



MANDAI PARK HOLDINGS

YEARBOOK 2017/18

Wildlife Reserves Singapore Group



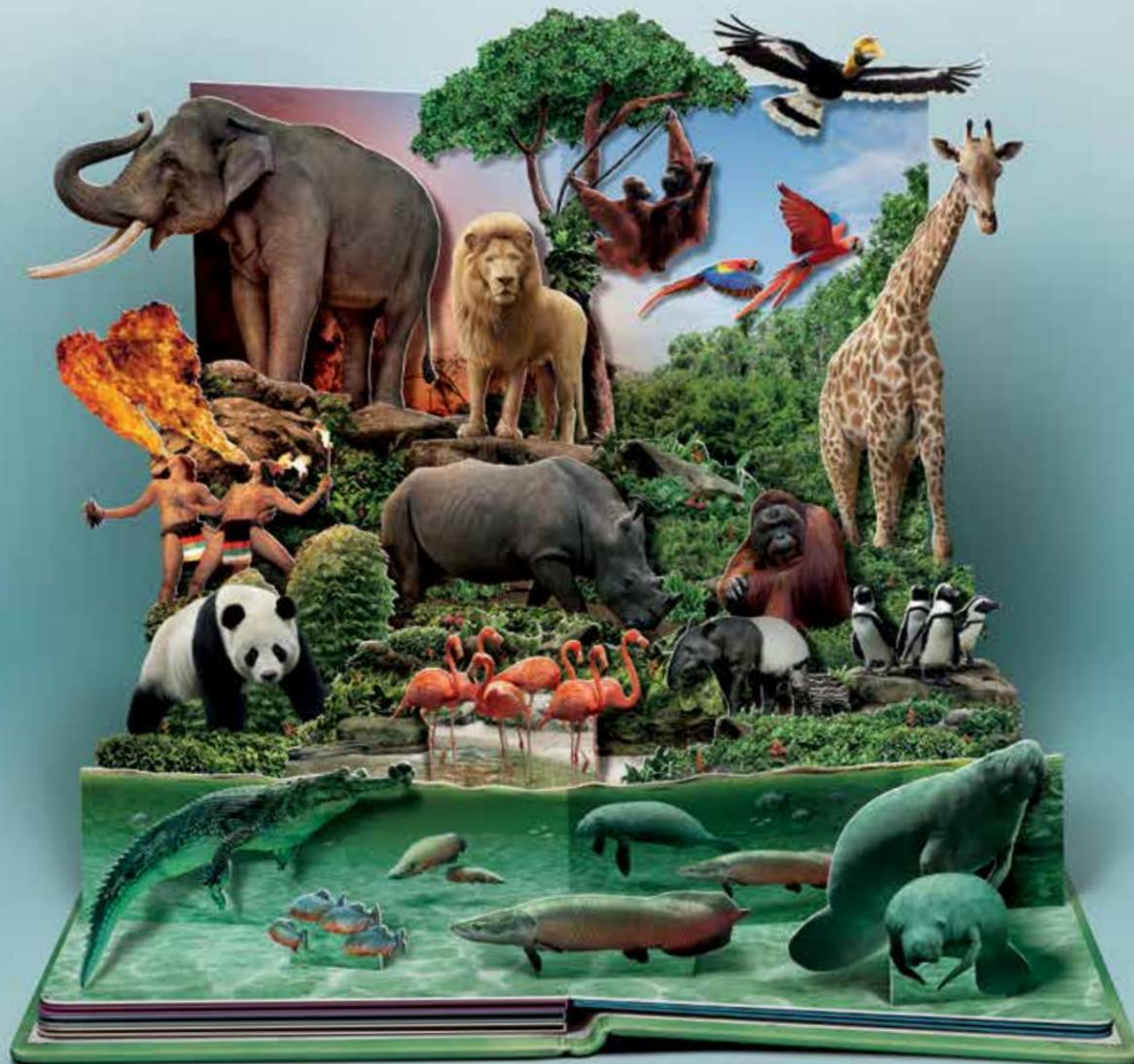
MANDAI PARK HOLDINGS

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

A self-funded organisation, WRS also collaborates with various partners, organisations and institutions aimed at protecting local and global biodiversity. In this financial year the four parks welcomed just over 5 million visitors for the first time, with Jurong Bird Park contributing 0.85 million, Night Safari 1.3 million, Singapore Zoo 1.9 million and River Safari just under 1 million.

