



## ***Porites rus***

**Amir, H.**

Citation: Amir, H., 2022. *Porites rus*. The Maldives Red List of Threatened Species.

# Maldives National Red List Assessment: *Porites rus*

## A. Background Information

### 1. Assessment Information:

Assessor Name(s)	Hana Amir
Date of Assessment	3 March 2022
Contributors	Maeesha Mohamed, Phillipa Roe, Simone Montano, Ilham Mohamed
Institutional contributors	Ministry of Environment, Climate Change and Technology; Maldives Marine Research Institute; IUCN Project REGENERATE; Maldives Allen Coral Atlas; Noo Raajje; Six Senses Laamu
Facilitators	James Tallant
Reviewers	Janice Chanson, Maldives Marine Research Institute

### 2. Taxonomic Information:

Scientific Name	Porites rus (Forskål, 1775)	
Common Name (English)	No species name	
Common Name (Dhivehi)	No species name	
	Generic name: Hiri   ހිරި	
Taxonomy	Order	Scleractinia
	Sub-order	-
	Family	Poritidae
Taxonomic Notes	Previously <i>Synaraea rus</i> (Forskål, 1775) and <i>Madrepora rus</i> (Forskål, 1775)	

### 3. Geographic Range:

#### 3.1 Summary of Global Distribution

The range of the species extends from the Red Sea through the southwest and northern Indian Ocean, and the central Indo-Pacific. It is found in the west, north and east of Australia, south-east Asia, southern Japan, the South China Sea and the oceanic West Pacific along the central and eastern Pacific through the Hawaiian Islands (Sheppard et al., 2014).

#### 3.2 Countries of Occurrence

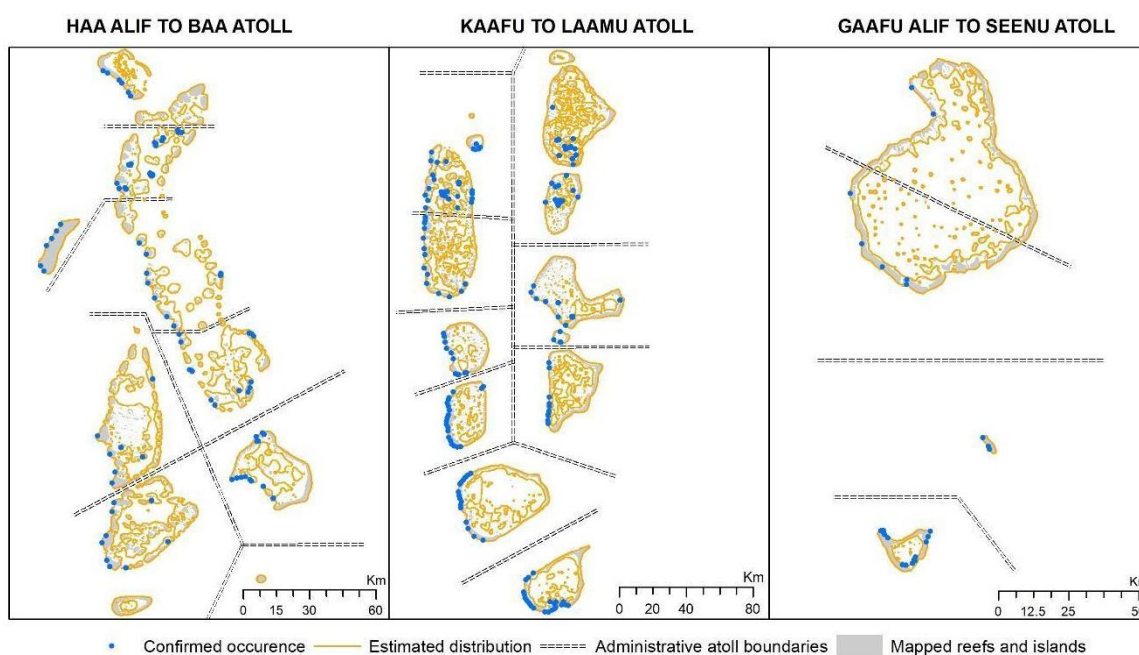
American Samoa, Australia, British Indian Ocean Territory, Cambodia, Christmas Island, Cocos Islands, Comoros, Costa Rica, Djibouti, Egypt, El Salvador, Eritrea, Fiji, Guadeloupe, Guam, Honduras, India, Indonesia, Israel, Japan, Jordan,

