IUCN Conservation Outlook Assessment 2017 **(archived)**
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Please note: this is an archived Conservation Outlook Assessment for Aldabra Atoll. To access the most up-to-date Conservation Outlook Assessment for this site, please visit https://www.worldheritageoutlook.iucn.org.

Aldabra Atoll

SITE INFORMATION

Country:
Seychelles
Inscribed in: 1982
Criteria:
(vii) (ix) (x)

Site description:

The atoll is comprised of four large coral islands which enclose a shallow lagoon; the group of islands is itself surrounded by a coral reef. Due to difficulties of access and the atoll's isolation, Aldabra has been protected from human influence and thus retains some 152,000 giant tortoises, the world's largest population of this reptile. © UNESCO

SUMMARY

2017 Conservation Outlook

Good with some concerns

Aldabra Atoll is one of the most undisturbed island ecosystems in the world, home to several unique species whose populations thrive in this remote location. The threat posed by the many of the most concerning invasive animal species have been eliminated, and the removal of the main invasive plant species has nearly been completed. Plans are in place to control / eradicate the rats and cats, and a comprehensive new biosecurity plan has been prepared to limit new introductions. New high resolution maps of the atoll's marine and terrestrial habitats have been completed providing a solid baseline against which future changes in habitat status and extent can be detected. The long term monitoring programmes have been reinvigorated and new technologies adopted to streamline data collection and management processes. These smart technologies have reduced the overall costs of the monitoring programmes and increased the responsive capacity of managers. A new management plan and zoning plan has been prepared, which identifies key management strategies and actions. The proposed extension to Aldabra's marine boundary, which increases the size of the protected area to 2,559.019 km², has been submitted to and approved by Cabinet. The management team are now awaiting the preparation of the new national Protected Area Legislation in order to finalise these legal processes. The results of the habitat mapping and monitoring programmes are showing that habitats and populations of many flagship species are stable or increasing. With the implementation of biosecurity measures to prevent further invasions, the management plan to guide and help prioritise actions, the conservation outlook for Aldabra Atoll is currently very good.

Current state and trend of VALUES

Low Concern
Trend: Stable

The terrestrial and marine monitoring programmes are showing that most

habitats and species are generally in a good condition, and that populations of endemic or threatened species are either stable or improving. While the ecological integrity of the whole site is good and appears to be stable, there are differences in current state and trend of marine and terrestrial components of the site. The invasive mammals continue to pose the greatest threat to the status of terrestrial fauna. The high sea water temperatures and coral bleaching and mortality that happened in the past few years, have degraded the condition of the coral reef. Aldabra's coral reef is likely to recover from this event quicker than in other areas that are subject to other pressures (e.g. overfishing and pollution). Climate variability and change currently pose the greatest threat to marine ecosystems and the frequency of similar coral bleaching events is likely to increase in future years.

Overall THREATS

High Threat

With the considerable amount of effort that has been invested to tackle some of the more manageable threats (e.g. invasive species), and further mitigation measures being enacted (e.g. biosecurity plan, expansion of the marine boundaries), current and future potential climate variability and severe weather events are now becoming the biggest threat to the atoll's ecosystem and species. The analyses of long term rainfall patterns and sea and air temperatures are showing that changes have already occurred. Further modelling work is needed to help better predict the potential impacts of climate change on habitats and species.

Overall PROTECTION and MANAGEMENT

Highly Effective

SIF's management of Aldabra is extremely professional. Despite the atoll's remote location the site is well protected, legally and in practice. Protection of the marine areas around the atoll has improved in recent years through the presence of coast guard on the atoll. In addition to this: monitoring programmes have been revised and new technologies introduced to allow site managers to track progress and respond more quickly to any new concerns as they emerge. A new biosecurity plan and a new management plan, which includes a sustainable financing plan, has been prepared. These documents provide the updated

guidance needed to help SIF prioritise their activities to manage site values.

FULL ASSESSMENT

Description of values

Values

World Heritage values

▶ Geomorphology

Criterion:(vii)

Aldabra Atoll is overall one of the largest coral atolls in the world (Hillary et al. 2002) and one of only two raised coral atolls worldwide to not be heavily impacted by human activities. Aldabra Atoll consists of four main islands of coral limestone separated by narrow passes and enclosing a large shallow lagoon, providing a superlative spectacle of natural phenomena (World Heritage Committee, 2010). The lagoon contains many smaller islands and the entire atoll is surrounded by an outer fringing reef (World Heritage Committee, 2010). Geomorphologic processes have produced a rugged topography, which supports a variety of habitats with a relatively rich biota for an oceanic island and a high degree of endemism (World Heritage Committee, 2010).

▶ Terrestrial vegetation

Criteria:(ix)(x)

Aldabra is an outstanding example of an oceanic island ecosystem in which evolutionary processes are active within a rich biota (World Heritage Committee, 2010). Most of the land surface comprises ancient coral reef (~125,000 years old) which has been repeatedly raised above sea level (World Heritage Committee, 2010). The size and morphological diversity of the atoll has permitted the development of a variety of discrete insular communities with a high incidence of endemicity among the constituent

species (World Heritage Committee, 2010). Aldabra houses at least one currently unique, but potentially formerly widespread, habitat type, the tortoise turf. These relatively highly diverse grass-dominated areas are likely to be maintained due to the heavy grazing pressure exerted by the giant tortoises (Merton et al., 1976). Terrestrial habitats and vegetation types, have been mapped in last 5 years using high resolution satellite imagery. The vegetation mapping has indicated no significant change in the area of Aldabra's terrestrial vegetation (Walton, 2015).

► Freshwater and brackish pools

Criteria:(ix)(x)

There are 20 freshwater and brackish pools on the platin surface across the Atoll, which vary from shallow depressions holding water for only a few hours; a thin lens over saline pools; to pools that are permanent throughout the wet season (Cognan & Hutson 1971; SIF 2016). The largest pool is Bassin Flamant, which has a dry season diameter of about 300 m, but this and other pools increase in size during the wet season (Stoddart et al., 1971). The pools provide habitat for various algal species, crabs and fishes, and are an important source of food and water for tortoises, birds and land crabs. The recently completed habitat map includes freshwater pools as a habitat category which can be used for future monitoring (Walton, 2015). Endemic red shrimps, especially on Picard Island, are found in some of the pools.

