IUCN Conservation Outlook Assessment 2017 **(archived)**
Finalised on 08 November 2017

Please note: this is an archived Conservation Outlook Assessment for Lake Malawi National Park. To access the most up-to-date Conservation Outlook Assessment for this site, please visit https://www.worldheritageoutlook.iucn.org.

Lake Malawi National Park

SITE INFORMATION

Country:
Malawi
Inscribed in: 1984
Criteria:
(vii) (ix) (x)

Site description:
Located at the southern end of the great expanse of Lake Malawi, with its deep, clear waters and mountain backdrop, the national park is home to many hundreds of fish species, nearly all endemic. Its importance for the study of evolution is comparable to that of the finches of the Galapagos Islands. © UNESCO

SUMMARY

2017 Conservation Outlook

Significant concern

The rapidly increasing human population in the area around Lake Malawi National Park and in Malawi as a whole drives depletion in natural resources. In the lake, overfishing results in depletion of stocks and increasing targeting of the waters within the park boundaries. Depletion of the more valuable food fishes such as chambo results in smaller, formerly low value species, being increasingly targeted, and this includes the mbuna. These are the major component of the fauna in the park; a major attraction for tourists because of their abundance and bright colours, and a species flock of global significance in the field of evolutionary theory. Fuelwood collection, increasing cropping and livestock, and annual veld burning leads to deforestation of hillsides both inside and outside the park resulting in loss of wildlife habitat in the terrestrial areas and siltation and nutrient enrichment in the aquatic environment. Wildlife poaching and harvesting of plants for food and traditional medicine also impact the terrestrial environment.
Other current threats are a result of the increase in tourism in the area. Access to the park has been improved and a large number of tourism establishments now crowd the lakeshore between Golden Sands and Chembe village. This has led to an influx of people from outside the park seeking employment and providing services to the tourists. This has disrupted the traditional way of life in Chembe village, caused overcrowding. It has caused an increase in pollution from sewage, soap (body and laundry) and litter, particularly plastics, which detract from the aesthetic value of the park. There is also a major increase in small boat traffic in the park waters, leading to fuel and oil pollution from poorly maintained engines. There are two major potential threats; spillages from oil exploration and extraction, and introduction of alien invasive species and diseases.
The combined current and potential threats listed above are of serious concern. The World Heritage Site status of the park is more vital than ever. Concerted efforts to raise awareness and to support the Malawi Government and equally importantly the local communities to improve management of the Lake Malawi

National Park and the resources of the lake as a whole.
In summary, the values that resulted in the establishment of Lake Malawi National Park as a World Heritage Site are still intact. Despite the deterioration in the natural environment throughout Malawi as a result of anthropogenic factors caused by rapid human population growth, the park still provides protection to an incredibly beautiful natural environment. The fish populations in the park remain as an example of high biodiversity and a major global asset in terms of evolutionary processes.
Effective management of Lake Malawi National Park faces the following problems:
• lack of financial support for national parks, wildlife, and fisheries management;
• failure to engage with potential partners for tourism development;
• weaknesses in monitoring and enforcement;
• weaknesses in environmental education;
• threats from external sources, most notably the uncontrolled expansion in the human population in the area, but also the risks from oil exploration, introduction of alien invasive species, overfishing, pollution/nutrient enrichment, siltation,deforestation, wildlife poaching and loss of habitat.
The problems the property faces are considerable but not insurmountable. Concerted efforts are needed to provide Malawi with the support it needs to address the challenges in the lake as a whole, and to expand the park's boundaries to include other areas of high biodiversity significance around the lake.

Current state and trend of VALUES

High Concern
Trend: Stable

The values that resulted in the establishment of Lake Malawi National Park as a World Heritage Site are still intact. Despite the deterioration in the natural environment throughout Malawi as a result of anthropogenic factors caused by rapid human population growth, the park still provides protection to an incredibly beautiful natural environment. The fish populations in the park remain as an example of high biodiversity and a major global asset in terms of evolutionary processes.
The current and potential threats are, however, of high concern and could have major adverse impacts on the values.
Re-assessment of the current status of the fish faunas of the islands and

terrestrial components of the park is strongly recommended.

Overall THREATS

Very High Threat

The combined current and potential threats listed above are of serious concern. The World Heritage Site status of the park is more vital than ever. Concerted efforts to raise awareness and to support the Malawi Government and equally importantly the local communities to improve management of the Lake Malawi National Park and the resources of the lake as a whole.

Overall PROTECTION and MANAGEMENT

Serious Concern

In summary, effective management of Lake Malawi National Park faces the following problems:
• lack of financial support for national parks, wildlife, and fisheries management;
• failure to engage with potential partners for tourism development,
• weaknesses in monitoring and enforcement;
• weaknesses in environmental education;
• threats from external sources, most notably the uncontrolled expansion in the human population in the area, but also the risks from oil exploration, introduction of alien invasive species, overfishing, pollution/nutrient enrichment, siltation,deforestation, wildlife poaching and loss of habitat.
The establishment of the Lake Malawi National Park as a World Heritage Site highlights the enormous global as well as national importance of the park. The problems it faces are considerable but not insurmountable. Concerted efforts are needed to provide Malawi with the support it needs to address the challenges in the lake as a whole, and to expand the park’s boundaries to include other areas of high biodiversity significance around the lake.

