilliant golden orange.

The species is a rheophilic cichlid, whose natural habitat is the fast flowing rapids within these rivers, as well as isolated pools with rocky bottoms, interspersed with patches of cobble and coarse gravel.

The species was originally known from the Akalimotra and Boinakely rivers, but additional populations have recently been found in the Kamoro river basin[37].

17 new fish species have been discovered by scientists in the last 11 years.

Paretroplus tsimoly

17
NEW FISH HAVE BEEN DISCOVERED ON MADAGASCAR SINCE 1999

Paretroplus tsimoly

Frozen in time

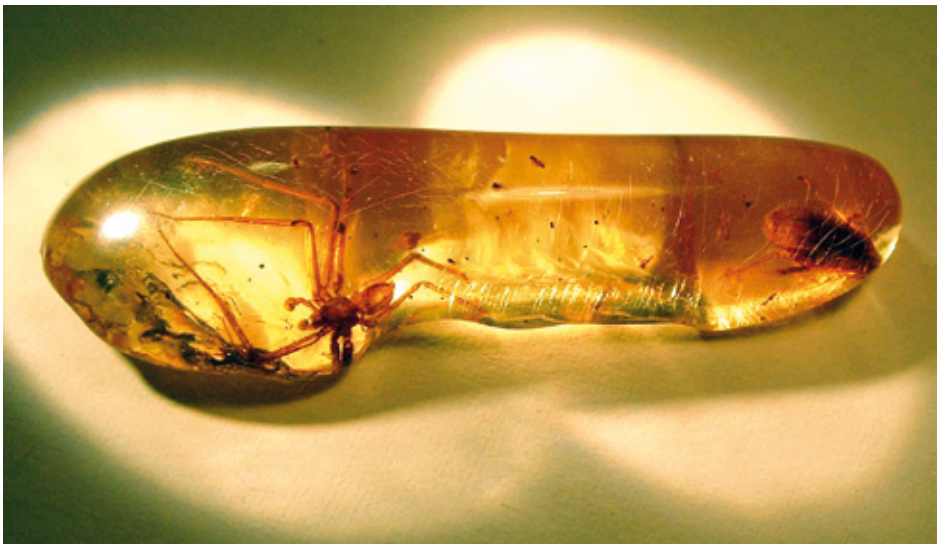
(GARCOROPS JADIS)

A new species of spider known only from a beached piece of copal of uncertain origins and age, was found in the vicinity of Sambava, North-East Madagascar, and officially described in 2004[38]. One large male spider, *Garcorops jadis*, was found in copal, a hardened, subfossil diterpenoid resin estimated by different authors to be between a few hundred and four million years old.

The species is named after Jadis, the Ice Queen from C.S. Lewis' youth novel "The Lion, the Witch and the Wardrobe" because the beautiful specimen seems enclosed in ice, frozen in time forever.

The discovery has baffled scientists who are unable to ascertain whether *Garcorop jadis* may be an existing species not yet discovered in its natural habitat or long extinct species.

Garcorops jadis



Garcorops jadis

A radiant orchid

(POLYSTACHYA CLAREAE)

Among the hundreds of new plants species are 12 new orchid species. One particularly attractive species is *Polystachya clareae*, or Clare's Polystachya, a bright orange orchid described in 2003 from Manjakandriana in Madagascar's Antananarivo province, at 850m above sea level[39]. Found in humid evergreen rainforest, the species has bright green leaves and when it blooms in Summer many bright orange flowers appear in clusters on three branches. The species apparently has a scent reminiscent of "artificial citrus sweets".

© Eric Hunt

Polystachya clareae

Antananarivo province, home to Madagascar's capital city and a number of new species discoveries, including the new orchid *Polystachya clareae*

GREENING THE GREAT RED ISLAND

Madagascar has evolved remarkably diverse ecosystems including lush tropical rainforests, mountain peaks, tropical dry forests, near-desert environments, mangrove forests, and coral reefs – together supporting 5% of all plant and animal species known to man.

Today, international economic forces, a growing global demand for natural resources, and widespread regional poverty are putting the species, forests, freshwater and marine ecosystems of this globally outstanding region at risk. Approximately 200,000 to 300,000 hectares of natural forest are cleared each year, mostly due to clearance for agriculture, cattle grazing and firewood, but poorly-planned economic development projects and extensive mining are also responsible. The result is that less than 10% of Madagascar's original forest cover now remains[40]. Several factors have contributed to deforestation: rapid population growth, an increasing impoverishment of the local population, its need to increase food production and a rising demand for wood for domestic energy. For their domestic energy needs, almost 95% of Malagasy households use firewood and charcoal. Also, there are logging requirements for timber and construction. In the highlands, deep gashes caused by deforestation are leaving the land bare in many places. Local timber barons are also harvesting scarce species of rosewood and other precious wood trees and exporting the wood to China. The wood is used to make furniture and musical instruments. Most of the wood is being removed illegally from national parks in Madagascar and in the last year the trade has increased 25 fold to the value of USD220million[41].

As Madagascar's forests continue to be cut, all that remains is a red trail that runs down the rivers into the sea. Soil erosion is leaving the land naked and unfit for agriculture. Downstream, increased sediment loads are silting estuaries and smothering sensitive marine habitats. As a result, marine species lose their home, and communities lose their source of income. And silted reefs are more vulnerable to climate change.

These threats place an untold number species at risk of extinction – not just the ones that have been newly discovered, but symbolic and charismatic species for which Madagascar is known the world over. Many animals and plants are also threatened with excessive hunting, killing off the island's emblematic species, including the lemur and terrestrial tortoises. It is estimated that 60,000 tortoises are collected from the wild every year to feed the pet trade in South East Asia, Japan and Europe[42]. The freshwater fishes of Madagascar are considered the island's most endangered vertebrates. An IUCN assessment of 98 endemic freshwater fish species found that 54% of the fish were either Critically Endangered, Endangered or Vulnerable[43].

Habitat degradation, siltation, temperature increases, agriculture and overfishing are considered the main causes of species decline. Introduced fish species have already replaced many native species in inland lakes and streams. Trade for pets and plants have weakened populations of endemic animals and vegetation, especially amphibians, reptiles and succulent plants. According to WWF studies in North Eastern and Western Madagascar, rosewood is now on the brink of local extinction because of increased illegal exploitation.

WWF has been active on the island for 47 years, working with local communities to protect Madagascar's unique environment.

WWF seeks to conserve and sustainably manage the biodiversity and ecosystems in Madagascar and the Western Indian Ocean (WIO) region by 2050. Through appropriate legal and political frameworks at local, regional and national level, and by prioritizing sustainable livelihoods, WWF aims to promote the whole region as a model for conservation of key ecosystems, habitats and species already by 2025.

WWF's conservation strategy for the upcoming five years (2012-2016) is organized under three priority approaches and seven objectives:

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1 Conserving biodiversity

Objective 1: Priority terrestrial and marine landscapes
Activities focus on ten landscapes representative of the local biodiversity. They include the protection of biodiversity, especially by supporting Madagascar's National Parks System; the sustainable management of natural resources, particularly through community management and promotion of improved agricultural practices; and the restoration of natural resources through involvement of local stakeholders and partners. The goal is to link conservation with the improvement of local people's livelihoods.

