



MANDAI PARK HOLDINGS
YEARBOOK 2019–2020

MANDAI PARK HOLDINGS

Mandai Park Holdings (MPH) is the parent company for Wildlife Reserves Singapore (WRS) and Mandai Park Development (MPD). WRS is the operating arm of MPH, and is responsible for Jurong Bird Park, Night Safari, Singapore Zoo and River Safari. WRS is dedicated to the management of world-class leisure attractions that foster conservation and research, while educating guests about animals and their habitats.

A self-funded organisation, WRS also collaborates with various partners, organisations and institutions aimed at protecting local and global biodiversity. In this pandemic-impacted financial year, we welcomed 4.7 million guests, with Jurong Bird Park contributing 0.7 million, Night Safari 1.2 million, Singapore Zoo 1.9 million and River Safari 0.9 million.

MPD works on refreshing the Mandai district to become a world-leading nature and wildlife district. Once the project is completed, Mandai will feature five zoological parks, two indoor nature-themed attractions, a variety of accommodation options, an array of new restaurants, extensive public spaces and a wildlife bridge to allow animals safe passage across Mandai Lake Road.



CONTENTS

04 MESSAGE FROM CHAIRMAN & GROUP CEO

06 OUR VISION, OUR MISSION, OUR VALUES

07 THE TRIPLE BOTTOM LINE,
STRATEGIC THRUSTS &
KEY SUSTAINABLE DEVELOPMENT GOALS

09 ORGANISATIONAL STRUCTURE

10 BOARD OF DIRECTORS,
COMMITTEE MEMBERS &
SENIOR MANAGEMENT

14 ADOPTERS & DONORS

16 YEAR IN REVIEW

18 CARING FOR OUR PLANET

20 New Mandai Precinct Taking Shape

30 Providing World-Class Animal Care

46 Playing A Leading Role In Conserving Biodiversity

56 Environmental Sustainability

62 Spreading The Message

68 BUILDING A PEOPLE-FOCUSED CULTURE

70 Rallying Staff To The Cause

72 Human Capital Management

74 Learning And Development

76 Social Sustainability

80 SUSTAINING OUR BUSINESS PERFORMANCE

82 Enhancing Guest Experience

86 Driving Footfall

90 FINANCIAL & ATTENDANCE HIGHLIGHTS

93 THE YEAR AHEAD

94 ANNEX



MESSAGE

from Chairman & Group CEO



S Dhanabalan
CHAIRMAN
MANDAI PARK HOLDINGS



Mike Barclay
GROUP CEO
MANDAI PARK HOLDINGS

While the 2019/2020 financial year ended on a sombre note, with the emergence of the Covid-19 pandemic, there were many noteworthy achievements from the preceding months. We made good progress on the Mandai rejuvenation project, which will establish Mandai as a world-leading nature and wildlife destination. Years of planning, design and construction work began to bear fruit, with the opening of the Mandai Wildlife Bridge. For the first time in 60 years, local wildlife can enjoy safe passage between the Central Catchment Nature Reserve forests to the north and south of Mandai Lake Road. In addition, our new animal quarantine facility is almost ready. Construction of the avian hospital and nutrition centre at the new Bird Park has been completed and we have started installing the structures for the eight walk-in aviaries planned for the attraction.

At the same time, we have pushed forth with the Development Masterplan for our existing zoological parks. Construction will start soon on a new amphitheatre in Night Safari, to allow for a seamless interface with the upcoming Rainforest Park. Work on the new KidzWorld in the Singapore Zoo is now well underway. These upgrading works are necessary to ensure our operating parks will be on par with the new Mandai offerings.

We launched the rallying call 'Together, We Protect Wildlife' to sum up our mission in a few memorable words. It expresses how all of us have a role to play in championing and caring for wildlife.

In keeping with our mission to protect wildlife, we inked an agreement with the Department of Environment and Natural Resources of the Philippines to bring a pair of Philippine eagles to Jurong Bird Park. They are the first representatives of their species to be cared for outside of their native range. The Philippine national bird is now critically endangered, with only 400 pairs remaining in the wild. We are deeply honoured to be working with our partner the Philippine Eagle Foundation, and we hope to breed the species and contribute to the sustainability of their population.

To achieve greater conservation impacts, we continued to expand our involvement in international managed species programmes between zoos. These programmes coordinate global efforts to breed threatened species, while ensuring genetic diversity and robust populations in human care. By March 2020 we were participating in 104 managed species programmes. Our staff have been selected to play the species coordinator role for eight of these programmes, based on their deep knowledge and high standing in the zoological community.

We continue to support the international zoo fraternity by taking on leadership responsibilities with World Association of Zoos and Aquariums (WAZA), the Southeast Asian Zoos and Aquariums Association (SEAZA) and Species 360 (which oversees the animal database used by zoos, aquariums, universities and researchers worldwide). We also work closely with the Species Survival Commission of the International Union for Conservation of Nature (IUCN SSC) to monitor and conserve threatened species in the region.

Indeed conservation work is like a marathon: it takes a long period of sustained effort before positive results start to show. The Wildlife Reserves Singapore Conservation Fund (WRSCF) turned ten this year. The fund was initiated as a way for us to fulfil our responsibility as a zoological institution to protect

Singapore's native wildlife. Over the past decade, WRSCF has disbursed funds to more than 40 projects covering a range of species and habitats. We have empowered over 40 researchers and we have shared important conservation messages with close to 100,000 individuals through workshops, symposia and community outreach programmes. WRSCF has also initiated and funded the development of National Conservation Strategy and Action Plans for the Raffles banded langur, the Singapore freshwater crab and the Sunda pangolin, all critically endangered species. We would like to thank and congratulate everyone who has run this marathon together with us over the last ten years.

Beyond our shores, we have funded 53 regional conservation projects over the past year. All are focused on species threatened with extinction. Several of these species first benefitted from our support two decades ago. We have also sought to provide our staff with the opportunity to experience conservation work in the field by sponsoring them to assist our conservation partners across Southeast Asia.

We continue to encourage everyone working for Mandai Park Holdings to stay relevant through reskilling or upskilling. We were honoured to have received a Skillsfuture Employer Award for our commitment to forge a culture of lifelong learning. We also received a Partner of Labour Movement Award at the NTUC May Day Awards 2019, noting our contributions to the movement and efforts to improve staff wellbeing.

It is the same spirit of teamwork and the drive to make every guest's experience a memorable one that saw 218 of our staff being recognised at the annual Excellent Service Awards (EXSA) 2019, with Damian Wong from Night Safari winning the annual EXSA Superstar Award. This was the icing on the cake for Night Safari, as the park celebrated its 25th anniversary.

On the sustainability front, WRS clinched a Merit Award at the Singapore Packaging Agreement Awards 2019. Over the year, we saved more than 100 tonnes of food waste and reused 25 tonnes of horticultural waste. This

is supported by our Green Procurement Policy, which commits us to work with our suppliers to procure more sustainable goods and services. We are seeking to champion green procurement at the national level by becoming one of the founding members of the National Sustainable Procurement Roundtable (NPPR). With concerted efforts, we hope to inspire more procurement executives to embrace sustainable procurement practices and to shape supply chains to respond more positively to sustainable procurement requirements.

To spread the message on conservation and sustainability, our Education department connected with 335,000 schoolchildren, park guests and members of the public, a feat made possible by the staunch support of our partners and volunteers. 91% of guests are now aware of our focus on protecting biodiversity in Singapore and the region. This is an important affirmation of our conservation communication efforts.

As the financial year drew to a close, we faced the unprecedented challenge of the Covid-19 pandemic. The pandemic soon escalated, and we had to shut our parks in April for a period of 87 days, the first time we have had to do so since we started operating Jurong Bird Park almost 50 years ago. Tourism has dried up and we have had to tighten our belts. Despite this exceptionally difficult operating environment, we remain committed to protecting jobs and supporting our conservation partners, and we will not compromise on the welfare of the animals under our care.

In every crisis there are opportunities to be found. We have focused on uncovering new revenue streams, including a range of virtual offerings, and innovating with how we operate. We have put together a solid plan in anticipation of a rebound in demand. The support shown by our board, our staff and our community has been extraordinary. With your continued support, we are confident we will emerge from this crisis in good shape.

Finally, we would like to express our heartfelt appreciation to retiring board members Prof Tan Chorh Chuan and Mr Lam Yi Young for their invaluable contribution to our deliberations.

our vision

To be a world-leading zoological institution that inspires people to value and conserve biodiversity.

our mission

We provide meaningful and memorable wildlife experiences with a focus on protecting biodiversity in Singapore and the region.

our values

ethics



excellence

We strive for the highest standards in all we do.



hospitality

We serve from the heart.



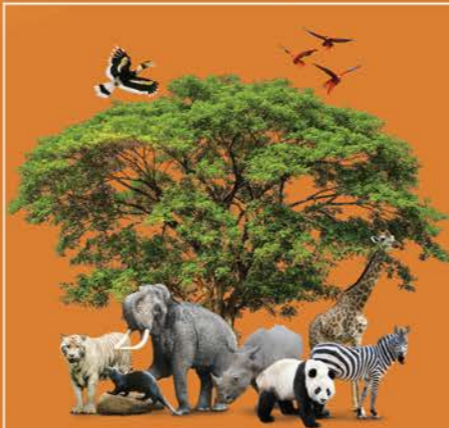
integrity

We are honest and fair in all our dealings.



care for wildlife

We protect wildlife and provide excellent care for our Living Collection.



sustainability

We embrace sustainable best practices.



teamwork

We achieve more together.

The Triple Bottom Line, Strategic Thrusts & Sustainable Development Goals (SDGs)

3Ps	STRATEGIC THRUSTS	SDGs
PLANET	Provide World-class Care For Our Living Collection	14 LIFE BELOW WATER, 15 LIFE ON LAND, 17 PARTNERSHIPS FOR THE GOALS
	Be A Regional Leader In Environmental Sustainability & Conservation	7 AFFORDABLE AND CLEAN ENERGY, 11 SUSTAINABLE CITIES AND COMMUNITIES, 14 LIFE BELOW WATER, 15 LIFE ON LAND, 17 PARTNERSHIPS FOR THE GOALS
PEOPLE	Apply Leading Organisation & HR Practices	7 AFFORDABLE AND CLEAN ENERGY, 11 SUSTAINABLE CITIES AND COMMUNITIES, 12 RESPONSIBLE CONSUMPTION AND PRODUCTION, 14 LIFE BELOW WATER, 15 LIFE ON LAND
	Forge A Strong National Love & Pride For Our Parks	4 QUALITY EDUCATION, 11 SUSTAINABLE CITIES AND COMMUNITIES, 14 LIFE BELOW WATER, 15 LIFE ON LAND, 17 PARTNERSHIPS FOR THE GOALS
PERFORMANCE	Create Exceptional Guest Experiences	4 QUALITY EDUCATION, 14 LIFE BELOW WATER, 15 LIFE ON LAND
	Ensure Long-term Commercial Viability	12 RESPONSIBLE CONSUMPTION AND PRODUCTION, 14 LIFE BELOW WATER, 15 LIFE ON LAND, 17 PARTNERSHIPS FOR THE GOALS

OUR COMMITMENT TO KEY SUSTAINABLE DEVELOPMENT GOALS (SDGs)



QUALITY EDUCATION

Our parks are living classrooms that strengthen early childhood and multi-disciplinary learning, including the mother tongue languages, as well as 21st century competencies through volunteerism, work attachment and career guidance. Through our educational offerings, we empower guests, including those with special needs and from disadvantaged backgrounds, with the chance to learn about wildlife and connect with nature. Robust training for our staff facilitates lifelong learning and acquisition of specialist skills.



AFFORDABLE AND CLEAN ENERGY

We review energy consumption in our parks through comprehensive audits. We are converting to energy-saving electrical devices and solar panels. We have converted all the trams in Jurong Bird Park to run on electricity, and have also converted 40% of the trams in Singapore Zoo to electric trams. We targeted to complete the conversion by end 2021. The principle of using clean energy through innovative solutions guides all development work in Mandai.



SUSTAINABLE CITIES AND COMMUNITIES

We galvanise the community to refuse single-use plastic and to choose sustainably-sourced products. We save 1.3 million single-use plastic bottles per year by providing water refill points in our parks. This year, we received the Singapore Packaging Agreement (SPA) Merit Award, in recognition of our efforts to reduce, reuse and recycle packaging waste.



RESPONSIBLE CONSUMPTION AND PRODUCTION

Our green procurement policy commits us to work with suppliers to procure sustainable goods and services. We use certified segregated sustainable oil for cooking and we serve sustainable seafood in all F&B outlets. We source for sustainable animal feed - the diets of our sealions and penguins are 100% sustainable. We use paper packaging for drinking water, in place of plastic. Other than reducing energy consumption and single-use plastic, we also cut down on food waste in our operations by creating closed loop systems.



LIFE BELOW WATER

Through River Safari, we highlight the fragility of river ecosystems to our guests, and encourage them to take action to protect freshwater life forms, which are disappearing faster than those on land or in the sea. We support local and regional conservation projects to protect biodiversity in aquatic ecosystems. We spread the message on plastic pollution and rally our guests to join us in taking sustainable action.



LIFE ON LAND

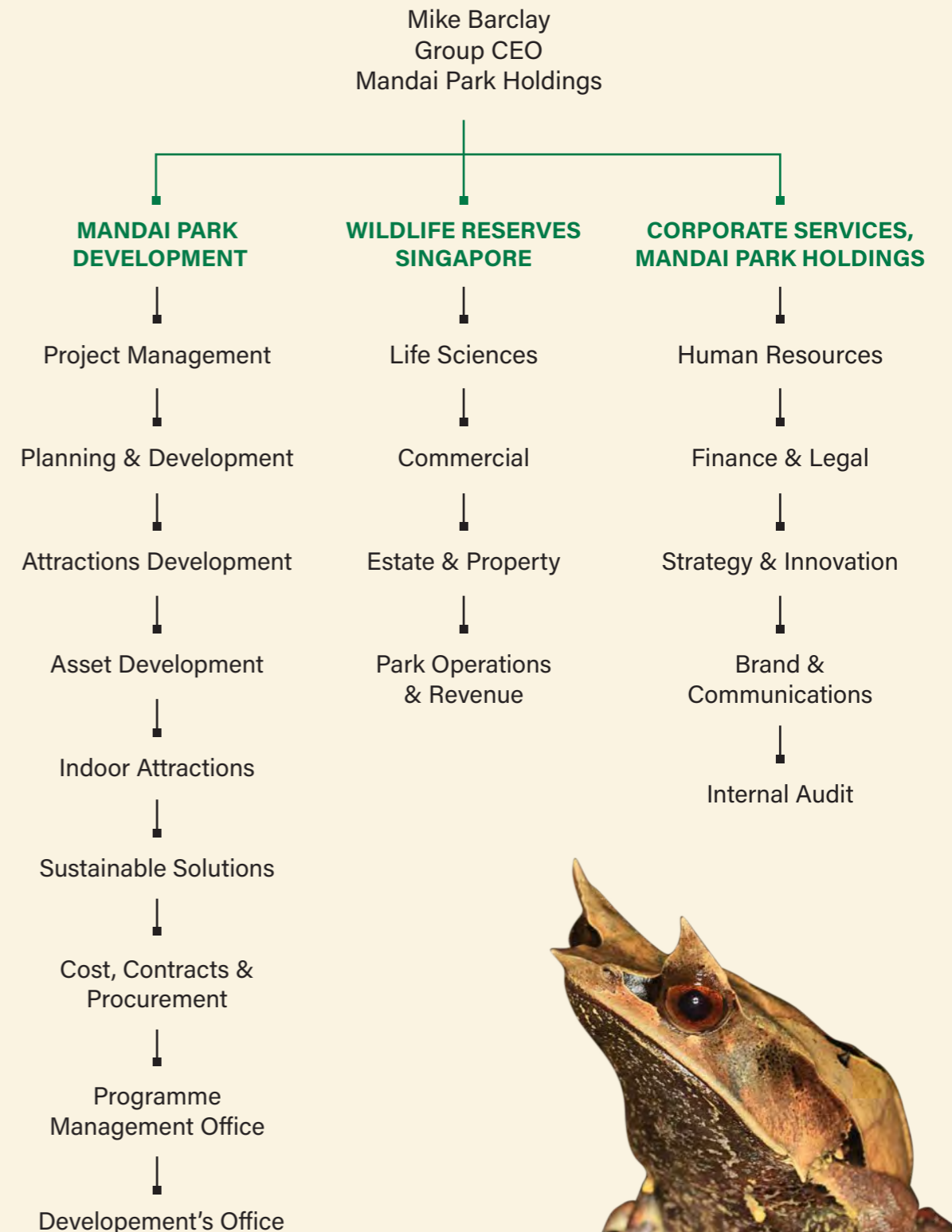
We provide world-class care for the animals in our living collection, which serve as ambassadors to connect people with the natural world. Through conservation messaging with a strong call to action, we encourage people to do their part for wildlife. We work with other zoos through Managed Species Programmes to save threatened species. We contribute to these global programmes as species coordinators for eight threatened species. We support local and regional conservation and are directly involved in saving endangered wildlife such as the Santa Cruz ground-dove.



PARTNERSHIP FOR THE GOALS

We forge strong partnerships, locally and globally, with wildlife institutions, conservationists, NGOs, governmental agencies, businesses, sponsors, donors, schools, volunteers and various communities to achieve our goals.

ORGANISATIONAL STRUCTURE MANDAI PARK HOLDINGS





BOARD OF DIRECTORS

MANDAI PARK HOLDINGS

CHAIRMAN

Mr S DHANABALAN

Mr S Dhanabalan is also Chairman of Temasek Trustees Pte Ltd, the philanthropic arm of Temasek. He is a member of the Council of Presidential Advisers as well as the Presidential Council for Minority Rights. Mr Dhanabalan has been the Patron of the Singapore chapter of Habitat for Humanity since September 2003.

DEPUTY CHAIRMAN

Mr TAN Chuan-Jin

Mr Tan Chuan-Jin is the current Speaker of the Parliament of Singapore. He has served as the Minister for Social and Family Development, as well as the Minister for Manpower. He is currently Advisor to the National Council of Social Service, and also oversees SG Cares, the national movement that works towards building a more caring society. He is the President of the Singapore National Olympic Council and Chairman of the Advisory Board of Healthway Medical Corporation Ltd. Mr Tan is also the Patron of the Centre for Fathering, Club Rainbow (Singapore), and SHINE Children & Youth Services.



DIRECTORS

Mr Mike BARCLAY

Mr Barclay holds the position of the Group CEO of Mandai Park Holdings. He also serves on the Board of the Changi Airport Group, the Raffles Hospital Ethics Committee and the Governing Council of the World Association of Zoos and Aquariums.

Ms Claire CHIANG

Ms Claire Chiang is the co-founder of Banyan Tree Hotels & Resorts and the Chairperson for China Business Development, Banyan Tree Global Foundation, Wildlife Reserves Singapore Conservation Fund, Singapore Book Council and Shirin Fozdar Program in Singapore Management University. She is a director of ISS A/S, Denmark and Dufry AG, Switzerland. She is also a member in the Advisory Committee for Guilin Tourism University and School of Hotel and Tourism Management of Hong Kong Polytechnic University.

Ms NEO Gim Huay

Ms Neo Gim Huay is Managing Director, Sustainability of Temasek International Pte Ltd. She is on the Boards of Surbana Jurong Pte Ltd and the Intellectual Property Office of Singapore. Gim Huay is a member of the Creating Shared Value Council for Nestle and secretary for Eisenhower Fellowships Singapore.

Mr LAM Yi Young (Till 31 March 2020)

Mr Lam Yi Young is Deputy Secretary (Industry) in the Ministry of Trade and Industry. He serves on the boards of CapitaLand Commercial Trust Management Limited, EDB Investments Pte Ltd, JTC Corporation, Sentosa Development Corporation and Singapore GP Pte Ltd.

Mr Dilhan Pillay SANDRASEGARA

Mr Sandrasegara is the Chief Executive Officer of Temasek International Pte. Ltd. He serves on the boards of the National Research Foundation in Singapore and Enterprise Singapore. He is also a member of the Future Economy Council, the Financial Centre Advisory Panel of the Monetary Authority of Singapore and the National Jobs Council.

Ms CHONG Siak Ching

Ms Chong Siak Ching is the Chief Executive Officer of National Gallery Singapore and Head of the Visual Arts Cluster (VAC) Singapore comprising the Singapore Art Museum, Singapore Tyler Print Institute and the National Gallery Singapore. She is a member of the Yale-NUS Governing Board, and is Singapore's Non-Resident Ambassador to the Republic of Chile.

Mr SIM Hwee Cher

Mr Sim is a Council Member of Community Chest, Member of Duke-NUS Medical School Centre for Ageing, Research and Education (CARE) Advisory Board, Council Member of the National Youth Achievement Award Association, and Director of Mandai Park Holdings Pte Ltd, The Esplanade Co Ltd and UOL Group Ltd.

Professor Leo TAN

Professor Tan chairs the Temasek Foundation Innovates, and the Science Sub-Commission of the Singapore National Commission for UNESCO. He is Singapore Governor of Asia-Europe Foundation (ASEF), a Fellow of the Singapore National Academy of Science and Governing Member of the Singapore Environmental Council.

Mr Stephen FORSHAW

Mr Forshaw is the Head, Public Affairs and Managing Director, Australia and New Zealand for Temasek. He also serves on the board of the Real Pet Food Company, on the Singapore Advisory Board of the Australian Institute of Company Directors and is a Member of the Industry Advisory Council of Singapore University of Technology and Design's School of Humanities, Arts and Social Science.

Mr KEE Teck Koon

Mr Kee Teck Koon is the Board Exco Chairman of NTUC Enterprise, and Deputy Chairman of NTUC Income Insurance Co-operative Limited. He is an independent director of two public listed companies, namely, CapitaLand Ltd and Raffles Medical Group Ltd, and is also a Non-Executive Director of NTUC Fairprice Co-operative Limited, Changi Airport Group (S) Pte Ltd, and a member of Angsana Fund Investment Committee (AFIC) of the Singapore Labour Foundation.

Professor TAN Chorh Chuan (Till 29 September 2019)

Professor Tan is Executive Director of the Office of Healthcare Transformation as well as the Ministry of Health's Chief Health Scientist. He is on the Board of Directors of the Monetary Authority of Singapore, and of the Health Promotion Board. He is also a member of the Yale-NUS Governing Board and Senior Advisor to the Boards of the National University Health System and Duke NUS Medical School.



