THE SINGAPORE RED DATA BOOK

RED LISTS OF SINGAPORE BIODIVERSITY

Edited by
G.W.H. Davison, J.W.M. Gan, D. Huang, W.S. Hwang, S.K.Y. Lum and D.C.J. Yeo

THIRD EDITION

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J.W.M. Gan

D. Huang

W.S. Hwang

S.K.Y. Lum

D.C.J. Yeo

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LET'S MAKE SINGAPORE OUR CITY IN NATURE

May 2024

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Singapore 259569

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Edited by:
Geoffrey Davison, James Gan, Huang Danwei, Hwang Wei Song, Shawn Lum, Darren C.J. Yeo

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Cover illustration of Striped bead anemone *Paracondylactis singaporensis,* Singapore freshwater crab *Johora singaporensis,* Singapore ginger *Zingiber singapurense* by: Choo Yen Ee

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FOREWORD

We have come a long way in discovering more about our natural heritage since the release of the first Singapore Red Data Book in 1994. As we continue our journey towards transforming Singapore into a City in Nature, our commitment remains steadfast in our efforts to safeguard our native biodiversity and integrate nature into our urban landscape, while ensuring a liveable and sustainable environment for everyone.

Today, we enjoy the benefits of living close to nature through our extensive network of parks, park connectors and ecological corridors across Singapore – anchored by our Nature Reserves.

By taking a science-based approach to nature conservation, we continue to enhance and restore natural habitats and enable the long-term survival of our native biodiversity. The National Parks Board (NParks)'s Nature Conservation Master Plan consolidates and intensifies our conservation efforts. Examples include NParks' Species Recovery Programme, which helps rare species that are endemic, native or critically endangered to thrive.

This third edition of the Singapore Red Data Book marks a timely update in our biodiversity knowledge, and guides us in our conservation efforts moving forward. It is the result of 15 years of work, building upon the efforts from earlier editions of the Book. The breadth and depth of coverage of native species in this Book has increased significantly – more than tripled – over the past edition.

This book is made possible only because of the community coming together and working together. To produce this publication, NParks worked with the National University of Singapore's Lee Kong Chian Natural History Museum and the Nature Society Singapore. They represent the partnership of government, academia and civil society that continues from the approach taken for the second edition of the Singapore Red Data Book.

I trust that this book will continue to inform and inspire conservation efforts in Singapore, serving as a useful resource for people to better appreciate and cherish our biodiversity. I believe it will also encourage young Singaporeans with a passion for nature to look into addressing the gaps in our knowledge and find ways to make Singapore the best home for us and the biodiversity that share this island.

To all the editors, scientists and volunteers of the Singapore Red Data Book, thank you for contributing towards Singapore's transformation into a City in Nature, and your tireless efforts in conserving our natural heritage for generations to come.

DESMOND LEE
Minister for National Development
Minister-in-charge of Social Services Integration
Singapore

PREAMBLE

The IUCN Red List Categories and Criteria were developed for classifying species at risk of global extinction. Assessments of living species have been performed at the global level and results published in Red Data Books since the early 1960s. In the years thereafter, IUCN recognised that it could be useful to have regional assessments for species at the national and even local levels.

The first Singapore Red Data Book (SRDB) of threatened plants and animal species was compiled by Wee Yeow Chin and Peter K.L. Ng in the early 1990s with the book published in 1994. Inputs were sought and received from a wide variety of professionals who were also dedicated nature lovers. The intent was to highlight biodiversity that was in trouble and at risk of being extirpated so that conservation plans could be drawn up for actions to follow.

The second edition of the SRDB (RDB2) was published 14 years after the first edition – in 2008. The intervening years saw Singapore's landscape change biologically, physically, and politically. New conservation areas were established with the gazettement of the Labrador Nature Reserve (2001) and the Sungei Buloh Wetland Reserve (2002), while Chek Jawa in Pulau Ubin was administratively protected (2001). The human population of Singapore had increased while land reclamation and development work for urban infrastructure as well as a large increase in building projects meant that there were impacts to natural habitats affecting the populations of many native species.

Fast forward to today, the present third edition of the SRDB (RDB3) is produced by the National Parks Board working together with the National University of Singapore's Lee Kong Chian Natural History Museum and the Nature Society (Singapore), representing the partnership of government, academia and civil society that continues from RDB2. The six members of the editorial team formed in this partnership also constitute the core of the steering committee behind RDB3.

All contributors to the RDB3 project were invited to an inaugural workshop, which was held primarily to provide consistency, so far as it was practically possible, to the application of assessment criteria at the national level and across diverse taxa. The workshop enabled participants contributing to the RDB3 to hear the rationale of the RDB3 project and the call for data and stock take of the biodiversity of Singapore. It also promoted a common understanding among the contributors, enabling them to engage as well as to understand one another's perspectives on various issues.

In this RDB3, the number of taxonomic groups with species assessed has increased significantly over the RDB2, including new assessments of algae, fungi, poriferans (sponges), freshwater aquatic bugs, assassin bugs, marine insects, tanaids and marine fishes - chondrichthyians (sharks and rays). These taxonomic groups have species that are being assessed and assigned a category of threat status for the very first time. In addition to the breadth of coverage across taxa, many taxonomic groups have seen an increase in the depth of coverage. For example, only one ant species was assessed in RDB2, whereas in RDB3, 230 species were assessed. Taxa such as bees, beetles, cnidarians, echinoderms, flies, marine fishes, molluscs, moths, scleractinians, spiders and wasps also saw substantial numbers of species assessed for the first time. This increased the number of species compiled in the RDB3 over the RDB2 from just above 2,900 species to more than 9,400 species.

As editors, we have endeavoured to make a fair compilation of opinions from the contributors who are experts, specialists and authors in their respective fields. We are aware that compilations and categorisations of this nature are never exhaustive or perfect. While significant strides have been made over the past 16 years in both terrestrial and, especially, marine biodiversity, the ecological information on the population sizes and rates of decline that are required to assign the category of threat status using the IUCN threat categories is still patchy for many taxa even for national territories as small as Singapore's.