FULL ASSESSMENT

Description of values

Values

World Heritage values

▶ Outstanding natural beauty of Rift Valley Great Lake

Criterion:(vii)

Situated in the Great Rift Valley of Africa, Lake Malawi is the 3rd largest lake in Africa and the 9th largest in the world. It is characterised by crystal clear waters, and high diversity of habitats. On the Mozambique and Tanzanian shorelines the lake is bounded by wooded hillsides of steep escarpments, while on the Malawi coast there is greater variety of habitat with gentler sloping shorelines in many areas, but also extensive rocky islands and shorelines, with massive rounded granite boulders, partially submerged and washed by wave action in many areas. Between the rocky sections are sun-drenched sandy bays, with inflowing rivers and streams creating reedy lagoons and lake-edge swamps. The juxtaposition of these landscape elements creates scenes of outstanding natural beauty (World Heritage Committe, 2010).

▶ Key example of evolutionary processes

Criterion:(ix)

In the lake, the rapid speciation leading to the species flocks of cichlids and clariids, which challenge evolutionary biologists, are of particular significance (Kornfield and Smith, 2000; Snoeks, 2001; Turner, 2007; Weyl et al., 2010). The speciation of cichlid fishes in Lake Malawi is considered to be of equal or of greater importance for the study of evolutionary processes as the Galapagos Island finches or honeycreepers of Hawaii (IUCN 1984; World

Heritage Committee, 2010)

▶ Extraordinary diversity of fish species

Criterion:(x)

Lake Malawi contains more fish species than any other lake in the world, with estimates of number of species varying widely but most likely in the range of 1,000 species with hundreds of cichlid species still to be described (Turner et al., 2001). Its fishes are a source of food for millions, provide a livelihood for thousands, encourage tourism, fascinate the scientific fraternity, enchant aquarists around the world and maintain ecosystem processes in the lake (Weyl et al., 2010).
As a result there is an abundance of peer-reviewed and grey literature available on the limnology, fisheries and ichthyofauna of the lake (Oliver, 2017).

▶ Extremely high levels of species endemism

Criterion:(x)

Endemism is extremely high, with >99% of cichlid fish and an entire clariid species flock (Bathyclarias spp.) known only from Lake Malawi

Other important biodiversity values

▶ Terrestrial biodiversity

The terrestrial component comprises wooded hillsides that protect part of the catchment of the lake. The biodiversity of these terrestrial habitats includes a few notable species. Mammals include hippopotamus (Hippopotamus amphibius, VU) (particularly in the Monkey Bay area) grey duiker (Sylvicapra grimmia, LC), Sharpe’s grysbok (Raphicerus sharpei, LC), klipspringer (Oreotragus oreotragus, LC), baboon (Papio spp., LC), vervet monkey (Chlorocebus pygerythrus, LC), bush pig (Potamochoerus larvatus, LC) and warthog (Phacochoerus africanus,
LC) (Carter, 1987; Lewis et al., 1986). The elephant population, over 70 animals, that used to frequent wooded areas inland from the park and occasionally come down to drink in the lake, has been relocated to Majete Wildlife Reserve, with a small remnant remaining in the area. Leopard

(Panthera pardus, VU), greater kudu (Tragelaphus strepsiceros, LC), bushbuck (Tragelaphus scriptus, LC), zebra (Equus quagga, NT) and samango (Cercopithecus mitis, LC) are rare, probably greatly reduced but with no recent data. The park is rich in birdlife including fish eagle (Haliaeetus vocifer, LC) along the shoreline. The islands, especially Mumbo and Boadzulu, are important nesting areas for white-throated cormorant which number several thousand (Linn & Campbell, 1992). Reptiles include crocodiles and abundant monitor lizards on Boadzulu Island (World Heritage Committee, 2010)

Assessment information

Threats

Current Threats

Very High Threat

The major current threats to the property include: oil exploration, disease transmission from invasive alien species, overfishing and deforestation. Pollution is on the rise through expanding human populations, and increasing tourism capacity and development.

▶ **Changes in traditional ways of life and knowledge systems**

High Threat
Inside site, scattered(5-15%)
Outside site

The traditional way of life in Chembe Village, fishing and subsistence farming, has been irretrievably changed by the influx of tourists and outsiders seeking employment in the tourism and service sector and an increase in human population. Other enclave villages impacted by rising human populations, overcrowding, declining fish populations.

▶ **Mining/ Quarrying**

Low Threat

Inside site, extent of threat not known
Outside site

Sand and clay mining for building materials, brick production, etc. is a potential threat inside the park and causes land degradation and loss of aesthetics in surrounding areas.

► Solid Waste

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

Litter, both on land and in the lake, is a major growing problem.

