

Survival Blueprint

Pearl Bubble coral, *Physogyra lichtensteini*



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Suggested citation: Basheer, A.; Richards, K.; Pisapia, C.; Najeeb, A.; Rilwan, Y.; Naeem, R. and Fisam, A. 2019. A Survival Blueprint for the Pearls Bubble coral *Physogyra lichtensteini* in the Maldives. EDGE of Existence Programme, Zoological Society of London, UK.



1. STATUS REVIEW

1.1 Taxonomy:

Animalia > Cnidaria > Anthozoa > Scelerozoa > Euphyllidae

1.2 Distribution and population status:

According to the IUCN Red List of threatened species, *Physogyra lichtensteini* range encompasses the Red Sea, Arabian Sea, the Indian Ocean from Somalia to Mozambique and all island states, Southeast Asia and the north coast of Australia ranging from waters as shallow as 1 meter up to 20 meters depth.

1.2.2 Local distribution:

Country	Region / province	Site	Level of Protection	Population size
Maldives	Noonu Atoll	Maavelaavaru	Not protected	6 observed colonies
		Manadhoo	Not protected	3 observed colonies
		Dhigurah	Not protected	2 observed colonies
	Raa Atoll	Fasmendhoo	Not protected	9 observed colonies
		Meedhupparu	Resort / Defecto MPA	6 observed colonies
		Hulhudhuffaar	Not protected	12 observed colonies
	Baa Atoll	Sonevafushi	Resort / Defecto MPA	5 observed colonies
		Kendhoo	Not protected	11 observed colonies
		Olhugiri	Protected Island	4 observed colonies
	Lhaviyani Atoll	Kuredu	Resort / Defecto MPA	5 observed colonies
		Kurendhoo	Not protected	14 observed colonies
	Kaafu Atoll	Emboodhoo	Not protected	1 observed colony
		Gulhi	Not protected	5 observed colonies
		Guraidhoo	Not protected	1 observed colony
		Kurumba	Resort / Defecto MPA	6 observed colonies
		Maniyafushi	Not protected	6 observed colonies
		Udafushi	Not protected	7 observed colonies
		Vabbinfaru	Resort / Defecto MPA	10 observed colonies
		Villimale'	Not protected	2 observed colonies
	North Ari Atoll	Bodufolhadhoo	Not protected	31 observed colonies
		Feridhoo	Not protected	21 observed colonies
		Kandholhudhoo	Resort / Defecto MPA	17 observed colonies
		Maalhos	Not protected	1 observed colonies
		Maayafushi	Resort / Defecto MPA	8 observed colonies
		Madivaru	Not protected	4 observed colonies
		Meerufenfushi / Alikoirah	Not protected	1 observed colony
		Velidhoo	Resort / Defecto MPA	4 observed colonies
Vihamaafaru		Not protected	9 observed colonies	
Madoogali		Resort / Defecto MPA	7 observed colonies	
Gaathafushi		Not protected	6 observed colonies	



1.3 Protection status:

Physogyra lichtensteini is listed on the IUCN Red List of threatened species as Vulnerable under criteria A4cd. It is also listed on Appendix II of CITES. In Maldives, under the Environmental Protection and Preservation Act removal and destruction of corals for any purpose is prohibited. Under the fisheries act all coral species are prohibited from being exported.

1.4 Ecology, behaviour and habitat requirements:

Physogyra lichtensteini can be found commonly in turbid areas at a depth of 5m to 20m depth in crevices and overhangs within Maldives reefs.

Physogyra lichtensteini is a reef building stony coral forming massive colonies. The colonies have meandroid, short and widely separated valleys. Walls are solid and columellae are absent. Tentacles are extended only at night. During the day the whole colony surface is covered with a mass bifurcated in shape or small grape shape like vesicles which are retracted when disturbed. It can be found in pale grey or sometimes in dull green colour (Veron and Pichon, 1979, Veron,2000).

This species showed a low frequency of occurrence in all reefs surveys within North Ari and Male' atolls in Maldives, with densities averaging 0,0083 colonies per 100 m², with high variability (SE=0.0164). However, abundance seems to be highly variable. In Tiomar Island Malaysia, the species was recorded in six out of 10 surveyed sites, with a live cover of 6.9%; it was not detected in Payar Island, while accounting for more than 98% of total coverage in Payar Island (Saad and Khodzori, 2017).

1.5 Threat analysis:

Around a third of all hermatypic corals are now believed to be threatened. *Physogyra lichtensteini* is widely spread and highly susceptible to catastrophic events such as massive bleaching events. In 2016, almost 75% of Maldivian coral reefs were bleached (Ibrahim et al 2016). The species is also heavily harvested for aquarium trade around the world.