As such, there are plenty of opportunities for everyone with an interest in biodiversity to contribute to the body of knowledge and understanding that leads to the conservation and management of species, species recovery programmes and, just as importantly, the conservation of habitats and the ecological corridors connecting them in Singapore.

While the contributions to this book are substantial, and for which we hope will help spark an interest and raise awareness among readers that Singapore is home to a multitude of biodiversity, we have also enabled easy and convenient access to the general public to refer to the checklists and Red Lists of the species from the taxonomic groups covered in this book on the NParks biodiversity webpages.

We look forward to the growing use of this edition of the Singapore Red Data Book.

Geoffrey Davison
James Gan
Huang Danwei
Hwang Wei Song
Shawn Lum
Darren C.J. Yeo

Singapore
May 2024

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ACKNOWLEDGEMENTS

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All photographers who contributed their photographs for this publication.

CONTRIBUTORS

Editors of The Singapore Red Data Book: Red Lists of Singapore Biodiversity
G.W.H. Davison, J.W.M. Gan, D. Huang, W.S. Hwang, S.K.Y. Lum, D.C.J. Yeo

Applying the Red List Categories
G.W.H. Davison

Restoring Singapore's Biodiversity: From a Garden City to a City in Nature – Laws, Policies and Environmental Governance
L.H. Lye

Algae
A.C. Lee, J. Fong, Z.T. Yip, R.S.W. Yeo, V. Kwan

Flora
D.J. Middleton, S. Lindsay, B.C. Ho, K.Y. Chong, P. Athen, Bazilah Ibrahim, J. Chen, L.M.J. Chen, L.M. Choo, J.W.M. Gan, S.K. Ganesan, E.M. Gardner, A.Q. Hu, S.L. Koh, H. Kurzweil, S. Lai, W.N. Lam, S.M.L. Lee, P.K.F. Leong, J. Leong-Škorničková, D.C.H. Liew, R.C.J. Lim, W.H. Lim, Y.W. Low, H.K. Lua, L. Neo, X.Y. Ng, M.A. Niissalo, A. Phang, M.L. Rodda, W.W. Seah, D.C. Thomas, I.M. Turner, K.M. Wong, S.M. Yaakub, C.K. Yeo, Y.S. Yeoh

Fungi
A.M.F. Choong, S.M.L. Lee

FAUNA : INVERTEBRATES
Porifera – Sponges
S.C. Lim

Cnidaria (non-Scleractinia)
N.W.L. Yap, R.M. Oh, I. Iesa

Cnidaria (Scleractinia) – Stony Corals
L.C.S. Ng, S.Y.K. Chan, R. C. Poquita-Du, D. Huang

Polycladida – Flatworms
S.J.W. Tong, R.S.L. Ong

Marine Annelida – Segmented Worms
Y-L. Lee, H.P. Ang, C.H. Chuar, Gayathri D/O Sivananthan

Mollusca – Molluscs
S.K. Tan, K.S. Tan

Blattodea – Termites and Cockroaches
M. Foo, R. Choo (assessment dataset)

Coleoptera – Beetles
L.F. Cheong, W.F.A. Jusoh, X.R. Ong, S. Yap

Diptera – Flies
Y. Ang

Hemiptera – Freshwater Aquatic Bugs
A.D. Tran, R. Choo, M.J.J. Chang, W.S. Hwang

Hemiptera (Reduviidae) – Assassin Bugs
W.S. Hwang, R. Choo, H. Yeo

Hymenoptera – Bees & Wasps
Z.W.W. Soh, J.X.Q. Lee, J.S. Ascher

Hymenoptera (Formicidae) – Ants
W.Y. Wang

Lepidoptera – Butterflies
S.K. Khew, H. Tan, Y-K. Tea, A. Soh, J. Soong

Lepidoptera – Moths
A. Jain, J. Chua, C.W. Gan

Odonata – Dragonflies & Damselflies
R.W.J. Ngiam, M.F.C. Ng

Orthoptera – Crickets and Katydids
M.K. Tan

Phasmida – Stick Insects
F. Seow-Choen

Arachnida – Spiders
D.J. Court, J.K.H. Koh (checklist)

Miscellaneous Arthropoda and Onychophora
W.S. Hwang

Arthropoda – Tanaidacean Crustaceans
C.K. Chim

Arthropoda – Freshwater Decapod Crustaceans
Y. Cai, D.J.J. Ng, L.X. Gan, E.X.P. Toh, D.C.J. Yeo

Arthropoda – Horseshoe Crabs and Marine Decapod Crustaceans
J.C.E. Mendoza, B.Y. Lee, P.K.L. Ng, D.C.J. Yeo

Arthropoda – Marine Insects
M.J.J. Chang, L. Cheng, A.D. Tran, W.S. Hwang

Echinodermata – Sea Stars, Feather Stars, Brittle Stars, Sea Cucumbers and Sea Urchins
I. Iesa, D.J.W. Lane, H.P.-S. Wong, T.S. Tay

FAUNA : VERTEBRATES
Freshwater Fishes
B.W. Low, H.H. Tan, J.T.B. Kwik, Y. Zeng, D.C.J. Yeo

Marine Fishes
Z. Jaafar, K.K.P. Lim, J.K.Y. Low

Amphibians
N.J. Thomas, I.S. Law, K.K.P. Lim

Reptiles
N.J. Thomas, I.S. Law, K.K.P. Lim

Birds
D.L. Yong, A. Chia, A. Jain, B.P.Y-H. Lee, D.Z.W. Li, G.W.H. Davison, G. Lim, G.C. Tan, J. Lee, K.C. Lim, K.S. Lim, M. Nyanasengaran

