

A giant panda cub is climbing a tree trunk. The cub is positioned on the left side of the frame, clinging to the tree with its black-furred paws. Its body is mostly white with black patches around its eyes and on its limbs. The background is filled with dense green foliage, and the ground is covered with dry bamboo leaves and twigs.

MANDAI PARK HOLDINGS

YEARBOOK

2021-2022



About Mandai Wildlife Group

Mandai Wildlife Group is dedicated to caring for the planet and protecting animals and nature. Conservation education is intrinsic to all interactions with the Group, to inspire action for a healthier world.

Mandai Wildlife Group is the steward of Mandai Wildlife Reserve, a unique wildlife and nature destination in Singapore that is home to world-renowned wildlife parks which connect visitors to the fascinating world of wildlife. The Group is driving an exciting rejuvenation plan at Mandai Wildlife Reserve, adjacent to Singapore's Central Catchment Nature Reserve, that will integrate five wildlife parks with distinctive nature-based experiences, green public spaces and an eco-friendly resort.

The wildlife parks managed by the Group are accredited by two of the top international regional zoo associations, European Association of Zoos and Aquariums (EAZA), and Zoo and Aquarium Association of Australasia (ZAA), and the Group is an active member of the Southeast Asian Zoo and Aquarium Association (SEAZA) and the World Association of Zoos and Aquariums (WAZA).

Mandai Wildlife Group is committed to the vision of sustainable populations of wildlife and human communities thriving in functioning ecosystems. The Group will contribute by connecting people with wildlife, championing sustainable living, as well as participating in and supporting conservation efforts to safeguard wildlife and their habitats. The actions and contributions of the Mandai family of entities and brands are also aligned to the UN Sustainable Development Goals, in their focus to nurture a healthier world. The Group will work with our partners and like-minded collaborators to make a positive impact.

The Group provides funding and in-kind support to Mandai Nature for conservation work across Southeast Asia.

Mandai Global, an entity that is part of the Group, will establish and operate new lines of business anchored in creating positive outcomes for nature and wildlife.

Vision

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

Mission

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

Values



Excellence

We strive for the highest standards in all we do.



Integrity

We are honest and fair in all our dealings.



Teamwork

We achieve more together.



Care for Wildlife

We protect wildlife and provide excellent care for our animals.



Hospitality

We serve from the heart.



Sustainability

We embrace sustainable best practices.



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Message from Chairman & Group CEO



S Dhanabalan
CHAIRMAN
MANDAI WILDLIFE GROUP



Mike Barclay
GROUP CEO
MANDAI WILDLIFE GROUP

Over this period, our road to recovery from the global pandemic was strewn with obstacles. Time and again our park operations and development workstreams were disrupted by spikes in Covid-19 cases. But despite the difficult circumstances, we found reasons to cheer.

The start of the financial year coincided with giant pandas Kai Kai and Jia Jia's seventh breeding season. Five months later, Singapore's first giant panda cub arrived – the happy culmination of extensive efforts to learn from our Chinese partners and implement best practices in giant panda care and reproductive science. Amidst the doom and gloom of the global pandemic, Le Le's birth was like a beacon of hope, marking another step in the right direction towards conserving this charismatic species. This reminded us of the wonders that can be achieved when nations share knowledge and unite behind a common cause.

In another international cooperative effort, our conservation arm Mandai Nature engineered the successful repatriation of 13 Roti snake-necked turtles from Singapore to their native Indonesia. Endemic to Roti Island, these extraordinary turtles are believed to be extinct in the wild. Since 2015, we have been caring for an assurance colony of this species in Singapore Zoo, and 13 individuals from the colony were selected for the reintroduction programme. A great deal of work was put in to raise healthy individuals, restore the turtles' natural habitat and engage with the local community to ensure the turtles remain safeguarded. We

did this collaboratively, working close with like-minded conservation organisations and the highly supportive Indonesian government. This is a remarkable example of how applying the IUCN's One Plan Approach of assessing, planning and acting for the good of a threatened species can bring it back from a state of near extinction.

In order to protect biodiversity, we must do our bit to protect the environment. Working towards our goal to be carbon neutral by 2024, we prioritise sustainable operations to reduce carbon emissions and water consumption. The solar panels on our new quarantine building and multi-storey car park are in operation, while we have built and commissioned two wastewater recycling plants that are expected to meet 21% of our precinct's future water needs. We achieved a number of environmental accreditations this year, including attaining Platinum LEAF (Landscape Excellence Assessment Framework) certifications for the Singapore Zoo, River Wonders and Night Safari, BCA Green Mark (Platinum) Super Low Energy (SLE) award for Mandai Resort, the first hotel in Singapore to receive this accreditation, and BCA Green Mark (Platinum) for Penguin Cove in Bird Paradise.

The pandemic did not deflect us from working with partners to ensure our education programmes reach more diverse segments of the community. We were delighted to collaborate with the Ministry of Education (MOE) to make our content on sustainability and conservation accessible on the Student Learning Space, which has in turn extended

our reach to all MOE school leaders, teachers, and students in Singapore. We also worked with community partners including Temasek Foundation, Fei Yue Family Service Centre, Salvation Army, and special education schools like Delta Senior School, Pathlight School and St Andrew's Mission School to offer a range of equitable opportunities to learn and connect with wildlife.

Our collective commitment to a healthy, biodiverse planet is now embodied in our Mandai master brand. After months of planning, we are embarking on a new chapter with a new corporate brand – the Mandai Wildlife Group – along with a conservation arm in Mandai Nature and a commercial accelerator in Mandai Global. Mandai Wildlife Reserve encompasses our existing and upcoming wildlife parks and other offerings, including the indoor attractions, resort and green public spaces that are under construction. The rebranding comes at a time when action is critically needed to reverse the devastating decline in the earth's biodiversity. As such, we will redouble our commitment to work for a more sustainable future.

This commitment is what drives us to constantly innovate. Ranger Buddies (RB) is a novel programme that inspires children to care for wildlife and the environment every day and everywhere. Through a connected learning ecosystem, Ranger Buddies can participate in fun missions in schools, at home and in our parks with a view to making the world a better place. This will be anchored by our new KidzWorld under development within the Singapore Zoo which promises to be a place where children can nurture a

love for animals and nature, while creating positive memories with their families through discovery and play.

Brand new experiences are nearing completion at Bird Paradise, our new bird park. The aviaries and amphitheatre look more impressive with each passing day, as the finishing, theming and planting work come together. We have also commenced work on a new Night Safari amphitheatre, with an increased capacity and protection from the elements.

We were honoured that our Night Safari was presented with the prestigious Thea Classic Award by the Themed Entertainment Association (TEA) for standing the test of time as an outstanding wildlife park, delivering the unique experience of viewing nocturnal animals in a tropical forest. Our congratulations go out to everyone who has contributed to Night Safari's enduring success!

It will take a while before tourism recovers to pre-Covid levels, but we will ride the recovery and explore tapping on new market segments and new lines of business to strengthen Mandai Wildlife Group. Our collective ability to innovate and seek out new opportunities in these challenging times has strengthened the organisation. We would like to thank our board members, staff, volunteers, members, donors and sponsors for your steadfast support to help us stay the course. With your support, we look forward to even better things to come in the years ahead!

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



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.



CLIMATE ACTION

Our operation is guided by sustainable best practices in every possible way to reduce direct or indirect carbon emissions to mitigate climate change and to support our goal to be carbon neutral by 2024.



LIFE BELOW WATER

Through River Wonders, 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.



AFFORDABLE AND CLEAN ENERGY

We monitor energy consumption in our parks through a comprehensive energy metering network. We are converting to energy-saving electrical devices and solar panels. Our entire tram fleet runs on electricity. The principle of reducing energy consumption guides all development work in Mandai.



LIFE ON LAND

We provide world-class care for our animals, many of whom 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 help save threatened species. We contribute to these global programmes as species coordinators for 14 threatened species. Through our conservation arm Mandai Nature, we support local and regional conservation work to reverse species loss, protect ecosystems, and engage local communities. We are directly involved in saving threatened wildlife such as the Sunda pangolin and the Raffles' banded langur.



SUSTAINABLE CITIES AND COMMUNITIES

We galvanise the community to refuse single-use plastic and to choose sustainably sourced products. 80% of plastic items used in our F&B front-of-house operations have either been eliminated or replaced by reusables or alternative materials. We serve wildlife-friendly coffee and sustainable seafood at our F&B outlets and offer sustainable merchandise at retail outlets to advocate for sustainable living.



RESPONSIBLE CONSUMPTION AND PRODUCTION

Our green procurement road map, with its clear targets, guides us to work with suppliers to procure sustainable goods and services. We diversify and source for more sustainable alternatives for our animal feed, supporting local produce where possible, to reduce our carbon footprint. Other than reducing energy and water consumption, we are working towards achieving zero waste through circularity.



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.

Board of Directors

MANDAI WILDLIFE GROUP

CHAIRMAN

Mr Suppiah DHANABALAN

Mr S Dhanabalan is a Member of the Council of Presidential Advisers; Member of Presidential Council for Minority Rights; Chairman of Temasek Trust Ltd and Chairman of Mandai Park Holdings Pte Ltd.

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 and Minister for Manpower. He is currently Adviser to the National Council of Social Service and National Volunteer & Philanthropy Centre. Mr Tan 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, Deputy Chairman of Mandai Wildlife Group, Chairman of Lee Kong Chian Natural History Museum Advisory Committee 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 as Chairman of Mandai Global, a wholly-owned subsidiary of Mandai Park Holdings which focuses on establishing new lines of business in adjacent industries, and on the board of Mandai Nature, the conservation arm of the Mandai Wildlife Group. Mr Barclay acts as an Advisor to the Board of the Changi Airport Group.

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 the Chair of Yong Siew Toh Conservatory of Music in NUS, a member of the Yale-NUS Governing Board and Singapore's Non-Resident Ambassador to the Republic of Chile.

Mr KEE Teck Koon

Mr Kee is the Chairman of NTUC Fairprice Co-operative Limited and Deputy Chairman of NTUC Enterprise Co-operative Limited, the holding entity and single largest shareholder of the labour movement's social enterprises comprising NTUC FairPrice Group, NTUC First Campus, NTUC Health, NTUC Income, NTUC LearningHub, Mercatus and MoneyOwl. He is also the director of NTUC Income, CapitaLand Investment Limited, Mandai Park Holdings, Trust Bank Singapore Limited, and Changi Airport Group. In addition, he serves on the Angsana Fund Investment Committee (AFIC) of the Singapore Labour Foundation.

Mr SIM Hwee Cher

Mr Sim is a 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 The Esplanade Co Ltd, UOL Group Ltd and Asia Capital Reinsurance Group Ltd.

Ms Claire CHIANG

Ms Claire Chiang is the co-founder of Banyan Tree Hotels & Resorts, Chair of China Business Development, and Global Head of Learning and Talent Development in Banyan Tree Management Academy. She Chairs Banyan Tree Global Foundation, and its Enterprise Environmental and Community Fund in partnership with Chinese Environmental Protection Foundation. She is also a member in the Advisory Committee for Guilin Tourism University in China and School of Hotel and Tourism Management of Hong Kong Polytechnic University. She chairs the Singapore Book Council and Shirin Fozdar Program in Singapore Management University.

In 2021, she was appointed the Advisory Board Member of the Conference Board Global Sustainability Centre, Europe and the Climate Governance Singapore Advisory Board.

Mr Adrian CHUA

Mr Adrian Chua is Deputy Secretary (Industry) and Chief Sustainability Officer at the Ministry of Trade and Industry. Prior to this, he served as Deputy Secretary at the Ministry of Defence, on the Executive Board of the International Monetary Fund, and in the Monetary Authority of Singapore. Mr Chua is currently Chairman of the Audit Committee and board member of DSO National Laboratories, and a board member of Sentosa Development Corporation and JTC.

Er Dr LEE Bee Wah

Er Dr Lee is a Lead Independent Director of public listed Koh Brothers Group Limited and the Non-Executive Chairman of another public-listed company, the Amcorp Global Limited. Er Dr Lee is also a Board Member of the Building and Construction Authority, a statutory board under the Ministry of National Development and also chairs the Nanyang Technological University School of Civil & Environmental Engineering Advisory Committee. Er Dr Lee was appointed as Independent Director of listed company Heeton Holding Limited.

Professor Leo TAN

Professor Tan chairs 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 boards of the Real Pet Food Company and Perfection Fresh Australia, and is on the Singapore Advisory Board of the Australian Institute of Company Directors. He is a member of the Global Trends Watch Committee of the International Association of Business Communicators and a member of the Singapore Institute of Directors.

Mr NG Lang

Mr Ng Lang is CEO of the Land Transport Authority. Prior to this, he has served as CEO of the Jurong Town Corporation, the Urban Redevelopment Authority and the National Parks Board. He currently serves as a member of the Advisory Board for SMU Real Estate Programme.

Ms NEO Gim Huay

Ms Neo Gim Huay is Managing Director, Climate Change Strategy of Temasek International Pte Ltd. She is on the Boards of Surbana Jurong Pte Ltd, Intellectual Property Office of Singapore and Science Center Global. Gim Huay is a member of the Creating Shared Value Council for Nestle, board trustee for the Singapore Institute for Technology and also co-chair for the Singapore Eco-Fund.

Mr Dilhan Pillay SANDRASEGARA

Dilhan Pillay joined Temasek in September 2010. He was appointed Executive Director and CEO of Temasek Holdings on 1 October 2021 and is concurrently the CEO of Temasek International, a position he has held since April 2019.

Dilhan has held various leadership roles in Temasek, including Head of the Investment, the Portfolio Management and the Enterprise Development Groups. He has also led the Temasek market teams in Singapore and the Americas.

Dilhan serves on the boards of the National Research Foundation in Singapore, Enterprise Singapore and the Peterson Institute for International Economics. He is also a member of the Future Economy Council, the Financial Centre Advisory Panel of the Monetary Authority of Singapore, the National Jobs Council, the Singapore Judicial Service Commission and the Singapore Research, Innovation and Enterprise Council.

He graduated from the National University of Singapore with a Bachelor of Laws and obtained a Master of Law from the University of Cambridge.

Ms PEK Siok Lan

Ms Pek Siok Lan is General Counsel of Temasek International Pte Ltd, responsible for overseeing its legal, regulatory and compliance affairs. She also serves on the Investment Committee of ABC World Pte Ltd, a firm dedicated to impact investing.

Animal Welfare & Ethics Committee

CHAIRMAN:

Professor Leo TAN

SECRETARY:

Dr CHENG Wen-Haur

MEMBERS:

Dr YAP Him Hoo

Dr Leslie RETNAM

Dr Adrian LOO

Mr Vinayagan DHARMARAJAH

Prof Joseph CHUN

Mr Mike BARCLAY

Environmental Advisory Panel

CHAIRMAN:

Professor Peter NG

DEPUTY CHAIRMAN:

Er LIM Peng Hong

MEMBERS:

Dr Shawn LUM

Professor NG Soon Chye

Professor Erwin VIRAY

Professor Brenda YEOH

Management

Mr Mike BARCLAY • Group Chief Executive Officer

CORPORATE SERVICES

Mr Marcus HENG • Group Chief Human Resources Officer
Ms Shirley LIM • Group Chief Financial Officer

Ms Suzanne HO • Senior Vice President, Brand & Communications
Ms Liza CHANG • Vice President, People & Organisation Development
Ms Karen TAN • Vice President, Internal Audit
Mr Steven WONG • Vice President, Finance
Ms LOW Min Hwee • Vice President, Finance
Mr Thomas CHUA • Vice President, Information Technology
Ms Kelly CHEW • Vice President, Procurement

LIFE SCIENCES & OPERATIONS

Dr CHENG Wen-Haur • Deputy Chief Executive Officer (Life Sciences & Operations) & Chief Life Sciences Officer

Mr Melvin TAN • Chief Estate & Property Officer
Ms Sherri LIM • Chief Park Operations Officer

Dr Luis NEVES • Vice President, Animal Care
Ms Gail LAULE • Vice President, Animal Presentation
Dr Sonja LUZ • Vice President, Conservation, Research & Veterinary
Ms May LOK • Vice President, Education
Mr CHAM Tud Yinn • Vice President, Exhibit Design
Mr Kumar PILLAI • Vice President, Special Projects
Ms Rohaya SAHAROM • Vice President, Sustainable Solutions
Mr George KYAW • Vice President, Horticulture
Mr Donald TAN • Vice President, Facilities Management
Mr Andrew CHAI • Vice President, Technical Services
Ms Daisy LING • Vice President, Jurong Bird Park
Mr Elisha TEO • Vice President, Park Services

TRANSFORMATION & GROWTH

Ms Belina LEE • Deputy Chief Executive Officer (Transformation & Growth) & Chief Executive Officer (Mandai Global)

Ms Jean CHOI • Chief Sales & Marketing Officer

Ms Isabel CHENG • Senior Vice President, Partnership Development
Ms Monet ALUQUIN • Vice President, Asset Development
Mr Damon WEE • Vice President, Digital Marketing
Mr Steven TAN • Vice President, Food & Beverage
Ms Daisy TAN • Vice President, Retail
Ms Sherie YEO • Vice President, Guest Experience Management
Mr Terrence TANG • Vice President, Emerging Products (B2B)
Mr Anthony CHAN • Vice President, Emerging Products (Consumer)
Mr Chris CHIU • Vice President, Emerging Products (Creative & Content)
Mr Edmas NEO • Vice President, Transformation Office
Ms Sandy LEE • Vice President, Park & Attractions Marketing
Mr WONG Yu Hsiang • Head, New Business (Mandai Global)
Ms SEAH Seow Ling • Head, Finance (Mandai Global)

DEVELOPMENT

Mr LEONG Yue Kheong • Deputy Chief Executive Officer (Development)

Mr Kenneth NG • Project Director (West Zone)
Mr David GOH • Project Director (East Zone)

Mr Marc CREMADES • Vice President, Attractions Development
Mr Colin CHEW • Vice President, Cost, Contracts & Procurement
Mr Ivan WONG • Vice President, Strategic Planning

Mandai WILDLIFE GROUP

Corporate Functions

Corporate Services	Life Sciences & Operations	Transformation & Growth	Development
Brand & Communications	Animal Care	Asset Development	Attractions Development
◆	◆	◆	◆
Finance	Animal Presentation	Digital Marketing	Cost, Contracts & Procurement
◆	◆	◆	◆
Human Resources	Conservation, Research & Veterinary	Food & Beverage	Project Management (East Zone)
◆	◆	◆	◆
Information Technology	Education	Park & Attractions Marketing	Project Management (West Zone)
◆	◆	◆	◆
Internal Audit	Exhibit Design	Partnership Development	Strategic Planning
◆	◆	◆	◆
Legal	Facilities Management	Retail	
◆	◆	◆	
Procurement	Horticulture	Sales & Experience Development	
	◆	◆	
	Park Operations	Emerging Products (B2B)	
	◆	◆	
	Sustainable Solutions	Emerging Products (Consumer)	
	◆	◆	
	Technical Services	Emerging Products (Creative & Content)	
		◆	
		Transformation Office	
		◆	
		Guest Experience Management	



Mandai Wildlife Group has a conservation arm in **Mandai Nature** and a commercial accelerator in **Mandai Global**.

Mandai
N A T U R E

Mandai
G L O B A L

Adopters & Sponsors

Singapore Zoo

96 Capital Management Pte Ltd	Giant Tortoise, Belle
Agrocorp International Pte Ltd	Pygmy Hippopotamus, Divo
Capitaland Limited	Rainforest Fights Back Show
Equatorial Marine Fuel Management Services Pte Ltd	Asian Elephant, Intan
Haw Par Corporation Ltd	Leopard Exhibit
Henkel Singapore Pte Ltd	Chimpanzee, Gangga
Henkel Singapore Pte Ltd	Anoa Exhibit
Hong Leong Foundation	Fragile Forest Exhibit
Hotel Properties Limited	Orangutan, Adi
Kuok (Singapore) Limited	Giraffes, Adhil and Balaji
Lee Foundation Singapore	Garden With A View
MCC Singapore	Asian Elephant, Komali
Mdm Kay Kuok	Asian Elephant, Aprila
Mitsui & Co. (Asia Pacific) Pte Ltd	Elephant Presentation
Mr and Mrs Kenneth Goh Hoon Chuan	Dogs from Animal Friends Show
Mr Chew Shou Zi and Ms Vivian Kao	White Tiger, Pasha
Mr Dominic Teo	Asian Small-clawed Otter Exhibit
Mr Dominic Teo	Chimpanzee, Akinyi
Mr Dominic Teo	Falabella, Lovena
Mr Ken Tan Jin Tat	Falabella, Partidor
Mr Sandeep Sharma	Elephant Feeding Programme
Mr Stephan Ritzmann and Ms Mayumi Hori	Naked Mole-Rat Exhibit
Mrs Christina Ong	Orangutans, Binte & Saloma
Ms Carrie Wan Burke	Giant Tortoise, Mahe
Ms Goh Choi Fong	King Cobra Exhibit
Ms Sharon Gray and Mr Patrick Harrigan	Lion, Simba
MUFG Fund Services (Singapore) Pte Ltd	Hamadryas Baboon Exhibit
Nomanbhoy and Sons Pte Ltd	White Tiger, Keysa
NTT Asia Pacific Holdings Pte Ltd	White Rhinoceros Exhibit
Oiltanking Singapore Ltd	Giant Tortoise, Claude
Petrochina International (Singapore) Pte Ltd	Lion Exhibit
Petroship Marine Pte Ltd	Giant Tortoise, Astove
ReefMarketSG Pte Ltd	Roti Island Snake-necked Turtle Exhibit
Riverbank Chemicals Pte Ltd	Meerkat Exhibit
SHEIN	Cheetah Exhibit
Starbucks Coffee Singapore Pte Ltd	Komodo Dragon Exhibit
Swee Heng Bakery Pte Ltd	Asian Elephant, Gambir
TAG Industrial Pte Ltd	Giant Tortoise, Casela
Tan Chong International	Giraffes, Marco and Jubilee
Tan Chong International	Grevy's Zebra Exhibit
Temasek International Pte Ltd	Giant Tortoise, Kadoorie
The Shaw Foundation Pte	The Shaw Foundation Amphitheatre
Tipsy Collective Pte Ltd	African Penguin Exhibit
Tradecom Services Pte Ltd	Chimpanzee, Ida
Unilever Singapore Pte Ltd	Orangutan, Khansa
Valour Pets Global Pte Ltd	African Painted Dog Exhibit
Wing Joo Loong Ginseng Hong (Singapore) Company Pte Ltd	Malayan Tiger, Sulong
Wuthelam Holdings Pte Ltd	Rabbit Exhibit
Yuvabharathu International School Pte Ltd	Asian Elephant, Jati

Night Safari

Goodwood Park Hotel Pte Ltd	The Fishing Cat Trail
Haw Par Healthcare Limited	Malayan Tigers, Bongsu, Intan, Arhaa and Sali
JTB Pte Ltd	Elephant, Neha
JTB Pte Ltd	Asiatic Lion Exhibit
JTB Pte Ltd	Sambar Deer and Elephant Exhibit
Khoo Teck Puat Foundation	The Fishing Cat Trail
Mitsui & Co. (Asia Pacific) Pte Ltd	African White Lion Exhibit
Mr Martin Storey	Babirusa Exhibit
SHEIN	Pangolin Exhibit
Singapore Refining Company Pte Ltd	Barasingha Exhibit
The Shaw Foundation Pte	Slow Loris Exhibit
Toppan Leefung Pte Ltd	Asian Elephant, Sang Wira
Xiaomi	Asian Elephant, Chawang

River Wonders

Extra Space Self Storage	Giant River Otter Exhibit
Khoo Teck Puat Foundation	Red Panda Exhibit
Mitsui & Co. (Asia Pacific) Pte Ltd	Mekong Giant Catfish Exhibit
The Shaw Foundation Pte	Manatee Feeding Programme

Jurong Bird Park

Amazon Web Services	Waterfall Aviary
Equinix Singapore Pte Ltd	Waterfall Aviary
Facebook Singapore Pte Ltd	Waterfall Aviary
Goodwood Park Hotel Pte Ltd	Brahminy Kite, Ronnie II
Hong Leong Foundation	Flamingos From High Flyer Show
Kidz Meadow Childcare & Development Centre	Blue-eyed Cockatoo Exhibit
Mrs Verena and Mr Sharad Desai	Straw-headed Bulbul Exhibit
Telekomunikasi Indonesia International Pte Ltd	Waterfall Aviary
The Shaw Foundation Pte	Fly-Pass Macaws From High Flyer Show

Contributions Towards Animal Care

Cosmose Pte Ltd
Good Shepherd Convent Kindergarten
Lee Foundation Singapore

Bench, Sculpture & Tree Adoptions

Arts Kidz Pre-School Pte Ltd	Butterfruit Tree at White Tiger Exhibit
Moonday Studio	Bench at Free-Ranging Orangutan Island
Mr and Mrs Ong Seow Leong	Otter Sculptures at Otter Exhibit
Mr Andrew Ng Wai Hung	Bench at Giraffe Exhibit
Dr Chris Tan Kok Leong	Kapok Tree at Free-Ranging Orangutan Island
Dr Chris Tan Kok Leong	Bench at Free-Ranging Orangutan Island
Mr Felix Lim	Sandu Tree at Garden Pavillion
Mr Indra Widjaja	Rain Tree at African Painted Dog Exhibit
Mr Kelvin Chng	Sea Almond Tree near Ah Meng Memorial
Mr Morven Chin	Butterfruit Tree at White Tiger Exhibit
Mr Naresh Narasimhan	Rain Tree at Zebra Exhibit
Mr Ng Cheun Ser	Broad-leafed Mahogany Tree at Garden With A View
Mr Rik van Dijk	Rain Tree at Giraffe Exhibit
Ms Annette Brinch Jensen	Bench at Giraffe Exhibit
Ms Lee Whai Yih	Bench along Rainforest Walk
Ms Tan Keng Keng	Sentol Tree along Rainforest Walk
Ms Verena Poh	Broad-leafed Mahogany Tree at Garden With A View

Mandai Boardwalk

Du Pont Company Singapore Pte Ltd	Trees at Mandai Boardwalk
Daikin Airconditioning (Singapore) Pte Ltd	Trees at Mandai Boardwalk
GIC Pte Ltd	Trees at Mandai Boardwalk
Standard Chartered Bank	Trees at Mandai Boardwalk
The Chen Lin Trust	Trees at Mandai Boardwalk

Event Sponsorships

Lam Soon Singapore Pte Ltd	Rainforest Lumina Season 3
Pico Art international Pte Ltd	Rainforest Lumina Season 3
Amazon Web Services	Jurong Bird Park Gives Back
Equinix Singapore Pte Ltd	Jurong Bird Park Gives Back
Facebook Singapore Pte Ltd	Jurong Bird Park Gives Back
Telekomunikasi Indonesia International Pte Ltd	Jurong Bird Park Gives Back

Sponsorships In-Kind

Philips Electronics Singapore Pte Ltd
National University of Singapore

Year In Review

FY 2021 – 2022

Singapore's first giant panda cub, Le Le, was born to Kai Kai and Jia Jia on 14 August 2021, the 7th day of the 7th month of the lunar calendar.

Embarked on a new chapter with a new corporate brand – the **Mandai Wildlife Group** – along with a conservation arm in **Mandai Nature** and a commercial accelerator in **Mandai Global**.

Successfully repatriated **13 Roti snake-necked turtles** from the assurance colony in Singapore Zoo to their native country of Indonesia: a significant milestone in ongoing conservation efforts for the recovery of the species' wild population.

Lowered carbon footprint by 10%, from baseline in FY19/20, taking us closer towards our goal.

Worked with other wildlife institutions on **155 Managed Species Programmes** (up from 136 last FY) to save threatened species. 14 of these programmes (up from 11 last FY) are coordinated by our staff.

Held our **inaugural Innovation Forum**. Featuring speakers from tech-industry luminaries like Grab, Singtel and Google, the forum had 276 participants from across the globe and garnered 15,000 social media views.

Operationalised **new quarantine facilities**.

Completed **roof installation of Bird Paradise entrance**.

Received Temporary Occupation Permit (TOP) for large **water treatment plant**.

Soft launched Ranger Buddies programme which inspires children to care for wildlife and the environment every day and everywhere through fun missions.

Night Safari won the prestigious **Thea Classic Award** presented by the Themed Entertainment Association.

Engaged **205,000** people through **conservation and sustainability education**. Though we could not conduct many programmes in-person, we kept up the engagement virtually and achieved more than half of pre-Covid numbers.



Singapore's First Giant Panda Cub

Giant panda reproduction is unique and complex. Females ovulate only once a year, and are only receptive to the male for about 48 hours. Missing the narrow window for conception means having to wait for the next breeding season, next year. Kai Kai and Jia Jia's breeding journey began with the building of a conducive environment in their exhibits, which was complemented by attentive monitoring and behavioural conditioning as well as refinement of the artificial insemination process with the help of specialists in gynaecology and giant panda experts from China.

Jia Jia has come into oestrus quite regularly every year since 2015 and there have been annual attempts to encourage Kai Kai and Jia Jia to mate. When natural mating proved unsuccessful during the 2021 breeding season, experts from China advised our vets to perform artificial insemination before the end of Jia Jia's receptive period. On 24 April 2021, Jia Jia underwent artificial insemination during the final stretch of her fertile period – the 47th hour of the 48-hour window.