Kenya, Kiribati, Madagascar, Malaysia, Marshall Islands, Mauritius, Mayotte, Mexico, Micronesia, Mozambique, Myanmar, Nauru, New Caledonia, Nicaragua, Niue, Northern Mariana Islands, Palau, Panama, Papua New Guinea, Philippines, Reunion, Samoa, Saudi Arabia, Seychelles, Singapore, Solomon Islands, Somalia, Sri Lanka, Sudan, Taiwan, Tanzania, Thailand, Tokelau, Tonga, Tuvalu, United States Minor Outlying Islands, Vanuatu, Vietnam, Wallis Futuna, Yemen (Sheppard et al., 2014).

### 3.3 National distribution

Although the species has been recorded in literature (Pichon and Benzoni 2007; Bigot and Amir 2012; Jimenez et al. 2012) and the genus has been widely observed nationwide throughout the years (e.g., Ciara and Passeri 1993), the exact species distribution is unknown.

Data confirmed occurrences of the genus are available from every atoll. Based on known observations, available data, species characteristics it is estimated that there is possibility for the genus and the species to occur on shallow reef systems in the North, Central and South of the Maldives.



## 4. Population

### 4.1 Summary

Species specific population information, including exact population size and population trends, is not available. Population estimates and distribution are derived based on best available generic information.

### 4.2 Population Size

The global population is generalized as being “common” (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 mean derived from available data is  $3.00 \pm 0.27\%$  ( $\pm$  S.E). Recent estimates indicate genus cover is between 10.00 – 15.00% and is the most dominant genus (Noo Raajje 2021). Therefore, based on generic estimates the species population may vary between ~0.1 to ~10% cover assuming differing levels of dominance in a community. Additionally, the species has been observed to be increasingly prolific with high percent cover in the shallows.

### 4.3 Population Trend

Both global and national past population trends are unknown. Future population trend is likely to be stable or decreasing.

#### 4.4 Generation length

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.

#### 4.5 Continuing Decline in Number of Mature Individuals?

Unknown

#### 4.6 Extreme Fluctuations?

No

#### 4.7 Severely Fragmented?

Population assumed to be cohesive based on generic distribution and mode of reproduction, although degree of connectivity (genetic or otherwise) within and between atolls is unknown

### 5. Habitat and Ecology

#### 5.1 Summary

The species range is between 1 and 20 m. It can frequently be found in shallow reef environments in both sheltered and exposed areas (Veron et al., 2022).

#### 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?

No

#### 6.2 Summary

## 7. Threats

### 7.1 Summary

Specific species threats are not known. The species is known to be relatively resilient to bleaching (Cannon et al 2021; Donner and Carilli 2019) along with other climate change impacts (Comeau, Carpenter and Edmunds 2013) and is able to adapt and recover quickly from bleaching and environmental stressors like sedimentation (Padilla-Gamiño et al., 2012). Therefore, whilst the species is likely to face the impacts of coastal development and climate change due to its shallow depth range (<20 m), it also has a higher chance of recovering from and surviving the impacts.

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, *P. rus* 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*

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*

11.4. 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	1
Resistance to bleaching	1
Recovery from bleaching or disease	2
Resistance to disease	3
Susceptibility to predation	2
Recovery from sedimentation	1
Resistance to sedimentation	1
Susceptibility to sedimentation	1
<i>Average</i>	2

## 8. Conservation and Research

### 8.1 Summary

The species is listed as "Least Concern" on the IUCN Red List of Threatened Species and is included within 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 listed as Least Concern within 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 Summary

The species is listed as “Least Concern” on the IUCN Red List of Threatened Species and is included within 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.

### Conservation Actions/Research in Place

Globally, as a coral the species is included within CITES Appendix II. It is listed as Least Concern within 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.