COMMITTEE MEMBERS

ANIMAL WELFARE AND ETHICS COMMITTEE

Chairman: **Prof Leo TAN**

Secretary: **Dr CHENG Wen-Haur**

Members: **Dr YAP Him Hoo**

Dr Leslie RETNAM

Dr TAN Hwa Luck

Dr Adrian LOO

Dr Stephanie HO

Mr Vinayagan DHARMARAJAH

Prof Joseph CHUN

Mr Mike BARCLAY

WRSCF SPECIALIST PANEL

Chairman: **Dr Shawn LUM**

Secretary: **Dr Jessica LEE**

Members: **Dr Benjamin LEE**

Dr Norman LIM

Dr Danwei HUANG

Dr Darren YEO

Dr Janice LEE

Dr LEONG Tzi Ming

Dr CHENG Wen-Haur

Dr Sonja LUZ

SENIOR MANAGEMENT

Mr Mike BARCLAY ▪ Group Chief Executive Officer & Executive Director, Mandai Park Holdings

Dr CHENG Wen-Haur ▪ Deputy Chief Executive Officer & Chief Life Sciences Officer
Mr Benjamin TAN ▪ Deputy Chief Executive Officer & Chief Commercial Officer
Mr LEONG Yue Kheong ▪ Deputy Chief Executive Officer Mandai Park Development

Mr Melvin TAN ▪ Chief Estate and Property Officer
Ms LOW Wai Peng ▪ Chief Financial Officer
Mr Marcus HENG ▪ Chief Human Resources Officer
Ms Irene LIN ▪ Chief Marketing Officer
Ms Sherri LIM ▪ Chief Park Operations & Revenue Officer
Ms Belina LEE ▪ Chief Strategy & Innovation Officer

Ms Maritonet ALUQUIN ▪ Vice President, Asset Development
Mr Marc CREMADES ▪ Vice President, Attractions Development
Ms HO Hui Ching Suzanne ▪ Vice President, Brand & Communications
Mr CHIA Gim Peng Chris ▪ Vice President, Cost, Contracts & Procurement
Mr TANG Siew Wah Terrence ▪ Vice President, Digital Transformation
Ms LOW Min Hwee ▪ Vice President, Finance
Ms TAN Mui Tian Karen ▪ Vice President, Internal Audit
Ms Jolene GOH ▪ Vice President, Legal
Mr David TK GOH ▪ Vice President, Project Management
Mr NG Kong Wey Kenneth ▪ Vice President, Project Management
Dr LEE Hui Mien ▪ Vice President, Sustainable Solutions

Ms Isabel CHENG ▪ Senior Director Partnership Development

Ms Gail LAULE ▪ Director Animal Presentation
Dr Sonja LUZ ▪ Director Conservation, Research & Veterinary Services
Ms May LOK ▪ Director Education
Mr CHAM Tud Yinn ▪ Director Exhibit Design
Mr Donald TAN ▪ Director Facilities Management
Mr Steven WONG ▪ Director Finance
Mr Steven TAN ▪ Director Food & Beverage
Mr George KYAW ▪ Director Horticulture
Mr Thomas CHUA ▪ Director Information Technology
Ms Daisy LING ▪ Director Jurong Bird Park
Ms Liza CHANG ▪ Director Learning and Organisational Development
Ms Sandy LEE ▪ Director Marketing
Ms Kelly CHEW ▪ Director Procurement
Ms Jean CHOI ▪ Director Sales
Mr Kumar PILLAI ▪ Director Special Projects
Mr Andrew CHAI ▪ Director Technical Services
Dr Luis Carlos NEVES ▪ Director Zoology



ADOPTERS & DONORS

Jurong Bird Park

Goodwood Park Hotel Limited
Hong Leong Foundation
Lee Foundation Singapore
M1 Limited
M1 Limited
Ms Isabella Loh
State Bank Of India (Singapore)
The Shaw Foundation Pte

Brahminy Kite, Ronnie II
Flamingoes from the High Flyers Show
Penguin Coast Exhibit
Malayan Fish Owl, Tupa
Great-Pied Hornbill Exhibit
Scarlet Macaw, Aedric from the High Flyer Show
American Flamingo Exhibit
Fly-pass Macaws from the High Flyers Show

Night Safari

Goodwood Park Hotel Private Limited
Haw Par Healthcare Limited
JTB Pte Ltd
JTB Pte Ltd
JTB Pte Ltd
Kenny Pang
Khoo Teck Puat Foundation
M1 Limited
Martin Storey
Mitsui & Co. (Asia Pacific) Pte Ltd
Singapore Refining Company Pte Ltd
Starisland Travel Pte Ltd
Thai Beverage Public Company Limited
The Shaw Foundation Pte

The Fishing Cat Trail
Tiger Exhibit
Lion Exhibit
Sambar Deer & Elephant Exhibit
Elephant, Neha
Pangolin Exhibit
The Fishing Cat Trail
Hippopotamus Exhibit
Babirusa Exhibit
African White Lion Exhibit
Barasingha Exhibit
Indian Rhinoceros Exhibit
Asian Elephant, Chawang
Slow Loris Exhibit

River Safari

CapitaLand Limited
Khoo Teck Puat Foundation
M1 Limited
Mitsui & Co. (Asia Pacific) Pte Ltd
Tan Chin Tuan Foundation
The Shaw Foundation Pte

Presenting Sponsor & Conservation Donor of Kai Kai & Jia Jia
Red Panda Exhibit
Jewel Tank Exhibit
Mekong Giant Catfish Exhibit
Black Howler Monkey Exhibit
Manatee Feeding Programme



Singapore Zoo

DBI Private Limited
DBS Bank Limited
Fruits Vending Pte Ltd
Greenland Childcare @ Punggol Drive Pte Ltd
Haw Par Corporation Ltd
Henkel Singapore Pte Ltd
Hong Leong Foundation
Hotel Properties Limited
Industrial And Commercial Bank Of China Limited
Jason's Pet Relocation (Singapore)
Kay Kuok
Kentucky Fried Chicken Management Pte Ltd
Lee Foundation Singapore
Lee Foundation Singapore
Leonteq Securities (Singapore) Pte Ltd
M1 Limited
M1 Limited
Mitsui & Co. (Asia Pacific) Pte Ltd
Mrs Christina Ong
Nomanbhoy & Sons Pte Ltd
NTT Asia Pacific Holdings Pte Ltd
Oiltanking Singapore Ltd
Petrochina International (Singapore) Pte. Ltd.
Power Force Technologies Pte Ltd
Sesami (Singapore) Pte Ltd
Standard Chartered Bank Recreation Club
Starbucks Coffee Singapore Pte Ltd
State Bank Of India (Singapore)
Tan Chin Tuan Foundation
Tan Chin Tuan Foundation
Tan Chin Tuan Foundation
Thai Airways International Public Co. Ltd
The Shaw Foundation Pte
Tour East Holdings Pte Ltd
Tradecom Services Pte Ltd
Wuthelam Holdings Pte Ltd

Wildlife Reserves Singapore General Adoption Funds
Buddy Barn Exhibit
Small-clawed Asian Otters Exhibit
Wildlife Reserves Singapore General Adoption Funds
Leopard Exhibit
Chimpanzee, Gangga
Fragile Forest Exhibit
Orangutan, Adi
Treetops Trail
Giant Tortoise, Astove
Asian Elephant, Aprila
Zebra Exhibit
Orangutan, Chomel
Tropical Crops Plantation
Giant Tortoise, Casela
Orangutan, Endah
Amhara Stone Village
Elephant Presentation
Orangutans, Binte & Saloma
White Tiger, Keysa
White Rhinoceros Exhibit
Giant Tortoise, Claude
Lion Exhibit
Chimpanzee, Asha
Chimpanzee, Akinyi
Babirusa Exhibit
Komodo Dragon Exhibit
Asian Elephant, Gambir
Giraffe, Jubilee
Green Iguana, Iguacu
Mini Pigs Exhibit
Asian Elephant, Intan
The Shaw Foundation Amphitheatre
Jungle Breakfast with Wildlife
Chimpanzee, Ida
Rabbit Exhibit

Mandai Wildlife Bridge

Lam Soon Singapore Pte Ltd
Panasonic Asia Pacific Pte Ltd
Temasek Capital Management Pte Ltd

Trees
Trees
Trees

Wildlife Reserves Singapore - Event

Lam Soon Singapore Pte Ltd
Pico Art International Pte Ltd
PT Bank Central Asia TBK

Rainforest Lumina Season 2 (14 Jun 2019 - 9 Feb 2020)
Rainforest Lumina Season 2 (14 Jun 2019 - 9 Feb 2020)
Rainforest Lumina Season 2 (14 Jun 2019 - 9 Feb 2020)

YEAR IN REVIEW



Supported 53 conservation projects regionally and globally (up from 31 last FY) to protect species in their habitat.



Received a Skillsfuture Employer Award and an NTUC Partner of Labour Movement Award, in recognition of our holistic efforts to upskill our human resources and improve staff wellbeing.



Completed construction of the Mandai Wildlife Bridge, avian hospital and nutrition centre at the new Bird Park. Started installation of the structures for the walk-in aviaries; new animal quarantine facility nearing completion.



Worked with other wildlife institutions on 104 Managed Species Programmes (up from 77 last FY) to save threatened species, with staff stepping up as coordinators for eight of these species.



Implemented the Green Procurement Policy which commits us to work with suppliers to procure more sustainable goods and service. Became a founding member of the National Sustainable Procurement Roundtable (NSPR).



WRSCF celebrated 10 years of protecting local wildlife by supporting over 40 researchers and sharing conservation messages with close to 100,000 individuals.



Welcomed a pair of Philippine eagles to Jurong Bird Park to mark 50 years of diplomatic relations between Singapore and the Philippines. This is also a conservation breeding initiative with the Department of Environment and Natural Resources of the Philippines and the Philippine Eagle Foundation.



Welcomed 7,425 beneficiaries from various Social Service Organisations to our parks; engaged 335,300 people through conservation and sustainability education.



Continued to revamp existing exhibits in line with the WRS Development Masterplan: Opened Explorer Outpost in Night Safari and upgraded the Anaconda Exhibit in River Safari.



Converted more than 100 tonnes of food waste into liquid fertiliser and compost; reused 25 tonnes of horticultural waste as mulch for planting beds.





Caring for our Planet

Besides nurturing a highly skilled team to deliver world-class care for our animals, we also drive conservation efforts by leading field conservation projects, supporting research and education, empowering people to take action, and building relationships with like-minded organisations. By rejuvenating the Mandai precinct, we hope to create more opportunities to connect people to nature and inspire them to protect wildlife.

FY19/20 HIGHLIGHTS

Completed construction of the **Mandai Wildlife Bridge**

Provided care for **952** animal species, **26%** of which are threatened in the wild

Participated in **104** global managed species programmes to save these threatened species from extinction

Invested **\$1.8 million** in conservation projects and related work

Engaged and empowered **335,300** people through conservation and sustainability education

NEW MANDAI PRECINCT TAKING SHAPE

Development for the Mandai Rejuvenation Project continues into its third year of construction. 2019 saw the completion of the Mandai Wildlife Bridge, the first feature of the project. We have completed construction of the new avian hospital and nutrition centre at the new Bird Park and started installing the columns, cables and mesh for its eight walk-in aviaries. The new animal quarantine buildings are nearing completion. At the same time, the preparation for works is commencing for the Rainforest Park and stormwater boardwalk while tunnel boring works for the external effluent discharge pipe are ongoing.

Dedicated to animal crossings, the Mandai Wildlife Bridge re-connects the buffer areas leading to the Central Catchment Nature Reserve on both sides of Mandai Lake Road. Connecting the bridge to the buffer zones ensures that this infrastructure does not encroach into the nature reserve.



Development Milestones

Mandai Wildlife Bridge

For the first time in 60 years, the two forest patches of the Central Catchment Nature Reserve on both sides of Mandai Lake Road have been reconnected by the newly constructed Mandai Wildlife Bridge, which spans 140 metres. Situated within the buffer zones adjacent to the nature reserve, the bridge provides a safe passage for wildlife crossing.

Having a wildlife bridge is central to Mandai's efforts in establishing vital habitat connectivity for native wildlife movement in the area. Construction of the bridge began in June 2017 and was prioritised as a key milestone in the development project, making it the first feature of the Mandai Rejuvenation Project to be completed.

Over 31,000 native trees and shrubs representing 25 species have been planted on the bridge to create a 'green crossing' for wildlife. WRS volunteers, as well as volunteers from our partners Lam Soon Singapore, Panasonic Asia Pacific and Temasek, rolled up their sleeves to help plant around 100 saplings and trees in preparation for the launch of the bridge.

Six colugo poles of heights varying from 10 to 15 metres (including one in the buffer area of the new bird park) have also been erected on the bridge to facilitate colugo

movement while the trees grow. To monitor and track animal movement across the bridge, six wildlife monitoring cameras have been installed.

Since the opening of the bridge, at least 19 species have been seen using the bridge. This includes reptiles as well as mammals such as the long-tailed macaque, sambar, wild pig and common palm civet. Wildlife were also observed to be using the bridge for resting and foraging.



Participants from Lam Soon Singapore braved the rainy weather and planted more than 60 saplings and trees as part of their contribution to the Mandai Wildlife Bridge under the NooTrees brand campaign.

New Bird Park

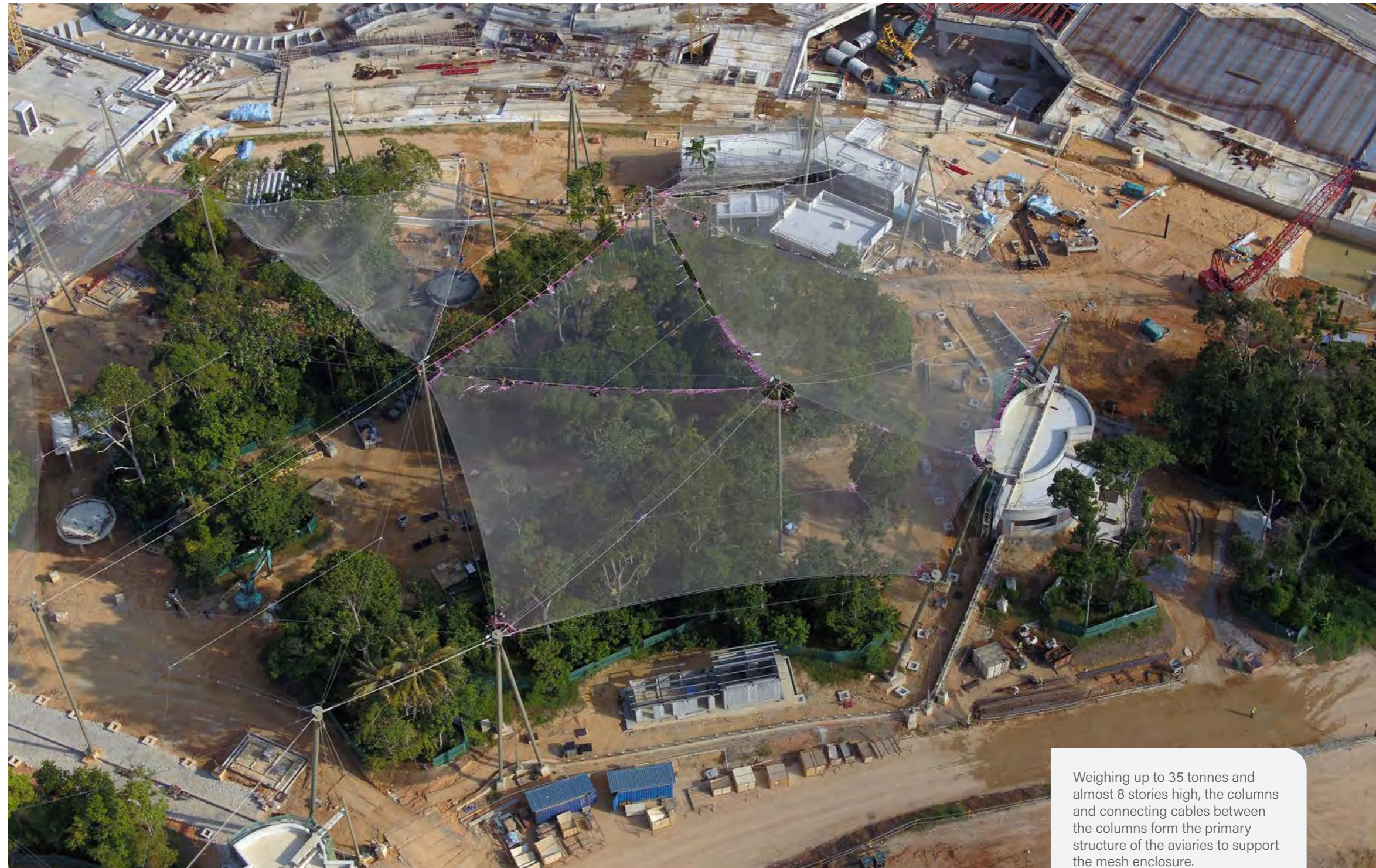
Following the completion of the Mandai Wildlife Bridge, we are making good progress on the construction for the new Bird Park and West Arrival Node.

The new Bird Park will be home to eight large walk-in aviaries, which are enclosed by a steel structure of columns, cables and mesh. 170 columns and 140,000m² of mesh are to be installed across the site. Works are well underway for these structural elements.

Meanwhile, construction of the new avian hospital and nutrition centre has been completed. The former is designed to world-class standards and boasts key biosecurity features, the latter is bigger in size than the current facility. Interior works are in progress.



Expert rope accessors take on the tedious and dangerous job of tensioning the pieces of mesh together over the cables.



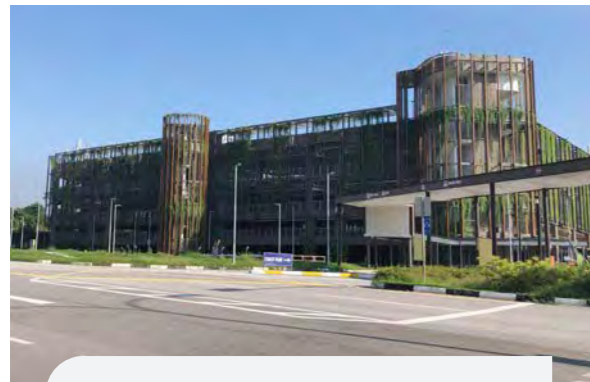
Weighing up to 35 tonnes and almost 8 stories high, the columns and connecting cables between the columns form the primary structure of the aviaries to support the mesh enclosure.

New Animal Quarantine Building

The project is nearing completion, with the majority of essential works like pump installations and key features like the retractable roof all in place. Once completed, the new animal quarantine building will receive imported animals for the living collection across all existing parks and new parks.

Multi-Storey Carpark

To accommodate the expected increase in attendance with the new parks, two levels were added to the multi-storey carpark serving the Singapore Zoo, River Safari and Night Safari, increasing the total number of lots by 40%.



Multi-storey visitor carpark serving Singapore Zoo, River Safari and Night Safari at Mandai

Right: Cross section illustration of the resort. Wherever possible, the resort is elevated several metres above the ground to allow native wildlife to move across the site.

Credit: WOW Architects

New Resort At Mandai

Local architectural firm, WOW Architects, has been appointed the lead design architect for the new resort at Mandai. WOW Architects joins resort operator Banyan Tree Hotels & Resorts – another home-grown brand – in translating our vision of bringing guests closer to nature. Taking a biophilic approach, the unobtrusive design integrates the buildings with their natural surroundings. Sustainable and environmentally friendly best practices will be adopted to build what is to be Singapore’s first Super Low Energy (SLE) resort. The resort sits at the doorstep of the wildlife parks in the precinct, where guests can enjoy specially crafted programmes and activities aimed at inspiring a more ‘conscious’ way of life that is in tune with the natural world.

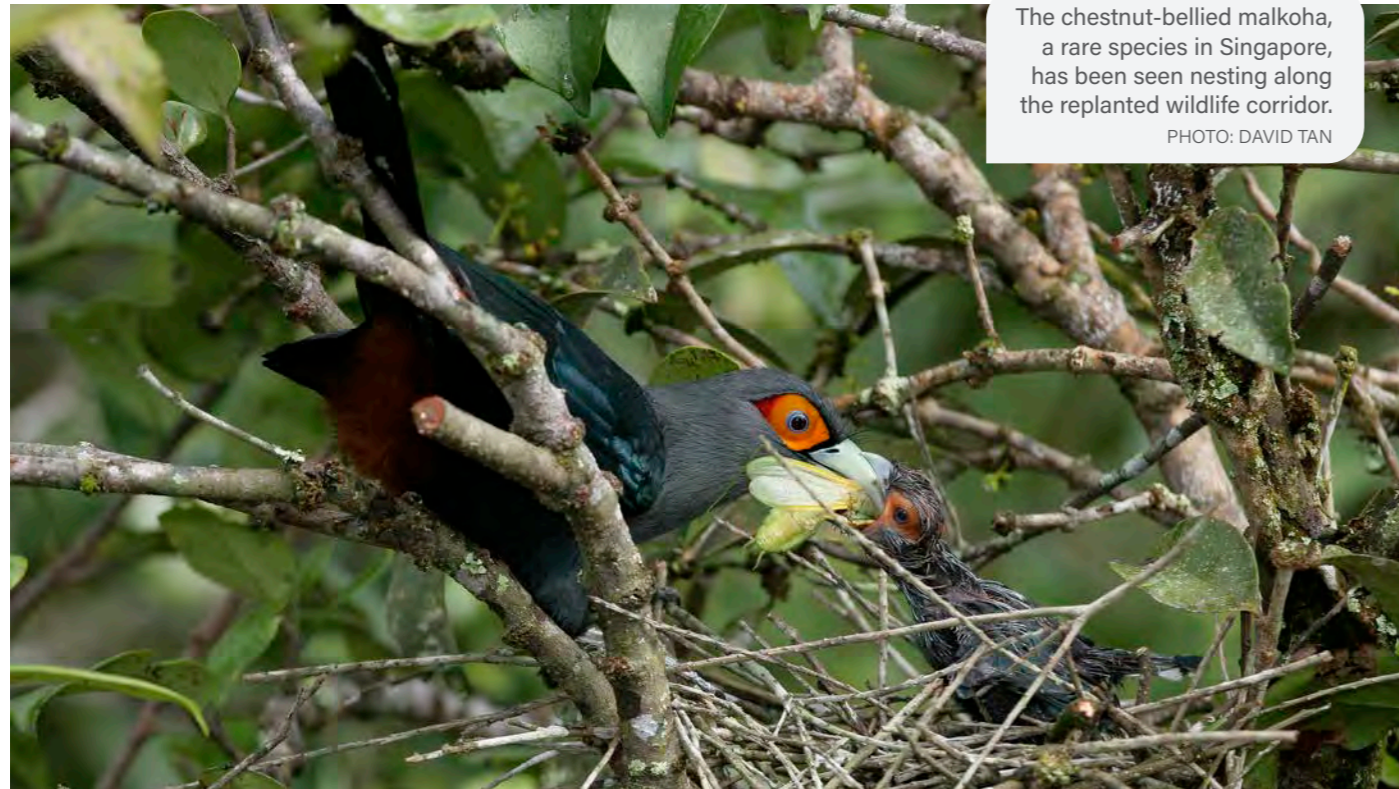


Interior illustration of a treehouse room. Rooms are designed to blur the boundaries between nature and living spaces, allowing guests to come closer to nature.