Marine Mammals
S.Z.H. Ng, Z. Jaafar

Terrestrial Mammals
N.T-L. Lim, B.P.Y.-H. Lee, R.C.H. Teo, M.A.H. Chua, S.H. Yeo, M.D.Y. Khoo, T.K. Fung

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AFFILIATIONS OF EDITORS AND CONTRIBUTORS

EDITORS

Editors of The Singapore Red Data Book: Red Lists of Singapore Biodiversity

G.W.H. Davison	National Parks Board, Singapore
J.W.M. Gan	National Parks Board, Singapore
D. Huang	Lee Kong Chian Natural History Museum, Faculty of Science, National University of Singapore
	Department of Biological Sciences, Faculty of Science, National University of Singapore
W.S. Hwang	Lee Kong Chian Natural History Museum, Faculty of Science, National University of Singapore
S.K.Y. Lum	Asian School of the Environment, Nanyang Technological University
	Nature Society Singapore
D.C.J. Yeo	Lee Kong Chian Natural History Museum, Faculty of Science, National University of Singapore
	Department of Biological Sciences, Faculty of Science, National University of Singapore

CONTRIBUTORS

Applying the Red List Categories

G.W.H. Davison	National Parks Board, Singapore

Restoring Singapore's Biodiversity: From a Garden City to a City in Nature – Laws, Policies and Environmental Governance

L.H. Lye	Hon. Advisor & former Director, Asia-Pacific Centre for Environmental Law (APCEL), Faculty of Law, National University of Singapore
	Advisory Council Member, Nature Society Singapore

ALGAE

A.C. Lee	Tropical Marine Science Institute, National University of Singapore
J. Fong	Department of Biological Sciences, Faculty of Science, National University of Singapore
Z.T. Yip	Department of Biological Sciences, Faculty of Science, National University of Singapore
R.S.W. Yeo	Amakusa Biological Marine Laboratory, Kyushu University, Japan
V. Kwan	Centre for Nature-based Climate Solutions, National University of Singapore

FLORA

D.J. Middleton	National Parks Board, Singapore Royal Botanic Garden Edinburgh, Scotland
S. Lindsay	National Parks Board, Singapore Royal Botanic Garden Edinburgh, Scotland
B.C. Ho	National Parks Board, Singapore
K.Y. Chong	National Parks Board, Singapore
P. Athen	National Parks Board, Singapore
Bazilah Ibrahim	National Parks Board, Singapore
J. Chen	National Parks Board, Singapore
L.M.J. Chen	National Parks Board, Singapore
L.M. Choo	National Parks Board, Singapore
J.W.M. Gan	National Parks Board, Singapore
S.K. Ganesan	National Parks Board, Singapore
E.M. Gardner	Case Western Reserve University, Ohio, United States of America
A.Q. Hu	National Parks Board, Singapore

S.L. Koh	National Parks Board, Singapore
H. Kurzweil	National Parks Board, Singapore
S. Lai	National Parks Board, Singapore
W.N. Lam	Asian School of the Environment, Nanyang Technological University
S.M.L. Lee	National Parks Board, Singapore
P.K.F. Leong	National Parks Board, Singapore
J. Leong-Škorničková	National Parks Board, Singapore
D.C.H. Liew	National Parks Board, Singapore
R.C.J. Lim	National Parks Board, Singapore
W.H. Lim	National Parks Board, Singapore
Y.W. Low	National Parks Board, Singapore
H.K. Lua	National Parks Board, Singapore
L. Neo	National Parks Board, Singapore
X.Y. Ng	National Parks Board, Singapore
M.A. Niissalo	National Parks Board, Singapore
A. Phang	National Parks Board, Singapore
M.L. Rodda	National Parks Board, Singapore
W.W. Seah	National Parks Board, Singapore
D.C. Thomas	National Parks Board, Singapore
I.M. Turner	National Parks Board, Singapore
	Royal Botanic Gardens Kew, United Kingdom
K.M. Wong	National Parks Board, Singapore
S.M. Yaakub	International Blue Carbon Institute, Conservation International
C.K. Yeo	National Parks Board, Singapore
Y.S. Yeoh	National Parks Board, Singapore

FUNGI

A.M.F. Choong — Department of Biological Sciences, Faculty of Science, National University of Singapore

S.M.L. Lee — National Parks Board, Singapore

FAUNA : INVERTEBRATES

Porifera – Sponges

S.C. Lim — Department of Biological Sciences, Faculty of Science, National University of Singapore

Cnidaria (non-Scleractinia)

N.W.L. Yap — Tropical Marine Science Institute, National University of Singapore

R.M. Oh — Department of Biological Sciences, Faculty of Science, National University of Singapore

I. Iesa — Lee Kong Chian Natural History Museum, Faculty of Science, National University of Singapore

Cnidaria (Scleractinia) – Stony Corals

L.C.S. Ng — Department of Biological Sciences, Faculty of Science, National University of Singapore

S.Y.K. Chan — Department of Biological Sciences, Faculty of Science, National University of Singapore

R. C. Poquita-Du — Senckenberg Biodiversity and Climate Research Centre, Senckenberg Gesellschaft für Naturforschung

D. Huang — Lee Kong Chian Natural History Museum, Faculty of Science, National University of Singapore

Department of Biological Sciences, Faculty of Science, National University of Singapore

Polycladida – Flatworms

S.J.W. Tong — Tropical Marine Science Institute, National University of Singapore

R.S.L. Ong — Tropical Marine Science Institute, National University of Singapore

Marine Annelida – Segmented Worms

Y-L. Lee	Tropical Marine Science Institute, National University of Singapore
H.P. Ang	Tropical Marine Science Institute, National University of Singapore
C.H. Chuar	Tropical Marine Science Institute, National University of Singapore
Gayathri D/O Sivananthan	Tropical Marine Science Institute, National University of Singapore