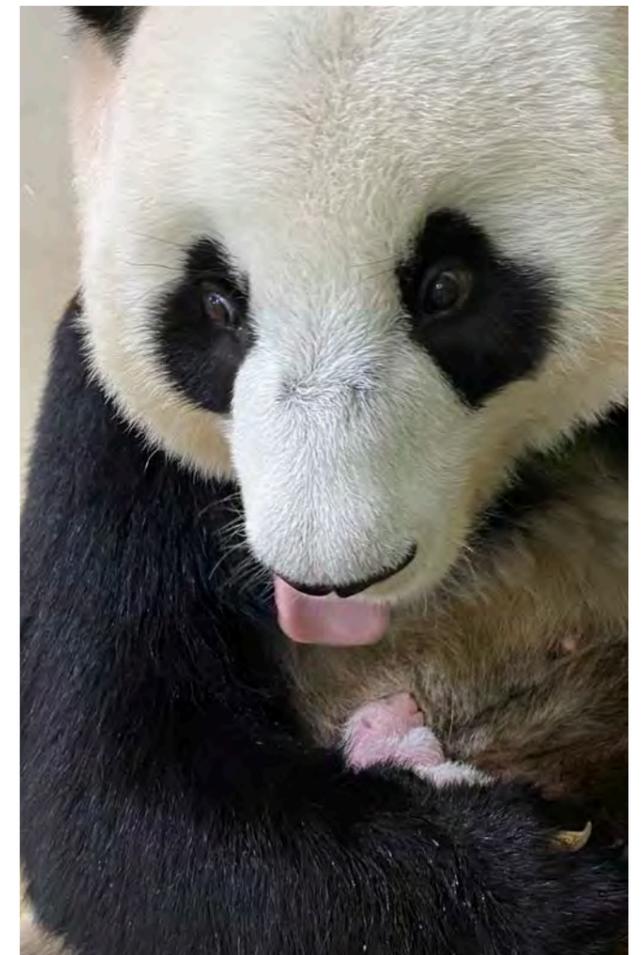
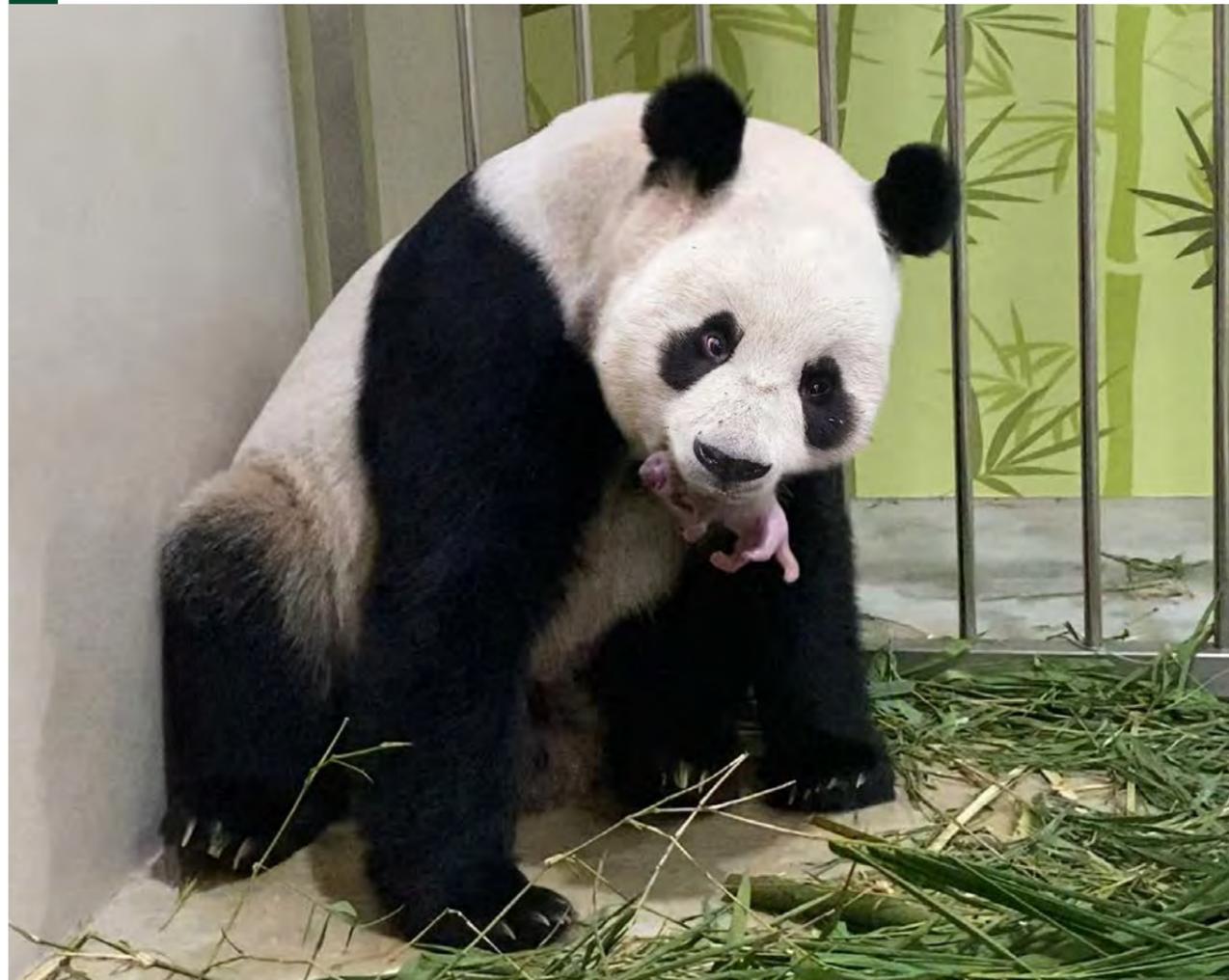
On 10 August 2021, a foetal heartbeat was detected on an ultrasound scan on Jia Jia. A second ultrasound scan two days later revealed clear images of a giant panda foetus. Another two days later, on 14 August 2021 at 0600hrs, Jia Jia went into labour. At 0750hrs, she gave birth to a healthy panda cub – a success on her seventh breeding season!

The cub's arrival was like a ray of light shining through the doom and gloom of the global pandemic. The people of Singapore, China and around the world rejoiced with us when the news broke. China experts lent 24/7 support to advise the team in supporting Jia Jia to raise her newborn cub, especially during the first seven days of the cub's birth – the period of time most critical to the survival of her newborn. We are extremely grateful for their generous guidance, which has empowered our inexperienced team, boosting their confidence and providing them with the knowhow to provide the best of care for Jia Jia and her cub.



Prime Minister of Singapore Mr Lee Hsien Loong makes a special mention of Kai Kai and Jia Jia's cub during his National Day Rally speech. The cub's birth in the month of August 2021 coincided with our nation's 56th birthday. It also coincided with Chinese Valentine's Day – the seventh month and seventh day of the lunar calendar.

Giant panda Jia Jia went into labour at 0600hrs on 14 August 2021. At 0750hrs, she gave birth to a healthy panda cub – a success on her seventh breeding season!





- Joycelyn Tan: YAY! CONGRATULATIONS TO KAI KAI AND JIA JIA! Yesterday was also Chinese Valentine's Day! So meaningful! Well done Wildlife Reserves Singapore!
- Francis Chia: Wow finally!!! Congratulations to KaiKai & Jia.Jia and big thanks to all animal care teams from Wildlife Reserves Singapore to put in so much effort to make this happen and welcome this little miracle to Singapore stay safe everyone happy birthday Singapore
- Jenny Kyw: Congratulations to Wildlife Reserves Singapore! Welcome baby panda cub!
- Haslinda Hussain: Congrats Jia Jia & Kai Kai and Wildlife Reserves Singapore team!. So happy for the Pandas!
- Gyendaline Yeo: Yay... Congratulations to Kaikai & Jiajia. Kudos to the care team their round the clock care. Looking forward to see the happy family
- Lim Sze Tein: Congratulations Kai Kai and Jia Jia, and the team at Wildlife Reserves Singapore!!! Well done!!!
- Julie Chong: Finally and congratulations to Wildlife Reserves Singapore and the entire care team for the! Happy that Jia Jia had a safe and smooth delivery. Can't wait to see the little one.
- Jen ML Lee: Congrats to Jia jia & Kai kai for the arrival of the new addition! Good job to the WRS caregiver(s) to the pandas @ #riversafari



Members of the Panda Care Team, Ms Norfaizah Abdul Aziz (left) and Ms Sim Pei Ying (right) with a bouquet of roses sent by a giant panda fan. The community showered us with gifts and congratulatory notes after the birth of Le Le. We are extremely touched by the immense outpouring of love not only for the giant pandas in our care but also the team caring for them.



Giant panda Kai Kai revealing the gender of his newborn cub – a boy – yesterday at the River Safari. The gender reveal was part of Kai Kai's 14th birthday celebration. ST PHOTO: KEVIN LIM

SINGAPORE
Gender of first giant panda cub born in Singapore revealed

The first cub born in Singapore to giant pandas Kai Kai and Jia Jia is a healthy baby boy. The panda cub was born on Aug 14 at the

River Safari after seven attempts by his parents to conceive. Wildlife Reserves Singapore said yesterday that its panda care team determined the cub's gender through a series of visual assessments. **B3**

It's a boy! Gender of first panda cub born here revealed

WRS determined gender after observation, checks with China experts



Left: Jia Jia with her cub on Sunday. The new panda cub has regained her appetite and is regularly seen munching on her favourite bamboo leaves. She is also comfortable leaving her cub unattended for short intervals.

Below: Kai Kai sniffing blue and pink 'candles' set up for a gender reveal party of his new cub, during his 14th birthday celebration at the River Safari yesterday. Kai Kai turns 14 on Tuesday. PHOTOS: WILDLIFE RESERVES SINGAPORE, REUTERS



To mark Le Le's first public debut on 30 December 2021, Mandai Wildlife Group's Deputy Chairman Mr Tan Chuan-Jin presents Chinese Ambassador to Singapore, His Excellency Mr Hong Xiaoyong with the book, "Singapore's First Panda Cub". The book details how super mum Jia Jia cares for her baby and Le Le's growth journey from tiny pink cub to chubby furry bear.



Singapore's Deputy Prime Minister Mr Heng Swee Keat and Chinese Vice-Premier Mr Han Zheng reveal our panda cub's name at the 17th Joint Council for Bilateral Cooperation and related Joint Steering Council meetings, held virtually on 29 December 2021. The winning name – Le Le (呦呦) – garnered more than 31,000 votes out of more than 64,000 votes received in the online poll.



A media event was held on 10 March 2022 to announce Le Le's debut at the Giant Panda Forest with his mother, Jia Jia. The event was graced by Deputy Prime Minister and Coordinating Minister for Economic Policies Mr Heng Swee Keat (third from left) and Ambassador of the People's Republic of China Mr Hong Xiaoyong (second from right). They were hosted by members of our Board and Senior Management, including Mr S. Dhanabalan, Chairman, Mandai Park Holdings (first from left), Mr Mike Barclay, Group CEO, Mandai Wildlife Group (second from left) and Mr Tan Chuan-Jin, Deputy Chairman, Mandai Park Holdings (first from right).



Launch Of A New Brand

On 13 October 2021, a new corporate identity as well as a new Masterbrand and park logos were unveiled. The new visual identity unites the Group's wildlife parks, nature precinct and commitment to conservation.

Brand relaunch

A new corporate identity, Mandai Wildlife Group, replaces Wildlife Reserves Singapore and encompasses both our wildlife park operations and the ongoing rejuvenation work at the Mandai precinct.

The rebranding comes at a critical time when action is urgently needed to mitigate climate change and reverse the devastating decline in the earth's biodiversity. In looking to the future, Mandai Wildlife Group will redouble its commitment to work for a more sustainable future, together with new entities - Mandai Nature and Mandai Global.

With the ongoing development for the Mandai Rejuvenation Project, the expanded suite of offerings including the existing wildlife parks will be clustered together in the new integrated destination that is Mandai Wildlife Reserve.

With the parks now under one brand, the Group also announced changes to the visual identities of its parks. While the ever-popular Singapore Zoo and Night Safari retain their names, River Safari is renamed River Wonders to better reflect the experience it offers of taking guests on a meandering walk through the aquatic world of freshwater habitats. Mandai Wildlife Reserve will also later welcome Singapore's new bird park, replacing Jurong Bird Park. The new park, to be named Bird Paradise, will bring guests on a journey into the world of avian wonders. Rounding up the wildlife park experiences in Mandai Wildlife Reserve will be Rainforest Wild, which offers explorations within a rainforest setting where habitats, adventure and animals are weaved together into one compact experience.

A new Masterbrand Mandai that embodies the passion and commitment for a thriving, biodiverse planet was also unveiled alongside the new corporate identity. The new brand world is inspired by nature and the animals under its care, which continue to spark a sense of wonder amongst guests. Its new tagline, 'Come to life', serves both as an invitation - to come closer to nature and experience the wonders of wildlife at Mandai Wildlife Reserve, and a call - to take action and protect the planet by making better choices every day.



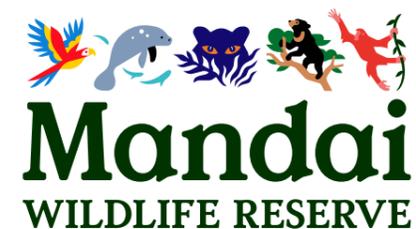
Mandai

WILDLIFE GROUP

Mandai
NATURE

Mandai
GLOBAL

Mandai Wildlife Group is our new corporate identity. The Group encompasses the zoological park operations, which will be located together in Mandai Wildlife Reserve; the ongoing rejuvenation work at the Mandai precinct; Mandai Nature, jointly established with Temasek to scale up conservation contributions; and Mandai Global, which is responsible for establishing new lines of business in nature and wildlife.



Mandai Wildlife Reserve is our integrated destination dedicated to the care and protection of wildlife. As part of the branding exercise, River Safari has been renamed River Wonders, and Jurong Bird Park will be replaced by Bird Paradise in its new location. Singapore Zoo and Night Safari have retained their names. A new offering, Rainforest Wild, will offer the chance to explore a rainforest setting.



Caring For Our Planet

Urgent action is needed to reverse the devastating decline in the earth's biodiversity and we continue to be at the forefront of conservation efforts, starting with animals in our care and wildlife in our precinct. The Mandai Rejuvenation Project is in its fifth year, and we are getting closer to creating even more opportunities to connect people to nature. Through our conservation arm, Mandai Nature, we fund and provide in-kind support for conservation work in Singapore and across Southeast Asia.

To bring about a more sustainable future, one in which wildlife and humans can thrive together in well-functioning ecosystems, we have committed to changes in how we operate. We prioritise sustainable operations through responsible sourcing and resource optimisation to become a carbon neutral destination by 2024.

FY21/22 HIGHLIGHTS

- Provided care for **978** animal species, **26%** of which are threatened in the wild
- Admitted **1,379** rescued native animals to our veterinary facilities for medical attention, of which **61%** were successfully released back into the wild.
- Invested **\$1.4 million** through Mandai Nature, in support of local and regional conservation projects, as well as conservation partnerships
- Reduced carbon footprint by **10%** since baseline in FY19/20, as part of our 2024 carbon neutral target
- Engaged and empowered **205,000** people with conservation and sustainability messaging through virtual, in-person, hybrid, and Ranger Buddies programmes.
- Obtained **Temporary Occupation Permit (TOP)** for newly constructed large water treatment plant; completed roof structure for Bird Paradise entrance and new Night Safari amphitheatre



New Mandai Precinct Taking Shape

The Mandai Rejuvenation Project is into the fifth year of construction. Development work has picked up, with construction activities now in progress for all features. Piling works and tree surveys commenced at the worksites for Rainforest Wild, East Arrival Node, Indoor Attractions and the eco-friendly resort. Over at the West Node, planting and theming works are also taking shape while construction at the northern edge is in progress.

Development work continued to be guided by the Environmental Impact Assessment, and Environmental Management and Monitoring Plan (EMMP) which details a comprehensive set of mitigation measures in consideration of the surrounding flora and fauna.

The principle of inclusion is one of the key pillars that shapes our design approach for the development work in Mandai precinct. We are pleased that our efforts to promote inclusivity have been recognized by Building and Construction Authority (BCA) through the conferment of the BCA Universal Design Mark (Design) Gold Plus Awards for Mandai Resort, East Node and the two indoor attractions.

Amidst the ongoing pandemic, the safety and wellbeing of staff and site workers remain a priority and precautions continue as needed.





Bird Paradise Developments

Construction activities are underway for Bird Paradise. Theming works and planting have also begun.

Building The Boardwalk

The boardwalk will be a green space accessible to public, outside of the ticketed parks. Works for the boardwalk commenced in 2021 along the perimeter of Singapore Zoo. Given the proximity to the Upper Seletar shoreline and Singapore Zoo, precautionary measures have been taken to reduce impact on the surroundings as well as guest experience in the existing parks. In adherence to the mitigation measures set out in the Environmental Management and Monitoring Plan (EMMP), the deployment of heavy machinery is not permitted at the boardwalk site. Work is carried out manually to minimise disturbance to the environment.



Eco-friendly Resort

A new resort experience will open to guests of Mandai Wildlife Reserve. Based on a biophilic design, the resort integrates the buildings with their natural surroundings. It is elevated several metres above the ground to allow native wildlife to move across the site wherever possible. The eco-friendly resort will offer different types of accommodation including elevated treehouses that will be set amongst the trees surrounding the property. Designed to resemble a seed pod, a prototype of the treehouse has been developed.

Infrastructural Upgrades

It has been more than 50 years since Singapore Zoo was first constructed in Mandai, and the infrastructure was showing signs of wear and tear. The Mandai Rejuvenation Project presents an opportunity to upgrade the sewage and water treatment plants, stormwater drains and water tanks to serve the entire Mandai precinct, and with features that allow for sustainable best practices. The external water discharge pipe was completed in September 2021 while the Mandai Wildlife Reserve Wastewater Recycling Plant (WRP) received Temporary Occupation Permit (TOP) in March 2021 and will soon be operational.



Providing World-Class Animal Care

We continued to provide the best possible care for our animals despite challenges including the financial impact and manpower crunch brought about by the pandemic. One key area of focus in the FY was to elevate animal welfare standards with an evidence-based approach, and much progress has been made through the launch of the Behavioural Management Framework, and collaborative efforts with zoo associations on certification, audit, evaluation and implementation processes. Apart from deepening subject matter knowledge and building in-house expertise, the Animal Care and Veterinary Teams also leveraged on technology for innovative solutions to enhance efficiency and effectiveness.

Over the FY, we

- Launched the **Behaviour Management Framework** for optimal husbandry and elevate animal welfare standards
- Participated in **155 global managed species programmes** to help save these threatened species from extinction
- Attended to **3,841 clinical cases**, of which 26% required hospitalisation for close medical supervision
- Contributed to scientific knowledge and global wildlife management decision-making through the publication of **24 papers**, of which 20 appear in peer-reviewed journals

Animal Care Updates

Over the FY, we cared for some 21,000 animals across nearly a thousand species. 26% of these species are threatened in the wild. Besides species of high conservation or population sustainability value, we also focus on the inclusion of species for education. The animals we care for are ambassadors for their species in wild habitats. By connecting guests with our animals, we hope to inspire more people to love, appreciate and take action to save wildlife.

Improving Animal Welfare Standards

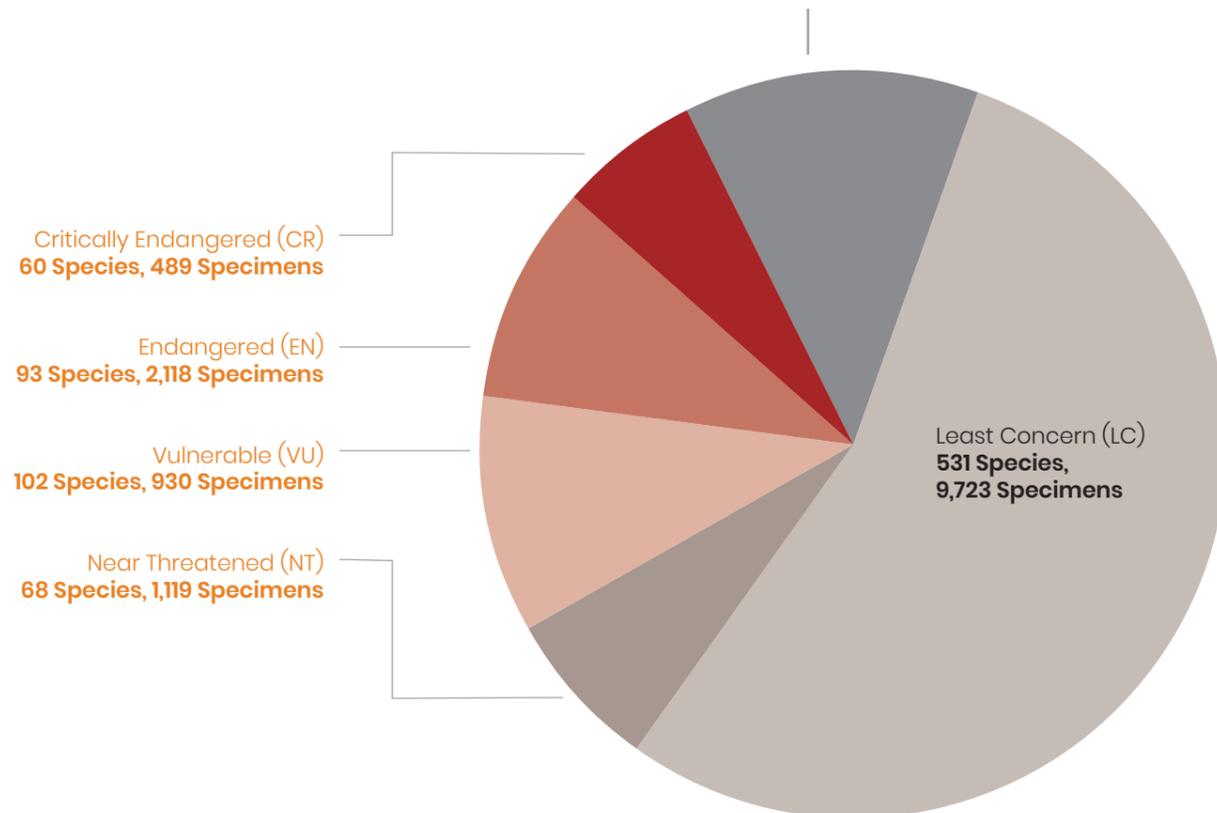
The Behavioural Management Framework (BMF) was launched to offer support for all animal care staff towards optimal husbandry and increased welfare standards for our animals. The BMF guides animal care staff in natural history research of the species in their care and to identify potential issues their charges might face. Through a problem-solving process, animal care staff can tackle prioritised behavioural challenges with evidence-based implementation and evaluation. In line with the World Association of Zoos and Aquariums' (WAZA) goal for all members to undergo an accredited evaluation of their animal welfare standards by 2023, we supported the rollout of a modular system for a zoo animal welfare certification process. In November 2021, the Auditor Training Course for Southeast Asian Association of Zoos and Aquariums (SEAZA) was conducted online for our Animal Care staff as well as those from zoos in the region. All 32 auditor candidates were subsequently certified as SEAZA Welfare Auditors.

**Total Animal Collection (FY21/22):
978 species, 21,861 specimens**

**Threatened species*:
255 species (26%), 3,537 specimens**

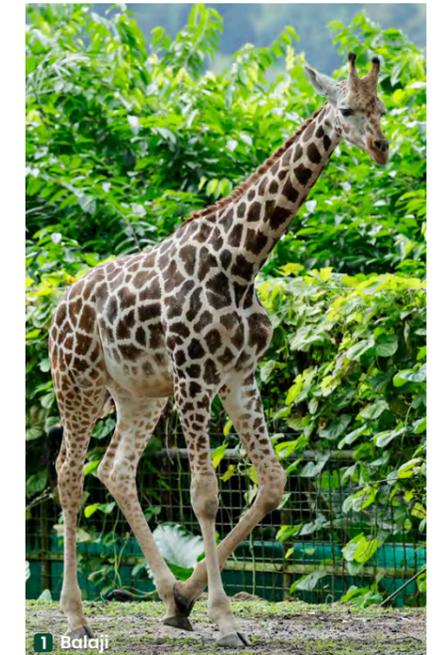
*Threatened species include animals that are
 - Extinct In The Wild,
 - Critically Endangered,
 - Endangered and
 - Vulnerable;
 classification is based on The IUCN Red List of Threatened Species.

**Non Evaluated (NE) & Data Deficient (DD)
124 Species, 7,482 Specimens**



Notable Newcomers

Despite uncertainty and challenges posed by the pandemic, including limited flight options and additional veterinary testing (Covid-19 test), we orchestrated a total of 48 inter-zoo transfers, up from 37 in the previous FY. A tremendous amount of coordination and logistical planning goes behind every transfer. A total of 25 new species joined us, and here are some significant new arrivals.



1 Rothschild's Giraffes 'Adhil' & 'Balaji'
 - Arrived in May 2021
 - From Mysuru Zoo, India
 - New home: Wild Africa @ Singapore Zoo



2 Northern Cassowary
 - Arrived in Aug 2021
 - From Avilon Zoo, The Philippines
 - Temporary home: Dinosaur Descendants @ Jurong Bird Park;
 - New home: Bird Paradise

3 Woylies
 - Arrived in Sep 2021
 - From Menagerie du Jardin des Plantes, France
 - New home: Wallaby Trail @ Night Safari

Tall Order

Transporting the world's tallest animals is a tall order. Already 1.8m at birth, giraffes may grow to be 2.5m by their first month. Zoos rarely transport giraffes above two years of age and only those 3.5m or below in height can clear the height limit for air cargo. When Mysuru Zoo confirmed they could send us two giraffe calves, we had to time the journey with their growth while navigating Covid-19 travel restrictions. Eventually, we decided to transport them here by sea. Two of our animal care staff travelled to India to ensure the safe journey of the giraffes over a seven-day sea voyage.



Saving Species At The Global Level

Our parks are part of a global network of zoos that play a pivotal role in maintaining genetically healthy populations of animal species. By collaborating with other zoos on internationally managed programmes, we help save threatened species from extinction. Transfers of animals between zoos for breeding are based on genetic compatibility and aimed at sustaining the genetic viability of the species in human care. We participated in 155 international Managed Species Programmes, up from 136 last FY (see Annex for full list).

The coordinator in charge of each programme makes recommendations for inter-zoo transfers of individuals to achieve the best welfare and conservation outcomes for the species. We continue to develop the competencies of our animal care staff to perform the specialised role of species coordination. Our staff helm the international coordination of the following 14 Managed Species Programmes (up from 11 in the previous FY).

SPECIES	IUCN RED LIST STATUS	PROGRAMME*	SPECIES COORDINATOR
Black Hornbill <i>Anthracoeros malayanus</i>	VU Vulnerable	EEP	Mark Rusli, Junior Avian Care Officer
Black-winged Myna <i>Acridotheres melanopterus</i>	CR Critically Endangered	EEP	Anais Tritto, Curator, Birds
Bornean Orangutan <i>Pongo pygmaeus</i>	CR Critically Endangered	SSMP	Wendy Chua, Curator Curator, Animal Data Management & Transactions
Knobbed Hornbill <i>Rhyticeros cassidix</i>	VU Vulnerable	EEP	Luis Neves, Vice President, Animal Care
NEW Moluccan Cockatoo <i>Cacatua moluccensis</i>	VU Vulnerable	EEP	Mark Rusli, Junior Avian Care Officer
Santa Cruz Ground-dove <i>Alopecoenas sanctaecrucis</i>	EN Endangered	EEP	Luis Neves, Vice President Vice President, Animal Care
NEW Sloth Bear <i>Melursus ursinus</i>	VU Vulnerable	ISB	Anand Kumar, Assistant Curator, Carnivores & Small Mammals
Straw-headed Bulbul <i>Pycnonotus zeylanicus</i>	CR Critically Endangered	EEP	Rachel Lee, Junior Keeper
Sumatran Orangutan <i>Pongo abelii</i>	CR Critically Endangered	SSMP	Wendy Chua, Curator Curator, Animal Data Management & Transactions
Sun Bear <i>Helarctos malayanus</i>	VU Vulnerable	SSMP	Anand Kumar, Assistant Curator Assistant Curator, Carnivores & Small Mammals
Sunda Clouded Leopard <i>Neofelis diardi</i>	VU Vulnerable	EEP	Cecilia Tang, Assistant Curator Assistant Curator, Carnivores & Small Mammals
NEW Sunda Pangolin <i>Manis javanica</i>	CR Critically Endangered	SSMP	Ade Kurniawan, Animal Care Officer
Sunda Slow Loris <i>Nycticebus coucang</i>	EN Endangered	EEP	Cecilia Tang, Assistant Curator, Carnivores & Small Mammals
Victoria Crowned Pigeon <i>Goura victoria</i>	NT Near Threatened	ESB	Anais Tritto, Curator Curator, Birds

*PROGRAMME
EEP – EAZA (European Association of Zoos and Aquaria) Ex-situ Programme
ESB – European Studbook
ISB – International Studbook
SSMP – SEAZA (Southeast Asian Zoos and Aquariums) Species Management Programme

Bornean orangutans exported to Mysuru Zoo, India

In August 2021, Bornean orangutans 'Merlin' and 'Atina' were transferred from Singapore Zoo to Mysuru Zoo, India, as part of a recommendation under the SEAZA Managed Species Programme for the species. It is hoped that the two female orangutans will breed and contribute to enhancing the gene pool of their species in human care.

With Covid-19 so rampant, an additional requirement of testing the export animals for coronavirus was requested by the Indian veterinary authority. Besides ensuring that this atypical and time restrictive request was observed, a thorough risk assessment was also conducted to mitigate all potential risks to the animals' safety – due to flight limitations and road restrictions, their journey was longer than usual.

Only with all risks addressed did 'Merlin' and 'Atina' board their direct freighter flight from Singapore to Bengaluru. Mysuru Zoo has become the latest participant of the SEAZA Species Management Programme for the Orangutans.

1
(Left: 'Atina', Right: 'Merlin')
Bornean orangutans recovering in their export crates after their sedation; waiting for departure to the airport

2
Export crates of orangutans being safely secured and stowed prior to their departure flight

3
(Top: 'Atina', Bottom: 'Merlin')
Bornean orangutans' safe arrival at Mysuru Zoo quarantine centre



Bundles Of Joy, Big And Small

Over the FY, we successfully bred around 900 young—almost double the number in the previous FY. Around a third of these are threatened in the wild. With their numbers dwindling in the wild, each birth is of great significance. 24 of some 160 species bred are also part of globally managed programmes and they represent important additions to the collective gene pool of their species in human care.



Giant Panda 'Le Le'

Singapore's very first panda cub, 'Le Le' was conceived through artificial insemination. Given the technological and biological complexities, Le Le's birth represents a significant breakthrough in our breeding efforts.



Izara



Tari

Grevy's Zebra 'Izara' and 'Tari'

Our zebras are part of a population management programme and the birth of these foals are a boost to the population of this highly threatened species in human care. There are only around 3,000 Grevy's zebras left in their native Kenya and Ethiopia.



Negros Bleeding-heart

The first hatchlings outside of the Philippines, these chicks are part of a breeding programme set up by Jurong Bird Park and Mandai Nature in partnership with Talarak Foundation Inc (TFI). We hope to build a sustainable population of this species in human care for eventual reintroduction in the wild. Jurong Bird Park is the only zoological institution to hold this species.



Sakishima Grass Lizard

A pair of Sakishima grass lizards hatched over the FY. Once abundant in the Southern islands of Japan, this species is now threatened in the wild. It reproduces slowly as females lay clutches of only one or two eggs.



Golden Mantellas

More than 70 endangered golden mantella frogs hatched in Singapore Zoo's RepTopia. This critically endangered species is only found in central-eastern Madagascar.



Sunda Slow Loris

This slow loris baby joins the ranks of others of its species in an international breeding programme that is coordinated by our staff. Native to Singapore and other parts of Southeast Asia, wild populations have been decimated by demand in the illegal pet trade.

African Painted Dogs
For the first time in 16 years, we welcomed a litter of pups. Once widespread across the African savannahs, the species is now globally endangered.



Straw-headed Bulbuls

A Critically Endangered species native to Singapore, this bird used to be common in Southeast Asia, but capture for the songbird trade has driven it to extinction in many areas. Despite being a challenging species to breed under human care, we have seen consistent breeding success and shared our knowledge and experience through the publication of the Best Practice Guidelines for the species. The three chicks hatched at Jurong Bird Park are welcome additions to the global breeding programme, also coordinated by our staff.





Breeding crocodylians

For the first time ever, the false gharial bred successfully at Singapore Zoo. A threatened species of crocodile in Southeast Asia, false gharials are notoriously difficult to breed under human care as they require very specific breeding conditions. Encouraged by this success, the Herpetology Team is now preparing to breed the Indian gharial under the recommendation of the EAZA Ex-situ Programme. In preparation for this, a breeding pair has been moved into the old saltwater crocodile exhibit, which will hopefully provide an optimal environment for breeding to take place.



Breeding endemic invertebrates

The Chrisangi leaf insect was first described only in 2017 but recent population trends suggest that it is already at risk of extinction. It is found only in Singapore, in tropical forests near mangroves. After acquiring two males and two females in 2021 from local researchers, the Invertebrate Care Team has successfully raised 29 nymphs. These nymphs form an assurance colony that has the function of preserving the gene pool. They ensure the survival of the species in the eventuality that wild populations are wiped out.



