



## ***Leptoseris yabei***

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# Maldives National Red List Assessment: *Leptoseris yabei*

## A. Background Information

### 1. Assessment Information:

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Date of Assessment	3 March 2022
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### 2. Taxonomic Information:

Scientific Name	<i>Leptoseris yabei</i> (Pillai and Scheet 1976)	
Common Name (English)	-	
Common Name (Dhivehi)	-	
Taxonomy	Order	Scleractinia
	Sub-order	-
	Family	Leptoseris
Taxonomic Notes	Originally named <i>Pavona yabei</i> (Pillai & Scheer 1976)	

### 3. Geographic Range:

#### 3.1 Summary of Global Distribution

The species can be found in the Red Sea, Central Indian Ocean and Indo-Pacific, and extends through Australia, southern Japan, the south China Sea, and the oceanic west Pacific (Hoeksema et al., 2008).

#### 3.2 Countries of Occurrence

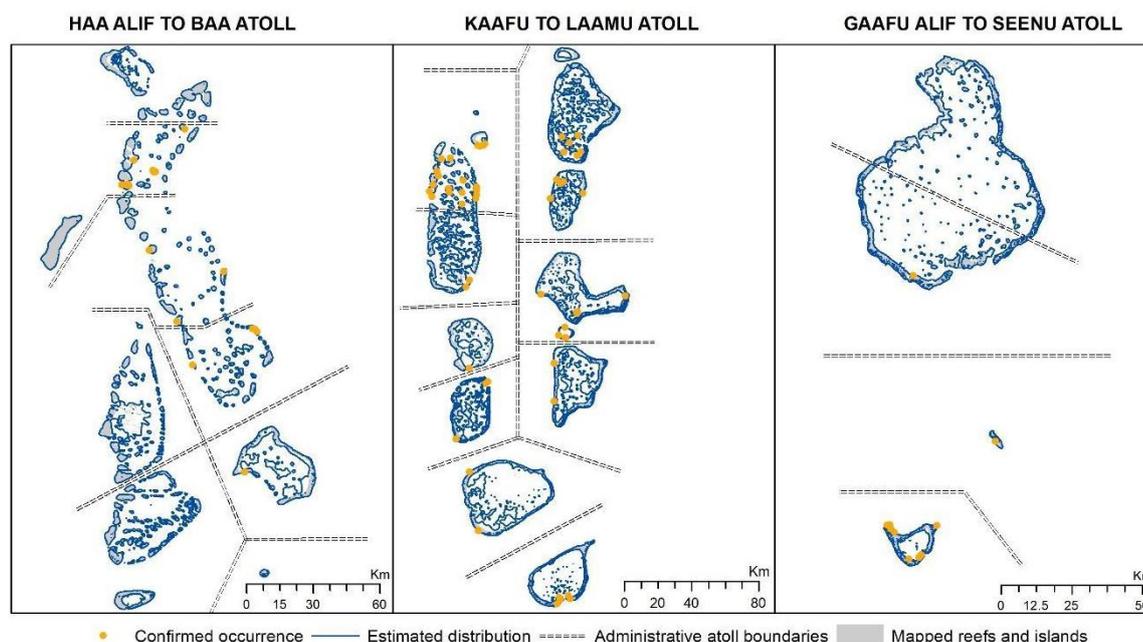
American Samoa, Australia, British Indian Ocean Territory, Cambodia, Djibouti, Egypt, Eritrea, Fiji, India, Indonesia, Israel, Japan, Jordan, Kiribati, Madagascar, Malaysia, Marshall Islands, Micronesia, Nauru, New

Caledonia, Palau, Papua New Guinea, Philippines, Samoa, Saudi Arabia, Solomon Islands, Sudan, Taiwan, Thailand, Tuvalu, Vietnam, Wallis and Futuna, Yemen (Hoeksema et al., 2008)

### 3.3 National Distribution

The species was first originally described by Pillai and Scheer (1976) during the *Xarifa* Expedition, and the species has been reported in recent literature within the Maldives (Bigot and Amir 2012; Jimenez et al., 2012; Pichon and Benzoni 2007).

The genus has been recorded throughout all the atolls of the Maldives. Hence, it is likely that the species is distributed across the Maldives where habitat and depth is suitable. The species is restricted to shallower depths than some others of this genus.



## 4. Population:

### 4.1 Summary

Species specific population information is not available. Population estimates are derived based on best available generic information.

### 4.2 Population Size

Global species population is generalized as “Uncommon” (Devantier, Turak and Szava-Kovats 2020). National species population size is unknown.

A ten-year generic mean, the mean percent cover of the genus over a ten year period of time, was calculated for each genus. This was used as a proxy for the potential species population size.