Mollusca – Molluscs

S.K. Tan	Lee Kong Chian Natural History Museum, Faculty of Science, National University of Singapore
K.S. Tan	Tropical Marine Science Institute, National University of Singapore

Blattodea – Termites and Cockroaches

M. Foo	Lee Kong Chian Natural History Museum, Faculty of Science, National University of Singapore

Coleoptera – Beetles

L.F. Cheong	c/o Lee Kong Chian Natural History Museum, Faculty of Science, National University of Singapore
W.F.A. Jusoh	School of Science, Monash University Malaysia
X.R. Ong	Tropical Ecology and Entomology Lab, Nanyang Technological University
S. Yap	Asian School of the Environment, Nanyang Technological University

Diptera – Flies

Y. Ang	Lee Kong Chian Natural History Museum, Faculty of Science, National University of Singapore

Hemiptera – Freshwater Aquatic Bugs

A.D. Tran	Faculty of Biology, Vietnam National University, Hanoi
R. Choo	Lee Kong Chian Natural History Museum, Faculty of Science, National University of Singapore
M.J.J. Chang	Department of Biological Sciences, Faculty of Science, National University of Singapore
W.S. Hwang	Lee Kong Chian Natural History Museum, Faculty of Science, National University of Singapore

Hemiptera (Reduviidae) – Assassin Bugs

W.S. Hwang	Lee Kong Chian Natural History Museum, Faculty of Science, National University of Singapore
R. Choo	Lee Kong Chian Natural History Museum, Faculty of Science, National University of Singapore
H. Yeo	Department of Biological Sciences, Faculty of Science, National University of Singapore

Hymenoptera – Bees and Wasps

Z.W.W. Soh	National Parks Board, Singapore
J.X.Q. Lee	No. 2, 2/F, Sai Wang Lane, Sai Kung, N.T., Hong Kong
J.S. Ascher	Department of Biological Sciences, Faculty of Science, National University of Singapore

Hymenoptera (Formicidae) – Ants

W.Y. Wang	Lee Kong Chian Natural History Museum, Faculty of Science, National University of Singapore

Lepidoptera – Butterflies

S.K. Khew	c/o Lee Kong Chian Natural History Museum, Faculty of Science, National University of Singapore
	Butterfly Circle (www.butterflycircle.com)
H. Tan	Butterfly Circle (www.butterflycircle.com)
	tan.horace@gmail.com

Y-K. Tea	Australian Museum Research Institute, Sydney, New South Wales, Australia
	School of Life and Environmental Sciences, University of Sydney, New South Wales, Australia
A. Soh	atronox2006@yahoo.com.sg
J. Soong	jonathan.soongster@gmail.com

Lepidoptera – Moths

A. Jain	Nature Society Singapore
	bioSEA Pte Ltd
J. Chua	Nature Society Singapore
C.W. Gan	Nature Society Singapore

Odonata – Dragonflies and Damselflies

R.W.J. Ngiam	yanrobin@hotmail.com
M.F.C. Ng	thebudak@gmail.com

Orthoptera – Crickets and Katydids

M.K. Tan	Department of Biological Sciences, Faculty of Science, National University of Singapore

Phasmida – Stick Insects

F. Seow-Choen	c/o Lee Kong Chian Natural History Museum, Faculty of Science, National University of Singapore

Arachnida – Spiders

D.J. Court	c/o Lee Kong Chian Natural History Museum, Faculty of Science, National University of Singapore
J.K.H. Koh	c/o Lee Kong Chian Natural History Museum, Faculty of Science, National University of Singapore

Miscellaneous Arthropoda and Onychophora

W.S. Hwang — Lee Kong Chian Natural History Museum, Faculty of Science, National University of Singapore

Arthropoda – Tanaidacean Crustaceans

C.K. Chim — Tropical Marine Science Institute, National University of Singapore

Arthropoda – Freshwater Decapod Crustaceans

Y. Cai — National Parks Board, Singapore

D.J.J. Ng — National Parks Board, Singapore

L.X. Gan — Lee Kong Chian Natural History Museum, Faculty of Science, National University of Singapore

E.X.P. Toh — Department of Biological Sciences, Faculty of Science, National University of Singapore

D.C.J. Yeo — Lee Kong Chian Natural History Museum, Faculty of Science, National University of Singapore

Department of Biological Sciences, Faculty of Science, National University of Singapore

Arthropoda – Horseshoe Crabs and Marine Decapod Crustaceans

J.C.E. Mendoza — Lee Kong Chian Natural History Museum, Faculty of Science, National University of Singapore

B.Y. Lee — Tropical Marine Science Institute, National University of Singapore

P.K.L. Ng — Lee Kong Chian Natural History Museum, Faculty of Science, National University of Singapore

Department of Biological Sciences, Faculty of Science, National University of Singapore

D.C.J. Yeo — Lee Kong Chian Natural History Museum, Faculty of Science, National University of Singapore

Department of Biological Sciences, Faculty of Science, National University of Singapore

Arthropoda – Marine Insects

M.J.J. Chang	Department of Biological Sciences, Faculty of Science, National University of Singapore
L. Cheng	Scripps Institution of Oceanography, University of California, San Diego
	c/o Lee Kong Chian Natural History Museum, Faculty of Science, National University of Singapore
A.D. Tran	Faculty of Biology, Vietnam National University, Hanoi
W.S. Hwang	Lee Kong Chian Natural History Museum, Faculty of Science, National University of Singapore

Echinodermata – Sea Stars, Feather Stars, Brittle Stars, Sea Cucumbers and Sea Urchins

I. Iesa	Lee Kong Chian Natural History Museum, Faculty of Science, National University of Singapore
D.J.W. Lane	c/o Lee Kong Chian Natural History Museum, Faculty of Science, National University of Singapore
H.P.-S. Wong	Tropical Marine Science Institute, National University of Singapore
T.S. Tay	Tropical Marine Science Institute, National University of Singapore