► Sand beaches

Criteria:(ix)(x)

There are 50 beaches along the outer coastline of Aldabra Atoll, predominantly on the sheltered north and south west coasts. There are also various smaller beaches within the lagoon, interspersed between the mangroves. Sandy beaches are important habitat as they provide nesting areas for green and hawksbill turtles (Mortimer et al., 2011). Sand beaches are currently in a good condition although there is some erosion occurring on parts of Aldabra's largest beach, accumulation of marine debris is substantial in all areas but particularly on the south/east coastline, but sand deposits occurring elsewhere. Coral mortality following bleaching events may contribute to beach erosion and beaches are also susceptible to changing sea levels. Recent habitat mapping will help to assess and quantify long-term

trends.

▶ Intertidal mudflats

Criteria:(ix)(x)

Extensive intertidal mudflats fringe the inner edges of the lagoon on Aldabra Atoll, which have been estimated to cover a total area of 12.6 km2 (Hamylton et al. 2012). These are in good condition and apparently stable, and the populations of wading birds that use this habitat are stable (SIF, unpublished data, 2016).

▶ Mangrove communities

Criteria:(ix)(x)

The edge of Aldabra's lagoon is lined with extensive mangrove forests composed of seven species (Macnae, 1971). A study showed that Aldabra's mangrove communities have been stable and even increased slightly in the last 15 years (Constance, 2016).

▶ Seagrass and macroalgal communities

Criteria:(ix)(x)

Aldabra Atoll hosts large seagrass meadows both inside the lagoon and around the atoll., with the most abundant beds being found off Picard Island. Seagrass beds are an important functional habitat, whose roots stabilise the sediments and the leaf blades help filter water by slowing water currents and encourgaing finer particulates to settle. Seagrasses are also important primary producers and critical feeding habitats for dugongs and turtles (Hamylton et al. 2012, Mortimer et al. 2011), as well as acting as nursery grounds for many species of juvenile fishes, and hunting grounds for adults. Seagrass beds appear to be stable (SIF marine monitoring programme, unpublished data, 2016).

▶ Coral communities

Criteria:(ix)(x)

Aldabra Atoll is characterised by a shallow lagoon (40 metres deep). The reef supports a high coral coverage and numbers of coral species, with an estimated of 118 species (SIF, 2016). During the first global coral bleaching

event in 1997/1998, corals around Aldabra were subject to elevated seawater temperatures which resulted in coral mortality. During the third global coral bleaching event in 2015/2016, there was a 50% decline in hard and soft coral cover; the marine monitoring programme, which started in 2012 will continue to track the recovery of the reef after this event (SIF, unpublished data, 2017).

► Marine water quality

Criterion:(ix)

Due to the isolation of the island, there are few direct anthropogenic pressures affecting the quality of water. There is localised sewage leaching from the research base septic tank although this is low levels and believed to be insignificant (SIF, 2016). Marine water quality is believed to be stable (SIF, unpublished data, 2016).

► Aldabra giant tortoises

Criterion:(x)

Aldabra hosts the largest extant population of giant tortoises worldwide (~100,000 animals) (World Heritage Committee, 2010). Giant tortoises of many taxa were widespread, in high densities, on islands around the world until humans arrived and exterminated them – directly, or via introduced predators (Hansen et al., 2010). Aldabra remains one of only two places in the world where giant tortoises survive (the other being Galapagos, which currently hosts a much lower density of giant tortoises per km2) and the last remaining place among the Indian Ocean islands. The tortoise population is entirely self-sustaining: all the elements of its intricate interrelationship with the natural environment are evident (World Heritage Committee, 2010). Aldabra thus emerges as the last place in the world, where the evolutionary ecology of giant tortoise – plant interactions can be studied (World Heritage Committee, 2010). Long-term monitoring data indicate that the Aldabra giant tortoise population has remained stable over the past 15 years (Turnbull et al., 2015).

► Landbirds

Criterion:(x)

The property is a significant natural habitat for birds, with three endemic

landbird species, including two extant species (Aldabra drongo and Aldabra fody) and one species presumed extinct (Aldabra Brush Warbler). The Aldabra fody was only recently confirmed as a separate species by SIF staff (Van de Crommenacker et al. 2015a). There are another ten distinct subspecies of landbird, amongst which is the White-throated rail, the last remaining flightless bird of the western Indian Ocean. Long term monitoring of seven landbird species found populations to be either increasing (6 species) or stable (1 species, the Aldabra drongo) between 2002 and 2014, showing an overall stable trend (Van de Crommenacker 2015b). The Aldabra rail has expanded its re-introduced population size on Picard island to greater than the predicted carrying capacity on the island (Sur et al. 2013).

► Other terrestrial fauna

Criterion:(x)

There is rich aquatic insect fauna on Aldabra Atoll in comparison with other island groups, due to the high variability in chemical and biological conditions of the freshwater pools (SIF 2016). There are 11 species of land crabs on Aldabra Island, including three types of hermit crabs (SIF 2016). Aldabra’s coconut crab (Birgus latro) population has been monitored twice monthly since 2006 and although there are seasonal changes in abundance, the population is stable (SIF, pers. comm.). There are three known species of lizards on Aldabra Atoll; a skink (Cryptoblepharus boutonii), and two gecko species (Hemidactylus mercatorius, LC and Phelsuma abbotti LC), the latter being emdemic to the Aldabra Atoll. The population status is understood to be stable (SIF 2016). Bats are the only mammals native to Aldabra Atoll and there are four species, three of which are endemic to the atoll. There is no trend data is available for other terrestrial species (SIF, unpublished data, 2016).

► Sea and shorebirds

Criterion:(x)

There are vast waterbird colonies including the second largest frigatebird colony in the world and one of the world's only two oceanic flamingo populations (World Heritage Committee, 2010). Aldabra also contains a population of the endangered Madagascar Pond-heron (Bunbury, 2014), which is in decline in most other parts of its range. Monitoring shows that

population of seabirds are stable or increasing. The annual frigatebird census indicates stable or increasing numbers of both species (with substantial year-to year fluctuation) with 6,000 pairs of lesser frigatebird (Fregata ariel) and, 4,000 pairs of great frigatebird (Fregata minor) (Šúr et al. 2013a). Tropicbird nest monitoring shows no decline in numbers of nests in last 7 years although nesting success is among the lowest recorded for the species, surveys are needed for other species (e.g. red-footed boobies). Wading bird populations are seasonal but stable (SIF, unpublished data, 2016).