Eggs of the Chrisangi leaf insect



Chrisangi leaf insect nymphs hatched at Singapore Zoo



Fish breeding efforts

After months of trials with various fish species, our aquarists saw their efforts pay off with the arrival of broods of tiny fry. To provide the ideal environment for their charges, they had to pay meticulous attention to factors like toggling the temperature and pH of the water at the optimal range for the species in question, provision of suitable nesting areas and substrate for egg deposition, as well as timely and abundant in-house production of infusoria (microscopic organisms as food for newly-hatched fry). The knowledge and skillsets gained will stand the team in good stead in future attempts to breed other species of fish as well as increase the sustainability of the fish populations in our care.



Bintan Licorice Gourami

Found in peat swamp forest habitats, most species of licorice gourami have an extremely small and limited range. Their biggest threat is habitat destruction caused by irresponsible farming as well as peatland draining and burning. 19 of out 20 species of licorice gourami are threatened with extinction. We successfully bred the Bintan licorice gouramis and we are maintaining a breeding colony to ensure their continued survival.



Cockatoo Cichlids

By providing suitable nesting sites like overturned flower pots, the aquarists ensured these cave breeders had a safe and secure environment for spawning.

Blue Discus

These fish deposit their eggs on submerged tree roots in the wild. To replicate this, the aquarists provided a variety of vertical surface substrates, including a fabricated terracotta cone ("spawning cone") and cut PVC tube lengths.



Enriching Our Animals' Lives

Our animal care teams tapped on the Behavioural Management Framework to further expand on efforts to promote evidence-based, welfare-oriented species management. Most of our animals enjoy the benefits of a structured enrichment programme, and huge amounts of time and effort go into designing enrichment devices to elicit natural behaviour of the animals while giving them a mental and physical workout. An enrichment calendar is planned out for them to ensure the enrichment activities are varied to encourage exploration with different devices and in variable settings. Close observations of the animals' interaction with the enrichment provided are made, which help the care teams finetune enrichment activities. The information gathered is also important for animals that we help protect in the wild, especially in the case of rescue and release centres. By working with our conservation partners to implement best practices in caring for these animals they get a better shot at survival when they are eventually released in the wild.

Here, we have members of the care teams share how they go about improving the physical and mental wellbeing of their charges.



Parrots at Parrot Paradise

Wild parrots can spend up to eight hours of the day foraging, flying long distances to look for food. Foraging in the wild includes not just eating the food, but also the process of finding access to the food, like tearing the husk to get to the fruit and seeds. To extend feeding time and effort, we think of ways to make our parrots work for their food such as having to fly or climb to the food, balance on unsteady perches or hang upside down. The idea is to make the birds actively think about how to use their bodies and their natural abilities to best access food. These activities not only keep them engaged, but also increase the general welfare of the animals.

- Mark Rusli, Avian Care Officer



Refurbishment of Tigerfish Exhibit

Keeping different species in the same area (ie. Tigerfish Exhibit) is complex. Some species prefer shade, some open, bright areas. Some love to hide, others keep swimming around. The results from the animal welfare assessment before the refurbishment of the exhibit showed that functional space and refuge for the African pike and zebra tilapia needed improvement. By adding cut branches and aquatic plants, we increased the number of hiding spaces and visual barriers. After the enhancement, we saw that the fish utilised most of the space, swimming around and foraging. We even observed the tilapia engage in nesting behaviour! The welfare score for all five species improved, especially for African pike, which increased from 47% to 87%.

- Joan Tan, Animal Care Officer & Sandra Muhamad, Senior Aquarist



Greater Hog Badgers at Zoo Amphitheatre

The badgers were skittish and shy when they first arrived. The dens were modified with logs and ramps that led to more hiding spaces as we wanted the badgers to have options. They have access to a pool since these badgers love to swim. Training for husbandry and medical behaviours were introduced as soon as the badgers were settled into their new home. Simple enrichment was introduced once they exhibit natural behaviour such as exploration and foraging. Gradually, they were desensitised to various sounds, people and movement. This was when we moved them closer to the dens near the staging area. We kept their comfort in mind and ensured their participation in shows would be solely voluntary. During showtime, various enrichment activities were provided to allow them to show as many natural behaviours as possible. They are always given an option to exit the show if they wish to do so.

- Kaitri Raveendhran, Senior Animal Trainer/Presenter



Conditioning For Behaviours On Cue

Animals are encouraged to cooperate in medical procedures through positive reinforcement training, which affords them an element of choice, while allowing the care teams to build closer bonds with their charges. When animals participate voluntarily in these procedures, the need for physical restraint and the use of anaesthesia – both of which cause stress to the animals and their care teams – is eliminated. A targeted approach is adopted to elicit desired behaviours, which may range from getting an animal to come close enough for visual assessments or weight-taking to challenging procedures like blood collection, injections or even dental care.

Blood collection

In comparison to the previous FY, an additional 22 animals are now cooperating for blood draws. After months of hard work, the care teams have seen success with the big cats, including the Asian lions, Sri Lankan leopards, clouded leopards and a puma. Given a number of these are geriatric animals, voluntary blood draw is especially important for effective monitoring of their health. Indian rhinos 'Thulie' and 'Newari' were trained for voluntary blood draws within a year of their arrival at Night Safari. Rothschild's giraffes 'Adhil' and 'Balaji' were also conditioned within months of their arrival from India to cooperate with a standing sedation for blood draw. Given the risks involved in anaesthetising giraffes, this was a significant achievement.



Weighing Mummy Tamarin

Previous attempts to weigh pregnant and infant-carrying tamarin mothers had not been successful – the fathers would be highly protective of the family and the mothers would be wary and carry their infants a distance away. During the FY, the care team finally succeeded in conditioning an emperor tamarin mother to voluntarily have her weight taken. The success demonstrates the trust the female and her family place in their care team.



Ultrasound scans

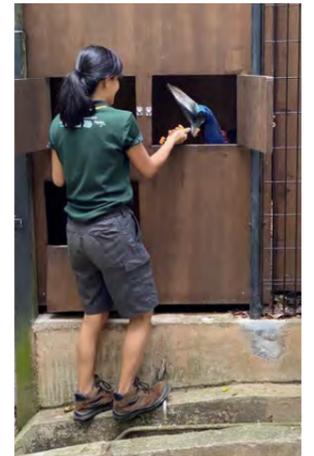
Ultrasound scans are key to confirming a pregnancy and monitoring the health of the foetus. With an increasing number of species now part of international breeding programmes, the care teams have stepped up efforts to train would-be mothers to cooperate with this procedure. An additional 10 animals now cooperate for ultrasound scans and these include the pygmy hippos and babirusa, both species managed under the EAZA Ex-situ Programme.



Feeding Goncalves

Goncalves, a king vulture from the Kings of the Sky show, was conditioned during his stay at the avian hospital to calmly accept the presence of keepers and vets for treatments as well as feeding and handling. He had sustained a serious constriction of the oesophagus. Though the stricture was successfully resolved through surgery, his food intake was limited to small amounts of chopped meat only. This meant he had to be fed 4-5 times a day to meet his nutritional requirements. Frustrated at not being able to eat normally, Goncalves became increasingly aggressive.

Goncalves' care team trained him to make association between a target and food, and in less than a week, he was able to touch the target in a non-aggressive manner. This allowed his care team to bring food and water to him safely. As a result of this successful training, Goncalves was soon able to return to normal vulture diet proportions and given a clean bill of health to return to the Kings of the Sky show.



- 1 Before conditioning
- 2 Wary of target
- 3 Targeting more calmly

Revvng up for Bird Paradise

One of the key steps required to move the birds from Jurong Bird Park to Bird Paradise in Mandai is crate conditioning. The Avian team has been hard at work acclimatising the birds to smaller aviaries installed at the Waterfall Aviary and African Treetops. Daily headcounts are performed in them so that the bird numbers can be collated accurately.

Crate training cassowaries

With its powerful kicks and dagger-like talons, the cassowary is reputedly the world's most dangerous bird. Getting our cassowaries to voluntarily enter a crate is the safest way to transport them from Jurong Bird Park to Bird Paradise. Conditioning of the cassowaries using positive reinforcement began with desensitising them to touch. The care team observed that cassowaries enjoy being out in the rain, and arrived at the idea of using showers as an incentive during training sessions. When the cassowaries approach the crates, they are rewarded with a cool shower. Gradually, they became comfortable enough to enter the crate voluntarily, where they are treated to a thorough hosing down.

Macaw flight conditioning

To prepare our scarlet macaws for their new home in Crimson Wetlands at Bird Paradise, they are conditioned to fly freely within Waterfall Aviary. This activity strengthens the birds' flight muscles. Their keepers also perform regular recall training sessions for the macaws to land at specific locations on cue, in preparation for more guest interactions at Bird Paradise.



Conditioning of the macaws to come to the chitchat area.

Veterinary Highlights

The Veterinary Team delivers on the diagnosis and treatment of disease and injury not only in our animals but also rescued animals brought to us from various emergency situations. Health surveillance, preventive medicine and pathology are pivotal to providing top-notch medical solutions and the best healthcare.

Vets On The Case

Over the FY, the veterinarians were kept busy with a total of 3,846 clinical cases. 26% of these required close monitoring and treatment at dedicated facilities. Here, we feature three significant cases.

Covid-19 infection of our lions

From the start of the global pandemic, strict measures were put in place to mitigate the risks of our animals contracting Covid-19. When the Asiatic lions at Night Safari first presented with symptoms, representative samples from two lions were taken, which were later confirmed to be Covid-19 positive. The African lions at Singapore Zoo also presented with similar mild symptoms and tested positive for the disease. Besides the proactive closure of their exhibits, the strictest biosecurity was adhered to by the core group of animal caretakers to look after our recovering lions. Daily veterinary health checks were done to ensure the animals were recovering well. This ubiquitous virus put our safety protocols to the test but after serving a short 'Stay-Home Notice', all infected animals made a full recovery.



Standing sedation for elephant tail surgery

When our Asian elephant 'Gambir' sustained a tail injury, best efforts at managing the wound with bandages and medications did not work. Gambir was swinging and rubbing her tail more and the wound was worsening. A severe infection rendered a portion of her tail dead and the tail tip had to be partially amputated.

The Elephant Care Team has been working hard for many years to condition our elephants to voluntarily cooperate for various husbandry and medical procedures. Gambir's prior training meant she was already desensitised to the needle and when the vets needed to operate on her, she voluntarily presented her ear for the injection of a sedative to keep her calm.

With the use of ropes, the care team guided Gambir to stand still while the vets surgically removed the tip of her tail and cleaned her wound. The entire procedure was stress-free for Gambir and the wound has since completely healed.



Escaped lions at Changi Airport

An incident occurred at Changi Airport where two lions from a shipment of seven lions broke free from their crates while in transit to their destination. Our Veterinary and Animal Care Teams responded swiftly to assist Singapore Airlines with managing the situation. For the safety and welfare of the animals, the lions were transported to the Mandai quarantine facility for temporary care while new crates were constructed. The lions eventually continued their journey to their onward destination. The swift resolution of the incident is testament to the capabilities and expertise of our staff, which extend beyond the confines of our parks when it comes to dealing with emergencies involving wildlife.



Prevention Is Better Than Cure

To look after the health of all the animals in our care, we have in place structured disease-prevention programmes extending from husbandry practices to disease screening techniques and vaccination strategies. We are one of the first zoos to pioneer a geriatric animal care plan to better manage age-related health conditions in our more senior animals. We are also one of the few zoological institutions to have a team of veterinary pathologists who study and diagnose diseases in deceased animals: lessons learnt from the dead can guide us in providing better care for the living.

Preventive healthcare

Over the FY, nearly 900 mammals and birds were vaccinated and over 9,000 parasite checks were conducted. To support ongoing as well as increased health surveillance for various diseases, we have been ramping up capacity in laboratory testing. Our ability to perform many of the necessary tests in-house means timely results and treatment for affected animals. A total of 34,773 tests were completed during the FY, of which 4,239 are PCR tests – more than double the number done in the previous FY.



Amoebic dysentery in reptiles

Amoebic dysentery, or entamoebiasis, is a serious disease in reptiles. Symptoms include reduced appetite, weight loss, vomiting and diarrhoea. The disease can cause sudden death in certain species without any clinical signs. We have been on high alert and surveillance work involving frequent checks was stepped up to facilitate early detection and treatment of the disease in affected individuals.

In-house dental care

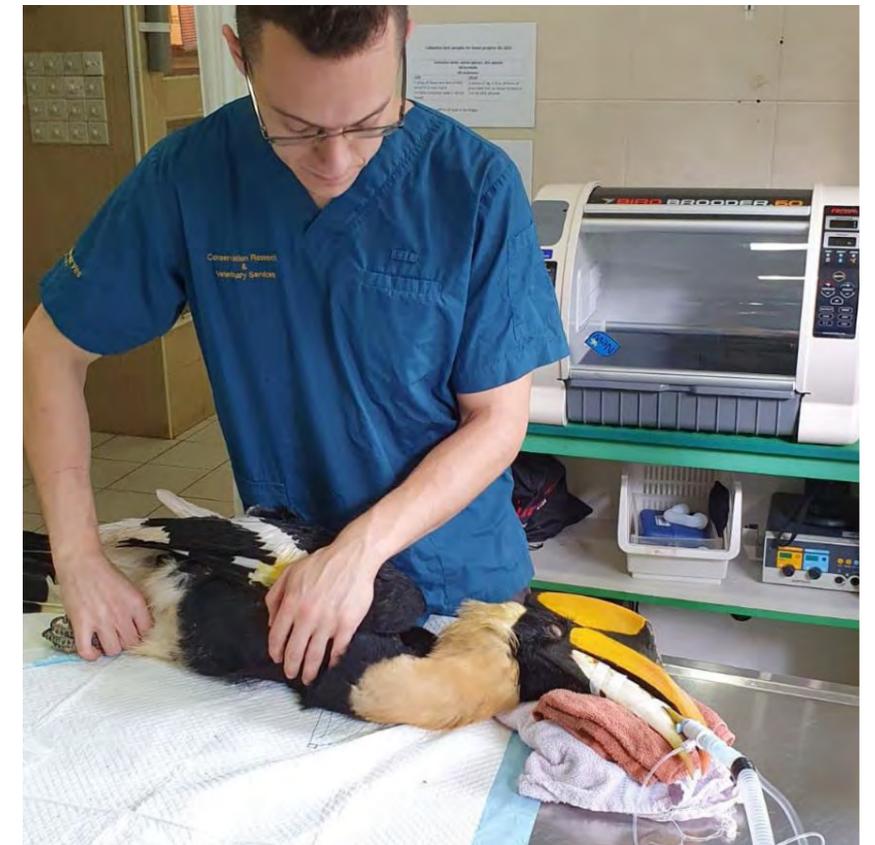
Besides causing extreme discomfort, dental diseases have also been linked to cardiovascular problems. Regular oral care and examinations can help prevent and detect dental conditions before they cause serious illness. Working hand in hand with the Animal Care Team, our vets have identified individuals at higher risk of dental problems. Besides diet adaptations, many of these animals are also conditioned for dental health procedures ranging from regular dental hygiene care like toothbrushing and jet-flossing to more complex ones like scaling to remove tartar buildup, and dental radiographs.

Our Veterinary Team is equipped to handle most dental issues and they have also benefitted from the expertise of dental specialists for more complicated procedures. The team now has the expertise to carry root canal treatment for small mammals.



Hornbill iron storage disease

Hornbills are particularly susceptible to iron storage disease, which occurs when too much iron accumulates within the liver and then in other vital organs, leading to significant damage and eventually death if left untreated. Through a proactive monitoring programme, hornbills in the earlier stages of iron storage disease have been identified. With changes to their diets, and the help of medication, quite a few of them showed reduced iron accumulation levels: a sign that the disease is under control.



Geriatric animal care plan

To ensure our older animals get the additional attention they require, a geriatric register is maintained: individual animals are added when they reach 75% of their lifespan in human care. The register contains updated information on all health, husbandry, and welfare matters pertaining to these individuals. In the FY, 30 new individuals joined the geriatric animal care plan, expanding its scope to serve a total of 361 senior animals. Every individual is assigned a vet, who oversees medical assessments and builds a customised care plan for it together with its caregivers. The programme can be as simple as an annual visual assessment for those in good health, or something more intensive with full body checks, medical treatment, husbandry adaptations and Quality of Life assessments for those with deteriorating health. These vary in frequency, depending on the needs of the animal. One adjustment common for all geriatric animals is that their diet is modified with the addition of a geriatric supplement suitable to their age and their species. Here, we highlight a few of these senior animals and the care and the treatment they have received under the geriatric care plan.

3D-printed shoes to treat bumblefoot in ageing birds of prey

Bumblefoot causes pressure sores, tissue swelling and bone callus. If left untreated, it could become disabling and even fatal. Arthritis, which is common in older birds, may also lead to bumblefoot. Two

of our geriatric birds of prey were afflicted with this foot condition. While the disease can be treated with traditional bandages, the idea of 3D-printed shoes was mooted to provide a more precise way of distributing the pressure borne by the feet away from the areas with

sores. To achieve a creative solution for patient care that combines technology and veterinary sciences, the avian veterinary team reached out to the Keio-NUS Cute Centre of the National University of Singapore's (NUS).

The team at Keio-NUS CUTE Centre had to cater to various design considerations - the shoes must serve their main purpose of relieving and distributing pressure on the feet, while not compromising on comfort and mobility. In addition, the shoes had to be easily removable for cleaning, non-toxic, and durable in nature, as the patients may pick at them with their sharp beaks. The team went through multiple iterations, and took two years before they successfully arrived at a shoe design deemed suitable for use in treatment.

After fitting the patients out with their new bespoke footwear, the vets commenced a weekly regime of monitoring and reviews. The patients were discharged with a clean bill of health after a few months of treatment. They now spend their golden years at the Raptor Retirement Aviary, in the company of fellow retirees.



Kidney disease in Susie the chimpanzee

Susie, our 49-year-old female chimpanzee, has been diagnosed with chronic kidney failure. Unfortunately, dialysis or organ transplant are not viable treatment options for chimpanzees. To manage her condition, it is essential she keeps up a daily water intake of at least 2 litres. Her care team coaxes her with sips of her favourite beverages, like bandung, to encourage her to drink. She has become very picky with her food, so her care team has had to constantly explore different diet alternatives for her. Unlike other chimpanzees, she

receives a lot more fruits, while balancing the potential for other medical concerns, such as diabetes and dental conditions. From an all-time low of 34kg, Susie has regained some weight and now weighs more than 40kg, a significant improvement.

Susie has been successfully conditioned for urine collection to facilitate urine analysis. To monitor her condition more closely, her care team is also training her for blood draw. Her vet-in-charge makes a 'house call' every fortnight. Susie is reported to be in good spirits.

Pathology

From large mammals to the tiniest of invertebrates, all animals that pass on in our parks are sent to the veterinary pathologists for a necropsy to be done. By ascertaining the causes of death and determining predisposing factors, the pathologists help the clinical veterinarians formulate preventive regimes. Collection of data and tissue biobanking during post-mortems also contributes much-needed information on poorly studied species. Besides the animals in our care, the pathologists also perform post-mortems on native wildlife that are found dead and brought to us by the authorities and our local conservation partners. The findings inform conservation actions such as roadkill mitigation measures and sensitive site development policies.



Research And Innovations For Wildlife

The work of our in-house care teams presents opportunities for the development of scientific expertise in animal handling, advanced veterinary medicine, as well as husbandry and breeding knowhow. These advancements translate to improved welfare and healthcare for our animals. The skills and techniques acquired could also inform species management plans for depleted wild populations in the future.

Aviary Mesh Inspection Proof-of-Concept

A proof of concept is being trialled with a force displacement and vibration sensor network that can help investigate aviary mesh integrity. By conducting automated inspections, the system can detect possible breaches. The initial results are encouraging and the learnings gained will provide valuable insights in the monitoring and management of new aviaries.



Fresh Off The Press

Through continued research and publication efforts, we hope to share our knowledge and learnings with other institutions and form new collaborations to continue discovering more. In the FY, research focused on animal welfare and care. Total research output for FY21/22 stands at 24 publications, 20 of which are peer-reviewed (see Annex for full list), adding to the body of scientific knowledge.



Hormone profiling for Malayan sun bear

Bolstered by the giant panda breeding success, the Veterinary Team is applying the learnings to the breeding of the Malayan sun bear. Threatened by habitat loss and hunting, sun bear numbers in the wild have plummeted. Our staff coordinates the Southeast Asian Zoos and Aquariums (SEAZA) Species Management Programme for the species, which aims to ensure the survival of the species through coordinated breeding efforts among participating zoos. However, the sun bear is notoriously difficult to breed under human care. Through hormone profile monitoring, the Veterinary Team aims to decipher the female's estrous cycles and identify optimum timings to mix breeding pairs.

Banking On The Data

Biomaterial banks provide a supply of reference material and are essential tools for an evidence-based approach to research and action. Continual improvements in genome resource banks and reproductive technologies have come to fruition with the arrival of our first panda cub and will hopefully help us in sustaining populations of other species in human care.



Successful artificial insemination of the giant panda

The giant panda breeding season in April 2021 started with the mixing of Kai Kai and Jia Jia but natural mating was unfortunately not observed. The decision was made to carry out artificial insemination at the 47th hour of Jia Jia's annual 48-hour fertility window. The Veterinary Team was able to successfully inseminate Jia Jia using Kai Kai's frozen semen. The Veterinary and Giant Panda Care Teams had been working closely on medical conditioning of Jia Jia to cooperate for ultrasound scans, which made for stress-free confirmation and monitoring of the pregnancy. Four days after the first detection of the foetal heartbeat on an ultrasound scan, Jia Jia gave birth to a healthy cub on 14 August 2021.



Wild pangolin semen storage and collection

Pangolins are the world's most trafficked mammals and globally threatened with extinction. Despite steps to protect them from the threat of illegal poaching, the survival of all eight species of pangolins remains on the line. One of the species – the Sunda pangolin – is native to Singapore. Given the slide in wild populations, the formation of an assurance colony in human care is one way to ensure the survival of the species. When wild individuals are found dead, often as a result of traffic accidents, they are brought to our pathologists for a full necropsy. Semen samples are collected from male pangolins and added to our biobank to be used in assisted reproduction efforts in the future. These samples, being from wild specimens, represent important genetic lines and are key to resuscitating the population should wild numbers continue to decline.

Optimum semen collection methods are necessary to ensure successful assisted reproduction but there is a dearth of information on pangolin reproductive biology. The Veterinary Team experimented with different collection methods and observed improvements in the vitality of the sperm collected with adjustments to semen storage methods. Successful preservation of sperm with higher vitality is an important first step for future assisted reproduction efforts to bring the Sunda pangolin back from the brink of extinction.





Playing A Leading Role In Conserving Biodiversity

Besides helping to maintain the population of threatened species in human care, we also play an important role in rehabilitating rescued native wildlife. Harmonising environmental management practices across the organisation allows us to strengthen our efforts in safeguarding the rich biodiversity in Mandai Wildlife Reserve. Through our conservation arm, Mandai Nature, we focus on preventing and reversing species loss in the wild, protecting and restoring ecosystems, and benefitting local communities in Singapore as well as Southeast Asia.

In FY 21/22,

- We provided **\$1.4 million** funding to Mandai Nature to support **61** conservation projects and partnerships locally and beyond our shores.
- **1,379** animals were admitted to our veterinary facilities for medical attention, of which **61%** were subsequently released back to the wild
- **0.33ha** of degraded land was restored as part of the Mandai Rejuvenation Project.

Saving Wildlife In Singapore

Despite its highly urbanised landscape and dense population, Singapore's warm tropical climate makes it a haven for rich biodiversity. Our organisation plays a vital role in protecting wildlife outside of the Mandai Precinct.

Rehabilitating Rescued Animals

One of the ways we contribute to the protection of native biodiversity is through the rehabilitation of rescued animals brought to us from around Singapore. Over the FY, 1,379 animals were admitted to our veterinary facilities, of which 61% were successfully nursed back to health by our Veterinary Team and subsequently released back to the wild. Around 40 of the rescued animals made a full recovery but were deemed unsuitable for release - they stayed on in our care or were transferred to other suitable facilities. Unfortunately, some of the rescued animals presented with such grievous injuries it was beyond our vets to save them.

Pedicure For Colugos

Colugos are tree-dwelling mammals native to Singapore. They cling on to trees during the day and glide between trees to forage for food at night. Many rescued colugos present with worn nails, which impair their ability to cling on to trees or land safely. A nail scoring system, and nail shaping procedures were developed to help in their rehabilitation. Reshaping their nails gives them a better shot at navigating their arboreal habitat successfully after their release.



Injured Birds

We adopted a more streamlined approach to diagnostics and treatment of injured birds, including a postmortem for individuals that succumb to their injuries. The latter provides useful insights for us and our conservation partners in the implementation of measures to reduce incidents of injuries.

Partnership

We assisted in conducting a total of nine handling practicals for reptiles and mammals as part of the animal management course spearheaded by NParks. These practical sessions aim to upskill wildlife management companies with safe, effective and low-stress handling techniques for wildlife rescue.



Here, we highlight some of the animals that were successfully rehabilitated and released together with local wildlife authority NParks:



Greater mouse deer 'Naputri'

Reportedly attacked by a monitor lizard at Pulau Ubin, Naputri presented pregnant, very weak, dehydrated and with multiple wounds on her body. Her foetus had to be aborted to save her life and she had to undergo multiple surgeries as well as intensive wound care. To complicate matters, she also suffered from a muscle disorder which made recovery an uphill task.

After five months of rehabilitation, Naputri finally pulled through her ordeal to make a full recovery. She was tagged by researchers from the National Institute of Education and released back to Pulau Ubin.

Once thought to be extinct in Singapore, greater mouse deer have made a surprising comeback on Pulau Ubin after an absence of more than 80 years.



Changeable hawk-eagle

A changeable hawk-eagle was brought in with shredded feathers that inhibited its ability to fly. Birds would naturally moult to replace these feathers but this process takes several months and for a wild bird that has to fly to hunt and move away from danger, the bird would be unlikely to survive. Feather imping can be done within a few hours to give these birds a brand new set of healthy feathers, allowing them to be released back into the wild quickly. Our avian vets replaced over 50 feathers on the eagle's wings and tail with donor feathers taken from other birds which had succumbed to sickness or injury. The bird was successfully released a day after the procedure with an NParks tracking device attached. The tracker indicates that the bird has been flying around successfully, covering great distances and is alive and doing well.

Cinereous vulture

Found on the ground along Cornwall Road, the juvenile bird was rescued by NParks and sent to Jurong Bird Park's avian hospital for rehabilitation. A full physical examination, blood tests and radiographs were performed on admission. The bird was suspected to be fatigued from the demands of its migration flight. It was started on fluids and feeding up and its condition improved significantly. After its first two flight attempts, the vulture successfully took off on 10 January 2022.

The largest raptor in Africa, Asia and Europe, the cinereous vulture usually winters in northern India, the Middle East and occasionally South Korea. The rescued individual is thought to have blown off-course during its migration flight.



Horsfield's flying squirrel 'Bawang'

Bawang was rescued by a member of public and brought to us via NParks for emergency care after a nasty attack by ants. She was successfully stabilised and treated but her tender age meant that she had not been weaned and would not be able to survive on her own. The vets took on 24/7 'nanny' duties to handraise Bawang and when she was weaned, she was provided a naturalistic environment to hone survival skills like climbing and foraging. After two months, Bawang was finally assessed to be fit for release.

The endangered Horsfield's flying squirrel is one of three species of flying squirrel native to Singapore. The species is seldom rescued and Bawang was the first of her species to be admitted to our facility in over 10 years.

Local Project Highlights

Conservation projects focusing on protecting local biodiversity continued to grow from strength to strength. Mandai Nature invested over \$94,000 to support 15 projects (see Annex for full list). We also continued to work with stakeholders on the local scene towards more concerted conservation outcomes. Here are some key species and projects where we have achieved considerable impact:

Raffles' Banded Langur

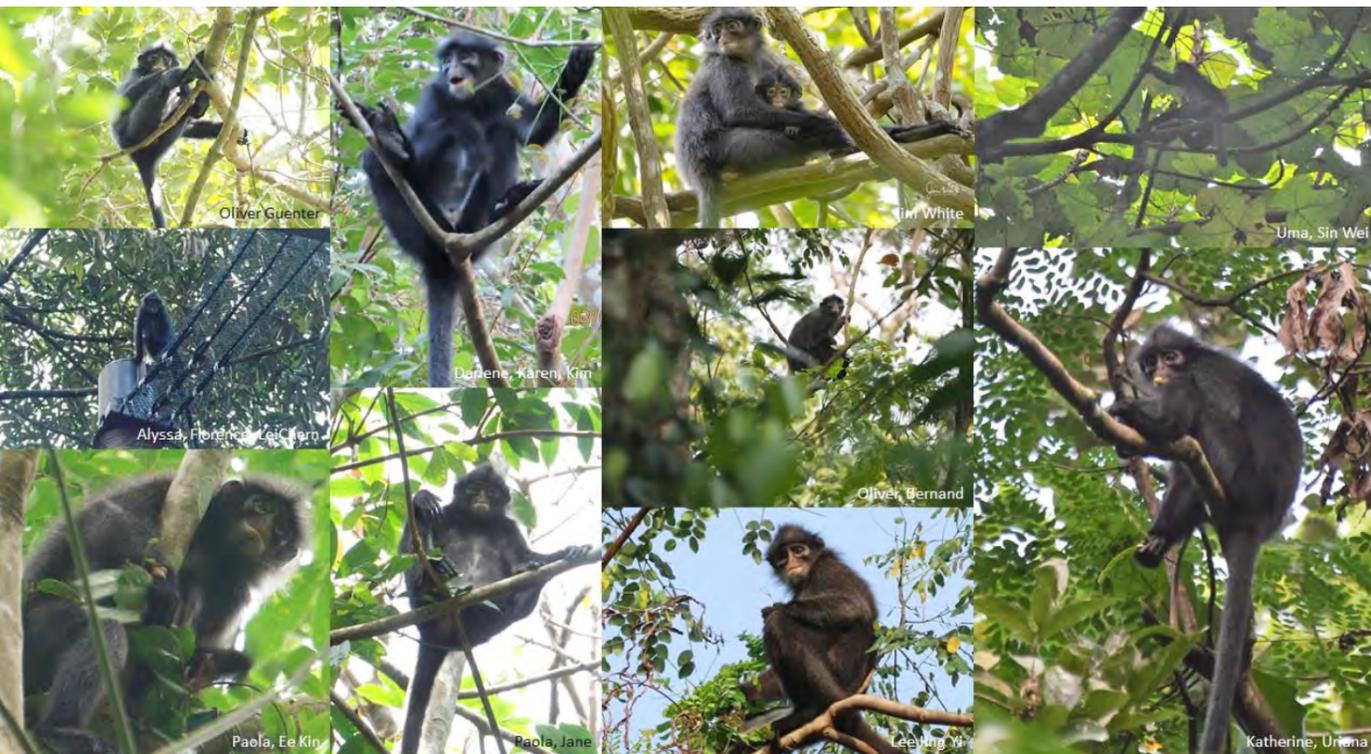
A leaf-eating monkey first reported by Sir Stamford Raffles in Singapore, the Raffles' banded langur is listed as Critically Endangered on the IUCN Red List. In 2010, there were only approximately 40 individuals left in the Central Catchment Nature Reserve (CCNR) in Singapore. A DNA analysis of the population through faecal samples also showed that the langurs might be experiencing genetic inbreeding due to a small population size, which could drive the species to extinction.