FAUNA : VERTEBRATES

Freshwater Fishes

B.W. Low	Department of Biological Sciences, Faculty of Science, National University of Singapore
H.H. Tan	Lee Kong Chian Natural History Museum, Faculty of Science, National University of Singapore
J.T.B. Kwik	Department of Biological Sciences, Faculty of Science, National University of Singapore
Y. Zeng	Asian School of the Environment, Nanyang Technological University

D.C.J. Yeo	Lee Kong Chian Natural History Museum, Faculty of Science, National University of Singapore
	Department of Biological Sciences, Faculty of Science, National University of Singapore

Marine Fishes

Z. Jaafar	Department of Biological Sciences, Faculty of Science, National University of Singapore
	Lee Kong Chian Natural History Museum, Faculty of Science, National University of Singapore
J.K.Y. Low	National Parks Board, Singapore
K.K.P. Lim	Lee Kong Chian Natural History Museum, Faculty of Science, National University of Singapore

Amphibians and Reptiles

N.J. Thomas	National Parks Board, Singapore
	Herpetological Society of Singapore
I.S. Law	Herpetological Society of Singapore
K.K.P. Lim	Lee Kong Chian Natural History Museum, Faculty of Science, National University of Singapore

Birds

D.L. Yong	BirdLife International
	Nature Society Singapore
A. Chia	Nature Society Singapore
A. Jain	BirdLife International
	Nature Society Singapore
	bioSEA Pte. Ltd
B.P.Y-H. Lee	Wildlife & Natural Heritage Division, Royal Commission for Al-Ula, Kingdom of Saudi Arabia
D.Z.W. Li	National Parks Board, Singapore
G.W.H. Davison	National Parks Board, Singapore
G. Lim	Nature Society Singapore

G.C. Tan	Nature Society Singapore
J. Lee	Mandai Nature, Mandai Wildlife Group
K.C. Lim	Nature Society Singapore
K.S. Lim	Nature Society Singapore
M. Nyanasengaran	Department of Biological Sciences, Faculty of Science, National University of Singapore

Marine Mammals

S.Z.H. Ng	Department of Biological Sciences, Faculty of Science, National University of Singapore
Z. Jaafar	Lee Kong Chian Natural History Museum, Faculty of Science, National University of Singapore
	Department of Biological Sciences, Faculty of Science, National University of Singapore

Terrestrial Mammals

N.T-L. Lim	National Institute of Education, Nanyang Technological University
B.P.Y.-H. Lee	Wildlife & Natural Heritage Division, Royal Commission for Al-Ula, Kingdom of Saudi Arabia
R.C.H. Teo	National Parks Board, Singapore
M.A.H. Chua	Lee Kong Chian Natural History Museum, Faculty of Science, National University of Singapore
S.H. Yeo	Nature Society Singapore
M.D.Y. Khoo	National Parks Board, Singapore
T.K. Fung	Department of Biological Sciences, Faculty of Science, National University of Singapore
	Centre for Nature-based Climate Solutions, National University of Singapore

APPLYING THE RED LIST CATEGORIES

G.W.H. DAVISON

Rationale for the Red Data Book

Red Data Books were first begun in 1961 by the International Union for the Conservation of Nature and Natural Resources (IUCN). They were loose-leaf ring binders containing one sheet of paper for each species, considered at global level, and covered only a relatively small number of interesting and charismatic species, mostly birds and mammals. The species included made up the "Red List" of threatened species. Whenever the text on a species was revised, the outdated sheet could be removed and replaced by the new one.

Red Lists have changed dramatically. They are still produced globally, but many nations and even some subnational territories have produced regional and local Red Lists or Red Data Books. The functions have also expanded. Currently, they:

- Help to fulfill and to track performance and commitment to international treaty obligations (e.g. the Convention on Biological Diversity)
- Provide common terms of reference and baseline data on the status of species, of biodiversity as a whole, and information for Singapore's biodiversity reports (including for planning purposes, environmental impact assessments)
- Highlight taxonomic groups and individual species for conservation action (including habitat recovery, connectivity, species recovery programmes).

Background to previous editions

The first edition of the Singapore Red Data Book was published by the Nature Society (Singapore) in 1994 and edited by representatives of the society (NSS) and the National University of Singapore (NUS). The categories of threat used then were Extinct (Ex), Endangered (E), Vulnerable (V), Rare (R), and Indeterminate (I). The second edition (RDB2) was published in 2008, with representatives of NSS, NUS and the National Parks Board (NParks). It had greater taxonomic coverage of the flora and fauna and used the revised threat categories then recommended by IUCN and adopted by the global conservation community.

A third edition of the Singapore Red Data Book (RDB3) was required in order to:

- Update information for all potential users;
- Improve taxonomic and species coverage;
- Enhance consultation with a broader pool of expertise;
- Align more closely with the recommended IUCN guidelines for the assessment process; and
- Provide background information relevant to new and amended legislation (see the chapter in this volume).

The basic principles that were applied throughout the Red Data Book revision were:

- That the IUCN criteria apply across all taxonomic groups;
- That assessments are fact based;
- That the precautionary principle should be applied; and
- That the assessments be done according to the best of the groups' current knowledge, recognizing the continuing shifts in status and information.

The individuals and organisations responsible for the Singapore Red Data Book already intended, before RDB2, that it would eventually become an on-line resource. RDB3 now begins that trend with both print and a summarized on-line version.