More Protective Measures For Wildlife



The chestnut-bellied malkoha, a rare species in Singapore, has been seen nesting along the replanted wildlife corridor.
PHOTO: DAVID TAN

The Mandai Ecological Restoration Plan (Merp)

The Mandai Ecological Restoration Plan (MERP) was developed to guide the restoration and enhancement of habitats for local biodiversity and improve overall wildlife connectivity across the Mandai precinct in the long term. Around 20% of our development land, mainly forested areas adjacent to the Central Catchment Nature Reserve, is protected as buffers for wildlife. While these patches of degraded

land do provide habitats for wildlife, some areas are characterised by poor forest structure, compacted soil and besieged by weedy species..

Through the propagation of local flora species, the MERP aims to restore the natural ecology of degraded areas and enhance their livability for a greater variety of wildlife. These regeneration efforts will create a variety of microhabitats and provide conducive passageways for animals between patches of forest. The reforestation of

the buffer area that connects the Mandai Wildlife Bridge and the nature reserve is the start of these efforts. The chestnut-bellied malkoha, a rare species in the local context, has been seen nesting along the replanted wildlife corridor leading to the bridge and a few individuals have been seen using the tree canopy to cross from one side to another. We are heartened by these uncommon sightings and hope to see more animals as we continue with the reforestation work.

Mandai Environment Research Projects

While in-house environmentalists and consultant ecologists have been steadily accumulating baseline data on the biodiversity in the surrounding Mandai precinct, we hope to build on this by partnering the research and academic community. To this end, the Mandai Research Fund was established. Four environmental research projects helmed by different institutions received grants amounting to SGD\$600,000 under the Fund. The awarded

projects allow us to proactively identify knowledge gaps and delve deeper into specific issues unique to the Mandai precinct through evidence-based models and systems, and to explore novel solutions to address these issues. Such studies also help to provide additional comprehensive assessment of the impact of the development, beyond the scope of the Environmental Impact Assessment (EIA), that we hope will contribute towards Singapore's environmental knowledge base.

For project details, please refer to the Annex.

Flora Protection

As part of our efforts to preserve and improve habitats for native wildlife, 94 tree protection zones were set up across the Mandai Rejuvenation Project site. 2,500 saplings have been salvaged and 80 trees transplanted within the site. Within the project buffer zones and areas adjacent to the Central Catchment Nature Reserve, 1,576 trees across 28 vegetation survey plots were assessed and mapped as part of our long-term vegetation monitoring, to ensure the wellbeing of the reserve.



Malaise traps being set up for insect sampling. These tent-like traps are generally placed in a natural flyway where it can sample a good representation of flying insects present in a week.



A tree that has been transplanted, tagged with info including its species and date of planting.

Developing Sensitively

Over the FY, Biodiversity Awareness Training conducted in-house saw more than 5,000 attendees, including staff and construction personnel. With additional tenders awarded as construction progresses, we continue to step up efforts to ensure that contractors appreciate the environmental sensitivities and comply with the project's stringent environmental requirements.

292 environmental, health and safety inspections and 73 environmental compliance

audits were carried out in total. Environmental, Safety and Health (ESH) Roundtable sessions were also held for contractors from different worksites, and shared initiatives were identified for implementation across the work site.

As part of capacity building efforts, an Environmental Management Forum was initiated for managers of the various work sites to come together to learn about good practices, share challenges faced on site and brainstorm solutions together.



Engaging Community Stakeholders



Hosted by MPH Chairman Mr S Dhanabalan, the appreciation dinner was a platform to deepen engagement with members of the nature community.

We continued to involve community stakeholders through regular updates and consultations. In the FY, nine sessions were organised for the nature community, including three small group meetings, two site visits, two sharing sessions, one workshop and an appreciation

dinner hosted by MPH Chairman, Mr S Dhanabalan.

The launch of the Mandai Wildlife Bridge was a milestone we celebrated collectively with community stakeholders. The nature community has been actively involved in the design and construction

environmental management of the bridge since it was first mooted in 2015. Members of the nature community were invited to join us for the final leg of tree planting in the lead-up to the launch.

From left:
Er. Lim Peng Hong, Member of Mandai's Environmental Advisory Panel,
Mr Mike Barclay, Group Chief Executive of Mandai Park Holdings,
Mr S. Dhanabalan, Chairman of Mandai Park Holdings and
Minister Desmond Lee, Minister for Social & Family Development and Second Minister for National Development, planting a 3.5m *Horsfieldia superba*, a critically endangered native tree species, on the Mandai Wildlife Bridge to mark its opening.



PROVIDING WORLD-CLASS ANIMAL CARE

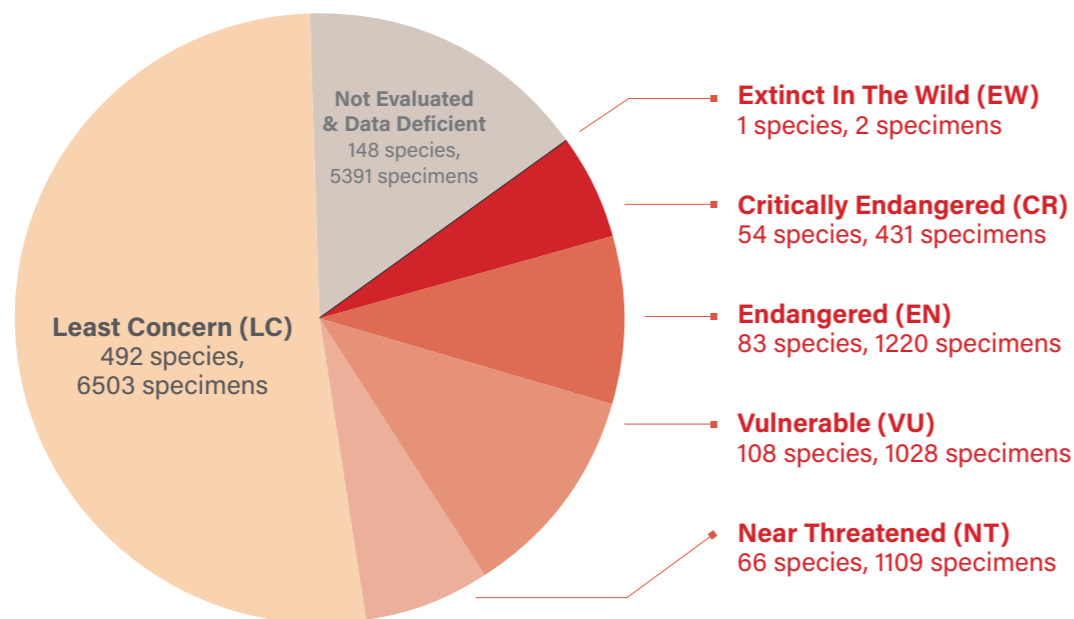
This FY, the Animal Welfare Working Group (AWWG) was restructured to coordinate regular welfare assessments for all species in our living collection, to promote evidence-based, welfare-oriented species management and enclosure planning, as well as ensure welfare-driven healthcare for our animals. Our successful annual reaccreditation under Zoo and Aquarium Association (ZAA) is recognition of our commitment to positive animal welfare. Through our support of the establishment and enactment of the Southeast Asian Zoos and Aquariums (SEAZA) Standard of Welfare, we are also contributing to regional zoo animal welfare.

Over the FY, we

- Provided care for **15,684** animals across **952** species
- Participated in **104** global managed species programmes to save these threatened species from extinction
- Bred **626** young across **135** species, **21%** of which are threatened with extinction

TOTAL ANIMAL COLLECTION (as at 31 March 2020):
952 species, 15,684 specimens (26% are threatened*)

* **Threatened species** include animals that are - *extinct in the wild*, - *critically endangered*, - *endangered* and - *vulnerable*; classification is based on The IUCN Red List of Threatened Species.



Our Valuable Living Collection

We have one of the largest and most biologically diverse living collections seen in zoos worldwide. Slightly over a quarter of the 952 species we care for are threatened in the wild. Looking after such a valuable collection necessitates both hard work and detailed planning by the Life Sciences team.

Saving Species At The Global Level

Participating in global managed species programmes is one of the key ways we can contribute to saving species from extinction. Transfers of animals for collection planning and breeding amongst zoos are based on genetic compatibility. Through such collaborative

efforts, we help to ensure the genetic diversity of the managed species and their long term survival. As of end FY, we participate in 104 international managed species programmes, up from 77 last year (see Annex for full list).

A species coordinator for each managed programme is appointed amongst participating zoos. The coordinator's main role is

that of a master planner and matchmaker who oversees how the species should be best taken care of, and to achieve the conservation goal through breeding and animal exchange. We have been systematically developing the scientific competencies of our animal care staff and with this, we are seeing a steady increase in the number of our staff performing the species coordination role.

PROGRAMME	SPECIES	IUCN RED LIST	SPECIES COORDINATOR
EEP*	Straw-headed Bulbul <i>Pycnonotus zeylanicus</i>	CR Critically Endangered	Manoj Kumar, Junior Avian Care Officer
EEP*	Sunda Slow Loris <i>Nycticebus coucang</i>	VU Vulnerable	Cecilia Tang, Assistant Curator (Carnivores & Small Mammals)
EEP*	Black-winged Myna <i>Acridotheres melanopterus</i>	CR Critically Endangered	Anais Tritto, Curator (Birds)
EEP*	Santa Cruz Ground-dove <i>Alopecoenas sanctaecrucis</i>	EN Endangered	Luis Neves, Director (Zoology)
ESB**	Victoria Crowned Pigeon <i>Goura victoria</i>	NT Near Threatened	Anais Tritto, Curator (Birds)
SSMP#	Bornean Orangutan <i>Pongo pygmaeus</i>	CR Critically Endangered	Wendy Chua, Assistant Curator (Records & Transactions)
SSMP#	Sumatran Orangutan <i>Pongo abelii</i>	CR Critically Endangered	Wendy Chua, Assistant Curator (Records & Transactions)
SSMP#	Sun Bear <i>Helarctos malayanus</i>	VU Vulnerable	Anand Kumar, Assistant Curator (Carnivores & Small Mammals)

* EEP - EAZA (European Association of Zoos and Aquaria) Ex-situ Programme

** ESB - EAZA (European Association of Zoos and Aquaria) Studbook

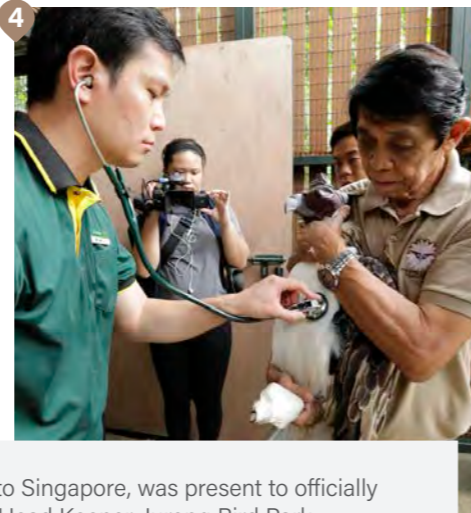
SSMP - SEAZA (Southeast Asian Zoos and Aquariums) Species Management Programme



THE PHILIPPINE EAGLES HAVE LANDED

The national bird of the Philippines, the Philippine eagle is highly endangered. Only 400 pairs remain in the rainforests of Mindanao, Samar, Leyte and Luzon. We work with the Department and Environment and Natural Resources of the Philippines and the Philippine Eagle Foundation to care for the species outside of its wild habitat. It is the first time the Philippines is loaning this national treasure to another country and it marks 50 years of diplomatic ties between the Philippines and Singapore. Eventually, we hope to breed the species and contribute to the sustainability of its population under human care.

1. Airport staff unloading the animal carriers holding Philippine eagles from their flight. Geothermica and Sambisig made their historic flight from the Philippines to Singapore on 4 June 2020.
2. The Jurong Bird Park team and staff from Philippine Eagle Foundation received the Philippine eagles at the airport upon their arrival.



3. His Excellency Joseph del Mar Yap, Ambassador of the Republic of the Philippines to Singapore, was present to officially welcome the Philippine eagles into Jurong Bird Park. From left: **Peter Teo**, Deputy Head Keeper, Jurong Bird Park, **Dr Luis Neves**, Director, Zoology, Wildlife Reserves Singapore, **Dr Cheng Wen Haur**, Deputy CEO and Chief Life Sciences Officer, Wildlife Reserves Singapore, **His Excellency Joseph del Mar Yap**, Ambassador of the Republic of the Philippines to Singapore, **Domingo Tadena**, Consultant, Philippine Eagle Foundation, **Dominic Tadena**, Manager, Conservation Breeding, Philippine Eagle Foundation, **Anais Tritto**, Curator, Jurong Bird Park and **Kimberly Wee**, Junior Keeper, Jurong Bird Park.
4. **Dr Xie Shangzhe**, Assistant Director, Conservation, Research and Veterinary Services, Wildlife Reserves Singapore, conducts a health check on one of the Philippine eagles while **Domingo Tadena**, Consultant, Philippine Eagle Foundation, secures the animal before release into its new aviary at Jurong Bird Park.

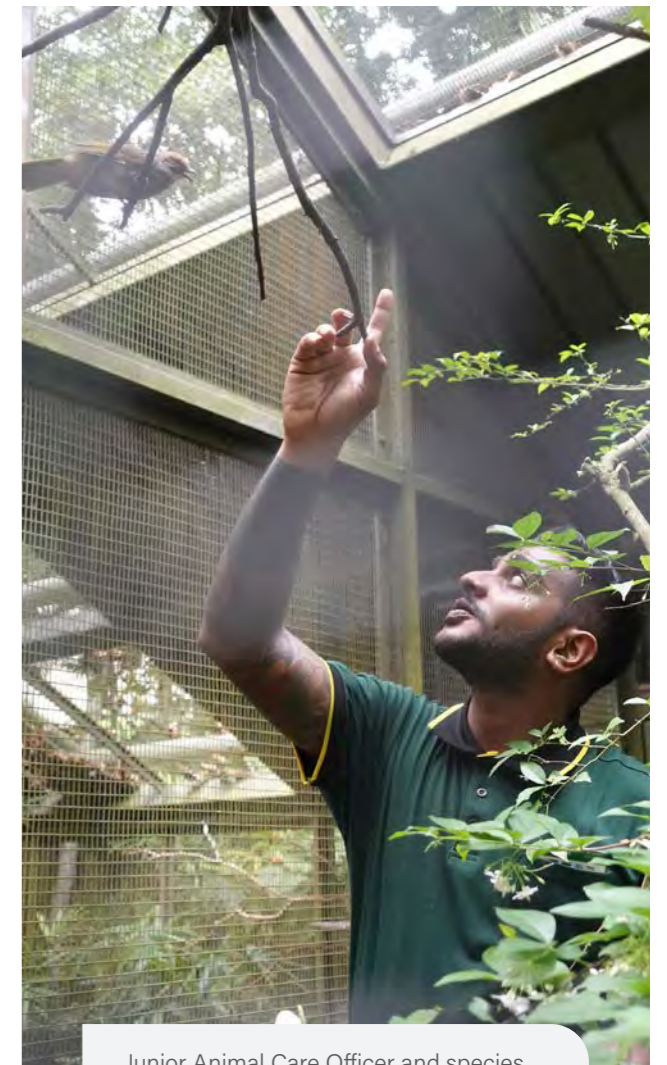


SAVING STRAW-HEADED BULBULS

Straw-headed bulbuls are a critically endangered species of songbird native to Southeast Asia that has seen their wild population reduce rapidly by over 90% due to poaching for the caged bird trade. It has become extinct in areas like Sumatra. The species is relatively stable in Singapore where there is no poaching pressure, and it seems to have found a safe haven here.

It is in situations like this that establishing assurance populations in human care plays a crucial role in saving the species. We have been championing the care for this bird since it was flagged as a top priority species affected by the Asian songbird crisis. By setting up a breeding programme for it at Jurong Bird Park, we gathered vital data and knowledge and produced the "Straw-headed Bulbul Best Practice Guidelines", which is now the international reference for all zoos worldwide to care for the species. We are the first zoo to breed this species in over a decade and as of end-FY, we have welcomed a total of six chicks. The breeding programme at JBP is now a full-fledged programme under the European Association of Zoos and Aquaria.

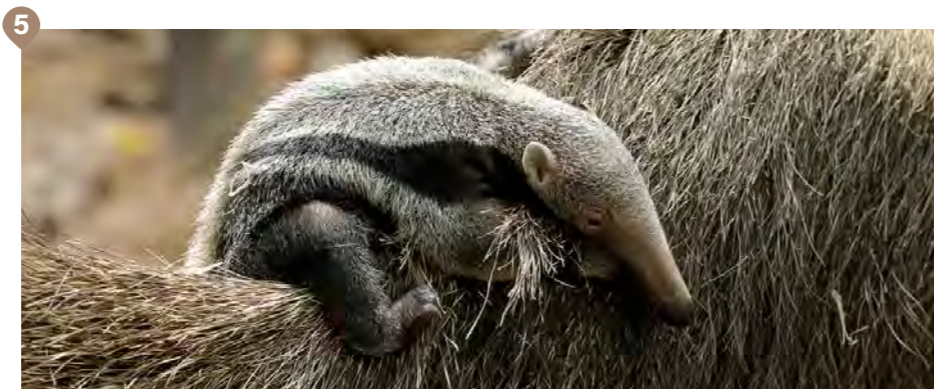
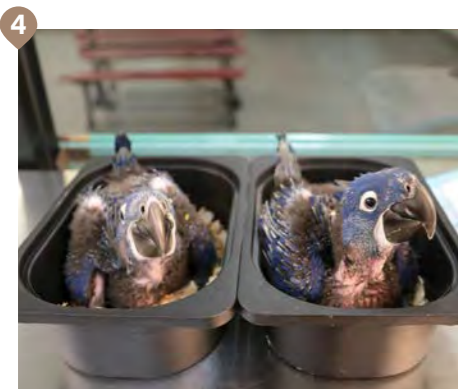
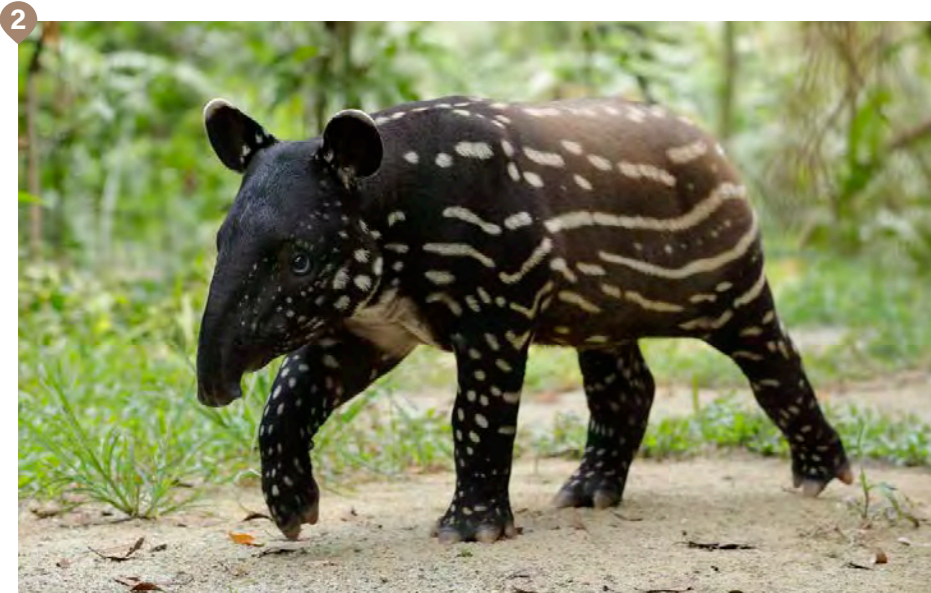
Setting up the first internationally managed programme and being the species coordinator mean we are now able to make decisions that will help establish a sustainable population in human care, with a view on potential reintroduction back to the wild.



Junior Animal Care Officer and species coordinator for the straw-headed bulbul **Mr Manoj Kumar** with one of his charges at Jurong Bird Park.

Bundles Of Joy, Big And Small

Over the FY, we successfully bred 626 young across 135 species. 21% of these species are threatened with extinction. Breeding these threatened species under human care helps to ensure that there remains a sustainable assurance population, that could one day be reintroduced to their native habitat should the wild populations dwindle further.



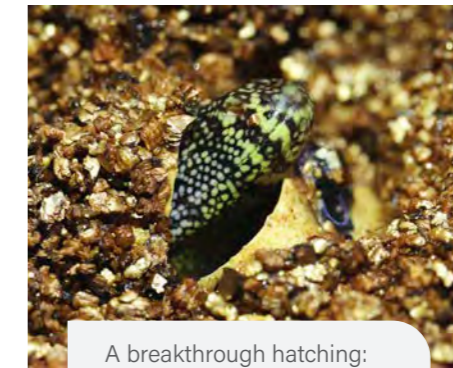
1. Santa Cruz ground-dove chick
2. Malayan tapir cub
3. White rhino cub
4. Hyacinth macaw chicks
5. Giant anteater pup
6. Manatee pup
7. King penguin chick

BREEDING CROCODILE MONITORS

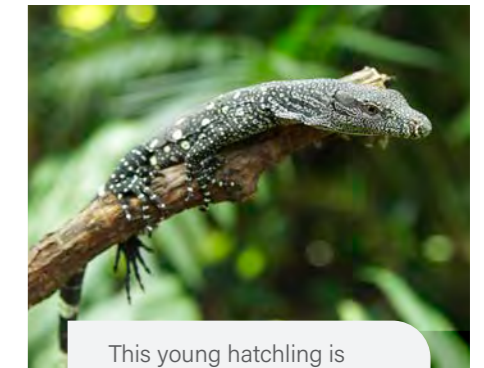
Found exclusively in mountainous primary rain forest in New Guinea, crocodile monitors are large arboreal lizards threatened by deforestation and poaching in the wild. Owing to their cryptic nature, these reptiles are difficult to study in the wild, and therefore, information on them is limited.

Keeping crocodile monitors in human care is a challenge, and breeding has only been achieved on very few occasions. The difficulties of breeding the species are associated with factors ranging from physical condition, social dynamics (compatibility of animals) and egg incubation.