► Tourism/ visitors/ recreation

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

As in all tourist areas, there is a finite capacity for visitors. Large numbers of visitors result in noise and waste pollution, including plastic and other litter, engine oil and fuel leakage from poorly maintained outboard engines, etc. Too many visitors to the more popular fish-viewing sites adversely impacts on natural behaviour of the fish.
On land, tourism has created a large service industry, most notably at Cape Maclear. Resultant increased human population impacts on the natural environment and on the lifestyle of the original indigenous village inhabitants

► Fire/ Fire Suppression

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

Uncontrolled burning of almost the entire terrestrial component of the park estate is an annual occurrence, with major impacts on resource diversity, soil erosion, etc.

► Forestry/ Wood production

High Threat

Inside site, throughout(>50%)
Outside site

The denudation of the hills of the LMNP is clearly apparent in satellite photos in the 2014 mission report (UNESCO & IUCN, 2014). This is due to excess harvesting of fuelwood. Abbott (1996) showed that, contrary to public opinion, collection of firewood (fallen dead branches and twigs of small diameter) for domestic use was less to blame than harvesting large trees and branches for use in smoking fish. The situation is likely to have changed however with a >4 times increase in human population in the enclave villages since park establishment (UNESCO & IUCN, 2014), resulting in greatly increased firewood demand.
Denudation of the hills leads to soil erosion and siltation in the park's waters, affecting fish habitats, particularly for rocky shore dwelling mbuna.

► Water Pollution, Household Sewage/ Urban Waste Water, Air Pollution

High Threat
Inside site, localised(<5%)
Outside site

Seepage from septic tanks and long drops and run-off from contaminated soils through use of the bush for defaecation, particularly early in the rains when accumulated human waste is washed into the lake, creates problems, leading to infectious diseases and schistosomiasis. The lake is also used for clothes washing by the entire population of the enclave villages, thereby contaminating the water, but such impacts require a detailed assessment. There are also small boat traffic in the park waters leading to fuel and oil pollution of the lake due to poorly maintained boat engines.
Air pollution is also a threat (though much lower than water pollution), caused by smoke from annual bush burning, and burning of plastic waste.

► Agricultural effluents

Low Threat
Inside site, localised(<5%)
Outside site

Leaching of ferilisers and consequential eutrophication of the lake has not been adequately explored to date. However a very small scale agricultural effluent remains a possibility, and erosion is leading to siltation in the lake,

thereby affecting the rocky shore habitat of fish the park protects.

► Oil/ Gas exploration/development

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

Off-shore oil exploration activities have commenced in the northern part of the Lake (Ntaukira, 2012). Although this is some distance from the World Heritage property it presents the risk of oil and other pollutants spilling into the lake, which would have far-reaching consequences. Oil drilling anywhere in the lake could affect the entire lake ecosystem and represents a significant threat to the unique assemblage of endemic fish species, other biodiversity and associated evolutionary processes, which are the basis for the property's inscription on the World Heritage List (World Heritage Committee, 2016). In late 2013, a second oil concession was awarded, which covers the southern part of the lake, including the entire property. This concession is incompatible with the property's World Heritage status, and should be adjusted to exclude the property (UNESCO and IUCN, 2014). Confidential correspondence between conservation organisations and government offices has yet to clarify the situation, and furthermore scientists recently expressed their concerns for oil extraction in Africa lakes in a letter in Science (Verheyen, 2016). The environmental catastrophe in the Niger Delta is a salutary lesson to the risks involved even if exploratory drilling takes place far from the World Heritage property. Estimates of Niger Delta oil spills vary but the World Bank claims the true amount could be 10 times the official figures of 2,300 cubic metres in 300 individual spills annually (Wikipedia). Spills of a small fraction of these figures would be catastrophic in the closed environment of Lake Malawi.

► Poaching

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

Poaching is a major problem in the park. The mammal fauna, with the exception of vervet monkeys and baboons, has been reduced to a fraction of that when the park was established, which was itself impoverished

(Carter,1987; Chafota et al., 2005).

▶ Fishing / Harvesting Aquatic Resources

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

Overfishing and illegal fishing is a major problem throughout the park waters. The zonation plan developed by Tweddle et al. (1984), designed in consultation with the fishing communities to reduce conflict and restore fishers' rights to some key fishing sites, was never implemented. Without effective policing, the park remains an actively fished area, with even the smallest of species, previously ignored, now targeted. Areas around tourist lodges and sites are the only areas where some protection takes place, but even here there are conflicts. While it is claimed that mbuna stocks remain healthy, the UNESCO & IUCN (2014) reported mbuna being targeted around Mbenji Island. There is a lack of monitoring efforts and an evaluation of the lake is urgently required.

▶ Livestock Farming / Grazing

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

Along with crop production, grazing of domestic animals is leading to denudation of the environment. While impacts within the park are likely to be low they cannot be discounted. Competition with livestock greatly reduces carrying capacity for wildlife.