Resources

In addition to the Singapore Red Data Book first edition and second edition, useful guiding documents were:

- Bubb, P.J., Butchart, S.H.M., Collen, B., Dublin, H., Kapos, V., Pollock, C., Stuart, S.N. & Vié, J-C. 2009. IUCN Red List Index - Guidance for National and Regional Use. IUCN, Gland, Switzerland.
- IUCN Species Survival Commission. 2012a. IUCN Red List Categories and Criteria, Version 3.1. Gland, Switzerland.
- IUCN Species Survival Commission. 2012b. Guidelines for Application of IUCN Red List Criteria at Regional and National Level. Version 4.0. IUCN, Gland, Switzerland. (http://www.iucnredlist.org/technical-documents/categories-and-criteria).
- IUCN Standards and Petitions Subcommittee. 2017. Guidelines for Using the IUCN Red List Categories and Criteria. Version 13. Prepared by the Standards and Petitions Subcommittee, IUCN. Gland, Switzerland. Downloadable from http://www/iucnredlist.org/documents/RedListGuidelines.pdf

Steering Committee

A steering committee was formed consisting of representatives of the National Parks Board, Nature Society (Singapore) and the National University of Singapore. On 10th September 2019, the steering committee members held a coordination meeting:

The approach taken for the third edition was articulated. The tripartite group of academia, civil society and government as practiced in the second edition should continue. The steering committee had been formed to drive the project, approve editors and taxonomic leads, manage the process and scientific strategy, define and realise the publication of the Red Data Book. The committee members agreed on the following:

- Adherence to IUCN principles and guidelines as far as is practical in the national context;
- Highlighted the composition of the steering committee and the leads for all taxonomic groups;
- The form of credits and acknowledgements for all parties involved in the work was discussed.

Comments were welcomed on the Species Information Sheet template. Specific comments received include how to calibrate and assess between what is endangered nationally but abundant throughout its range in other countries; this comment also applies especially to invertebrates that have largely disappeared from Singapore but are abundant in

South-east Asia. Other comments included adding additional fields such as a "Justification" field and also the date of "First Record for Singapore", "Number of Digital Records", and "Remarks".

It was agreed to circulate an amended Species Information Sheet to all taxonomic leads for further collaborative comments.

Mention was made of the plant taxonomy groups. The Singapore Herbarium (SING) had largely worked out the species list of higher plants for the forthcoming Flora of Singapore project and was already in the process of assigning status and categories to every species.

Discussion was held on the development of common standards for invertebrates so that there would be consistency in application across taxonomic groups. The taxonomic leads for the various invertebrates were encouraged to coordinate their mutual approach.

As a guideline, the overall approach would include all Singapore native species. All other species that are non-native, naturalised and hybrids would be subject to further scrutiny by the steering committee for consideration. The status of non-breeding migrant and vagrant animal species would rely on their international assessment by IUCN, because criteria such as breeding population size, number of mature individuals, and area of occupancy do not apply in the Singapore national context.

Taxonomic Group Leads were identified, and each leader was invited to form a group to consider the status of every species respectively.

Participants' Workshop

A full day workshop was held on 7th March 2020. There were 65 participants including independent experts and taxonomic specialists, the Group Leads and their group members, and representatives of the National Parks Board, Nature Society (Singapore), National University of Singapore, and Wildlife Reserves Singapore. The expectations of the workshop by participants were:

- Learning from other taxon groups' experiences;
- Addressing instances where there are incomplete data;
- Achieving alignment between taxa and between global/regional/local assessments;
- Understanding and using IUCN criteria properly especially for data deficient taxa, unknown taxa, invertebrates, and small geographic areas;
- Resolving inconsistencies of assessment across taxa;
- Credible information that will help guide policy, development and conservation management plans; and
- Managing the 'Species Information Sheets' that had been prepared as a resource document for participants to use in compiling relevant information for every species.

There was substantial agreement on key issues. All taxonomic group leads were encouraged to commence assessment for their respective taxonomic groups and to complete the assignment of categories and status.

- **Native Species**
  All native species were to be assessed while non-native species were to be excluded unless they are of conservation concern but to be placed in a holding section.
- **Residents and Migrants**
  We aimed to assess the status of migrants and not vagrants. Vagrants to Singapore already globally assessed by IUCN may be noted in a separate list.
- **Hybridisation**
  Natural hybrids were to be assessed (should look for and focus on parent species and assess them) and artificial hybrids were not to be assessed.
- **Nationally Extinct versus Non-Extinct**
  Time frame criteria were adopted to determine a threshold for presuming that a species is Nationally Extinct: No records for 30 years for plants, and 50 years for animals with some flexibility based on recent context and justifications.
- **Endemic Species**
  Assessment should mirror the existing IUCN red list status and an endemic species not yet assessed should have both the national and global IUCN assessments done. Any non-alignment at national and global levels should be followed by coordination with IUCN for a review in change of status.
- **Cryptic Species**
  Described species to be assessed; and if there is strong evidence to suspect the presence of an undescribed cryptic species, then groups may provide an assessment with thorough justification.
- **Data Deficient**
  All taxon leads were advised to attempt a status for all species, other than DD, by relying on historic records and other data. No target was given for the number of taxa that may be listed as DD.

The process was impacted soon after the workshop by the advent of Covid-19 and response measures including transmission 'circuit breakers' when everyone in Singapore was advised to stay at home as much as possible and to avoid public spaces and public gatherings. However, taxon expert groups were able to continue their efforts through emails and the use of other technology in IT, preparing the requisite information in the form of MS ExcelTM spreadsheets.

Red List Criteria and Categories

The criteria used internationally for assessing threat levels include:

- Absolute population size and number of mature (potentially breeding) individuals;
- Rate of decline
- Range size and fragmentation

The categories used in this third edition are shown in Table 1. They follow the categories and definitions used by IUCN, plus one additional category relevant to Singapore (Not Listed).