► Marine turtles

Criterion:(x)

Aldabra is a highly significant breeding ground for green turtles (Chelonia mydas, EN) and it also hosts a small population of breeding hawksbill turtles (Eretmochelys imbricata, CR) (World Heritage Committee, 2010). The atoll is also an important feeding ground for both species and for occasional loggerhead turtle (Caretta caretta, VU), which occur in the area but do not breed on the atoll. Aldabra Atoll is the largest rookery in the western Indian Ocean for green turtles. Last published data to 2008 showed a 500-800% increase in nesting green turtles over a 40-year period (Mortimer et al. 2011). Numbers of green turtles have continued to increase at the same rate since then (SIF, unpublished data). While green turtles tend to nest on the sand beaches on the outer edges of the atoll, the critically endangered hawksbill turtles nest primarily on beaches inside the lagoon (SIF 2016).

► Marine mammals

Criterion:(x)

Aldabra hosts various species of marine mammals at different times throughout the year, which include humpback whales and dugong. Aldabra’s dugong population is the only one remaining in Seychelles, and one of the few remaining in the western Indian Ocean region. The dugong population appears to be larger than initially thought, with at least 14 individual animals counted in one partial survey of the lagoon (SIF, unpublished data, 2013). The increased frequency of sightings indicate that Aldabra’s dugong population is increasing (SIF Newsletter August 2016). Furthermore, several observations of female dugongs with juveniles in Aldabra’s lagoon suggest that the site plays an important regional role as a dugong breeding/nursery

area (SIF Newsletter August 2016). Further research into the dugong of Aldabra is needed.

► Fishes

Criterion:(x)

The coral reef surrounding Aldabra host a wealth of marine life with exceptionally high abundances of reef associated fishes and pelagic species, including many threatened species of bony fishes and elasmobranchs. The marine monitoring programme, which started in 2012/2013 introduced the use of Baited Remote Underwater Videos (BRUVs). The BRUVs have since been used to record fish community composition and abundances around the atoll. The cameras have detected high abundances of threatened shark species, such as hammerheads, and giant groupers. Results of the monitoring programmes indicate that fish populations are exceptionally high in comparison to other locations within Seychelles and the wider region, and populations are increasing (SIF marine monitoring programme, unpublished data). This was also confirmed by National Geographic Pristine Seas team expedition in 2015, which estimated fish biomass in the near shore waters surrounding Aldabra to be 5 tonnes per hectare, more than ten times the fish biomass found in the Seychelles inner islands (Pristine Seas, 2015).

► Marine invertebrates (other)

Criterion:(x)

The coral reef surrounding Aldabra host a wealth of marine life with high abundances of other types of marine invertebrates (e.g. echinoiderms, gastropods, crustaceans etc.). There is limited information available to date and further more in depth research is required.

Assessment information

Threats

Current Threats

High Threat

Several of the invasive species that previously threatened Aldabra's unique flora and fauna have been eradicated in recent years. The feral goats were removed in 2012, the two recently introduced invasive bird species were eradicated in 2016 and the island is nearly free from sisal, the main invasive plant species in 2017. The neighbouring island of Assumption was also declared free from the invasive bird species, further reducing the likelihood of imminent reintroduction (although these two species are present on other islands in Seychelles). The remaining invasive mammal and plant species still pose a threat, particularly with regards to the rats which may prove extremely difficult to eradicate. Marine litter remains an ongoing challenge as does illegal fishing. Marine litter is being addressed through regular cleanups on Aldabra's more accessible sand beaches, but the rubbish accumulating on more remote inaccessible beaches is a concern. The threat of illegal fishing is being addressed by an increase in the marine boundary delimitation, by the presence of coast guard on the island as well as by increased surveillance capacity and activities at the national level and within the wider region. The results of terrestrial and marine monitoring programmes and analyses of archive datasets, such as seawater temperature and rainfall data, are revealing that changes have already occurred on the atoll (e.g. coral bleaching). With the efforts that have been invested in tackling the invasive species and other threats now being mitigated for (e.g. introduction of new invasive species), climate related threats are becoming more prominent as the main threats to Aldabra's terrestrial and marine ecosystems and flora and fauna.

▶ Invasive Non-Native/ Alien Species, Hyper-Abundant Species

High Threat
Inside site, throughout(>50%)
Outside site

Cats and rats are the two remaining invasive mammal species that currently pose the greatest threat to Aldabra after the feral goats were successfully eradicated in 2012. Cats and rats are highly invasive species and problematic on tropical islands around the world. Research into rat abundances and impacts on Aldabra (Harper et al. 2015, Harper and Bunbury 2015) found

particularly high abundances of rats in the mangrove habitats, where they grow larger, survive for longer, have larger litters and longer breeding seasons compared to rats in other habitats (scrub and coastal habitats). Rats are having impacts on seabirds, landbirds, small reptiles, plants, invertebrates and turtle and tortoise nests through egg predation. Research into cats on Aldabra found that they are not particularly abundant but their main prey is turtle hatchlings, rats, small reptiles and invertebrates. The cats that are found on the largest island of Aldabra, Grand Terre, may be responsible for the absence of frigatebirds on that part of the atoll, and their presence prevents the reintroduction of Aldabra rails, which would improve the prospects for this species. The eradication of these two species remains a priority (SIF 2016). The results of the rat ecology research indicates that eradication will be particularly challenging due to the high abundance of this species mangrove habitats. Since the last report, a comprehensive biosecurity plan for Aldabra has been developed, which includes a risk assessment, identification of invasive species pathways and a step-wise approach to implement effective biosecurity measures for Aldabra at all levels. The biosecurity plan has only been partly implemented to date due to financial and logistical constraints. Further biosecurity measures will help support all ongoing eradication programmes and prevent other new species, such as the myna bird, yellow crazy ant, and African land snail, known to be invasive elsewhere in Seychelles, from being introduced.

► Water Pollution, Household Sewage/ Urban Waste Water

Low Threat
Inside site, localised(<5%)

Due to the isolation of the island, there are few direct anthropogenic pressures affecting marine water quality. There is localised sewage leaching from the research base septic tank although this is low and believed to be insignificant (SIF 2016). There is a risk that the amount of waste water being released into the marine environment may increase if more tourist boats are to visit the island again.