Since 2010, we have been the staunchest supporter of studies on the Raffles' banded langur led by primatologist Dr Andie Ang, who chairs the Raffles' Banded Langur Working Group. The findings inform crucial conservation actions to prevent extinction of this critically endangered species in Singapore. Funds disbursed over the FY went towards the salaries of the project team, purchase of field equipment, molecular analysis and publication costs as well as other operating expenses. As members of the Raffles' Banded Langur Working Group, we continue the implementation of the Species Action Plan (developed at Singapore Zoo in 2016), towards key outcomes in these areas: population monitoring, habitat connectivity and education outreach.

Population Monitoring

An understanding of population size and distribution of the langurs is imperative for conservation planning, such as the protection of core home range areas. The approval for a first-of-its-kind installation of arboreal camera traps in the Central Catchment Nature Reserve (CCNR) research area was secured in the FY. This will allow for the collection of more comprehensive data on the occurrence and habitat use of langurs and other wildlife.

Over the FY, the project team and volunteers performed field surveys within the CCNR, Lower Peirce and Old Upper Thomson areas. Citizen science surveys which started in 2016, allow members of the public to volunteer their time towards the conservation of the langur. Today, the total population count of the Raffles' banded langurs in Singapore stands at approximately 70. Mothers with infants in tow continue to be spotted, indicating the population is recovering, slowly but surely.



Compilation of photos taken by citizen scientists



Habitat Connectivity

Canopy connectivity is especially important for tree-living animals such as the Raffles' Banded Langurs. The roadkill of a juvenile male in August 2021 highlights an urgent need to restore canopy connectivity in fragmented habitats. With the identification of road-crossing hotspots along Old Upper Thomson Road, the National Parks Board (NParks) installed two rope bridges to help arboreal wildlife like the langurs to cross the road safely. Analysis of camera trap footage from the bridges revealed a total of 307 successful crossings times by the langurs between March 2020 and August 2021. Another two rope bridges have been installed by NParks on Rifle Range Road in February 2022, signalling the commitment from the authorities to address some of the threats arising from habitat fragmentation. Such collaborative partnerships with government agencies have allowed for the implementation of successful conservation applications.

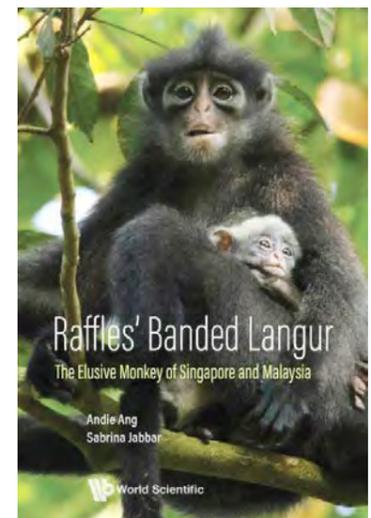


One of the rope bridges installed by NParks at Rifle Range Road.



Education Outreach

In February 2022, the first resource book on the Raffles' banded langurs of Singapore and Malaysia was published, providing greater access to the public to better understand their distribution, diet, family structure, even infant development. The book also highlights threats as well as cross-border conservation efforts and plans to safeguard the long-term survival of the Raffles' banded langur in both countries. It is hoped that the publication will promote a better understanding and appreciation of our shared natural heritage.



Professor Tommy Koh (centre) with the authors of the first resource book on the Raffles' banded langurs. Professor Koh also wrote the foreword to the book.

Sunda Pangolin

The pangolin is the world's most heavily trafficked mammal in the illegal wildlife trade. In Singapore, the Sunda pangolin's main threat is another kind of traffic: the one on roads. Little is known about this enigmatic creature that lives in our own backyard. To increase knowledge of pangolin biology and behaviour, our staff have been actively building up their expertise since we first started caring for pangolins back in 2009. We have also been supporting pangolin research since 2010. Over the years, we have amassed data on the pangolin's diet, genetics and navigation of the urban landscape. These learnings culminated in the Sunda Pangolin National Conservation Strategy and Action Plan, established in 2018.

As co-chairs of the Singapore Pangolin Working Group (SPWG), we led a strategic review of the National Action Plan to streamline goals and to include a new action plan: to develop a protocol for managing pangolin seizures in Singapore. Progress in the following areas was also achieved:

- A systematic study of pangolin roadkill hotspots was conducted by analysing data from a shared database of pangolin occurrence consolidated from various agencies. This information will be used to advocate for enhancements to urban designs to facilitate safe movement of pangolins.
- An analysis of pangolin seizure data to shed light on the scale of trafficking through Singapore and the modus operandi of traffickers. This will enable better enforcement to deter trafficking.
- With the formation of the Communications and Outreach subgroup, outreach efforts were stepped up, including a webinar to mark World Pangolin Day. Our staff were among featured SPWG members who shared about pangolin rescue, rehabilitation and release in Singapore.



Singapore Freshwater Crab

Ranking among the world's 100 most threatened species, this diminutive crab is found only in Singapore. It plays a key role in the stream ecosystem as an opportunistic predator of small animals. If the freshwater crab disappeared, the ecosystem will be adversely impacted. Already, it has disappeared from one of the few hill streams that form its habitat, with unknown ramifications. We have been a part of a working group formed to arrest the decline of this Critically Endangered species since 2014.

The fastidious Singapore freshwater crab requires fast-flowing hill streams at the right pH level with high amount of oxygen. Mandai Nature continued to fund a study by the National University of Singapore to assess how vulnerable this tiny crustacean is to the threats of climate change-associated drought and acidification. On-site surveys and lab experiments found that while the Singapore freshwater crab showed resilience to drought, the burrows created in response to drought tend to be shallow, which may not be sufficient for survival over long periods of drought. To ensure the continued survival of the species, it is of paramount importance to continue long-term monitoring to identify the impacts of climate change on both the habitat and species. The data gathered will be useful in the implementation of appropriate mitigating measures in future.



DNA-based biodiversity monitoring tool using dung beetles

Species in the wild are part of complex food webs which can be adversely altered by factors such as agricultural expansion and climate change. Given the difficulties of assessing these impacts, scientists are increasingly turning to molecular techniques using invertebrates as samplers for biodiversity monitoring.

Mandai Nature supports a study led by a researcher from Nanyang Technological University on the use of DNA metabarcoding to detect mammal DNA from dung beetles, and to map out dung beetle-mammal food chains in Singapore's regenerated forests. The technique can be further applied in rapid assessments of mammalian diversity across Southeast Asia, and aid future conservation assessments.



Every Singaporean a Naturalist

Mandai Nature continued to support Every Singaporean A Naturalist (ESN), a citizen science project and nature education programme by Nature Society (Singapore). Now into its fifth year, ESN aims to provide students and teachers with a hands-on conservation experience to deepen their appreciation and knowledge of nature. 14 new schools were successfully recruited, bringing the total number of schools to 44 – more than seven times the number of schools in the programme's first year.

NSS experts and volunteers conduct training sessions for both students and teacher mentors, empowering them to contribute to biodiversity science by uploading their observations to the iNaturalist website, a social network to share observations of biodiversity across the globe. In the FY, 1,414 new observations were made, around 100 of which are species never recorded before under the project.

Protecting Wildlife Beyond Our Shores

Southeast Asia is home to more than a fifth of the world's vertebrates and plant species – many of which are not found elsewhere. This exceptionally rich biodiversity makes it a hub for tourism and conservation, but also a target for parties out to exploit its resources.

To protect wildlife in the region, Mandai Nature supported 38 projects in the FY, with strong focus on:

- One Plan Approach – an integrated approach to species conservation encompassing conservation and wildlife research efforts within our parks at Mandai Wildlife Reserve and conservation action plans for these species in their natural habitats across Southeast Asia
- Supporting projects that benefit and empower local communities to safeguard species and habitats
- Strategy planning and action for threatened species through global collaborations

One Plan Approach To Saving Threatened Southeast Asian Species

Traditional species conservation planning followed two parallel but separate tracks. Conservationists work in the field to monitor wild populations and develop conservation strategies to conserve threatened species. On the other hand, the zoo and aquarium community develop long-term goals for sustaining populations in human care. The One Plan Approach to species conservation brings together different stakeholders including the zoo community, conservation partners, government, and local communities to formulate conservation action strategies for threatened species. The Approach allows us, as a zoological institution, to align our conservation breeding programmes with field work for the best possible outcomes to fight species extinction. It leverages on our resources and network, and the expertise of conservationists and NGOs working in the range countries of the species. Here are two examples of the impact we have achieved by adopting this approach.

Negros Bleeding-heart

Named after Negros Island, one of the last remaining forested areas in the West Visayan region in the Philippines, this is one of the rarest birds in the world. Mandai Nature joined hands with Talarak Foundation Inc, to set up a conservation breeding programme in Jurong Bird Park. This is the only breeding programme for the Negros bleeding-heart outside its natural range. After just three months into their new home, Jurong Bird Park welcomed its first Negros bleeding-heart chick on 26 November 2021. Since then, two more chicks have hatched (see page 39 'Bundles of Joy').

Successful breeding under human care forms part of the safety net for the species. Meanwhile, we work with multiple stakeholders to protect and restore the wild habitat of the Negros Bleeding-heart, and engage the community to enhance the success of future reintroduction efforts.

"[...] [T]his dove is an ambassador to the conservation of all Negros wildlife. The species is impacted both by local poaching pressure and the loss of its lowland forest habitat, requiring a multifaceted approach to conserve the remaining populations [...]. Our outreach and education team have been working hard to raise the profile of the species in rural communities, using pride campaigns to make the Bleeding-heart an emblem to Negros communities. Our research team are scouring the remaining forest patches of Negros to find any elusive remnant populations, whilst developing a release site for the reintroduction of the animals born under human care back into a protected lowland forest."

Matthew Ward,
Project Manager at Talarak Foundation Inc



One of three males and three females that came to Jurong Bird Park from the Philippine island of Negros in September 2021.



First Negros bleeding-heart chick hatched at Jurong Bird Park.

Roti Snake-necked Turtle

Severely impacted by overharvesting and habitat destruction, this turtle is believed to be extinct in the wild. The assurance colony we care for in Singapore Zoo is the only one for the species in Asia and was established to help repopulate the species in the wild. In September 2021, 13 of the turtles from the colony were successfully repatriated from Singapore to their native country of Indonesia. This marks a significant milestone in ongoing conservation efforts for the recovery of the species' wild population led by Ministry of Environment and Forestry of the Republic of Indonesia (MOEF) and Balai Besar KSDA Nusa Tenggara Timur (BBKSDA NTT) Province with the support of Mandai Nature, Singapore Zoo and Wildlife Conservation Society – Indonesia Program (WCS-IP).

The turtles form part of the first structured conservation breeding programme located in Indonesia and they have settled in well at a breeding facility in Kupang, East Nusa Tenggara. Constructed with Mandai Nature's support, the facility was built to house a head-starting programme where eggs and hatchlings are cared for till they are ready to be reintroduced into the wild. Such programmes help increase individuals' chances of survival when released into the wild. Breeding efforts are underway and both WCS-IP and BBKSDA NTT are closely monitoring the progress.

"This repatriation is the first step in restoring the Roti Snake-necked Turtle population in its natural habitat, as well as showing that species conservation is a concern for the international community."

Director General Wiratno,
Directorate General of Natural Resources and
Ecosystem Conservation (KSDAE) at MOEF



One of the turtles being scanned for a microchip at the Singapore Zoo. Each individual is fitted with a microchip to provide a form of identification.



The turtles undergo a full health assessment to ensure they are healthy and in good condition before their departure from Singapore Zoo. This includes blood draws and weight checks.



The authorities at the breeding facility in Kupang examine the turtles' condition upon their arrival, while the Head of BBKSDA NTT Kupang (right, in white) looks on.

PHOTO: BBKSDA NTT

Galvanising Community Action For Wildlife

Local communities and indigenous people who co-exist with nature are its strongest guardians. Mandai Nature supports these local communities to ensure they benefit from wildlife and habitat protection through developing sustainable livelihoods, often helping these communities become advocates for nature.

Citizen action for Malayan tigers

Once present in the forests of Singapore and Peninsular Malaysia, the Malayan tiger is now extinct in Singapore and numbers in Malaysia have dwindled by over 90% – fewer than 200 are left in the wild today. Relentless poaching, habitat loss, prey depletion and human-tiger conflict severely impact the species. We have been supporting the Malaysian Conservation Alliance for Tigers (MYCAT) in their work since 2005 to ensure the Malayan tiger's survival. Over the years, with our continued support, they have empowered and engaged many in the community to be part of the solution to the wildlife extinction crisis.

To deter illegal tiger poaching activity, the Citizen Action for Tigers (CAT) walk was initiated, deploying volunteers on a guided anti-poaching surveillance trek through the Sungai Yu corridor, a critical link between the two largest tiger habitats in Peninsula Malaysia. Since the initiation of the walks in 2010, over 2,100 members of the public from 38 countries have patrolled over 15,000km of the forest while disarming 300 snares. In 2018, MYCAT also started working with the indigenous Bateq community to monitor more inaccessible areas not covered by volunteers.

There are now 19 regular Bateq rangers who have all undergone rigorous training in field methodology and threat identification. With these rangers on board, the intensity and coverage of the protection patrols have increased. Over the reporting period, 29 snares and 65 box traps were found and destroyed. Our support over the FY went towards defraying the salaries of key personnel of the MYCAT team working onsite as well as project administration costs.



PHOTO: MYCAT



PHOTO: MYCAT

An illegal trap found and destroyed by community rangers. All information on threats and wildlife signs are reported to the Department of Wildlife and National Parks monthly.



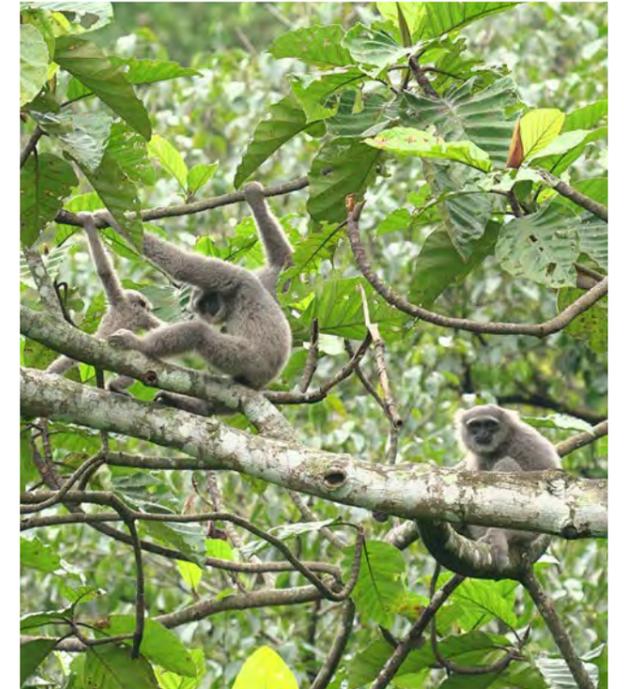
PHOTO: MYCAT

A MYCAT Conservation Officer conducting a training workshop for community rangers in Taman Negara Merapoh.

Gibbons and community-based conservation in Java and Mentawai

Javan gibbons and other rainforest animals in Indonesia face severe habitat loss caused by increasing land use for agricultural activities. Many end up in fragmented pockets of largely unprotected forests, often too small to support them. We have been supporting SwaraOwa, which developed the Coffee and Primate Conservation Project (CPCP) to preserve gibbon habitat since 2014. The team works with coffee farmers to share techniques on growing and processing shade coffee in an economically viable manner. Shade-grown coffee trees thrive under forest canopies. The forests remain intact while the coffee provides a source of income for local farmers. To ensure the quality of the coffee produced, we funded product development by sending a coffee consultant to introduce industry-level coffee production expertise to the farmers. The result is a high-end product: Owa Coffee. We have been serving Owa coffee at selected F&B outlets in Mandai Wildlife Reserve since 2017. By doing so, we channel income directly back to the coffee farmers while increasing guest awareness of sustainable consumer choices.

Aside from Owa Coffee, the team also worked with local farmers on beekeeping and honey production projects. Part of our FY21/22 funding went towards training, purchase of equipment for beekeeping and honey storage, and quality testing of the honey produced. Results were encouraging. Two villages have started supplying honey regularly to a local rehabilitation centre for slow lorises. This not only provides a regular source of income for the beekeepers but also contributes to the rehabilitation of another threatened primate.

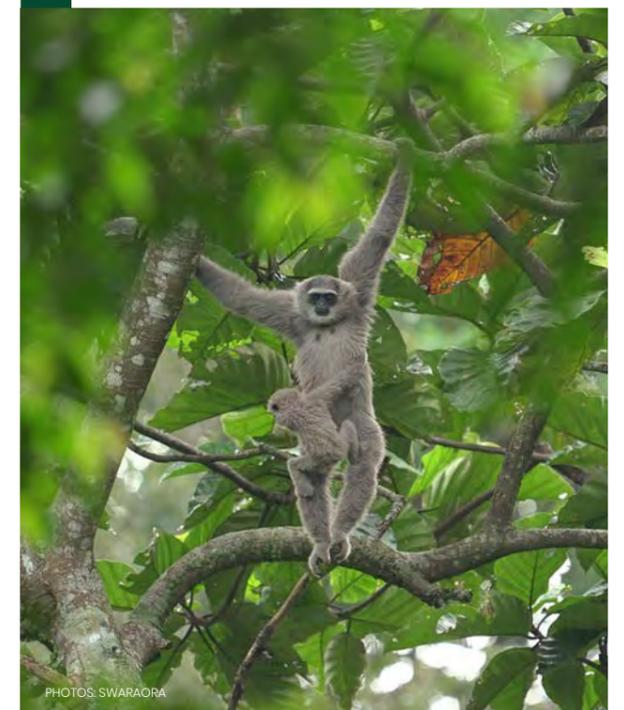


Cultivating shade-grown coffee means that the forest home of these gibbon is preserved.

A mother and baby Javan Gibbon.



The SwaraOwa team in Sokokembang distributing coffee plants in Petungkriyono district.



PHOTOS: SWARAORA

Campaigning for behaviour change to save the Celebes crested macaque

Found only in North Sulawesi, Indonesia, the iconic Celebes crested macaque – known as “yaki” among locals – is facing extinction due to the illegal bushmeat trade and habitat loss. Its population has declined by more than 80% in the last 40 years. To protect the Celebes crested macaques and their habitat, we have been supporting the work of Selamatkan Yaki (SY) since 2016. The North Sulawesi-based programme is focused on education and outreach, protected area management, and biodiversity monitoring. The team works alongside the local community and bushmeat hunters, promoting sustainable livelihoods by providing training in income-generating activities like permaculture hydroponics. FY21/22 funding went toward the salaries of key team members; the continued facilitation of the multi-year trader and hunter engagement strategy aimed at behaviour change; as well as education and outreach events targeted at the youth.

A key programme is the Yaki Pride Campaign, aimed at promoting yaki as a popular icon. Through school engagements and a strong network of Yaki ambassadors – students, celebrities and community leaders – this campaign raises awareness of the ecological and cultural importance of the macaques and inspires the locals to contribute to their conservation. Significant achievements over the FY

include:

– Successful engagement of meat sellers at two well-known traditional markets, Tomohon and Langowan, who publicly joined the efforts to tackle illegal wildlife trade and declared that they are proud to not sell meat from protected and endangered species at their market.

– Educational outreach for close to 2,000 students in the Minahasa regency and recruitment of 27 new Yaki ambassadors from the 41 schools visited. To build the Yaki ambassadors’ conservation knowledge, the team organised a 3-day Yaki Youth Camp in end 2021 and a 2-day immersive trip to Tangkoko in March 2022 to see the yaki in the wild. These new Yaki ambassadors have in turn started giving their own outreach talks at schools.

“I am very happy with the Selamatkan Yaki activity. During these few months, we feel entertained in the market, there is new information that we did not know and did not understand before. We were also taught how to be friends with nature and what people can do as traders.”

Evy Sumarandak, trader in Langowan market



Yaki billboard installed on a highway in the busy coastal area in Kapatatan, Minahasa.



The declaration to not sell and eat meat of endangered and protected wildlife, signed by traders from Tomohon Market and local government representatives



Yaki photos and artwork exhibition.

Conservation Leadership And Partnerships



The **IUCN SSC Asian Species Action Partnership (ASAP)** is a partnership platform of over 200 organisations which focuses on conserving Critically Endangered land and freshwater vertebrate species found in Southeast Asia.



Mandai Nature has hosted ASAP since 2016, supporting its secretariat and contributing to other operational and manpower costs.



The **IUCN SSC Hornbill Specialist Group (HSG)** aims to facilitate conservation efforts for hornbills across the globe, but with a specific focus on Asia. We are the host institution of HSG’s Asian arm and supports its secretariat. Funds went towards maintaining operations, particularly in communications.

Safeguarding Biodiversity Within Mandai Precinct

The Mandai Precinct is situated adjacent to the Central Catchment Nature Reserve (CCNR), which houses almost 97% of Singapore's biodiversity. To reduce negative environmental impacts and enhance ecological and social benefits, we continued to work hard at improving the way we manage our parks and work sites.

Developing Sensitive

Owing to the ecological sensitivity of the Mandai environment, it is necessary for new developments and upgrading works in the existing parks to minimise negative impacts through environmentally sensitive design, planning and construction.

Mandai Environmental Impact Assessment (EIA)

Undertaken at a conceptual design stage of the Mandai Rejuvenation Project, the Mandai Environmental Impact Assessment (EIA) surveyed the baseline environmental conditions within the project site and evaluated potential environmental impact of the project. The report includes recommended mitigation measures and an Environmental Management and Monitoring Plan (EMMP), which were approved by the relevant government agencies. Our Environmental Advisory Panel (EAP) provides guidance and oversight for the implementation of the EMMP. Since the publication of the Mandai EIA Report in 2015, regular discussions on environmental management have continued with various stakeholders. As Mandai Rejuvenation project progresses, refinements in environmental management requirements were made. Accordingly, the EIA report was updated in February 2022 with the inclusion of the second addendum.

Please click below image to view the report and addendum for a summary of design updates and approved changes to the Mandai EIA Report.



Compliance To EMMP

With the resumption of work across all developing features in Mandai, the team continues to ensure strict compliance to the EMMP for each work site.

Measures undertaken include:

- More than 200 environmental, health and safety inspections and over 80 environmental compliance audits were carried out.
- 2 Environmental, Safety and Health (ESH) Roundtable sessions were conducted for contractors from different worksites to share learnings and good practices that could be replicated across the work site.

Ongoing biodiversity awareness training conducted in-house for staff and construction personnel. Apart from strict adherence to the tree conservation guidelines, we also adopt a flora protection and re-greening strategy to enrich the surroundings through the removal of invasive plant species and planting of native tree species. By end-FY, 0.33 ha of degraded land had been restored.

Flora protection efforts include:

- Monthly monitoring of over 5,000 trees in more than 200 Tree Protection Zones across development areas of Mandai Rejuvenation Project. Around 11,000 saplings were salvaged, and 350 trees were transplanted.
- Twice yearly monitoring of over 250 planted trees on and around Mandai Wildlife Bridge to ascertain tree growth and progression of vegetation structure to achieve a multi-layered, continuous canopy cover over the bridge.
- A survey of the 1,199 trees within Mandai Project Buffer and adjacent CCNR as part of our long-term tree growth monitoring efforts.
- Planting of more than 300 native saplings along the Mandai Boardwalk with the help of employees from our partners, GIC and Standard Chartered Bank.
- About 500m² of open area infested with the African yam in the Mandai Resort setback was restored with 315 trees.



Employees from GIC planting tree saplings as part of their Gift A Tree initiative to commemorate their 40th Anniversary.

Connectivity Restored: Mandai Wildlife Bridge

A key feature of the Mandai Rejuvenation Project is a dedicated wildlife bridge that connects the buffer areas leading to the CCNR on both sides of Mandai Lake Road. It is central to the green stitching of Mandai Wildlife Reserve, creating vital habitat connectivity and safe passage for wildlife movement. The movement of over 70 species of mammals, birds, bats, reptiles and amphibians (up from 57 in FY20/21) have been documented.

While the bridge is used mainly as a crossing, and other animal behaviours such as foraging and nesting activities have also been observed. Saplings of recently discovered and locally threatened tree species *Glochidion obscurum* have also been found growing on the bridge. They are the result of animal dispersal, a positive indicator of natural regeneration of flora on the bridge.



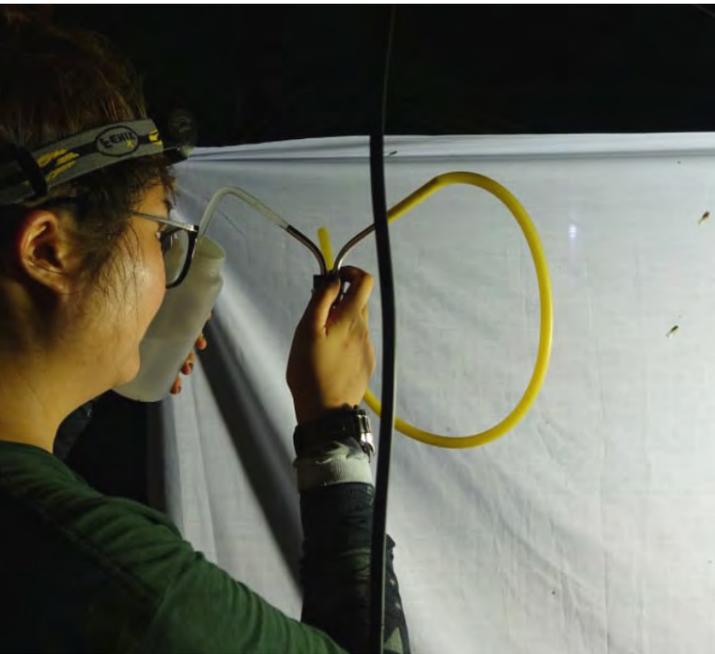
Camera trap footage of a lesser mousedeer seen near the Mandai Wildlife Bridge in the buffer areas of the development project.

Research And Biodiversity Protection

We continued to rally efforts behind various research which will help us develop more targeted initiatives to protect the wildlife in our own backyard.

Mandai Insect Survey

The Mandai Insect Survey was concluded, with 16,460 insect DNA barcodes obtained from individuals in Mandai forests. 2,851 distinct species were identified, around half of which have not been previously recorded in Singapore. The findings provide important baseline information of the insect diversity present in the Mandai precinct and contribute towards understanding of insect diversity not only in Mandai but also Singapore at large.



To sample insects of varying sizes, the team uses an assortment of equipment for optimal data collection.



The research team samples nocturnal insects through the use of mercury-vapour light.



Invertebrate Care Team member assisting on-site contractors with stingless bee hive removal.

Species Prioritised For Conservation

Mandai is home to a remarkable variety of wildlife. A targeted approach is adopted to deploy limited resources to focus on species prioritised for conservation, as follows:

Stingless Bee

Since the Pollinator Project was initiated in 2018 to enhance habitats for pollinators, continued efforts have been taken to protect the stingless bees found naturally in our parks, and have been affected by human traffic and development. To deepen the knowledge of these bees, the Invertebrate Care Team studied hive activities before embarking on their first hive translocation and induction exercise. Following this success, the team has relocated more than 10 hives, and effectively mitigated human-bee conflict. The team also advises contractors in cases where hives are found at the construction sites and assists in the relocation of bee hives to suitable habitats.

Green Tree Snail

Green tree snails are endemic to Singapore and endangered. There is a small population of these snails in Night Safari that we have been monitoring since 2019. During the FY, six more snails were added to the study, bringing the total number of individuals monitored to 14.

A snail with a broken shell was identified. To increase its chances of survival, the Invertebrate Care Team brought the snail back to our facility and cared for it. After two weeks, the snail had regrown part of its shell and was assessed to be physically ready for release back into its wild habitat. A few days later, the team encountered the released snail and observed that it had further regrown its shell. This is the first known successful case study of first aid care for the species and adds to the team's knowledge to care for it.

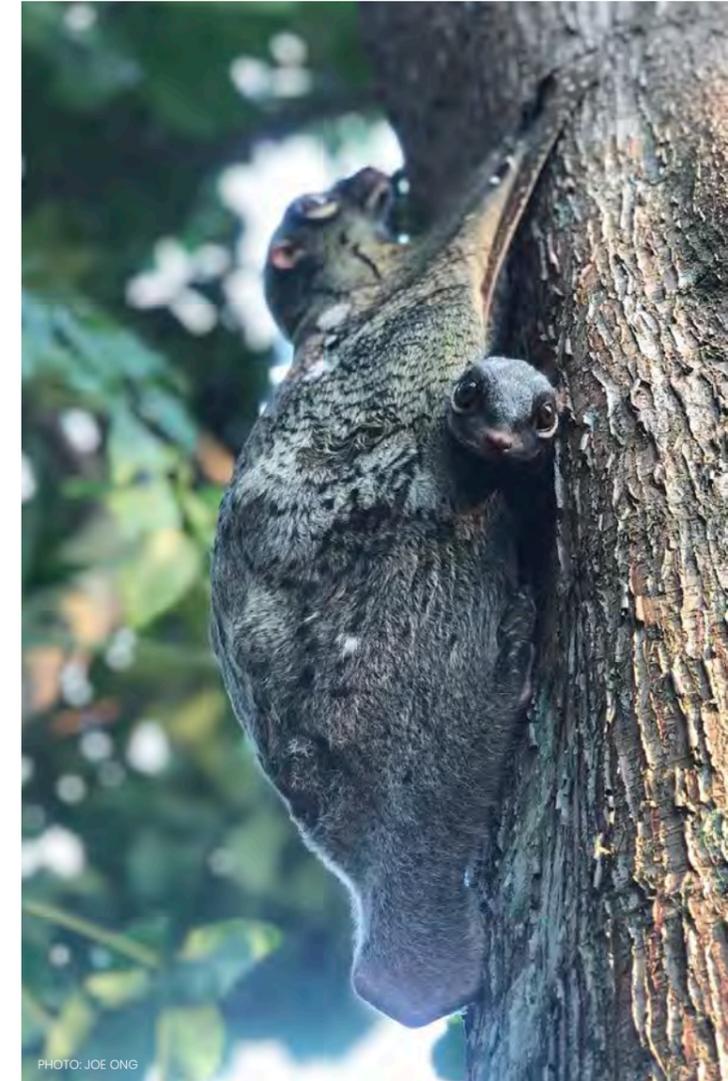
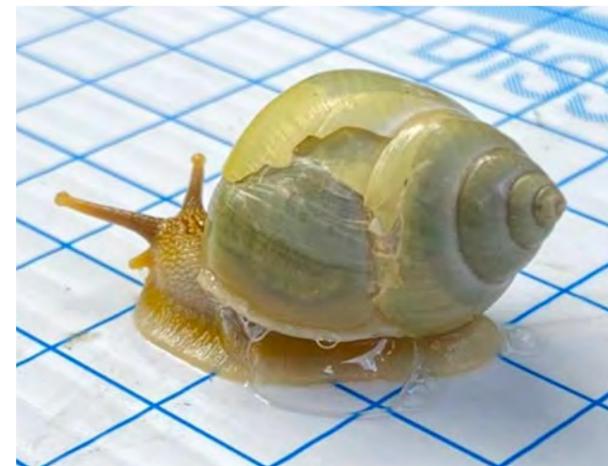


PHOTO: JOE ONG

Sunda Colugo

Sunda colugos occur naturally within our parks and are seen frequently. However, much remains unknown about colugos and further research is needed to fill the gaps in our knowledge. The colugos in our parks are already habituated to human presence, which presents a unique opportunity for us to study this species in its natural habitat. In a study conducted from June 2020 to February 2022, 230 sighting records were logged. By analysing this data, we have been able to map out activity hotspots as well as identify individuals by their coat pattern and other characteristics. These findings will aid us in monitoring the health of the colugo population in our parks.