Prior to receiving our breeding pair of crocodile monitors, their destined exhibit was designed to simulate their natural habitat. As they were not in optimal physical condition when they first arrived in Singapore, physical training regimes were implemented. These were to help develop muscle tone,



A breakthrough hatching: a crocodile monitor baby breaks out of its shell and takes its first breath.



This young hatchling is one of a pair of the world's first second-generation crocodile monitors.

which is especially important for the female to have sufficient strength to pull through the egg laying phase,

As they are solitary by nature, introducing the female to the male was a delicate affair that required close supervision from keepers as the female tended to be aggressive. After successful introduction and mating, egg incubation proved to be a major challenge. Records have shown this species to be sensitive to slight changes in incubation perimeters like humidity, temperature and moisture of

nesting material. The team had to pay meticulous attention to maintaining these consistently. After two unsuccessful clutches, the team was finally rewarded with two hatchlings from the third clutch of eggs.

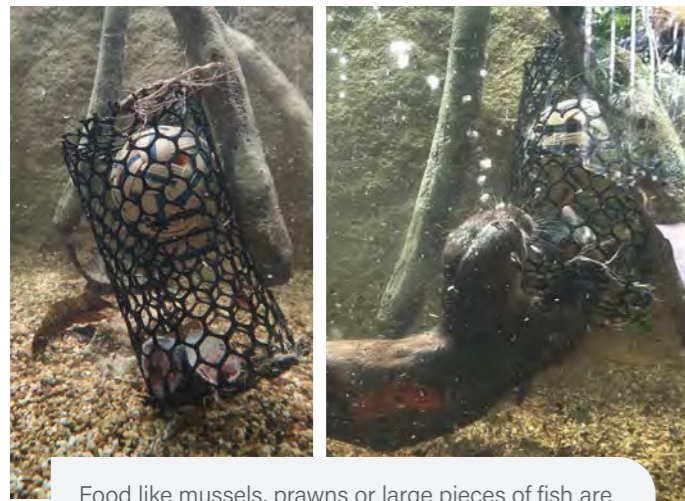
While it is already unusual to breed them, the hatchlings are extra special in that both parents are themselves hatched under human care. This makes them the world's first second generation crocodile monitors to be hatched in a zoo in nearly 20 years, a significant milestone achievement for the herpetology team.





Enriching Our Animals' Lives

The reporting period saw our animal care teams further expanding on efforts to promote evidence-based, welfare-oriented species management. We saw a significant increase in species enjoying the benefits of a structured and efficient enrichment programme. Most of our animals have an enrichment calendar planned out for them by their keepers. Enrichment activities are carefully curated based on the biology of the species and sometimes even the character of the individual animals. Huge amounts of time and effort go into crafting enrichment devices that would elicit natural behaviour from the animals while giving them a mental and physical workout. Close observations of the animals' interaction with the enrichment provided are made. These records help the keepers enhance enrichment activities to improve the physical and mental well-being of their charges.

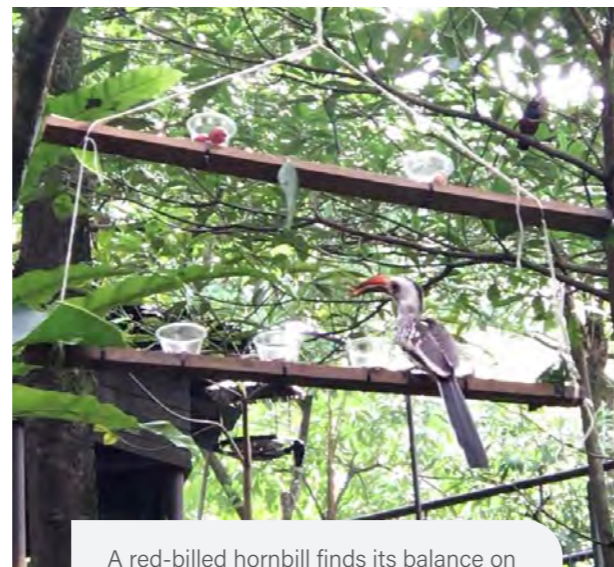


Food like mussels, prawns or large pieces of fish are added to the device to encourage foraging behaviour. To create variety for the otters, a ball may be used to float the device or a weight added to sink it to the bottom of the pool.

ENRICHMENT FOR BIRDS IN A MIXED-SPECIES AVIARY

This enrichment is for an aviary with different species. Large enrichment devices like this suspended feeding platform are a great way for all the birds to interact while feeding together. The 'smarter' species like the hornbills and starlings had the chance to 'work' together by balancing on the feeding beam, which they did!

- Kamisah Sulaiman, Keeper (Avian)



A red-billed hornbill finds its balance on the enrichment device in order to enjoy its mealworm snack.

WATER-BASED ENRICHMENT FOR THE OTTERS

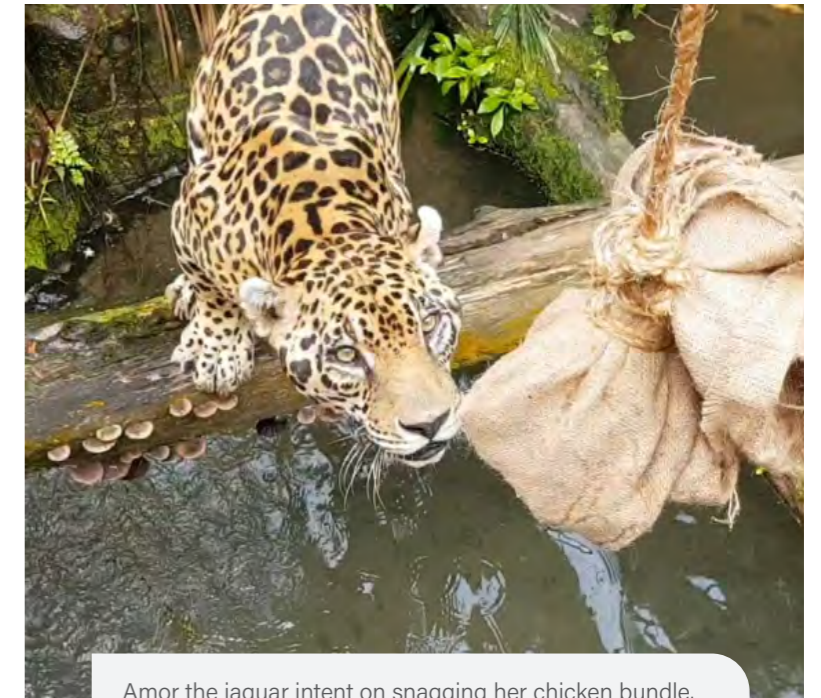
In the wild, Asian small-clawed otters work together to hunt fish or molluscs deep in the water. Providing enrichment devices in the water mirrors the natural foraging behaviour for this species. It enables them to use the muscles and skills as they would in the wild when hunting.

- Joey Song, Keeper (Carnivores and Small Mammals)

ENRICHMENT FOR THE JAGUARS

In the beginning, all four jaguars were not keen to engage with enrichment activities nor participate in any husbandry training or conditioning. They were also unresponsive to our cues, which made day-to-day husbandry tasks such as shifting from dens to exhibit and back, very difficult and time-consuming. Through daily operant conditioning with positive reinforcement, we were able to observe each individual's behaviour, preferences and strengths and weaknesses. Over time, we were able to figure out what would serve as better motivation to get the desired action or reaction from the animal.

- Annanthan Murugian, Keeper (Carnivores and Small Mammals)



Amor the jaguar intent on snagging her chicken bundle. Amor was born with vestibular disorder, which made seemingly simple physical movements difficult for her. This enrichment encourages her to look up and move upwards, which helps strengthen her neck muscles and limbs.

ENRICHMENT FOR ASTOVE THE ALDABRA GIANT TORTOISE

Initially, a food kebab made with Astove's favourite treats was hung up in the enclosure. But Astove only had to stretch his neck to reach the hanging food. The see-saw food kebab was created when we noticed that Astove was particularly keen to snack avidly on leaves from overhanging branches in his enclosure, even those outside of the exhibit that are challenging to reach.

- Jonathan Hong, Keeper (Herpetology)



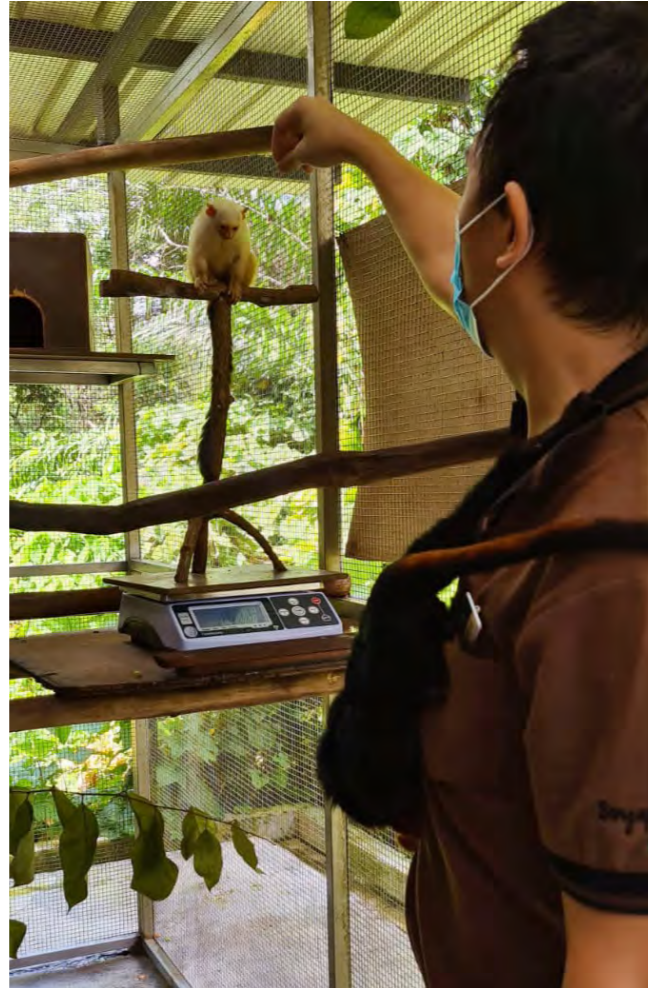
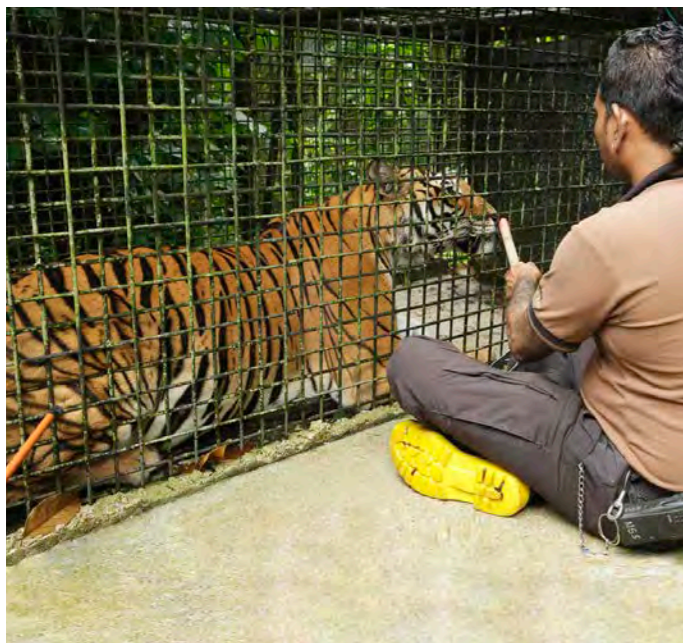
To make things more challenging for Astove, bamboo sticks were used to create a see-saw kebab. This increased the axis of movement of the treats, making it more stimulating both mentally and physically.

Medical Conditioning For Stress-Free Health Checks

Physical restraint for health checks, transfers, and medical examinations can cause anxiety for both animals and staff. With the right training, much of this stress can be alleviated, while strengthening the trust between the animals and their care personnel. Over the FY, the animal care team continued to work closely with the veterinary team to have more animals accustomed to and cooperative with procedures necessary for proper health management.

✦ DRAWING BLOOD FROM CARNIVORES

The big cats and the bears are among some of the species that pose the greatest challenges when it comes to compliance with veterinary procedures. During the reporting period, the carnivore care team at Night Safari made great strides in training all the Malayan tigers, sloth bears and Asiatic black bears to cooperate with blood draws.



✦ TRAINING TAMARINS AND MARMOSETS FOR WEIGHT CHECKS

Tamarins and marmosets (mini-monkeys) are highly sensitive animals and easily intimidated by changes in their routine. It is not always easy to visually assess the body condition for some individuals due to the thick fur concealing the arms and abdomen. Weight records provide a more objective way to measure their health: for these tiny primates, a weight drop of 10% within two weeks is a red flag. Around 80% of our tamarins and marmosets are now comfortable with the procedure, and 50% have their weight taken at least once a month.

✦ CONDITIONING MANATEES FOR HEALTH CHECKS

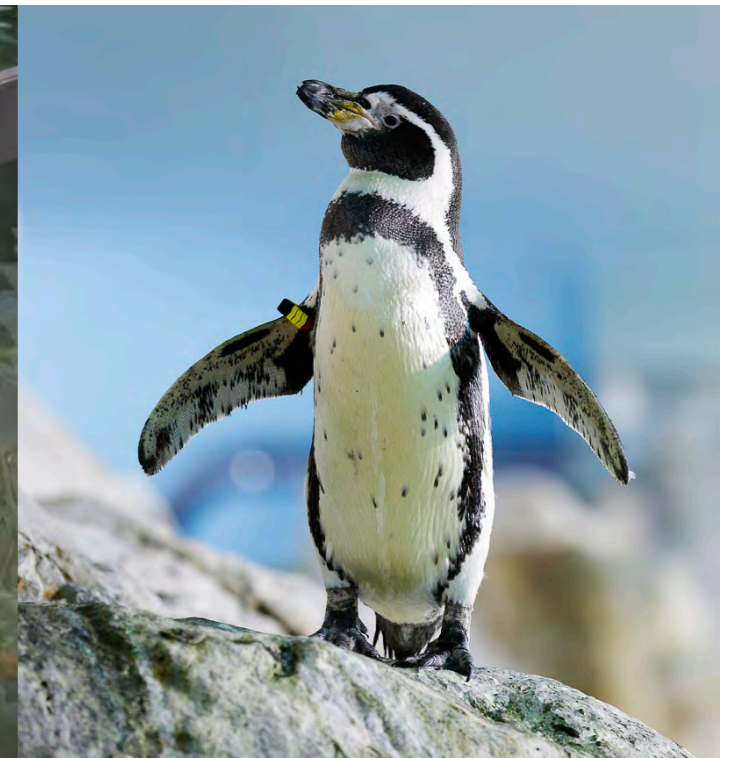
As demonstrated in various scientific studies, manatees are capable of learning fairly complicated tasks. At River Safari, training for desired medical behaviours is now part of the husbandry routine. All 17 manatees under our care are target-trained to facilitate movements from one pool to another. Breathing conditioning has also been completed for all. Manatees naturally surface to breathe every two to five minutes. When they are brought to the surface for medical checks, they sometimes need to be prompted to breathe. Being able to breathe on cue is important especially during lengthier procedures. The aquarists also doubled up on the training of some of the less cooperative manatees. The daily training sessions saw extraordinary results: four of our manatees are now successfully conditioned for blood draw.



✦ ANNUAL HEALTH CHECKS FOR HUMBOLDT PENGUINS

Jurong Bird Park is home to a colony of 14 Humboldt penguins. Given a life expectancy of 15-20 years in human care, all our Humboldts are considered geriatric as they are all in this age bracket or even older. To monitor their health, these veteran birds are provided an annual health check. The avian veterinarian conducts the check at the penguins' back of house area - a familiar environment to help reduce the stress on the birds.

All penguins have been conditioned to cooperate with the check, which includes weight-taking, physical assessment, eye examination and blood sampling. An X-ray of the legs and feet is also taken using a portable machine to evaluate each bird for the presence or development of age-related degenerative bone and joint diseases such as osteoarthritis.





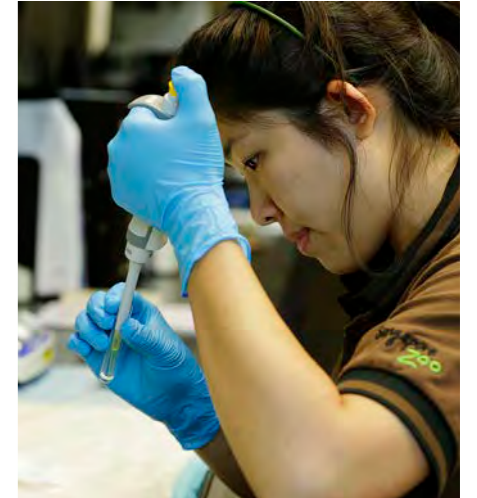
Diets Reviewed

The team from the Wildlife Nutrition Centre (WNC) continued to research and review diets for animals to optimise their health. A significant effort led by the WNC team was the implementation of a body condition scoring system (BCS) this FY. BCS is a visual assessment of the amount of fat and muscle an animal has. When done regularly, it serves as an important health surveillance tool for individual animals. A systematic BCS was rolled out in July 2019. Some 1,000 animals are now evaluated every two months, and their diet to be reviewed and adjusted accordingly if they score out of the healthy range.



Keeper Research Initiatives

On top of their day-to-day work, the animal care team also devotes time to research projects. Studies revolving around growth rates, activity budgets and environmental preferences of our animals provide insights to help improve animal care standards. There are also projects that will add to the scientific body of knowledge, like the one that investigates if orangutans follow the eye-gaze of other orangutans, and the one that looks into the evolution of eye colour patterns in primates. Others, like the pilot study to assess hormonal levels in the female giant panda using saliva samples, aim to improve current practice and may eventually have an impact on animal care on a global scale.



Veterinary Highlights

The veterinary team works closely with the animal care team to provide whole-of-life care for some 16,000 animals from 952 species in our living collection. To look after the health of such a large and diverse group of animals, the team has in place well-structured care and monitoring programmes. Of significant mention this FY is the completion of a comprehensive health care assessment for all 23 orangutans in our collection, in collaboration with the Great Ape Heart Project and the International Primate Heart Project. Assessments included general examination and specific diagnostics such as hormonal analysis, urinalysis, chest radiographs, pouch cultures, dental examinations and treatment, genetic testing and echocardiograms and electrocardiograms.

Vets On The Case

A wide range of medical conditions and emergencies kept our veterinarians busy throughout the year. We would like to thank our network of specialists like orthopaedic surgeons, dentists and ophthalmologists for sharing their expertise with us on some of the more complicated treatments and procedures.



JELLY THE CAPYBARA'S DISLOCATED SHOULDER

Due to a shoulder dislocation, Jelly the capybara had to undergo a major corrective surgery with consultant veterinarians. New bone had started to form around the bone ends, complicating the procedure. The new bone formed had to be broken down, and capybara bone is very strong. The capybara's anatomical features were also novel to the specialist surgeon. After seven hours in surgery, Jelly came around well and was visibly more comfortable.

For post-surgery physiotherapy, a variety of soft tissue techniques, such as massage to reduce swelling; and joint techniques like stretches are carried out as appropriate on the affected limb. Exercise rehabilitation is also key to his healing, and Jelly's trainers have been taking him out on short walks. While his recovery has not been as quick as hoped for, Jelly is showing signs of improvement slowly but surely.



ABNORMAL GROWTH ON A FALSE GHARIAL

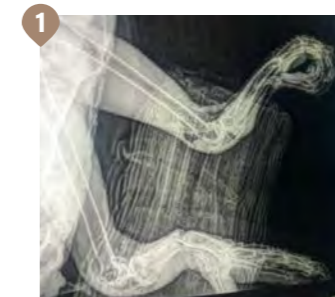
Garbage the false gharial first came to our parks in the 1980s and was so named for his ability to clean up all food offered to him. A small growth on his hind paw became progressively larger, exposing part of the skin. An infection from the exposed skin could spread and affect underlying bone. As Garbage was considered elderly by false gharial standards, his ability to survive a surgery under anaesthesia could not be guaranteed. The only viable option was to physically restrain him to allow for a full examination, X-rays of the growth and a surgical biopsy. Experienced handlers and veterinarians pooled their knowledge and expertise to plan and execute this elaborate procedure.

The procedure went as planned and the X-rays indicated no sign of infection to the bone. The vets removed the growth in entirety within the limited time in which they had to operate. The mass weighed 1.2kg and was later confirmed to be a cancerous growth. The reptile care team monitored Garbage closely post-procedure – he appeared none the worse for it and looked to be in stable condition.

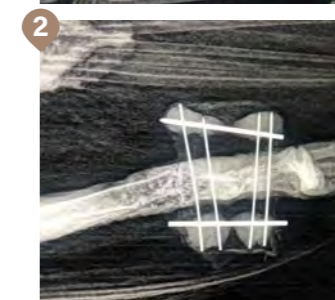
LEG FRACTURE IN PAPUAN HORNBILL

A female Papuan hornbill was brought to the avian hospital, having suffered a comminuted fracture, where the broken bone splinters into several fragments. The fracture was challenging to repair, but as her prognosis was poor if the injury could not be fixed, the vets put their heads together to come up with a plan that would work. The use of an external skeletal fixator was decided upon to hold the bone in place to facilitate healing.

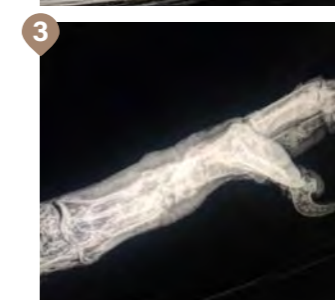
The hornbill recovered from surgery without incident and remained warded at the hospital so the vets could conduct post-surgery physiotherapy and monitor her healing progress closely. The bone developed a healthy callus and began to strengthen by the fourth week, at which point the pins were removed under anaesthetic. By the time she was discharged, she was able to perch, jump and climb normally, indicating successful repair of the fracture with minimal long-term effects.



1. Initial X-ray indicating a serious fracture on the right (lower in image) tarsometatarsus.



2. Multiple X-rays are taken during the repair process to confirm correct placement of the pins, and alignment of the bone fragments.



3. After removal of the external fixator and bone pins one month post-surgery, the previously broken bone has almost completely healed in its normal position.



4. The hornbill with her bandaged leg post-surgery. She was transferred to the intensive care unit, and eventually recovered fully.



Geriatric Animal Plan

Older animals may develop some of the same issues that humans face with age, such as abnormal growths, arthritis, changes in appetite, muscular pain and vision problems. Keeping close tabs on our geriatric animals helps us detect diseases early and respond with treatment and management plans. Many of our animal veterans also benefit from a structured behavioural training programme to get them used to medical procedures.