► Invasive Non-Native/ Alien Species

Low Threat
Inside site, scattered(5-15%)

In 2012, during Aldabra’s outer reef mapping project, an encrusting sponge

identified as Terpios hoshinota was observed at high densities on the coral reefs around the atoll (R. Klaus, pers. obs). This sponge has caused massive and rapid coral mortality in other parts of the world. T. hoshinota grows rapidly and widely and can outcompete hard corals. It also releases compounds that are toxic to other reef organisms. Once the sponge has colonized an area of the reef it can last for over a decade, dominating the reef bottom and preventing the recruitment of juvenile corals. The cause of these ’outbreaks’ is still unknown, although pollution, coastal development and other human activities such as boats and shipping have been implicated. A monitoring programme for this species was started, and surveys are ongoing.

► Tourism/ visitors/ recreation

Low Threat
Inside site, localised(<5%)

With the drop in piracy in the western Indian Ocean region over the past few years, there is now a likelihood that more tourist boats will want permission to visit Aldabra. Moorings have been installed in four locations in the protected area in the past (two in front of the field station, one in front of Passe Gionnet and one in front of the East Channel, Passe Houareau). Only one small vessel mooring in front of the field station is currently operational (SIF 2016). If tourism demand increases in the protected area, there is a designated anchoring area in the vicinity of the field station, over a sandy rubble bottom, which should minimise impacts to coral (SIF 2016).

► Temperature extremes

Very High Threat
Inside site, throughout(>50%)
Outside site

Aldabra was subject to coral bleaching during the first global mass coral bleaching event in 1997/1998 (Soutier et al. 2000; Stobart et al. 2005). The recently updated marine monitoring programme on Aldabra detected more recent changes in the status of the coral reef. The results of seawater temperature monitoring revealed that temperatures were higher than normal over the past few years, leading up to 2016, during which there were excessively high temperatures that were sustained for several months. These conditions occurred during the third global mass coral bleaching event and

resulted in bleaching and subsequent mortality around Aldabra. Seawater temperatures at 15m depth were above average for a long period of time, reaching a maximum of 36.2oC in April 2016, which is close to 5oC above the maximum temperatures recorded in other years. Between 69-99% of all coral colonies bleached in 2016 and coral cover declined by 50% between 2014 and 2016 (SIF Newsletter December 2016). The highest overall coral cover remaining was ca. 23-28% at two sites within the lagoon. These sites also had the highest cover of coral recruits and the highest proportion of herbivores in relation to total fish abundance on shallow surveys across all survey sites (SIF Newsletter February 2017). While the signs of recovery are promising, it will probably take between 5 to 10 years for hard coral cover to return to previous levels, and this assumes there are no further mass coral bleaching events in the intervening years.

► Droughts

Low Threat
Inside site, throughout(>50%)
Outside site

Aldabra's terrestrial vegetation is being impacted by changes in rainfall patterns and increased drought frequency, which could also pose a threat to the giant tortoise population (Haverkamp et al., 2017). Analysis of the long-term monthly rainfall data between 1969 and 2013 revealed that rainfall has declined and the average number of drought months per annum has increased three-fold, from an average of two to six drought month per annum. Open mixed scrub and grasslands, the preferred habitats of tortoises, showed the greatest variation in response between drought and non-drought months. In the short term, tortoises could be impacted by a reduction in the quality and quantity of food and shade available, and in the long term by changing habitat composition on the atoll (Haverkamp et al., 2017). A reduction in rainfall and increased droughts could also impact other types of vegetation such as the mangrove communities and other terrestrial fauna.

► Fishing / Harvesting Aquatic Resources, Poaching

Low Threat

Inside site, widespread(15-50%)
Outside site

No fishing is permitted around Aldabra apart from in the specified subsistence fishing zones, which can only be fished by SIF staff to feed the staff on the research base (SIF 2016). Surveillance and enforcement of the marine environment of Aldabra is a challenge given the remote location and large area that needs to be patrolled and there have previously been reports of poaching. In 2015, staff based on the atoll reported the presence of two unidentified vessels in the waters around Aldabra, one August and another in October (SIF Newsletter October 2015). On both occasions, the Seychelles Coastguard were asked to carry out additional air and sea patrols. After these events it was agreed that members of the Seychelles Coast Guard would be stationed on Aldabra on a full time basis, to allow for a timely response to any illegal activities that are sighted in Aldabra's waters. The collaboration with the Seychelles Coast Guard has increased the frequency of boat patrols and will assist in safeguarding Aldabra's pristine ecosystem from any illegal activities (SIF Newsletter October 2015). Subsistence fishing for Aldabra residents was previously unrestricted although there was a risk that this could cause localised depletion of targeted fish (SIF 2016). To address this subsistance fishing activities have since been restricted to specific zones around the atoll (SIF 2016). Subsistence fishing activities are included as part of the regular monitoring programmes carried out by staff. Collection and entry of subsistence fishery data has recently been streamlined, using a custom built cybertracker application loaded onto a hand held Trimble GPS. The device allows data collectors to record the location where each individual fish is caught, along with other information, which are then easily downloaded and ready for analysis (SIF Newsletter July 2015). A new Fishing App has also been developed to allow for the instantaneous visualization of the collected data (SIF newsletter October 2016). Illegal fishing activities remain a threat to the marine ecosystem and regular surveillance and enforcement patrols need to be maintained and eventually upgraded, especially once the marine boundaries have been increased.

► Invasive Non-Native/ Alien Species

Low Threat

Inside site, widespread(15-50%)
Outside site

There are several plant species on Aldabra that are known to be invasive, including: sisal (Agave sisalana), Casuarina (Casuarina equisetifolia), and herbs such as the Madagascar periwinkle (Catharanthus roseus) and the porterweed (Stachytarpheta jamaicensis). The latter two species are able to dominate low ground vegetation and are not grazed by tortoises. Casuarina is highly invasive in many places, and is believed to have been planted and now thought to be invading Ile Picard and Middle Camp on Ile Malabar. Since the last report, a sisal eradication programme, was started in 2014 (SIF Newsletter, November 2014). The eradication programme started by testing different methods to kill these plants. The most effective method was to remove the central growth ring before applying a herbicide. The largest and densest of the three stands treated was at Ile Michel, a small island inside the Aldabra lagoon, where 2500–3000 plants were treated. Plants have continued to be treated and Aldabra is near to being declared sisal free (SIF Newletter June/July, 2016). Further research is needed to assess the magnitude of impacts of the other introduced plant species, and decide on control/eradication efforts (WHOA 2014).

