

Mangroves of the atolls of the Maldives, rich among the atoll groups of the Indian Ocean

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Background

The Maldives islands are located in the Indian Ocean about 480 km south-west of Cape Comorin, India, and 650 km south-west of Sri Lanka. Mangrove diversity of the atolls of the Maldives is impressive when the other atolls of the Indian Ocean are considered, as they support 15 mangrove plant species among the 17 species reported from the Indian Ocean atoll islands. Thus, the atolls of the Maldives are richer in the diversity of mangroves compared to other atolls of the Indian Ocean. Figure 1 shows the rich and luxuriant mangroves of Thakafathi-filadhoo, Maldives.



Figure 1 Aerial view of mangroves at Thakafathi-filadhoo, Maldives (Photo credit: Bluepeace)

Species found in the mangroves of Maldives are *Acrostichum aureum* (fern), *Avicennia marina*, *Bruguiera cylindrica*, *Bruguiera gymnorrhiza*, *Bruguiera sexangula*, *Ceriops tagal*, *Derris trifoliata* (climber), *Excoecaria agallocha*, *Heritiera littoralis*, *Lumnitzera racemosa*, *Pemphis acidula*, *Rhizophora apiculata*, *Rhizophora mucronata*, *Sonneratia caseolaris* and *Xylocarpus moluccensis* (Jagtap & Untawale, 1999; Ahmed & Aminath, 2003; Kathiresan & Rajendran, 2005; Bluepeace, 2007; UNICEF, 2008; Spalding *et. al.*, 2010).

The Seychelles are a nation of small islands with mangroves occurring in small pockets at Baie Ste Anne, Anse Volbet, Anse Possession and Grand Anse (Praslin), and at Anse Severe (La Digue). Larger mangrove areas are found on the Aldabra group of islands consisting of Aldabra, Cosmoledo and Astove. Of the nine mangrove species found on the 115 islands of Seychelles, *Avicennia marina* is found most widely.

The Aldabra atolls harbour a considerable number of mangroves. Mangrove trees grow only on the sheltered coasts, and occur along the shores of the lagoon. *Avicennia marina* (Figure 2), *Bruguiera gymnorrhiza*, *Ceriops tagal* and *Rhizophora mucronata* are common. In a few localities, *Lumnitzera racemosa*, *Pemphis acidula*, *Sonneratia alba* and *Xylocarpus granatum* occur. The fern *Acrostichum aureum* is commonly found in Aldabra (Macnae, 1971).



Figure 2 *Avicennia marina* found in the Aldabra atoll (Photo credit: Thomas P. Peschak)

In the Arabian Sea, roughly 200 km off the west coast of southern India, are the islands of Lakshadweep, an island chain of 27 islands with coral atolls and sand banks. The atolls of Lakshadweep have four major species viz. *Avicennia marina*, *Bruguiera cylindrica*, *Ceriops tagal* and *Pemphis acidula*. Most of the mangroves are reported only from the Minicoy island. Only *Pemphis acidula* has been reported from the Bangaram atoll of Lakshadweep (Figure 3).

The Chagos Islands is a group of seven atolls comprising more than 60 individual tropical islands in the Indian Ocean, and situated about 500 km south of the Maldives. Chagos has only two mangrove species. A small patch of *Lumnitzera racemosa* has been observed only in Eagle Island with an associated peat bog (Figure 4). Moresby Island has two species of mangroves i.e. *Lumnitzera racemosa* and *Pemphis acidula* (Royal Botanical Garden, 2010).

Similarly, the Keeling Islands (situated 2750 km northwest of Perth, Western Australia) comprise two atolls of coral islands) where two species of mangroves viz. *Rhizophora apiculata* and *Pemphis acidula* have been reported (William, 1994). A voucher specimen of *Pemphis acidula* collected by Charles Darwin from Keeling Islands has been deposited in the Cambridge University Herbarium (Figure 5).