## 8.4 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

Research Needed

1. Research

1.1. Taxonomy

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

3.3. Trade 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 (%)		20-30%
Meets criteria thresholds?	A1	-
	A2	-
	A3	Projected population reduction of 30-40% over the next three generations. Nearly meets VU A3
	A4	-
Reduction based on which sub-criteria?	a	-
	b	-
	c	Decline in habitat quality associated with impacts of climate change.
	d	-
	e	-

**Assessment Under Criterion A** **NT (nearly meets VU A3c)**

#### Reasoning:

Our assessment of future population reduction is based on the projected date of onset of ASB. *P. rus* is expected to undergo ASB starting in 2041.

The species ranges between 1-20 m and is fully restricted to depths shallower

than 30 m. 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.

The species is considered weedy, thermally resilient (Cannon et al 2021; Donner and Carilli 2019) along with other climate change impacts (Comeau, Carpenter and Edmunds 2013), often outcompeting other hard coral species after disturbance events. In addition, it is able to adapt and recover quickly from bleaching and environmental stressors like sedimentation (Padilla-Gamiño et al., 2012).

As such, the species is considered to be relatively resilient to climate change, with low susceptibility and high resistance based on literature review and scientific expertise. Therefore, although population decline is anticipated over 100% of the species' depth range, it is not expected to experience as severe a population decline as other coral species.

This species is projected to undergo a reduction of 20-30% over the next three generations (2022-2052).

## 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	-

**Assessment Under Criterion B**

**DD**

## 11. CRITERION C

### Criterion C

No. Mature Individuals		Unknown
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	Unknown
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?	No
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**    **NT (nearly meets VU A3c)**

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**    **NT (nearly meets VU A3c)**

### Narrative Justification for Assessment:

*Porites rus* is likely distributed throughout all the atolls of the Maldives, with a depth range of 1-20 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.

Although the current population size and past rate of decline are not known, 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, affecting 100% of its depth range.

However, the species has been identified as being relatively resilient to bleaching (with low susceptibility and high resilience). It is considered a weedy species with the capacity to recover quickly and can adapt to changes to its environment. Whilst it is vulnerable to loss of quality and quantity of suitable habitat, the species has mechanisms that allow it to survive better than other species in similar conditions and circumstances. Due to this species' relative resilience to bleaching, ASB is expected to result in a population reduction of only 20-30%.

Based on the best available data, we project a 20-30% reduction in population size within the next three generations (2022-52), prompted by degradation in habitat quality associated with the impacts of climate change. It is assessed as Near Threatened (nearly meeting VU A3c).