▶ Housing/ Urban Areas

High Threat
Outside site

The human population in the enclave villages has increased from an estimated 6000 to 25000 since the park's establishment (UNESCO & IUCN, 2014). This places major strain on the natural environment as well as the social and physical health of the communities themselves. A World Bank supported 'Infrastructure Services Project' has over the past five years assisted the Monkey Bay port town with a variety of additional urban infrastructure to upgrade the settlement. The resulting increased urban

population has catalysed a high deforestation rate in the area both for the baking of bricks for construction works and for household fuelwood supply. This project does not appear to have implemented any environmental mitigation activities to reduce the negative impacts upon the dry woodlands nearby.

► Tourism/ Recreation Areas

High Threat
Inside site, localised(<5%)
Outside site

The sandy beach at Cape Maclear, extending for 4.2 km from the Park's Golden sands property north east to the base of the range of hills that extend down to Monkey Bay is now closely packed with tourism accommodation. Although these developments can benefit the property through increased tourism, sustainable employment and income generation, some areas such as Chembe Village in the north east corner, is becoming overcrowded and puts a strain on the environment and on social cohesion.
A five-star hotel, golf course and other inappropriate activities for a World Heritage Site was fortunately stopped around 1990 at Golden Sands, but there is always a risk of such schemes being revived. Fortunately, the 2014 mission report (UNESCO & IUCN, 2014) was mistaken in its belief that the Cape Maclear Resort was to be based at Golden Sands. It is in fact well outside the park's boundaries on the South West Arm of the lake.

► Marine/ Freshwater Aquaculture

Very High Threat
Outside site

The threat to indigenous species as a result of ill-advised introduction of alien fish species to the catchment for aquaculture remains high and is increasing (Chirwa et al., 2017).
The major threat is the Nile tilapia (Oreochromis niloticus), which has been introduced to fish farms in the catchment in Tanzania (Genner et al., 2013). The species has been responsible for the extinction of Oreochromis esculentus in Lake Victoria, the near extinction of Oreochromis mortimeri in Lake Kariba, and the current ongoing elimination of O. mossambicus in the Limpopo River system (Tweddle & Wise, 2007; Canonico et al., 2005). There can be little doubt that the invasion of Lake Malawi by Nile tilapia will have

major impacts on the ecosystem.
Other reports on LMNP have discussed the risk of introduction of predators such as Nile perch and tigerfish (UNESCO & IUCN, 2014). The risk of the former species is minimal as it would require a coordinated multinational project to succeed, but there is a risk of accidental introduction of tigerfish through the canals of the proposed Lower Shire Irrigation Scheme (pers. comms.). Introductions of such predators, if successful, would indeed irreparably destroy the unique ecosystem as the cichlid flocks have not co-evolved in the presence of such predators.
A further risk is the introduction of diseases with introduced fishes. Recent epidemics of the Asian fish disease EUS in the Zambezi and Okavango river systems are a salutary lesson on the dangers posed by aquaculture to the natural environment.

► Roads/ Railroads

Low Threat
Inside site, localised(<5%)
Outside site

Upgrading of road to Cape Maclear removes vegetation from widened road reserve, improves access to Cape Maclear leading to more traffic, and facilitates illegal activities within the park’s terrestrial component. On the other hand however, road upgrade can also offer benefits to the conservation of the property, by improving visitor access and patrolling by park staff to enforce and reduce illegal activities.

Potential Threats

Very High Threat

There are two major potential threats; spillages from oil exploration and extraction, and introduction of invasive alien species and diseases. The former is a major threat with exploration licences having been granted throughout the lake, and a spill could have a significant negative impact on the ecosystem. The biggest alien threat is the presence of Nile tilapia in the lake catchment for aquaculture. Escape and colonization of the lake is inevitable without urgent action to remove the threat. Nile tilapia invasions have caused the extinction/near extinction of more valuable species in several lakes in Africa and on other continents. Carp is another threat to the lake environment.

Tigerfish may get into the lake via the Lower Shire irrigation scheme and these could have a devastating impact on the endemic species flocks. Aquaculture also causes disease outbreaks when fish are moved around.

► Oil/ Gas exploration/development

Very High Threat
Inside site, extent of threat not known
Outside site

An oil spill has the potential to have a significant negative impact on the lake including its fish population, and may take a considerable time to recover.

► Invasive Non-Native/ Alien Species

Very High Threat
Inside site, extent of threat not known
Outside site

The biggest alien threat is the presence of Nile tilapia in the lake catchment for aquaculture. Escape and colonization of the lake is inevitable without urgent action to remove the threat. Nile tilapia invasions have caused the extinction/near extinction of more valuable species in several lakes in Africa and on other continents. Carp is another threat to the lake environment. Tigerfish may get into the lake via the Lower Shire irrigation scheme and these could have a devastating impact on the endemic species flocks. Aquaculture also causes disease outbreaks when fish are moved around.

Protection and management

Assessing Protection and Management

► Relationships with local people

Serious Concern

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► Legal framework

Mostly Effective

The policy and legislative framework is strong, as laid out in Section 2 of the

2014 monitoring mission (UNESCO and IUCN, 2014). There is an overarching statute, i.e. the Environmental Management Act of 1996.