Objective 2: Endemic species and migratory marine species
By improving the knowledge on endangered species such as Madagascar's tortoises and marine turtles, and ensuring that appropriate management measures are put in place, WWF aims to ensure better enforcement of the Convention on International Trade of Endangered Species of flora and fauna (CITES).

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2 Promoting sustainable use

Objective 3: Sustainable fishing
Coastal and marine ecosystems of the WIO region are home to a very rich biodiversity and play a key role for the local – and global – economy and culture (tuna fishing is a good example). To promote sustainable fishing, WWF is building the local stakeholders' capacities to manage traditional and artisanal fishing, and help the islands' authorities manage tuna fishing. WWF also supports a model of sustainable shrimp ecobusiness.

Objective 4: Sustainable energy
Together with key actors of the Atsimo Andrefana region, in the south west of Madagascar, WWF is implementing a management plan for sustainable fuel wood. The conservation organization is also running pilot projects to show that energy efficiency and renewable energy sources are ecologically and economically pertinent, in accordance with its global policy on mitigating the effects of climate change.

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3 Creating the appropriate conditions

Objective 5: Integrate conservation into sectoral policies
Extractive industries, land use planning, biofuels and energy are the main sectors where WWF is active to promote policies which fully integrate environmental aspects and good practices within industrial companies, and ensure net environmental and social gains for local people.

Objective 6: Implement sound environmental governance
Responsible participation of key actors in all sectors is needed to implement sound environmental governance. In 2012-2016, WWF will continue to work closely with its partners at the State level. WWF will also build capacities in the civil society and local organisations through environmental education and information.

Objective 7: Adapt to climate change
In Madagascar and WIO islands, communities living close to natural resources already feel the effects of climate change in their daily life. To ensure a better understanding of this phenomenon, protect the people and ecosystems and develop effective adaptation measures, WWF is providing specific training and information to the region's stakeholders.

The Holistic Conservation Programme for Forests in Madagascar is a four-year innovative and large-scale project funded by the French Foundation GoodPlanet - with Air France as sole sponsor - and implemented in the field by WWF. It aims to Reduce greenhouse gases Emissions from Reducing Deforestation and Degradation of forests (REDD) in Madagascar, is a good example of putting this strategy's objectives into action.

The project boundary covers an area of more than 500,000 ha of moist and dry forests. By March 2012, it will help to achieve the following objectives:

Improve knowledge on effective and verifiable measure of the impact of field activities to reduce greenhouse gas emissions and, to a lesser extent, sequester CO_2 already present in the atmosphere.

Improve the living conditions of local communities through the transfer of natural resource management and development of sustainable agricultural practices (system of rice intensification, fish farming, bee keeping, small-scale breeding, etc.)

Fully integrate the conservation of the unique biodiversity of Madagascar. Successfully placing the region on a sustainable development path will require the commitment and the increased capacity of governments, industry and local communities alike to protect and sustainably manage one of the world's most outstanding forest, freshwater and marine landscapes.

With protection and management comes a viable future for the people and species that live there.

For more information:
www.wwf.mg
wwf.panda.org/what_we_do/where_we_work/madagascar/

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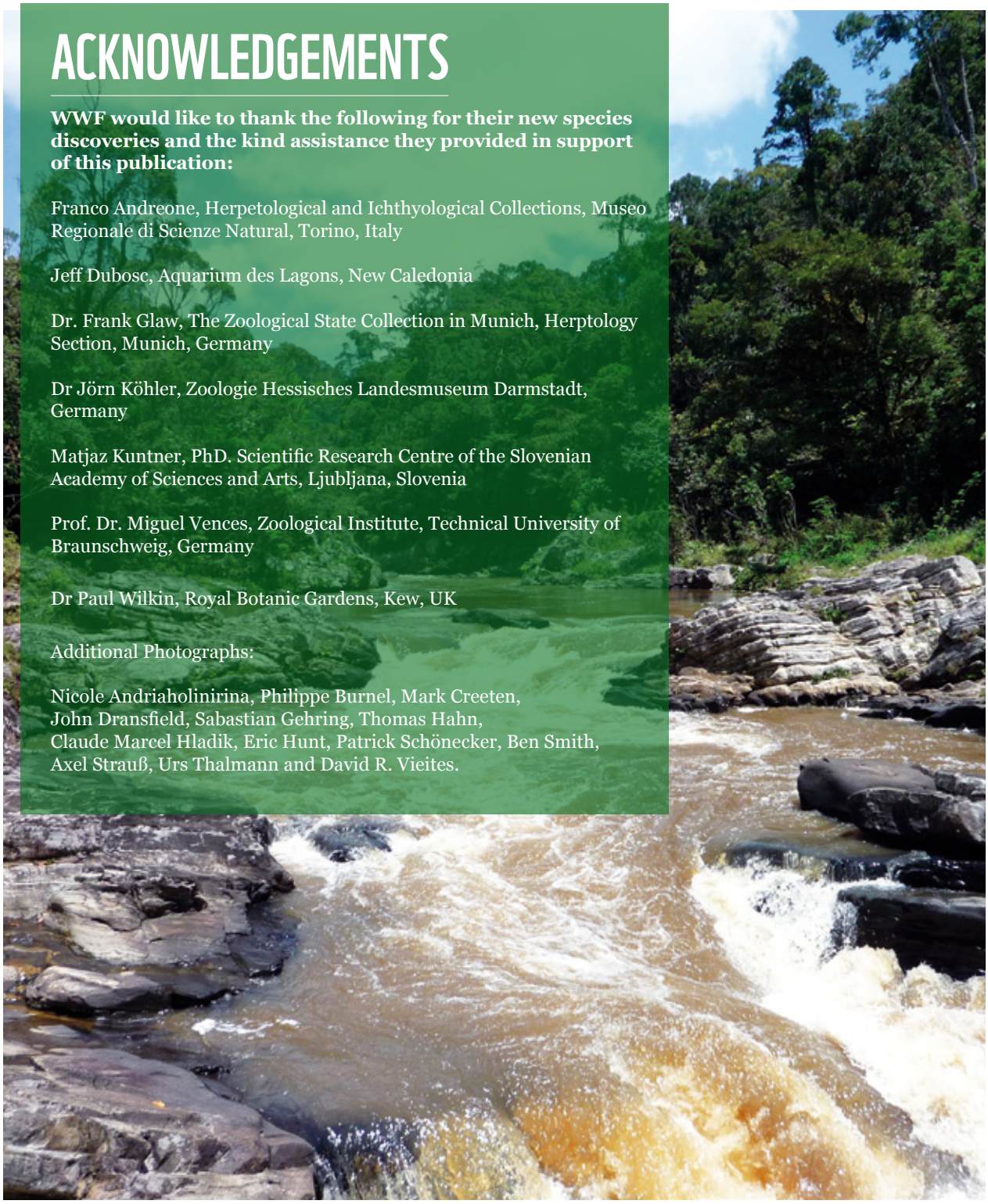

