Vallée de Mai Nature Reserve

2020 Conservation Outlook Assessment

SITE INFORMATION

Country: Seychelles
Inscribed in: 1983
Criteria: (vii) (viii) (ix) (x)

In the heart of the small island of Praslin, the reserve has the vestiges of a natural palm forest preserved in almost its original state. The famouscoco de mer, from a palm-tree once believed to grow in the depths of the sea, is the largest seed in the plant kingdom. © UNESCO

SUMMARY

2020 Conservation Outlook

Finalised on 01 Dec 2020

GOOD WITH SOME CONCERNS

The protection and management of Vallée de Mai Nature Reserve is generally effective and is supported by a national legal framework, although there is a lack of a national protected area system. The management authority is very competent and is effectively implementing science-based programs and outreach and education schemes. However, the future of the site’s key value, the coco de mer palm, is still under threat from illegal collection and over-exploitation for its nuts and kernel. The site's management has reduced both commercial harvesting and illegal collection of nuts based on scientific research, although the conservation impacts of these requires further assessment. The National Government and the managing agency are implementing targeted conservation measures and aim to tighten law and legislation to protect the species, which include an increase in penalty for poaching of coco de mer nuts. Current priorities for the Nature Reserve include continuation and expansion of the outreach and education programme; promoting an increase in the size and connectivity of Vallée de Mai within the Praslin Island landscape, with a legally designated buffer zone; increasing anti-poaching; and continuing to control the harvesting of coco de mer seeds while expanding a program of replanting seedlings. The site's monitoring program is currently ensuring (a) effective monitoring of key values during Invasive Alien Species control; (b) fully functioning databases and developed protocols. Invasive Alien Species management has been mainstreamed in the site management, and an emergency action plan is currently executed managing the invasion by yellow crazy ants. In the future an additional focus should be on invasive species new to the site, as e.g. common mynas and feral cats, directly competing with native wildlife and indirectly by carrying diseases, as well as wildlife poaching events and the wildlife trade in general posing a threat.

FULL ASSESSMENT

Description of values

Values

World Heritage values

▶ Scenic palm forest **Criterion:(vii)**

The site contains a scenic mature palm forest. The natural formations of the palm forests are of aesthetic appeal with dappled sunlight and a spectrum of green, red and brown palm fronds. The natural beauty and near-natural state of the Vallée de Mai are of great interest, even to those visitors who are not fully aware of the ecological significance of the forest (World Heritage Committee, 2010).

▶ An oustanding example of an ancient monodominant ecosystem **Criterion:(viii)**

The site is an outstanding example of a very old, monodominant ecosystem (Edwards et al., 2015), and supports several species that have adapted to the unusual environment provided by the dominant tree, the coco de mer, which produces the largest seed in the plant kingdom. It is probable that this is the oldest monodominant forest in the world, and shows the greatest range of adapted species. Such monodominance is usually interpreted as the end-point of a successional process (Hart et al., 1989). The survival of this ecosystem is probably due to it being on an island, since it would almost certainly have been replaced by faster growing species on the continental mainland.

▶ An outstanding example of biological evolution dominated by endemic palms **Criterion:(ix)**

The site represents an outstanding example of biological evolution dominated by endemic palms. The site's low and intermediate-altitude palm forest is characteristic of the Seychelles and is preserved as something resembling its primeval state. The forest is dominated by the coco de mer Lodoicea maldivica but there are also five other endemic species of palms. Located on the granitic island of Praslin, the Vallée de Mai is the only area in the Seychelles where all six species occur together and no other island in the Indian Ocean possesses the combination of features displayed at the site. The ancient palms form a dense forest, along with Pandanus screw palms and broadleaf trees, which together constitute an ecosystem where unique ecological processes and interactions of nutrient cycling, seed dispersal and pollination occur (World Heritage Committee, 2010).

▶ Endemic palm species **Criterion:(x)**

The Vallée de Mai is the world’s stronghold for the endemic coco de mer (Lodoicea maldivica, EN). In addition, the endemic palm species millionaire’s salad (Deckenia nobilis, VU), thief palm (Phoenicophorium borsigianum, LC), Seychelles stilt palm (Verschaffeltia splendida, NT), latanier millepattes palm (Nephrosperma vanhoutteanum, LC) and latanier palm (Roscheria melanochaetes, NT), are also found at the site (World Heritage Committee, 2010).

▶ Endemic animal species supported by the palm habitat **Criterion:(x)**

The palm forest has been highly altered by past use (Vesey-Fitzgerald, 1940), but still provides a refuge for viable populations of many endemic species, some of them only to be found in the palm habitat. These include three endemic species of bronze gecko, endemic blue pigeons, bulbuls, sunbirds, swiftlets, Seychelles skinks, burrowing skinks, tiger chameleons, day geckos, caecilians, tree frogs, freshwater fish and many invertebrates (World Heritage Committee, 2010). The Seychelles black parrot (Coracopsis barklyi, VU), recently identified as a distinct species, is restricted to Praslin Island and totally

dependent on the Vallée de Mai and surrounding palm forest (BirdLife International, 2016).