► Enforcement

Serious Concern

Enforcement of park and fisheries regulations is unfortunately very weak, severely handicapped by inadequate recurrent budgets and insufficient vehicles, boats and other equipment (UNESCO and IUCN, 2014). Furthermore, the park staff have terrestrial backgrounds and are not adequately prepared for the tasks of managing an aquatic environment.

► Integration into regional and national planning systems

Serious Concern

There is still a lack of integration of biodiversity in general into regional and national planning systems. The fish and fisheries of Lake Malawi are vital natural resources for the countries around the lake. The lack of integration is highlighted in Malawi's National Biodiversity Strategy and Action Plan II (2015 – 2025), which states that: "Despite their economic, social and environmental importance, biodiversity and its ecosystem services are poorly understood and undervalued. It is important that relevant sectors are aware of the value of biodiversity so that they are fully engaged to ensure protection, conservation and restoration of biodiversity. Mainstreaming biodiversity conservation and its value into sectoral policies and accounting systems will improve the management of biodiversity in Malawi." The plan has a very modest target, in that: "By 2025, biodiversity values are integrated into national, sectoral and local development policies and plans." The situation with regard to fisheries management and protection of the lacustrine environment is critical and cannot wait until 2025 to be resolved.

► Management system

Mostly Effective

Park management is organised around four departments responsible for (a) conservation management (b) research and monitoring (c) education and extension and (d) administration. There is a good park management plan developed in 2007 with UNESCO/WHC support, According to UNESCO and IUCN (2014), this was never formally approved and remains in 'draft' form,

and no further information appears to be available. It was preceded by a series of earlier plans developed in 1980, 1993 and 2001 with support from various external partners.

▶ Management effectiveness

Some Concern

The 2014 monitoring report (UNESCO and IUCN, 2014) stated that the mission was impressed by the resourcefulness of the management team, and that with a modest level of additional finance much more could be achieved. Better education of the staff in management of aquatic ecosystems is essential for effective management of the property, along with improved environmental education for communities.

▶ Implementation of Committee decisions and recommendations

Serious Concern

There is little evidence of any recommendations from any previous projects being implemented. The Education Centre has been neglected. The aquatic zonation plan developed collaboratively by Fisheries and National Parks (Tweddle et al., 1984) appears to be totally ignored, indeed there is no evidence that anyone is aware of its existence.

▶ Boundaries

Some Concern

Satellite imagery shows that the terrestrial boundaries are relatively well-defined, but it is clear that the aquatic boundaries are totally ignored by fishers.

▶ Sustainable finance

Serious Concern

Lack of finance is a serious concern, affecting management effectiveness. A possible way forward is for support from, and partnerships with, the tourism sector. Opportunities for conservancies and joint ventures should be explored.

▶ Staff training and development

Some Concern

Management staff are well-motivated according to the 2014 monitoring report, but their training is largely terrestrial and thus aquatic ecology knowledge is lacking. Partnerships with fisheries organisations/departments and international organisations such as the South African Institute for Aquatic Biodiversity is strongly recommended.

► Sustainable use

Serious Concern

The aquatic zonation plan developed collaboratively by Fisheries and National Parks (Tweddle et al., 1984) appears to be totally ignored, indeed there is no evidence that anyone is aware of its existence.

► Education and interpretation programs

Serious Concern

The Education Centre in the park at Golden Sands is sadly neglected. The environmental education programme in the GEF/SADC Lake Malawi/Nyasa Biodiversity Conservation Project had an environmental education component, but this had no visible outputs, as reflected in the Implementation Completion Report. Developing an effective environmental education programme, drawing on skills available with NGOS s and government in Malawi, with outside assistance if found necessary, is vital for the long-term future of the lake’s fish, fisheries and tourism resources.

► Tourism and visitation management

Some Concern

Small eco-lodges on the islands in the park appear to be well-managed and beneficial to the park on the whole, as their presence inhibits (but does not eliminate) illegal activities.
An appropriate small-scale development at Golden Sands is needed, possibly as a joint venture between the park and a suitable developer.
The large-scale, low-end tourism along the beach occupied by Chembe Village has both positive and negative impacts. The sector has impacted on the lifestyle of the indigenous Chembe community and led to an influx of people from outside seeking employment and servicing the tourists. It is

unfortunate that the park has no control over the scale of the influx.

► Monitoring

Serious Concern

There is no monitoring in the property and as a result, the effectiveness of the park cannot be evaluated. It should be of utmost priority that monitoring is introduced. Regular repeats of the diving transect surveys conducted by Ribbink (1983) to assess fish population diversity and health should be a minimum requirement. Catches of fishers in the enclave communities should also be monitored to ensure that the mbuna are not being illegally exploited in park waters.

► Research

Some Concern

In the past, high quality research has been conducted in the park into a wide range of aquatic topics and a very large body of scientific literature is available. This research has, however, all been driven by outside interests, particularly evolutionary biologists attracted by the globally important cichlid species flock. The Department of National Parks and Wildlife has been very much on the periphery of this activity and should be more pro-active in coordination and collaboration. The challenge is also that research is driven by the short term nature of grant funding and does not contribute towards long term monitoring. It is therefore important that methods for longer term assessments are developed.