APPENDIX

Madagascar new species 1999 - 2010

Plants

Species	Scientist(s)	Year
Aloe albostriata	T.A.McCoy, Rakouth & Lavranos	2008
Aloe altimatsiatrae	J.-B.Castillon	2008
Aloe ambositrae	J.-P.Castillon	2008
Aloe ambrensis	J.-B.Castillon	2007
Aloe ampefyana	J.-B.Castillon	2007
Aloe andohahelensis	J.-B.Castillon	2002
Aloe antonii	J.-B.Castillon	2006
Aloe argyrostachys	Lavranos, Rakouth & T.A.McCoy	2007
Aloe aurelienii	J.-B.Castillon	2008
Aloe bruynsii	P.I.Forst.	2003
Aloe castilloniae	J.-B.Castillon	2006
Aloe charlotteae	J.-B.Castillon	2006
Aloe darainensis	J.-P.Castillon	2009
Aloe deinacantha	T.A.McCoy, Rakouth & Lavranos	2008
Aloe droseroides	Lavranos & T.A.McCoy	2003
Aloe edouardii	Rebmann	2008
Aloe estevei	Rebmann	2008
Aloe eximia	Lavranos & T.A.McCoy	2006
Aloe florenceae	Lavranos & T.A.McCoy	2004
Aloe ifanadianae	J.-B.Castillon	2008
Aloe inexpectata	Lavranos & T.A.McCoy	2003
Aloe johannis	J.-B.Castillon	2006
Aloe johannis-bernardii	J.-P.Castillon	2008
Aloe johannis-philippei	J.-B.Castillon	2009
Aloe makayana	Lavranos, Rakouth & T.A.McCoy	2008
Aloe manandonae	J.-B.Castillon & J.-P.Castillon	2008
Aloe mandotoensis	J.-B.Castillon	2003
Aloe mitsioana	J.-B.Castillon	2006
Aloe pachydactylos	T.A.McCoy & Lavranos	2007
Aloe philippei	J.-B.Castillon	2005
Aloe pseudoparvula	J.-B.Castillon	2004
Aloe richaudii	Rebmann	2008
Aloe rodolphei	J.-B.Castillon	2008
Aloe roeoeslii	Lavranos & T.A.McCoy	2005
Aloe sakarahensis	Lavranos & M.Teissier	2004
Aloe saronarae	Lavranos & T.A.McCoy	2006
Aloe tulearensis	T.A.McCoy & Lavranos	2007
Aloe werneri	J.-B.Castillon	2007
Aloe zakamisyi	T.A.McCoy & Lavranos	2007
Amorphophallus mangelsdorffii	Bogner	2003
Amphistemon humbertii	Groeninckx	2010
Amphistemon rakotonasolianus	Groeninckx	2010
Angraecum oeonioides	Bosser	2007
Anisotes divaricatus	T.F.Daniel, Mbola, Almeda & Phillipson	2007
Apodytes bebile	Labat, R.Rabev. & El-Achkar	2006
Aponogeton eggersii	Bogner & H.Bruggen	2001
Aponogeton gottlebei	Kasselm. & Bogner	2008
Aponogeton masoalaensis	Bogner	2002
Aponogeton schatzianus	Bogner & H.Bruggen	2001
Artabotrys darainensis	Deroin & L.Gaut.	2008
Aspidostemon andohahelensis	van der Werff	2006
Aspidostemon antongilensis	van der Werff	2006
Aspidostemon apiculatus	van der Werff	2006
Aspidostemon capuronii	van der Werff	2006
Aspidostemon conoideus	van der Werff	2006
Aspidostemon fungiformis	van der Werff	2006
Aspidostemon grayi	van der Werff	2006
Aspidostemon insignis	van der Werff	2006
Aspidostemon litoralis	van der Werff	2006
Aspidostemon longipedicellatus	van der Werff	2006
Aspidostemon lucens	van der Werff	2006
Aspidostemon macrophyllus	van der Werff	2006
Aspidostemon manongarivensis	van der Werff	2006
Aspidostemon masoalensis	van der Werff	2006
Aspidostemon microphyllus	van der Werff	2006
Aspidostemon occultus	van der Werff	2006
Aspidostemon reticulatus	van der Werff	2006
Aspidostemon trichandra	van der Werff	2006
Baroniella linearifolia	Klack.	2007
Bathiorhamnus capuronii	Callm., Phillipson & Buerki	2008
Bathiorhamnus vohemarensis	Callm., Phillipson & Buerki	2008
Beilschmiedia pedicellata	van der Werff	2003
Beilschmiedia rugosa	van der Werff	2003
Bertiera brevithyrsa	A.P.Davis	2010
Billburttia capensoides	Sales & Hedge	2009
Billburttia vaginoides	Sales & Hedge	2009
Bonamia ankaranensis	Deroin	2004

Species	Scientist(s)	Year
Brexia alaticarpa	G.E.Schatz & Lowry	2004
Brexia australis	G.E.Schatz & Lowry	2004
Brexia marioniae	G.E.Schatz & Lowry	2004
Bulbophyllum ambatoavense	Bosser	2004
Bulbophyllum jackyi	G.A.Fisch., Sieder & P.J.Cribb	2007
Bulbophyllum labatii	Bosser	2004
Bulbophyllum petrae	G.A.Fisch., Sieder & P.J.Cribb	2007
Buxus cipolinica	Lowry & G.E.Schatz	2006
Cadia multifoliolata	Nusb. & Labat	2008
Calyptranthera filifera	Klack.	2007
Calyptranthera sulphurea	Klack.	2007
Calyptranthera villosa	Klack.	2007
Campnosperma zacharyi	Randrian. & Lowry	2004
Celtis madagascariensis	Sattarian	2005
Cissus zombitsy	Desc.	2007
Cloiselia humbertii	S.Ortiz	2006
Cloiselia madagascariensis	S.Ortiz	2006
Coffea bissetiae	A.P.Davis & Rakotonas.	2008
Coffea boinensis	A.P.Davis & Rakotonas.	2008
Coffea labatii	A.P.Davis & Rakotonas.	2008
Coffea namorokensis	A.P.Davis & Rakotonas.	2008
Coffea pterocarpa	A.P.Davis & Rakotonas.	2008
Coffea toshii	A.P.Davis & Rakotonas.	2010
Colea gentryi	Zijhra	2006
Colea resupinata	Zijhra	2006
Colea rosea	Zijhra	2006
Colea sytsmae	Zijhra	2006
Commelina lukei	Faden	2008
Commiphora capuronii	Bard.	2002
Coptosperma mitochondrioides	Mouly & De Block	2008
Crassula ankaratrensis	Desc.	2007
Crassula bevilanensis	Desc.	2007
Crinum hanitrae	Lehmiller & Sisk	2008
Crinum lavrani	Lehmiller	2007
Cryptocarya glabriflora	van der Werff	2008
Cyathea basirotundata	Rakotondr. & Janssen	2008
Cyathea conferta	Janssen & Rakotondr.	2008
Cyathea dilatata	Rakotondr. & Janssen	2008
Cyathea emilei	Janssen & Rakotondr.	2008
Cyathea hebes	Janssen & Rakotondr.	2008
Cyathea impolita	Rakotondr. & Janssen	2007
Cyathea lisyae	Janssen & Rakotondr.	2008
Cyathea longispina	Janssen & Rakotondr.	2008
Cyathea meridionalis	Janssen & Rakotondr.	2008
Cyathea obtecta	Rakotondr. & Janssen	2008
Cyathea pseudobellisquamata	Janssen & Rakotondr.	2008
Cyathea rouhaniana	Rakotondr. & Janssen	2007
Cyathea valdesquamata	Janssen & Rakotondr.	2008
Cynorkis guttata	Hermans & P.J.Cribb	2007
Cynorkis subtilis	Bosser	2004
Cyphostemma ankaranense	Desc.	2007
Cyphostemma caerulans	Desc.	2007
Cyphostemma mandrakense	Desc.	2007
Cyphostemma marojejyense	Desc.	2007
Dalbergia gautieri	Bosser & R.Rabev.	2005
Dalbergia manongarivensis	Bosser & R.Rabev.	2005
Dalbergia masoalensis	Bosser & R.Rabev.	2005
Dalbergia occulta	Bosser & R.Rabev.	2005
Dalbergia pseudoviguieri	Bosser & R.Rabev.	2005
Dioscorea bako	Wilkin	2008
Dioscorea bosseri	Haigh & Wilkin	2005
Dioscorea buckleyana	Wilkin	2009
Dioscorea kimiae	Wilkin	2009
Dioscorea orangeana	Wilkin	2009
Dioscorea sterilis	O.Weber & Wilkin	2005
Dombeya gautieri	Dorr & Skema	2010
Dypsis andilamenensis	Rakotoarin. & J.Dransf	2010
Dypsis anjae	Rakotoarin. & J.Dransf	2010
Dypsis ankirindro	W.J.Baker, Rakotoarin. & M.S.Trudgen	2009
Dypsis betsimisarakae	Rakotoarin. & J.Dransf	2010
Dypsis brittiana	Rakotoarin.	2009
Dypsis culminis	Rakotoarin. & J.Dransf	2010
Dypsis delicatula	Britt & J.Dransf.	2005
Dypsis dracaenoides	Rakotoarin. & J.Dransf	2010
Dypsis gautieri	Rakotoarin. & J.Dransf	2010
Dypsis gronophyllum	Rakotoarin. & J.Dransf	2010
Dypsis humilis	M.S.Trudgen, Rakotoarin. & W.J.Baker	2009