MPD is refreshing of the Mandai District to become a world-leading nature and wildlife district.

Once the project is completed, Mandai will feature five zoological parks, two indoor nature-themed attractions, a variety of accommodation options, an array of new restaurants, extensive public spaces and an eco-link bridge to allow animals safe passage across Mandai Lake Road.



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MESSAGE

from Chairman & Group CEO



S Dhanabalan
CHAIRMAN
MANDAI PARK HOLDINGS



Mike Barclay
GROUP CEO
MANDAI PARK HOLDINGS

This past year has been a very significant one for Mandai Park Holdings. In addition to our operating entity, Wildlife Reserves Singapore, enjoying a record year for visitorship at our four operating zoological parks, our development arm, Mandai Park Development, went beyond the planning stage and triggered the first phase of construction work as we look to transform Mandai into a world-leading nature and wildlife district.

While we are happy to have attracted record crowds in FY 17/18 and exceeded the 5-million mark for the first time, we draw greater satisfaction from the fact that the quality of our offerings has been recognised. TripAdvisor ranked Singapore Zoo as the best zoo in Asia and amongst the top five zoos in the world. At the Singapore Tourism Awards 2017, Singapore Zoo clinched the Best Attraction Experience award. This will encourage us to maintain our unwavering focus on enhancing the experience we offer to our guests.

To reinforce our service culture and recognise staff who have gone the extra mile for service, we launched the Service Hero Awards, which pays tribute to staff who have displayed exceptional acts of service heroism in creating guest experiences that exceeded expectations.

We were also excited to roll out a more personalised and dynamic website at the start of 2018. In addition to being a conduit for booking park experiences, the website shares important messages on the work we do to provide world-class animal care, protect threatened species and to advocate biodiversity conservation

At Singapore Zoo, the revamped reptile exhibit RepTopia was opened to much fanfare in June. Reptopia seeks to deepen our guests' affinity for reptiles through strong exhibits combined with digital interactive stations, play features and keeper demonstrations. In just four months after its soft opening in May 2017, the exhibit attracted close to 400,000 guests.

Over at Jurong Bird Park, Parrot Paradise underwent a major revamp to welcome the arrival of the world's rarest blue macaws – the Spix's and the Lear's macaws - to mark 50 years of diplomatic relations between Brazil and Singapore. The critically endangered Spix's macaw is believed to be extinct in the wild with just over 100 individuals left under human care worldwide. We are honoured to be a partner in the effort to bring the Spix's macaw back from the brink of extinction, by participating in a Brazilian project to prepare a safe habitat for the eventual release of this species back into the wild.

Sadly of the 1,000 or so species represented across our four parks, more than 20% are threatened in the wild, and a number of critically endangered species were added to the collection during the reporting year. Holding such a precious collection brings with it the responsibility to help sustain the populations of these species. We continued to collaborate with zoos from around the world in managed breeding programmes, which are designed to enhance genetic diversity and demographic sustainability of the species. This year, we participated in 45 of these species-specific programmes, up from 34 last year.

We have successfully undergone the animal welfare accreditation process by the Zoos and Aquariums Association of Australasia (ZAA). Being accredited by ZAA means the standard of care and welfare we provide for our animals is recognised to be on a par with member zoos in Australasia. This accreditation also facilitates our participation in species management and scientific programmes with the other member zoos.

During the reporting year, WRS has extended support to 30 conservation projects in the region, seven more than the year before. Besides providing funding, WRS also deepened its engagement in regional conservation work by sending staff to assist in the field.