Assessment information

Threats

Current Threats

High Threat

The illegal collection, plus the unsustainable harvesting of coco de mer nuts are the major pressures on the Vallée de Mai. Although the site's management, SIF, has implemented a coco de mer regeneration programme, it cannot be promoted openly to better engage staff due to the risk of poaching. The illegal collection of coco de mer nuts substantially reduces natural regeneration and the findings of the giant bronze geckos in the illegal pet trade requires urgent investigation to protect all endemic species. The invasive yellow crazy ant (Anoplolepis gracilipes) and black rat (Rattus rattus) continue to be a serious threat to the site’s endemic fauna such as the Seychelles black parrot (Coracopsis barklyi).

▶ **Logging/ Wood Harvesting**

High Threat

(Commercial harvesting of coco de mer nuts)

Inside site, throughout(>50%)
Outside site

Coco der mer nuts were previously heavily exploited in Vallée de Mai, and it was clear that harvesting at those levels could not be maintained indefinitely. It was recommended that a set of sustainable harvesting and replanting strategies should be implemented to increase the regeneration rate and long-term sustainability of the site (Rist et al., 2010; Fleischer-Dogley et al., 2011). Based on these recommendations, SIF has initiated an incentive-driven stewardship scheme to ensure that a minimum number of 20% of nuts remain in the forest (Newsletter SIF, September 2018). Poaching of coco de mer nuts has substantially decreased due to increased surveillance but it remains a long-term threat to the integrity of the World Heritage site (IUCN Consultation, 2017). In 2018 higher patrol procedures were introduced, which lead to the year of lowest poaching compared to previous years with poaching on the decline since 2014 (Newsletter SIF, April 2019).

▶ **Roads/ Railroads**

Data Deficient

(Main road passes adjacent to site)

Outside site

The main Praslin road passes through the Praslin National Park, adjacent to the Vallée de Mai. The effects of disturbance and noise on the site's fauna are unknown.

▶ **Invasive Non-Native/ Alien Species**

High Threat

(Invasive alien plant and animal species)

Inside site, throughout(>50%)
Outside site

The threat of invasive alien species is high in the site since they can lead to changes in species composition and habitats (Ketterer, 2010). This threat has decreased in terms of invasive plant species (which have been controlled for the last six years with excellent progress made in removing several invasive plant species entirely from the site and a biosecurity plan developed). The threat from invasive animals has only partially decreased, with new species posing as potential threats. The Indian ring-necked parakeet (Psittacula krameri) has been successfully eradicated from Mahé island seemingly without having transferred the deadly PBFD (Psittacene Beak and Feather Disease) virus to the black parrot population on Praslin island (Fogell et al., 2018). Another success is currently seen on the highly invasive yellow crazy ant Anoplolepis gracilipes, which is impacting upon black parrot nests, and threaten much of the native biodiversity of the site. The number and abundance of several endemic arboreal species was lower in invaded areas (Kaiser-Bunbury et al., 2014b). The expansion of the Anoplolepis gracilipes, which in October 2018 had reached its peak with 100% cover of the site (SIF, 2018, 10), has been under control after an emergency assistance request was granted (World Heritage Committee, 2019) with the latest research showing a decrease to a 60% coverage of the site (SIF, 2019, 12). Rats remain a problem, but have been controlled locally around black parrot nests during their breeding season as well throughout the entire site since the introduction of the invasive species management team Inva'Ziles before the start of the black parrot breeding season in October 2017 (SIF,

2017, 10). Besides a few brown rats (Rattus norvegicus), mainly black rats (Rattus rattus) were trapped successfully from 2017 onwards, resulting in parrot breeding with seemingly no rat disturbances (SIF, 2018a, unpubl. report). Tenrecs potentially pose a threat to the ground fauna and therefore trapping was introduced in 2017. This trapping and dissection of the animal could not yet reveal their impact on native wildlife due to a lack of specified staff (SIF, 2018a, unpubl. report). However, the report points out that there is likely to be an impact of feral cats (Felis catus) within the site and across Praslin and the impacts of this additional invasive alien species on black parrots and their nesting success is not yet known (SIF, 2018a, unpubl. report). In 2018 a black parrot census study was executed, which showed a higher distribution of the common myna (Acridotheres tristis) encroaching from the coast line towards the inside of Praslin island into the site, posing a potential threat to native wildlife as e.g. potentially competing with black parrots for nesting sites (SIF, 2018b, unpubl. report).