Species	Scientist(s)	Year
Dypsis jeremiei	Rakotoarin. & J.Dransf	2010
Dypsis makirae	Rakotoarin. & Britt	2009
Dypsis metallica	Rakotoarin. & J.Dransf	2010
Dypsis rakotonasoloi	Rakotoarin.	2009
Dypsis reflexa	Rakotoarin. & J.Dransf	2010
Dypsis sancta	Rakotoarin. & J.Dransf	2010
Dypsis vonitrandambo	Rakotoarin. & J.Dransf	2010
Euphorbia berevoensis	Lawant & Buddens.	2008
Euphorbia erythrocucullata	Mangelsdorff	2005
Flagenium farafanganense	Ruhsam & A.P.Davis	2007
Flagenium pedunculatum	Ruhsam & A.P.Davis	2007
Flagenium petrikense	Ruhsam & A.P.Davis	2007
Gaertnera bambusifolia	Malcomber & A.P.Davis	2005
Gaertnera brevipedicellata	Malcomber & A.P.Davis	2005
Gaertnera darcyana	Malcomber & A.P.Davis	2005
Gaertnera ianthina	Malcomber	2009
Gaertnera lowryi	Malcomber	2009
Gaertnera monstruosa	Malcomber	2009
Gaertnera pauciflora	Malcomber & A.P.Davis	2005
Gaertnera raphaelii	Malcomber	2009
Gaertnera schatzii	Malcomber	2009
Garcinia capuronii	Z.S.Rogers & P.W.Sweeney	2007
Garcinia lowryi	Z.S.Rogers & P.W.Sweeney	2007
Gnidia neglecta	Z.S.Rogers	2009
Gnidia razakamalalana	Z.S.Rogers	2006
Goodyera goudotii	Ormerod & Cavestro	2006
Gymnosiphon marieae	Cheek	2008
Gyrostipula obtusa	Eman. & Razafim.	2007
Habenaria tianae	P.J.Cribb & D.L.Roberts	2008
Heliotropium perrieri	J.S.Mill.	2003
Helmiopsis polyandra	Appleq.	2009
Hibiscus lamalama	Callm., Buerki & Koopman	2009
Hildegardia dauphinensis	J.G.Zaborsky	2009
Hilsenbergia angustifolia	J.S.Mill.	2003
Hilsenbergia apetala	J.S.Mill.	2003
Hilsenbergia bosseri	J.S.Mill.	2003
Hilsenbergia capuronii	J.S.Mill.	2003
Hilsenbergia croatii	J.S.Mill.	2003
Hilsenbergia darcyana	J.S.Mill.	2003
Hilsenbergia labatii	J.S.Mill.	2003
Hilsenbergia leslieae	J.S.Mill.	2003
Hilsenbergia lowryana	J.S.Mill.	2003
Hilsenbergia moratiana	J.S.Mill.	2003
Hilsenbergia randrianasoloana	J.S.Mill.	2003
Hilsenbergia schatziana	J.S.Mill.	2003
Hymenodictyon antakaranensis	Razafim. & B.Bremer	2006
Hymenodictyon tsingy	Razafim. & B.Bremer	2006
Impatiens academiae-moguntiae	Eb.Fisch. & Raheliv.	2007
Impatiens ambahatrensis	Eb.Fisch. & Raheliv.	2007
Impatiens ambanizanensis	Eb.Fisch. & Raheliv.	2007
Impatiens ampokafoensis	Eb.Fisch. & Raheliv.	2007
Impatiens andapensis	Eb.Fisch. & Raheliv.	2007
Impatiens ankaranensis	Eb.Fisch. & Raheliv.	2007
Impatiens bardotiae	Eb.Fisch. & Raheliv.	2007
Impatiens barthlottii	Eb.Fisch. & Raheliv.	2007
Impatiens befiananensis	Eb.Fisch. & Raheliv.	2007
Impatiens benitae	Eb.Fisch., Wohlh. & Raheliv.	2003
Impatiens betsomangae	Eb.Fisch. & Raheliv.	2007
Impatiens callmanderi	Eb.Fisch., Wohlh. & Raheliv.	2003
Impatiens carlsoniae	Eb.Fisch. & Raheliv.	2007
Impatiens druartii	Eb.Fisch. & Raheliv.	2007
Impatiens fianarantsoae	Eb.Fisch. & Raheliv.	2007
Impatiens georgei-schatzii	Eb.Fisch. & Raheliv.	2007
Impatiens guillaumetii	Eb.Fisch. & Raheliv.	2007
Impatiens haingosonii	Eb.Fisch. & Raheliv.	2007
Impatiens kraftii	Eb.Fisch., Wohlh. & Raheliv.	2003
Impatiens kuepferi	Eb.Fisch. & Raheliv.	2004
Impatiens laurentii	Eb.Fisch. & Raheliv.	2007
Impatiens loki-schmidtiae	Eb.Fisch. & Raheliv.	2004
Impatiens luisae-echterae	Eb.Fisch., Wohlh. & Raheliv.	2003
Impatiens maevae	Eb.Fisch. & Raheliv.	2007
Impatiens mahalevonensis	Eb.Fisch. & Raheliv.	2007
Impatiens mamyi	Eb.Fisch. & Raheliv.	2007
Impatiens mayae-valeriae	Eb.Fisch. & Raheliv.	2004
Impatiens messmerae	Eb.Fisch. & Raheliv.	2007
Impatiens mindiae	Eb.Fisch., Wohlh. & Raheliv.	2003
Impatiens nanatonanensis	Eb.Fisch. & Raheliv.	2007
Impatiens nicolliae	Eb.Fisch. & Raheliv.	2007
Impatiens nidus-apis	Eb.Fisch. & Raheliv.	2007
Impatiens nomenyae	Eb.Fisch. & Raheliv.	2007
Impatiens nosymangabensis	Eb.Fisch. & Raheliv.	2007
Impatiens nusbaumeri	Eb.Fisch. & Raheliv.	2007
Impatiens paranyi	Eb.Fisch. & Raheliv.	2007
Impatiens purpureolucida	Eb.Fisch., Wohlh. & Raheliv.	2003
Impatiens purroi	Eb.Fisch., Wohlh. & Raheliv.	2003
Impatiens rakotomalazana	Eb.Fisch. & Raheliv.	2007
Impatiens rapanarivoi	Eb.Fisch. & Raheliv.	2007
Impatiens razanatsoa-charlei	Eb.Fisch. & Raheliv.	2007
Impatiens renae	Eb.Fisch. & Raheliv.	2004
Impatiens rivularis	Eb.Fisch., Wohlh. & Raheliv.	2003
Impatiens salifii	Eb.Fisch. & Raheliv.	2007
Impatiens saolana	Eb.Fisch. & Raheliv.	2007
Impatiens scenarioi	Eb.Fisch. & Raheliv.	2007
Impatiens sidiformis	Eb.Fisch. & Raheliv.	2004
Impatiens stefaniae	Eb.Fisch. & Raheliv.	2004
Impatiens tafononensis	Eb.Fisch. & Raheliv.	2007
Impatiens tsararavina	Eb.Fisch. & Raheliv.	2007
Impatiens tsingycola	Eb.Fisch. & Raheliv.	2007
Impatiens vebrowniae	Eb.Fisch., Wohlh. & Raheliv.	2003
Impatiens vellela	Eb.Fisch. & Raheliv.	2004
Impatiens volatianae	Eb.Fisch. & Raheliv.	2007
Impatiens wohlhauseri	Eb.Fisch. & Raheliv.	2004
Ipomoea darainensis	Deroin, Ranir. & Nusb.	2008
Ixora clandestina	De Block	2009
Ixora densithyrsa	De Block	2008
Ixora peculiaris	De Block	2008
Ixora rakotonasoloi	De Block	2009
Jumellea alionae	P.J.Cribb	2009
Kalanchoe inaurata	Desc.	2005
Kalanchoe maromokotrensis	Desc. & Rebmann	2006
Kalanchoe pareikiana	Desc. & Lavranos	2005
Kalanchoe peltigera	Desc.	2005
Kalanchoe rebmannii	Desc.	2006
Kalanchoe tenuiflora	Desc.	2004
Lastreopsis coriaceosquamata	Rakotondr.	2009
Lastreopsis fidelei	Rakotondr.	2009
Lastreopsis manongarivensis	Rakotondr.	2009
Lepisanthes sambiranensis	Buerki, Callm. & Lowry	2009
Ludia craggiana	Z.S.Rogers, Randrian. & J.S.Mill.	2006
Mantalania longipedunculata	De Block & A.P.Davis	2006
Mauloutchia annickiae	Sauquet	2004
Mauloutchia capuronii	Sauquet	2004
Memecylon acrogenum	R.D.Stone	2006
Memecylon amplifolium	R.D.Stone	2006
Memecylon impressivenum	R.D.Stone	2006
Memecylon interjectum	R.D.Stone	2006
Memecylon perditum	R.D.Stone	2006
Memecylon pterocladum	R.D.Stone	2006
Memecylon sejunctum	R.D.Stone	2006
Memecylon xiphophyllum	R.D.Stone	2006
Micronychia bemangidiensis	Randrian. & Lowry	2009
Micronychia benono	Randrian. & Lowry	2009
Micronychia kotozafii	Randrian. & Lowry	2009
Micronychia striata	Randrian. & Lowry	2009
Nesogordonia rakotovaoi	Rakotoar., Andriamb. & Callm.	2009
Noronhia jeremii	Hong-Wa & Callm.	2009
Oeceoclades callmanderi	Bosser	2006
Olax antsiranensis	Z.S.Rogers, Malécot & Sikes	2006
Olax capuronii	Z.S.Rogers, Malécot & Sikes	2006
Oliganthes anjanaribensis	Beentje & D.J.N.Hind	2010
Operculicarya capuronii	Randrian. & Lowry	2006
Operculicarya multijuga	Randrian. & Lowry	2006
Ophiocolea vokoaninensis	Zjhra	2006
Pandanus callmanderiana	Laivao & Buerki	2006
Pandanus humbertii	Laivao, Callm. & Buerki	2007
Pandanus kuepferi	Callm., Wohlh. & Laivao	2003
Pandanus marojejicus	Callm. & Laivao	2003
Pandanus masoalensis	Laivao & Callm.	2000
Pandanus nusbaumeri	Callm. & L.Gaut.	2009
Pandanus sermollianus	Callm. & Buerki	2008
Pandanus validus	Huynh & Callm.	2003
Pentopetia astephana	Klack.	2007
Pentopetia viridis	Klack. & Meve	2007
Peperomia ankaranensis	G.Mathieu	2006
Peperomia costata	G.Mathieu	2003
Peperomia erythrocaulis	G.Mathieu	2006
Peperomia humbertii	G.Mathieu	2003
Peperomia mantadiana	G.Mathieu	2003
Peperomia nicolliae	G.Mathieu	2003
Peperomia pluvisilvatica	G.Mathieu	2003
Peperomia ratticaudata	G.Mathieu	2003
Peperomia richardsonii	G.Mathieu	2006
Peperomia terebinthina	G.Mathieu	2003
Peponidium crassifolium	Lantz, Klack. & Razafim.	2007
Phanerodiscus capuronii	Malécot, G.E.Schatz & Bosser	2003
Phyllarthron nocturnum	Zjhra	2006
Phyllarthron sahamalazensis	Zjhra	2006
Phyllarthron vokoaninensis	Zjhra	2006
Pilgerina madagascariensis	Z.S.Rogers, Nickrent & Malécot	2008
Plectranthus papilionaceus	Ranir. & Phillipson	2007
Plectranthus rosulatus	Hedge	2005
Plukenetia ankaranensis	L.J.Gillespie	2007