Wildlife Rescue In Our Parks

Some of the many native animals that call our parks home get themselves into situations that require intervention. Staff on ground are always ready to lend a hand.



Family Reunions – Colugo pup back to mum

Following learnings from the reunion of a colugo pup with its mother in 2019 (the first ever on record), our vets managed to repeat the success with another mother-child pair on 27 July 2021.



Family Reunions – Goshawk goes home

Goshawks are small birds of prey. Resident in Singapore, crested goshawks used to be rare but are now more commonly seen. A breeding pair had nested in a large tree within our parks and the fledgling was becoming more active and attempting to fly. On 10 December 2021, the fledgling was found on the ground and rescued by our staff. Our vets did a quick check to ensure the bird was fit for release. As it seemed relatively unscathed, it was returned to the tree it fell from and was quickly joined by one of its parents.



PHOTO: CRAIG JUSTIN TAN

A crested goshawk fledgling rescued by staff and returned to its parents.



PHOTOS: HSU CHIA-DA

Snake Rescue Christmas

On the morning of Christmas Day, a wild reticulated python was found hanging precariously about 4-5 storeys high from a tree in Night Safari. A closer look revealed the python had its tail knotted around a branch. Despite manpower constraints due to the public holiday crowd, staff from Conservation, Research and Veterinary, Animal Care, Technical Services, Facilities Management and Horticulture Departments leapt to the snake's rescue, swiftly pooling resources and securing necessary equipment.

The rescue took two hours, from the initial test with the cherry picker to clearing of the 'dropping ground' to ensure a safe landing for the python. The snake was safely extricated and sent to the animal hospital. After an X-ray to check for any broken bones, fluid therapy for rehydration and some quiet rest, the snake was confirmed to be none the worse for the ordeal it had gone through and eventually released.





Environmental Sustainability

As part of our strong commitment to achieve carbon neutrality by 2024, we continued to follow through on our responsibility to reduce our environmental impacts. Well-defined policies and practices underpin our approach towards our role as stewards of our environment.

During the FY, we:

- Lowered our carbon footprint by **10%** below that of our baseline in FY19/20, taking us steadily towards our goal of carbon neutrality.
- Commissioned Mandai Wildlife Reserve Wastewater Recycling Plants for the developing parks. The new Wastewater Recycling Plants are expected to meet **21%** of the precinct's future water needs.
- Won the **Special Award for Sustainability** at the Singapore Tourism Awards 2021 for our contributions to conservation and environmental sustainability.
- Attained **Platinum LEAF (Landscape Excellence Assessment Framework)** certifications for Singapore Zoo, River Wonders and Night Safari.
- Attained **BCA Green Mark (Platinum) Super Low Energy (SLE)** award for Mandai Resort - the first hotel in Singapore to attain this accreditation.
- Attained **BCA Green Mark (Platinum)** for Penguin Cove at Bird Paradise.

Responsible Procurement

Green procurement is an integral part of our sustainable operations, not only to lighten carbon footprint but also to influence the supply chain for sustainable products. Launched in June 2019, our Green Procurement Policy provides detailed guidance to business users on sustainable buying and exemplifies our preference for responsibly sourced products. As far as possible, we incorporate sustainability requirements in tender specifications.

Roadmap for Key Spend Areas

Sustainable Procurement Roadmaps were developed based on top spends and environmental impact to guide our procurement. Palm oil, wood-based products and seafood are among goods that must be sustainably sourced, with set sustainability criteria and targets for the following:

Palm Oil

We have committed to the use of 100% sustainable cooking oil since 2017.

During the FY, we incorporated a sustainable palm oil declaration form into our procurement process to inform suppliers about our commitment and to request for them to source for sustainable options.



Wood Pulp

70% of all Mandai-produced paper-based consumables are either certified sustainable by the Forestry Steward Council or made from recycled paper, and we are on track to achieve our target of 100% by 2025.



Seafood and Meat

Seafood served at our F&B outlets is 100% sustainably sourced, while 24% of all seafood served to our animals were from sustainable sources.

From October 2021, 100% of beef to feed our carnivores met sustainability criteria.



Sustainable Merchandise

All main retail stores have a completed Sustainability Corner featuring merchandise that meets sustainability standards and/or contributes to either wildlife conservation or social causes. 34% of the merchandise sales met our defined sustainable standards. One of these products is Canopy Chocolate, made from sustainable cocoa and palm oil. The chocolates were launched as part of the Fighting Deforestation Campaign in December 2021 to help promote sustainable choices among our guests.



PACT To Reduce Plastic

As a member of World Association of Zoo and Aquariums and WWF-PACT (Plastic ACTION) champion, we are committed to significantly reduce single-use plastics from our F&B and retail operations. At our F&B outlets, 9 out of 10 plastic items like cups and food containers have been converted to reusables or alternative materials. Items like straws, stirrers and carrier bags are offered only on demand.



Greener Menus

Plant-based dishes were made available at two of our F&B outlets, Ah Meng Kitchen and Chawang Bistro – these make up 20% of our F&B menu offerings. Sustainable initiatives are part of our tenancy agreement: F&B tenants are encouraged to work towards sustainable sourcing for 20% of their menu items.



Journey To Carbon Neutrality

Our climate ambition to be carbon neutral by 2024 is in line with the Singapore Green Plan 2030 – a whole-of-nation movement to transform into a global city of sustainability.

Since 2019, we have been tracking our carbon footprint to better understand the sources of carbon emissions in our existing parks. Through a combination of solutions, we have lowered our carbon footprint by 10% below that of the baseline set in FY19/20, taking us steadily towards our goal of carbon neutrality. We also continued to make good progress on our sustainability commitments (see Annex for details).

Clean And Efficient Use Of Energy

Besides prioritising improvements in energy efficiencies, plans to integrate and maximise renewable solar energy throughout Mandai precinct have been put into action, setting the stage for our pivot towards greener sources of energy.

Increased Energy Efficiency

Energy consumption was reduced by 20% when compared with our baseline in FY19/20. Various upgrading projects implemented across the precinct have helped reap energy savings. Key initiatives to improve operational efficiency in our existing parks include:

1. Replacing old and defective air-conditioning units with hybrid thermal units. Six new units installed in the Zoo are projected to yield savings of 43,000 kWh/year. We are also looking at retrofitting existing air-conditioner compressors with energy-saving devices.
2. Upgrading of aging equipment to more energy efficient ones, for e.g the upgrade of the filtration system at the Zoo Pygmy Hippo Exhibit and that at the sewer pump station are projected to save 46,643 kWh/year.
3. Modifications to wet moat circulation pumps operation for Zoo and Night Safari for e.g. the installation of digital timers to run at alternate hours, with projected savings of 54,676 kWh/year. We also continued to explore the use of solar-powered pumps.



Solar And Other Renewables

We are striving towards 100% renewable electricity by 2030. We will implement on-site solar panels at all available and permissible rooftops across new and existing parks, while exploring how to tap into the electricity generated by larger-scale solar farms at off-site locations.

1. On-site Solar

The installation of solar panels was carried on the roof of the newly constructed animal quarantine building and the existing multi-storey carpark. Consisting of 77 solar panel modules, the system at the animal quarantine building will generate about 50 MWh/year. The carpark houses 694 solar panel modules, which will generate about 450 MWh/year. Around 1.5% of our current electricity needs can be met from these on-site solar installations and we intend to ramp capacity up to about 5% in 2025.

2. Renewable Energy Certificates (RECs)

To offset our carbon emissions from electricity consumption, we purchased and retired Renewable Energy Certificates (RECs) worth 5,000 MWh in the FY. We are exploring other green energy alternatives to meet our goal of 100% renewable electricity by 2030.



Green Transport

We have been electrifying our internal fleet since 2018 and all electric trams as well as two electric vans are now operational. We also conducted a pilot study to use biodiesel for our Khatib Shuttle Buses and are exploring ways to circularise used cooking oil from our kitchens. Meanwhile, the EV charging lots at our multi-storey car park are well used by staff as well as park guests, and more EV charging lots will be installed within Mandai precinct to support Singapore's ambition to power all vehicles using clean energy by 2040.



Green Mark of Excellence

We attained Platinum LEAF (Landscape Excellence Assessment Framework) certifications for Singapore Zoo, River Wonders and Night Safari. Two developing projects – Penguin Cove at Bird Paradise and the eco-friendly resort – were accredited with the Building and Construction Authority (BCA) Green Mark (Platinum). Of special note is our resort's design, which won the Super Low Energy (SLE) award in recognition of its potential to reduce its annual energy consumption by 40% through best-in-class energy efficiency, the use of onsite renewable energy and innovative energy management strategies. Our resort is the first hotel in Singapore to attain this accreditation.



Saving And Recycling Water

Focused enhancement works have yielded water savings of 60,000m³/year.



Closing Mandai's water loop

From rainwater collection to the treatment of wastewater, we continued to devise ways to manage our water resources more effectively.

Rainwater Harvesting

Rainwater harvesting features are implemented in developing parks where feasible and are projected to meet 5% of the precinct's water needs. We are exploring the feasibility of capturing rainwater on-site in existing parks to decrease potable water usage.

Recycling Of Wastewater

The newly commissioned Mandai Wildlife Reserve wastewater Recycling Plants will soon start recycling wastewater from cleaning of animal dens and other back-of-house activities. We can expect 21% of the precinct's future water needs to be met by this wastewater recycling.



Reduced Water Consumption

During the FY, a defect reporting application was rolled out for prompt reporting and tracking. The continued upcycling of residues from horticultural activities into animal bedding allows for dry spot clean and therefore reduces water consumption (please also see section titled Branches To Bedding on page 82). To better understand our water usage, we continued to improve our water metering system. A network of meters linked to monitoring software aids us in monitoring water consumption more closely and detect pipe leaks.

Testbed For Automated Misting

One of the orchid arches in Jurong Bird Park Entrance was test bedded with an automated misting system. With a bluetooth-enabled irrigation controller, the automated system activates misting 4 times a day and 5 minutes each time. Data collected showed the water consumption per minute for misting system was 94% lower than when using the watering hose.



Untreated water



Treated water

Manatee Water Recovery System

Each manatee's food intake is 35 – 60kg a day, with an output to match. To keep the water in the manatee's habitat at River Wonders clean while optimising water usage, wastewater from the tank is not directly discharged but cycled through a bio bed filter. Specially selected plants such as pandan and alligator-flag are grown in the bio bed to remove contaminants in the water. Besides improving water quality, the alligator-flag attracts bees and dragonflies and provides natural shelter for them. This water recovery system recycles around 30,000m³ of water, which is 50% of our annual water savings,

Towards Zero Waste

By using less resources, we take less from the wild and can hence help preserve natural habitats. We continued to work towards our target of achieving 60% waste diversion rate by 2030 through a variety of measures including the facilitation of digital park map downloads and replacing paper cups with reusable ones for dining in at our F&B outlets.



Waste To Improve Animal Welfare

With careful planning and a touch of creativity, unwanted items can wind up improving the welfare of animals in our care.

Animal Playground

Unwanted items from around our parks were upcycled to create the Animal Playground. To bring out the animals' playful nature and promote natural behaviours, the Animal Presentations Team specially designed the features at the Playground to cater for different animal behaviours and motivations, for e.g. dynamic branches for climbers, different substrates for diggers. The result is a safe place for our animals to exercise and explore in. Throughout the day, different animals get the opportunity to explore the area and the variety of 'toys' available.



Branches To Bedding
32% of our overall waste profile consists of recyclable horticultural residue, which is converted into mulch for planting beds and animal bedding. We are also exploring the chipping of leftover herbivore browse from the rhino, tapir, and hippo exhibits, which amounts to 7 tonnes and makes up 3% of our total waste. This proposed conversion of leftover herbivore browse into animal bedding will benefit our animals as natural substrate encourages them to explore their environment.



Waste For Worms, Worms As Feed

Staff from the Wildlife Nutrition Centre have started an initiative on vermicomposting using blue worms, which are fed leftovers from animal food preparation. The worms can be used as animal feed and the team has started to trial this with some of our insectivorous animals.

Feeding Our Animals Sustainably

Mandai's green vegetation has long provided a sustainable source of browse for animals in our care. During the FY, we also tapped on the following sources of sustainable animal feed.

Embracing "Ugly" Greens

Vegetables with holes or yellowing leaves tend to be rejected by human consumers for cosmetic reasons, resulting in the waste of resources like water that went into their growth and production. These "ugly" vegetables are in fact just as nutritious as "good-looking" ones. In FY21/22, "ugly" greens made up about 40% of all fresh vegetables purchased for animal feed.



Invertebrates To Feed Insectivores

To provide our insectivorous animals with variety in their diet, the Invertebrate Care Team focused efforts on breeding of invertebrates like stick insects and black soldier flies as a supply of sustainable animal feed. More than 180,000 insects were produced for animal feed in FY21/22, which is an 18-fold increase from just 9,253 insects bred in FY20/21. The leap in production was a result of the team's enhanced husbandry practices.





Spreading The Message

With the on-going pandemic, we continued to innovate and leverage on virtual offerings to connect with educators, students, volunteers and public of the members. A key breakthrough was our collaboration with the Ministry of Education (MOE) to curate sustainability and wildlife content on the Student Learning Space (SLS) as resources for 465,000 school leaders, teachers and students in Singapore. With the soft launch of Ranger Buddies programme, we firmly cement the connected learning experience for children, enabling them to explore virtual wildlife conservation and sustainability content at home, in schools and community spaces.

The FY ended with the easing of Safe Management Measures in schools to permit outdoor learning journeys, and we finally saw the return of school groups to our parks.

Over the FY, we:

- Reached out to **205,000** students, park guests and members of the public with conservation and sustainability messaging, mostly through virtual engagement.
- Soft launched Ranger Buddy programme with around **42,000** Ranger Buddies enlisted to go on missions to protect wildlife and the environment.
- Empowered school children to act for wildlife through our inaugural **Adopt An Animal (School Edition) programme**.
- Launched **Conservation Champions** webinar series: by featuring conservationists working on the projects we support, we bring conservation stories to life and help the community connect with the wildlife we protect.
- Diversified volunteer opportunities to optimise volunteer talents. **228** volunteers contributed to our cause by committing a total of **6,464** hours towards guest engagement, animal care, and research data collection.

Instilling A Love For Wildlife

Panda Power

Pandas are so adorable that it is difficult not to fall in love with them. Undeniably the most successful and iconic of wildlife ambassadors, their cuteness has an immense hold on people and acts as an effective hook for them to learn not only about panda conservation programmes but also other endangered wildlife and related conservation issues.



SEE-THINK-WONDER

SEE Let's take 15 seconds to look at these animals. What animals do you see? In what ways are they different from us?

THINK What do you think they are doing? How did Kai Kai and Jia Jia help their animal neighbours?

WONDER I wonder how these animals move.

Mandai WILDLIFE GROUP



Early Days

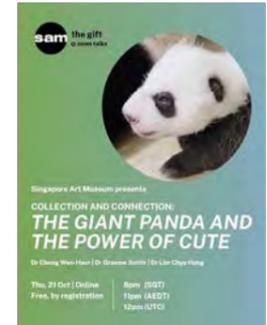
Despite being a first time mum, Jia Jia is doing a great job.



6:27 / 59:15

Pandas: The Cute Connection

In an example of how the panda is helping to promote biodiversity conservation to an audience that might not normally visit our parks, we collaborated with the Singapore Art Museum to give an online talk titled **"Collection and Connection: The Giant Panda and the Power of Cute"**. By leveraging on the panda's appeal, we sought to shine the spotlight on threatened species that were not as well known to the public. 22% of participants polled pointed out that they liked learning about other endangered wildlife and conservation programmes the most. The joy people feel when engaging with giant pandas became a source of motivation to discover more wildlife conservation issues and may just nudge behaviour change that not only saves the pandas but other species too.



Learning with Kai Kai, Jia Jia & Le Le

By sharing the unique stories of our endearing black-and-white ambassadors, we hope to spark curiosity about the natural world and encourage holistic learning across different domains.

Social-Emotional Learning

Social-emotional learning (SEL) can be challenging for some educators to facilitate. To aid in this, we developed a toolkit using the Kai Kai and Jia Jia book series, which promotes self-awareness, respect for diversity, teamwork and empathy. Thinking routines are incorporated in activities that invite children to think critically while honing skills in other developmental areas. Teacher training webinars are made available to familiarise educators with the toolkit for optimized application.

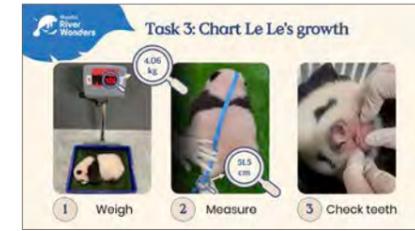
Baby Panda Keeper Virtual Programme

Through a virtual programme about Le Le the panda cub, children discover what they can do to protect threatened wildlife. The primary school programme promotes the use of science process skills while that for preschoolers is aligned to the Nurturing Early Learners (NEL) framework in the areas of discovery as well as social and emotional development.



Growing Up With Le Le

Le Le's curious and gritty nature makes him a great model to engage children in social-emotional learning, inspiring them to be curious about the natural world and to learn the Chinese language, which many children find daunting. To further enhance the Wow Wild Learn Chinese programme, we collaborated with two Chinese language specialists to produce a book titled **叻叻对你说**. This publication complements the other panda preschool Chinese language teaching resources.

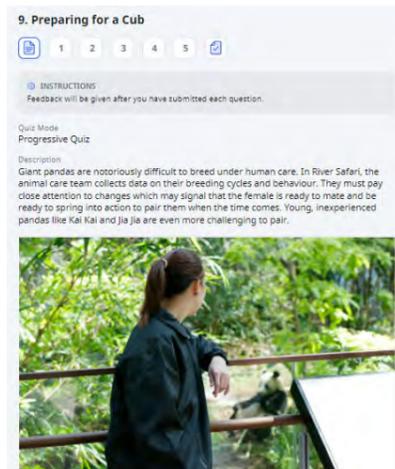


Working With Educators

In today's urbanised environment, children risk being cut off from nature in their formative years. By complementing the curriculum in innovative ways, we kept conservation on the agenda for educators, helping them forge connections with nature for young people and inspire them to protect wildlife.

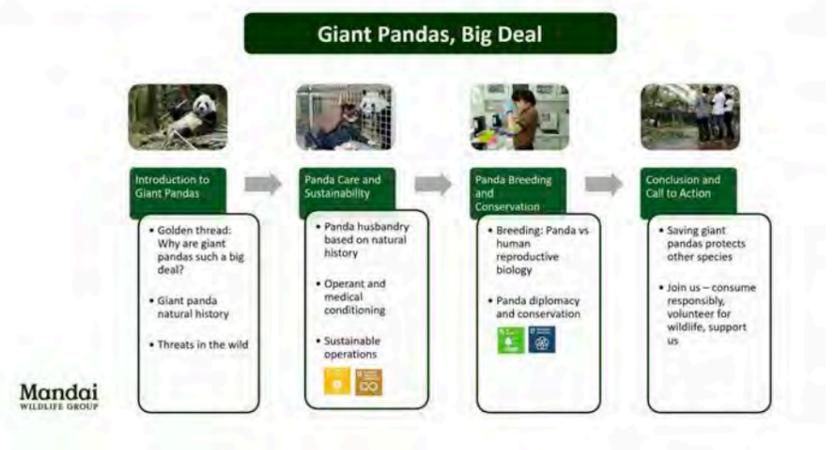
Conservation and Sustainability on Nation-Wide Learning Platform

The Student Learning Space (SLS) is the Ministry of Education (MOE)'s online learning platform. We have created content for a programme that focuses on pandas using a multi-disciplinary approach. Besides learning about how we provide the best of care for giant pandas based on their ecology, physiology and behaviour, the module also examines cross-cutting issues like sustainable practices in panda care, giant panda conservation breeding as well as panda diplomacy and pandas as conservation icons. By offering authentic examples of real-world curriculum applications within a world-leading zoological institution, we hope to nurture global citizens who care for nature and the environment. Having our content on the SLS platform can help us reach all school leaders, teachers and students in MOE schools in Singapore and excite them to take action for wildlife conservation and sustainability.



Pilot Lesson Content Overview

Connecting MOE's Curriculum to Mandai



Teacher Training and Sharing Sessions

Curating outdoor learning experiences was daunting for educators during the pandemic. As part of our continued partnership with PAP Community Foundation (PCF) Sparkletots, we rolled out 'Creative Facilitation of Outdoor Learning', a bespoke training programme to support 200 educators in facilitating outdoor learning for preschoolers. The virtual training programme utilises a unique 'Minds-on, Hands-on, Hearts-on' approach to help the educators incorporate outdoor learning, conservation, sustainability and literacy elements as part of their school curriculum.

To increase awareness of our Chinese programmes and resources, we organised a virtual sharing session for 42 Mother Tongue Language teachers. The session was very well-received and within the ensuing month, five schools had confirmed their bookings for 30 virtual programmes which would reach out to some 3,600 students.

Creative Facilitation of Outdoor Learning for Preschoolers

Blended Training for EL and MTL Educators



Parent Engagement

Promoting an appreciation of the natural world in children requires more than just the efforts of educators; getting parents involved becomes our strategic intent in nurturing the next generation of eco-stewards. A parent education webinar 'Babies Included: Family Bonding Through Wildlife Encounters' allowed us to share strategies in facilitating nature and wildlife appreciation. One is never too young to connect with nature and through this workshop, we equipped parents with the tools to cultivate a love of animals in their children from age zero.

In another parent workshop titled 'Brain Matters – Learning Essentials Life Skills With Singapore Zoo', we invited early childhood expert, Beth Fredericks, to share on the neuroscience research behind the 7 Essential Life Skills, and ways for parents to create animal-inspired brain-building moments while visiting Singapore Zoo with their children.



Adopt An Animal (School Edition)

Adopt An Animal (School Edition) was developed to empower school children to act for wildlife through fundraising efforts. Beyond fundraising for the adopted animal, the students also honed essential life skills such as critical thinking, taking perspective, teamwork and communication.



Members of our Education Team with educators from Artemis PreSkool@Woodleigh at a ceremony to mark the school's symbolic adoption of Sumatran orangutan 'Ah Meng'. Their students fundraised to adopt Ah Meng and do their part for wildlife protection under the Start Small Dream Big initiative by the Early Childhood Development Agency.

Digital In-Park Programming

With frequent changes to Safe Management Measures, we have to stay nimble and continue to connect with our guests through a diverse range of engaging in-park experiences. By leveraging on cloud-based tools and game dynamics, the Education Team curated various digital trails with highly interactive features that gamify in-park learning explorations that appeal to digitally savvy guests.

Wild About Singapore

In celebration of Singapore's 56th birthday, the WILDerful Explorer Trail was rolled out to shine a spotlight on native wildlife. 2,100 guests participated in the digital trail and learnt how to be good neighbours to native species which are our natural heritage.

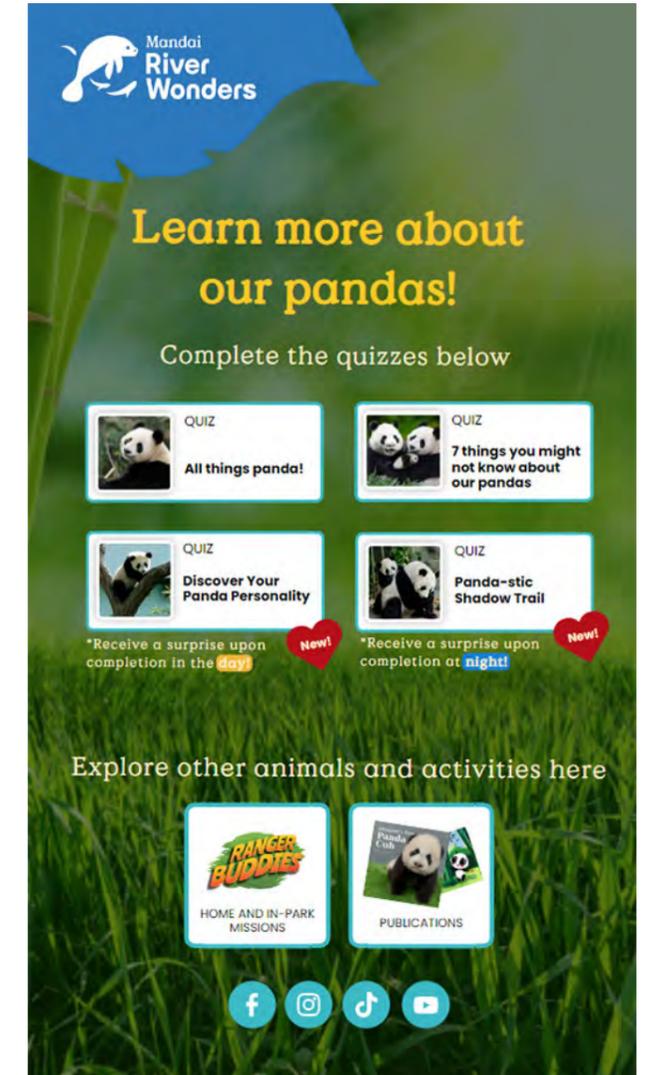
Back From The Brink

Tying in with the year-end blockbuster Brickosaurs campaign, the Back From The Brink Of Extinction trail was designed to deliver the message that we can help save threatened animals today before they become extinct like dinosaurs. Through the interactive trail, nearly 27,000 guests travelled back in time to encounter the extinct dinosaurs before returning to the present day and pledged to fight extinction.



Giant Panda Q-quiz

In anticipation of strong turnout for Le Le's debut in Giant Panda Forest in March 2022, the Giant Panda Q-quiz was created as part of our queue management efforts and at the same time to provide opportunities for guests to more about our black-and-white panda family. The well-received digital engagement was a great way to fill 'white spaces' and generate awareness of wildlife conservation while guests wait in queue.



Ranger Buddies (RB)

Ranger Buddies (RB) was conceptualised to nurture every child, every day and everywhere to drive positive change for themselves, others and the world. Filled with exciting missions for children to take part in together with their Animal Buddies as trusty co-explorers, RB seeks to nurture every child into a future-ready global citizen and a responsible steward of our planet.

RB Soft Launch

A soft launch campaign of Ranger Buddies was carried out in October 2021 amidst a resurgence of the delta variant of Covid-19. Rooted in the concept of connected learning experiences, RB soft launch campaign activations spanned the Zoo, PLQ Mall, and Marine Parade neighbourhood. Children across Singapore were invited to be Ranger Buddies and join orangutan Khansa on a quest to fight deforestation – the main threat to orangutans in the wild. They could also access RB Mission Web-App at home to learn about deforestation, and to take action for wildlife. By the end of the campaign in December 2021, 8,000 children had signed up on the web app, with 37% completing at least 2 cross-location missions across home, the Zoo, PLQ mall and Marine Parade neighbourhood.



RB Virtual Live Shows

School outreach came to a halt with the pandemic but this did not stop us from reaching out to students. We pivoted to virtual live shows and were pleasantly surprised at the phenomenal response from the schools. The first season featured Sally the hornbill and saw over 10,000 children tuning in. Encouraged by the response, we decided to make available the virtual live shows on a quarterly basis. We also went on to curate a holistic learning experience with pre-show resources for teachers and parents to prepare the children for the live show, and post-show activities for extended explorations. A virtual gallery on RB website allows children to share their artwork and photos of their nature explorations as post-show missions. The virtual live shows enjoyed tremendous support, and the recent sessions garnered participation from some 29,000 preschool and primary school children – a feat close to impossible to achieve for in-person engagement.

The recorded version of the shows enjoys healthy downloads and continues to connect children to the natural world. In the FY, we offered four virtual live shows:



RB School Programme

A 3-week pilot with Gan Eng Seng Primary School (GESPS) to integrate wildlife conservation and sustainability into the Primary 6 curriculum saw students completing over 1,500 environmentally friendly activities including recycling, identifying products with FSC logo and upcycling used paper products. 254kg of paper products were recycled and sold for cash, which was donated to the Zoo.



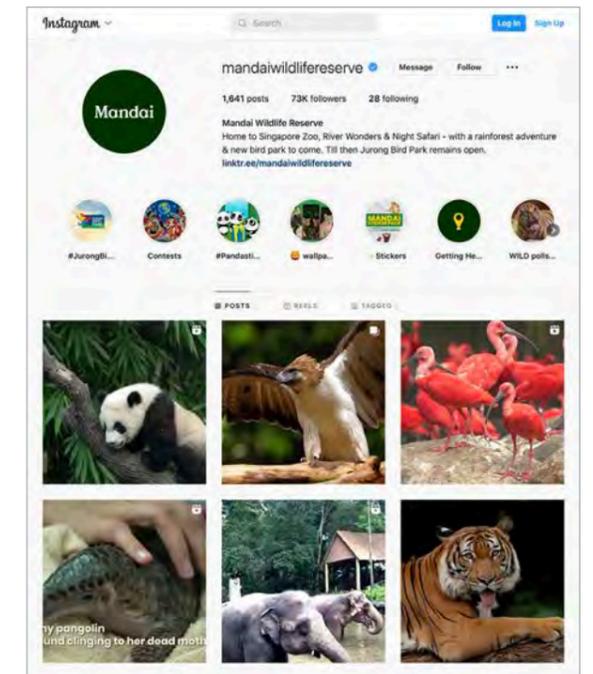
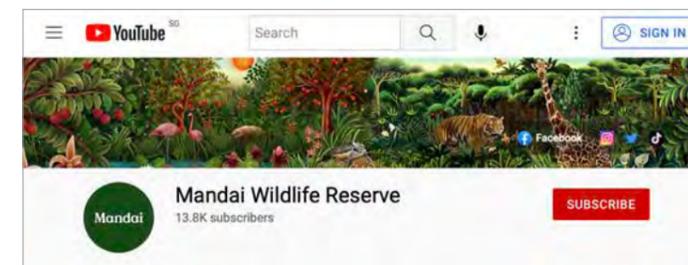
"It was seriously great and I had loads of fun!!! I used to think that the deforestation mission was boring but now, I realised how fun and important it is!"

GESPS student participant in RB school programme



Wildlife Connections Through Social Media

Social media is the tool our guests use to connect with us from a distance – content on our channels become an extension of their experience beyond our parks and serves as a digital mirror for our mission to inspire our guests to care for wildlife and protect biodiversity. By leveraging the power of our social channels, we extended our messaging on animal care and welfare, environmental education and global conservation to 943,000 FB Fans and 67,000 followers on Instagram. The video content on our platforms did exceptionally well, with 4.4 million and 1.2 million minutes watched on Facebook and YouTube respectively.



Advocating For Sustainability & Wildlife Conservation

Staff Advocacy

Advocating for wildlife and sustainable living is the responsibility of everyone in our organisation. To embed this at all levels across the organisation, we incorporated staff engagement as an essential component of campaign mechanics. All public campaigns are to begin with internal campaigns to equip staff with fundamental knowledge to engage guests. Fight Deforestation was the first campaign to adopt this holistic approach, with activities carefully curated based on insights from a survey on staff attitudes towards conservation and sustainability.