Maldives is undergoing a rapid development and its coral reefs are at a high risk due to land reclamation. The health and resilience of reefs have been compromised due to the reclamation process leading to high sediment flow. Some reefs and areas with abundant coral life have been lost. However, reefs at semi-managed (resort house reefs) areas can be a future hope spots for the species survival and management.



1.6 Stakeholder analysis:

Country	Stakeholder	Stakeholder's interest in the species' conservation	Current activities	Impact (positive, negative or both)	Intensity of impact (low, medium, high or critical)
Maldives	Marine Research Centre	Government	Researchers	Positive	Critical
Maldives	Environmental Protection Agency	Government	Law enforcement	Positive	High
Maldives	Ministry of Environment	Government	Law enforcement, conservation, practitioners	Positive	Critical
Maldives	Ministry of Fisheries, marine resources and Agriculture	Government	Law enforcement, conservation, practitioners	Positive and Negative	Medium
Maldives	Save the Beach Maldives	Conservation	Conservation	Positive	High
Maldives	Parley	Conservation	Conservation	Positive	High
Maldives	Gemana	Conservation	Conservation	Positive	High
Maldives	UNDP Maldives	Development	Funder	Positive	High
Maldives	Maldives National University	Research	Research and Extension	Positive	High
Maldives	Ministry of Tourism	Government	Law enforcement, practitioners	Positive and Negative	Medium
Maldives	Fisherman's Association of Maldives	Commercial / Conservation	Commercial and Conservation	Positive and Negative	Medium
Maldives	Ministry of Education	Government	Law enforcement, practitioners	Positive	High
Maldives	National Institute of Education	Government	Research and Extension	Positive	Medium
Maldives	IUCN Maldives	Conservation	Research and Conservation	Positive	Medium
Maldives	Maldives Whaleshark Research Programme	Conservation	Research and Conservation	Positive	Medium



Maldives	Manta Trust Maldives	Conservation	Research and Conservation	Positive	Medium
Maldives	Maldives Coral Reef Society	Conservation	Research and Conservation	Positive	Medium
Maldives	Blue Marine Foundation	Conservation	Research and Conservation	Positive	Medium
Maldives	CDE Consulting	Commercial	Practitioners and Research	Positive	Medium
Maldives	Water Solutions	Commercial	Practitioners and Research	Positive	Medium
Maldives	LaMER	Commercial	Practitioners and Research	Positive	Medium
Maldives	Divers Association of Maldives	Commercial and Conservation	Commercial and Conservation	Positive	Medium
Maldives	Liveaboard Association	Commercial and Conservation	Commercial and Conservation	Positive	Medium
UK	ZSL	Conservation	Research, Conservation, Practitioners	Positive	Medium
International	UNEP	Conservation	Research, Conservation, Practitioners	Positive	Medium
UK	Reef World	Conservation	Research, Conservation, Practitioners	Positive	Medium



1.7 Context and background information that will affect the success of any conservation action for this species:

	Description	Barriers to conservation	Opportunities for conservation
Socio-cultural effects and cultural attitudes	Most of the fishing methods practised in the Maldives are environmentally safe compared to other global areas within the species range. Netting, dynamite and trawling is banned in the Maldives which has massive destruction towards reef habitat. Although netting in general is banned, it is allowed for bait fishing. A lift net is used to collect baits. At times there have been incidents where these nets are being entangled or while lifting the net, corals get damaged by entangling.	There are not much of direct impacts given the gear types used in the fisheries of the country. However, there is some minimal damage to the reefs when lifting nets during the bait overhauling. In addition to this, fishers' step on the corals when they snorkel causing further damage.	Fisherman's Association of Maldives (NGO) is actively involved in educating the fishermen. Best practices such as Green Fins methods for snorkelling can be taught to fishers.
Economic implications	Coral reef species and habitat are in general affected by the coastal development that is ongoing in the country. Development of harbours, resorts, jetties has led to reclaim some reefs while others have been impacted due to siltation from dredging	Sedimentation and siltation smother the reefs contributing to the decline of reefs. Dredging and reclamation has been carried out in some of the environmentally sensitive areas losing the biodiversity regardless of the conservation efforts and conservationists lobbying efforts to stop it.	Environmentally safeguard designs for projects needs to be adopted and made mandatory for the developers in order to avoid further environmental degradation and loss of biodiversity