Species	Scientist(s)	Year
Plukenetia decidua	L.J.Gillespie	2007
Polyscias kalabenonensis	Lowry & Callm.	2009
Polyscias pachypedicellata	Lowry & Callm.	2009
Polyscias wohlhauseri	Lowry & Callm.	2009
Polystachya clareae	Hermans	2003
Pouzolzia tsaratananensis	Friis & Wilmot-Dear	2006
Prockiopsis calcicola	G.E.Schatz & Lowry	2003
Pseudotectaria analamazaotrensis	Rakotondr.	2010
Pseudotectaria jouyana	Rakotondr.	2010
Pyrenacantha ambrensis	Labat, El-Achkar & R.Rabev.	2006
Pyrenacantha andapensis	Labat, El-Achkar & R.Rabev.	2006
Pyrenacantha perrieri	Labat, El-Achkar & R.Rabev.	2006
Pyrenacantha rakotozafyi	Labat, El-Achkar & R.Rabev.	2006
Pyrenacantha tropophila	Labat, El-Achkar & R.Rabev.	2006
Pyrostria pendula	Lantz, Klack. & Razafim.	2007
Pyrostria serpentina	Lantz, Klack. & Razafim.	2007
Radcliffea smithii	Petra Hoffm. & K.Wurdack	2006
Ravenea beentjei	Rakotoarin. & J.Dransf.	2010
Ravenea delicatula	Rakotoarin.	2008
Ravenea hypoleuca	Rakotoarin. & J.Dransf.	2010
Rhodocolea lemuriphila	Zjhra	2006
Rhodocolea multiflora	Zjhra	2006
Rhopalocarpus mollis	G.E.Schatz & Lowry	2006
Rhopalocarpus randrianaivoi	G.E.Schatz & Lowry	2006
Schizolaena isaloensis	Rabeh. & Lowry	2009
Schizolaena raymondii	Lowry & Rabeh.	2006
Secamone galinae	Klack.	2003
Secamone trichostemon	Klack.	2005
Seddera madagascariensis	Deroin & Sebsebe	2009
Staufferia capuronii	Z.S.Rogers, Nickrent & Malécot	2008
Stephanodaphne pedicellata	Z.S.Rogers	2004
Stephanodaphne pilosa	Z.S.Rogers	2004
Stephanodaphne schatzii	Z.S.Rogers	2004
Sterculia cheekii	Dorr	2004
Suregada celastroides	Radcl.-Sm. & Petra Hoffm.	2004
Tahina spectabilis	J.Dransf. & Rakotoarin.	2008
Tarenna capuroniana	De Block	2005
Thamnoldenlandia ambovombensis	Groeninckx	2010
Toliara arenacea	Judz.	2009
Tricalysia ambrensis	Ranariv. & De Block	2007
Tricalysia dauphinensis	Ranariv. & De Block	2007
Tricalysia humbertii	Ranariv. & De Block	2007
Tricalysia majungensis	Ranariv. & De Block	2007
Tricalysia orientalis	Ranariv. & De Block	2007
Trichilia sambiranensis	Callm. & Phillipson	2009
Uncarina ankaranensis	Ihlenf.	2004
Uncarina ihlenfeldtiana	Lavranos	2004
Uvaria relambo	Deroin & L.Gaut.	2006
Uvaria sambiranensis	Deroin & L.Gaut.	2006
Warneckea masoalae	R.D.Stone	2006
Weinmannia aggregata	Z.S.Rogers & J.Bradford	2004
Weinmannia magnifica	J.Bradford & Z.S.Rogers	2004
Wielandia unifex	Petra Hoffm. & McPherson	2007
Xerochlamys coriacea	Hong-Wa	2009
Xerochlamys itremoensis	Hong-Wa	2009
Xerochlamys undulata	Hong-Wa	2009
Xylopia kalabenonensis	D.M.Johnson, Deroin & Callm.	2009
Zygophlebia anjanaharibensis	Rakotondr.	2006
Zygophlebia goodmanii	Rakotondr.	2006

