

List of Wetlands Described

1. Tidal Swamps
2. Wetlands of the Coastal Plain
 - (a) Pangalanes-East Lagoon Complex
 - (b) Loza Lagoon
 - (c) Taolanaro Lagoon Complex
 - (d) Other Coastal Lagoons
3. Floodplains and Inland Swamps
 - (a) The Betsiboka River System
 - (b) The Sofia River System
 - (c) The Tsiribihina River System
 - (d) Anketraka Swamp
4. Natural Lakes
 - (a) Lake Alaotra
 - (b) Lake Kinkony
 - (c) Lake Ihotry
 - (d) Lake Itasy
 - (e) Lake Tsimanampetsotsa
 - (f) Other Natural Lakes
5. Artificial Impoundments
 - (a) Tsiazompaniry Reservoir
 - (b) Mantasoa Reservoir
 - (c) Other Artificial Impoundments

1. Tidal Swamps

Country: Madagascar

General: Extensive mangrove swamps (with a total area of 3020 km²) are located on the west coast of Madagascar in association with river mouths. Surface areas of swamps are as follows: Mahavavy-Nord (332 km²), Loza and Marinda (180 km²), Mahajamba (394 km²), Betsiboka (460 km²), Mahavavy-Sud and Soalala (340 km²), Besalampy (457 km²), Maintirano (255 km²), Tsiribihira (370 km²) and Mangoky (232 km²). Altogether there are 29 separate mangrove areas on the west coast. East coast mangrove sites number 11, but are all small (i.e. the largest at Rodo Bay is 22.2 km²).

Flora & Fauna: Mangrove assemblages consist of *Rhizophora mucronata*, *Avicennia marina*, *Sonneratia alba*, *Ceriops tagal*, *Bruguiera gymnorrhiza*, *Xylocarpus granatum*, *X. moluccensis*, *Lumnitzera racemosa* and *Heritiera littoralis*. The endangered Madagascar fish eagle *Haliaeetus vociferoides* occurs in mangrove areas.

Human Impact & Utilization: Mangroves are important nursery areas for inshore fisheries stocks. Shrimp (*Paenaeus monodon*, *P. indicus*), crab (*Scylla serata*), and finfish (*carangids*, *carcharinids*, *mugilids*, *serranids*, *sparids*) are important. Salted-dried shark and sawfish meat is an important market commodity. Crab fisheries in mangroves have declined in commercial importance since the early 1970s. Little data is available on other forms of utilization of mangroves.

Conservation Status: The mangrove swamps of Madagascar are the largest in the western Indian Ocean. To date no special provisions have been made to protect mangrove habitats or species.

2. Wetlands of the Coastal Plain

(a) Pangalanes-East Lagoon Complex

Coordinates: 18°10'-22°49' S/47°49'-49°24'E

Area: 180 km² combined

Altitude: sea level

Nearest Towns: Toamasina; Mahanoro; Farafangana

General: Pangalanes-East consists of a chain of over 18 lagoons interconnected by the Pangalanes Canal. The largest lagoons are Osive (35.7 km²), Rasoabe (20 km²) and Ampitambe-Irangy (11.5 km²). Others are: Rasoamasay, Ihosy, Alanampolsy, Rangazavaka, Morongary and Tampolo. Maximum water depths are generally in the range of 3-7 m. The deepest lagoon is Rasoabe at 12 m.

Hydrology & Water Quality: The main rivers flowing into the lagoon complex are the Ivondro, Rianila, Sakanila, Mangoro, Masora, Mananjary, Faraony, Matitanana and Manampatrana. Rainfall peaks in January/February. Annual fluctuation in water level is 1-2 m. The lagoons are essentially freshwater. Conductivity (k₂₀) ranges from 1325 µS/cm during the dry season down to 437 µS/cm during the rainy season, and the incursion of seawater is minimal. Water clarity is generally excellent. Water surface temperature ranges from 23°C in July up to 32°C in November. pH is slightly acid, from 6.5 - 7.0.

Flora & Fauna: Aquatic vegetation consists mainly of *Cyperus madagascariensis*, *C. latifolius*, *Eleocharis plantaginea*, *Typhonodorum lindlyanum* and *Pandanus* sp. Less common are *Nymphaea* sp., *Jussiaea* sp. and *Eichhornia crassipes*. Macro-invertebrates are *Macrobrachium* spp., *Metapenaeus* spp., *Pyrasus palustris* and *Melanoides tuberculata*. Some 61 species of fish are found in the lagoon, and many are euryhaline species (i.e. *Liza macrolepis*, *Mugil robustus*, *Arius africanus*, *Gerres* spp., *Leiognathus equulus*, *Paretroplus polyactis*, *Ptychochromis oligacanthus*). Fish species successfully introduced are *Osphronemus goramy*, *Tilapia rendalli*, *Oreochromis mossambicus* and *Heterotis niloticus*. Reptiles include *Acratophis madagascariensis*, *Ithyciphus miniatus*, *Liotherodon madagascariensis* and very rarely *Crocodylus niloticus*. The main birds recorded on the lagoons are *Sarkidiornis melanotus*, *Denrocygna viduata*, *Bulbucus ibis*, *Melanophloix ardesiaca*, *Scopus umbretta*, *Corythornis cristata*, *Milvus migrans* and *Merops superciliosus*.