Table 1. The list of categories used in RDB3 and the criteria applied to each category

	Category	Abbreviation	Criteria
Not Threatened	Least Concern	LC	Not approaching the threat criteria
	Near Threatened	NT	Approaching but not yet reaching the threshold for the threat criteria
Threatened	Vulnerable	VU	There are fewer than 1,000 mature individuals but more than 250 and there may or may not be any other evidence of decline, small range size or fragmentation
	Endangered	EN	There are fewer than 250 mature individuals and no other evidence of decline or fragmentation
	Critically Endangered	CR	There are fewer than 50 mature individuals OR, if more than 50 but fewer than 250 mature individuals, with some evidence of decline or fragmentation
Extirpated or Extinct	Presumed Nationally Extinct	NEx	The species is extinct (extirpated) within Singapore but it still survives outside Singapore
	Globally Extinct	EX	The species is extinct all over the world, both in the wild and in cultivation
Other Categories	Data Deficient	DD	Species eligible for assessment at the national level but with inadequate information to make an informed assessment
	Not Applicable	NA	Species that are not eligible for assessment at the national level (mainly introduced taxa and vagrants)
	Not Evaluated	NE	Species that are possibly eligible for assessment but have not yet been evaluated against the criteria
	Not Listed	NL	Species not listed in the records (in the IUCN Global Red List database, or the Singapore RDB1 and RDB2) for whatever reason (e.g., taxonomic uncertainty, synonyms)

Scope and Coverage

The entire land area, freshwater system and marine territory of Singapore has been included within the geographical scope.

All species of angiosperms, pteridophytes and bryophytes were included. Most recorded species of algae were included (a significant improvement to previous editions), but information about fungi and lichens is still too fragmentary to make a full species-by-species assessment.

All species of vertebrates were included, whether terrestrial, freshwater or marine. There have been major advances in coverage of invertebrate groups, notably cnidarians, soft and hard corals, polyclads, molluscs, beetles, flies, bees, wasps, ants, moths, dragonflies and damselflies, spiders, and marine insects. In the first and second editions, small selections from these groups had been included as examples. But since 2008 there have been major surveys of national scope (e.g., spiders, and the Comprehensive Marine Biodiversity Survey) as well as in some of Singapore's key nature reserves and natural areas (Nee Soon freshwater swamp forest, Bukit Timah Nature Reserve, Pulau Ubin). These have permitted much improved coverage and assessments of status.

Already in the second edition, taxonomic coverage of horseshoe crabs and marine decapods, butterflies, phasmids and echinoderms were largely complete, and the status of all species has been revised for the third edition.

Realities in Singapore

The land area of Singapore including all its offshore islands is currently about 735.2 km^2, and it has increased owing to various land reclamation projects during the past two centuries. For comparison, Rhode Island (the smallest US state) is more than four times bigger and Denmark is 60 times bigger than Singapore. The human population density of about 9,000 individuals per square kilometre, very high in comparison with the global average, reflects the fact that Singapore is a city state with extremely limited hinterland.

Small size and high population density have placed significant constraints on land use. Areas of dense urban development, non-natural soil profiles (e.g. through reclamation, landfill and site preparation following many years of prior agricultural and mixed land use) meant that most natural habitats were modified long before the modern conservation era. Even by the end of the 19th century the extent of primary forest was extremely limited, and very little primary forest has been lost since 1900.

The small size of Singapore has meant that populations of all species of plants and animals, even those occurring as commensals with man, are limited. For even the best-known species in such a small area as Singapore, there is seldom any information about population size, area of occupancy and rates of decline. Like other countries, Singapore has difficulty using the criteria to modify categories at 'regional' or national level. This is primarily because man-made political boundaries are a poor reflection of biological processes and limits.

In spite of that, surprising diversity still remains, with more than 2600 species of native plants. Since the publication of the second edition of the Red Data Book there have even been discoveries of totally new plant species such as *Hanguana rubinea* and a new orchid *Nervilia singaporensis*, as well as numerous rediscoveries of species previously thought to have been extirpated such as the orchid *Pinalia floribunda*. New records of species already known from neighbouring countries include even big trees such as *Dipterocarpus chartaceus*. There have been major changes in populations of conspicuous animals such as the Eurasian wild boar, smooth otter and red junglefowl, also of less conspicuous species such as sambar deer, lesser mouse-deer and Malayan porcupine, and there have undoubtedly been changes in many overlooked species as well.

The concept of Singapore as a Garden City was introduced shortly after national independence in 1965. The result was impressive greenery in the form of roadside treescapes, as well as the conservation of forests within the Central Catchment. The concept then developed further to make Singapore a City in a Garden: the implication was that Singapore had shifted from greenery maintained in a garden that was an adjunct to development, towards a garden with a city embedded in it. That concept has since transitioned into a City in Nature, in which both flora and fauna are recognised and valued as an integral part of everyone's day-to-day life in Singapore.

Singapore has adopted very long-term planning horizons. The Urban Redevelopment Authority leads the formulation of the iterative Concept Plan, relevant many decades into the future, through well defined consultation procedures between government agencies, non-governmental organisations, members of the public, and the private sector. The broad brush approach of the Concept Plan is elaborated within Master Plans that have shorter time horizons. Accompanying plans are prepared for special purposes including the Parks and Waterbodies Plan, which includes designated National Parks, Nature Reserves and Nature Areas.

There has been a succession of Singapore Green Plans (SGP), beginning with the SGP 2012 (covering the years 2002–2012), then SGP 2020 (2012–2020) and the next SGP is in preparation covering the period up to 2030. There is also a Singapore Blue Plan (SBP) covering the marine environment and biodiversity. These plans all rely on consultation with communities and non-governmental organisations.

In addition to the above, government agencies maintain much longer lists of sites requiring consultation on biodiversity and options for requiring environmental impact assessments.

Singapore has a National Biodiversity Strategy and Action Plan (NBSAP) reflecting national policy and commitments under the Convention on Biological Diversity. SGP, SBP and NBSAP are all underpinned by the species listing in the Singapore Red Data Book. A Nature Conservation Masterplan outlines the National Parks Board's plans to coordinate, strengthen and intensify our biodiversity conservation efforts.