Overall assessment of protection and management

Serious Concern

In summary, effective management of Lake Malawi National Park faces the following problems:
• lack of financial support for national parks, wildlife, and fisheries management;
• failure to engage with potential partners for tourism development,
• weaknesses in monitoring and enforcement;
• weaknesses in environmental education;
• threats from external sources, most notably the uncontrolled expansion in

the human population in the area, but also the risks from oil exploration, introduction of alien invasive species, overfishing, pollution/nutrient enrichment, siltation,deforestation, wildlife poaching and loss of habitat.
The establishment of the Lake Malawi National Park as a World Heritage Site highlights the enormous global as well as national importance of the park. The problems it faces are considerable but not insurmountable. Concerted efforts are needed to provide Malawi with the support it needs to address the challenges in the lake as a whole, and to expand the park's boundaries to include other areas of high biodiversity significance around the lake.

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

Serious Concern

Protection and management of the lake resources outside the park is weak, handicapped by a lack of institutional funds and a lack of training

State and trend of values

Assessing the current state and trend of values

World Heritage values

▶ **Outstanding natural beauty of Rift Valley Great Lake**

High Concern
Trend:Deteriorating

Lake Malawi, including the lake Malawi National Park, is an exceptional lake, with outstanding beauty and incredible biodiversity. While overall biodiversity remains high, with only one or two fish species probably extinct through overexploitation, individual populations are in decline.
The threats to the system are in the form of habitat degradation, both on land and in the water. Deforestation continues, overfishing becomes ever more serious, pollution and nutrient inputs are increasing, and the potential for oil exploration in the lake is a serious risk that cannot be ignored.

► Key example of evolutionary processes

Low Concern
Trend:Stable

There is no current threat for this value. The lake remains an ecosystem of remarkable global significance for understanding of evolutionary processes. There is a potential future threat in the form of catastrophic pollution resulting from accidental spillages during oil exploration/production. Increased pollution/eutrophication through nutrient loading from anthropogenic activities associated with the rapidly increasing human populations around the lake is another long-term threat. The classification of Stable reflects the current situation and does not take notice of these potential threats.

► Extraordinary diversity of fish species

High Concern
Trend:Deteriorating

There are three potential threats, alien invasive species, discussed below, lakewide oil pollution, and increased pollution/nutrient loading leading to excessive eutrophication.

► Extremely high levels of species endemism

High Concern
Trend:Stable

The trend here is classed as stable, but there is a major threat to endemism in the form of the culture of Nile tilapia in the catchment in Tanzania (pers. comms.). If introduced, Nile tilapia will have a major impact on, at a very minimum, tilapiine diversity.
There is also a renewed, ill-advised, proposal to farm with common carp in the catchment (Chirwa et al., 2017), a species that is known to cause major issues with sedimentation and turbid waters in lakes wherever it is introduced.
There is a risk of tigerfish invasion via the Lower Shire through a planned irrigation canal that will bypass the exiting natural barrier to upstream migration, i.e. Kapachira Falls (Tweddle et al., 1979).
Deliberate release of tigerfish and/or Nile perch is suggested as a threat by

other reports on the park (e.g. UNESCO & IUCN, 2014) but this is considered highly unlikely as such introduction would have to be organized through a coordinated international effort and this is highly improbable in the present climate of awareness. If such predators were introduced, however, there can be little doubt that they would have an enormous impact on biodiversity and endemicity in the lake.
The classification of Stable reflects the current situation and does not take notice of these potential threats.

Summary of the Values

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

High Concern

Trend: Stable

The values that resulted in the establishment of Lake Malawi National Park as a World Heritage Site are still intact. Despite the deterioration in the natural environment throughout Malawi as a result of anthropogenic factors caused by rapid human population growth, the park still provides protection to an incredibly beautiful natural environment. The fish populations in the park remain as an example of high biodiversity and a major global asset in terms of evolutionary processes.
The current and potential threats are, however, of high concern and could have major adverse impacts on the values.
Re-assessment of the current status of the fish faunas of the islands and terrestrial components of the park is strongly recommended.

► Assessment of the current state and trend of other important biodiversity values

High Concern

Trend: Deteriorating

While the park was established primarily to protect the aquatic environment, it also has a sizeable terrestrial component. The area formerly supported a depleted but a diverse mammalian fauna, including lion, leopard, elephant, zebra, kudu, grey duiker, klipspringer, blue monkey, vervet monkey, baboon and dassies. There have been serious declines in most of these, with the

probable exception of vervet monkey and baboon. it is likely that lion and zebra were already gone before the park was gazetted, and it is also unlikely that any kudu, blue monkey or leopard remain.

Additional information

Benefits

Understanding Benefits

► Collection of wild plants and mushrooms

Enclave communities had high dependence on natural resources, including indigenous plants for food, medicine, etc.