▶ **Tourism/ visitors/ recreation**

Data Deficient

(Increasing numbers of tourists)

Inside site, localised(<5%)

Tourism numbers are increasing annually at this small site (SIF 2009, unpubl. report), and although tourism management is conducted (via paths and guided tours and off-peak activities), the impacts of 100,000 tourists a year in a 19.5-ha site need effective management. So far the trail infrastructure has been improved substantially to limit erosion of trails. It is also important to monitor noise levels and disturbance to black parrot nests to better understand possible impacts (IUCN Consultation, 2020).

▶ **Collection of non-timber forest products (NTFPs), Other Biological Resource Use**

High Threat

(Illegal collection of coco de mer nuts)

Inside site, extent of threat not known
Outside site

Illegal collection of coco de mer nuts in Vallée de Mai has long posed a threat due to the high value of its nuts and kernels, with the total economic value of the species estimated at $2.89 million for 2018 (SIF 2019, 05). Poachers often climb the palms and cut off all infructescences with mature and immature nuts, an impact which appears to negatively affect reproduction in female trees for up to 3–5 years (Rist et al., 2010). Poaching primarily targets the kernel of both mature nuts, sold as an aphrodisiac in the Chinese medicine market, and of immature nuts, as a delicacy for local consumption (Kaiser-Bunbury et al., 2014a). Despite legal protection under Seychelles' law and international regulations, poaching still jeopardises the future of this iconic species and all that depend on it. Since 2014 a decline in poaching has been observed and the illegal collection of coco de mer nuts has substantially decreased due to increased surveillance by the management authority (SIF 2019, 04), but remains a long-term threat to the integrity of the site (IUCN Consultation, 2020).

▶ **Other Activities**

Data Deficient

(Management of the site causing unintended disturbance)

Inside site, extent of threat not known

The thick palm leaf litter of the Vallée de Mai is a hugely important part of the ecosystem and trampling/disturbance of this substrate is likely to have unpredictable effects on leaf litter fauna and possibly also nutrient recycling. Walking off-path through the Vallée de Mai by staff is controlled. More work needs to be done to raise awareness of and limit these impacts (IUCN Consultation, 2017).

▶ **Hunting and trapping, Other Biological Resource Use**

Data Deficient

(Wildlife trade)

Inside site, extent of threat not known
Outside site

There have been cases of illegal wildlife poaching observed, e.g. on the endemic giant bronze gecko in 2018. The endemic giant bronze geckos are regarded as "holy grails" amongst reptile collectors and are consequently being traded for thousands of Euros each, online and at international reptile fairs with an estimated more than 2% of the global population of this gecko poached in one year (Nature Seychelles, 2018). The wildlife trade also impacts the native fauna and flora by introduced 'pets' being competitors, but also carrying diseases as e.g. PBFD in introduced ringed-neck parakeets on Mahé (Fogell et al., 2018) as well as chytrid infection in the herpetofauna, which is a global problem and can pose a great threat to the native herpetofauna (Greenberg & Palen, 2019).

▶ Other

High Threat

(Small populations of endemic animals)

Inside site, throughout(>50%)
Outside site

Vallee de Mai is a small site supporting several unique animal species. Relatively little is known about the populations of most these species, including endemic reptiles, amphibians and molluscs. However, their presumably small populations makes them vulnerable to a variety of threats, including extreme climate events, fire, deomographic stochasticity and invasive species. This vulnerability became very clear during the recent outbreak of yellow crazy ant, when populations of endemic molluscs were visibly reduced. For example, the formerly abundant endemic slug was nowhere to be seen (IUCN Consultation, 2020). Strengthening the management of the surrounding areas of Lodoicea forest will be important for reducing the constant threat posed by small populations.

Potential Threats

High Threat

Forest fire is a high threat which can lead to loss of habitats and potential loss of the largest coco de mer population. Further wildlife trade poses a threat to endemic wildlife of the site, which needs urgent investigation.

▶ Fire/ Fire Suppression

High Threat

(Fire threat)

Inside site, throughout(>50%)

There is a high volume of fallen dry leaves from the palms in the site (a natural part of the ecosystem), thus the fire hazard is high. The risk is exacerbated by the public road crossing through the middle of the Praslin National Park which is adjacent to the site. Forest fire is a high threat which can lead to loss of habitats and potential loss of the largest coco de mer population. A firebreak around the perimeter of the site is maintained. An improved fire prevention and response plan has been developed in collaboration with the local fire brigade and been activated, and several fire drills have been organised. Furthermore, a corner for smokers visiting the site has been constructed in the open car park in 2018 and smoking is strictly prohibited elsewhere in the site.