<p>Existing conservation measures</p>	<p>Environmental Protection and Preservation Act is the law under which protected areas are declared. Under this law, EIA has been declared as mandatory process prior to the inception of any project in order to account the impact towards the site. Under this law several other regulations have been made such as waste regulation, dewatering regulation, clearing coastal vegetation and palm forests. Maldives have banned fishing, anchoring in all the 42 marine protected areas. Furthermore, resort house reefs are de-facto protected areas where fishing and anchoring is banned. Under the fisheries law, ecologically significant species such as turtles, whale sharks, sharks, corals (all species), napoleon wrasse, sea birds, dolphins are protected, and the fishing and export trade of these species are considered as a legal offense</p>	<p>Most of the actions have been started but follow up actions are yet to be implemented. For instance, protected areas have been declared but few are managed properly and most of them ended up as “paper parks”. There is little to no enforcement and implementation of these environmental laws.</p>	<p>The environmental law needs to be reviewed. Regulations should be revised. Instead of one general environmental law, several laws need to be made. The local councils have shown some interests of managing the critical habitats within their atolls, which indicates the enthusiasm among the local community. Given the legal power and financial providence, local governments should be attained to implement and monitor the environmental laws and regulation</p>
<p>Administrative/political set-up</p>	<p>The new administration shows a balance notion towards environment and economic development. The</p>	<p>Promising early actions for conservations. Regulations and strategies need to be put in place</p>	<p>With the current movement of declaring new protected areas and the government’s vision in</p>



	existing government prioritise environmental protection however, economic stability is also given equal if not more priority. More protected areas are being declared and management plans for these are planned but at the same time lagoons and reefs are being declared to reclaim land in order to pave way for development of infrastructure	while the interest in environment is stale	protection and preservation of natural habitats, specific regulations should be proposed for coral reef conservation and management. The interested units within the government should lobby in making the development plans pertinent to attaining the conservation of species
Local expertise and interest	There is a big dive community among the Maldives tourism industry. Among this dive community, most are very well informed on the habitats and species of the marine environment and some are actively involved in environmental campaigns. Underwater photography is also growing within the dive community hence the interests shown to marine species is increasing	New impacts from increased diving activities might become an immediate threat to coral reefs and corals.	The dive enthusiasts and photographers (underwater) can be utilised in running campaigns to make the status of EDGE coral species and its significance. They can also be used for simple data collection which can be used as “self-esteem boosting campaign for underwater enthusiasts”
Resources	There is a national institute for the coral reef research and the Environmental Protection Agency (EPA) which works closely in coral reef compliances. Few but emerging NGO’s are working to raise awareness towards coral reef	None	There are few marine scientists in the Maldives. More people need to be engaged and trained in this field. There are young enthusiasts on coral reef conservation.



	<p>management. International NGO's and institutes such as IUCN, UNEP, UNDP, Blue Marine Foundation have projects which focuses in resilience reef projects. Some resorts pay a keen interest in coral reef conservation by periodic monitoring and coral reef restoration. Maldives due to its vulnerability towards climate change is eligible towards most of the grants which focuses on coral reef management and climate change adaptation.</p>		
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2. ACTION PROGRAMME

Vision (30-50 years)	
Pearl bubble coral <i>Physogyra lichtensteini</i> is economically and ecologically valued and protected across the Maldives	
Goal(s) (5-10 years)	
Areas with high abundance of <i>Physogyra lichtensteini</i> are protected through well managed conservation measures	
Objectives	Prioritisation (low, medium, high or critical)
Strengthen enforcement and legal framework relevant to environmental conservation	Critical
Increase the capacity of stakeholders to monitor and manage coral reefs	Critical
Improve and maintain access to coral reef science for policy development and decision making	High
Increase awareness about coral reef science and conservation	Critical



Activities	Country / region	Priority (low, medium, high or critical)	Associated costs (currency)	Time scale	Responsible stakeholders	Indicators	Risks	Activity type
Objective 1: Strengthen enforcement and legal framework relevant to environmental conservation								
Review existing environmental laws and regulations to identify loop holes	Maldives	Critical	30,000 USD	6 months	Attorney General Office, Ministry of Environment, Ministry of Fisheries Marine Resources and Agriculture, Environmental Protection Agency Maldives	Number of inconsistencies and holes identified	Existing environmental regulations are made under one single umbrella law which does not address specific environmental components such as conservation at its best interest. In addition, loop holes such as conflict of areas for usage in tourism and fisheries law enables environmental misconducts being judged lightly	Law and Policy
Develop law and regulation to give a stronger legal framework to MPA's and coral reefs	Maldives	Critical	30,000 USD	12 months	Attorney General Office, Ministry of Environment, Ministry of Fisheries Marine Resources and Agriculture,	New law passed upon presidential decree	Lack of specific laws and regulations addressing the different components of environmental management meant	Law and Policy