► Solid Waste

Low Threat
Inside site, throughout(>50%)
Outside site

Aldabra is remote place but the beaches are often inundated with marine litter, reflecting the increase in this problem within the region and at the global scale. Low lying parts of the coastline are affected by marine litter and other debris brought in by the tide (plastics, fishing nets, rope, buoys, glass bottles, flip flops, drinks cans etc.). The amount of litter arriving on different parts of the island varies depending on monsoon season. Regular clean-up activities are carried out on the sandy beaches around the atoll, particularly those visited as part of the regular turtle monitoring activities. Marine litter can however accumulate in other less frequently visited parts of the atoll. Clearing the more inaccessible areas would require additional sources of external funding. The trash poses a threat to wildlife that use the beaches (e.g. turtles, seabirds and waders), as they may consume or become entangled in the litter that washes up on the beaches. The litter can also

spread inland and affect coastal grasslands, the favoured grazing areas for giant tortoises. Marine wildlife on the coral reef and in the pelagic zone are also at risk. Lost fishing gear, line and nets including the nets attached to drifting fish aggregating devices (FADS) for example, can become caught on the reef and cause breakages of the coral (pers. obs.). Fishes, turtles, and marine mammals may also be affected.

Potential Threats

High Threat

The risk of new potentially invasive species being introduced to the atoll (e.g. crazy ants) is being addressed through the implementation of a new biosecurity plan. Even though the biosecurity plan has only been partially implemented to date, work is ongoing to fully realise the plan with support from a new project. The potentially devastating impacts of climate change, particularly the impact of coral bleaching, and severe cyclonic storms have proven as a stark reminder of the potential damage that could be caused in the future. Warming sea water temperatures, sea level rise and ocean acidification and severe storms could all cause serious damage to Aldabra. Further assessment of the potential impact of climate change on Aldabra’s ecosystem and biodiversity, including modelling exercises to assess possible climate driven changes in habitats, as well as species focused predictions on the reproductive biology and demography (sex ratio) of sea turtles and giant tortoises for example, are now needed as these may help anticipate additional management interventions.

▶ Invasive Non-Native/ Alien Species

Low Threat
Inside site, extent of threat not known
Outside site

Aldabra has now reclaimed the title as the largest tropical islands free from invasive birds (SIF Newsletter, March 2017). In 2012, two invasive alien bird species, the red-whiskered bulbul and Madagascar fody, were discovered on Takamaka, during the goat eradication campaign (Bunbury et al 2013a,b). These species posed a major threat to native bird populations through competition for food, disease transmission hybridisation (Roberts 1988). Genetic research showed that the Madagascar fody (Foudia

madagascariensis) had begun to hybridse with the Aldabra fody (Foudia eminentissima aldabrana). The eradication campaign took 3 years to complete, and was implemented at the same time as an campaign on the adjacent island of Assumption, which was suspected to be the original source of the invasive birds. As Assumption is situated only 27km from Aldabra, it was considered critical that both species were eliminated simultaneously from both islands in order to lessen the likelihood that Aldabra would be invaded again. After several follow up missions, Assumption was declared free from both invasive bird species in January 2017 and Aldabra was declared free from both species in March 2017 (SIF Newletter, March 2017). Both bird species are still present on other islands in the Seychelles so the risk of reintroduction remains, but it is now considered to be much lower than before.

► Temperature extremes

High Threat
Inside site, throughout(>50%)
Outside site

Changes in air and sea water temperatures may result in further changes in the terrestrial and marine ecosystems and associated flora and fauna. Climate-driven changes are already impacting the coral reef and may impact vegetation ecology, with impacts that then cascade through the ecosystem (e.g. plant-animal interactions, such as herbivory, pollination, seed dispersal) and as yet unquantified impacts on the associated flora and fauna.

► Shipping Lanes

High Threat
Outside site

Aldabra atoll is situated very close to the major shipping lane along the east African coast, and there is a potential risk of collisions and oil- or chemical spills. While the risk is small, the potential for damage is great. There is a 30 NM oil tanker avoidance area around Aldabra. A new lighthouse was installed on the atoll in 2012 to help mitigate the risk of collisions and spills. An extension to the boundary of the MPA has been submitted to government and Aldabra could also be designated as an International Maritime Organisation Particularly Sensitive Sea Area.

▶ Habitat Shifting/ Alteration

High Threat
Inside site, throughout(>50%)
Outside site

Sea level rise has the potential to directly impact and result in the loss of all low lying habitats around the atoll. This could result in a loss of critical habitats such as beaches, mudflats, mangroves, coastal grasslands, with implications for associated flora and fauna.

▶ Storms/Flooding

High Threat
Inside site, throughout(>50%)
Outside site

Seychelles is situated outside the cyclone belt in the Indian Ocean. However, as the global climate continues to change, sea water temperatures continue to rise, weather patterns across the wider region are likely to become more unstable, and other climate hazards, such as cyclones, may also pose a threat. In April 2017, cyclone Fantala destroyed infrastructure and vegetation the island of Farquhar. Fantala was the strongest cyclone on record in the south-west Indian Ocean, matched only by cyclone Agnielle in November 1995. The damage to Farquhar was a stark reminder of the vulnerability of Seychelles' outer islands. In 2016, a cyclone shelter was constructed on Aldabra to provide refuge to research staff on the island.

▶ Invasive Non-Native/ Alien Species

High Threat
Inside site, throughout(>50%)

The potential risk of marine or terrestrial invasive species being introduced to the atoll (e.g. crazy ants, African landsnail, myna) is being addressed through the implementation of a new biosecurity plan. Even though the biosecurity plan has only been partially implemented to date, work is ongoing to fully realise the plan with support from a new project.