Our focus in saving regional wildlife extended beyond the boundary of Southeast Asia when we responded to a call from conservation partners in the Solomon Islands to save the Santa Cruz ground doves. The rapid response from our staff in Jurong Bird Park resulted in a 100% survival rate for the 112 ground doves confiscated from poachers, which likely constitute half of the surviving population of this critically endangered species.

Back in Singapore, the Wildlife Reserves Singapore Conservation Fund (WRSCF) supported nine local projects. WRS also provides platforms for conservation specialists and the wider nature community to share, learn and collaborate on conservation issues. A key move was the formation of the first Asian Songbird Trade Specialist Group to campaign against the illegal and unsustainable cage bird trade.

In keeping with our vision to be a world-leading wildlife institution, we are transforming Mandai into an integrated wildlife precinct to feature a new bird park, a rainforest park, two nature-themed indoor attractions, accommodation options and public recreational spaces. Our development work is guided by an Environmental Impact Assessment (EIA), which sets guidelines to help us construct in a sensitive manner and to mitigate the impact of this work on the surrounding wildlife. In addition, we engage in regular consultation with key government agencies, relevant experts and members of the nature community to fine-tune our planning and development work.

Construction of an Eco-Link bridge across Mandai Lake Road, the new Bird Park and the public space serving the Bird Park commenced in 2017. Mandai Park Development has prioritised completing the Eco-link bridge by the end of 2019. This bridge will seamlessly connect the Central Catchment Nature Reserve across Mandai Lake Road for the first time since the road was built more than 50 years ago. Various other measures have been undertaken to enhance connectivity for wildlife across Mandai Lake Road in the meantime.

To guide us on our sustainability journey, we have linked our work plans to the most applicable Sustainable Development Goals (SDGs) adopted by world leaders at the UN summit in 2015. These include providing quality education, working towards having sustainable cities and consumption, and protecting life on land and in the water.

As part of our commitment to sustainability, we continue to use only sustainably-sourced palm oil and seafood in our kitchens, while gradually eliminating single use plastic from our parks. This is because unsustainably planted palm plantations, over-fishing and plastic waste are three of the biggest threats to biodiversity in the region. We were gratified to have been recognised by the World Wildlife Fund for being an organisation that is 'leading the way' in using sustainably sourced palm oil. WRS also became a signatory of the Singapore Packaging Agreement, demonstrating our commitment to reduce packaging waste.

To galvanise community efforts in conservation and sustainability, Singapore Zoo marked World Wildlife Day with the 'Together For Wildlife' conservation campaign in March 2018. We engaged social media influencers and garnered over 12,000 participating posts on Instagram. The campaign was launched with a 'Walk for Wildlife', which was attended by over 200 preschool children.

We were also honoured to work with Lee Kuan Yew Fund for Bilingualism to publish a series of four bilingual children's books that tell the heart-warming stories of our wildlife professionals saving local wildlife. Apart from promoting the learning of the Chinese language, we hope to engage and inspire our children to join us in protecting local wildlife.

Our education and outreach programmes continue to grow, engaging some 368,000 school children, park guests and members of the public. This was strongly supported by the efforts of our dedicated volunteers, who helped us engage with our park guests and members of the public.

To ensure that our zoological parks remain as accessible and inclusive as possible, we extended complimentary admission to some 4,000 beneficiaries from 61 Volunteer Welfare Organisations (VWOs). Many were accompanied by our Wildlife Buddy volunteers.

Finally, we would like to thank our board members, committee members, partners, adopters, sponsors, volunteers and park guests for their contributions to our work. We could not have achieved these outcomes without your steadfast support. In the year ahead, we look forward to the opportunity to forge new paths, to deliver more exceptional wildlife experiences and to inspire more people to protect wildlife.

our vision

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

our mission

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

our values

ethics



excellence

We strive for the highest standards in all we do.



hospitality

We serve from the heart.