Conservation Champions Webinar Series

As part of the Fighting Deforestation campaign, we kicked off the first Conservation Champions webinar in December 2021, focusing on our work in orangutan conservation and our sustainability journey. This was followed by a second instalment on our efforts to save the Malayan tiger. By bringing together in-house animal care specialists and partners in the field working on projects supported by Mandai Nature, these in-depth sharings strengthened our positioning as a world-class wildlife institution dedicated to caring for the planet and protecting animals and nature. Recordings of these sessions are available for viewing on our YouTube channel.



"Proud to hear our Mandai support the conservation in Sumatra... [I] learn a lot [about] protection [of] wildlife."

Orangutan Conservation Champion webinar participant

"Give more engaging talks... overall it is an enlightening experience that we now understand how to protect tigers from extinction."

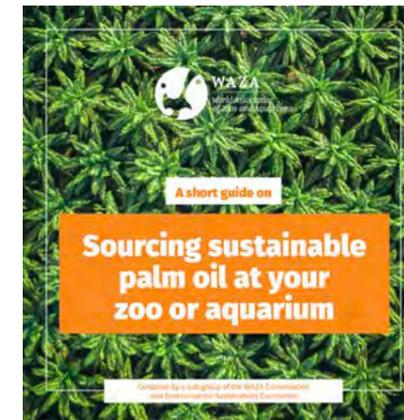
Tiger Conservation Champion webinar participant

Sharing Sustainability Solutions

We "walk the talk" by making more sustainable choices in our procurement and the use of resources like palm oil and plastics. By sharing learnings from our own sustainability journey with a wider audience, we hope to inspire more to join us in choosing more pro-environmental actions.

Contributed Case Study To WAZA Palm Oil Guide

This guide aims to help WAZA members understand and support the World Association of Zoos and Aquariums (WAZA)/ Roundtable on Sustainable Palm Oil (RSPO) Memorandum of Understanding (MoU) regarding sourcing of sustainable palm oil. We contributed a case study on our journey in switching to 100% RSPO-certified cooking oil for our F&B outlets, and also our advocacy efforts targeted at staff, suppliers and members of public.



Presenting at WAZA Sustainability Webinar Series

In 2021, WAZA hosted a series of five webinars highlighting the sustainability initiatives of its members. We presented at two of the webinars, sharing how we have successfully reduced plastic use in our facilities as well as insights from and challenges faced in our journey to carbon neutrality.



Engaging Volunteers

Engagement And Training

For most part of the FY, we kept in touch with our volunteers virtually with updates on our conservation projects and refresher training sessions. Remote volunteering opportunities were introduced and enjoyed very good response. Once Safe Management Measures were eased, we resumed in-park volunteer duties with modifications, and on-site training. Our 330-strong members volunteer community continued to show unwavering support, with some 32% of the volunteers having been with us for five years and more.

Long-service volunteers

We would like to thank Cheng Yun and Nien Sien for volunteering with us for the last 20 years!

Their commitment in helping us spread the conservation message is truly inspiring. They shared some reflections on their journey with us.

"I see my volunteer journey with the zoo as a definitive connection to our natural world and all things of nature."

Cheng Yun



Going Above And Beyond

Sharon has been a docent with us since 2011. The pandemic did not dampen her volunteer spirit – she continued to volunteer as a Wildlife Ranger at Singapore Zoo and as Zooper Safe Crew at the Squirrel Monkey Forest, River Wonders. Sharon demonstrated her giving spirit further by committing to sponsorship of our young African lion, Simba, together with her partner, Patrick.



"Fantastic journey, not without its ups and downs, but a fulfilling one... and one of the few places where my heart is kept young."

Nien Sien



Diversifying Volunteer Opportunities

By modifying in-park duties and offering remote volunteering opportunities such as copywriting and data processing, we were able to continue to tap on volunteer resources during the pandemic.

Wildlife Ranger Volunteer

The Wildlife Ranger Volunteer initiative was developed to continue our guest engagement and at the same time observe safe management measures. Instead of having guests clustered at Ranger Stations, the volunteers adopted a roving approach, which also allows them to be on a look-out for guest-wild macaque conflicts. During the reporting period, 45 ranger volunteers collectively logged 905 hours to keep our parks safe for both guests and wild macaques while inspiring an appreciation for native biodiversity.



Remote Wildlife Buddies

Building on the success of the virtual version of Wildlife Buddies rolled out in 2020, we developed a different iteration that would motivate students with varying interest levels and heighten a sense of ownership. We ran a pilot version in collaboration with CHIJ St Theresa's Convent, by inviting students to develop a solution that would generate awareness of native wildlife among their schoolmates. Students could decide on the mode of engagement and they elected to produce their own video and poster to share the message of human-animal co-existence during school assembly talks and learning week. The programme model is still undergoing refinement, but we have already received enquiries from other schools interested to collaborate and we could potentially expand into other topics such as sustainability.





Building a People-focused Culture

Nurturing an engaged workforce and building an attractive workplace are the twin cornerstones of our organisation's vision, mission and values. We seek to leverage differences as a rich wealth of resources for our holistic growth and support a #OneUnitedMandai culture. This goes together with efforts to listen to staff concerns and to protect those who were more vulnerable. We continue to upskill and reskill our workforce to get them future-ready while deepening engagement with the community, especially those with special needs or hail from disadvantaged backgrounds.

FY21/22 HIGHLIGHTS

- Formalised the **Diversity, Equity and Inclusion (DEI)** policies; established a DEI panel
- Launched **CARElephant**, a workplace well-being initiative
- Bagged **#37** ranking by The Straits Times in Top 200 list of **“Singapore’s Best Employers 2021”**
- Partnered with Temasek Foundation to extend discounted park admission to **7,000+ healthcare workers** in appreciation of their tireless work to keep the nation safe
- **4,107 beneficiaries** from various social service agencies enjoyed complimentary park admission, and in-park and virtual programming

Human Capital Management

We ranked #37 and came in #4 under the Travel and Leisure sector in the Top 200 list for The Straits Times' "Singapore's Best Employers 2021", which surveyed more than 6,000 employees from more than 1,700 companies. This is a powerful endorsement that we are an organisation where staff have a strong sense of purpose and commitment. We were also conferred the Special Award for Most Exemplary Employer at the Singapore Tourism Awards 2021, which pays tribute to businesses who have displayed exceptional care towards employees and shown exemplary commitment to retain jobs and capabilities, while ensuring staff welfare is protected during challenging times.



Diversity, Equity and Inclusion

In June 2021, we formalised the Diversity, Equity and Inclusion (DEI) policies, which set out explicit guidelines for our corporate behaviour to ensure a fair and inclusive environment for all staff. To foster equitable access and embrace diversity, a DEI panel comprising members from the Senior Management Team and the Human Resources Team has been formed. The panel provides guidance and advice on organisational initiatives to promote and nurture a harmonious and safe workplace.

Delta Senior School work programme

As part of our effort to be an inclusive employer, we collaborated with APSN Delta Senior School (DSS), a post-secondary school that offers vocational training to students with mild intellectual disability. We made special arrangements for three of their students to be attached as interns at our Wildlife Nutrition Centre (WNC) for 5 months for their Onsite Training Programme. We began working with DSS six months prior to the start of the internship on vocation-mapping, site assessments and stakeholder engagements. From January 2022, the three students began working alongside the WNC Team, accompanied by a DSS Trainer.

To cater to the students' needs and help the students thrive in their roles, the WNC Team had to adapt their way of work and adjust their coaching style. While guiding the students in the preparation of food for the animals, the Team used thoughtful visual cues like putting up fruits and vegetable images on the walls to help the students better remember the process. Through this meaningful experience, the WNC Team report feeling a good sense of achievement when they observe the students' improvement.

Employee Well-being

As a progressive employer, we remain committed to creating a sustainable work-life culture that supports our employees' well-being and meaningful work engagement. Our wellness model focuses on four dimensions of renewal – Body, Mind, Heart and Spirit, which shape the design, implementation and evaluation of our workplace well-being initiative – CARElephant programme, and other wellness activities. Being conferred the Employee Well-being Award (Silver Standard) at the 15th HR Awards Gala Presentation is a testament to our dedication towards our staff members.



CARElephant Programme

During the FY, we strengthened the CARElephant programme by engaging a professional counselling body to provide counselling services for our employees. It was critical to ensure employees' mental wellness during the prolonged pandemic and we believed it was opportune to make available such services. To complement the counselling services, we partnered Health Promotion Board to provide exercise programmes and talks for our staff members on a regular basis. We also registered for the National Steps Corporate Challenge, which saw 47% of our workforce signed up.

Work-Life Harmony Pledge

Studies have shown that organisations that champion work-life balance are able to attract and retain talents better, leading to higher productivity. The Management Team is keenly aware that everyone needs to exercise self-care and to set sensible boundaries between work and personal life to prevent burn-out at work. They committed to a Work-Life Harmony Pledge in November 2021 to encourage healthy work-life practices in staff's day-to-day activities.

IT'S OK TO ASK FOR HELP

About the Online Counselling Service

The sessions will be conducted via video-conferencing, audio call, and text-based live chat - that are accessible, convenient and of high quality.

Confidential

Fully Subsidized

Quality Care

Capped at 3 Sessions Per Staff

7 am - 11 pm Monday - Sunday

To Book Your First Session

Everyone needs support at some point.

When you need it, connect with Talk Your Heart Out.

Staff Recognition – Experience & Innovation Hero Awards

Designing and implementing employee-centred initiatives is key to promote a positive work environment and active employee engagement. Through the inaugural Experience & Innovation Hero Awards, we celebrated staff who embody the outstanding characteristics of service and hospitality, and demonstrate the 5 Innovation Behaviours by enhancing the experience of our staff, guests, and animals. The Awards were presented to 15 Individual Category and four Group Category Champions.



BEST EXPERIENCE INNOVATION PROJECT	
<p>FOR STAFF: HR eDeclaration and eVaccination</p> <p>The HR team capitalised on an existing platform and technology to simplify workflows, enhancing an otherwise tedious, time-consuming, and time-critical process.</p>	<p>FOR STAFF: Powerapp Project for Store Operations</p> <p>The Powerapp Project for Store Operations team successfully developed an app that helped their colleagues save time and resources by streamlining operational processes.</p>
<p>FOR GUESTS: Staycation at Mandai</p> <p>During the pandemic, the team saw an opportunity to boost business by creating a living space in our parks. Through the creative combination of accommodation and immersive wildlife interactions, our guests got to enjoy an experience that was elevated, exclusive, and unforgettable.</p>	<p>FOR ANIMALS: Animal Activity Devices</p> <p>This team drove innovation by designing an interactive device that not only helps to enhance our animals' overall activity level, but also alerts our animal carers to issues that require attention, such as cleaning and feeding matters.</p>

EXPERIENCE HERO OF THE YEAR

Who said only Disney has magic? Mandai Wildlife Reserve does too, through **Sathes**, who seeks out every opportunity to delight guests by engaging them, learning what they like and what they want, before going the extra mile to create joyful and memorable experiences for them. **Sathes'** empathy, attentiveness, and initiative always warm our guests' hearts, and he inspires and encourages his teammates to do the same and make a real difference in our guests' experiences.

BEST EXPERIENCE BFF

Chandran always works closely with his team, leading and creating a culture to craft special memories for guests. This has benefited both the team and our guests, as seen by the frequent compliments received.

BEST EXPERIENCE ROLE MODEL

Sean not only impresses guests through his energy, dedication, and knowledge, he also supports, guides and trains his team members to reach greater heights of service excellence, and rallying them especially during the pandemic.

BEST SERVICE RECOVERY

Kendra is able to deal with any situation that happens during her usual day-to-day duties, and she has the amazing ability to turn an unhappy guest / situation into a satisfied / positive one by going the extra mile.

BEST EXPERIENCE HOST

Fahmi is a wonderful service ambassador for our parks. He has a keen eye for spotting even the most elusive animals and helps make our guests' visits more meaningful. This leads to delighted guests wanting to return to our parks again and again.

BEST EXPERIENCE HOSTS (PART-TIMER/PARTNER)

Nicholas took it upon himself to personally engage each and every family he encountered during his duties, impressing them with his wealth of knowledge while putting them at ease with his charisma and warm demeanour.

Pavidhra never fails to greet staff cheerily with 'Happy morning!' which always uplifts the spirits of staff. Although her key focus is to ensure security, she goes beyond the call of her duties to set up queue areas, provide directions to guests, and answer their enquiries.

BEST EXPERIENCE ROLE MODEL (PART-TIMER/PARTNER)

Benjamin's caring nature not only shines through while he is performing his duties, but also when interacting with his teammates, as evidenced by the yummy treats he cooks and shares with them during festive periods.

USER-FOCUSED CHAMPION

When put in charge of a new project, **Suresh** gamely took it on and completed it to great success by reinventing a key queue area to accommodate more guests and create engagement opportunities, so that many more would be able to catch a glimpse of Le Le.

DATA-DRIVEN CHAMPIONS

Alvin analysed Day-In-A-Life data to understand pain points, and devised a combination of technical and process solutions to increase productivity, reduce costs, and make life better for our staff.

Connie asked the right questions to understand guest preferences, and tracked data over several iterations to increase viewership for our virtual programmes from just 10 guests to 12,000 guests!

OPTIMISING CHAMPION

Alex developed an impressive app that helped the entire department move into paperless preventative maintenance and ensured data was captured properly for record keeping.

EXPERIMENTAL CHAMPION

Carmen is one of the key team members involved in the development and promotion of virtual products and expansion of offerings to include all parks, while ensuring a continued connection to wildlife even during the pandemic.

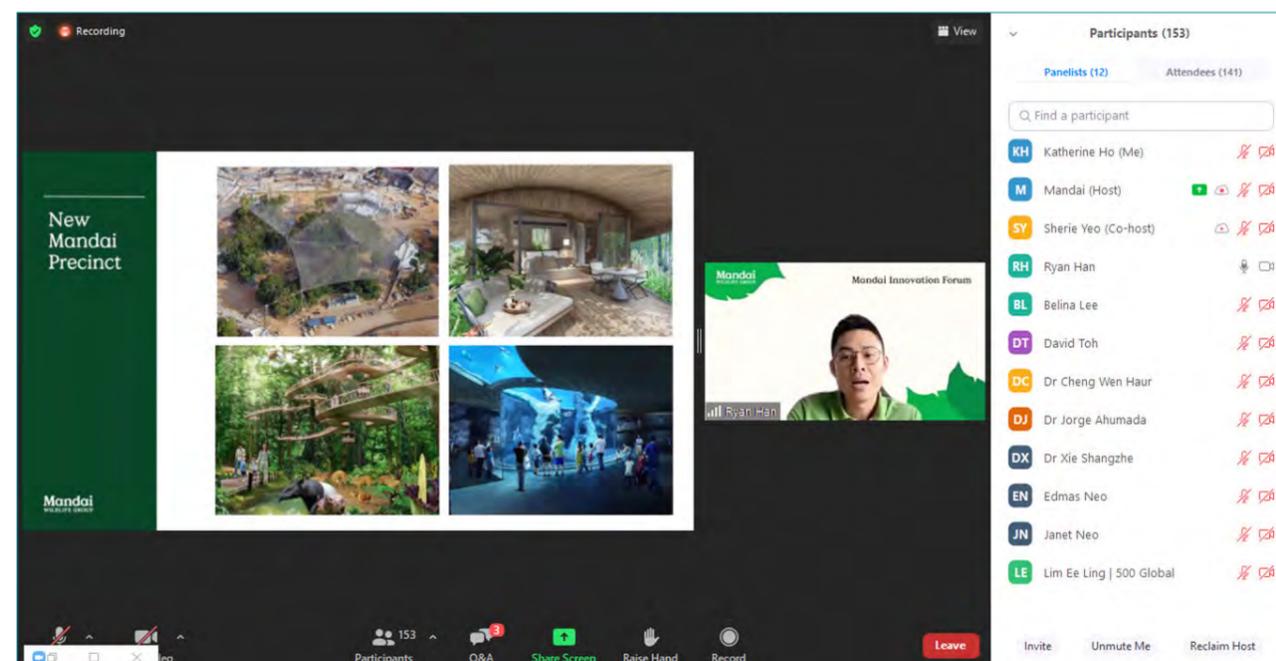
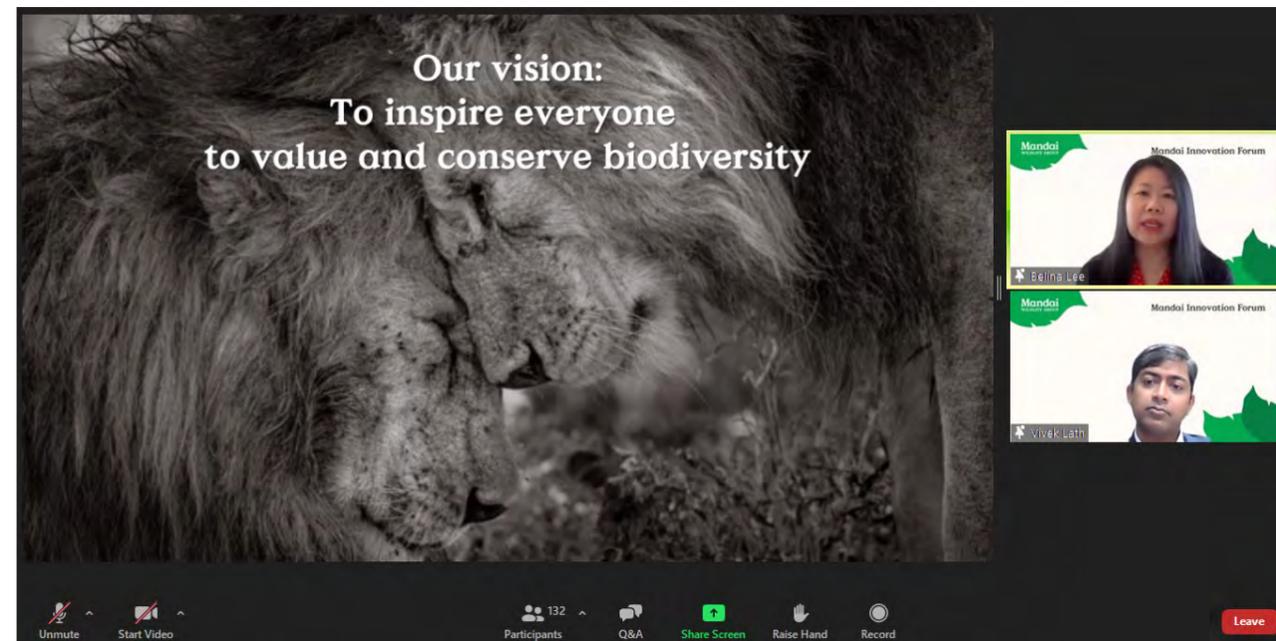
AGILE CHAMPIONS

Liyana saw a recurring problem where similar questions were being asked repeatedly by various staff, and created a prototype chatbot to assist staff with these enquiries.

Wei Meng consistently encourages and guides his team on how to better streamline work processes and cope more efficiently with the increased workload during the peak of the Covid pandemic.

Staying Agile, Building Resilience

Through these unpredictable times, our people have proven their collective resilience. We continued to be nimble in our response to new developments, making rapid adjustments to not only restore business operations, and also ensure future success in the new normal. In recognition of our efforts to adapt to business disruptions by leveraging our digital capabilities, we were presented the 2021 IDC Special Award for Digital Resiliency at the IDC Asia Pacific Future Enterprise Awards. This is one of the industry's most prestigious awards and we were honoured to be recognised alongside other heavyweights like Changi Airport Group, DBS and Grab.



Mandai Innovation Festival

Mandai Innovation Forum

Our first Mandai Innovation Forum, held in conjunction with Singapore Week of Technology & Innovation (SWITCH) on 11 November 2021, drew a worldwide audience from organisations like WWF, Ocean Park and Google as well as 70 of our staff. Speakers and panelists from Conservation International, Singtel, Lazada etc. were engaged in rich discussions on the use of technology, innovation and data in the conservation of wildlife and biodiversity, sustainability and engagement.

Besides providing a platform to network with likeminded academics, change-agents and start-up companies, the Forum also helped showcase Mandai's innovation projects to an international audience, and the exposure could be a catalyst for partnerships. By establishing Mandai as the thought-leader in our domain, we hope to ignite interest in global talents to join our mission. The Forum garnered an impressive 15,000 social media views and 276 sign-ups, including participants from Japan and the USA. We received feedback that the forum was engaging and provided our partners with a whole new perspective about us and the transformation efforts we have in the pipeline. Staff members who participated were reported excellent takeaways.



Mandai Hackathon

The Mandai Hackathon, held for 4 days in January 2021, aimed to build an innovative culture in Mandai. A learn-by-doing platform was provided for our staff to develop a chatbot using Power Virtual Agent that would assist frontline staff with answering guest enquiries and to provide them with timely updates on animals and park activities. A total of 29 participants worked in three cross-department teams to create three chatbots each with different features to enhance guest experience.

Mandai Innovation Week

Held over 25 – 27 January 2021, the event was an opportunity for our staff to learn about sustainability, technology, and guest experience from invited keynote speakers from Changi Airport Group, Grab and ELXR as well as in-house experts from the Commercial, Life Sciences, Park Operations and Strategy & Innovation Teams. The event was hopefully a springboard for our staff to have conversations about new ways of working.

Leveraging on Technology

We embarked on a Robotics Process Automation (RPA) project for New Joiners Onboarding Process. The bot was successfully launched in February 2022. The end-to-end process was reviewed to identify opportunities for process improvement and repetitive tasks were flagged out for automation.

With the process improvements and automation, the final onboarding process requires less human intervention and provides greater accuracy and consistency which result in faster turnaround time – average time saved is 66%.



Training And Development

Over the course of the financial year, 93% of our staff members participated in at least three learning activities. We continued to commit to staff development through the Continuing Education Scheme (CES), which will support ten members of staff for studies ranging from specialist diplomas to Masters programmes.

Skilling up for Animal Welfare

Training for Animal Care Staff

The quality of animal care and welfare is intrinsically related to the competency and effectiveness of our Animal Care Staff. A structured training framework guides the implementation and evaluation of the Zookeeper Development Programme (ZDP) and the in-house Animal Management Course (AMC). Together, they provide our Animal Care staff with a robust training and development plan, supported by coaching, and on-the-job and formal classroom learning.

The Zookeeper Development Programme (ZDP)

ZDP was launched in November 2019 to map out a path to guide Animal Care staff in attaining different competencies. It focuses on the hands-on and operational skills of animal care. In FY21/22, 63 staff completed at least one level of the ZDP. Since the launch of the programme, the total number of Animal Care staff who have completed at least one level of ZDP stands at 101.

Animal Management Course (AMC)

AMC seeks to bring a deeper understanding of the role of Animal Care staff in a modern zoo, and the zoo community at large. Through the training, the Animal Care staff are also given the opportunity to establish good communication lines with respective subject matter experts within our organisation.

We also reviewed the AMC syllabus to include more in-depth coverage of the care and physiological needs of each animal taxon. The knowledge gained will help Animal Care staff better understand their charges, leading to better informed decisions on care plans.



ZIMS Training

The Zoological Information Management System (ZIMS) is a global source of information on animals and their environments for zoos and aquariums built to serve animal management and conservation goals. Over the FY, the Animal Data Management and Transactions (ADMT) Team conducted in-house training for members from the Life Sciences Division. 34 staff are now proficient in the usage of the ZIMS Husbandry module, which is designed to manage information including animal behavioural observations, enrichment, training and feed logs. Nine staff members also attended the ZIMS Care and Welfare module to learn to use parameters such as physiological, behavioural, and environmental factors to monitor animals under their care.

Vet Skills Training

Internal skills training in clinical pathology, postmortem rounds, specialised ophthalmology surgery as well as reptile handling and snake relocation was conducted monthly. These sessions ensure veterinary staff are equipped with the skills to deliver best-in-class medical care for our animals.



Job Redesigning and Reskilling

Reskilling is essential to ensure our workforce is future-ready. Staff from the Commercial Team attended the Job Redesigning and Reskilling Programme to equip themselves with the necessary competencies required to create marketing campaigns and digital sales activities. They were also exposed to analytical skills and techniques to boost digital reach.

Culture Building

Mandai DNA

Leading up to our rebranding as Mandai Wildlife Group in October 2021, we ran a series of Mandai DNA workshops for close to 600 staff. The workshops aimed to bring our staff members onboard as wildlife advocates as we renewed our commitment to conservation and a sustainable future. As a wrap-up to the workshop, each participant made a commitment to protect wildlife in his/her own way and be a positive force for change.

Service Training

Customised training courses were developed for various departments such as F&B and Retail to help them deliver good guest experiences. In line with the brand change, service training was also conducted for Retail frontliners to help them tell more conservation stories to engage our guests better and deliver a unique shopping experience.

Our Commitment

- Pei Yee & Shangari "1. Protect the animals and their environment. 2. Share our knowledge on sustainability and conservation. 3. Provide best standards of care for our animals."
- Glenn "I want to gain more knowledge on reptiles & amphibians specifically, so that I can educate people that has fear on them."
- Adam "Animal welfare!"
- Vanessa "Give my support to colleagues, friends, family and visitors to the parks, when they want to learn more about animals and how we can make their lives better."
- Brynnia "To love them the best way I can."
- Reneed "I will commit to give my best care for the animals within our park including respect for our local fauna."
- Clara "To show love and respect for animals and nature."
- Yara "Animal health, welfare and conservation as a priority in our lives."
- Anba "To educate people/visitors more on great apes and specifically the issue on deforestation."
- Delio "Care for the animals, environment and nature to our best abilities."
- Karthirish "I will carry a tote bag with me whenever possible to reduce the impact of consuming plastics as an individual and to strive to be an epitome of sustainability."
- Salam "I will try my best to help our animal care staff to articulate their amazing experiences and stories about the animals they care for."
- Hafis "To educate people to love and conserve nature."
- Shanice "Same as Anba's! Just in general, to encourage conservation in small ways."
- Nickhoas "I will commit to educating the public on our animals and their needs."
- Joyce "I will try to advocate sustainability more fiercely to my colleagues, such as to save water at our workplace."
- Vernice "I commit to educating people that african painted dogs are not hyenas."
- Omar "I want to contribute more on the nutritional needs as part of the the welfare of animals."
- Gerardine "To prevent as many animals as possible from going extinct."
- Jagan "I will try to educate and share my love for nature to everyone I come across."
- Yuting & Charmaine "1. Learn something new about wildlife every day; 2. Interact with guests and share more about conservation."
- Amy "I will make sure my animals are healthy and happy!"
- Reuben "Provide for the needs for the animals and spread the message of conservation"
- Claudia "I. Strive to communicate with the public about animals that will hopefully leave a lasting positive impact on them. 2. Improve the lives of all animals."
- Xi Yun "To establish and uphold the best standards in care and welfare for animals and environment"
- Stefan "I commit to give positive experiences to our public and a safe living environment for our animals."
- Adrianna "I will be committed to learn more about wildlife and educate my little one, including other young individuals too."

Life Sciences & Mandai Nature

RFKW Stefan Nick Amy "We commit ourselves to do the best for our animals and the environment."

Sathia and Vijay "To share our knowledge on the animals to the public."

Dr Minerva "I will try my best to walk the talk - conservation really takes a lot of effort. I need to be more dedicated and take time to put in effort to join and share time to do conservation."

Amy "I will make sure my animals are healthy and happy!"

Adrianna "I will be committed to learn more about wildlife and educate my little one, including other young individuals too."

Collaborations For A Future-Ready Workforce

SGUnited Traineeship

We tapped on SGUnited Traineeship Programme to provide fresh graduates from Higher Institutes of Learning traineeship opportunities amidst a Covid-19 hit labour market.

Of the six trainees who joined under this programme, four of them have stayed on with us in either a permanent or contract role.

Internships Programmes

Internships are a way for us to collaborate with Institutes of Higher Learning (IHL). We welcomed 78 interns who were deployed in various departments across our organisation.

INSTITUTE OF HIGHER LEARNING	NUMBER OF INTERNS
INTERNATIONAL BACCALAUREATE ACS (Independent)	1
INSTITUTE OF TECHNICAL EDUCATION (ITE) College Central, College West	19
POLYTECHNIC Ngee Ann Polytechnic Republic Polytechnic Singapore Polytechnic Temasek Polytechnic	34
UNIVERSITY Nanyang Technological University National University of Singapore University Malaysia Sarawak Yale-NUS College	24
TOTAL	78

Social Sustainability

We continued to work closely with Social Service Agencies (SSAs) to make our parks accessible to more segments of our community. Close to 2,000 beneficiaries from various SSAs like Institute of Mental Health, St Andrew's Nursing Home, AWWA and AIC Agency for Integrated Care enjoyed a complimentary virtual outing via our 'Hello From The Wild Side' programme. More than 2,000 came on in-person visits, bringing the total number of beneficiaries to 4,107 – double the number in FY20/21. We also worked with existing and new partners to co-create wildlife experiences tailored to the specific needs of the communities they serve.

Serving The Community

JBP Gives Back

As part of Jurong Bird Park's year-long golden jubilee celebration, September 2021 was designated as a month of giving to remember the Singapore community that has continually supported JBP. More than 800 beneficiaries from various SSAs enjoyed complimentary visits, virtual Hello From the Wild Side or My Animal Buddy sessions and received goodie bags sponsored by our partners and personally delivered by staff volunteers. In support of the nation's call for seniors to be vaccinated, we also extended \$1 admission to some 2,500 vaccinated seniors. We also extended special JBP admission of \$5 to more than 150 frontline healthcare workers.



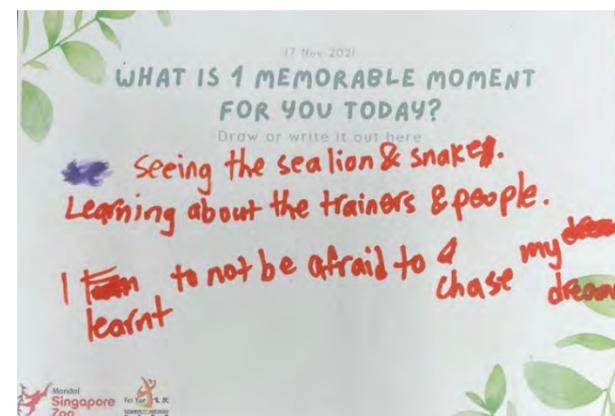
MWG x Temasek Foundation

In further appreciation of healthcare workers who have been working tirelessly to keep the nation safe, we partnered with Temasek Foundation to extend 50% discount on admission tickets to SingHealth, NHG and NUHS healthcare workers. More than 7,000 healthcare workers took up the discounted offer over the months of December 2021 and January 2022. On top of the discount, Temasek Foundation also purchased 12 corporate memberships and three giant panda virtual Hello From The Wild Side sessions for healthcare workers to enjoy with their families.

Career Guidance for Youths at Risk

Fei Yue (YouthGo!) Zoo Career Workshops

Fei Yue YouthGo! conducts outreach to support youths-at-risk and keep them off the streets. Collaborating with Fei Yue, we curated Zoo Career Workshops to provide social and work experience for the youths, in the hope that they may eventually seek meaningful careers with us. Besides interactions with animals, the youths gained insights into zoo careers through engagement with Life Sciences teams. Staff members also shared their personal experiences, which resonated well with the youths. Encouraged by the positive impact observed in the youths, an enhanced version of the programme was rolled out in early 2022 to expose the participants to other careers at the Zoo and also hone essential life skills needed in the work place.