▶ Ocean acidification

High Threat
Inside site, throughout(>50%)

Outside site

Marine organisms are highly susceptible to changes in ocean chemistry. The ocean currently absorbs approximately half of the CO2 produced by burning fossil fuel. When CO2 dissolves in seawater it forms carbonic acid, and as more CO2 is taken up by the ocean, the pH decreases becoming more acidic. Ocean pH has already decreased by about 30%; by 2100 it is predicted that ocean acidity will increase by about 150%. Such a monumental shift in basic ocean chemistry will have implications for ocean life, especially for those organisms that require calcium carbonate to build shells or skeletons. Ocean acidification thus poses a potentially high threat to many forms of marine life globally from plankton to corals to fishes and other megafauna.

Protection and management

Assessing Protection and Management

► Relationships with local people

Highly Effective

Seychelles Islands Foundation (SIF) runs various activities throughout the year to engage and inform Seychellois about Vallee de Mai and Aldabra, and has a monthly newsletter, a website, facebook page, and twitter account. The outreach activities also includes an school competition, the winner of which gets to visit Aldabra. SIF is also planning to construct a building on Mahé, called Aldabra House. The building will serve as the SIF headquarters and as a visitor attraction featuring outdoor and indoor exhibits, displays and activities designed to recreate the magic of Aldabra (SIF 2016). Aldabra House could provide opportunities to generate revenue for Aldabra’s management through merchandise, entry fees etc.

► Legal framework

Mostly Effective

The Aldabra Atoll Special Reserve was declared under the National Parks and Nature Conservancy Act 1969. A review of the protected areas legislation resulted in the preparation of the Seychelles Protected Area Policy (2013), which stated that the current suite of legislation and regulations that directly

or indirectly apply to protected area management are mostly out of date, incomplete and sometimes contradictory. This led to a new Protected Areas Act (2017). There is now a need to update the following (SIF 2016):
• Gazette the protected area as a strict nature reserve and ecological reserve under new Protected Area Legislation when that legislation is enacted.
• Ensure that the necessary legislative mechanism is in place to implement zoning of the ecological reserve.
• Ensure that necessary orders under other relevant legislation are in place to give effect to management arrangements in the protected area (e.g. fisheries and wildlife protection notices).
• Investigate the designation of Aldabra Atoll as an International Maritime Organisation Particularly Sensitive Sea Area (PSSA).
• The management plan also included recommendations to update / develop policies pertaining to management of the protected area and review these policies on a three yearly basis, including but not restricted to:
• Biosecurity manual and protocols
• Tourism Policy
• EMS policy
• Piracy emergency response policy
• Human resource policies and procedures
• Staff training programs/needs assessment
• Research policy and procedures
• Sustainable financing strategy
• Requisition protocol
• Oil spill contingency plan

► Enforcement

Mostly Effective

SIF have now partnered with Seychelles Coast Guard. Since 2015, coast guard has staff based on Aldabra on a full time basis, which has improved their ability to respond quickly to potential illegal activity in the area and increased the number of surveillance patrols. With an increase in the boundary of the MPA additional measures may need to put in place to enforce the boundary, which could involve the use of remote surveillance technology.

► Integration into regional and national planning systems

Highly Effective

SIF is an active partner in several national and regional planning programmes. SIF were active participants in the UNDP/GEF funded Protected Areas through NGO Modalities project. One component of that project explored the potential to expand the terrestrial and marine protected area boundaries to meet with CBD targets and the Seychelles government commitment to achieve 30% protection on land and in the sea. SIF has also been actively participating in the follow on project, which is UNDP/GEF initiative and now TNC led project to develop a Marine Spatial Plan for the Seychelles entire Exclusive Economic Zone (EEZ).

► Management system

Highly Effective

The original management plan (Beaver & Gerlach 1998) has now been replaced by a new management plan, prepared last year (SIF 2016). The new plan provides site managers with clear guidance on the key management strategies and identifies the priority actions needed to effectively manage and maintain values. The outer boundary of the marine area has been expanded, the boundary extension submitted to and accepted by cabinet.

► Management effectiveness

Highly Effective

The permanent manned research station on Aldabra ensures timely implementation of all monitoring and management decisions (SIF 2016). In addition to this, management effectiveness assessments have been completed for Aldabra as these are a requirement of GEF (Global Environment Facility) funded project.

► Implementation of Committee decisions and recommendations

Data Deficient

N/a

► Boundaries

Highly Effective

The whole of Aldabra atoll is included within the boundary of the site, and the marine boundary extends from the mean high water mark to 1km offshore. A proposed extension to the size of the protected area will be a square boundary that approximates the 3km depth contour line and increase the size of the protected area to 2,559.019 km². The proposed boundary extension has been approved by Cabinet and the legal processes to gazette this under the National Parks and Conservancy Act 1969 were underway. This process is now likely to be completed as part of the process to amend the Protected Area Legislation.

► Sustainable finance

Some Concern

Aldabra is situated 1000km from the inner islands, and basic operational costs (e.g. transferring staff, equipment and supplies) are therefore very high. Aldabra is part-financed by entrance fees for the SIF-managed UNESCO World Heritage site Vallée de Mai on Praslin and by external project funding. While the Vallée de Mai generates a substantial fairly consistent income stream for Aldabra, project funding is much less predictable. So as previously reported (WHOA 2014), the current funding situation outlook for Aldabra is adequate, but vulnerable. Funding is at least in part dependent on the number of international tourists visiting the Seychelles and the Vallée de Mai. An economic recession or any adverse event affecting the Vallée de Mai (a fire for example) could jeopardize this source of income. The installation of a decentralized photo-voltaic system in 2012, in combination with a switch to energy-efficient appliances and a new environmental management protocol, substantially reduced operational costs as the permanent research station is now 97% self-sufficient in its energy requirements (Quartz et al, 2013). SIF has now prepared a sustainable financing plan as part of the management planning process (SIF 2016). While this part of the document has not been seen by the assessor, it is assumed that it includes a more diverse selection of potential funding streams. One of these additional sources is likely to be Aldabra House, the visitors centre that SIF plans to construct on Mahé. Another possible source is likely to be entrance fees, as given the alleviation

of the threat of piracy more tourists are likely to want to visit the island.