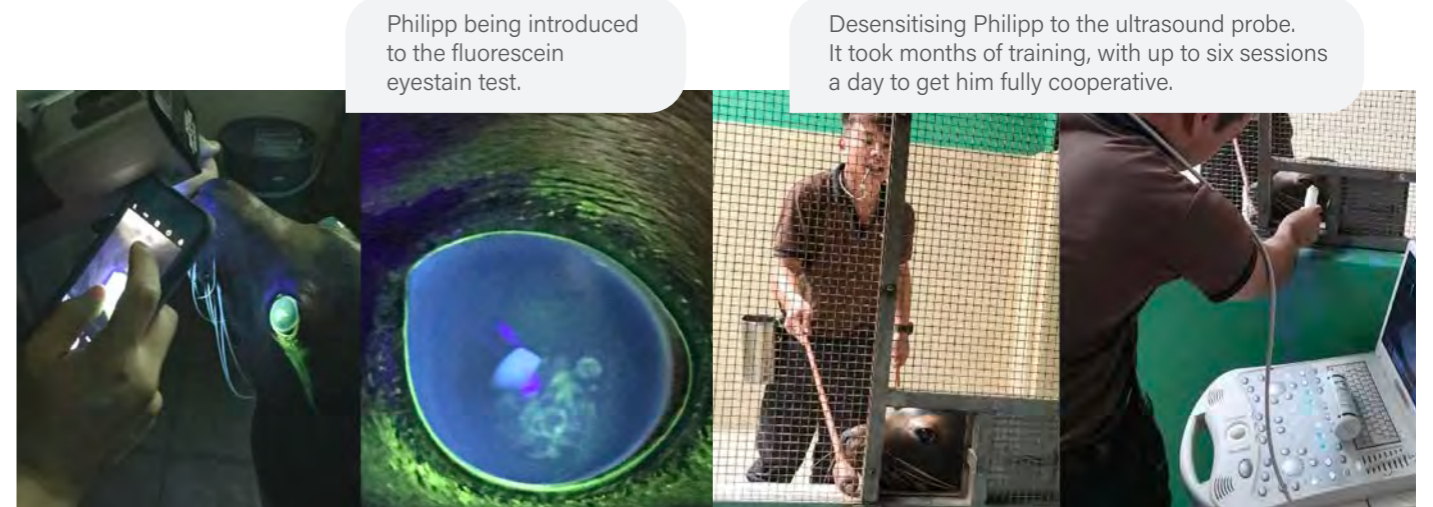
EYEDROPS TO TREAT CATARACTS IN HAWKEYE THE HARRIS HAWK

Hawkeye the Harris hawk was a stalwart of the Kings of the Sky show at Jurong Bird Park for many years. Her trainers noticed her eyesight was deteriorating and she was eventually diagnosed as having cataracts and also a condition called iris bombe, which increases the pressure in the eye and can be quite painful.

Medicated eyedrops were prescribed to control the pressure and prevent the condition from worsening. But first, Hawkeye had to be conditioned to cooperate with the daily application of eyedrops. Due to her calm and intelligent nature and her many years of performance, it took only a couple of weeks for Hawkeye to be fully comfortable with the daily treatment plan.



Hawkeye was already well-accustomed to flying to the falconer's glove when called. Her trainers taught her to keep her head still, while allowing her beak to be held and her head tilted to the side so the eye drops could be applied. A few blinks and the procedure was over.



Philipp being introduced to the fluorescein eyestain test.

Desensitising Philipp to the ultrasound probe. It took months of training, with up to six sessions a day to get him fully cooperative.

EYE EXAMINATIONS FOR SEA LIONS

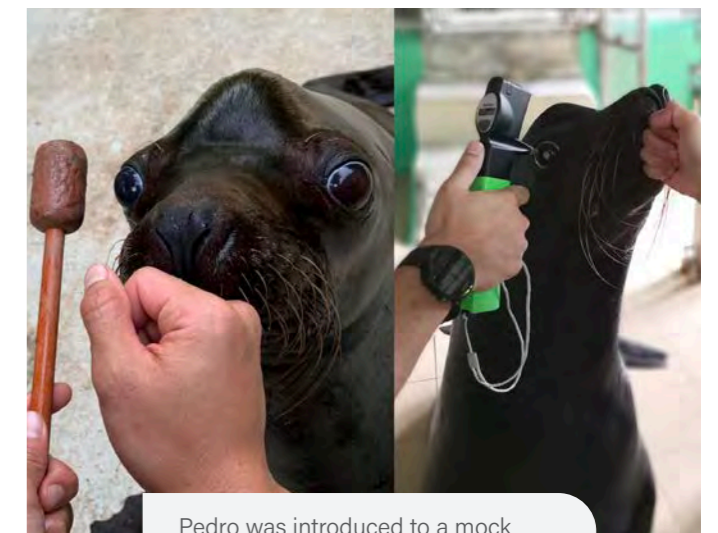
Given their age, Pedro and Philipp our Californian sealions, are susceptible to eye diseases. To diagnose, monitor and treat these health conditions, their trainers have been working hard to get their voluntary cooperation for specialised medical procedures. Procedures involving the eyes have a certain level of risk as the trainers, vets and the animals need to be very close physically. During training, safety has to be ensured for both the animals and the trainers and at the same time offer a pleasant experience to the animal.

Philipp initially presented with symptoms indicative of corneal ulcer and cataract development. For a proper diagnosis of the ulcer condition, Philipp underwent a fluorescein eye stain test which uses orange dye (fluorescein) and UV light to detect foreign bodies in the eye. The test confirmed it was a case of ulcerative keratitis, but in stable condition, to be treated with daily eyedrops over the long term.

To check on the cataract condition, an ultrasound scan of the eye was performed. This delicate procedure involves the placement of the ultrasound probe directly on the eyeball and requires complete trust between animal, trainer and vet. Through the scan, the presence of a

cataract was confirmed. The sealion care team will continue to monitor the condition with bi-weekly checks while planning for surgery.

Similarly for Pedro, progressive clouding of the eye is suggestive of a maturing cataract and he has been successfully trained to undergo eye ultrasound scans as well. Pedro also shows symptoms of glaucoma, a disease often associated with elevated eye pressure and a tonometry test was done to measure Pedro eye pressure. The test confirmed he had high levels of eye pressure. He now goes for his tonometry eye review weekly and is given eyedrops daily to help lower the pressure.



Pedro was introduced to a mock tonometer, then the actual instrument itself, in preparation for a test to measure eye pressure.



PLAYING A LEADING ROLE IN CONSERVING BIODIVERSITY

As a world-leading zoological institution located in the heart of a biodiversity hotspot, we have a responsibility to contribute towards the conservation of species locally, regionally and globally. Over the FY, we expanded on our role as leaders in biodiversity conservation. We continued to strengthen our conservation work in saving critically endangered species in Southeast Asia through our collaboration with the Asian Species Action Partnership (ASAP), contributing more than 50% of our overall conservation budget towards the protection of ASAP species.

In the FY, we

- Invested **\$1.8 million** in support of **six** local projects, **53** regional field projects, **11** conservation conferences, workshops and meetings and other conservation partner support.
- Received **special recognition** from the Species Survival Commission of the International Union for Conservation of Nature (IUCN SSC) for our commitment to conserving biodiversity
- Devoted **2,703 hours** of veterinary care for **1,865** wild rescued animals brought in for treatment



Protecting Local Wildlife

On the home front, we marked ten years of local conservation support through the Wildlife Reserves Singapore Conservation Fund (WRSCF), which has, over the decade, disbursed some S\$2 million to more than 40 projects covering a range of species and habitats. We also continue our work of rehabilitating rescued animals and creating havens for native wildlife in our parks.

The Wildlife Reserves Singapore Conservation Fund Celebrates Ten Years

The Wildlife Reserves Singapore Conservation Fund (WRSCF) was established in 2009, the first fund of its kind offering grants to conservation-minded individuals working to protect threatened native species. Over the years, the fund has brought together the nation's students, academia, authorities, and scientists to carry out projects to save our nature heritage. 2019 marked the 10th anniversary of WRSCF, which has, in its first decade, empowered over 40 researchers and engaged and shared the conservation message with close to 100,000 individuals through 70 workshops, symposia and community engagement and education programmes.

Support from WRSCF was pivotal in the launch of National Species Conservation Action Plans for the Raffles' banded langur, Singapore freshwater crab, and Sunda pangolin, and proved crucial in their continued implementation. We have started integrating conservation breeding programmes into local conservation action plans, and we will focus on developing ex-situ breeding programmes for critically endangered species like the straw-headed bulbul.

In the decades to come, we will continue to build capacity by nurturing a new generation of conservationists, qualified and empowered to identify and address the increasing conservation needs locally, to make protection of nature and wildlife an integral part of the Singapore identity.

Intricate drawings of native wildlife done by **Mr Joe Ong**, Senior Keeper, were among some of the items put up for auction to raise funds for the WRSCF during its 10th anniversary gala dinner.



President Halimah Yacob receives a copy of 'Wildlife Matters' from **Ms Claire Chiang**, Chairperson, Wildlife Reserves Singapore Conservation Fund (WRSCF). The book was published to commemorate the 10th anniversary of the WRSCF and to inspire more people to play their part in conserving native wildlife.



WRSCF Project Findings And Achievements

Over the FY, the WRSCF invested \$384,370 towards the work of six projects to protect native wildlife. These studies of local species across land and marine habitats have yielded impressive biodiversity breakthroughs that have made ripples not just on the local scene but have also been acknowledged by the international scientific community.

A RAFFLES' BANDED LANGUR SPECIES ACTION PLAN:

With some help from 82 citizen scientists, and arboreal camera traps, a total of 63 Raffles' banded langurs were recorded in Singapore. New findings in a study co-led by WRSCF research scientist Dr Andie Ang indicate that the Raffles' banded langur is a species by itself and not a subspecies as previously thought. This new species classification brings urgent conservation concerns, as the Raffles' banded langur now qualifies as critically endangered and ranks among the most endangered primates in the world. Singapore is home to about 20% of its estimated global population of 300 - 350. By continuing to protect the langurs in Singapore, we pave the way for the possibility of future 'genetic exchange programmes' with Malaysia to safeguard the long-term survival of the species in both countries.

B BIODIVERSITY OF SHARK AND RAY CATCH AT LOCAL FISHERY PORTS

The fishery industry is impacting fish populations in our oceans. Globally, 25% of all shark and ray species are threatened by overfishing. We support The Dorsal Effect in their sharks and rays monitoring programme. Through bi-monthly trips to the Jurong Fishery and Senoko Fishery ports, data has been collected on more than 11,000 rays, 1,700 sharks, and 1,130 wedgefish, a near extinct species. The fact that severely threatened species are caught for consumption calls for urgent fishery management for long term sustainability.

C BAMBOO SHARK BIOLOGY AND DISTRIBUTION

This study involves tracking of individual bamboo sharks through deployment of acoustic tags. The body of data gathered will improve understanding of the ecology of these sharks within local waters. Engagement with the general public and fishing stakeholder groups also ongoing.

D BIODIVERSITY OF MARINE FUNGI ASSOCIATED WITH SEAGRASS

Studies confirmed distinct fungal communities associated with the seagrass at each sample site - that is, the fungal community composition in samples collected from Semakau differs from that found in samples collected from Chek Jawa. This finding is a clear indication for conservationists to consider fungi composition before proceeding with seagrass transplant or restoration programmes.

E GLOBAL POPULATION GENETIC STRUCTURE AND CONNECTIVITY OF SICKLE SEAGRASS

The sickle seagrass is listed as critically endangered in the Singapore Red List Databook. It is an important component of mature seagrass habitats in Singapore but very little is known about it. Meadows dominated by this species tend to be in close proximity with mangroves and coral reefs. Together, they serve as buffer to protect coastal environment. Among the animals that eat this seagrass are dugongs and green turtles.

Samples of sickle seagrass from Singapore, Malaysia, Thailand, Vietnam, Taiwan, China and Australia have been collected and are being analysed. The findings will improve understanding of the species and have an impact on its protection and restoration.

F NOVEL TECHNIQUES FOR THE CONSERVATION OF THE CAVE NECTAR BAT IN SINGAPORE

Cave nectar bats are the principal pollinator of the culturally and economically important durian. Unfortunately, their habitat is being rapidly depleted due to human intervention and there is an urgent to protect their natural roost caves. Insights gained from the use of novel genomic techniques for DNA testing will help to expand our understanding of bat ecology. Samples from individuals in two Singaporean colonies as well as from Cambodia have been prepared and sequenced.

Rehabilitating Rescued Wildlife

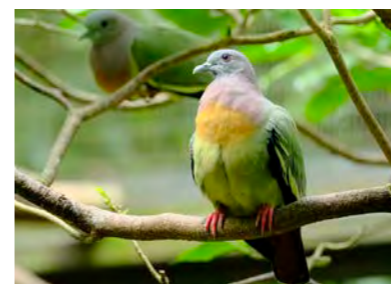
Being the designated rescued wildlife centre in Singapore, our vets and animal care team also looks after injured animals brought in for medical attention. Most regularly admitted species included reticulated python, common palm civet, lesser dog-faced fruit bat and the pigeons. The rehabilitation of rescued animals is one of the key roles we play in protecting local wildlife. Over the FY, we devoted 2,703 hours of veterinary care for 1,865 wild rescued animals brought in for treatment.

REHABILITATING PINK-NECKED GREEN PIGEONS

Pink-necked green pigeons are commonly found in Singapore. They feed on fruits, playing an important role in seed dispersal. Some of the pigeons brought in to Jurong Bird Park for medical cares had injuries likely sustained in attacks by other animals or window strikes, others presented with various infections.

Of the trauma cases, two birds were brought in with injuries to their neck and rupture of the crop, a thin-walled pouch that functions to store food temporarily. They underwent a surgical stitch up of the crop and skin. Both operations went smoothly and the birds were hospitalised for post-surgery monitoring to ensure full recovery prior to release.

Distressed pigeon nestlings found out of their nests were also brought in for urgent medical care. Some had to be handraised and conditioned for eventual release. On average, these juvenile pink-necked green pigeons stayed with us five weeks before they could be returned to the wild.



EXTRAORDINARY RESCUE AND RELEASE OF A NEWBORN COLUGO

A tiny unfurred newborn colugo was found on the ground under a tree near the rhino exhibit. As there were no adult colugos seen in the trees or on the ground nearby, the newborn was brought back to the hospital.

The baby colugo, a male, had no injuries, apart from mild abrasions. Supportive care with active warming, fluids and electrolytes were administered. As he would have the best chance of survival with his mother, field staff were urgently notified to keep a lookout for any adult colugos around the rescue location, so that a reunion could be attempted.

After two failed attempts, the team was about to give up hopes of finding the mother, when an adult colugo glided in unexpectedly and landed directly under the baby, who was placed on a tree near the rescue location. She started sniffing him and eventually enveloped him protectively with her body. Within a few minutes, she was off, the baby in tow.

This first-known case of rescue and release effort not only helped contribute to the scant knowledge of this elusive species, but also saw different teams in the field - Operations, Zoology and Veterinary - working together to protect a native animal.



Creating Havens For Native Wildlife

In line with the National Biodiversity Strategy and Action Plan of Singapore and our focus on protecting local biodiversity, we have been proactively creating habitats in our parks with native animals in mind.

DRAGONFLY PROJECT

Dragonflies and damselflies are unique invertebrates which play important roles in the ecosystem as natural predators and as an important source of food for other animals. We initiated the 'Dragonfly Project' to enhance selected water features around Singapore Zoo with a deliberate choice of plants used by dragonflies and damselflies throughout their lifecycle.

67 species of some 2,000 aquatic plants were grown to attract the dragonflies and damselflies to the water features. To evaluate the impact of this project, a total of 30 surveys of the overall population count and species richness were conducted before landscaping and after it was completed.

The results showed an increase in the number of species and individuals. However, due to the long lifecycle of these insects, we need to conduct more surveys to validate the positive long-term impact of the project on their population.

The project also picked up a Silver Award at the Landscape Industry Association (Singapore) Awards of Excellence 2019, earning our Horticulture team well-deserved recognition by their peers in the industry.

ENHANCING BUTTERFLY BIODIVERSITY

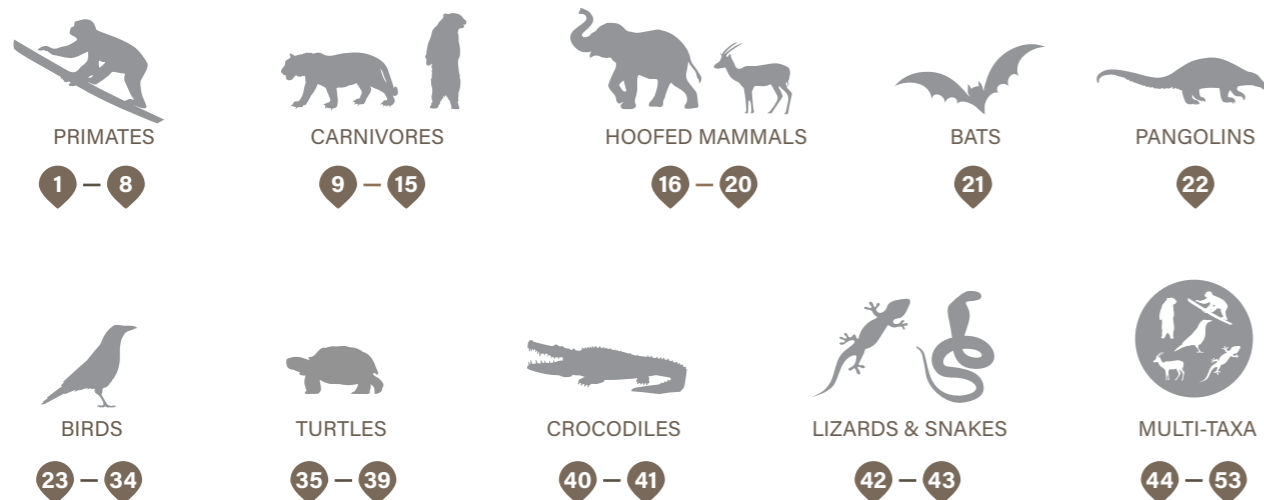
Butterfly biodiversity is an indicator of healthy ecosystems. The 'Butterfly Biodiversity Enhancement' project was initiated to better understand the butterfly fauna found in our grounds as well as to implement measures to protect them.

Protecting Wildlife Beyond Our Shores

All the 53 projects we funded outside of Singapore have a positive impact on the protection of threatened species. Six of these are coordinated on a global level, and nearly 60% focus on critically endangered species. Special recognition from the Species Survival Commission of the International Union for Conservation of Nature (IUCN SSC) is testimony that our dedication to conserving biodiversity has had a positive impact not just regionally but worldwide.



We supported the important conservation work that is being done in these projects to protect wildlife in and beyond the region.



MAMMALS

- PRIMATES**
1. Safeguarding the crested black macaque through holistic conservation and research approaches in North Sulawesi, INDONESIA
 2. Protecting the Delacour's langur in Kam Bang Forest, Ha Nam Province, VIETNAM
 3. Protecting Javan gibbon habitats and promoting shade-grown coffee in Java, INDONESIA
 4. Mitigating human-orangutan conflict in Sumatra, INDONESIA
 5. Studying the Hepatitis B virus through faecal samples from wild pileated gibbons in Cardamom Rainforest, CAMBODIA
 6. Studying the behavioural ecology of the red-shanked douc for long-term in-situ and ex-situ conservation management, LAOS
 7. Conserving the Sundaland tarsier in Tanjung Puting National Park, Central Kalimantan, INDONESIA
 8. Protecting the habitat of the newly discovered Tompotika tarsier, INDONESIA
- CARNIVORES**
9. Ending the practise of bear bile farming in LAOS
 10. Studying the ecology of the Eurasian otter in HONG KONG
 11. Developing a metabarcoding protocol for prey species of the fossa to reduce carnivore-human conflict, MADAGASCAR
 12. Testing the potential of passive acoustic monitoring units to estimate fossa, MADAGASCAR
 13. Engaging people to value and protect Malayan tigers and their habitat in MALAYSIA
 14. Establishing the Owston's civet conservation breeding programme as a model for species recovery efforts, VIETNAM
 15. Contributing to the creation of a resilient wild population of Tasmanian devils, AUSTRALIA
- HOOFED MAMMALS**
16. Protecting elephant habitats and mitigating human-elephant conflict in Way Kambas National Park, INDONESIA
 17. Estimating the density of wild elephants in Ulu Muda, northern PENINSULAR MALAYSIA
 18. Publication support for 'Gajah' by Asian Elephant Specialist Group, REGIONAL
 19. Saving saolas in LAOS
 20. Conserving the tamaraw, THE PHILIPPINES
- BATS**
21. Promoting the importance of bats as pollinators in PENINSULAR MALAYSIA
- PANGOLINS**
22. Tracking movements of the Palawan pangolins, THE PHILIPPINES

BIRDS

23. Community breeding and release of the Bali myna in Melinggih Kelod, Bali, INDONESIA
24. Surveying the population of the Edwards's pheasant, VIETNAM
25. Determining focal areas for hornbill surveys, BRUNEI
26. Involving coastal communities in Philippine cockatoo conservation, THE PHILIPPINES
27. Saving the Philippine eagle in the Northern Sierra Madre Mountains of Luzon Island, THE PHILIPPINES
28. Using conservation genetics for the breeding of Santa Cruz ground-doves, THE SOLOMON ISLANDS
29. Building capacity at the Kembali Bebas Avian Rescue, Rehabilitation and Release Centre in INDONESIA, which houses parrots confiscated from the illegal trade and prepares them for release back to the wild
30. Capacity building at Aketajawe-Lolobataa National Park, vital for the survival of endemic parrot species, INDONESIA
31. Breaking the wild bird supply chain to stop the illegal songbird trade in Jakarta, INDONESIA
32. Executing the Emergency Action Plan for the Asian Songbird Crisis in Simeulue, INDONESIA
33. Using evidence to quell an emerging trade trend: catalysing songbird conservation in INDONESIA
34. Putting a stop to vulture poisoning in CAMBODIA through public awareness

REPTILES

- TURTLES**
35. Establishing a breeding population of the Burmese star tortoises at Chattin Wildlife Sanctuary, MYANMAR
 36. Protecting the nests of the Cantor's giant softshell turtle, CAMBODIA
 37. Researching diet and conditions conducive to fertility for the Palawan forest turtle, THE PHILIPPINES
 38. Paving the path for repopulation of the Roti Island snake-necked turtle, INDONESIA
 39. Conserving the Southern river terrapin in CAMBODIA

- CROCODILES**
40. Recovering a Siamese crocodile population in Sre Ambel River, CAMBODIA
 41. Securing the last population of Siamese crocodiles in INDONESIA

- LIZARDS & SNAKES**
42. Tracking and documenting movement and behaviour of the king cobra in Northeast THAILAND
 43. Conserving the Komodo dragon on Flores Island, INDONESIA

MULTI-TAXA

44. Supporting forest patrol staff to carry out critical law enforcement to protect threatened species in the Cardamom Mountains rainforests, CAMBODIA
45. Conserving ASAP and priority species through an integrated approach in West Kalimantan, INDONESIA
46. Protecting threatened species like the babirusa and anoa by conserving the Nantu Forest in Sulawesi, INDONESIA
47. Providing core support, with an emphasis on medical capacity, for endangered Indonesian species housed at Cikananga Conservation Foundation, INDONESIA
48. Anti-poaching strategies to protect Sunda pangolins and other threatened species in the Deramakot Forest Complex, Sabah, MALAYSIA
49. Supporting the West Visayan Species Recovery Project, THE PHILIPPINES
50. Establishing and enacting an international animal welfare and husbandry standard within Southeast Asia, REGIONAL
51. Tackling Southeast Asia's wildlife crime, REGIONAL
52. Contributing to Species360 Conservation Science Alliance Support, GLOBAL
53. Contributing to Species Conservation Toolkit Initiative (SCTI), GLOBAL



We feature three of the 53 projects supported to spotlight some of the on-ground efforts that have effected change for threatened species in their habitats.