The National Parks Board is the principal agency responsible for the conservation of biological diversity in Singapore. Significant changes in scope occurred in 2017 when the former Agri-Food and Veterinary Agency (AVA) was split. The veterinary and animal health functions, wildlife trade and management, and enforcement of wildlife protection under the old Animals and Birds Act and the Wild Animals and Birds Act (now completely revised and re-enacted) were all subsumed under the National Parks Board.

The National Parks Board is responsible for maintenance and management of the two national parks, four nature reserves, more than 400 public parks (some of them termed 'nature parks'), and roadside plantings ('Streetscapes') throughout Singapore. In addition there is a system of Park Connectors for pedestrians and cyclists, connecting parks and public spaces throughout the country, with a Round Island Route that will eventually link them all together.

Some streetscapes have been upgraded to Nature Ways by dense interplanting between tall roadside trees, consisting of both higher and lower vegetation layers, understorey and ground vegetation. These now give emphasis to native plant species (including some on the Red List) that support native wildlife. They have greater biomass, more complex layered structure, and greater plant species diversity than unmodified lines of roadside trees. Nature Ways are intended to benefit the public by providing greater shade, more variety and pleasant surroundings, to facilitate people's movement and access to green spaces especially for pedestrians, and to facilitate the natural spread of animal and plant populations from area to area.

Innovative connectors for wildlife have been created such as the BKE wildlife bridge, and rope connectors for use by arboreal monkeys and squirrels.

Species Recovery Programme

A Species Recovery Programme was introduced in 2015 as part of the Nature Conservation Masterplan. It aims to conserve native flora and fauna by targeting endemic, rare or threatened native species in Singapore through

reintroduction, habitat enhancement and protection efforts. Some species targeted by the programme occur in small populations or in only a few places. The programme thus aims to increase the populations of these species and help them survive adverse environmental changes, together with the help of volunteers including academia and the nature community.

In 2020, NParks announced its aim to have 90 plant and 40 animal species under the programme by 2030. In 2021 the targets were raised to 100 plant and 60 animal species by 2030. These efforts to strengthen the conservation of our endangered and key species will further restore ecological habitats for our wildlife and provide Singaporeans with greater access to biodiversity and a more immersive experience in nature.

Ten species of hard corals were added so as to enhance the resilience of Singapore's reefs, as they are extremely vulnerable to climate change. The coral nubbins of these species will be nurtured in NParks' coral nursery at St John's Island and outplanted onto reef enhancement units off Sisters' Islands Marine Park when ready. Further research and conservation efforts focused on these reef-building hard corals will enhance the resilience of Singapore's reefs and benefit the marine life that inhabit them. In addition, 17 animal species that have ongoing species recovery efforts will be included into the programme. This brings the total number of species under the Species Recovery Programme to 80 plant and 40 animal species, as of September 2023. These include trees, climbers, palms, orchids, gingers, freshwater prawns and crabs, butterflies, amphibians, birds and mammals. All of the targeted species have threatened status in the Singapore Red Data Book.

Uses of the Singapore Red Data Book

All of the steps mentioned above, including the designation of park connectors, nature ways, national parks, nature reserves, corridors for animal and plant dispersal, the Concept Plan, Master Plan and Parks and Waterbodies Plan, the Singapore Green Plans and Blue Plans, the lists of sites for biodiversity consultation and environmental impact assessment, all make reference to the Singapore Red Data Book (first, second, and now third edition) as a fundamental reference when assessing biodiversity values.

The choice of species for the Species Recovery Programme is also guided by the Red Data Book.

Least Cost Pathway analysis has been used to identify appropriate routes for enhancement. Source areas (where species of interest already occur), and potential sites for the spread of these species (where they do not yet occur) are identified, and connecting routes evaluated in terms of distance, cost and ease of creating suitable ecological links that can facilitate movements from patch to patch.

Agent Based Modelling is now being used to analyse animal movements between patches, including the dispersal of their propagules (e.g., coral larval dispersal), and plant colonization and genetic exchange (e.g., mangrove fruit dispersal).

The listing of threat status is of basic importance to environmental impact assessments (EIAs). The EIA processes are able to quantify rarity, the number of species under threat, the types of threat, and their relationship to specific development proposals and project designs. The use of the Red Data Book ensures that consultants are using a common source and that studies are comparable across sites.

Newer conservation techniques include camera trapping, bioacoustics, telemetry, the use of drones, and eDNA (environmental DNA or trace DNA). Their use often depends on the existence of biodiversity databases, intelligent

or interactive intuitive databases, and Artificial Intelligence. For example, ultrasound detection of bats requires specialized (but increasingly affordable) equipment, and also a robust library of definitively identified recordings to be used for comparison. Bioacoustics to detect birds or crickets and grasshoppers requires similarly robust databases, and recordings can be analysed by training computer programmes to identify sound patterns.

Tracking Conservation Progress with Biodiversity Databases

When the IUCN criteria are consistently applied to a wide range of organisms, then changes in the number of species in each category can be used as a tracking system to determine whether we are approaching the target of the Convention on Biological Diversity (CBD): to reduce the rate of loss of the world's biodiversity by the year 2010. Since 1988 or 1994, when the criteria for different groups of organisms underwent their last major amendments, such tracking has been possible at a global scale (Butchart et al. 2004, 2005), at regional scale (Gregory et al. 2005) and at individual country level, for example Switzerland (Keller et al. 2005) and Britain (Eaton et al. 2005).

The relevant organisations in Singapore — principally the National Biodiversity Centre and the Singapore Herbarium under the National Parks Board; the Nature Society Singapore; and the Lee Kong Chian Natural History Museum of the National University of Singapore — are repositories for species information that can be analysed using the IUCN criteria. Enthusiasts also maintain databases on selected groups of their interest, such as seagrasses, molluscs, dragonflies, birds and other vertebrates. Singapore records are also represented on international databases such as eBird. Hence it should be possible to use the IUCN categories as a measurement of Singapore's performance in contributing towards the 2030 target of the CBD, and our performance in the decades beyond.