▶ Hunting and trapping, Other Biological Resource Use

Data Deficient

(Wildlife trade)

Inside site, extent of threat not known
Outside site

Since the detection of poaching in the giant bronze geckos Ailuronyx spp. in 2018, other endemic wildlife could be at potential risk of illegal trade including other herpetofauna, birds, molluscs as well as endemic plant species. The wildlife trade also impacts the native fauna and flora by introduced 'pets' being competitors, but also carrying diseases e.g. PBFD in introduced ringed-neck parakeets on Mahé (Fogell et al., 2018) as well as chytrid infection in the herpetofauna, which is a global problem and can pose a great threat to the native herpetofauna (Greenberg & Palen, 2019).

▶ Droughts, Storms/Flooding

High Threat

(Catastrophes related to extreme weather)

Inside site, throughout(>50%)
Outside site

Climate change has a potential impact causing changes in seasonal rainfall patterns, which are likely to cause longer periods of drought leading to a greater risk of fire. Climate change may also lead to more storms and heavier rains which could result in soil erosion and falling trees. An automatic weather station installed at the Vallée de Mai allows SIF to monitor these changes. Extreme weather related to climate change can potentially be a cause of a drop out of breeding in black parrots as e.g. the last breeding season 2019 (IUCN Consultation, 2020).

Overall assessment of threats

High Threat

The illegal collection, plus the unsustainable harvesting of coco de mer nuts are the major pressures on the Vallée de Mai. The site's management, SIF, has implemented a coco de mer regeneration scheme, however the scheme cannot be promoted openly to better engage staff due to the risk of

poaching. Invasive alien species are a threat to the site's endemic fauna such as the Seychelles black parrot. Forest fire and climate change are high threats which can lead to loss of habitats and potential loss of the largest coco de mer population.

Protection and management

Assessing Protection and Management

▶ **Management system** **Some Concern**

The Vallée de Mai (19.5 ha) was declared a nature reserve in 1966 to protect the coco de mer. It was declared a World Heritage site in 1983 and the Seychelles Island Foundation has been responsible for its management since 1989 (Birdlife, 2013). The last management plan, adopted in 2002, was based on a management effectiveness assessment, with the time-frame until 2008 (SIF, 2008), but is now outdated. SIF is currently working on the new management plan (IUCN consultation, 2020). There is coordination between a range of administrative bodies/levels involved in the management of the World Heritage site, which has seen an improvement. The CEO of the Sychelles National Parks Authority is a trustee of the board of the Seychelles Islands Foundation. Local communities have some input into discussions relating to management but no direct role in management.

▶ **Effectiveness of management system** **Mostly Effective**

Although the management plan has expired, it was identified that management decisions are successfully going towards preserving and improving upon the site values. However the visitor management (particularly during peak times) needs improvement, whereas the data management system has been successfully updated with the help of an international data management expert (SIF, 2018a). Most important is, however, the compilation of a new Management Plan to steer management, measure progress and to build the basic structure of the follow-up actions identified (Ketterer, 2010). SIF now runs extensive education and outreach campaigns (Kaiser-Bunbury et al., 2014a), and a large number of scientific research programs have recently been carried out/are currently being carried out at the site. Invasive Alien Species management has been mainstreamed in the site management.

▶ **Boundaries** **Mostly Effective**

The current delimitation of the World Heritage site is thought to be adequate. Nevertheless, an extension of the reserve area to help curb coco de mer poaching in the immediate vicinity of the Reserve was recommended (Periodic Reporting, 2001). The extension to the site (Fond Peper area) has now been implemented, and boundary clarification adopted by the Committee in 2017 (World Heritage Committee, 2017). However, the boundary had previously been requested by the Committee to be extended to include the whole of Praslin National Park in order to ensure the natural functioning of the forest ecosystem and its integrity, and this has not been implemented yet.

▶ **Integration into regional and national planning systems** **Highly Effective**

The site is fully integrated and the whole of the reserve is mapped as a sensitive zone, which is legalised in the Environment Protection Act 1994. The site is additionally fully recognised and protected as a water catchment area.

▶ **Relationships with local people** **Highly Effective**

There are no residents inside or adjacent to the site due to the fact that the site is within the bigger 300 ha Praslin National Park (Seychelles, 2001). The site has good relationships with local people living on Praslin Island, and admission is free for local residents. Excellent education, communication and outreach programmes are implemented included annual holiday camps, information days and competitions for local school children, guided tours, and open days to raise awareness of coco de mer poaching, as well as using the visitor centre as an educational interaction with local people.

Furthermore, the first forum on 'Sharing Good Practice' on invasive alien species was successfully organiszed by SIF and included various stakeholders (SIF, 2018a). However, cooperation with the private sector, especially tour guides based at the site, is not satisfactory and their potential to assist with policing of the site and visitors is untapped despite the increasing numbers of tourists.

▶ Legal framework — Highly Effective

The World Heritage site is embedded within the Praslin National Park (300 ha). The site is legally protected under national legislation and is managed by a public trust, the Seychelles Islands Foundation (World Heritage Committee, 2010). An adequate legal framework for the maintenance of the Outstanding Universal Value including conditions of Integrity of the World Heritage site exists.