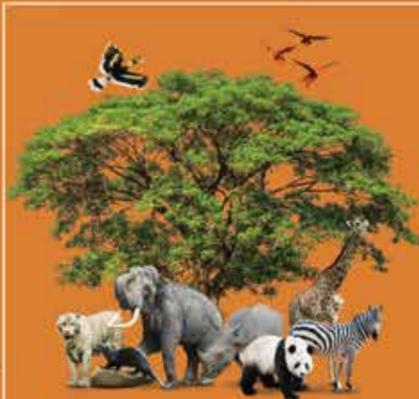
integrity

We are honest and fair in all our dealings.



care for wildlife

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



sustainability

We embrace sustainable best practices.



teamwork

We achieve more together.

THE TRIPLE BOTTOM LINE, STRATEGIC THRUSTS & SUSTAINABLE DEVELOPMENT GOALS (SDGs)

3Ps STRATEGIC THRUSTS

SDGs

PERFORMANCE

CREATE EXCEPTIONAL GUEST EXPERIENCE



ENSURE LONG TERM COMMERCIAL VIABILITY



PEOPLE

APPLY LEADING ORGANISATION & HR PRACTICES



FORGE A STRONG NATIONAL LOVE & PRIDE FOR OUR PARKS



PLANET

PROVIDE WORLD-CLASS CARE FOR OUR LIVING COLLECTION



BE A REGIONAL LEADER IN ENVIRONMENTAL SUSTAINABILITY & CONSERVATION



OUR COMMITMENT TO KEY SUSTAINABLE DEVELOPMENT GOALS (SDGs)



We reach out to over 350,000 people on conservation education. Our parks are living classrooms for strengthening early childhood development, 21st century skillsets and volunteerism, and facilitating multi-disciplinary learning including the mother tongue languages. Robust training for our staff facilitates lifelong learning and acquisition of specialist skills.



We review energy consumption in our parks and implemented energy-saving initiatives including the use of solar panels, energy-saving electrical devices and electric trams. The principle of using clean energy through innovative solutions will guide all development work in Mandai.



We galvanise community support to reduce single-use plastic, and to use sustainably-sourced products. By facilitating guests to refill their water bottles, we save 1.3million single-use plastic bottles per year. We are ranked #2 and recognised as 'Leading The Way' in the region in WWF's Palm Oil Buyers' Scorecard 2017 for Malaysia and Singapore.



We embrace sustainable best practices through stringent procurement process for sustainable products, reducing energy consumption, single-use plastic and food waste. We use certified segregated sustainable oil for cooking and serving sustainable seafood in all F&B outlets. We have also switched to paper packaging for drinking water.



Through River Safari, we highlight the fragility of river ecosystems to our guests, and encourage them to take action to protect freshwater life forms, which are disappearing faster than land or marine creatures. We support local and regional conservation projects to protect biodiversity in aquatic ecosystems. We spread the message on plastic pollution, with a call to action.