► Staff training and development

Mostly Effective

Staff facilities on Aldabra are excellent and even though the site is remote SIF makes every effort to provide training, led by experts in the field or by the scientific coordinator. For example, this year the staff have been participating in a Massive Online Open Course (MOOC) in biodiversity and climate change based at the University of Zurich, providing university level information and mentorship by top level scientists. This is complimented by on-site training by Aldabra's Scientific coordinator. Staff members have also been being asked to present on a topic of their choice, building their confidence in public speaking and expanding everyone's knowledge on the selected topics. Staff are given exams every two weeks, to ensure competency in species identification for high quality data collection (e.g. plant species identification). One of the main problems that SIF encounters is that given the remote location of the atoll it can sometimes be difficult to retain staff. Although not ideal, establishing a rolling system of staff training, as is being implemented, is one way to address this issue.

► Sustainable use

Mostly Effective

Subsistence fishing for Aldabra residents could easily cause localised depletion of targeted fish even though the numbers of staff based on the island is low (SIF 2016). Fishing activities have now been restricted to specific zones around the atoll (SIF 2016). The fishing activities are monitored by staff to help ensure that localised depletion does not occur. Collection and entry of subsistence fishery data has also recently been streamlined to enable site managers to respond more quickly to any concerns.

► Education and interpretation programs

Highly Effective

SIF has dedicated outreach staff that ensures a high visibility of Aldabra in the Seychelles’ society and beyond. The Visitor’s Centre at Vallée de Mai has improved people’s knowledge of the management link mentioned above. Since 2012, SIF has launched a monthly e-newsletter, a popular Facebook

profile and a Twitter page, in addition to regular newspaper and magazine articles. All of these forums have helped to increase the visibility of Aldabra. In addition to this SIF runs a regular schools competition the winner of which gets to visit Aldabra.

► Tourism and visitation management

Mostly Effective

Aldabra Atoll has huge potential as an ecotourism destination. The designation of the Atoll as a World Heritage Area has further enhanced the protected area's marketability. Tourism on Aldabra is restricted to day-time visitors from boats mooring outside the reef of the research station and there are strict visitor protocols. When visiting the protected area, tourists can participate in wildlife viewing, snorkelling and SCUBA diving. The remoteness of the Atoll and the cost to get there have been the main factors limiting factors for tourism development, as well as the threat of piracy between 2009 and 2013. With the piracy under better control, there is the potential for ecotourism to expand, but also the potential for introducing other threats, such as increased damage to the coral reefs through indiscriminate anchoring, disturbance of the terrestrial flora and fauna, fishing, and the introduction of non-native species etc. The management plan provides guidance for site managers on how to mitigate these issues and ensure that site values are maintained (e.g. new protocols for marine ecotourism).

► Monitoring

Mostly Effective

Terrestrial and marine monitoring programmes are carried out according to annual workplans and undertaken by staff at the research station. Monitoring programmes cover key species, habitats and ecological processes on the land (e.g. flowering plant phenology, landbird and seabird nesting success) and in the sea (e.g. water quality, coral reef and associated fish species), as well as management-specific monitoring (e.g. invasive species). The long-term species monitoring programmes were recently revised to ensure that they are able to accurately detect changes to the values of the site and address key management focused questions. The aim was to shift towards a more adaptive and responsive approach. This transition has been achieved through using new technologies, including the use of hand-held smart GPS

devices with customised software (e.g. cybertracker) and applications for data visulation. These technologies are improving the ease of data management, as they streamline data collection and entry.

▶ Research

Highly Effective

SIF have long-term established collaborations with world-class research institutions on several aspects

Overall assessment of protection and management

Highly Effective

SIF's management of Aldabra is extremely professional. Despite the atoll's remote location the site is well protected, legally and in practice. Protection of the marine areas around the atoll has improved in recent years through the presence of coast guard on the atoll. In addition to this: monitoring programmes have been revised and new technologies introduced to allow site managers to track progress and respond more quickly to any new concerns as they emerge. A new biosecurity plan and a new management plan, which includes a sustainable financing plan, has been prepared. These documents provide the updated guidance needed to help SIF prioritise their activities to manage site values.

▶ Assessment of the effectiveness of protection and management in addressing threats outside the site

Data Deficient

Little information is available on the effectiveness of protection and management in addressing threats outside the site, however, the commendable efforts to eradicate invasive birds on the nearest neighbouring island of Assumption in order to prevent re-invasion of Aldabra should be noted in this regard.

▶ Best practice examples

The effective eradication of invasive alien species from Aldabra and the nearest neighbouring island of Assumption is an example of best practice.

The efforts put into habitat mapping and the upgrading of the monitoring programmes, particularly the use of new technologies to streamline data management process are another example of best practice.

State and trend of values

Assessing the current state and trend of values

World Heritage values

▶ **Geomorphology**

Good
Trend:Stable

Terrestrial (including categories for limestone areas, beaches, and freshwater pools), lagoon and forereef habitats mapped in last 5 years. These maps can be used to assess, e.g. seabed disturbance, land degradation, coastal erosion.

▶ **Terrestrial vegetation**

Low Concern
Trend:Stable

Vegetation mapping has indicated no significant change in the area of Aldabra’s terrestrial vegetation (Walton, 2015, MSc thesis, University of Zurich). There are still some invasive species present.

▶ **Freshwater and brackish pools**

Low Concern
Trend:Data Deficient

No trend data available but habitat map recently completed which includes freshwater pools as a category and can be used for future comparisons. Changes in rainfall and periods of drought may impact on these pools in the future.

▶ **Sand beaches**

Low Concern
Trend:Deteriorating

Sand beaches are impacted by marine litter and there is some evidence of erosion. Although erosion and accretion is part a natural process, this may increase with climate change and changes in weather patterns. Coral mortality following bleaching events may contribute to beach erosion and beaches are also susceptible to changing sea levels. Recent habitat mapping will help to assess and quantify long-term trends.

▶ Intertidal mudflats

Good
Trend:Stable

In good condition and apparently stable: habitat map recently completed which can be used for future comparisons; populations of wading birds that use this habitat are stable (SIF, unpublished data, 2016)

▶ Mangrove communities

Good
Trend:Stable

A 2016 study showed that Aldabra’s mangrove communities have been stable and even increased slightly in the last 15 years (Constance, 2016, MSc thesis, University of Zurich)

▶ Seagrass and macroalgal communities

Good
Trend:Stable

Seagrass beds and macroalgal communities appear to be stable (SIF marine monitoring programme, unpublished data, 2016). There is seasonal variability which may need to be accounted for in the future.