## C. References

- Biggot, L., & Amir, H. (2012). Scleractinia corals of Baa Atoll (Maldives): First checklist and overview of stony corals community structure.
- Carpenter, K.E., Abrar, M., Aeby, G., Aronson, R.B., Banks, S., Bruckner, A., Chiriboga, A., Cortés, J., Delbeek, J.C., DeVantier, L., Edgar, G.J., Edwards, A.J., Fenner, D., Guzmán, H.M., Hoeksema, B.W., Hodgson, G., Johan, O., Licuanan, W.Y., Livingstone, S.R., Lovell, E.R., Moore, J.A., Obura, D.O., Ochavillo, D., Polidoro, B.A., Precht, W.F., Quibilan, M.C., Reboton, C., Richards, Z.T., Rogers, A.D., Sanciangco, J., Sheppard, A., Sheppard, C., Smith, J., Stuart, S., Turak, E., Veron, J.E.N., Wallace, C., Weil, E. and Wood, E. 2008. One-Third of Reef-Building Corals Face Elevated Extinction Risk from Climate Change and Local Impacts. *Science*. 25 July 2008: 560-563. DOI: 10.1126/science.1159196. Supporting online material: [www.sciencemag.org/cgi/content/full.1159196](http://www.sciencemag.org/cgi/content/full.1159196).
- Ciarapica, G., & Passeri, L. (1993). An Overview of the Maldivian Coral Reefs in Felidu and North Male' Atoll. *Erlagen*, 28(33–66), 9–17.
- Comeau, S., Carpenter, R. C., & Edmunds, P. J. (2013). Effects of feeding and light intensity on the response of the coral *Porites rus* to ocean acidification. *Marine Biology*, 160(5), 1127-1134.
- Cannon, S. E., Aram, E., Beiateuea, T., Kiareti, A., Peter, M., & Donner, S. D. (2021). Coral reefs in the Gilbert Islands of Kiribati: Resistance, resilience, and recovery after more than a decade of multiple stressors. *PloS one*, 16(8), e0255304.
- DeVantier, L., & Turak, E. (2017). Species richness and relative abundance of reef-building corals in the Indo-West Pacific. *Diversity*, 9(3), 25.
- DeVantier, L., Turak, E., & Szava-Kovats, R. (2020). Species Richness and Abundance of Reef-Building Corals in the Indo-West Pacific: The Local–Regional Relation Revisited. *Frontiers in Marine Science*, 7, 487.
- Donner, S. D., & Carilli, J. (2019). Resilience of Central Pacific reefs subject to frequent heat stress and human disturbance. *Scientific Reports*, 9(1), 1-13.
- Hoeksema, B. W.; Cairns, S. (2022). World List of Scleractinia. *Porites rus* (Forskål, 1775). Accessed through: World Register of Marine Species at: <https://www.marinespecies.org/aphia.php?p=taxdetails&id=207231> on 2022-03-03
- Jimenez, H., Bigot, L., Bourmaud, C., Chabanet, P., Gravier-Bonnet, N., Hamel, M. A., Payri, C., Mattio, L., Menou, J. L., Naeem, S., Rilwan, Y., Sattar, S., Scott, L., Shiham, A., Vigliola, L., & Andréfouët, S. (2012). Multi-taxa coral reef community structure in relation to habitats in the Baa Atoll Man and Biosphere UNESCO Reserve (Maldives), and implications for its conservation. *Journal of Sea Research*, 72, 77–86. <https://doi.org/10.1016/j.seares.2012.04.011>
- NooRaajje (2021). Maldives Coral Reef Assessment. Waitt Institute. 73 pp.
- Padilla-Gamiño, J. L., Hanson, K. M., Stat, M., & Gates, R. D. (2012). Phenotypic plasticity of the coral *Porites rus*: acclimatization responses to a turbid environment. *Journal of Experimental Marine Biology and Ecology*, 434, 71-80.
- Pichon, M., & Benzoni, F. (2007). Taxonomic re-appraisal of zooxanthellate Scleractinian Corals in the Maldivian Archipelago. *Zootaxa*, 33(1441), 21–33. <https://doi.org/10.11646/zootaxa.1441.1.2>
- Rasheed, S., Warder, S. C., Plancherel, Y., & Piggott, M. D. (2021). An Improved Gridded Bathymetric Data Set and Tidal Model for the Maldives Archipelago. *Earth and Space Science*. <https://doi.org/10.1029/2020EA001207>
- Riegl, B. and Piller, W.E. 2003. Possible refugia for reefs in times of environmental stress. *International Journal of Earth Sciences* 92(4):520-531.

Sheppard, A., Fenner, D., Edwards, A., Abrar, M. & Ochavillo, D. 2014. *Porites rus*. The IUCN Red List of Threatened Species 2014: e.T133492A54272623. <https://dx.doi.org/10.2305/IUCN.UK.2014-1.RLTS.T133492A54272623.en>. Accessed on 04 March 2022.

UNEP 2017. Coral Bleaching Futures - Downscaled projections of bleaching conditions for the world's coral reefs, implications of climate policy and management responses. United Nations Environment Programme, Nairobi, Kenya

UNEP 2020. Projections of future coral bleaching conditions using IPCC CMIP6 models: climate policy implications, management applications, and Regional Seas summaries. United Nations Environment Programme, Nairobi, Kenya

Veron J.E.N., Stafford-Smith M.G., Turak E. and DeVantier L.M. (2022). Corals of the World. Accessed 3 March 2022, Version 0.01 (Beta). [http://coralsoftheworld.org/v0.01\(Beta\)](http://coralsoftheworld.org/v0.01(Beta)). (To go to the current version access: <http://coralsoftheworld.org>)