Human Impact & Utilization: The lagoons are intensively fished. Catches ranged between 300 and 400 tonnes/yr in the period 1960-1975, but currently have declined to only 45 tonnes, seemingly due to excessive fishing effort. The yield of 8 kg/ha/yr is very low in comparison to lagoon fisheries elsewhere. Some 600 fishermen once earned their livelihood from the lagoons. *Paretroplus polyactis* and *Ptychochromis oligacanthus* are important components of the catch. Aside from subsistence agriculture a small production of sugar cane takes place. Tourism and industries are small local economic sectors.

Conservation Status: The lagoons are not under any special form of protection. Depletion of the fisheries resources is cause for concern.

(b) Loza Lagoon

Coordinates: 14°37'S/47°54'E

Area: 156 km²

Altitude: sea level

Nearest Town: Befotaka

General: Loza is the only lagoon situated on the western coastline. The principal inflowing rivers are the Doroa and Maevarano. Salinity near the outflow to the sea is very high. An extensive mangrove system (180 km²) is developed around the lagoon. The fish fauna is euryhaline and includes a large stock of shrimp.

(c) Taolanaro Lagoon Complex

Coordinates: 24°47'-25°09'S/46°42'- 47°11'E

Area: 45 km² combined

Altitude: sea level

Nearest Town: Taolanaro

General: This lagoon complex consists of a number of small lagoons not all of which are interconnected. The main lagoons are Anony (22.6 km²), Mananivo (4.43 km²), Ambavarano (3.3 km²), Lanirano, Andriambe (7 km²), Andranasy (2.5 km²), Andratoloharano and Ranofotsy (4.6 km²). Maximum depth is 5 m, but most are between 1-3 m.

Hydrology & Water Quality: Maximum rainfall is in January/February. Salinities vary from freshwater (in the absence of a connection to the sea) to highly saline (where a permanent connection exists with the sea). Water clarity is very high. pH is alkaline, from 7.9 - 8.3.

Flora & Fauna: Abundant macrophytes are *Typhonodorurn lindleyanum*, *Pandanus coneretus* and *Crinum* sp. Other species present are *Eleocharis plantaginea*, *Cyperus latifolius*, *Phragmites communis*, *Pandanus* sp. and *Ravenala madagascariensis*. Important macro-invertebrates are prawns, lobsters and other crustaceans. Fish species (at Anony) include *Ptychochromis oligocanthus*, *Caranx melampygus*, *Mugil* spp., *Ambassis commersoni*, *Epinephelus fario* and *Cerognathus aequula*. Birds visiting Andranasy and Andratoloharano Lagoons are *Phoeniconaias ruber antiquorum* and *P. ruber*.

Human Impact & Utilization: Fishing in the lagoons around Taolanaro is intense and stocks are thought to be over-exploited. Shrimp are fished in large quantities mainly in December/January at the beginning of the hot season. Mainly females and juveniles are caught. Landings are about 60 tonnes/yr. Ambinanikely is lady' and all fishing is prohibited by local communities.

Conservation Status: Action is required to rehabilitate and rationally manage the fisheries resources of some of the lagoons.

(d) Other Coastal Lagoons

General: Several other small to medium size lagoons are scattered along the coast. These include: Ampahana (21.8 km²) in the northeast near Antalaha (14°46'S/50°13'E), Tampolo-Fenerive-Est (1.37 km²) near Fenerive (17°20'S/49°30'E) and Masianaka (13.3 km²) in the south-east near Vangaindrano (23°35'S/47°36'E). The latter is adjacent to a large marsh (30 km²). The fish fauna is diverse and typically euryhaline.

3. Floodplains and Inland Swamps

(a) The Betsiboka River System

Co-ordinates of Rivermouth & Floodplain: 15°55'S/46°25'E

Area: 850 km² (floodplain)

Nearest Town: Ambato Boeni

General: The Betsiboka River originates near Falaise de l'Angavo at 1755 m asl. Its total length is 525 km, and it discharges to the Indian Ocean at Bombetoka Bay. The drainage basin area is 11 800 km². Major tributaries are the Mahajamba, Isandrano and Ikopa. A floodplain is developed in the lower course containing some 150 small lakes. These include Amparihibe-South (12.5 km²), Ambania (9.1 km²), Amboromalandy (6.6 km²) and Bondrony and Matsiabe (5.0 km² combined). Total area of the lakes is 80 km². The Ikopa tributary basin has large dams at Mantasoa and Tsiazompaniry.

Hydrology & Water Quality: Flooding reaches a peak between January and March with maximum discharge of 12 000 m³/sec at the mouth. Monthly mean discharge ranges between 74.3 and 678 m³/sec. Deforestation has resulted in severe erosion in the upper catchment area of the river and the river is heavily silted.

Flora & Fauna: Aquatic macrophytes include *Phragmites* spp., *Cyperus* spp., *Jussiaea* sp., *Polygonum* sp., *Eichhornia crassipes*, *Nymphaea stellata*, *Salvinia natans* and *Pistia*