The ten-year generic percent cover mean derived from available data is  $1.48 \pm 0.25\%$  ( $\pm$  S.E). Therefore, based on generic estimates the species population may vary between  $\sim 0.081$  to  $\sim 3.75\%$  cover assuming differing levels of dominance in a community.

### 4.3 Population Trend

Global and national past population trends are unknown. The future population trend is likely to be decreasing.

### 4.3 Population Trend

Estimates for coral generation lengths are based on Carpenter *et al.* 2008, as follows. The coral colony is considered to be the mature individual, as it typically lives, is injured, or dies as a unit. The average age of

natural survival of a coral colony was defined as the average age of a mature individual, or one generation length. Based on available knowledge of coral species' biology and life history, this was determined to be 10 years. Therefore, population reductions are estimated over 30 years, representing three generation lengths.

#### 4.4 Generation length

Unknown

#### 4.5 Continuing Decline in Number of Mature Individuals?No

#### 4.6 Extreme Fluctuations?

No.

#### 4.7 Severely Fragmented?

Degree of fragmentation is unknown. However, it is assumed to be minimal or limited based on observations indicating there could be connectivity between islands and atolls.

### 5. Habitat and Ecology:

#### 5.1 Summary

The species is generally found on low slopes between 6-20 m depths (Veron et al., 2022). However it has also frequently been recorded at depths below 30m and has been found in mesophotic coral ecosystems (Rooney et al 2010; Pyle et al., 2016; Turak and Devantier 2019).

#### 5.2 Systems (terrestrial / freshwater / marine)

Marine

#### 5.3 Continuing Decline in Area, Extent, and/or Quality of Habitat?

Yes. There is continuous loss of area, extent and habitat quality stemming from coastal development projects and increase in frequency and magnitude of climate change impacts including extreme temperature fluctuations.

#### 5.4 A Migratory Species?

No

### 6. Use and Trade

#### 6.1 Is the species used or traded?

Unknown

#### 6.2 Summary

Unknown

### 7. Threats:

#### 7.1 Summary

Species specific threats are not known. The species is found in shallow reef habitats (6-20 m), it is expected that the species is vulnerable to the impacts of sedimentation, bleaching, disease and predation. However, the species has been recorded at depths below 30 m (Rooney et al 2010; Pyle et al., 2016; Turak and Devantier 2019).

The projected date of onset of Annual Severe Bleaching (ASB) is the date after which the capacity of coral reefs to recover from repeated bleaching events is expected to significantly reduce - resulting in fundamental, permanent population changes (UNEP 2017). The calculation of ASB by UNEP (2020) is restricted to a 30 m depth, due to the dataset used for the spatial analysis.

We calculated the mean year of ASB onset, assuming 0° coral adaptation (UNEP 2020) to climate change, for areas occupied by the genus. A 0° adaptation (i.e. no adaptation) to climate change was applied as a precautionary approach:

- as the capacity of coral to adapt to climate change is not yet well understood
- as there are other climate change impacts that may compound population decline and affect population refuges, and
- to account for impacts from coastal development that could potentially exacerbate the effect of bleaching prompted by climate change.

Based on this analysis, *L. yabei* is expected to undergo ASB starting in 2041.

## 7.2 Major Threats to the Species (using IUCN Threat Classification Scheme)

### 1. Residential & commercial development:

#### 1.1. Housing & urban areas

Timing: Ongoing

Stresses:

1. Ecosystem/Community stresses
  - 1.1. Ecosystem conversion
  - 1.2. Ecosystem degradation
  - 1.3. Indirect ecosystem effects
2. Species stresses
  - 2.2. Species disturbance
  - 2.3. Indirect species effects
    - 2.3.7. Reduced reproductive success

#### 1.2. Commercial & industrial areas

Timing: Ongoing

Stresses:

1. Ecosystem/Community stresses
  - 1.1. Ecosystem conversion
  - 1.2. Ecosystem degradation
  - 1.3. Indirect ecosystem effects
2. Species stresses
  - 2.2. Species disturbance
  - 2.3. Indirect species effects
    - 2.3.7. Reduced reproductive success

#### 1.3. Tourism & recreational areas

Timing: Ongoing

Stresses:

1. Ecosystem/Community stresses
  - 1.1. Ecosystem conversion
  - 1.2. Ecosystem degradation
  - 1.3. Indirect ecosystem effects
2. Species stresses
  - 2.2. Species disturbance
  - 2.3. Indirect species effects
    - 2.3.7. Reduced reproductive success

### 7. Natural system modifications:

#### 7.3. Other ecosystem modifications

Timing: Ongoing

Stresses:

1. Ecosystem/Community stresses

1.1. Ecosystem conversion

1.2. Ecosystem degradation

1.3. Indirect ecosystem effects

2. Species stresses

2.2. Species disturbance

2.3. Indirect species effects

2.3.7. Reduced reproductive success

8. Invasive & other problematic species, genes & disease:

8.2. Problematic native species/diseases

8.2.1. Unspecified species/disease

2. Species stresses

2.1. Species mortality

2.2. Species disturbance

2.3. Indirect species effects

2.3.2. Competition

2.3.7. Reduced reproductive success

11. Climate change & severe weather:

11.1. Habitat shifting & alteration

Timing: Ongoing

Stresses:

1. Ecosystem/Community stresses

1.2. Ecosystem degradation

2. Species stresses

2.1. Species mortality

2.2. Species disturbance

2.3. Indirect species effects

2.3.2. Competition

2.3.7. Reduced reproductive success

11.2. Temperature extremes

Timing: Ongoing

Stresses:

1. Ecosystem/Community stresses

1.2. Ecosystem degradation

2. Species stresses

2.1. Species mortality

2.2. Species disturbance

2.3. Indirect species effects

2.3.2. Competition

2.3.7. Reduced reproductive success

11.4. Storms & flooding

Timing: Ongoing

Stresses:

1. Ecosystem/Community stresses

1.2. Ecosystem degradation

### 7.3 Species vulnerability modifiers

Coral abundance and distribution data is only available at the genus level. Species characteristics were used to evaluate how susceptible each species is to treats. This data was gathered from the IUCN SSC Coral Working Group's Global Traits Database, and available literature. Each species was assigned a vulnerability score for each

trait (3 = high vulnerability; 2 = medium vulnerability; 1 = low vulnerability). This species was scored as follows.

Trait	Vulnerability score
Susceptibility to bleaching	2
Resistance to bleaching	1
Recovery from bleaching or disease	2
Resistance to disease	2
Susceptibility to predation	2
Recovery from sedimentation	2
Resistance to sedimentation	2
Susceptibility to sedimentation	2
<i>Average</i>	2

## 8. Conservation and Research:

### 8.1 Summary

The species is included in CITES Appendix II. Collection, killing and export of live and dead scleractinian corals is illegal under Maldivian fisheries law. Distribution of the species falls under multiple national MPAs though not all the MPAs are properly managed. Species distribution and population information would be required to better manage and protect the species especially as it is a popular target for propagation products and for aquaria. Further species-specific research for threats would support development and implementation of necessary legislation.

### 8.2 Conservation Actions/Research in Place

Globally, as a coral the species is included within CITES Appendix II. It is also listed as “Vulnerable” on the IUCN Red List of threatened species.

Nationally, collection, killing, and export of both live and dead scleractinian corals (under phylum Cnidaria) are illegal in the Maldives under the Maldives Fisheries Law 2020/R-75. The distribution of the genus, and likely the species, overlaps multiple MPAs including Baa atoll biosphere reserve SAMPA.

### 8.3 Conservation Actions Needed

Despite laws and regulations protecting coral species within the country, implementation of such laws and regulations are a challenge. There is a need to create infrastructure and capacity that would enable relevant laws and regulations to be enforced whilst educating the general public that they exist. Educational and training needs extend to more educational opportunities in the marine field as well as skill training opportunities that can support research, further education, institutional development, awareness and communication efforts. Moreover, with the spatial distribution of maldivian reefs and the corals that are found within them, there is an urgent need to foster intra-governmental as well as inter-agency and inter-organizational cooperation and partnerships to mediate limitations related to capacity and resources. Areas of high abundance of specific species along with areas of high coral cover and resilience need to be identified and managed if not fully protected to ensure sustainable use and longevity. Management includes mitigating impacts from coastal development and resolving conflict of multi-use resources. Further, with increasing interest in restoration of reefs, there is a need to properly manage species harvest for projects to ensure that wild stocks are not decimated and species are able

to recover.

1. Land/water protection

- 1.1. Site/area protection
- 1.2. Resource & habitat protection

2. Land/water management

- 2.1. Site/area management
- 2.3. Habitat & natural process restoration

3. Species management

- 3.1. Species management
  - 3.1.1. Harvest management
- 3.2. Species recovery
- 3.4. *Ex situ* conservation
  - 3.4.1. Captive breeding/artificial propagation
  - 3.4.2. Genome resource bank

4. Education & awareness

- 4.1. Formal education
- 4.2. Training
- 4.3. Awareness & communications

5. Law & policy

- 5.3. Private sector standards & codes
- 5.4. Compliance & enforcement
  - 5.4.1. Scale unspecified

7. External capacity building

- 7.1. Institutional & civil society development
- 7.2. Alliance & partnership development
- 7.3. Conservation finance

## 8.4 Research Needed

1. Research

- 1.2. Population size, distribution and past trends
- 1.3. Life history and ecology
- 1.5. Threats
- 1.6. Conservation actions