▶ Law enforcement — Data Deficient

Poaching of coco de mer nuts is still a big problem, and increased patrolling to deter poachers would be beneficial if more resources were available. In addition, the poaching of endemic wildlife for the pet trade raises concerns.

▶ Implementation of Committee decisions and recommendations — Mostly Effective

Capacity-building has substantially increased – a research team has been established and is led by a local graduate. Scientific research has greatly improved at the site - SIF carries out long-term research programs on-site, as well as collaborating with other universities and research bodies nationally and internationally. Computer facilities are now available on-site. Educational programs and public participation have further improved. An extension to the World Heritage site (Fond Peper area) has now been implemented (World Heritage Committee, 2017). However, the Committee requested the State Party to extend the boundary of the site to include the whole of Praslin National Park (300 ha) and this has not yet been met.

▶ Sustainable use — Data Deficient

Coco de mer nuts are harvested on-site for sale due to their high value. It was previously overharvested, with 99% of nuts taken out of the site, with only a handful left to germinate. Rist et al. (2010) recommended that 20% of nuts should be left in the forest to regenerate, to move towards sustainable management of the most iconic and flagship species, the national symbol of Seychelles. In response, a stewardship scheme commenced in 2012, whereby a greater proportion of nuts are left to regenerate in the forest (Kaiser-Bunbury et al., 2014a). The effectiveness of the scheme has been reviewed and the recommendations have been implemented. Other pressures such as from illegal harvesting to fill demand for coco de mer kernel represent significant additional threats (Rist et al., 2010). The extent of poaching across the Vallée de Mai and adjacent palm forest area continues to be assessed with a notable decline in poaching since 2014.

▶ Sustainable finance — Mostly Effective

The available budget is sufficient but further funding would enable more effective management to international best practice standard. The existing sources of funding are secure in the medium-term and planning is underway to secure funding in the long-term. Tourism provides the major sources of revenue, and the site is self-sustaining (Periodic Reporting, 2001).

▶ Staff capacity, training, and development — Mostly Effective

A range of human resources exist, but these are below optimum to manage the World Heritage site. Training has greatly improved at the site. A capacity development plan is in place and partially implemented; technical skills are being transferred from external staff to those managing the World Heritage site locally. Responsibilities have been transferred to local rangers, university graduates involved in scientific monitoring, management and human resources. Support is given to local staff to complete training and education abroad, temporarily, as well as ecological, natural history and statistical training on-site. However, the site is somewhat in competition with the tourism industry for

skilled staff, and tourism generally provides better employment conditions.

▶ Education and interpretation programs

Highly Effective

An outreach programme was initiated in 2009 (Friends of Vallée de Mai) which aims to bring all local schoolchildren to the Vallée de Mai to experience the site and learn about its values. SIF holds regular education and outreach events including annual camps, information days and competitions for local school children, guided tours, and open days to raise awareness of coco de mer poaching. A community stewardship scheme was launched in 2014 to promote the protection of palm forest, and the importance of tackling invasive alien species. The visitor centre ensures that education and awareness is a substantial part of the activities there.

▶ Tourism and visitation management

Mostly Effective

There is an average understanding and promotion of the site values in local and national tourism policies. There is limited co-operation between those responsible for the World Heritage site and the tourism industry to present the Outstanding Universal Value and increase appreciation. A visitor fee is collected and makes a substantial contribution to the management of the World Heritage site. Visitor services and facilities meet standards of design and safety, and are appropriate for the character and values of the protected area. However, the increasing numbers of visitors at the site will require management of visitor flow to reduce numbers of visitors during peak hours, which is mainly linked to transport availability. Regular patrolling is carried out to monitor and minimise the impact of visitors, but there is potential for cooperation with private tour guides based at the site to assist with policing. A visitor management strategy should be developed, especially since the site is highly dependent on the fees collected.

▶ Monitoring

Highly Effective

A phenology programme was started in 2008 to collect long-term data on plant species at the Vallée de Mai. In 2009 SIF launched a long-term monitoring and research programme. This has focused on the Seychelles black parrot, sooglossid frogs, giant bronze gecko and Seychelles chameleon, and has since been extended. The coco de mer long-term monitoring programme focuses on growth and reproductive patterns. Furthermore, effective monitoring of key values before, during and after Invasive Alien Species control has been implemented, e.g. a population estimate of the Seychelles black parrot population in 2018 and a herpetofauna and molluscs surveys in 2019, which accompany the yellow crazy ant control (SIF 2018b; SIF 2019a). Moreover, databases and protocols have been worked on and greatly improved. Analysis of existing data on phenology and possible links to fluctuating breeding activity of black parrots are currently being worked on. The presence of the chytrid fungus was assessed but undetected on the Frigate Island caecilian, Hypogeophis rostatus, in the Vallée de Mai and other places (Labisko et al., 2015).