Figure 3 *Pemphis acidula*, the only mangrove species of the Bangaram atoll
(Photo credit: K. Sivakumar)



Figure 4 *Lumnitzera racemosa* in Chagos archipelago with associated peat bog
(Photo credit: Jesse C. Hillman)



Figure 5 Voucher specimen of *Pemphis acidula* collected by Charles Darwin
from Keeling Island (Photo credit: Cambridge University Herbarium)

Image Processing of the Indian Ocean Mangroves

Image processing of the Indian Ocean mangroves was carried out by downloading the vector images from Global administrative areas in shape file format, based on the coordinate reference system with WGS84 datum. Arc GIS 10.1 was used to create vector maps for spatial mapping. All manually collected mangrove diversity data were plotted and can be located on the vector map (Figure 6).

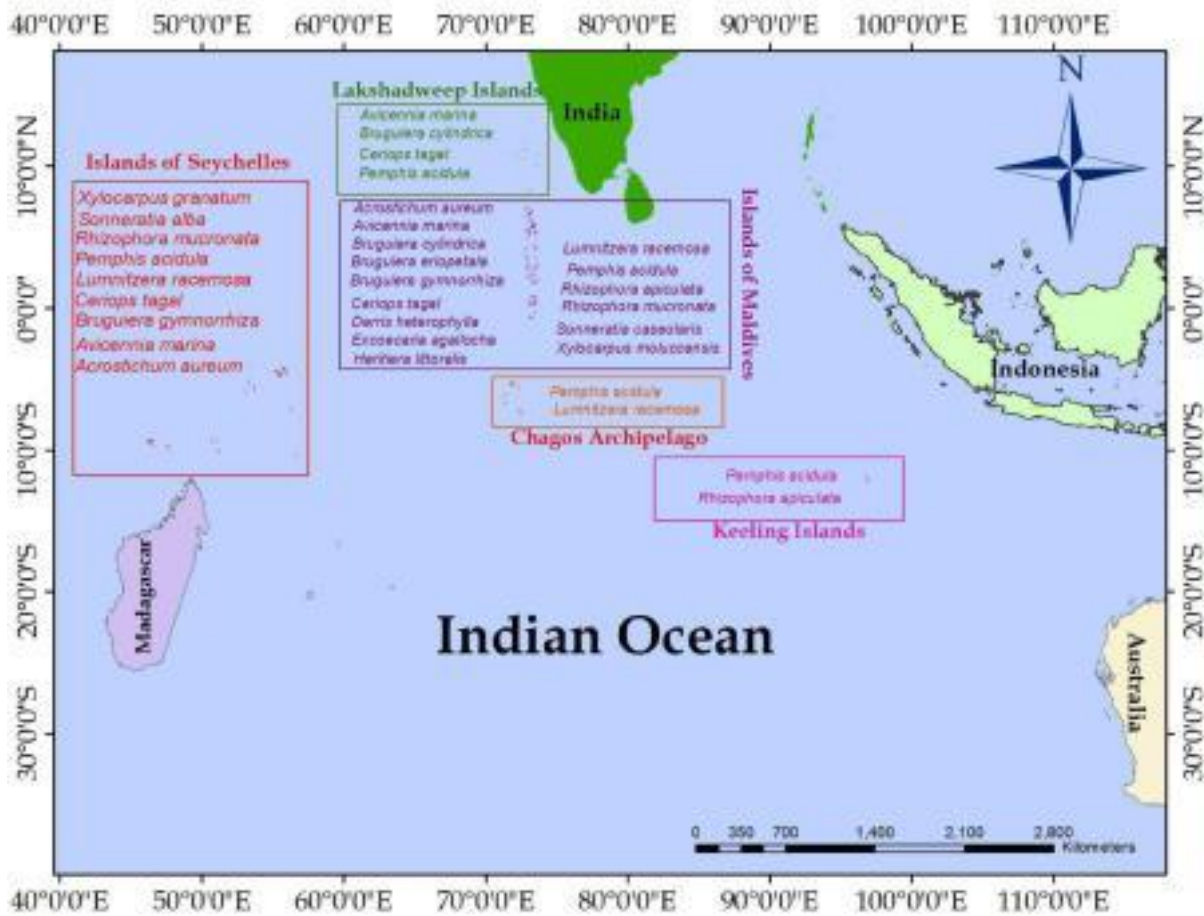


Figure 6 Vector map of the mangrove species diversity in the atolls of the Indian Ocean