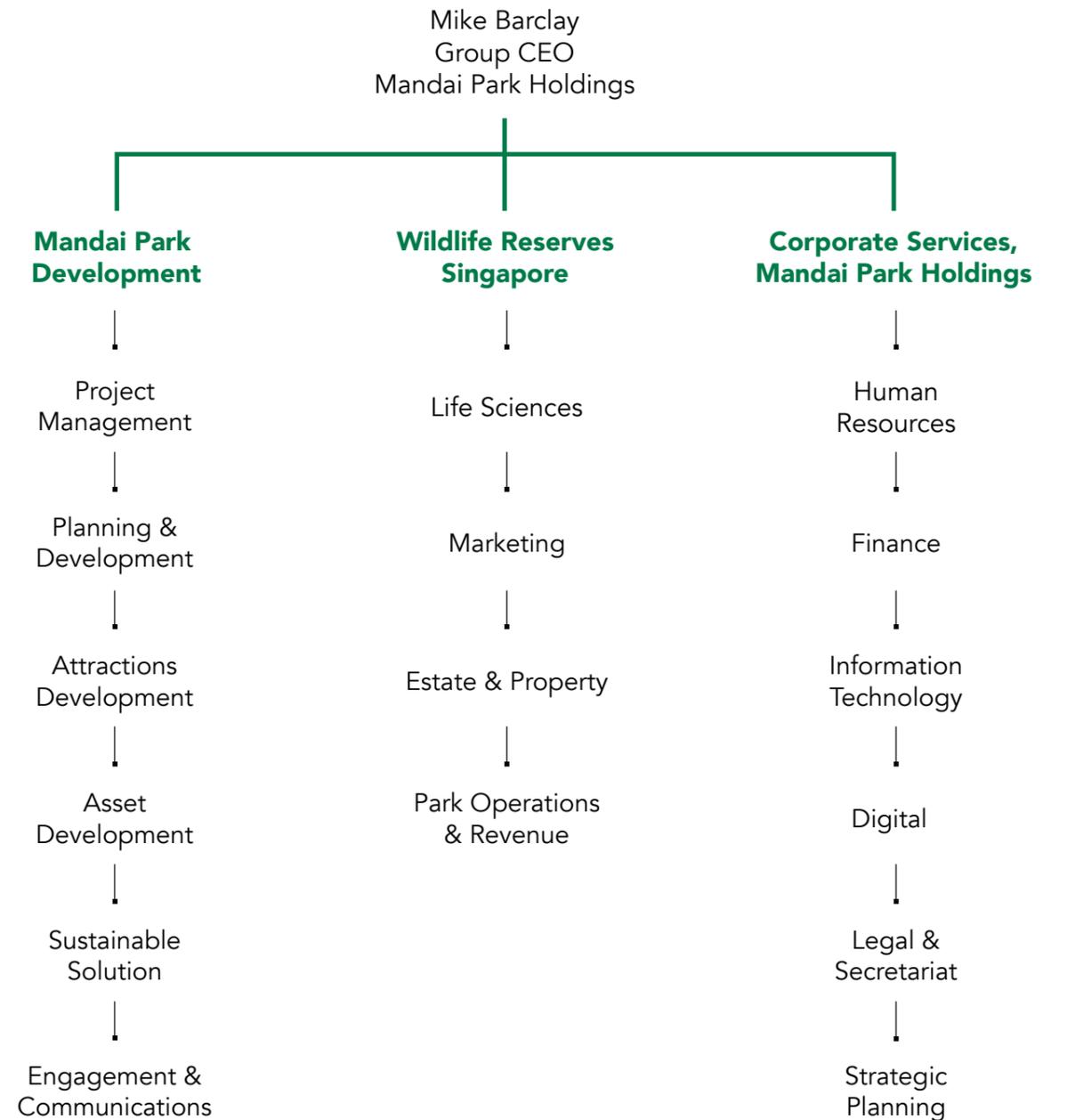


We provide world-class care for the animals in our living collection, which serves as ambassadors to connect people with the natural world. Conservation messaging with a strong call to action encourages people to do their part for wildlife. We work with other zoos through Managed Species Programmes to save threatened species. We support conservation projects to protect biodiversity.



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

ORGANISATIONAL STRUCTURE MANDAI PARK HOLDINGS



BOARD OF DIRECTORS, MANDAI PARK HOLDINGS

CHAIRMAN

Mr S DHANABALAN

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

DEPUTY CHAIRMAN

Mr TAN Chuan-Jin (wef 8 Nov 2017)

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



DIRECTORS

Mr Mike BARCLAY

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

Ms Claire CHIANG

Ms Claire Chiang is the co-founder of Banyan Tree Hotels & Resorts and the chairperson for China Business Development. She chairs Banyan Tree Global Foundation and Wildlife Reserves Singapore Conservation Fund. She is also the chairperson for Singapore Book Council. She champions gender diversity and chairs the Shirin Fozdar Programme at Singapore Management University.