Total: 385

Invertebrates

Afrorheithrus admirabilis	John S. Weaver Iii, François-Marie Gibon & Pavel Chvojka	2008
Afrorheithrus fallax	John S. Weaver Iii, François-Marie Gibon & Pavel Chvojka	2008
Afrorheithrus mirus	John S. Weaver Iii, François-Marie Gibon & Pavel Chvojka	2008
Aptinoma antongil	Brian L. Fisher	2009
Aptinoma mangabe	Brian L. Fisher	2009
Cheimacheramus rossi	Kjell Arne Johanson & János Oláh	2006
Coptotriche alavelona	Lees And Stonis	2007
Garcorops jadis	Jan Bosselaers	2004
Helicopsyche ambodiva	Kjell Arne Johanson & János Oláh	2006
Helicopsyche hadika	Kjell Arne Johanson & János Oláh	2006
Helicopsyche ninakosha	Kjell Arne Johanson & János Oláh	2006
Heptascelio noyesi	Masner & Johnson	2008
Heptascelio orarius	Johnson & Masner	2008
Heptascelio paralugens	Masner & Johnson	2008
Heptascelio sicarius	Johnson & Musetti	2008
Heptascelio teres	Johnson & Masner	2008
Hessemydas Parkeri	B. C. Kondratieff, Ryan J. Carr & Michael E. Irwin	2005
Hessemydas tulear	B. C. Kondratieff, Ryan J. Carr & Michael E. Irwin	2005
Hydrothelphusa vencesi	Neil Cumberlidge, Saskia A. E. Marijnissen & Jonelle Thompson	2007
Laelius mekes	D. N. Barbosa & C. O. Azevedo	2009
Laelius mekes	D. N. Barbosa & C. O. Azevedo	2009
Mahafalymydas tuckeri	B. C. Kondratieff, Ryan J. Carr & Michael E. Irwin	2005
Mahafalymydas wiegmanni	B. C. Kondratieff, Ryan J. Carr & Michael E. Irwin	2005
Nephila komaci	Kuntner & Coddington	2009
Ninetis toliara	Bernhard A. Huber & Hisham K. El-Hennawy	2007
Olixon martini	Volker Lohrmann & Michael Ohl	2007
Olixon toliaraensis	Volker Lohrmann & Michael Ohl	2007
Paduniella ambra	Kjell Arne Johanson & János Oláh	2010
Paduniella flinti	Kjell Arne Johanson & János Oláh	2010
Paduniella madagassa	Kjell Arne Johanson & János Oláh	2010
Paduniella nandra	Kjell Arne Johanson & János Oláh	2010
Paduniella sona	Kjell Arne Johanson & János Oláh	2010
Petrothrincus andohel	Kjell Arne Johanson & János Oláh	2006
Petrothrincus andring	Kjell Arne Johanson & János Oláh	2006
Petrothrincus dhritaparam	Kjell Arne Johanson & János Oláh	2006
Petrothrincus newidop	Kjell Arne Johanson & János Oláh	2006
Petrothrincus pauliani	Kjell Arne Johanson & János Oláh	2006
Petrothrincus tsaratananensis	Kjell Arne Johanson & János Oláh	2006
Planeocoris redeii	Dominik Chlond	2010
Ranomafana pollocki	Hermes E. Escalona & Adam Slipinski	2008
Ravavy miafina	Brian L. Fisher	2009
Rhoizema mahalevonum	Kjell Arne Johanson & János Oláh	2006