SAVING THE PHILIPPINE EAGLE IN THE NORTHERN SIERRA MADRE MOUNTAINS OF LUZON ISLAND, THE PHILIPPINES

The project is primarily focused on building regional conservation capacity by training project collaborators on raptor field research and management techniques. A total of 19 representatives from local government units and personnel from various Department of Environment and Natural Resources offices attended the training. The participants also prioritised areas for eagle survey sites as part of their 2020 work plans.

Conservation education and public awareness campaigns tailor-made for children in elementary schools near eagle habitats were also rolled. The forest around Maddela town is the suspected new habitat of Philippine eagle "Raquel", released in 2011. Outreach for the children in Maddela's elementary schools was prioritised, with close to 1,200 children engaged on the need to save the eagles and protecting their forest habitat.



SAFEGUARDING THE CRESTED BLACK MACAQUE THROUGH HOLISTIC CONSERVATION AND RESEARCH APPROACHES IN NORTH SULAWESI, INDONESIA

The project continued to monitor wild populations of the Celebes crested macaque and investigate if there are other threats besides previously identified ones. The data gathered help determine appropriate conservation actions.

The hunting and consumption of the macaques as bushmeat is one of the key threats to the species. The project continued with a survey of bushmeat sold at local markets. The results reveal alarming trends and point to an urgent need to clamp down on the illegal wildlife trade. The project is working to foster a culture of care and wildlife stewardship among the locals with a 3 year-long campaign aimed at changing behaviours.

The project also received a World Association of Zoos and Aquariums Nature Connect grant to conduct educational outreach and encourage sustainable living practices in the community. Two of our Education staff were involved in facilitating the programme for 23 families from two villages located on the borders of protected macaque habitats.



PROTECTING THREATENED SPECIES LIKE THE BABIRUSA AND ANOA BY CONSERVING THE NANTU FOREST IN SULAWESI, INDONESIA

This project is directly protecting critical wild populations of babirusa and anoa, as well as many thousands of additional threatened endemic species in the 520km² Nantu Rainforest Wildlife Sanctuary, Sulawesi. It is also working to secure formal protection for a further 61km² of pristine rainforest located immediately east of Nantu. During the reporting period, around 300 days of forest and species protection patrols, covering over 2,500 km were conducted. These patrols are essential and were successful in protecting the Nantu Wildlife Sanctuary from forest burning, wildlife poaching, illegal logging and illegal gold-mining activities.



Conservation Leadership And Partnership

We continued to lead the work of conservation planning and training, providing platforms for colleagues from the wildlife conservation arena to share, learn and collaborate.

Over the FY, we sponsored 11 conservation conferences, workshops and meetings, bringing together specialists the world over to work towards the common mission of protecting biodiversity.

Key Updates On Collaborative Efforts With The International Union For Conservation (IUCN)



IUCN ASIAN SPECIES ACTION PARTNERSHIP (ASAP)

As the host organisation to the ASAP, we fund all operational costs and pay the salaries of two full-time staff that make up the ASAP Secretariat. We are the major financial contributor to the initiative and with our support, ASAP grew to become an alliance of over 100 organisations. Led by its 5-year strategy, ASAP analysed conservation capacity gaps in Southeast Asia, reporting key areas for additional support. In addition, ASAP worked with the ASEAN Centre for Biodiversity (ACB) to call for increased support for ASAP species conservation, and to halt the extinction crisis faced in the region.



IUCN CONSERVATION PLANNING SPECIALIST GROUP (CPSG) SOUTHEAST ASIA REGIONAL RESOURCE CENTRE (SEA RRC)

Regional Resource Centres (RRC) take CPSG tools and principles into the local institutions of a region or country, allowing stakeholders to adapt appropriate conservation techniques to meet their unique needs. We host the Southeast Asian RRC, with staff of our Conservation and Research Department as co-covenantors to lead and coordinate regional efforts to build conservation capacity. We also provide funding to achieve conservation targets that have been defined.

Complementing the work of ASAP, the SEA RRC assisted in three workshops focusing on the development of conservation action plans and strategies for eight critically endangered Southeast Asian species, including the Owston's civet, Visayan warty pig, and Walden's hornbill across their entire geographic range and the leopard cat in Singapore. To push for urgent protective measures for threatened species, the RRC also worked on the Red Listing evaluation for reptiles found in the Wallacea, a biodiversity hotspot formed by Sulawesi and surrounding islands.



IUCN ASIAN SONGBIRD TRADE SPECIALIST GROUP (ASTSG)

Since its establishment in 2017 to prevent the imminent extinction of songbirds threatened by unsustainable trapping and trade, we have continued to support and host the ASTSG as it seeks to find solutions to reverse the threats and improve the conservation status of all prioritised bird species.



IUCN HORNBILL SPECIALIST GROUP (HSG):

We host this specialist group, and funded the participation of members in the second steering committee meeting, as well as the publication of a newsletter to share knowledge. Our staff is one of the coordinators of a task force under the HSG, the Helmeted Hornbill Working Group (HHWG). The helmeted hornbill is threatened with extinction by the illegal trade. As part of the HHWG, we helped review and revise a CITES notification that was subsequently tabled and adopted at the CoP* 18 meeting in Geneva in August 2019. We supported the participation of HSG members in the COP meeting to push for urgent legislation to protect the helmeted hornbill. CITES delegates have subsequently formed a working group to strengthen efforts to combat the illegal trade on 'red ivory' derived from the hornbill's casque.

* Convention on International Trade in Endangered Species of Wild Fauna and Flora Conference of Parties

Scientific Inquiry And Research

We continued to foster a supportive environment for inquiry and research to bring about scientific solutions. A total of 93 research projects were ongoing during the reporting period. The projects delve in diverse areas including animal behaviour, conservation communication, ecology, environmental biology, health and population management. For scientific publications, we published 41 papers, including 27 in peer-reviewed journals, five book chapters, seven articles in bulletins and newsletters, as well as two conservation action plans.

Please refer to Annex for details



ENVIRONMENTAL SUSTAINABILITY

As an institution dedicated to protecting wildlife and their habitats, we embrace sustainability best practices to reduce our impact on the environment and guide us in our operation and development. In FY19/20, we continued to implement sustainability initiatives, with emphasis on green procurement and developing baseline levels for energy and water consumption. We have also refined waste measurement and collection methods that allow for better tracking of waste generated.

Over the FY, we

- Implemented **Green Procurement Policy**
- Converted **56 tonnes** of raw fruit and vegetable peelings into liquid fertiliser
- Composted **52 tonnes** of cooked food waste
- Decomposed **25 tonnes** of horticultural waste into mulch for planting beds and animal bedding
- Commenced **tracking of carbon emissions**
- Completed **identification** of all food and non-food products used and sold in our parks containing **palm oil**



Our Continuous Journey Towards Sustainable Best Practices

Sustainable Procurement

Green procurement has been identified as our key strategic focus area. With the adoption of our Green Procurement Policy, tender specifications now incorporate our sustainable requirements. As a result, tenders with sustainable considerations have increased to about 30% of our tender value over the FY. Our next step is to develop a robust Green Procurement Roadmap looking into key spend areas to build relevant sustainable benchmarks, source or cultivate sustainable supplies and measure our progress against sustainability targets.



PALM OIL

The production of unsustainable palm oil is a major driver of deforestation, pushing many rainforest animals to the brink of extinction. Over the FY, we have completed the identification of all food and non-food products (i.e. cleaning supplies, toiletries, animal feed) used and sold in our parks that contain palm oil derivatives. We have committed that by 2025, 100% of the palm oil and palm oil derivatives used in our end products will be RSPO-certified or offset by RSPO Book and Claim credits (for details, please refer <https://bit.ly/3mx8FcA>). As a founding member of Support Asia for Sustainable Palm Oil (SASPO), we will continue to work with other SASPO members to advocate for companies and consumers to transition to sustainably-sourced palm oil.



COFFEE

Wildlife-friendly Owa Coffee makes up 29% of brew coffee sold at our F&B outlets. Owa Coffee is grown by villagers in the shade of forest trees so that the existing forests do not have to be cleared for coffee cultivation. This initiative by the Coffee and Primate Conservation Project not only protects the forest home of many animals, including the Javan gibbon, but also creates sustainable livelihoods for locals. We support the Coffee and Primate Conservation Project, and by selling Owa coffee at Singapore Zoo, we contribute towards the livelihoods of the villagers and saving wildlife.



SEAFOOD

Unsustainable fishing methods are threatening the food source of many marine animals. We advocate for the consumption of sustainably sourced seafood and walk the talk by serving the same in all our F&B outlets. We have also looked into sustainable sources for animal feed – the diets of our sea lions and penguins are now 100% sustainable.

Reducing Single-Use Plastics

Plastic pollution from single-use plastics has become one of the world's greatest environmental challenges. Each year, over a million animals are killed as a result. Building on the previous year's success in replacing all single-use plastic bottles with cans or paper cartons at our retail and F&B outlets, we continue to review our operations and opt for eco-friendly alternatives. We have also developed and communicated a set of requirements and guidelines for our tenants and vendors to ensure that they embrace the same best practices.

Tracking Our Carbon Footprint

In line with our aspiration to become climate positive, we have started tracking our carbon footprint, using a framework from the widely adopted Greenhouse Gas (GHG) Protocol Corporate Standards. A defined carbon inventory helps us to better understand the sources of carbon in the existing parks and to implement effective solutions to reduce our carbon footprint. [Please refer to Annex for details](#)

Waste Management

Working towards zero waste, we have ramped up key recycling efforts in our parks. Thanks to the groundwork laid in previous years, we now see results of our cross-departmental efforts to create closed loop systems for horticultural and food waste. These include converting 25 tonnes of horticultural waste into mulch for planting beds and animal bedding, 56 tonnes of raw fruit and vegetable peelings into liquid fertilizer, as well as the composting of 52 tonnes of cooked food waste.

For the Mandai rejuvenation project, we have established a waste management strategy and catered for horticultural waste management facilities. We have made provisions for food waste composters at the Resort and Rainforest Park as well as a waste-to-energy gasification facility at East Node.

Reducing Water Consumption

We have seen a 15.6% year-on-year decrease in overall water consumption, achieved through initiatives including leak detection and rectification, time-based operations as well as improvements to metering. To drive water savings, we have installed an automated drip irrigation system for some of the plants grown at our nursery. By delivering water directly to the plant ground, the system avoids water wastage experienced in manual irrigation methods.

Sustainable Mobility

The electrification of our internal fleet has been underway since 2018. We have converted all the trams in Jurong Bird Park to operate on electricity. As of the end of FY, we have ten electric trams and one electric van in operation in Singapore Zoo. We target to convert our entire fleet to run on electricity by end 2021.



Establishing Thought Leadership



Awarded For Sustainability Efforts

SINGAPORE PACKAGING AGREEMENT (SPA) AWARD 2019

The annual SPA Awards serve to recognise signatories who have made notable efforts and achievements in reducing packaging waste. WRS received the Merit award for the slew of in-house activities initiated to rally employees towards reducing waste. One of the noteworthy measures we have taken to reduce packaging waste is the discontinuation of single-use paper boxes for corporate staff lunch takeaways. Through this initiative, an estimated 0.13 tonnes of paper packaging waste can be avoided annually.



INAUGURAL ECO-BUSINESS A-LIST

Dr Lee Hui Mien, Vice President (Sustainable Solutions), is one of nine sustainability executives acknowledged on the Eco-Business A-List for her contribution in championing sustainable best practices. This is in recognition of her work in conceptualising and implementing an organisation-wide strategy for sustainability.

Partnerships For A Sustainable Future

SUSTAINABILITY WORKSHOP

We held a workshop themed around sustainable retail and F&B, the third in our series of sustainability workshops. Attended by more than 40 individuals and professionals from private organisations, industry associations, environmental NGOs, community groups, tertiary institutions and government agencies, the workshop served as a platform for exchange of ideas and created opportunities for collaborations and partnerships.

FOUNDING MEMBER OF NATIONAL SUSTAINABLE PROCUREMENT ROUNDTABLE (NSPR)

To champion green procurement at the national level, we founded the NSPR with three other founding member companies that share our vision to drive sustainable buying. Together, we hope to shape the supply chain to respond positively towards sustainable sources and inspire more procurement professionals to embrace sustainable procurement practices.

GOLD MEMBER OF GLOBAL COMPACT NETWORK SINGAPORE (GCNS)

The local chapter of the United Nations Global Compact, the GCNS is the national lead platform promoting corporate sustainability. As a Gold Member, we look forward to further aligning our strategies and operations with universal principles on human rights, labour, environment and anti-corruption as we move towards achieving the United Nations' Sustainable Development Goals (SDGs).

INVOLVEMENT IN SUSTAINABILITY EFFORTS BY WORLD ASSOCIATION OF ZOOS AND AQUARIUMS (WAZA)

WAZA is the global alliance of nearly 400 zoos and aquariums, which together receive some 700 million visitors annually. The association is working to promote sustainable and responsible consumer consumption, improvement of industry standards and environmental awareness. One of its key initiatives is the development of a framework to guide zoos and aquariums in supporting the United Nations Sustainable Developments Goals (SDGs). Through leadership of WAZA and active collaboration with other WAZA members in working groups for sustainable palm oil, single-use plastics and carbon, we hope to tap on their collective power to inspire a global audience as well as our partners to make sustainable choices.



SPREADING THE MESSAGE

With our living collection as the anchor, we engage and educate through age-appropriate and relevant programming for the target audience. By delivering unique learning experiences filled with moments of wonder, we hope to inspire and empower more champions for wildlife and sustainability. We also ramped up efforts to leverage on the power of social media for engagement with a wider audience.

Over the FY, we have

- Engaged **335,314** park guests and members of the public with conservation and sustainability messaging
- Offered a wide range of outdoor learning journeys at our parks to **117,986** students
- Garnered the support of **1,690** volunteers who devoted 33,197 hours to help us spread the conservation and sustainability message



Advocating For Sustainable Choices



Sharing Mandai's Sustainability Journey

To contribute to the local sustainability scene and to build relationships with like-minded organisations, we shared Mandai's sustainability journey at events hosted by industry partners including the Agency for Science, Technology and Research, Singapore Environmental Council, Changi Airport Group and Development Bank of Singapore.

Fight The Deadliest Monster

Over a million animals are killed each year when they mistake plastic waste for food or get entangled in plastic debris. Plastic waste in our environment never breaks down and never goes away: it is the deadliest monster to be found in our waters. To encourage more to participate in the fight against the deadliest monster, a range of programming offerings were rolled out to in-park guests, schools and the community at large during outreach events, as part of our flagship campaign for sustainability, now into its third year.

Contributed To Publication Of Waza Guide To Reduce Single-Use Plastics

An initiative by the WAZA, the guide aims to support zoos and aquariums in developing an institutional policy to reduce and ultimately eliminate single-use plastics. Our staff contributed to the compilation of this guide. We also shared learnings from our journey in reducing single-use plastics.



Instilling A Love For Wildlife

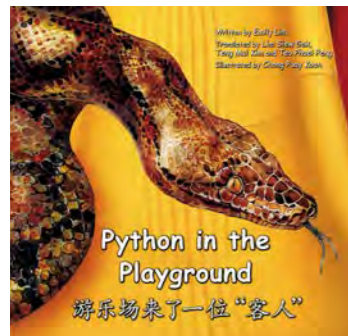
Loving Our Locals

We developed innovative offerings for in-park programming as well as outreach, with a strong call to action to protect native species.

Two new bilingual books on the reticulated python and long-tailed macaque were published with the support of the Lee Kuan Yew Fund for Bilingualism. The annual National Day campaign also shone the spotlight on native wildlife to help increase awareness of the animals we live alongside with.



To mark National Day and increase awareness of local biodiversity, a Native Species Trail was run across our three day parks. Here, our docents engage guests with interesting activities to connect them with our nature heritage.



Over the FY, we published two bilingual storybooks on local wildlife, supported by the Lee Kuan Yew Bilingualism Fund.

Temasek Shophouse Opening

On invitation to celebrate the opening of Temasek Shophouse, we conducted interactive activities for the community to learn about native wildlife like the pangolin. Domestic animals such as rabbits and goats were also brought in as animal ambassadors for photo opportunities as part of our outreach efforts.



World Animal Days

The Life Sciences division worked closely for on-ground programming in conjunction with specially designated days that celebrate animals as diverse as vultures, lizards and bears.



1. During World Tiger Day, the Life Sciences Team came up with special in-park programming. Here, a docent engages guests at a booth set up to raise awareness of the plight of wild tigers and our efforts to conserve them.
2. Keepers from the Carnivores Team building an enrichment device for the tigers with some help from a young guest and his family.
3. Our white tiger relishing the mental and physical challenge of a good tug-of-war with the novel object in its exhibit.



Best Friends Animal Adoption Day

To promote pet responsibility and encourage the public to adopt a pet instead of buying one, we brought together various players in the local animal welfare ecosystem at this adoption drive. A total of nine animal welfare groups gathered to help 52 animals find a 'fur-ever' home. Through informative talks and animal presentations, the event helped increase awareness of responsible pet ownership among the event's 913 attendees.

Digital Messaging

Through messaging on digital platforms, we reached out to a global audience to raise awareness of the plight of threatened animals. By creating content with powerful narratives to tug at the heartstrings of our audience, we converted the unaware, galvanising support for conservation and sustainability efforts.

Collaborating In Environmental Education



National Primary School Photography Competition

More than 350 students from 59 primary schools snapped away to showcase their photographic talents at the National Primary School Photography Competition 2019. Organised by Fuhua Primary School, the event focused on Sustainable Development Goal 15- Life On Land. The participants were challenged to tell stories about animals and habitats through photographs to create greater connections to wildlife in the wider community. Our contribution to the event involved hosting the participants in our parks to capture their favourite shots for submission. We also organised specially curated talks and tours to engage the participants on wildlife conservation issues.

Ideathon At The Tourism Career Fair

The five polytechnics and the Institute of Technical Education collaborated to organise the Tourism Career Fair 2019, held at Temasek Polytechnic on 15 November 2019. The highlight of the Career Fair was Ideathon, a competition that required students to develop solutions to real-life problems faced by practitioners in the tourism industry. As the host of the competition, we presented the contestants with a challenge to brainstorm ideas to delight tourists who seek exceptional wildlife experience with meaningful engagement. The contestants also gain insights into the tourism industry through the sharing by Assistant Director of Marketing, Ms Brenda Tan. The event provided a great opportunity for us to connect with the youths, who are not our traditional market segment.



Venturing Into Outdoor Learning

To boost the focus on nature in outdoor education, we became a member of the Outdoor Learning and Adventure Education Association (OLAE). We also conducted a workshop at the Outdoor Education Conference to share ways in which we can inspire a love for wildlife in the context of outdoor experiential learning.

We completed four pilot overnight camps with the Outward Bound School (OBS) with very positive feedback from the student campers. This pilot programme marked the beginning of our partnership with OBS as a way to reach out to secondary students who do not visit our parks often, and most importantly, to incorporate wildlife appreciation into the OBS camp experience.



Training The Next Generation Of Outdoor Educators

In April 2019, the Education team welcomed the first two interns from Republic Polytechnic studying for the Diploma in Outdoor and Adventure Learning course. Through the five-month-long industry immersion programme, we hope to have instilled in them a deeper appreciation for our environment and that they will go on to inspire others to protect wildlife.

Engaging Volunteers



To better fit the busy schedules of our docents and Conservation Ambassadors, who hail from all walks of life, we opened weekend volunteering opportunities. The response has been very encouraging. The flexible timing allows for more volunteers to engage our guests and deliver a better wildlife experience which helps build affinity for the natural world.

In response to the Volunteer Engagement Survey, we ramped up efforts to provide relevant training to better equip our volunteers in guest engagement and to deepen specialist knowledge. Ms Beth Fredericks, our consultant in family learning and engagement, facilitated a training workshop on guest engagement. Online learning modules based on the workshop were made accessible to all volunteers so that those who could not participate in the workshop could learn at their own pace virtually.

Sharing sessions on our efforts in caring for rescued local wildlife, and our sustainability initiatives were conducted. We hope these sessions give insights into the work that goes into saving and conserving species, that our volunteers can go on to share with the guests they engage with.





Building a People-focused Culture

We adopt forward-looking, best-in-class practices to develop our people to provide world-class animal care, to increase our conservation footprint and deliver exceptional guest experiences. Strengthening our social sustainability pillar, we not only ensure that our parks are accessible to all segments of the society but also deepen engagement with those from disadvantaged backgrounds by providing specially curated wildlife experiences.

FY19/20 HIGHLIGHTS

88% of staff attended at least 3 learning activities during the FY

Conferred the **Partner of Labour Movement Award**

Received the **Singapore SkillsFuture Award**

Launched the **Animal Presentation Competency Framework**

Welcomed **7,425 beneficiaries** from various Social Service Organisations

RALLYING STAFF TO THE CAUSE

“Together, we protect wildlife.”

On top of our Vision, Mission and Values, a short rallying call was necessary: one that captures the essence of what we stand for, and that everyone can remember and use. This tagline serves to remind us that it is our duty to care for and protect wildlife. In linking our day-to-day work to the immediate or indirect benefit to animals and habitats, the rallying cry calls on staff and volunteers to unite behind our common cause, to lead by our actions and in so doing, inspire more people to act for wildlife.

Raising Standards



Park mascot Ah Meng the orangutan greets young guests at Singapore Zoo.