▶ Research

Mostly Effective

Knowledge about the values of the World Heritage site is good for most key areas. Research into and control of yellow crazy ants was declared an emergency situation by the board and external funding has been secured to control and manage the invasion. After an initial trial without success resulting in a 100% abundance of yellow crazy ants at the site, a new strategy had been developed with current successful reduction of the abundance to 60% (SIF 2019, 12). A re-survey of black parrot and mynah bird populations was carried out suggesting a potential of of myna birds becoming a major threat to the site (SIF 2018b). There are several research programmes related to the site (SIF, 2013), and research results are widely shared locally, nationally and internationally.

Overall assessment of protection and management

Mostly Effective

Vallée de Mai’s protection and management to preserve the site’s key values is sufficient to maintain a stable conservation trend. There have been significant improvements in scientific research and site management capacity over the last eight years. The management authority has made important

changes to their strategies and use of science-based decision-making as a principle. There is a positive level of outreach to local communities, tourists and local tourism enterprises. A series of research studies conducted form a strong base for the site's managers to make informed, adaptive decisions. The levels of coco de mer commercial harvesting have been reduced. Management's responses to address illegal collection of nuts appears to have had a positive effect since 2014. A further focus should be given to the illegal wildlife trade, e.g. poaching of giant bronze geckos.

▶ **Assessment of the effectiveness of protection and management in addressing threats outside the site** — **Mostly Effective**

SIF, as well as being responsible for the Vallée de Mai, is responsible for the adjacent area of the Praslin National Park, Fond Peper. Coco de mer nuts are also commercially harvested from this area so a regeneration scheme in Fond Peper is being implemented though there is a greater difficulty in patrolling this larger area of forest.

▶ **Best practice examples**

The site offers one excellent example of best practice in conservation financing. The revenues from tourism fully fund the core management and protection of both UNESCO World Heritage Sites managed by SIF (Vallée de Mai and Aldabra Atoll), as well as benefiting local business and the community. The site also has a very effective education and outreach programme that involves and benefits the local community. Local and international researchers are working hand-in-hand including local nature conservation organisations sharing good practice.

State and trend of values

Assessing the current state and trend of values

World Heritage values

▶ **Scenic palm forest** — **Good** / **Trend:Stable**

The site remains a stable haven for many endemic and native species of fauna and flora. It has maintained its aesthetic, beautiful character as a remarkable and accessible example of a palm forest ecosystem (Ketterer, 2010).

▶ **An oustanding example of an ancient monodominant ecosystem** — **Good** / **Trend:Stable**

The site continues to support several unique species that have adapted to the unusual monodominant environment provided by the coco de mer forest (Edwards et al., 2015).

▶ **An outstanding example of biological evolution dominated by endemic palms** — **High Concern** / **Trend:Improving**

The palm species found in the area together constitute an ecosystem where unique ecological processes and interactions continue to occur. However, the key iconic species of the site, the coco de mer, is under threat due to illegal collection of nuts and its inability to regenerate naturally (Rist et al., 2010). With the implementation of the regeneration scheme 20% of the nuts are left in the forest. Furthermore, increased patrols seem to have lead to a reduction in poaching since 2014.

▶ **Endemic palm species** — **Good** / **Trend:Improving**

The endemic coco de mer Lodoicea maldivica, and other rare palms, including five other endemic species, continue to be preserved as an outstanding example of ancient palm forest (Ketterer, 2010).

This is the only site where these species co-exist and is one of the best preserved examples of palm forest globally (Rist et al., 2010). Previous surveys of the permanent sample plots have indicated an increase in palm density, although there is no available data from more recently.

▶ **Endemic animal species supported by the palm habitat** — **Good** — **Trend:Stable**

The small site remains a stable haven for many endemic and native species of fauna. Black parrots (Coracopsis barklyi) are probably the most important avian flagship species of the Vallée de Mai and the Vallée is thought to form the population's stronghold. The last parrot population estimate showed an estimate of around 1400 individuals (SIF, 2018b).

Summary of the Values

▶ **Assessment of the current state and trend of World Heritage values** — **Low Concern** — **Trend: Stable**

The overall values of Vallée de Mai are currently stable. Scientific understanding of its values has improved considerably over the last eight years. However, the key iconic species of the site, the coco de mer (Lodoicea maldivica), is under threat due to illegal collection of nuts reducing its ability to regenerate naturally. Invasive species pose another substantial threat to the site, as well as poaching of wildlife, such as geckos. Only under continuous management, the site can remain a stable haven for many endemic and native species of fauna and flora.

Additional information

Benefits

Understanding Benefits

▶ **Direct employment**

The site provides jobs to local islanders, and to Seychellois from other islands, from field staff through to upper management.