High human population growth is causing serious depletion of these resources

► Fishing areas and conservation of fish stocks

Enclave communities have high dependence on natural resources, including fish. Fish stocks throughout the lake are in severe decline through overexploitation (Weyl et al., 2010). Lake Malawi National Park, if properly managed, acts as a Fish Protection Area where breeding can take place to restock surrounding fishing grounds naturally,

High human population growth results in increased fishing effort, causing declining catches, countered by increasing size and number of fishing gears, creating a vicious circle. This leads to severe overexploitation and switch to smaller species, including the mbuna species the park was set up to protect.

► Access to drinking water

Communities around the park and in the enclave villages are totally dependent on the lake for their drinking water.

Increasing nutrient levels and sedimentation in the lake affects water quality. Algal blooms become more frequent. Bilharzia is increasing because of

increased human population, poor sanitation, and overexploitation of snail eating fishes.

► History and tradition

Chembe Village is a long-established community originally occupied by local people. The other enclave villagers are migrants from the north of the lake, who moved south to take advantage of the more productive fishing grounds in the south of the lake.

The traditional livelihood strategies of Chembe village, based largely on fishing, is being impacted by immigration of people from outside the area looking to benefit from the influx of tourists.

► Wilderness and iconic features

Wildlife sustainability is dependent on habitat integrity and sufficient relatively undisturbed (i.e. wilderness) natural environments.

High human population growth results in increased encroachment into wilderness areas for exploitation of natural resources, including firewood (thus deforestation), wildlife (poaching).
Plastic and other waste pollution is extreme in the enclave villages and surrounding areas and spills over into the park boundaries. This is an increasing threat.

► Sacred natural sites or landscapes

Mwalawamphini (the rock of the tribal face markings) is a National Monument on the road through the park to Cape Maclear. The carved appearance of this rock is due to natural shrinkage and weathering processes (Carter, 1987), but the site is considered sacred with healing powers by some medicine men

Vandalism is a potential risk to Mwalawamphini National Monument.

► Sacred or symbolic plants or animals, Cultural identity and sense of belonging

Data deficient

Data deficient

► Collection of medicinal resources for local use

Traditional medicinal plants collected from the protected areas

With increasing human populations, harvesting of medicinal plants increases, placing resources under threat. There is no known information on the scale of this problem.

► Outdoor recreation and tourism

Traditional medicinal plants collected from the protected areas
Tourism is a major contributor to the local economy

Tourism is now a major livelihood contributor, particularly at Cape Maclear and tourist camps/lodges on the islands. While the presence of tourism concerns on islands have localized negative impacts due to their development removing some natural environment, they also have major benefits in that their presence inhibits illegal activities on the islands, such as deforestation and illegal fishing.
While tourism brings investment and employment into the area, there are some consequences. Demand for fuelwood and fish is greatly increased, exacerbating deforestation and overfishing and illegal fishing; while, with influx of people from outside the area to the villages, crime increases as well as alcohol and drug misuse. Sewage disposal has potential hazards through septic tank overflows and seepage into the lake, affecting drinking water quality and human health.

► Natural beauty and scenery

The park is noted for its outstanding scenery, i.e. forested offshore islands and mainland hills, rocky coastlines, golden sandy beaches, and crystal clear waters supporting an abundant and highly colourful inshore, shallow water fish fauna, most notably the mbuna cichlids.

High human population growth results in degradation of the scenery, through deforestation and overcrowded enclave villages

► Importance for research

The lake is world-renowned for its 1000+ species of endemic cichlid species. The phenomenal adaptive radiation of this species flock has been a major focus of study for evolutionary biologists, resulting in an enormous amount of cutting-edge publications (see Oliver, www.malawicichlids.com, continually updated, for a detailed bibliography). The park has been the focus for a great deal of these studies, since the pioneering studies of Ribbink et al., 1983 and Lewis et al., 1986).

Overfishing and illegal fishing within the park boundaries, and illegal translocations of fish within the lake by aquarium traders can adversely impact on research activities.

► Contribution to education

WWF provided sustained low-level support during the early years of the park's development, contributing to the development of a residential environmental education centre at Cape Maclear. The GEF/SADC Lake Malawi/Nyasa Biodiversity Conservation Project had an environmental education component, but this had no visible outputs, as reflected in the Implementation Completion Report.
Globally, the cichlid flock evolution and adaptive radiation is a major contributor to reaching materials in many universities and a source for postgraduate studies from a wide range of countries.

The current status of the education centre at Golden Sands, Cape Maclear, is unknown. It was run-down when last visited by the author of this review in 2013, and the 2014 monitoring report makes no mention of its status at that time, nor does it make any recommendations.

► Collection of genetic material

Data deficient

Data deficient

► Carbon sequestration, Pollination

Data deficient

Data deficient

► **Soil stabilisation, Flood prevention**

The protection of the hillsides in the park boundary theoretically protects against soil erosion, maintaining near pristine aquatic habitat.

While satellite imagery shows that vegetation cover in the park is better than in surrounding areas, with the park boundaries still visible on satellite imagery (Patry and Howard, 2014), the vegetation is sparse, lacks big trees, and the impoverished sandy soils are vulnerable to erosion. Annual burning of virtually the whole park also exposes the soils to erosion with the first rains.