The year ended with an overall guest satisfaction score of 87%, a resounding affirmation of the work put into raising the bar on our service standards. The 3W pillars of being Welcoming, Willing and Well-Versed were reinforced with 780 participants in service-related training over the FY. Training on facilitation skills, guest engagement and family learning was conducted for various guest-facing teams including Education, Guest Experience, Operations, as well as Rainforest KidzWorld Zoology staff. Besides a quick overview of targeted engagement for various age groups, staff learnt techniques to facilitate guest interactions in a warm and responsive manner.

To ensure that basic service standards were being met consistently across various guest touchpoints, a Mystery Shopper Audit was rolled out. Results show a highly positive 91% adherence to standards across the parks, evidence that training efforts to polish service delivery have paid off.



A group shot with all our EXSA winners and supporters.

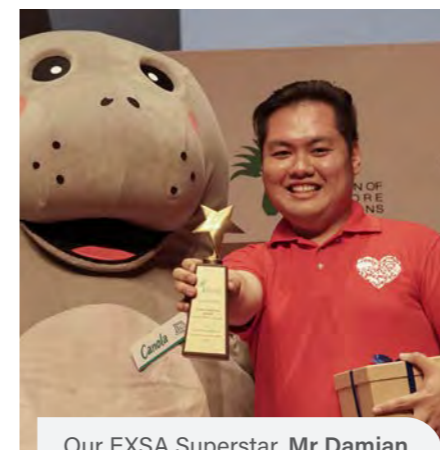
Service Recognition

Every year, the Association of Singapore Attractions (ASA) presents Excellent Service Awards (EXSA) to well-deserving service champions in the industry. 2019 marked the year with the highest number of wins for WRS since we began participating in EXSA. With a total of 218 winners, we broke our own

record of 179 last year. To top it off, we clinched the coveted EXSA Superstar Award 2019 for the second year running. Our congratulations go to Damian Wong from the Night Safari team!

Through the HEART Awards, we recognised staff who may not be in guest-facing roles

but have delivered remarkable service within the organisation. Award winners included some unsung heroes and heroines from Facilities Management and Veterinary Services, and were nominated by their teammates for demonstrating the **HEART** values of Heart, Empathy, Attentiveness, Reliability and Timeliness.



Our EXSA Superstar, Mr Damian Wong with our River Safari park mascot, Canola the manatee



Our 2019 HEART award winners taking a group photo with Group CEO, Mr Mike Barclay (centre front, in red).



HUMAN CAPITAL MANAGEMENT

In recognition of our commitment to developing our people, WRS was conferred the Partner of Labour Movement Award for our contribution towards good labour-management relations, workers' welfare and National Trades Union Congress initiatives. WRS was nominated by The Singapore Manual & Mercantile Workers' Union (SMMWU), Attractions, Resorts & Entertainment Union (AREU) and Employment and Employability Institute. This award underscores our strong partnership with the unions while affirming our standing as an employer of choice.



Developing Leaders

In a move to strengthen leadership competencies, around 100 participants from both the senior management and the middle management teams completed a 360° feedback exercise this year.

We also launched a new programme – LEAD: In Conversation. Featuring prominent leaders in industry and designed for management and talents, the programme exposed our management team to thought leadership and inspire them to create a stronger culture for innovation.

Staff Engagement

An Employee Engagement Survey (EES) was administered in September 2019. 1,067 employees (92%) responded to the survey. MPH returned a healthy engagement score of 86% against two external benchmark norms: the Singapore norm (84%), and the Global Travel and Leisure Companies norm (83%).

Improving Staff Well-Being

To build a supportive work environment and improve staff well-being, we continued with the rollout of Flexible Work Arrangements (FWA) that were first launched last FY. This FY, we worked with the departments that run on shifts to move into a 5-day workweek roster for their staff if productivity and operations are not affected. This gives staff the flexibility to take care of family commitments.

The prior establishment of FWA like telecommuting proved invaluable in helping staff adjust to split-team arrangements implemented as a result of the Covid-19 pandemic. Social distancing and physical segregation measures were necessary to reduce the risk of whole-team transmissions and ensure business continuity.

Digitalising Processes

As part of our move to improve productivity through digitalisation, leave application and approval were moved to an online e-leave system. Besides reducing paperwork, staff are also empowered to manage their time off with 24/7 convenience and even while they are on-the-go, which is especially useful for those who are based in the field.

LEARNING AND DEVELOPMENT

To engage and retain our people, as well as build sustainable capabilities to future-proof our organisation, we provide comprehensive and varied training opportunities to build work competencies, develop careers and immerse them in hands-on conservation and sustainability work. We base our staff training structure on the Skills Framework for Tourism to enhance our hiring and career development practices. On top of in-house training and overseas attachments, staff can also look forward to sponsorship through the Continuing Education Scheme. As a testament of our commitment to invest in the growth and development of our people, WRS was awarded the Singapore SkillsFuture Employer Award by the President of the Republic of Singapore during the year. This is an endorsement of the various initiatives implemented to augment workplace learning and career progression.

Training On The Go

To encourage our staff to stay relevant through training, we have a comprehensive learning system on mobile app that provides convenient access to learning courses. With an increase in focus on qualitative training, made available in bite-sized modules, the emphasis is now more on a range of learning opportunities undertaken rather than training hours clocked. During the reporting period, 88% of staff attended at least three learning activities during the FY.



Animal Presentation Development Programme

Modelled after the Zookeeper Development Programme launched last FY for our animal keepers, the APDP enables all animal presenters and trainers to be competent and gain confidence in their jobs. With this comprehensive skills and training roadmap in place, as well as a nurturing community of coaches to provide mentorship and guidance, the APDP will help Animal Presentation staff grow in their respective roles by providing a well-structured progression, while strengthening their readiness for promotion opportunities.

Conservation Sponsorship Programme

Four staff were selected to go on six-day field conservation trip in Southern Cambodia as part of our Conservation Sponsorship Programme. The trip, which coincided with the fourth release of the turtles into the wild, gave participants a better understanding of the plight of the critically endangered southern river terrapins. It also gave them an insight into our involvement in the recovery of the species since 2012, in partnership with Wildlife Conservation Society Cambodia and the Royal Government of Cambodia Fisheries Administration.



WRS staff participating in the reintroduction of critically endangered southern river terrapins back to their wild habitat.



Staff pausing for a photo with local guides during a trek to visit the endangered Siamese crocodile wetland habitat. Besides the southern river terrapin, the Siamese crocodile is another species we are trying to protect in collaboration with Wildlife Conservation Society Cambodia and the Royal Government of Cambodia Fisheries Administration.

Sustainability Training

Workshops to introduce the MPH Sustainability Strategy were rolled out for 138 staff across 28 departments to cultivate ownership and co-create sustainability-centred initiatives across the organisation. Following the workshops, Environmental Sustainability Working Groups were set up to lead cross-functional sustainability operations and advocacy efforts from 2020 onwards.

Sustainability training was also conducted for 56 Retail staff to deepen managers' understanding of sustainable retail to allow for better planning, as well as equip front-liners with sustainability-related knowledge of commonly retailed products.

We were [...] humbled by the realisation of the challenges faced by some countries and the efforts made by organisations and individuals to care for and preserve certain species of wildlife [...]. There is no glamour attached to these efforts which are sometimes arduous and require buckets full of patience and passion.
Ms Isabel Cheng and Ms Amelene Choo

WRS has the capacity to share our technical skills and abilities with our wildlife partners, and the Sre Ambel river conservation projects remain important for WRS to support, both financially and with resources.
Mr Anil Bisht and Dr Chong Shin Min



SOCIAL SUSTAINABILITY

During the reporting period, we welcomed 7,425 beneficiaries to our four parks and Rainforest Lumina. By offering complimentary admission to some 450 Social Service Organisations (SSOs) and engaging the disadvantaged through curate programming, we ensure our parks remain accessible to all segments of the community.

Reaching Out To The Disadvantaged

The Education team conducts **STEAM workshops** and teaches life skills on a monthly visit to Ahuva Good Shepherd Children's Home. Through close encounters with animal ambassadors like the stick insect, bearded dragon, and ball python, the children came to appreciate the strength and uniqueness of less charismatic animals. Reflecting on the learning and relating it to their own experiences, they embarked on a journey of self-discovery. The programme is now in its second year.

Also in its second year is '**Wild Adventures**', a programme co-created with the Salvation Army to bring families affected by incarceration into our parks. We have improved the programme by including both youth volunteers who are from families affected by incarceration and those who are not. Tasked with planning the

event activities experience for the younger children, the youths are encouraged to develop their self-esteem and leadership skills.

By creating family-bonding opportunities, the programme aims to strengthen the relationship between children and caregivers in families affected by incarceration. Frequently, the caregivers are too overwhelmed by single-parent responsibilities to spend quality time with their children in a relaxed environment. The programme also supports family reintegration and helps rebuild relationships after the release of an incarcerated parent. We have received resoundingly positive feedback from the parents and heartened that two formerly incarcerated individuals have themselves stepped forward to volunteer for upcoming events.

"[The game] does bond us more... we rarely spend time with each other"

"My child spent the full 30 mins of the visitation to tell me about their outing to the Jurong Bird Park"

"When I get out, I would like to volunteer for the family days at the zoo. Do we still get to go again?"



Making a viewfinder together during 'Wild Adventures', a programme that bonds families affected by incarceration

Autism-Friendly Engagement

To welcome children with autism and their families, we organised an Autism-friendly Weekend over 26-27 April 2019, in conjunction with World Autism Month. We reached out to the families through special needs schools and organisations – parents received online resources to prepare their children for the visit. River Safari was opened an hour earlier at 9am and specially designed activities were conducted at in-park activity stations. Provisions like quiet corners and a calming room were also made available.

We have also worked closely with Pathlight School to co-create Arts, Maths and Discovery Trails for primary and secondary school students and these autism-friendly resources have been made available online.



Students from Pathlight School visiting River Safari to experience the autism-friendly trails, which we co-created with Pathlight educators.

Career Guidance And Life Skills For Youths At Risk

A career guidance workshop was customised for Secondary Two students with challenging backgrounds from Serangoon Garden Secondary School. Apart from providing insights into the various careers in WRS, the workshop was facilitated to hone life skills such as teamwork, critical thinking and communication. Tapping on Maker Education philosophy, it encouraged self-directed learning and bolstered self-esteem through the hands-on design and prototyping of animal exhibits.



Secondary school students from challenging backgrounds taking part in the hands-on design of animal exhibits during a career guidance workshop.

Serving Our Community

On 5 October 2019, we hosted our very first Zoo Day Out, where we welcomed over 700 beneficiaries and caregivers of various ages and nationalities from across 20 social service organisations. More than 60 staff volunteers hosted our guests throughout the fun-filled morning, which included an exclusive animal presentation, exciting animal-themed games and guided walking tours at key animal exhibits.



Mr Tan Chuan-Jin, Deputy Chairman, Mandai Park Holdings and Guest of Honour for Zoo Day Out spends a slithery moment showing a royal python to 8-year-old Tan Rui Ze Issac from Club Rainbow.

Beneficiaries from Club Rainbow and MENDAKI, and their families, create a memory with Mr Tan Chuan-Jin, Deputy Chairman, Mandai Park Holdings and Guest of Honour for Zoo Day Out (centre, in green polo tee) during a special orangutan photography session. With the group are members of Wildlife Reserves Singapore's senior management team.





Sustaining our Business Performance

To do good, we need to do well. In order to provide the best possible care for our animals, support field conservation work and offer innovative, immersive wildlife experiences that inspire people to take actions to protect wildlife, we are constantly seeking to grow and diversify revenue streams. With the Covid-19 situation, tourism has dried up and we have to be relentless in reinventing our business model to adapt to and thrive in the new norm.

FY19/20 HIGHLIGHTS

Welcomed **4.7 million** guests, including 2.7 million international travellers, to our parks

Memberships across four parks totalled **40,000**

Fly Free Campaign at Bird Park attracted **104,000** guests over 10 days

Achieved **87%** guest satisfaction score, breaking the record last FY

Set up a brand-new **Strategy & Innovation Division** to intensify the pace and scale of guest-centred innovation

ENHANCING GUEST EXPERIENCE

Over the FY, we spared no effort in refreshing our in-park offerings, in order to attract guests to return parks time and time again. The WRS Development Masterplan embodies our long-term strategic approach to embed, by design, opportunities for immersive wildlife experience. To continuously refresh the in-park experience, existing exhibits have been revamped – the Explorer Outpost at Night Safari is one key enhancement made. Strategic partnership with Disney allowed us to feature the well-loved Lion King and Tsum Tsum characters in our campaign storyline and leverage on their brand equity to widen our reach. The newly formed Strategy & Innovation Division seeks to intensify the pace and scale of guest-centred innovation. With Design Thinking as a guiding framework, consumer journeys have been mapped out to discover user preferences, as well as identify gaps and opportunities. The ceaseless work put into improving the experience at our parks has yielded a guest satisfaction score of 87%, breaking the record set in the previous FY.

New Tortoise Exhibits @ SZ RepTopia

Designed with an immersive guest experience in mind, these new outdoor exhibits allow for guests to feed and interact with the radiated and Asian giant tortoises. Through such memorable encounters, we hope to educate guests on the threats faced by these critically endangered species in the wild and inspire them to act for wildlife.



Explorer Outpost @ NS Fishing Cat Trail

This project saw the transformation of an unused space along the Fishing Cat Trail into an animal presentation area and ranger station. The surrounding area was re-landscaped to create a more naturalistic environment. The open space provides increased visibility for the Keeper Talk sessions, when members of the animal care team share stories about Fishing Cat Trail residents like the pangolin, binturong and slow loris. The ranger station offers guests an interactive experience to explore and discover the world of nocturnal creatures native to Singapore.





New Anaconda Exhibit @ RS Wild Amazonia

The Anaconda Exhibit was revamped to recreate a South American riverine habitat and a spacious new home for our anacondas at River Safari. The largest snakes in the world, anacondas spend a substantial amount of time in water. The new glass-fronted exhibit invites guests for a close-up view of the snakes underwater. The exhibit also houses the plumed basilisks, also known as Jesus Christ lizards as they are able to run across water without sinking. Judging from the reactions of our guests, the habitat has created profound wildlife encounters that create sense of wonder.



Revamp of Stork Exhibit @ RS Mekong River

The exhibit was extensively re-landscaped to resemble a paddy field habitat commonly seen in the Mekong River basin. The addition of a water body and perching branches makes it more conducive for its water-loving inhabitants, which include a variety of storks, herons and cormorants. This also enhances the viewing experience of guests.



Enriching Animal Encounters @ RS

Offered in a 'pop-up' manner, these animal encounters allow guests to enjoy close encounters with small animals like the sugar gliders and tortoises. An enrichment activity is incorporated during the encounter to encourage the animals to display natural feeding and foraging behaviours. The animals remain active and engaged while guests can enjoy the encounter in proximity and gaining a better understanding of the animals' natural behaviour.



DRIVING FOOTFALL

Through continued efforts to cultivate interest in both locals and tourists, we saw an overall strong growth in our international markets, as well as an increase in the variety of local segments visiting our parks. Towards the end of FY, the global pandemic dealt tourism a huge blow, with strict travel restrictions put in place. Campaigns targeted at locals also had to be wound down in adherence to safe distancing measures. We are creating new ways of building connections with guests through our virtual offerings, and continue to explore new revenue streams amidst the challenging operating environment.

Fly Free @ JBP



In celebration of ten years of bird conservation, Jurong Bird Park offered free admission to all residents of Singapore from 6 – 15 September 2019. A nominal entry fee was charged for entry to show venues and certain aviaries. The High Flyers Show and Kings of the Skies Show played to sold out audiences, while queues for entry were seen snaking outside popular exhibits like the indoor Penguin Coast, Waterfall Aviary and Lory Loft. Over 104,000 local guests flocked down over the ten-day period, which made for a staggering 600% increase in attendance against budget. Fly Free @ JBP provided opportunities for us to attract and engage non-traditional guest segments.



Megafauna End-of-Year Campaign

A truly mammoth undertaking involving teams from Technical Services, Marketing, Education and Strategy & Innovation, 'A Mammoth Adventure Back in Time' saw over 15 replicas of prehistoric extinct animals come alive at Singapore Zoo's Valley of Giants display. Powered by electromechanical devices and an immersive soundscape to educate visitors about megafauna conservation, this campaign coincided with the Nov-Dec school holidays and was targeted at families.



Disney Tsum Tsum and The Lion King



We worked hand in hand with Disney to reach a wider audience, riding on their brand equity with the special customisation of beloved Tsum Tsum characters to match our living collection at River Safari. For the 'Disney Tsum Tsum River Escapade', Mickey and Minnie Tsum dressed in giant panda costumes, while Tigger Tsum swapped out his stripes for the spots of a jaguar. Guests were engaged in in-park missions where they learnt more about the emperor tamarin's diet and the red panda's adaptations, as well as the dangers posed by pollution to aquatic animals like the manatee.



For the mid-year 'Circle of Life' campaign, family-friendly programming was delivered through our annual Zoolympix event, with the key takeaway for guests to appreciate and respect all life. Through a range of hands-on activities focused on animals as diverse as the cockroach and the giraffe, guests had the opportunity to appreciate the important role that all living things play in maintaining the health of our ecosystems. Exclusive 'The Lion King' merchandising developed for the campaign also drew good response.



Delighting The Locals

A slew of members' exclusives, exciting in-park campaigns and interesting F&B options continued to be rolled out to delight our local guests.



Members' Exclusives

The Friends of Wildlife (FOW) membership, which consists of year-long admission to all four parks continues to be a popular programme. The inaugural Members' WILD Weekend held in conjunction with the "Hal-Glo-Ween" campaign, resulted in a 99% uplift in attendance in River Safari over the same period last year. In FY1920, we also hosted 515 corporate events at our parks and welcomed 50 new corporate members.



In-park and In-app Promotions

Publicity in-app on Alipay helped drive greater awareness and higher attendance amongst Chinese tourists during their summer break and Golden Week holidays. The average spend of Chinese tourists also saw an upward trend.

Promotion deals on the Changi Recommends app also helped spark interest from travellers from top markets such as India, Australia and The Philippines.

Bringing In The Globetrotters

In FY1920, we welcomed 2.7 million international guests to our parks. Key markets like China, Korea and Japan showed a strong growth. There was also significant growth from markets like Indonesia and The Philippines. We are also proud to have received the Most Family-Friendly Overseas Attractions Award for the second consecutive year running from Chinese online travel giant Ctrip.

In-park programming

Innovative programming and exciting promotions that helped reel in the residents drew resoundingly positive feedback – up to 97% of guests surveyed post-visit said they would recommend their friends and family to visit.

Making An Impression Online

Around 14%, or 1 in 7 of our online audience have Chinese as their default browser language. This makes Chinese-literate guests our biggest non-English language audience. The Chinese content site was developed and launched to reach out to them with information on our park offerings, animals and zones, handy tips and educational programmes.

Our partnership with NutriFood Indonesia saw a nationwide on-pack promotion across 37,000

supermarket outlets and 2.5 million products, achieving 5.3 million views and 30 million impressions. The media blitz with Singapore Guidebook partnership also raised awareness in the Indonesian market.

Closer to home, social media posts with Firefly Airlines saw high engagement with Malaysian tourists. Joint marketing efforts with STB Malaysia during the peak year-end travel period helped drive conversion rates of +186% versus FY1819.

Increasing Visibility Out-of-Park

Tourist post-arrival campaigns targeted at independent travellers during peak travel periods played an important role in raising awareness of our parks, driving 2.5 times more traffic to our online content. The ParkHopper bundle was promoted through targeted advertising at key transport hubs like bus interchanges and train stations. A wall poster along a busy walkway at Little India Station put up during India's peak

travel period drew five times more post-arrival conversions. Bus wraps on select services plying routes along the central shopping belt and bus stop posters were also deployed.

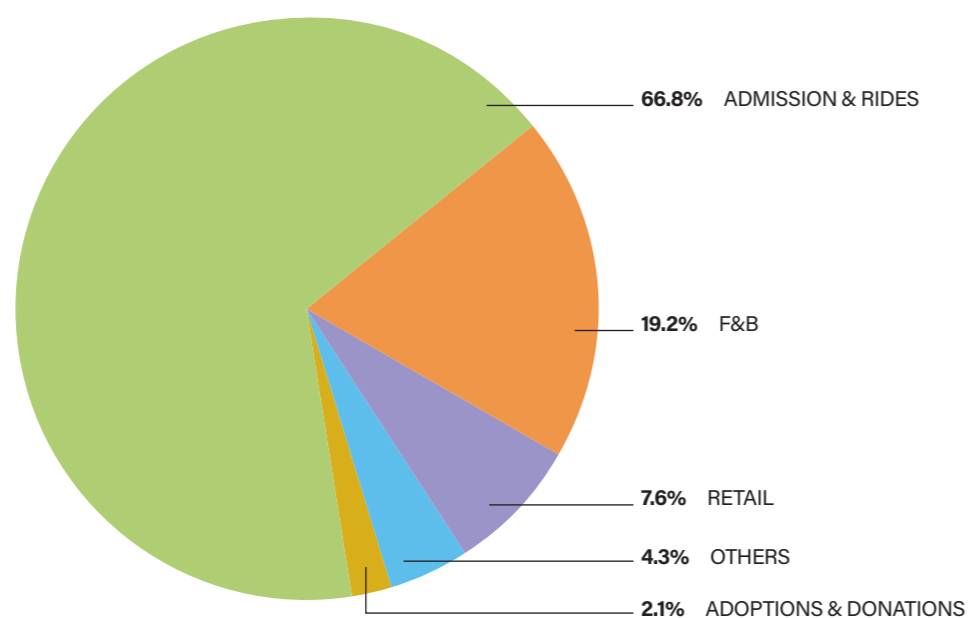
At the same time, the sale of our retail merchandise at department stores in downtown shopping centres – key tourist touchpoints – increased visibility of our parks.