					Environmental Protection Agency Maldives		less priority is given to environmental misconducts	
Increase number of marine rangers to increase enforcement	Maldives	Critical	60,000 USD	18 months	Ministry of Environment, Environmental Protection Agency Maldives	Trained rangers for each region of the Maldives	With Maldives reefs being remote, it is challenging for enforcement authorities in the central government to properly monitor these areas	Law and Enforcement
Increase competency of rangers for them to be able to charge offenders	Maldives	Critical	25,000 USD	12 months	Attorney General Office, Ministry of Environment, Ministry of Fisheries Marine Resources and Agriculture, Environmental Protection Agency Maldives, Ministry of Home Affairs, Maldives Police Service, Maldives National Defence Force	Number of fines given by rangers	Currently, rangers have to report to EPA from which the police is contacted upon approval. There is no formal management system in the Maldives for incidents and misconducts within MPAs	Law and Enforcement
Economic Valuation of Coral reefs (with a specific recognition to Pearl Bubble Coral) in order to attain a penalty	Maldives	Critical	40,000 USD	6 months	Ministry of Environment, Environmental Protection Agency Maldives, Ministry of	A penalty attained for shipwreck incidents in coral reef	Lack of environmental economic information about coral reefs have hindered the possibility of charging a value-	Law and Enforcement



fee for any offense related to coral reefs					Fisheries Marine Resources and Agriculture, NGO's, Attorney General Office, Ministry of Economic Development	habitats, import, export and removal of corals from the habitats, sale and aesthetic usage of corals, destructive actions on coral reef habitats	worth penalty towards environmental offense. Through this research, incidents such as shipwrecks on reefs can be accounted with a proper value to those held responsible	
Objective 2: Increase the capacity of stakeholders to monitor and manage coral reefs								
Integrate coral reef monitoring training programs within the national vocational training program	Maldives	Critical	25,000 USD	12 months for inception, afterward an annual program	Ministry of Environment, Environmental Protection Agency Maldives, Ministry of Fisheries Marine Resources and Agriculture, Marine Research Centre Maldives, Ministry of Education, National Institute for Education, Schools	Coral reef training taught as a module under the national vocational program	More youths will be engaged in coral reef monitoring. Currently, more youth seems to be interested in conservation activities but there is no platform for them to be trained. This seems to discourage these individuals	Capacity-Building
Regular training for resort marine biologists, local NGO's and other relevant stakeholders on coral	Maldives	High	50,000 USD	Annual	Marine Research Centre Maldives, Ministry of Fisheries Marine Resources and Agriculture,	Reef monitoring and management program	Coral reef monitoring in the Maldives will be more streamlined with stakeholders adopting one common method	Capacity-Building



reef monitoring and management					Ministry of Environment, Environmental Protection Agency Maldives, Resorts, NGO's		for data collection which will be run under a single common umbrella	
Coral reef leadership program for MPs, local councillors	Maldives	High	15,000 USD	Annual	Marine Research Centre Maldives, Ministry of Fisheries Marine Resources and Agriculture, Ministry of Environment, Environmental Protection Agency Maldives, Ministry of Housing, Local Government Authority, People's Majilis	Annual coral reef leadership program	Decision makers such as MP's and local councillors will be made aware about the importance of coral reefs and the best management practices to make informed decisions.	Capacity-Building
Objective 3: Improve and maintain access to coral reef science for policy development and decision making								
Foster and encourage scientific studies on the effectiveness of MPAs in habitat and species conservation	Maldives	High	60,000 USD	60 months	Marine Research Centre Maldives, Ministry of Fisheries Marine Resources and Agriculture, Ministry of Environment, Environmental Protection Agency,	Scientific meetings on habitat management and species conservation, technical reports,	At present there is a lack of scientific studies relevant to protected areas in the Maldives. Very few areas are in place with management plans, with no studies documenting the	Management and Assessment



					Maldives National University, Ministry of Education	scientific expeditions	effectiveness and benefits of MPAs. This has sometimes diffculted the justification of proposed conservation actions.	
Include a specific data collection protocol for Pearl bubble coral and EDGE coral species in the national coral database	Maldives	High	45,000 USD	6 months	Marine Research Centre Maldives, Ministry of Fisheries Marine Resources and Agriculture, Ministry of Environment, Environmental Protection Agency, Resorts, NGO's, EIA consultation firms	Database with distribution and composition patterns of EDGE coral species across the Maldives	There is an existing database which have protocols to collect coral and reef habitat data. This database is used by resort marine biologists, EIA consultants, technical staffs of relevant authorities and other interested individuals. Including a separate protocol to collect data on EDGE coral species in this platform could assist in tracking the status of these species in the country	Conservation, Management and Assessment
Objective 4: Increase awareness about coral reef science and conservation								
Include coral reef science and management as a	Maldives	Critical	30,000 USD	12 months	Marine Research Centre Maldives, Ministry of Fisheries	Coral reef science and management	More students will be engaged in marine science which might	Awareness and Education



3. LITERATURE CITED

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