▶ **Outdoor recreation and tourism**

Vallée de Mai is visited by the majority of tourists that come to Seychelles and is a major tourist attraction for the country as a whole (SIF, 2009).

▶ **Importance for research**

The scientific value of the Vallée de Mai 's ancient palm forest ecosystem is substantial – it is an important area for scientific research into palm forest ecology, ecosystem functioning, evolutionary processes and new species discovery. Vallée de Mai serves as a training platform for young Seychellois scientists and environmentalists as they can be involved in international research and receive strong training in scientific methods, ecological monitoring, and natural history. They have opportunities to get involved in many types of monitoring and research and in all aspects from designing studies, collecting data in the field, to entering data. Many local and international university students carry out their research at Vallée de Mai annually.

▶ **Contribution to education**

The Vallée de Mai is now a major platform for education and outreach on Praslin and in Seychelles, with a continuous intensive programme for schoolchildren and other groups to learn about the natural environment, sustainability and the importance of Vallée de Mai in conservation of those endemic species, especially the unique coco de mer.

▶ Soil stabilisation

Vallée de Mai's forest provides the stability for the soil on Praslin Island as it is situated on the hillside of the island.

▶ Water provision (importance for water quantity and quality)

Vallée de Mai provides important watershed protection services for water retention and holding capacity which bring benefits directly to the local population. The stream ecosystem within the site is also an important habitat for endemic freshwater species such as the Seychelles crayfish.

▶ Provision of jobs

The site provides jobs and important sources of direct income (via selling of merchandise, cafeteria products, guided tours) to the Praslinois population.

▶ Tourism-related income

The site is an essential source of indirect income from tourism on Praslin, in terms of attracting tourists (many of whom would otherwise not visit the island or spend less time there; SIF, 2009) who then require accommodation, food & provisions, transport and other services.

▶ Sacred or symbolic plants or animals

The biodiversity of the site serves as a symbol and icon for the country and the tourism industry (coco de mer, ancient, monodominant palm forest). The site is also the stronghold site for the national bird, the black parrot and several other endemic species.

Factors negatively affecting provision of this benefit :
- Overexploitation : Impact level - High, Trend - Continuing
- Invasive species : Trend - Continuing

▶ Natural beauty and scenery

The property is a scenically attractive area with a distinctive natural beauty (SoOUV, 2010).

Summary of benefits

Vallée de Mai is the most visited natural attraction in the Seychelles. The revenue from tourism has brought direct financial benefits for the conservation and management of the area. Income from entrance fees and sale of coco de mer nuts has enabled Seychelles Island Foundation, the management authority of Vallée de Mai, to carry out conservation and protection work on the site (SIF Annual Report, 2008). The site delivers direct key benefits associated with higher tourist numbers to the Praslinois (the local population on Praslin). A recent internal report by SIF identified large economic benefits to the Praslinois population as a direct result of the presence of the site on Praslin (SIF, 2009). The site directly provides jobs and sources of income to the Praslinois population, as well as indirectly supplying income from tourism.
The Vallée de Mai is the finest remaining representation of a once dominating habitat on Praslin (coco de mer also grows more sparsely on Curieuse Island), providing a cultural and scientific base-line for a close-to-natural state of a once dominating habitat type and its associated fauna. One important benefit of the Vallée de Mai ecosystem is the delivery of ecosystem services (e.g. little soil erosion within the site, intact watershed dynamics of water retention and holding capacity) which directly benefits the Praslinois people. From a more regional and global perspective, the protection and preservation of the Vallée de Mai is of scientific and cultural importance. Much scientific insight has been generated by understanding ecological and evolutionary processes of this ancient palm forest. From a cultural point of view, the Vallée de Mai forest has been depicted on thousands of paintings and provided inspiration of much craftwork, for both of which exists a high demand globally.