Mr KEE Teck Koon

Mr Kee is the Executive Director of NTUC Enterprise Co-Operative Limited, the holding entity of NTUC FairPrice, NTUC Income, NTUC Health and six other social enterprises. He is also a director of two public listed companies, namely, CapitaLand Ltd and Raffles Medical Group Ltd. Mr Kee is the Chairman of Changi Airports International (CAI), Deputy Chairman of NTUC Income, and also sits on the boards of Fullerton Fund Management Company and Lien Foundation.

Mr Lionel YEO

Mr Lionel Yeo is the Chief Executive of the Singapore Tourism Board. He currently serves on the board of the Sentosa Development Corporation and on the Board of Governors of Raffles Institution.

Ms NEO Gim Huay

Ms Neo Gim Huay is Managing Director, Sustainability of Temasek International Pte Ltd. She sits on the Boards of Surbana Jurong Pte Ltd, Singapore National Library and the Intellectual Property Office of Singapore. She is also the Secretary of Eisenhower Fellowships Singapore.

Mr Dilhan Pillay SANDRASEGARA

Mr Sandrasegara is Deputy Chief Executive Officer of Temasek International Pte. Ltd. He serves on the boards of the Singapore Management University, Singapore Institute of Legal Education, the National Research Foundation in Singapore, Singapore Innovate Pte. Ltd., Enterprise Singapore and certain subsidiaries of Temasek Holdings (Private) Limited. He is also a member of the Future Economy Council and the Financial Centre Advisory Panel of the Monetary Authority of Singapore.

Mr Stephen FORSHAW

Mr Forshaw is the Head, Public Affairs and Managing Director, Australia and New Zealand for Temasek. He also serves on the board of the Real Pet Food Company and the Singapore Millennium Foundation.

Professor TAN Chorh Chuan

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

Mr SIM Hwee Cher

Mr Sim is currently Council Member of Community Chest, Member of the National University of Singapore's School of Accounting Advisory Council, Member of Duke-NUS Medical School Centre for Ageing, Research and Education (CARE) Advisory Board and Director of Mandai Park Holdings Pte Ltd and the NTUC Income.

Professor Leo TAN

Professor Tan chairs the Temasek Foundation Innovates, and the Science Sub-Commission of the Singapore National Commission for UNESCO. He is a Fellow of the Singapore National Academy of Science and also a member of the governing board of the Singapore Environmental Council.

Mr FOCK Siew Wah (till 1 Aug 2017)

Mr Fock is the Group Chairman of PSA International Pte Ltd. He also serves as Chairman of Pavilion Capital Holdings Pte Ltd.

Ms CHONG Siak Ching (wef 1 Aug 2017)

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

COMMITTEE MEMBERS

Animal Welfare and Ethics Committee

Chairman : Prof Leo Tan
 Secretary : Dr Cheng Wen-Haur
 Members : Dr Chew Siang Thai
 Dr Leslie Retnam
 Dr Tan Hwa Luck
 Mr Wong Tuan Wah
 Dr Chris R Shepherd
 Ms Grace Chua
 Dr Stephanie Ho

WRSCF Specialist Panel

Dr Shawn Lum (Chairman)
 Dr Geoffrey Davison
 Dr Astrid Yeo
 Dr David Bickford
 Dr Cheng Wen-Haur
 Dr Leong Tzi Ming
 Dr Sonja Luz

SENIOR MANAGEMENT

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

Dr CHENG Wen-Haur | Deputy Chief Executive Officer &
 | Chief Life Sciences Officer

Mr LEONG Yue Kheong | Deputy Chief Executive Officer Mandai Park Development

Ms Belina LEE | Chief Corporate Development Officer
Mr Melvin TAN | Chief Estate and Property Officer
Ms LOW Wai Peng | Chief Financial Officer
Mr Marcus HENG | Chief Human Resource Officer
Ms Isabel CHENG | Chief Marketing Officer
Ms Sherri LIM | Chief Park Operations & Revenue Officer