Reaching Out To The Disadvantaged

Salvation Army Family Day

For the fourth year running, we co-created 'Wild Adventures' with the Salvation Army to bring families affected by incarceration on virtual and in-park outings. In response to feedback from past family days, we tailored the programme to cater to the interests of youths instead of just for young children. While the families enjoyed wildlife experiences virtually and in-park, they also gained exposure to the 7 Essential Life Skills, which are particularly useful to the children and youths. We were very heartened that the programme provided an opportunity of the families to spend quality time together to bond.



Partnerships For The Underprivileged

In partnership with The Hut, a non-profit organisation that supports underprivileged children, we matched every contribution via the Adopt an Animal Programme by members of the public in December 2021 with complimentary Rainforest Lumina tickets that were gifted to the children and their families. This provided an avenue for the public to make meaningful contributions in support of not only wildlife protection, but also a social cause with a tangible impact. A total of 57 tickets were given to the underserved community through The Hut.



Catering To Special Needs

Collaborating For Autism Awareness

The third Autism Awareness Weekend at River Wonders was made more meaningful through a collaboration with St Andrew's Autism School (SAAS). Prior to their learning journey SAAS students learnt more about freshwater animals through hands-on crafting of their likeness and learning activities for their visit were carefully curated and facilitated.

The children's artwork was showcased at the Amazon Flooded Forest over 2 & 3 April 2021, when River Wonders was opened an hour earlier to allow families with children on the spectrum to enjoy quiet moments and bonding time. Like in previous years, autism-friendly online resources were shared with families to help them plan their visit. A total of nine families participated in the early opening – a visual schedule and simple activities were prepared for them.



Thank you everyone for creating such a safe space for our students to learn, explore and grow. Thank you for going the extra mile with us. We truly appreciate it [...] and keep up the good work that you are doing. We look forward to our future collaboration together, as a team. Thank you for being advocates for people on the spectrum. :)

Educator from SAAS

Pause & Play with Pathlight School

Pause & Play is an online resource co-created with Pathlight School for special needs students. This is the second time we are collaborating with the school on autism-friendly resources, which comprise a video and manual to help teachers facilitate virtual learning journeys at Singapore Zoo. The resource was shared with all special needs schools in Singapore and made available on our website for all parents and educators to use with their children.



Sustaining our Business Performance

Though tourism took a tough hit with the global pandemic, we continued to enjoy staunch support from the locals. We remained nimble in reinventing our business model to not only survive but thrive in the new norm. With strengthened processes and controls firmly in place, we look forward to capitalising on opportunities that the tourism recovery will bring.

FY21/22 HIGHLIGHTS

- Achieved attendance of nearly **2 million** at our parks despite disruptions caused by the pandemic. A significant number were locals utilising their SingapoRediscover (SRV) vouchers.
- Launch of a **unified next-gen payments platform** covering all on-site and online channels, and all digital payment modes across the entire Mandai precinct.
- Launch of **Partners Promotions Portal**, an online platform to optimise sales outreach and dynamic collaborations with our Corporate Partners.
- Night Safari won the prestigious **Thea Classic Award** by the Themed Entertainment Association for standing the test of time over nearly three decades.

Driving Footfall

In FY21/22, attendance climbed to nearly 2 million, up 4% from 1.92 million in FY20/21. Visitorship for River Wonders jumped 10%, boosted no doubt by the heightened interest in Le Le, the panda cub who debuted in his nursery on 30 December 2021. Singapore Zoo also enjoyed a 10% uplift in attendance, attributed to unique park offerings and efforts to grow existing and new segments. Member attendance saw healthy growth, a nod towards innovative marketing campaigns that attract repeat visits. Though overall numbers are still less than half of what we saw pre-Covid, the upswing is encouraging, and we are gaining momentum.

A significant number of our visitors were locals utilising their SingapoRediscovered Vouchers (SRV). To offer more channels for citizens to book and spend their SRV voucher with us, we enabled the purchase of admission and other add-ons on both our direct channel and the five official SRV booking platforms. In total, we attracted more than 770,000 Singaporeans to spend their SRV vouchers to visit our four parks and Rainforest Lumina.

In-park Campaigns

Discover Mandai

Following the launch of our Mandai brand in October 2021, we partnered Sony on Discover Mandai, an activation that aims to showcase the different facets of Mandai Wildlife Reserve through photography. Seven of Sony's Alpha Photographers, each with a different area of expertise, were given access to our wildlife parks with the brief to uniquely interpret 'Mandai Come to Life' through their works. Displayed across Singapore Zoo and River Wonders, their photographs aim to introduce our transformation in identity and inspire the creation of Mandai moments in our parks. A #DiscoverMandai photo contest and series of photography workshops were conducted to deepen guest and member engagement.



Brickosaurs: Back From The Brink Of Extinction

Dinosaurs beguile young and old alike. To tap on the fascination with these ancient creatures and highlight the plight of threatened species, we brought in Brickosaurs, a unique, first-in-Asia experience. More than 60 structures made from over 1.5 million toy bricks were displayed across Singapore Zoo and River Wonders, from tiny raptors to the towering 4-metre-tall Plesiosaur, and the gigantic T-Rex weighing 1,964 kg. The display was complemented by plants décor featuring plants from prehistoric species, masterfully executed by our Horticulture Team.

The campaign paved the way for our first strategic marketing partnership with the LEGO Group. Exclusive mini figurines as door gifts were presented to all children visiting Singapore Zoo during the



campaign period of 13 November 2021 to 3 May 2022. Dinosaur-themed Brickosaurs set meals were introduced by F&B to complete the experience.



Wild About Twilight - A Pangolin's Tale

In response to positive feedback in the previous FY for Wild About Twilight, we followed up with Night Safari's very first wildlife Virtual Reality (VR) experience to attract young adults who resonate with digital offerings. Guests were invited to venture into the wild with Berani, our rescued Sunda pangolin, to discover hidden augmented reality animals and learn how they can lend a hand in the pangolin's fight against extinction.



JBP50 Jubilee Promotion

To round off JBP's 50th anniversary, locals enjoyed 50% off park admission in November and December 2021. Attendance received a boost of 59% against budget, bringing the total JBP visitorship in 2021 to 285,000, ending off the golden jubilee of Singapore's first wildlife park on a high.



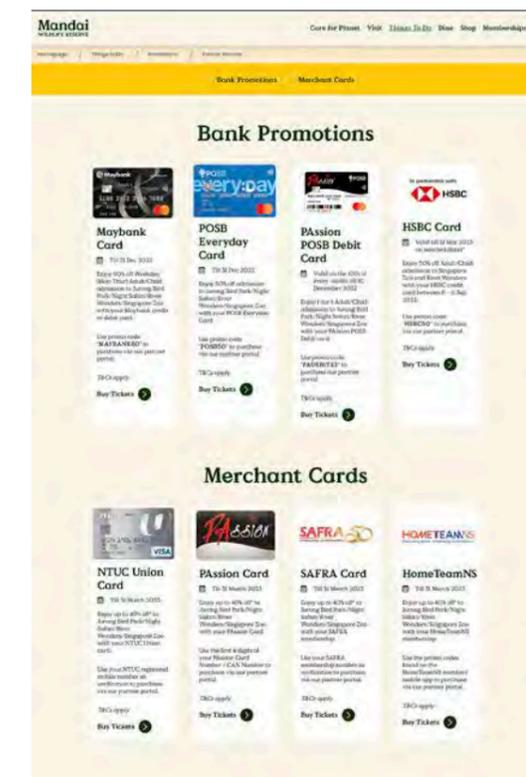
Rainforest Lumina Season 3

For the last season of Lumina from 8 July 2021 to 13 February 2022, we refreshed the experience with two new immersive zones. To tie in with the Chinese Mid-Autumn Festival, which sees families gathering for mooncake parties and other festivities, a special mid-autumn version was run in September 2021, with six new themed zones featuring traditional activities such as lantern making.



Partners Promotions Portal

Launched on 13 October 2021, the Partners Promotions Portal is an online platform to funnel multi-channel sales outreach and enable Corporate Partners to have more dynamic collaborations with us. By moving on-site and offline partnership online, the platform is a more robust way to maximise revenue stream. It also allows us to enable tactical offerings such as special weekday rates to push more visitations during our non-peak period. During the first launch, we activated partnership with banks like POSB, DBS and HSBC to offer attractive deals to their clients. We also joined hands with the three biggest community partners: PA, NTUC and SAFRA. Leveraging on their comms channels and databases, we increased outreach to their members. We will continue to use the portal to expand to wider customer segments and outreach both locally and globally.



Financial Sustainability

To protect jobs, provide for our animals and make impactful conservation investments, we continued with robust commercial approaches to secure the long-term financial sustainability of our operations. The Commercial Team worked tirelessly to offer not just new experiences but also focused on activities that increase yield per guest. Complimenting these efforts is the activation of a next-gen payments platform that covers all channels – on-site and online – while unifying all digital payment modes across existing and new attractions in our precinct.

Dining With A Difference

FY21/22 continued to be a challenging year for our F&B Team due to Safe Management Measures limiting dine-in group capacity and types of dining activities that can be carried out. Thanks to the team's resilience and adaptability to the evolving situation, we were able to continue delivering new dining initiatives and experiences to our guests.

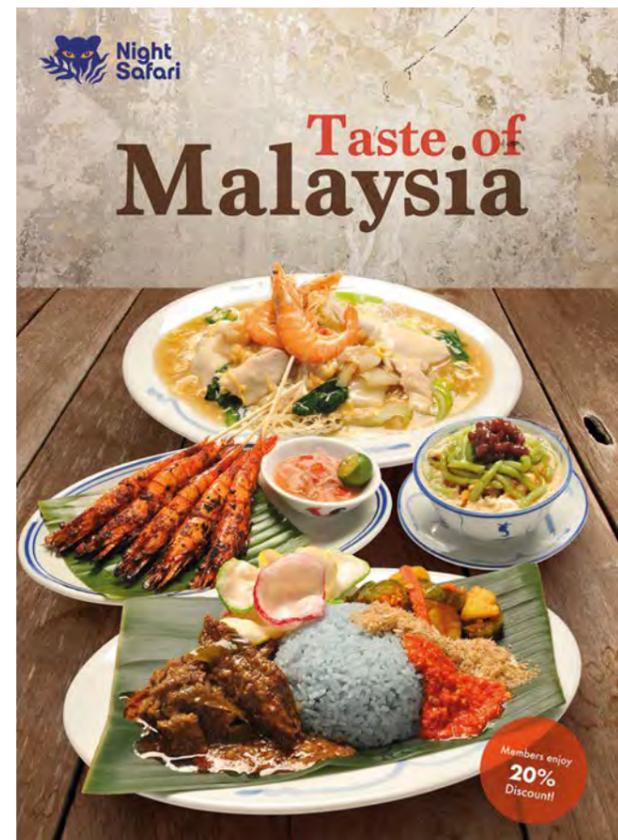
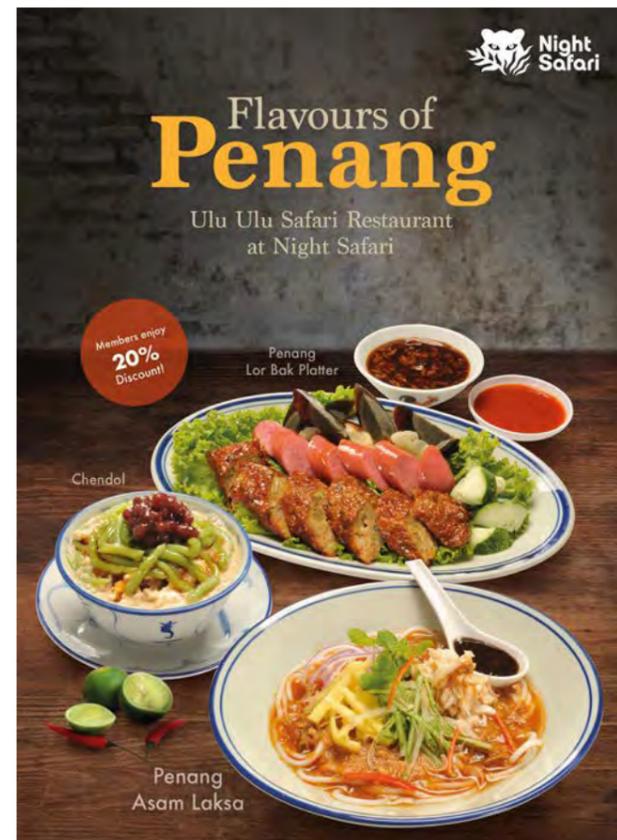
Adapting to Dine-in Limits

For nearly two and a half months in the first and second quarter, no dining-in was permitted at our F&B outlets though our parks continued to be operational. Within a short span of time, the team reworked all menus to offer grab-and-go meals to cater to guests needs. To comply with prevailing dine-in group capacity limits, the team had to respond almost

immediately with changes to seating arrangements multiple times throughout the reporting period. The team also refreshed the menus to cater to the largely local crowd.

Themed Dining

To allow for additional seating and dining choices, various set lunch menus were served at event venues like SZ Forest Lodge and JBP Flamingo Lodge. These are welcomed by guests as they provide a fuss-free dining experience in air-conditioned comfort. Flavours of Penang was launched at NS Ulu in July 2021 amidst much aplomb. Encouraged by the popularity of Flavours of Penang, the team launched Taste of Malaysia in January 2022 with expanded menu offerings to feature popular dishes and desserts from other parts of the peninsula.



Adoptions and Sponsorships

The support from individuals and corporates in the form of adoptions and donations grew even stronger in the FY. Key adoptions include the adoption of Sang Wira our male Asian elephant by Toppan Leefung and the adoption of our two giraffes by Kuok Singapore, which runs the PACC Container Line that transported them from India to Singapore in 2021.

Corporates and individuals also showed their support by sponsoring animal presentations, events and experiences in our parks. Bench, sculpture, and tree adoption opportunities continued to gain traction among the community.

We had five like-minded organisations including GIC and Standard Chartered Bank join us in the planting of trees along the Mandai Boardwalk. We also received in-kind sponsorship of veterinary equipment from Philips Healthcare that will help us provide better medical care for our animals. We are deeply grateful to all our adopters and sponsors for their generosity. Their solidarity with our cause helps us stand by our commitment to care for the animals living within and beyond our gates and also make a positive contribution to the fields of wildlife conservation and environmental protection. (see pages 14-15 for a complete list of adopters and sponsors)



Employees from GIC planting tree saplings as part of their Gift A Tree initiative to commemorate their 40th Anniversary.

Bringing New Experiences To Market

The Sales and Experience Development Team developed a full suite of Wildlife Experience programmes to expand our appeal across different segments. These allowed us to reposition our parks as some of the most iconic venues with one-of-a-kind experiences.

Hello from the Wild Side Season 2

The return of Season 2 of our virtual programme, Hello from the Wild Side, was timely as the relaunch coincided with the implementation of Phase 2 (Heightened Alert). The refreshed programme, titled Zoo Explained! took guests behind the scenes to meet our Veterinary and Animal Care teams to learn about how they care for our animals.



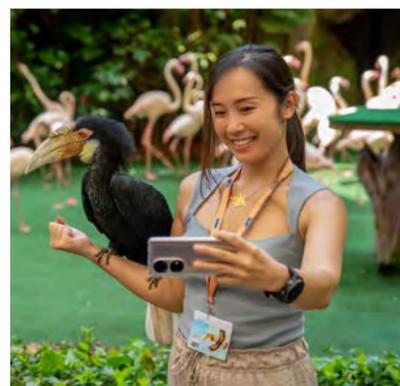
Evening In the Wild

We continued to roll out different thematic dining to capture the affluent segment. Corporates such as SIA Krisflyer, Audi, Xiaomi are among the companies that have seen value in our exclusive dining programme buyout. We hosted a reporter from CCTV, one of China's largest media platforms to experience Evening in the Wild: Night Safari's signature dining programme. The reporter shared her positive experience in a video story reaching a large potential key market for the programme.



Glamping to Staycation

We have transformed and enhanced Glamping to Staycation series, as the most sought-after staycation product in Singapore. Staycation with the Flamingos at Jurong Bird Park was launched, on the back of the positive reception to Staycation with the Manatees at River Wonders and Staycation in the Wild at Singapore Zoo last year. The nostalgic theme was most apt as this season of Staycation with the Flamingos would be the first and the last for Jurong Bird Park before moving to Mandai. Guests enjoyed exclusive interactions with birds and spent the night in a bell tent next to over 160 flamingos. The majority of the slots had been sold by end-FY.



Wild Weddings

We offer the one and only wildlife wedding concept in a natural setting – a departure from other offerings in the market. More than 20 weddings were held at our venues and we were recognised as one of the most noteworthy wedding venues in Singapore by Wedding Vow SG.

New Private Tours

New private tours such as Babies in the Wild and Panda-mania tour, increased revenue and yield significantly while providing memorable experiences to families and guests seeking a more immersive wildlife experience.



Rejuvenating In-Park Experiences

Despite the manpower crunch and worksite restrictions, we continued with master plan projects for our three parks at Mandai. Through the continual rejuvenation of exhibits and upgrading of back-of-house facilities, we hope to address customer pain points and deliver more uplifting wildlife experiences, and at the same time improve animal care standards.

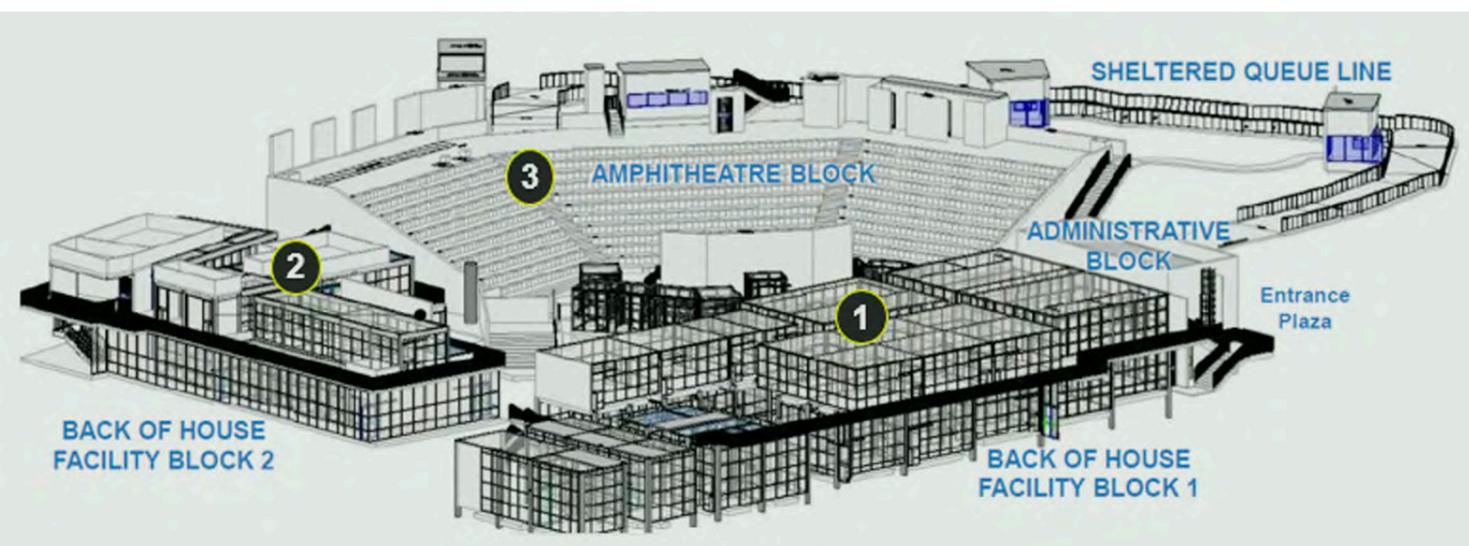
This spirit of constant renewal in our quest for excellence received a global stamp of approval in November 2021, when it was announced at the IAAPA Expo that Night Safari had won the Thea Classic Award. The award recognises an outstanding themed event or attraction that has stood the test of time. Presented by the Themed Entertainment Association (TEA), the Thea Awards are considered some of the most prestigious honours in the experience industry. Night Safari's win reinforces the value of experience design and themed approaches to engaging people worldwide. Past recipients include industry luminaries like Disneyland and Tivoli Gardens. We are humbled to join their ranks.

At Night Safari

New amphitheatre and presentation

The new Night Safari Amphitheatre will be home to a new immersive experience that draws guests into the mystery of the nocturnal world. Tapping on state-of-the-art audio, video, and lighting systems to create a magical atmosphere, the new presentation will use technology to complement the presentation of natural behaviours displayed by the animals.

Besides a larger seating capacity of 1,000 – up from 750 at the current one – seating and performance areas are also sheltered, so shows can continue even on rainy nights. A sheltered queue area will help ease congestion of Night Safari entrance plaza. The new amphitheatre and presentation are slated to debut at the end of 2022.



Indian rhino debut and feeding experience

30 April 2021 marked the official opening of the new Indian rhino complex, which is home to Indian rhino brothers "Thulie" and "Newari". The duo had arrived from Al Bustan Zoological Centre in the United Arab Emirates (UAE) in November 2020.

Prior to this, the Rhino Care Team had expended much effort to ready the herbivorous heavyweights for their guest interaction and feeding sessions. Given each of the rhinos is nearly 2 tonnes in weight, their training was not a task to be taken lightly by any means. The experience was opened for booking by members of the public on 13 February 2022.



Woylies @ Wallaby Trail

The woylies, or brush-tailed bettongs, arrived on 17 October 2021 from France. To accommodate the new arrivals, an exhibit which used to house the sugargliders was refurbished to simulate the natural habitat of the woylies. In view of their digging behaviour, extensive works entailing the installation of underground mesh had to be undertaken. The works were completed in time for the woylies to meet the Chinese New Year crowd on 28 January 2022.



At River Wonders

African Community Exhibit

Opened in June 2021, this new exhibit is one of the first to greet guests at River Wonders. It displays the unique and interesting reedfish. Also known as snakefish or ropefish, reedfish use full body movements when moving through the water quickly. They also possess a pair of lungs to help them breathe atmospheric air when they are out of water for an amount of time. The exhibit also showcases other African fishes like the kribensis as well as the yellowtail and oneline tetras.



Malawi Exhibit

An exhibit that previously housed the dwarf crocodile was converted to a new display featuring fishes and birds. The colourful and vibrant fishes which occupy the flowing water body of the exhibit can only be found in Lake Malawi of Africa. The exhibit highlights the diversity of animals that live in and around freshwater habitats.



At Singapore Zoo

Poison dart frogs @ Fragile Forest

With careful planning and creative use of space, a corner of Fragile Forest was carved out to become a beautifully planted habitat for the colourful and intriguing poison dart frogs. Through thoughtful refurbishments like this, we hope to spark in our guests a sense of wonder at the diversity of the world we live in.

Giant stick insects @ Australasia

Too often maligned and feared, many species of invertebrates remain unknown and unloved. To heighten guests' awareness of the indispensable role these unsung heroes play in the ecosystem, a section of the entrance to Australasia was converted into a display for two species of giant stick insects, which makes for an intriguing peek into their fascinating world of disguise, deception, and female domination.



Up close again with animals and keepers

Since the onset of the pandemic, Buddy Barn had remained closed to the public due to Covid-19 restrictions. With the relaxation of Safe Management Measures towards the end of FY, Buddy Barn was finally reopened to public and guests could come up close and personal with the animals at the barn. Keeper chats at other zones like Primate Kingdom were also resumed, allowing guests to hear first-hand again from the people closest to our animals.



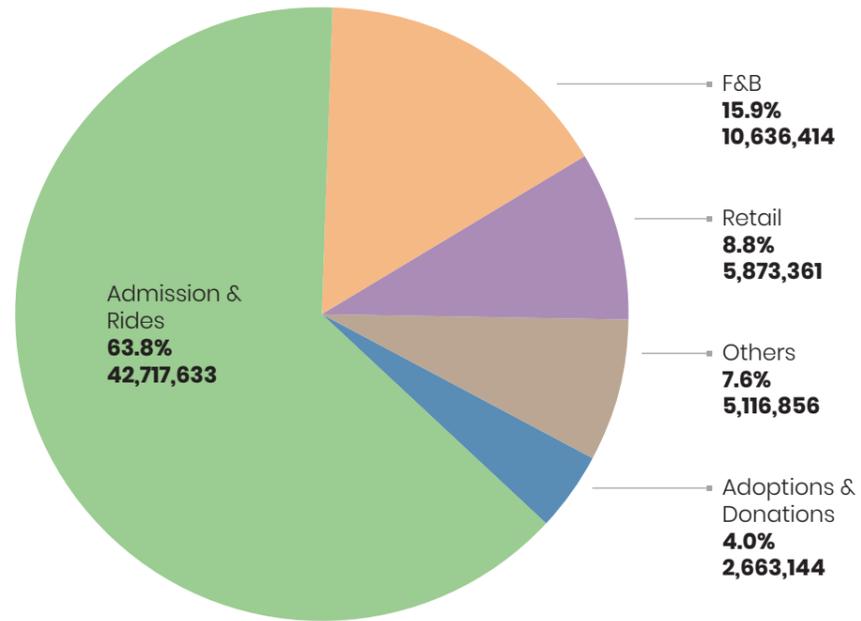
Constructing the new Kidzworld

By providing a compelling animal interaction experience that is positive for both guests and animals, the new KidzWorld is where children can nurture a love for animals and nature through discovery and play while creating memories with their families. Programming will differentiate each experience to encourage repeat visits while driving incremental revenue through premium activities. The new Kidzworld is slated to open in the first quarter of 2023.

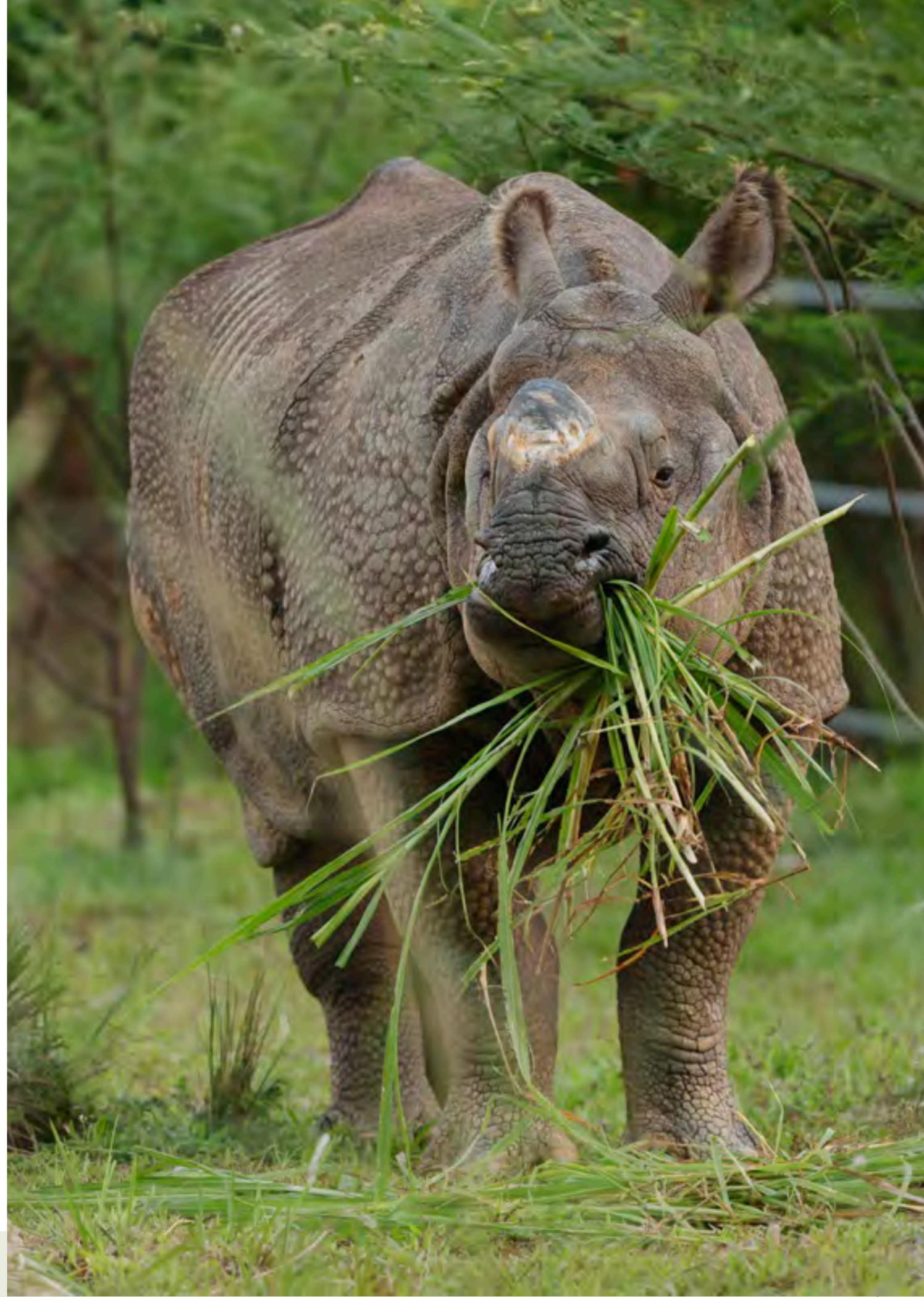
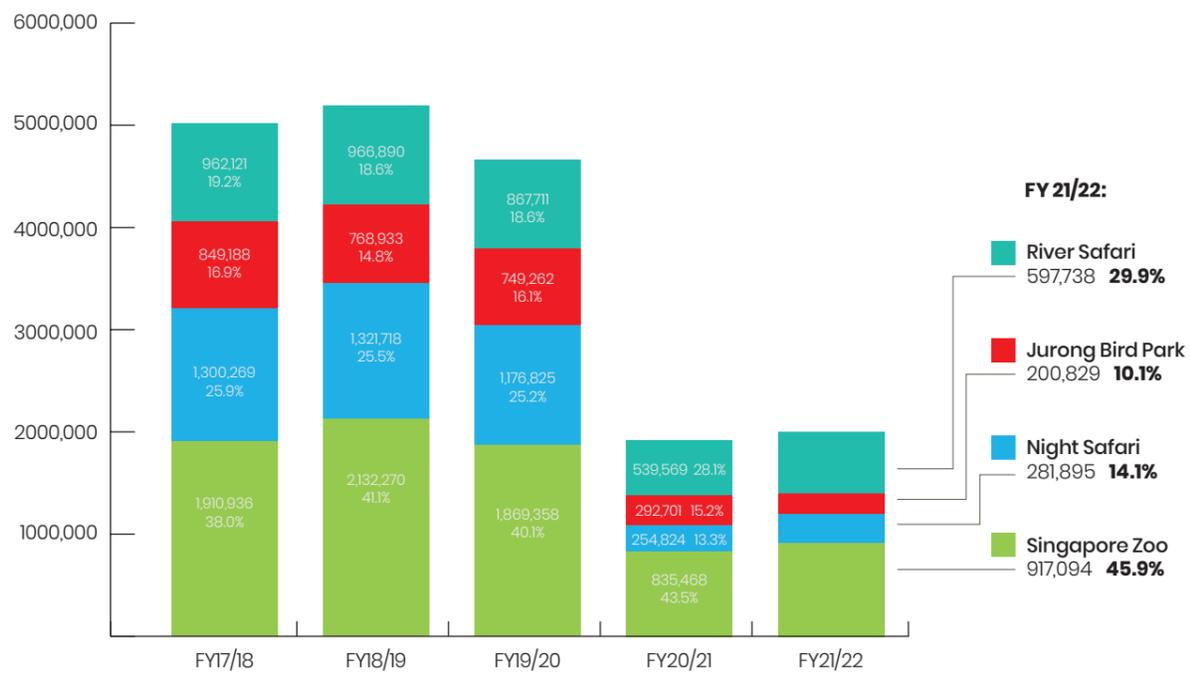


Financial & Attendance Highlights

REVENUE FOR FY21/22
\$67,007,408



TOTAL GUESTS FOR FY 21/22
1,997,556



The Year Ahead

Global travel is picking up, indicating strong pent-up demand, but arrival numbers remain a fraction of Singapore's pre-pandemic numbers. The slow opening of China, volatile global political and economic environment, as well as the evolving health situation, mean that tourism flows will continue to face headwinds. To navigate the challenges we face, we will focus on three key priorities:

- **Rebuild our visitorship and grow our revenue**

A huge array of commercial initiatives is being undertaken to rebuild our visitorship and generate the revenue needed to support the business. Our Sales & Marketing Teams are busy engaging with key markets, working with STB and key agents and preparing a whole range of exciting campaigns and experiences to boost interest and visitorship to our parks.