Projects

Compilation of active conservation projects

№	Organization	Brief description of Active Projects	Website
1	Seychelles Island Foundation (SIF)	Ecology, genetics and conservation of the Seychelles black parrot: long-term research programme into the endemic Seychelles black parrot including population monitoring, breeding monitoring, blood sample collection for genetics, disease research and sexing, feeding ecology, and habitat suitablility surveys on other islands. Project has included four MSc theses to date. Results published internationally (Reuleaux et al., 2013; Reuleaux et al., 2014a; Reuleaux et al., 2014b). Recently elevated to full species status (Jackson et al., 2016). Population estimate repeated in 2018 after breeding season partly funded by 'Fond für bedrohte Papageien' FbP, Germany (SIF, 2018b).	
2	SIF	Life history and reproductive ecology of coco de mer: project aims to unravel the elusive reproductive system and life history of the coco de mer including identification of the main pollinator, determining growth rates, reproductive success and variation, and investigating age and longevity. The nutrient economy of the coco de mer was also studied (Edwards et al., 2015).	
3	SIF/ETH Zurich	Demographic and genetic processes underlying reproduction in Lodoicea maldivica, the largest-seeded plant in the world: PhD research carried out by student Emma Morgan, based at ETH Zurich, investigating genetic processes, genetic variation, seed and pollen dispersal, reproduction, and genetic sex determination and ratio of coco de mer palms. Results published internationally (Morgan et al., 2016; Morgan et al., 2017a; Morgan et al. 2017b; Morgan et al., 2020).	
4	DICE/ NHM/ local partners	A cutting-EDGE approach to saving Seychelles' globally unique biodiversity: a multi-partner project focusing on research and conservation of the Seychelles EDGE species (Sooglossid frogs, caecilians, sheath-tailed bats, black parrots, corals).	
5	SIF/Durrell Institute of Conservation and Ecology (DICE)	Amphibians on the EDGE: evolutionary relationships and conservation ecology of sooglossid frogs (Sooglossus sp): PhD research carried out by student Jim Labisko based at DICE, University of Kent, UK, looking at ecology, genetics, vocalisations, pathogens and IAS impacts on this endemic frog family (continuation of Mres research). Further genetic research on the sooglossid frogs revealed classification into island specific evolutionary significant units ESUs (Labisko et al., 2019).	
6	SIF/Natural History Museum, UK	Phylogeographic patterns and systematics of Seychelles caecilians. Results published internationally (Maddock et al., 2016).	
7	SIF	Monitoring and control of yellow crazy ant distribution patterns across the site in an emergency plan. Project aims to understand and control the threat by the recent invasion of this species, which covered 100% of the site in October 2018 and is now reduced to 60% (last survey in December 2019). Results published internationally (Kaiser-Bunbury et al., 2014b).	
8	SIF/Durrell Wildlife Conservation Trust	Giant bronze gecko (Ailuronyx trachygaster) movement patterns at the Vallée de Mai. The gecko species is one of the largest in the world, and is endemic to the native palm forest of Praslin. Research is ongoing, looking into territory size and movements, and whether individual geckos move frequently between coco de mer adult trees. Project has included two MSc theses to date.	
9	University of Vigo	The evolutionary history and geographic structure of the endemic Seychelles and Wright’s skinks (Trachylepis sechellensis and T. wrightii respectively) across the Seychelles inner islands. Results published internationally (Rocha et al., 2016).	
10	SIF	Coco de mer regeneration scheme. Incentive-driven stewardship scheme to reduce commercial harvesting via increased seed planting and monitoring.	
11	SIF	Pioneering a holistic approach in managing invasive species in protected areas and testing it in the Vallée de Mai UNESCO World Heritage site	

№	Organization	Brief description of Active Projects	Website
12	SIF	Invasive bird species eradication: Five eradications, three species, three islands: insights and recommendations from invasive bird eradications in the Seychelles. EU-funded project (project DCIENV/2010/220-252: “Mainstreaming the management of invasive alien species to preserve the ecological integrity and enhance the resilience of Seychelles World Heritage Sites”) implemented by SIF between 2011 and 2015. Later financial support for the ringed-necked parakeet eradication was provided by the Environment Trust Fund Seychelles and the Global Environmental Faculty. The red-whiskered bulbul and Madagascar fody eradications on Aldabra were initiated under an Emergency Assistance project funded by UNESCO. Results published internationally (Bunbury et al., 2019).	
13	SIF/ERDF	A project on Ailuronyx genetics. Data suggests an old (Miocenic) divergence of Ailuronyx spp. Study suggests the existence of cryptic diversity within Ailuronyx seychellensis, and, to a lesser extent, within Ailuronyx tachyscopaeus. Research was funded by European Regional Development Fund (ERDF), through ‘Programa Operacional Factores de Competitividade’ – COMPETE– and by national funds through FCT project PTDC/BIA_BDE/6575/2006 (to DJH). Results published internationally (Rocha et al., 2017).	
14	SIF/DICE	A project discovering Psittacene beak and feather disease virus (PBFD) on introduced ringed-neck parakeets Psittacula krameri on Mahé island. A high degree of phylogenetic relatedness between viral variants from geographically distant populations suggests recent introductions to the island, likely driven by global trade. Internationally published (Fogell et al., 2018). Psittacula krameri was eradicated from Mahé island in another project (Bunbury et al., 2019).	
15	SIF / The Natural History Museum, London / University College London / University of Wolverhampton	A new species of indotyphlid caecilian amphibian, Hypogeophis pti sp. nov., is described based on a series of specimens from the Seychelles island of Praslin . Research funded by NHM- UCL IMPACT studentship and by an award and from the Systematics Research Fund of the Systematics Association and Linnean Society of London. RAN’s Seychelles caecilian research was funded by grants from the U.S.A. National Science Foundation and the National Geographic Society. Work internationally published (Maddock et al., 2017).	

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