Total: 42

Fish

Allenbatrachus meridionalis	Greenfield, D.W. & Wm. L. Smith	2004
Arius festinus	Ng & Sparks	2003
Arius uncinatus	Ng & Sparks	2003
Bedotia albomarginata	Sparks & Rush	2005
Bedotia alveyi	Jones, C.C., W.L. Smith & J.S. Sparks	2010
Bedotia leucopteron	Loiselle & Rodriguez	2007
Bedotia marojejy	Stiassny, M.L.J. & I.J. Harrison	2000
Bedotia masoala	Sparks, J.S.	2001
Gogo atratus	Ng, Sparks & Loiselle	2008
Paretroplus tsimoly	Stiassny, Chakrabarty & Loiselle	2001
Parupeneus fraserorum	Randall, J.E. & D.R. King	2009
Ptychochromis ernestmagnusi	Sparks, J.S. & M.L.J. Stiassny	2010
Ptychochromoides itasy	Sparks, J.S.	2004
Ptychochromoides vondrozo	Sparks & Reinthal	2001
Rheocles derhami	Stiassny, M.L.J. & D.M. Rodriguez	2001
Rheocles vatosoa	Stiassny, M.L.J., D.M. Rodriguez & P.V. Loiselle	2002
Sauvagella robusta	Stiassny	2002

Total:17

Amphibians

Anodonthyla emilei	Vences, Glaw, Köhler, & Wollenberg	2010
Anodonthyla hutchisoni	Fenolio, Walvoord, Stout, Randrianirina & Andreone	2007
Anodonthyla jeanbai	Vences, Glaw, Köhler & Wollenberg	2010
Anodonthyla moramora	Glaw & Vences	2005
Anodonthyla theoi	Vences, Glaw, Köhler &Wollenberg	2010
Anodonthyla vallani	Vences, Glaw, Köhler &Wollenberg	2010
Blommersia sarotra	Glaw & Vences	2002
Boophis arcanus	Glaw, Köhler, De la Riva, Vieites & Vences	2010
Boophis axelmeyeri	Vences, Andreone & Vieites	2005
Boophis baetkei	Köhler, Glaw & Vences	2008
Boophis bottae	Vences & Glaw	2002
Boophis calcaratus	Vallan, Vences & Glaw	2010
Boophis entingae	Glaw, Köhler, De la Riva, Vieites & Vences	2010
Boophis feonnyala	Glaw, Vences, Andreone & Vallan	2001
Boophis haematopus	Glaw, Vences, Andreone & Vallan	2001
Boophis haingana	Glaw, Köhler, De la Riva, Vieites & Vences	2010
Boophis liami	Vallan, Vences & Glaw	2003
Boophis lilianae	Köhler, Glaw & Vences	2008
Boophis luciae	Glaw, Köhler, De la Riva, Vieites & Vences	2010
Boophis miadana	Glaw, Köhler, De la Riva, Vieites & Vences	2010
Boophis picturatus	Glaw, Vences, Andreone & Vallan	2001
Boophis piperatus	Glaw, Köhler, De la Riva, Vieites & Vences	2010
Boophis praedictus	Glaw, Köhler, De la Riva, Vieites & Vences	2010
Boophis pyrrhus	Glaw, Vences, Andreone & Vallan	2001
Boophis roseipalmatus	Glaw, Köhler, De la Riva, Vieites & Vences	2010
Boophis sambirano	Vences & Glaw	2005
Boophis sandrae	Glaw, Köhler, De la Riva, Vieites & Vences	2010
Boophis schuboeae	Glaw & Vences	2002

Species	Scientist(s)	Year
Boophis solomaso	Vallan, Vences & Glaw	2003
Boophis spinophis	Glaw, Köhler, De la Riva, Vieites & Vences	2010
Boophis tampoka	Köhler, Glaw & Vences	2008
Boophis tasymena	Vences & Glaw	2002
Boophis ulftunni	Wollenberg, Andreone, Glaw & Vences	2008
Boophis vittatus	Glaw, Vences, Andreone & Vallan	2001
Cophyla berara	Vences, Andreone & Glaw	2005
Gephyromantis ambohitra	Vences & Glaw	2001
Gephyromantis azzurrae	Mercurio & Andreone	2007
Gephyromantis enki	Glaw & Vences	2002
Gephyromantis moseri	Glaw & Vences	2002
Gephyromantis runewsweeki	Vences & De la Riva	2007
Gephyromantis salegy	Andreone, Aprea, Vences & Odierna	2003
Gephyromantis schilfi	Glaw & Vences	2000
Gephyromantis striatus	Vences, Glaw, Andreone, Jesu & Schimmenti	2002
Gephyromantis tandroka	Glaw & Vences	2001
Gephyromantis tschenki	Glaw & Vences	2001
Gephyromantis zavona	Vences, Andreone, Glaw & Randrianirina	2003
Guibemantis kathrinae	Glaw, Vences & Gossmann	2000
Guibemantis timidus	Vences & Glaw	2005
Heterixalus carbonei	Vences, Glaw, Jesu & Schimmenti	2000
Mantella manery	Vences, Glaw & Böhme	1999
Mantidactylus charlotteae	Vences & Glaw	2004
Mantidactylus noralottae	Mercurio & Andreone	2007
Mantidactylus zipperi	Vences & Glaw	2004
Mantidactylus zolitschka	Glaw & Vences	2004
Paradoxophyla tiarano	Andreone, Aprea, Odierna & Vences	2006
Platypelis mavomavo	Andreone, Fenolio & Walvoord	2003
Platypelis tetra	Andreone, Fenolio & Walvoord	2003
Plethodontohyla fonetana	Glaw, Köhler, Bora & Rabibisoa	2007
Plethodontohyla guentheri	Glaw & Vences	2007
Plethodontohyla mihanika	Vences, Raxworthy, Nussbaum & Glaw	2003
Rhombophryne coronata	Vences & Glaw	2003
Rhombophryne matavy	D'Cruze, Köhler, Vences & Glaw	2010
Scaphiophryne boribory	Vences, Raxworthy, Nussbaum & Glaw	2003
Scaphiophryne menabensis	Glos, Glaw & Vences	2005
Spinomantis nussbaumi	Cramer, Rabibisoa & Raxworthy	2008
Spinomantis tavaratra	Cramer, Rabibisoa & Raxworthy	2008
Stumpffia helenae	Vallan	2000
Tsingymantis antitra	Glaw, Hoegg & Vences	2006
Wakea madinika	Vences, Andreone, Glaw & Mattioli	2002