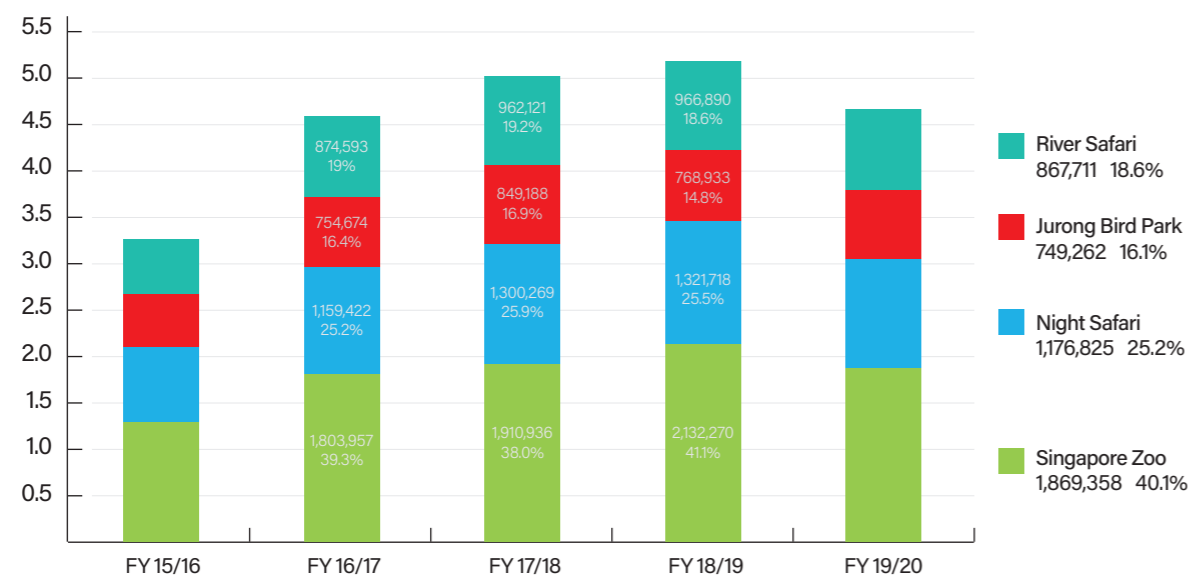


FINANCIAL & ATTENDANCE HIGHLIGHTS

REVENUE FOR FY19/20 **\$159,094,000**



TOTAL GUESTS **4,663,156**





THE YEAR AHEAD

Covid-19 has dealt us a severe blow. The Circuit Breaker and related park closure stress-tested our organisation. It forced us to work in different ways, in split teams and from home, and to rapidly reengineer how we engage with our guests. We have tapped on opportunities to fast-track new means of engaging a wider audience, via digital channels that transcend physical and geographical boundaries. The pace of progress of some developments will slow down. But the overall long-term vision of being and growing as a world-leading zoological institution remains.

Engaging guests in the new norm

During the lockdown we provided a glimpse into 'life behind closed doors' through our social media platforms, showing how our animals were faring and how essential services staff embraced safe work procedures while continuing to deliver world-class care. Our online animal care stories struck a chord with the community and their support has been tremendous.

One positive arising from this crisis is that we have shown that we can be an effective player in the digital space, reaching new audiences and finding new ways of generating revenue. We have come up with fun and interactive virtual programmes to connect people with our animals through virtual video dial-in programmes. Innovations like these are changing how we operate.

Our staff have proven to be resilient and adaptable, remaining nimble and learning how to adapt our park operations to deliver exceptional guest experience while coping with capacity limits safe distancing measures and other strict health procedures.

It has been heart-warming to observe our local guests' excitement and joy at being able to return to our parks, and we are deeply appreciative for their support. We will continue to try out new ways of doing business in the months to come. These changes will become part of our new norm and we will be embracing them for the long-term.

Creating new wildlife experiences at Mandai

We are continually refreshing our wildlife experiences, whether through new infrastructure or refreshing exhibits. As our Mandai development work speeds up again, our open-air car park has been closed and we expect to see traffic diversions on Mandai Lake Road to ensure works can be carried out safely and in sequence. Construction activities at the Zoo Entrance have also commenced to facilitate the construction of the New Indoor Attractions. Despite the 'hustle and bustle', we will work to ensure guest experience is not compromised. More multi-species exhibits and immersive exhibits will be introduced, which will enhance animal welfare and help us better deliver memorable wildlife encounters.

As the Circuit Breaker in Singapore and lockdowns elsewhere have allowed people to take time to reconnect with nature and appreciate the native animals that live around them, zoos will continue to play a critical role in urban societies by providing a "window into the wild" and building understanding of and compassion for wildlife. To take advantage of the opportunity that this crisis brings, we need to stay agile and adapt quickly to stay connected to our guests. We will work together to come through the toughest time in our operating history in relatively good shape.



ANNEX Mandai Research Fund Projects FY 19-20

The selection process for the proposals placed priority on research proposals that contained strong relevance and applicability to the Mandai project. Other evaluation criteria included the quality of scientific content, feasibility of research methodology and potential to build local capacity. The four projects awarded under the fund are:

RESEARCH PROJECT	DESCRIPTION	RESEARCH LEAD(S):
Mandai Insect Survey	The 2-year project aims to provide information on the insect diversity present in the buffer zones, setbacks and retained forests of the Mandai project through an extensive survey programme that aims to include as many habitats as possible and deployment of a variety of collection methods. This is the first time a survey of this kind is conducted in Mandai area. Such data are useful to foresee potential issues and explore solutions related to undesirable carriers of parasites and diseases, invasive species in the surrounding, and species reintroduction efforts.	Dr. Hwang Wei Song and Dr. Ang Yuchen Lee Kong Chian Natural History Museum, National University of Singapore.
Improving Habitat Connectivity for Sunda Colugos in Mandai	The two-year project aims to provide empirical evidence about the movement patterns and habitat use of Sunda colugos that are in or near the development areas. The findings will aid in the development of evidence-based solutions to enhance mitigation measures and habitat connectivity for the long term.	Dr. Norman Lim T-Lon, National Institute of Education, Nanyang Technological University Dr. Gregory T Byrnes, Biology Department, Siena College
Environmental Perception in Mandai Parks	This 18-month project aims to find out how environmental conditions such as thermal comfort impacts the effectiveness of environmental/educational message retention by guests visiting attractions. The research will be conducted in Singapore Zoo and River Safari. The research findings would be used to inform how and where messages should be delivered in the new features of the Mandai Project for maximum effectiveness.	Dr. Winston Chow Singapore Management University Dr. Sin Harnng Luh Sun Yat-Sen University
Managing Carnivore Dung with Black Soldier Flies	The 1-year project aims to use empirical validation to assess the possibility and efficacy of using black soldier fly (BSF) larvae in managing carnivore, herbivore and animal food waste and examine the safety and nutrient content of the larvae as animal feed. This would contribute towards a sustainable and closed loop waste management system solution for the existing and upcoming wildlife parks.	Dr Lily Ganda, Mr. Jeremy Wu, Dr. Goh Chee Keong, Mr Jeremy Kong, Republic Polytechnic

ANNEX Carbon Emissions FY 19-20

SCOPE	EMISSIONS (tCO ₂ e)
Scope 1 LPG Fuel (In-Park Vehicles) Refrigerant Gas	437.9
Scope 2 Grid Electricity	12,650.1
Scope 3 Animal Food and Freight Business Travel (Flights) Mandai Shuttle and Express Paper Consumption Waste Disposal, including transport Water Consumption	5,528.5
Total Carbon Emission (tCO₂e)	18,616.5

ANNEX Managed Species Programmes FY 19-20

SCIENTIFIC NAME	COMMON NAME	PROGRAMME	RANGE	IUCN RED LIST STATUS
Acinonyx jubatus jubatus	Southern Cheetah	EEP	Africa	VU
Acridotheres melanopterus	Black-winged Myna	ISB	SEA	CR
Ailuropoda menaloleuca	Giant Panda	CWCA	Asia	VU
Ailurus fulgens	Red Panda	GSMP	Asia	EN
Alligator sinensis	Chinese Alligator	EEP	Asia	CR
Alopecoenas sanctaerucis	Santa Cruz Ground-dove	EEP	Australasia	EN
Alouatta caraya	Black Howler	ESB	Neotropical	LC
Amazona lilacina	Ecuador Amazon	EEP	Neotropical	EN
Amazona viridigenalis	Green-cheeked Amazon	EEP	Neotropical	EN
Anas melleri	Meller's Duck	EEP	Africa	EN
Anodorhynchus hyacinthinus	Hyacinth Macaw	EEP	Neotropical	VU
Anodorhynchus leari	Lear's Macaw	ISB	Neotropical	EN
Anthracoeros malayanus	Black Hornbill	ESB	SEA	NT
Anonyx cinereus	Oriental Small-clawed Otter	ISB	SEA	VU
Aptenodytes patagonicus	King Penguin	EEP	Antarctica	LC
Ara ambiguus	Buffon's Macaw	EEP	Neotropical	EN
Ara glaucogularis	Blue-throated Macaw	EEP	Neotropical	CR
Ara rubrogenys	Red-fronted Macaw	EEP	Neotropical	CR
Asacornis scutulata	White-winged Duck	EEP	SEA	EN
Astrochelys radiata	Radiated Tortoise	ESB	Africa	CR
Astrochelys yniphora	Ploughshare Tortoise	ISB	Africa	CR
Aythya baeri	Baer's Pochard	ESB	Asia	CR
Bos gaurus	Gaur	ISB	Asia	VU
Buceros bicornis	Great Hornbill	EEP	Asia	VU
Buceros rhinoceros	Rhinoceros Hornbill	EEP	Asia	VU
Bucorvus leadbeateri	Southern Ground Hornbill	ESB	Africa	VU
Cacatua haematuropygia	Red-vented Cockatoo	EEP	Asia	CR
Cacatua moluccensis	Moluccan cockatoo	EEP	Asia	VU
Cacatua sulphurea citrinocristata	Citron-crested cockatoo	EEP	Asia	CR
Callimico goeldii	Goeldi's Monkey	EEP	Neotropical	VU
Capra falconeri	Markhor	ESB	Asia	NT
Casuarus casuarus	Southern Cassowary	ESB	Australasia	VU
Cattopuma temminckii	Golden Cat	EEP	Asia	VU
Cercocebus torquatus	Cherry-crowned Mangabey	ESB	Africa	EN
Cercopithecus neglectus	De Brazza's Monkey	EEP	Africa	LC
Chelodina mccordi	Roti Island Snake-necked Turtle	EEP	Asia	CR
Chilabothrus angulifer	Cuban Boa	ESB	Neotropical	NT
Choeropsis liberiensis	Pygmy Hippo	EEP	Africa	EN
Chrysocyon brachyurus	Maned Wolf	EEP	Neotropical	NT
Cicinnurus regius	King Bird-of-Paradise	ESB	Australasia	LC
Ciconia abdimi	Abdim's Stork	ESB	Africa	LC
Crocota crocuta	Spotted Hyena	EEP	Africa	LC
Cryptoprocta ferox	Fossa	EEP	Africa	VU
Cuon alpinus	Red Dohle	EEP	Asia	EN
Cyanopsitta spixii	Spix's Macaw	ISB	Neotropical	CR (EW)
Dendrolagus goodfellowi	Goodfellow's Tree Kangaroo	GSMP	Australasia	EN
Dryonastes courtioi	Blue-crowned Laughingthrush	GSMP	Asia	CR
Elephas maximus	Asian Elephant	EEP	Asia	EN
Gallicolumba criniger	Minadao Bleeding-heart	SSP	Asia	VU
Goura sclaterii	Sclater's crowned pigeon	ESB	Australasia	NT
Goura victoria	Victoria Crowned-pigeon	ESB	Australasia	NT
Gyps africanus	African White-backed Vulture	ESB	Africa	CR
Helarctos malayanus	Sun Bear	ESB	Asia	VU
Heloderma horridum	Mexican Beaded Lizard	EEP	Neotropical	LC
Heloderma suspectum	Gila Monster	EEP	Neotropical	NT
Hippopotamus amphibius	Common Hippo	EEP	Africa	VU
Hylabates pileatus	Pileated Gibbon	EEP	Asia	EN
Leontopithecus chrysomelas	Golden-headed Lion Tamarin	ISB	Neotropical	EN
Leontopithecus rosalia	Golden Lion Tamarin	ISB	Neotropical	EN
Lorius domicellus	Purple-naped Lory	ESB	Asia	EN
Lorius garrulus	Chattering lory	ESB	Asia	VU
Lycaon pictus	African Hunting Dog	EEP	Africa	EN
Macaca silenus	Lion-tailed Macaque	EEP	Asia	EN
Melursus ursinus	Sloth Bear	EEP	Asia	VU
Myrmecophaga tridactyla	Giant Anteater	EEP / ISB	Neotropical	VU
Nomascus gabriellae	Buff-cheeked Gibbon	ESB	Asia	VU
Nycticebus coucang	Sunda Slow Loris	EEP	Asia	VU
Otocyon megalotis	Bat-eared Fox	EEP	Africa	LC
Pan troglodytes	Chimpanzee	EEP	Africa	EN
Panthera leo persica	Asiatic Lion	EEP	Asia	EN
Panthera onca	Jaguar	EEP	Neotropical	LC
Panthera pardus kotiya	Sri Lankan Leopard	EEP	Asia	VU
Paradisaea raggiana	Raggiana Bird-of-Paradise	SSP	Australasia	LC
Phoeomyz pallidus	Northern Luzon Cloud Rat	ESB	Asia	LC
Pitta sordida	Hooded Pitta	SSP	Asia	LC
Platalea minor	Black-faced Spoonbill	JAZA	Asia	EN
Polyplectron inopinatum	Mountain Peacock-pheasant	ESB	Asia	VU
Polyplectron malaccense	Malayan Peacock-pheasant	ESB	Asia	VU
Pongo abelii	Sumatran Orangutan	SSMP / ISB	Asia	CR
Pongo pygmaeus	Bornean Orangutan	SSMP / ISB	Asia	CR
Probosciger aterrimus	Palm Cockatoo	EEP	Asia	LC
Pseudois nayaur	Bharal	ESB	Asia	LC
Pteronura brasiliensis	Giant Otter	EEP	Neotropical	EN
Pycnonotus zeylanicus	Straw-headed Bulbul	EEP	Asia	CR
Pythecophaga jefferyi	Philippine Eagle	DENR	Asia	CR
Ramphastos tucanus	Red-billed Toucan	ESB	Neotropical	VU
Rhabdotorhinus corrugatus	Wrinkled Hornbill	EEP	Asia	EN
Rhinoceros unicornis	Indian Rhino	EEP / ISB	Asia	VU
Rhyticeros plicatus	Papuan Hornbill	ESB	Asia	LC
Rhyticeros undulatus	Bar-pouched Hornbill	ESB	Asia	VU
Rudocervus duvaucelii	Barasingha	ESB	Asia	VU
Saguinus imperator	Emperor Tamarin	EEP	Neotropical	LC
Saimiri sciureus	Common Squirrel Monkey	EEP	Neotropical	LC
Scopus umbretta	Hammerkop	ESB	Africa	LC
Spheniscus demersus	African penguin	EEP	Africa	EN
Tapirus indicus	Malayan Tapir	SSMP	Africa	EN
Tockus deckeni	Von Der Decken's Hornbill	ESB	Africa	LC
Tomistoma schlegelii	False Gharial	ESB	Asia	EN
Trachypithecus auratus	Javan Langur	EEP	Asia	VU
Tragelaphus euryceros isaaci	Bongo	EEP / ISB	Africa	CR
Trichechus manatus	West Indies Manatee	EEP	Neotropical	VU
Trionoceph occipitalis	White-headed Vulture	EEP	Africa	CR
Varanus komodoensis	Komodo Dragon	EEP	Asia	VU
Wallabia bicolor	Swamp Wallaby	ESB	Australasia	LC

ABBREVIATIONS AND ACRONYMS

PROGRAMME

EEP
European Endangered Species Programme

ESB
European Studbook

GSMP
Global Species Management Plan

ISB
International Studbook

SSMP
Significant Species Management Plan

IUCN RED LIST STATUS

EW
Extinct in the Wild

CR
Critically Endangered

EN
Endangered

VU
Vulnerable

NT
Near Threatened

LC
Least Concern

PUBLICATION TITLE (PEER REVIEWED PUBLICATIONS)			WRS AUTHOR	JOURNAL NAME/PUBLISHER
1	Comparison of alfaxalone-medetomidine and tilatamine-zolazepam in rescued common palm civets	Ali Anwar Ahmad, Norsham Abd Wahab, Clara Yeo Wenjing, Serena Jocelyn Oh Wai Yin, Chen Hui Cheng	Journal of Veterinary Medical Science	
2	Erysiopelothrix septicaemia and hepatitis in a colony of Humboldt penguins (<i>Spheniscus humboldti</i>)	Shangzhe Xie, Chia-Da Hsu	Journal of Comparative Pathology	
3	Intralesional methylprednisolone injection as an adjunct treatment for peri-cloacal pyogranuloma in an African penguin (<i>Spheniscus demersus</i>).	Shangzhe Xie, Chia-Da Hsu, Gabrina Goh	Journal of Veterinary Medical Science	
4	The use of a 3D-printed prosthesis in a Great Hornbill (<i>Buceros bicornis</i>) with squamous cell carcinoma of the casque	Shangzhe Xie	PLoS One	
5	Classification of parasitic helminths detected at Jurong Bird Park and further information on disease	Chiharu Okumura	Journal of the Japanese Association of clinical avian medicine	
6	Copper isotopes as possible neoplasia biomarkers in captive wild felids	Guillaume Douay	Zoo Biology	
7	First report of co-invasion by the reptile nematode <i>Ozolaimus megatyphlon</i> (Nematoda: Pharyngodonidae) with invasive green iguanas (<i>Iguana iguana</i>) in the Asia-Pacific	Chia-Da Hsu, Chiharu Okumura	Acta Parasitologica	
8	First record of the hog louse <i>Haematopinus suis</i> (Insecta: Phthiraptera) in Singapore, and its implications on the emergence and spread of zoonoses and wildlife disease	Chia-Da Hsu	Nature in Singapore	
9	Tick-crocodilian interactions: a review with the first record of tick (Acari: Ixodidae) infestation on a saltwater crocodile (<i>Crocodylus porosus</i>) and a concise host-parasite index	Chia-Da Hsu, Webster Cheong	Experimental and Applied Acarology	
10	Canine parvovirus-2c (CPV-2c) infection in wild Asian palm civets (<i>Paradoxurus hermaphroditus</i>) in Singapore	Chong Shin Min, Chia-Da Hsu	Journal of Wildlife Disease	
11	Serological evidence of continued Japanese encephalitis virus transmission in Singapore nearly three decades after end of pig farming	Chiharu Okumura	Parasites and Vectors	
12	Organ Histopathology and Hematological Changes Associated with Heat Exposure in Australian Desert Birds	Shangzhe Xie	Journal of Avian Medicine and Surgery	
13	Evaluating the feasibility of pangolin farming and its potential conservation impact	Sonja Luz	Global Ecology and Conservation	
14	Flying into extinction: Understanding the role of Singapore's international parrot trade in growing domestic demand	Jessica Lee	Bird Conservation International	
15	Securing safe havens for the Helmeted Hornbill <i>Rhinoplax vigil</i>	Jessica Lee	Birding Asia	
16	Assessment of the utility of a commercial calprotectin and lactoferrin rapid test in diagnosis of marmoset wasting syndrome	Guillaume Douay, Francis Cabana	Journal of Zoo and Aquarium Research	
17	Sleep monitoring of an Asian elephant <i>Elephas maximus</i> calf at Night Safari, Singapore: testing whether sleep time is a significant predictor of cortisol or the onset of positive elephant endothelotropic herpesvirus viraemia	Kalirathinam Udhaya Kumar, Saravanan Elangkovan, Josephine Kawi, Francis Cabana	International Zoo Yearbook	
18	Preliminary results on the food intake and nutrient digestibility of southern white-cheeked gibbons and red-shanked douc langurs at the Endangered Primate Rescue Centre, Vietnam.	Francis Cabana	Vietnamese Journal of Primatology	
19	The addition of soil and chitin into Sunda pangolin (<i>Manis javanica</i>) diets affect digestibility, faecal scoring, mean retention time and body weight.	Francis Cabana, Claudia Tay	Zoo Biology	
20	Batagur trivittata (Burmese roofed turtle) sexual size dimorphism	Borja Reh	Herpetological Review	
21	Batagur trivittata (Burmese roofed turtle) behaviour	Borja Reh	Herpetological Review	
22	A lost world in Wallacea: Description of a montane archipelagic avifauna	Nathaniel Ng Shengrong	Science	
23	Pleasuring' through Scaly Friends - Nurturing the Seven Essential Life Skills at Singapore Zoo	Karen Chin	Journal of the Association for Early Childhood Educators (Singapore)	
24	Greater flamingo discospondylitis	Shangzhe Xie, Chia-Da Hsu, Gabrina Goh	Journal of American Veterinary Medicine Association	
BULLETINS AND NEWSLETTERS			WRS AUTHOR	JOURNAL NAME/PUBLISHER
1	Singapore's domestic and international parrot markets	Jessica Lee	NatureWatch	
2	A success with surrogacy	Kumaran Sesshe	Zoo Grapevine and International Zoo News	
3	Update from the Helmeted Hornbill Working Group	Jessica Lee	Hornbill Specialist Group Newsletter Hornbill Natural History & Conservation	
4	Santa Cruz Ground Dove breeding	Luis Carlos Neves	Zooquaria	
5	Tackling the illegal songbird trade in Southeast Asia	Jessica Lee, Roopali Raghavan	WAZA	
6	The return to Rote Island	Borja Reh	Zooquaria	
7	How to feed sugar gliders	Francis Cabana	AVA Unusual Pet and Avian Veterinarians Newsletter	
8	Fatal septicemia and mastitis in wild Sunda colugos (<i>Sunda flying lemurs</i> ; <i>Galeopterus variegatus</i>) in Singapore	Chong Shin Min, Pei Yee Oh, Delia Chua, Shangari Sekar, Chia-Da Hsu	Journal of Wildlife Disease	
9	IUCN SSC Asian Songbird Trade Specialist Group holds inaugural meeting to safeguard Asian songbirds	Jessica Lee	Birding Asia	
10	Attempted predation of Sunda colugo by a reticulated python	Charlene Yeong, Paige Lee	Singapore Biodiversity Records	
CONSERVATION ACTION PLANS			WRS AUTHOR	JOURNAL NAME/PUBLISHER
1	Regional Sunda Pangolin (<i>Manis javanica</i>) Conservation Strategy (2018-2028)	Francis Cabana, Nerissa Chao, Chia-Da Hsu, Ade Kurniawan, Paige Lee, Sonja Luz, Roopali Raghavan	IUCN	
2	Conservation strategy for Owston's civet (2019 - 2029)	Roopali Raghavan, Charlene Yeong	IUCN	
BOOK CHAPTERS			WRS AUTHOR	JOURNAL NAME/PUBLISHER
1	Nutrition of Lorisiformes	Francis Cabana	Cambridge University Press	
2,3,4,5	Pangolins: Biology and Conservation (Chapters 6, 26, 28 and 31)	Francis Cabana, Ade Kurniawan, Sonja Luz, Paige Lee	Elsevier	



Wildlife Reserves Singapore Group



JURONG BIRD PARK
2 Jurong Hill Singapore 628925

NIGHT SAFARI / RIVER SAFARI / SINGAPORE ZOO
80 Mandai Lake Road Singapore 729826
Tel: 62693411

www.wrs.com.sg