Maldives: Rich Diversity of Mangroves

Mangrove species diversity of the atolls of the Maldives is impressive when those of the other atolls of the Indian Ocean are taken to consideration (Table 1). The atolls of the Maldives support fifteen mangrove species. The Chagos Archipelago and the Keeling Islands support only two species. Aldabra atoll harbours a considerable number of mangroves (nine species), followed by the atolls of the Lakshadweep with four species.

Pemphis acidula has been reported in five island atoll nations and this species is an indicator species of the coral rich ecosystem. *Avicennia marina*, *Ceriops tagal* and *Lumnitzera racemosa* were found to occur in three island nations.

Table 1 Mangrove plant species of different atoll islands of the Indian Ocean

Species	Atolls of Maldives 1	Lakshadweep Atolls 2	Chagos Archipelago 3	Seychelles Group 4	Keeling Islands 5
<i>Acrostichum aureum</i>	+	–	–	+	–
<i>Avicennia marina</i>	+	+	–	+	–
<i>Bruguiera cylindrica</i>	+	+	–	–	–
<i>Bruguiera gymnorhiza</i>	+	–	–	+	–
<i>Bruguiera sexangula</i>	+	–	–	–	–
<i>Ceriops tagal</i>	+	+	–	+	–
<i>Derris trifoliata</i>	+	–	–	–	–
<i>Excoecaria agallocha</i>	+	–	–	–	–
<i>Heritiera littoralis</i>	+	–	–	–	–
<i>Lumnitzera racemosa</i>	+	–	+	+	–
<i>Pemphis acidula</i>	+	+	+	+	+
<i>Rhizophora apiculata</i>	+	–	–	–	+
<i>Rhizophora mucronata</i>	+	–	–	+	–
<i>Sonneratia alba</i>	–	–	–	+	–
<i>Sonneratia caseolaris</i>	+	–	–	–	–
<i>Xylocarpus granatum</i>	–	–	–	+	–
<i>Xylocarpus moluccensis</i>	+	–	–	–	–
Total	15	4	2	9	2

1 – Nasser *et al.* (1999); 2 – Department of Science & Technology, Lakshadweep; 3 – Royal Botanical Garden, 2010; 4 – de Lacerda (2002) & Forest Department, FAO (2005); 5 – Williams (1994)

Mangrove Conservation

Mangrove for the Future (MFF) is assisting the Maldives to adopt a National Integrated Coastal Management approach that responds to the Maldives National Adaptation Programme of Action on Climate Change. Mangrove awareness materials have been produced by MFF country office, UNDP, other NGOs and the Environment Ministry, with the relevant information to share with the stakeholders and to help mangrove conservation in the islands. Environment Protection Agency (EPA), a government agency that functions under the supervision of the Ministry of Environment and Energy, is involved in the conservation of mangroves. The World Bank and Wetland Conservation and Coral Reef Monitoring for Adaptation to Climate Change are also taking part in the conservation of the Maldivian mangroves. Bluepeace, a non-governmental environmental campaigning organization, works with local communities to carry out environmental campaigns and projects on the conservation of mangroves. There are five marine protected areas in the Seychelles that contain mangrove areas. Aldabra atoll, which makes up a third of the land area of the Seychelles, is a Special Nature Reserve at the national level and has been acclaimed internationally as a World Heritage site.

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