▶ Coral communities

High Concern
Trend:Deteriorating

The 2016 bleaching event caused a substantial and widespread decline in hard and soft coral cover and is now being monitored for recovery (SIF marine monitoring programme, unpublished data, 2017)

▶ Marine water quality

Low Concern
Trend:Stable

Marine monitoring programme indicates conditions are stable (SIF marine monitoring programme, unpublished data, 2016)

▶ Aldabra giant tortoises

Good
Trend:Stable

Long-term monitoring data published in 2015 show that Aldabra giant tortoise populations in the last 15 years are highly stable (Turnbull et al. 2015)

▶ Landbirds

Good
Trend:Improving

A paper published in 2015 by SIF staff showed that most endemic/native landbird species and sub-species are increasing in abundance, with one species (the Aldabra drongo) showing a stable trend (van de Crommenacker et al. 2015a). The Aldabra rail has expanded its re-introduced population size on Picard island to greater than the predicted carrying capacity on the island (Sur et al. 2013). Genetic research has confirmed the Aldabra fody as a distinct species (van de Crommenacker et al. 2015b)

▶ Other terrestrial fauna

Data Deficient
Trend:Data Deficient

Aldabra’s coconut crab Birgus latro population is stable but no trend data is available for other terrestrial invertebrate species including insects, molluscs, and crustaceans (SIF, unpublished data, 2016)

▶ Sea and shorebirds

Good
Trend:Improving

Annual frigatebird census indicates stable or increasing numbers of both

species (with substantial year-to year fluctuation); tropicbird nest monitoring shows no decline in numbers of nests in last 7 years although nesting success is among the lowest recorded for the species, surveys needed for other species (e.g. red-footed boobies). Wading bird populations are seasonal but stable (SIF, unpublished data, 2016).

▶ Marine turtles

Good
Trend:Improving

Last published data to 2008 showed a 500-800% increase in nesting green turtles over a 40-year period (Mortimer et al. 2011). Numbers of turtles have continued to increase at the same rate since then (SIF, unpublished data)

▶ Marine mammals

Low Concern
Trend:Improving

Aldabra’s dugong population (the only one remaining in Seychelles) appears to be larger than initially thought, with at least 14 individual animals counted in one partial survey of the lagoon (SIF, unpublished data, 2013).

▶ Fishes

Good
Trend:Improving

Results of the marine monitoring programme indicate that fish abundances are increasing (SIF marine monitoring programme, unpublished data)

▶ Marine invertebrates (other)

Data Deficient
Trend:Data Deficient

Marine monitoring programmes and biodiversity survey needed to increase knowledge of other marine invertebrates.

Summary of the Values

► Assessment of the current state and trend of World Heritage values

Low Concern

Trend: Stable

The terrestrial and marine monitoring programmes are showing that most habitats and species are generally in a good condition, and that populations of endemic or threatened species are either stable or improving. While the ecological integrity of the whole site is good and appears to be stable, there are differences in current state and trend of marine and terrestrial components of the site. The invasive mammals continue to pose the greatest threat to the status of terrestrial fauna. The high sea water temperatures and coral bleaching and mortality that happened in the past few years, have degraded the condition of the coral reef. Aldabra's coral reef is likely to recover from this event quicker than in other areas that are subject to other pressures (e.g. overfishing and pollution). Climate variability and change currently pose the greatest threat to marine ecosystems and the frequency of similar coral bleaching events is likely to increase in future years.

Additional information

Benefits

Understanding Benefits

► Importance for research

Aldabra provides a near-natural island laboratory, where terrestrial and marine components of ecosystems and associated biodiversity can be studied in the absence of many of the other factors that can so often otherwise obscure long term ecological trends (e.g. coastal development and other human uses, as well as pollution, etc). The protection of Aldabra has already provided significant benefits in terms of furthering knowledge related to the management of endemic species and research into the methods to control of invasive species. Knowledge gained from these existing programmes, and the lessons learnt can be used to inform conservation,

rehabiltation and restoration efforts on other degraded islands around the world. Aldabra could further expand this globally important role by building further programmes to detects changes in the marine and terrestrial island ecosystems that may already be happening in relation to climate change.

Summary of benefits

Aldabra is near-natural island laboratory, where research into and monitoring of terrestrial and marine components can be conducted in the absence of many of the common pressures found elsewhere that can otherwise obscure long term ecological trends. The management of Aldabra provides an excellent case study in itself, particular the monitoring programmes, which were recently redesigned so that they provided managers with the key information needed to allow them to respond should circumstances change. These programmes enable adaptive and responsive management, which is particularly critical in a remote location like Aldabra, but also directly relevant for other protected areas globally.

Projects

Compilation of active conservation projects

№	Organization/ individuals	Project duration	Brief description of Active Projects
1	Seychelles Islands Foundation		Indian Ocean Commission and European Union funded project to improve biosecurity measures for Aldabra, entitled, ‘Institutionalisation and implementation of biosecurity measures to ensure sustainable conservation management of biodiversity on Aldabra Atoll’.
2	Zurich-Aldabra Research Platform (University of Zürich, SIF)		Research on terrestrial ecology; focus on interplay between giant tortoises, vegetation and climate, movement ecology of giant tortoises.

Compilation of potential site needs

№	Site need title	Brief description of potential site needs	Support needed for following years
1	N/a	Implement the provisions of the Aldabra Atoll Biosecurity Plan, 2014, particularly in relation to surveillance and incursion response.	From: 2017 To: 2027
2	N/a	Implement plans for control and/or eradication of rats and cats.	From: 2017 To: 2027
3	N/a	Implement all other high priority key management strategies and actions included in the management plan, (identified as H-KMS)	From: 2017 To: 2021
4	.	Finalise the legal processes related to the extension of the marine protected area boundary and put in place surveillance measures and new technologies to ensure the boundary is enforced.	From: 2017 To: 2020
5	.	Implement marine water quality monitoring programme	From: 2017 To: 2027
6	.	Review marine monitoring programme to ensure that they adequately cover the newly extended marine protected area boundary	From: 2017 To: 2027
7	.	Implement monitoring programmes for other key coastal and marine habitats (e.g. sand beaches, seagrass beds and mangroves)	From: 2017 To: 2027

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