► **Water provision (importance for water quantity and quality)**

All communities in enclave villages and along the entire lakeshore are dependent on the lake water for all purposes.

Increasing nutrient levels and sedimentation in the lake affects water quality. Algal blooms become more frequent. Bilharzia is increasing because of increased human population, poor sanitation, and overexploitation of snail eating fishes.

► **Collection of timber, e.g. fuelwood**

The park is the source of fuelwood for the inhabitants of the enclave villages, and for smoking of fish caught around the park

Abbott's (1996) PhD thesis showed that fuelwood collection by women from the villages was not the primary cause of deforestation in the park as collection focused on dead branches of small diameter, and annual consumption did not exceed the rate of production. Instead, harvesting of larger trees and branches by men for use in smoking fish was pinpointed as the major culprit for deforestation. With the major increase in village populations (from 6000 when the park was established to 25000, Patry and Howard, 2014), it is likely that the situation with fuelwood harvesting is more severe than when Abbott conducted her research.

► **Sustainable extraction of materials (e.g. coral, shells, resin, rubber, grass, rattan, etc)**

The park is a source of thatching grass for roofs and fencing

While harvesting of thatching grass might be considered to be detrimental to the park's terrestrial ecology, this is far outweighed by the problem of annual burning of almost the entire park estate. Benefits to the communities outweigh the negative impacts on environment.

► **Tourism-related income, Provision of jobs**

The tourism developments in and around the park are a major source of employment, in the hospitality sector, guiding, provision of services such as boat transport, shops, etc.

Negative factors associated with employment opportunities include increased demands on natural resources for the larger population.

Summary of benefits

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Projects

Compilation of potential site needs

№	Site need title	Brief description of potential site needs	Support needed for following years
1	Updated assessment of fish populations	An updated assessment of the fish populations of the existing national park waters is urgently required. Ribbink et al. (1984) published comprehensive transect data on species identification, depth and abundance of all species. This assessment is fully repeatable and the capacity to do this exists, with a number of key experienced Lake Malawi ichthyology experts/ researchers available in South Africa, USA and UK. The assessment should be extended to other parts of the lake where protection is required as recommended in the 2014 UNESCO and IUCN mission report based on the findings in Snoeks (ed.)(2004).	
2	An effective monitoring protocol	Based on the updated assessment, an effective monitoring protocol needs to be developed as recommended in the 2014 UNESCO and IUCN mission report.	
3	Staff training	The staff of the park need comprehensive training in all aspects of aquatic park management. This should include monitoring protocols.	
4	Environmental education programme	A major environmental education programme needs to be put in place as was supposed to have been done in the GEF/SADC Lake Malawi/Nyasa Biodiversity Conservation Project, 1995-2000. The review of this project (World Bank, 2001) stated that “Piloting use of a touring drama group to promote environmental awareness in riparian countries is not sustainable without external funding, and awareness training may have targeted the wrong people, thus limiting its effectiveness.” This finding is fully endorsed here. Environmental education should engage the many highly competent community-based NGOs and the education authorities to enhance awareness of not just the park but the enormous and irreplaceable value of the lake itself. Surrounding communities should be involved, and separate modules developed for education aimed at all levels of society, from primary school children through to senior government politicians.	

№	Site need title	Brief description of potential site needs	Support needed for following years
5	Tourism	The prime tourism development site at Golden Sands needs to be given highest priority for a moderately sized facility in keeping with its surroundings. Upgrading of the Environmental Education Centre should be incorporated into this development. This centre was excellently designed but was in a very sad state when visited in 2016 (pers. obs.) having had no updating or maintenance since it was built. This recommendation endorses that of UNESCO and IUCN (2014), i.e. “Noting that the scope and scale of the Cape Maclear Resort proposed tourism development is clearly inappropriate within a World Heritage property, the mission recommends the State Party to promote low-impact eco-tourism ventures that comply with appropriate environmental and social impact standards, and continue to monitor and regulate their operation”.	
6	Enlargement of the property	The 2014 mission recommends that the States Parties of Malawi, Mozambique and Tanzania should investigate the feasibility of increasing protection for additional areas of the shoreline and islands that have been identified as important localities for the protection of endemic fish and evolutionary processes throughout the lake. Where possible, these areas might be designated as reserves or community-run ‘special use zones’ and might ultimately be incorporated into an extended trans-national serial property. The mission considers that the initial stages of such a collaborative programme might be facilitated by an international conservation non-governmental organisation or through an internationally-recognised mechanism (as per the SADC/GEF project of 1995-2000).	
7	Buffer zone	Define a wide buffer zone (e.g. 20-50km) around the property within which oil exploitation would not be permitted, as per the 2014 mission recommendation.	
8	Increase deployment of patrol boats	Increase the deployment of patrol boats, other equipment and personnel to ensure enforcement of fishing restrictions and other measures aimed at protecting the OUV of the property (2014 mission).	

№	Site need title	Brief description of potential site needs	Support needed for following years
9	Revised management plan	Revise the 2007-2011 draft management plan and ensure that it is formally approved for implementation (2014 mission).	

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