Philip YIM | Senior Vice President
SIM Yen Tze Shirlene | Vice President,
 Asset Development & Attractions Development (Indoor Attraction)

Marc CREMADES | Vice President, Attractions Development
HO Hui Ching Suzanne | Vice President, Brand & Communications
LOW Min Hwee | Vice President, Corporate Services - Finance
TAN Mui Tian Karen | Vice President, Internal Audit
LEE Hui Mien | Vice President, Sustainable Solutions
NG Kong Wey Kenneth | Vice President, Project Management

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



SPONSORS & DONORS

JURONG BIRD PARK

EMR (Asia) Limited – Emerson Climate Technologies	Toco Toucan
Goodwood Park Hotel Limited	Brahminy Kite, Ronnie II
Hong Leong Foundation	Flamingoes from the High Flyers Show
Lady Yuen Peng McNeice	Bali Mynah
Lee Foundation Singapore	Penguin Coast
M1 Limited	Malayan Fish Owl, Tupa
M1 Limited	Great-Pied Hornbill
Pokka International Pte Ltd	Luzon Bleeding Heart Pigeon
Protek Chemicals & Engineering Pte Ltd	White-collared Kingfisher
SPH Foundation Ltd	High Flyers Show
Starhub Mobile Pte Ltd	Scarlet Ibis Exhibit
State Bank Of India (Singapore)	Flamingo Lake
Sutera Harbour Resort	Lesser Bird of Paradise
The Shaw Foundation Pte	Fly Pass Macaws from the High Flyers Show

NIGHT SAFARI

Goodwood Park Hotel Limited	Fishing Cat Trail
Haw Par Healthcare Limited	Malayan Tiger
JTB Pte Ltd	Asian Lion
JTB Pte Ltd	Sambar Deer & Elephant
JTB Pte Ltd	Baby Elephant, Neha
Khoo Teck Puat Foundation	Fishing Cat Trail
M1 Limited	Giraffe
Mitsui & Co. (Asia Pacific) Pte Ltd	African White Lion
Mr Martin Storey	Babirusa
Singapore Refining Company Pte Ltd	Marsh Bird
Starhub Mobile Pte Ltd	Bharal
Starhub Mobile Pte Ltd	Serval Segment - Creature of the Night Show
Thai Beverage Public Company Limited	Asian Elephant, Chawang
The Shaw Foundation Pte	Slow Loris

RIVER SAFARI

CapitaLand Limited	Presenting Sponsor & Conservation Donor of Kai Kai & Jia Jia
Khoo Teck Puat Foundation	Red Panda
M1 Limited	Jewel Tank
Mitsui & Co. (Asia Pacific) Pte Ltd	Mekong Giant Catfish
SPH Foundation Ltd	Amazon Flooded Forest
The Shaw Foundation Pte	Manatee Feeding Program
United Microelectronics Corporation (SG Branch)	Alligator Gar