Total: 69

Reptiles

Amphiglossus mandady	Andreone & Greer	2002
Amphiglossus spilostichus	Andreone & Greer	2002
Amphiglossus stylus	Andreone & Greer	2002
Amphiglossus tanysoma	Andreone & Greer	2002
Calumma amber	Raxworthy & Nussbaum	2006
Calumma crypticum	Raxworthy & Nussbaum	2006
Calumma hafahafa	Raxworthy & Nussbaum	2006
Calumma jejy	Raxworthy & Nussbaum	2006
Calumma peltierorum	Raxworthy & Nussbaum	2006
Calumma tarzan	Gehring, Pabijan, Ratsoavina, Köhler, Vences & Glaw	2010
Calumma tsycorne	Raxworthy & Nussbaum	2006
Calumma vatosoa	Andreone, Mattioli, Jesu & Randrianirina	2001
Calumma vencesi	Andreone, Mattioli, Jesu & Randrianirina	2001
Compsophis fatsibe	Mercurio & Andreone	2005
Furcifer nicosiai	Esu, Mattioli & Schimmenti	1999
Furcifer timoni	Glaw, Köhler & Vences	2009
Heteroliodon fohy	Glaw, Vences & Nussbaum	2005
Heteroliodon lava	Nussbaum & Raxworthy	2000
Liophidium maintikibo	Franzen, Jones, Raselimanana, Nagy, C'cruze, Glaw & Vences	2009
Liophidium pattoni	Vieites, Ratsoavina, Randrianiaina, Nagy, Glaw & Vences	2010
Liopholidophis dimorphus	Glaw, Nagy, Franzen & Vences	2007
Lygodactylus roavolana	Puente, Glaw, Vieites & Vences	2009
Madascincus nanus	Andreone & Greer	2002
Paracontias fasika	Köhler, Vences, Erbacher & Glaw	2010
Paracontias hafa	Andreone & Greer	2002
Paracontias kankana	Köhler, Vieites, Glaw, Kaffenberger & Vences	2009
Paracontias manify	Andreone & Greer	2002
Paracontias tsararano	Andreone & Greer	2002
Paroedura karstophila	Nussbaum & Raxworthy	2000
Paroedura lohatsara	Glaw, Vences & Schmidt	2001
Paroedura maingoka	Nussbaum & Raxworthy	2000
Paroedura tanjaka	Nussbaum & Raxworthy	2000
Paroedura vahiny	Nussbaum & Raxworthy	2000
Paroedura vazimba	Nussbaum & Raxworthy	2000
Phelsuma borai	Glaw, Köhler & Vences	2009
Phelsuma hielscheri	Rösler	2001
Phelsuma hoeschi	Berghof & Trautmann	2009
Phelsuma kely	Schönecker, Bach & Glaw	2004
Phelsuma malamakibo	Nussbaum, Raxworthy, Raselimanana & Ramanamanjato	2000
Phelsuma ravenala	Raxworthy, Ingram, Rabibisoa & Pearson	2007
Phelsuma roesleri	Glaw, Gehring, Köhler, Franzen & Vences	2010
Phelsuma vanheygeni	Lerner	2004
Pseudoacontias menamainty	Andreone & Greer	2002
Pseudoacontias unicolor	Sakata & Hikida	2003
Pseudoxyrhopus oblectator	Cadle	1999
Sirenoscincus yamagishii	Sakata & Hikida	2003
Thamnosophis martae	Glaw, Franzen & Vences	2005
Thamnosophis mavotenda	Glaw, Nagy, Köhler, Franzen & Vences	2009
Trachylepis tandrefana	Nussbaum, Raxworthy & Ramanamanjato	1999
Trachylepis tavaratra	Ramanamanjato, Nussbaum & Raxworthy	1999
Trachylepis vezo	Ramanamanjato, Nussbaum & Raxworthy	1999
Trachylepis volamenaloha	Nussbaum, Raxworthy & Ramanamanjato	1999
Typhlops andasibensis	Wallach & Glaw	2009
Typhlops rajeryi	Renoult & Raselimanana	2009
Uroplatus giganteus	Glaw, Kosuch, Henkel, Sound & Böhme	2006
Uroplatus pietschmanni	Böhle & Schönecker	2004
Xenotyphlops mocquardi	Wallach, Mercurio & Andreone	2007
Zonosaurus anelanelany	Raselimanana, Raxworthy & Nussbaum	2000
Zonosaurus bemaraha	Raselimanana, Raxworthy & Nussbaum	2000
Zonosaurus maramaintso	Raselimanana, Nussbaum & Raxworthy	2006
Zonosaurus tsingy	Raselimanana, Raxworthy & Nussbaum	2000

Total: 61

Mammals

Avahi cleesei	Thalmann U. & Geissmann T.	2005
Avahi unicolor	Thalmann U. & Geissmann T.	2000
Chaerephon atsinanana	Goodman, Buccas, Naidoo, Ratrimomanarivo, Taylor & Lamb	2010
Chaerephon jobimena	Goodman & Cardiff	2004
Cheirogaleus minusculus	Groves	2000
Cheirogaleus ravus	Groves	2000
Eliurus antsingy	Carleton, Goodman & Rakotondravony	2001
Emballonura tiavato	Goodman, Cardiff, Ranivo, Russell & Yoder	2006
Lepilemur aeeclis	Andriaholinirina, N., Fausser, J., Roos, C., Rumpler, Y., et al	2006
Lepilemur ahmansoni	Louis, Jr	2006
Lepilemur betsileo	Louis, Jr	2006
Lepilemur fleuretae	Louis, Jr	2006
Lepilemur grewcocki	Louis, Jr	2006
Lepilemur hubbardi	Louis, Jr	2006
Lepilemur jamesi	Louis, Jr	2006
Lepilemur milanoii	Louis, Jr	2006
Lepilemur petteri	Louis, Jr	2006
Lepilemur randrianasoli	Andriaholinirina, N., Fausser, J., Roos, C., Rumpler, Y., et al.	2006
Lepilemur sahamalazensis	Andriaholinirina, N., Fausser, J., Roos, C., Rumpler, Y., et al.	2006
Lepilemur seali	Louis, Jr	2006
Lepilemur tymerlachsoni	Louis, Jr	2006
Lepilemur wrighti	Louis, Jr	2006
Macrotarsomys petteri	Goodman and Soarimalala	2005
Microcebus berthae	Rasoloarison et al.	2000
Microcebus jollyae	Louis et al	2006
Microcebus lehilahytsara	Roos and Kappeler	2005
Microcebus macarthurii	Radespiel et al.	2008
Microcebus mamiratra	Andriantompohavana et al.	2006
Microcebus mittermeieri	Louis et al.	2006
Microcebus sambiranensis	Rasoloarison et al	2000
Microcebus simmonsi	Louis et al.	2006
Microcebus tavarata	Rasoloarison et al	2000
Microgale jenkinsae	Goodman & Soarimalala	2004
Microgale jobihely	Goodman, Raxworthy, Maminirina & Olson	2006
Microgale nasoloi	Jenkins & Goodman	1999
Miniopterus petersoni	Goodman, Bradman, Maminirina, Ryan, Christidis & Belinda Appleton	2008
Miniopterus sororculus	Goodman, Ryan, Maminirina, Fahr, Christidis & Appleton	2007
Mirza zaza	Kappeler & Roos	2005
Scotophilus marovaza	Goodman, Ratrimomanarivo, Randrianandrianina	2006
Scotophilus tandrefana	Goodman, S.M., R.K.B. Jenkins & F.H. Ratrimomanarivo	2005
Voalavo antsahabensis	Goodman, Rakotondravony, Randriamanantsoa & Rakotomalala	2005

Total: 41

GRAND TOTAL: 615

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Madagascar in numbers

100% RECYCLED

36%

of all primate families (five of 14) are found in Madagascar, the land of lemurs and a highest priority for primate conservation

587,000 km²

about the size of France, Madagascar is the world's fourth largest island

250,000 species

Madagascar is home to 5% of the world's plant and animal species and most of them are endemic to the island

20 million

inhabitants, many of them facing poverty. Despite its rich biodiversity, Madagascar remains one of the world's poorest nations

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