3. Monitoring

- 3.1. Population trends
- 3.4. Habitat trends

## B. Assessment

### 9. CRITERION A

#### Criterion A

Generation Length		10 years
3 Generations		30 years
Reduction in population size?		Yes
Start Date of Reduction		2022
End Date of Reduction		2052
Rate of Reduction (%)		50-60%
Meets Criteria Thresholds?	A1	-
	A2	-
	A3	Projected population reduction of 50-60% over the next three generations (EN A3)
	A4	-
Reduction Based on Which Sub-criteria?	a	-
	b	-
	c	Decline in habitat quality associated with impacts of climate change.
	d	-
	e	Mortality due to repeated bleaching

Assessment Under Criterion A EN A3ce

**Reasoning** Our assessment of future population reduction is based on the projected date of onset of ASB. *L. yabei* is expected to experience ASB starting in 2041.

Depth and depth range is considered in our assessment, as populations at depths shallower than 30 m are expected to experience greater temperature fluctuations

and extreme temperatures (Riegl and Piller 2003), and therefore decline more quickly. Corals found at greater depths are likely to be less impacted by bleaching.

While the species ranges between 6 m and 20 m, the species has frequently been recorded at depths close to 40 m and is often found in mesophotic coral ecosystems (Rooney et al 2010; Pyle et al., 2016; Turak and Devantier 2019). The presence of depth refugia makes it more resilient to the impacts of climate change. Therefore, we project a population decline between 50-60% over the next three generations (2022-2052), meeting the threshold for EN A3.

## 10. CRITERION B

### Criterion B

AOO		-
EOO		-
Meets Criteria Thresholds?	B1	-
	B2	-
Severely Fragmented?		-
No. Locations		-
Threat used to calculate locations		-
Continuing Decline?	(i) EOO	-
	(ii) AOO	-
	(iii) Habitat	-
	(iv) Locations / Subpopulations	--
	(v) Mature Individuals	-
Extreme Fluctuations?	(i) EOO	-
	(ii) AOO	-
	(iii) Locations / Subpopulations	-
	(iv) Mature Individuals	-

## 11. CRITERION C

### Criterion C

No. Mature Individuals	-
Continuing Decline in Population Size?	-
Is Rate of Decline Known?	-
Generation Length	-
C1 Meets Thresholds for Rate of Decline?	-
Rate of Decline (%)	-
Time Period of Decline	-
C2 (a) (i) No. Mature Individuals in Each Subpopulation	-
(a) (ii) % Mature Individuals in one Sub-population	-
(b) Extreme Fluctuations in No. Mature Individuals?	-

Assessment Under Criterion C DD

## 12. CRITERION D

### Criterion D

No. Mature Individuals	-
Meets Criteria Thresholds?	-
VUD2 AOO	-
No. Locations	-

Plausible Future Threat That Would Quickly Drive Taxon -  
to CR or EX

Plausible Future Threat That Would Quickly Drive Taxon -  
to VU or EN

**Assessment Under Criterion D DD**

## **13. CRITERION E**

### **Criterion E**

Has a Quantitative Analysis Been Conducted? -

Type of Quantitative Analysis -

Generation Length -

Probability of Extinction within 100 Years -

Probability of Extinction within 20 Years / 5 Generations -  
(whichever is longer)

Probability of Extinction within 10 Years / 3 Generations -  
(whichever is longer)

**Assessment Under Criterion E DD**

## 14. Preliminary and Final Assessment

### Preliminary Assessment EN A3ce

Regional Adjustment	Up-list, Down-list, or No Change?	No change
	Justification for Regional Adjustment	No likely interaction with individuals outside the region

### Final Assessment EN A3ce

#### Narrative Justification for Assessment:

*Leptoseris yabei* is likely distributed throughout all the atolls of the Maldives, with a published depth range of 6-20 m. Coral species found at depths of less than 30 m are more exposed to extreme and fluctuating water temperatures associated with the impacts of climate change, which can lead to population reductions.

However, there are records of the species being found at much greater depths, and it can be a characteristic species of mesophotic ecosystems. Hence, while it may be vulnerable to the impacts of climate change and coastal development, it has a depth refugia that makes it less susceptible and more resilient.

The current population size and past rate of decline are not known. However, it is anticipated that the species will undergo a decline in the future based on the impacts of climate change on its local range. Based on published climate model-based bleaching assessments published by UNEP (2017, 2020), it is estimated that ASB will commence in the year 2041 over this species' distribution. However, as this species has a depth refugia that is likely less impacted by bleaching, this is considered to only result in a population reduction of 50-60%.

Therefore, based on the best available data, we project a 50-60% reduction in population size within the next three generations (2022-52), prompted by degradation in habitat quality associated with the impacts of climate change. This meets the threshold for Endangered under Criterion A3ce.

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