- **Complete the development work on Bird Paradise, and sustain our progress on other worksites and the rollout of the masterplan for existing parks**

We are confident of completing our construction work on Bird Paradise and West Node and securing the site-wide Temporary Occupation Permit (TOP) in the coming months. As we progress with all the development work, we will continue to work together to minimise the negative impact for guests and animals under our care.

- **Continue to innovate and explore new opportunities to grow our influence and transform our business**

We will continue to explore new opportunities in this area, including our Transformation 2.0 initiatives as well as collaborations with other leading zoos on long-term species management to ensure we have a genetically and demographically sustainable population of animals under our care. Working hand in hand with Mandai Nature, we will continue to ramp up direct conservation involvement and impact for threatened species locally and in the region.



Conservation Projects supported in FY21/22

NO	PROJECT NAME	COUNTRY	SPECIES	TAXON
1	Critical law enforcement support for Cambodia's Cardamom Rainforest	Cambodia	Multi taxa	Multi taxa
2	Conservation of the globally threatened Southern River Terrapin (<i>Batagur affinis</i>) in the Sre Ambel River System in Cambodia	Cambodia	Southern river terrapin	Reptile
3	Restoring a viable population of Siamese Crocodile within the Sre Ambel River system, Cambodia	Cambodia	Siamese crocodile	Reptile
4	Guidance on responsible conservation translocation of displaced threatened fauna and flora	Global	Multi taxa	Multi taxa
5	Species Conservation Toolkit Initiative	Global	Multi taxa	Multi taxa
6	Species360 Conservation Science Alliance Support	Global	Multi taxa	Multi taxa
7	IUCN Membership	Global	Multi taxa	Multi taxa
8	IUCN SSC Chair Support	Global	Multi taxa	Multi taxa
9	Amphibian Ark	Global	Multiple amphibian species	Amphibian
10	Save the Tasmanian Devil - Veterinary expenses to contribute to the goal of creating a resilient wild devil population	Global	Tasmanian Devil	Mammal
11	Addressing Human Orangutan Conflict in Leuser and Batang Toru Landscapes	Indonesia	Sumatran orangutan, Tapanuli orangutan	Mammal
12	Sustainable Operation Of The ERU as part of the Way Kambas National Park ERU Program for Habitat Protection and HEC Mitigation	Indonesia	Sumatran elephant	Mammal
13	Conservation of Rote Island Snake-necked Turtle (<i>Chelodina mccordi</i>)	Indonesia	Rote island snake-necked turtle	Reptile
14	Wildlife Trade Mitigation Strategy and Yaki Pride Campaign to reduce threats to the Critically Endangered Sulawesi crested black macaques (<i>Macaca nigra</i>)	Indonesia	Celebes Crested Macaque	Mammal
15	Gibbons and Community Based Conservation: Java and Mentawai	Indonesia	Multiple gibbon species	Mammal
16	Saving Sulawesi's Endemic Biodiversity at the Nantu Rainforest, Indonesia	Indonesia	Multi taxa	Multi taxa
17	EAZA Komodo EEP conservation programme: Wae Wuul Reserve Protection Programme 2020	Indonesia	Komodo dragon	Reptile
18	Conservation of the Bali Starling within the Melinggih Kelod village through Community Activities	Indonesia	Bali starling	Bird
19	Kembali Bebas Avian Rescue, Rehabilitation and Release Centre	Indonesia	Multiple bird species	Bird
20	Saving the Wild Bird Populations of Sumatra, Lombok and Bali	Indonesia	Multiple bird species	Bird
21	Asian Songbird Crisis Barusan Shama Breeding Facility - Simeulue Island	Indonesia	Barusan Shama	Bird
22	Core funding for the ex-situ programs at Yayasan Cikananga Konservasi Terpadu	Indonesia	Multi taxa	Multi taxa
23	Conserving ASAP and Priority Species through an Integrated Approach in West Kalimantan, Indonesia	Indonesia	Multi taxa	Multi taxa
24	Ending the practice of bear bile farming in Lao PDR	Lao PDR	Multiple bear species	Mammal
25	Biodiversity conservation in Nakai - Nam Theun National Park in the Annamite Mountains of Lao PDR	Lao PDR	Multi taxa	Multi taxa
26	Saola Foundation	Lao PDR	Saola	Mammal
27	Citizen Action for Tigers: engaging people to value and protect tigers and their habitat in Malaysia	Malaysia	Malayan tiger	Mammal
28	Anti-poaching strategies to protect Sunda pangolins and other threatened species Deramakot Forest Complex, Sabah, Malaysia	Malaysia	Multi taxa	Multi taxa
29	Crucial Bat Pollinators: Promoting and mainstreaming the importance of bat pollinators in Peninsular Malaysia	Malaysia	Multiple bat species	Mammal
30	Combating the illegal and unsustainable trade in songbirds in Sarawak, Malaysia	Malaysia	Multiple bird species	Bird
31	Restoring a population of critically endangered Burmese Star Tortoises at Chattin Wildlife Sanctuary, Myanmar	Myanmar	Burmese star tortoise	Reptile
32	The use of local dogs in detecting wild Palawan Pangolins for research and conservation in Palawan, Philippines	Philippines	Palawan pangolin	Mammal
33	Ex- and in-situ conservation of the critically endangered Palawan Forest Turtle (<i>Siebenrockiella leytensis</i>) in Palawan, Philippines - extension	Philippines	Palawan forest turtle	Reptile
34	Tamaraw: One Plan Approach Conservation Project	Philippines	Tamaraw	Mammal
35	Project Palaka Phase II Platymantis insulatus Conservation and Research	Philippines	Gigante Wrinkled Ground Frog	Amphibian
36	West Visayan Species Recovery Project	Philippines	Multi taxa	Multi taxa
37	Assessing the feasibility of Conservation Translocation for the Great Philippine Eagles	Philippines	Philippine Eagle	Bird
38	Community-based conservation of the Philippine Cockatoo (<i>Cacatua haematuropygia</i>) and its habitats	Philippines	Philippine Cockatoo	Bird
39	Global welfare certification and accreditation process training for online and onsite platforms	Regional	Multi taxa	Multi taxa
40	Safeguarding Southeast Asia's wildlife from illegal and unregulated trade	Regional	Multi taxa	Multi taxa
41	Conservation planning for terrestrial vertebrates of the Philippines	Regional	Multi taxa	Multi taxa
42	Publication support for 'Gajah' Journal	Regional	Asian elephant	Mammal
43	Himalayan Otter Network Workshop	Regional	Multiple otter species	Mammal
44	IUCN Hornbill Specialist Group	Regional	Multiple hornbill species	Bird
45	Species Action Plan for the Conservation of Raffles' Banded Langurs in Singapore (Phase 3)	Singapore	Raffles' Banded Langur	Mammal
46	Elucidating global population genetic structure and connectivity of turtle seagrass (<i>Thalassia hemprichii</i>)	Singapore	Turtle seagrass	Multi taxa
47	Biology and distribution patterns of "near threatened" sharks (Phase 2)	Singapore	Bamboo shark and other native species	Multi taxa
48	Novel techniques for the conservation of the Cave Nectar Bat (<i>Eonycteris spelaea</i>) in Singapore	Singapore	Cave nectar bat	Mammal
49	An investigation into sharks and rays imported to Singapore ports to uncover characteristics of this fishery and understand shark and ray biodiversity in the region	Singapore	Multi taxa	Multi taxa
50	Phenology of Singapore's Resident Avifauna	Singapore	Multiple bird species	Bird
51	Scaling up implementation of the Sunda Pangolin National Conservation Strategy and Action Plan	Singapore	Sunda pangolin	Mammal
52	Conservation biology of the Singapore freshwater crab: understanding drought and acidification impacts	Singapore	Singapore freshwater crab	Crustacean
53	Understanding the mechanisms underlying diversity patterns in rocky intertidal systems for creating sustainable coastal eco-engineering solutions in Singapore	Singapore	Multi taxa	Multi taxa
54	Every Singaporean A Naturalist	Singapore	Local biodiversity	Multi taxa
55	Preserving the moonlight orchestra of Singapore: Building bioacoustics database and investigating communication personality	Singapore	Multi taxa	Multi taxa
56	Using genomic data to elucidate transmission dynamics of blood parasites across bird hosts, mosquito vectors and endosymbionts in Singapore	Singapore	Multiple bird species	Bird
57	Genome sequencing and population genetic studies of the hawksbill turtles nesting around Singapore to protect the species	Singapore	Hawksbill turtle	Reptile
58	Integrating genetic data to construct dung beetle-mammal trophic networks in Southeast Asian forest canopies	Singapore	Multi taxa	Multi taxa
59	Conserving Singapore's Last Wildcat Through a Participative Community Mural	Singapore	Multi taxa	Multi taxa
60	Reducing threats of civet farming to secure Owston's Civet populations and protect public health	Vietnam	Owston's civet	Mammal
61	In Search of Vietnam Pheasant (<i>Lophura edwardsi</i>) in the wild	Vietnam	Vietnam Pheasant	Bird

Scientific Publications FY21/22

Peer-reviewed publications

Chong, S. M., Heng, Y., & Yeong, C. Y. F. (2021). Pyelonephritis and Cystic Endometrial Hyperplasia in a Captive Sunda Pangolin (*Manis javanica*). *Journal of Comparative Pathology*, 184, 101-105.

Tidière, M., Douay, G., Müller, P., Siberchicot, A., Sliwa, A., Whipple, M., & Douhard, M. (2021). Lifespan decreases with proportion of sons in males but not females of zoo-housed tigers and lemurs. *Journal of Evolutionary Biology*.

Rasidi, E. K., & Xie, S. (2021). Managing Disease Outbreaks in Captive Flocks of Birds. *Veterinary Clinics: Exotic Animal Practice*, 24(3), 531-545.

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Lloyd, R. Repair of a corneal laceration and iris prolapse in a juvenile goliath tigerfish, *Hydrocynus goliath* Boulenger. *Veterinary Record Case Reports*, e2155.

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Nguyen, P., Wearn, O. R., Nguyen, P. D., Raghavan, R., Wu, H. Y., Zhang, Z. J. (2021). International workshop to develop a conservation action plan for the Critically Endangered cao vit gibbon *Nomascus nasutus*. *Oryx* 55(5), 649-655

Jain, A., Aloysius, S. L. M., Lim, H., Plowden, T., Yong, D. L., Lee, J. G., & Phelps, J. (2021). Understanding Singapore's dynamic parrot trade ecosystem. *Oryx*, 1-11.

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Tidière, M., Müller, P., Sliwa, A., Siberchicot, A., & Douay, G. (2021). Sex-specific actuarial and reproductive senescence in zoo-housed tiger (*Panthera tigris*): The importance of sub-species for conservation. *Zoo Biology*.

Douay, G., Chong, S. M., Yeo, C. W., & Hsu, C. (2021). Carpal ganglion cyst in an Asian small-clawed otter (*Aonyx cinereus*). *Journal of Exotic Pet Medicine*, 39, 76-77.

Xie, S., Trott, D. J., Saputra, S., Ebrahimie, E., Dehcheshmeh, M. M., Page, C., ... & Govendir, M. (2021). Pharmacokinetic profile and effect on the faecal microbiome of a single dose of pradofloxacin oral suspension in the rabbit (*Oryctolagus cuniculus*). *Journal of Veterinary Pharmacology and Therapeutics*.

Aliansyah, E., Chng, H. T., & Xie, S. (2021). A Critical Review of the Pharmacokinetics and Pharmacodynamics of Opioid Medications Used in Avian Patients. *Birds*, 3(1), 1-28.

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Chao, N., Loffeld, T. A., Mastro, K., Willcox, D. H., Guthrie, V., & Rao, M. (2022). Strengthening capacity for species conservation in South-east Asia: a provisional assessment of needs and opportunities for the Asian Species Action Partnership. *Oryx*, 1-4.

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IUCN Working Group Report

The IUCN SSC Asian Songbird Trade Specialist Group: A Brief Report On Its First Four Years: 2017-2020

Husbandry Guidelines

EAZA Best Practice Guidelines for Dragon Headed Katydid

Bulletins and Newsletters

Dawn Chorus Vol 1(1): Newsletter of the IUCN SSC Asian Songbird Trade Specialist Group

How Covid-19 transformed guest interactions with wildlife at the Singapore Night Safari in AZA Ambassador Animal SAG Newsletter

Managed Species Programmes in FY21/22

SPECIES	COMMON NAME	PROGRAMME	IUCN RED LIST STATUS
<i>Acinonyx jubatus jubatus</i>	Southern Cheetah	EEP	VU
<i>Acridotheres melanopterus</i>	Black-winged Myna (Complex)	EEP / ISB	CR
<i>Aegypius monachus</i>	Cinereous Vulture	EEP	NT
<i>Ailuropoda melanoleuca</i>	Giant Panda	CWCA	VU
<i>Ailurus fulgens</i>	Red Panda	EEP / GSMP	EN
<i>Aldabrachelys gigantea</i>	Aldabra Tortoise	EEP	VU
<i>Alligator sinensis</i>	Chinese Alligator	EEP	CR
<i>Alopecoenas sanctaerucis</i>	Santa Cruz Ground-dove	EEP & In-situ linked project	EN
<i>Alouatta caraya</i>	Black Howler Monkey	EEP	LC
<i>Amazona a. lilacina</i>	Ecuadorian Amazon	EEP	EN
<i>Amazona viridigenalis</i>	Green-cheeked Amazon	EEP	EN
<i>Anas melleri</i>	Moller's Duck	EEP	EN
<i>Anodorhynchus hyacinthinus</i>	Hyacinth Macaw	EEP	VU
<i>Anthracoeros malayanus</i>	Black Hornbill	EEP	VU
<i>Aotus griseimembra</i>	Grey-handed Nigh-monkey	EEP	VU
<i>Aptenodytes patagonus</i>	King Penguin	EEP	LC
<i>Ara ambiguus</i>	Great Green Macaw	EEP	EN
<i>Ara glaucogularis</i>	Blue-throated Macaw	EEP	CR
<i>Ara rubrogenys</i>	Red-fronted Macaw	EEP	CR
<i>Aratinga solstitialis</i>	Sun Parakeet	EEP	EN
<i>Argusianus argus</i>	Great Argus	ESB	VU
<i>Asacornis scutulata</i>	White-winged Duck	EEP	EN
<i>Astrochelys radiata</i>	Radiated Tortoise	EEP	CR
<i>Astrochelys yniphora</i>	Ploughshare Tortoise	EEP	CR
<i>Aythya baeri</i>	Baer's Pochard	ESB	CR
<i>Balearia pavonina</i>	West African Crowned Crane	ESB	VU
<i>Bettongia penicillata</i>	Brush-tailed Bettong	EEP	CR
<i>Bubalus depressicornis</i>	Lowland Anoa	ISB	EN
<i>Buceros bicornis</i>	Great Hornbill	EEP	VU
<i>Buceros hydrocorax / mindanensis</i>	Rufous Hornbill	EEP	VU
<i>Buceros rhinoceros</i>	Rhinoceros Hornbill	EEP	VU
<i>Bucorvus leadbeateri</i>	Southern Ground Hornbill	EEP	VU
<i>Bugeranus carunculatus</i>	Wattled Crane	ESB	VU
<i>Bycanistes brevis</i>	Silvery-cheeked Hornbill	EEP	LC
<i>Cacatua alba</i>	White Cockatoo	EEP	EN
<i>Cacatua haematurophygia</i>	Philippine Cockatoo	EEP	CR
<i>Cacatua moluccensis</i>	Moluccan Cockatoo	EEP	VU
<i>Cacatua sulphurea citrinocristata</i>	Citron-crested Cockatoo	EEP	CR
<i>Callimico goeldii</i>	Goeldi's Monkey	EEP	VU
<i>Capra falconeri hepteneri</i>	Turkmenian Markhor	EEP	NT
<i>Casuarus casuaris</i>	Southern Cassowary	ESB	LC
<i>Ceratogymna atrata</i>	Black-casqued Hornbill	EEP	LC
<i>Ceratotherium simum simum</i>	Southern White Rhinoceros	ISB	NT
<i>Cercopithecus torquatus</i>	Cherry-crowned Mangabey	EEP	EN
<i>Cercopithecus neglectus</i>	De Brazza's Monkey	EEP	LC
<i>Chelodina mccordi</i>	Roti Snake-necked Turtle	EEP & In-situ linked project	CR
<i>Chilabothrus anguliger</i>	Cuban Boa	ESB	NT
<i>Choeropsis liberiensis</i>	Pygmy Hippopotamus	EEP	EN
<i>Choloepus didactylus</i>	Linnaeu's Two-toed Sloth	ESB	LC
<i>Chrysocyon brachyurus</i>	Maned Wolf	EEP	NT
<i>Cinnyrus regius</i>	King Bird-of-Paradise	EEP	LC
<i>Ciconia abdimii</i>	Abdim's Stork	ESB	LC
<i>Cissa thalassina</i>	Javan Green Magpie	EEP	CR
<i>Coendu prehensilis</i>	Prehensile-tailed Porcupine	ESB	LC
<i>Colobus guereza</i>	Eastern Black-and-white Colobus	EEP	LC
<i>Crocuta crocuta</i>	Spotted Hyena	EEP	LC
<i>Cryptoprocta ferox</i>	Fossa	EEP	VU
<i>Cyanerpes cyaneus</i>	Red-legged Honeycreeper	EEP	LC
<i>Dendrolagus goodfellowi</i>	Goodfellow's Tree Kangaroo	EEP	EN
<i>Dryonastes courtosi</i>	Blue-crowned Laughingthrush	EEP / GSMP	CR
<i>Elephas maximus</i>	Asian Elephant	EEP	EN
<i>Ephippiorhynchus senegalensis</i>	Saddle-billed Stork	ESB	LC
<i>Equus grevyi</i>	Grevy's Zebra	EEP	EN
<i>Eudiptes moselyi</i>	Northern Rockhopper	EEP	EN
<i>Galago senegalensis</i>	Northern Galago	EEP	LC
<i>Gallinula crinigera</i>	Mindanao Bleeding-heart	ESB	VU
<i>Gallinula keayi</i>	Negros Bleeding-heart	DENR	CR
<i>Garrulax bicolor</i>	Sumatran Laughingthrush	EEP	EN
<i>Gavialis gangeticus</i>	Indian Gharial	ESB	CR
<i>Geochelone elegans</i>	Indian Star Tortoise	EEP	VU
<i>Geochelone platynota</i>	Burmese Star Tortoise	EEP	CR
<i>Geokichla dohertyi</i>	Chestnut-backed Thrush	EEP	NT
<i>Geronticus eremita</i>	Northern Bald Ibis (Waldrapp)	EEP	EN
<i>Giraffa camelopardalis</i>	Giraffe	EEP	VU
<i>Goura cristata</i>	Western Crowned Pigeon	ESB	VU
<i>Goura slaterii</i>	Slater's Crowned Pigeon	ESB	NT
<i>Goura victoria</i>	Victoria Crowned Pigeon	ESB	NT
<i>Gyps africanus</i>	African White-backed Vulture	EEP	CR
<i>Helarctos malayanus</i>	Sun Bear	SSMP	VU
<i>Heloderma horridum exasperatum</i>	Mexican Beaded Lizard	EEP	LC
<i>Heloderma suspectum</i>	Gila Monster	EEP	NT
<i>Hoosemya spinosa</i>	Spiny Turtle	EEP	EN
<i>Hyaena hyaena</i>	Striped Hyena	EEP	NT
<i>Hylabates lar</i>	Lar (White-handed) Gibbon	EEP	EN
<i>Hylabates pileatus</i>	Pileated Gibbon	EEP	EN
<i>Lemur catta</i>	Ring-tailed Lemur	EEP	EN

SPECIES	COMMON NAME	PROGRAMME	IUCN RED LIST STATUS
<i>Leontopithecus chrysomelas</i>	Golden-headed Lion Tamarin	EEP / ISB	EN
<i>Leontopithecus rosalia</i>	Golden Lion Tamarin	EEP / ISB	EN
<i>Leptoptilos javanicus</i>	Lesser Adjutant	ESB / SSP	VU
<i>Leucopsar rothschildi</i>	Bali Myna	EEP	CR
<i>Liasis mackloti savuensis</i>	Savu Python	ESB	LC
<i>Lophura edwardsi</i>	Vietnam Pheasant	EEP	CR
<i>Lorius domicella</i>	Purple-naped Lory	ESB	EN
<i>Lorius garrulus</i>	Chattering Lory	ESB	VU
<i>Macaca silenus</i>	Lion-tailed Macaque	EEP	EN
<i>Madaqua kirkii</i>	Kirk's Dik-dik	ESB	LC
<i>Malaccochersus tornieri</i>	Pancake Tortoise	EEP	CR
<i>Manis javanica</i>	Sunda Pangolin	SSMP	CR
<i>Mauremys sp</i>	Chinese Stripe-necked Turtle	EEP	CR
<i>Melursus ursinus</i>	Sloth Bear	ISB / EEP	VU
<i>Mico argentatus</i>	Silvery Marmoset	EEP	LC
<i>Musophaga violacea</i>	Violet Turaco	ESB	LC
<i>Myrmecophaga tridactyla</i>	Giant Anteater	EEP / ISB	VU
<i>Neofelis nebulosa</i>	Clouded Leopard	EEP	VU
<i>Nesoenas mayeri</i>	Pink Pigeon	EEP	VU
<i>Nomascus gabriellae</i>	Buff-cheeked Gibbon	EEP	EN
<i>Nycticebus coucang</i>	Sunda Slow Loris	EEP	VU
<i>Pan troglodytes</i>	Chimpanzee	EEP	EN
<i>Panthera leo</i>	African Lion	EEP	VU
<i>Panthera leo persica</i>	Asian Lion	EEP	EN
<i>Panthera onca</i>	Jaguar	EEP	NT
<i>Panthera pardus kotiya</i>	Sri Lankan Leopard	EEP	EN
<i>Panthera tigris jacksoni</i>	Malayan Tiger	ISB	CR
<i>Pelecanus philippensis</i>	Spot-billed Pelican	EEP	NT
<i>Pelecanus rufescens</i>	Pink-backed Pelican	EEP	LC
<i>Phleomys pallidus</i>	Northern Luzon Cloud Rat	ESB	LC
<i>Pitta sordida</i>	Hooded Pitta	ESB	LC
<i>Platalea minor</i>	Black-faced Spoonbill	JAZA	EN
<i>Polyplectron inopinatum</i>	Mountain Peacock-pheasant	ESB	VU
<i>Polyplectron malacense</i>	Malay Peacock-pheasant	ESB	VU
<i>Pongo abelii</i>	Sumatran Orangutan	SSMP / ISB	CR
<i>Pongo pygmaeus</i>	Bornean Orangutan	SSMP	CR
<i>Prionailurus viverrinus</i>	Fishing Cat	EEP	VU
<i>Probosciger aterrimus</i>	Palm Cockatoo	EEP	LC
<i>Pteronutra brasiliensis</i>	Giant Otter	EEP	VU
<i>Ptilinopus melanospilus</i>	Black-naped Fruit-dove	ESB	LC
<i>Pycnonotus zeylanicus</i>	Straw-headed Bulbul	EEP	CR
<i>Pygoscelis papua</i>	Gentoo Penguin	ESB	LC
<i>Pythecophaga jefferyi</i>	Philippine Eagle	DENR	CR
<i>Ramphastos toco</i>	Toco Toucan	ESB	LC
<i>Ramphastos tucanus</i>	Red-billed Toucan	ESB	LC
<i>Rhinoceros unicornis</i>	Indian Rhinoceros	ISB	VU
<i>Rhyticeros cassidix</i>	Knobbed Hornbill	EEP	VU
<i>Rhyticeros plicatus</i>	Papuan Hornbill	EEP	LC
<i>Rhyticeros undulatus</i>	Bar-pouched Hornbill	EEP	VU
<i>Saguinus imperator</i>	Emperor Tamarin	EEP	LC
<i>Saimiri sciureus</i>	Common Squirrel Monkey	EEP	LC
<i>Sarcoramphus papa</i>	King Vulture	ESB	LC
<i>Scopus umbretta</i>	Hammerkop	ESB	LC
<i>Spheniscus demersus</i>	African Penguin	EEP	EN
<i>Spheniscus humboldti</i>	Humboldt's Penguin	EEP	VU
<i>Tapirus indicus</i>	Malayan Tapir	ISB	EN
<i>Tapirus terrestris</i>	Lowland Tapir	EEP	VU
<i>Tauraco erythralophus</i>	Red-crested Turaco	ESB	LC
<i>Tockus deckeni</i>	Van Der Decken's Hornbill	EEP	LC
<i>Tomistoma schlegelii</i>	False Gharial	ESB	EN
<i>Trachypithecus auratus</i>	Javan Langur	EEP	VU
<i>Trachypithecus francoisi</i>	Francois' Langur	ASMP	EN
<i>Tragelaphus angasii</i>	Lowland Nyala	ASMP	LC
<i>Tragelaphus euryceros isaaci</i>	Eastern Bongo	EEP	CR
<i>Trichechus manatus</i>	Caribbean Manatee	EEP	VU
<i>Trigonoceps occipitalis</i>	White-headed Vulture	EEP	CR
<i>Varanus komodoensis</i>	Komodo Dragon	EEP	VU
<i>Varecia rubra</i>	Red Ruffed Lemur	EEP	CR
<i>Varecia variegata</i>	Black-and-white Ruffed Lemur	EEP	CR

ABBREVIATIONS USED

PROGRAMME

- ASMP – Australasian Species Management Program
- CWCA – China Wildlife Conservation Association
- EEP – EAZA (European Association of Zoos and Aquariums) Ex-situ Programme
- ESB – European Studbook
- DENR – Department of Environment and Natural Resources (Philippines)
- GSMP – Global Species Management Plan
- ISB – International Studbook
- SSMP – SEAZA (Southeast Asian Zoos and Aquariums) Species Management Programme
- JAZA – Japanese Association of Zoos and Aquariums

IUCN RED LIST STATUS

- CR – Critically Endangered
- EN – Endangered
- VU – Vulnerable
- NT – Near Threatened
- LC – Least Concern

Carbon Emissions FY21/22

SCOPE	CATEGORIES	EMISSIONS (tCO2E)
Scope 1	LPG Fuel (In-park vehicle) Refrigerant Gas	158
Scope 2	Grid Electricity	10143
Scope 3	Category 1 – Goods & Services (Water, Animal food, Fresh food for F&B Outlets, Paper only)	4532
	Category 3 – Fuel- and Energy-Related Activities	666
	Category 4 – Upstream Transportation & Distribution (Animal Freight, Mandai Shuttle Express, Transport for Waste Disposal only)	377
	Category 5 – Waste Generated in Operations	2042
	Category 6 – Business Travel	2
	Category 8 – Upstream Leased Assets	44
FY2122 Total Carbon Emission (tCO2e)		17964

*Ongoing refinement of carbon inventory to include other scope 3 categories based on Greenhouse Gas Protocol (GHG Protocol).

Current Progress Of Mandai Wildlife Group Sustainability Commitments

COMMITMENTS	PROGRESS AS AT END FY21/22
Electricity From Renewable Sources By 2030 100% of electricity consumption from renewable sources through on-site solar, RECs and/or VPPAs.	23% of electricity consumption through RECs and on-site solar
Electrifying Internal Fleet By 2030 Convert 100% of our internal fleet to either electric vehicles or vehicles with lower carbon emission fuel	100% of buggies/trams are electric vehicles (EVs) 2/5 vans are EVs Exploring the use of biodiesel for lorries due to lack of availability for electric models
Reduce Water Consumption By 2030 Target 0.21m ³ /guest – reduction by 25% from 2020 baseline	0.31m ³ /guest
Waste Diversion from Incineration By 2030 Achieve a diversion rate of 60%	Current diversion rate is 34.5%
Sustainably-sourced Palm Oil By 2025 100% of palm oil and its derivatives used in all end-products will be from certified sustainable sources* *Physically sourced RSPO certified or offset with Independent Small Holder RSPO credits	100% palm cooking oil at F&B outlets
Paper Products By 2025 100% of Mandai-produced paper-based products will be FSC-certified or 100% recycled	79% of Mandai-produced paper-based products are sustainable
Single-use Plastics By 2023 Eliminate all single-use fossil-based plastics from guest operations	Eliminated/replaced 80% of our plastic items with reusables or alternative materials
By 2030 Restore 2.7 hectares of degraded land in the buffer zone and retained forest	Restored 0.33 hectares (12%)



Awards & Accreditations

Awards

- **15th HR Awards Gala Presentation 2021**
Employee Well-being Award (Silver Standard)
- **Asia Pacific Loyalty and Engagement Awards**
Campaign: Launch of My Animal Buddy
Best Engagement Strategy – Specific Audience (Gold)
Best Use of Experiential / Live (Silver)
Best Covid-19 Response – Engagement and CX (Bronze)
Best Use of Consumer Insights / Data Analytics (Bronze)
Best Engagement Strategy – B2C (Bronze)
Best Online Experience (Bronze)
- **IDC Asia Pacific Future Enterprise Awards 2021**
Special Award for Digital Resiliency
- **Mobex Awards for Mobile Experience**
Campaign: Launch of My Animal Buddy
Best Original Content – Gold
Best Hospitality & Travel Campaign – Bronze
- **Singapore Tourism Awards 2021**
Special Award for Most Exemplary Employer
Special Award for Sustainability
- **TEA Thea Awards 2022**
Thea Classic Award
- **The Straits Times’ “Singapore’s Best Employers 2021”**
Ranked #37 in the Top 200 list

Accreditations

- **BCA Green Mark (Platinum) Super Low Energy (SLE) Award**
for Mandai Resort
- **BCA Green Mark (Platinum)**
for Penguin Building
- **BCA Universal Design Mark (Design) Gold Plus Awards**
for Mandai Resort, East Node and indoor attractions
- **NParks Landscape Excellence Assessment Framework (LEAF) Platinum**
for Singapore Zoo, River Safari and Night Safari

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