SINGAPORE ZOO

Africa Society Of Singapore	You Buy They Die "Rhinos Campaign"
Cebu Air Travel And Tours Pte Ltd	King Cobra at RepTopia
CTBC Bank Co. Ltd.	Chimpanzee, Akiny
Dimension Data Asia Pacific Pte Ltd	White Rhinoceros
Edmund Optics Singapore Pte Ltd	Chimpanzee, Asha
Garena Online Private Limited	African Penguin Exhibit
Haw Par Corporation Ltd	Leopard
Henkel Singapore Pte Ltd	Chimpanzee, Gangga
Hivelocity Pte Ltd	Orangutan, Bino
Hong Leong Foundation	Fragile Forest
Industrial And Commercial Bank Of China Limited	Cotton-Top Tamarin
Kentucky Fried Chicken Management Pte Ltd	Zebra
Kinderland Educare Services Pte Ltd	Otter
Lady Yuen Peng McNeice	Malayan Tapir
Lee Foundation Singapore	Orangutan, Chomel
Lee Foundation Singapore	Tropical Crops
M1 Limited	Amhara Stone Village
M1 Limited	Orangutan, Endah
Mindchamps Preschool Franchise Pte Limited	Tree Kangaroo
Mitsui & Co. (Asia Pacific) Pte Ltd	Elephants at Work & Play Show
Mrs Christina Ong	Orangutans, Binte & Saloma
Ms Kay Kuok	Asian Elephant, Aprila
Ms Nicola Barrett	Memorial Bench
Protek Chemicals & Engineering Pte Ltd	Chimpanzee, Susie
RMZ Oilfield Engineering Pte Ltd	Chimpanzee, Rah
Samsung Asia Pte Ltd	White Tiger, Pasha
Singapore Petroleum Company Ltd	Lion
SPH Foundation Ltd	Polar Bear, Inuka
SPH Foundation Ltd	Celebes Crested Macaque at SPH Conservation Centre
Starbucks Coffee Singapore Pte Ltd	Komodo Dragon
Starhub Mobile Pte Ltd	Orangutan, Natu
Starhub Mobile Pte Ltd	Red Langur
Starisland Travel Pte Ltd	Gibbon Island
State Bank Of India (Singapore)	Asian Elephant, Gambir
Thai Airways International Public Co. Ltd	Asian Elephant, Intan
The Shaw Foundation Pte	The Shaw Foundation Amphitheatre
Wuthelam Holdings Pte Ltd	Rabbit

WILDLIFE RESERVES SINGAPORE – EVENT

Malaysia Dairy Industries	Land of Giants (Nov - Dec 2017)
Starbucks Coffee Singapore Pte Ltd	Land of Giants (Nov - Dec 2017)



YEAR IN REVIEW



- ✿ Welcomed a record 5million guests, a 9% increase over FY17/18
- ✿ Singapore Zoo voted as the best zoo in Asia and amongst the top five zoos in the world by Trip Advisor, and clinched the Best Attraction Experience Award by STB.
- ✿ Launched Service Hero Awards to pay tribute to staff who have displayed exceptional acts of service heroism.
- ✿ Launched RepTopia to deepen guests' affinity for reptiles.
- ✿ Launched Together For Wildlife to galvanise community efforts in conservation and sustainability. Garnered 12,000 Instagram posts and involved 200 preschoolers in a 'Walk For Wildlife'.
- ✿ All four parks accredited by Zoos and Aquariums Association of Australasia (ZAA).
- ✿ Supported 30 conservation projects to save threatened species in the region.
- ✿ Collaborated with wildlife institutions globally to save 51 threatened species through Managed Species Programmes.
- ✿ Saved 1.3million single-use plastic bottles by facilitating guests to refill their water bottles.
- ✿ Became a signatory of the Singapore Packaging Agreement to demonstrate commitment to reduce packaging waste.
- ✿ Supported nine local projects to help save native species.
- ✿ Welcomed the rare Spix's macaw and Lear's macaws in Jurong Bird Park. Participating in a Brazilian project to release the Spix's macaw back into the wild.
- ✿ Recognised by the World Wildlife Fund for being an organisation that is 'leading the way' in using sustainably sourced palm oil.
- ✿ Hosted 4,000 beneficiaries from 61 VWOs
- ✿ Partnered 2,277 volunteers to engage the community on wildlife conservation and sustainability.
- ✿ Commenced construction of eco-link bridge, the new Bird Park and public spaces serving the Bird Park.
- ✿ Saved 112 endangered Santa Cruz ground doves on the Solomon Islands.
- ✿ Engaged 360,000 children and adults on wildlife conservation and sustainability through in-park and outreach programmes, with strong call to action.



CREATING EXCEPTIONAL GUEST EXPERIENCES

To delight every guest and create memorable experiences, we are constantly rejuvenating our exhibits and park facilities, as well as strengthening service delivery and programming.



The service champions at the inaugural HEART Award Presentation.

DRIVING A SERVICE CULTURE

We launched two different service awards to reinforce our service culture and recognise staff who have gone the extra mile for service. The HEART Awards is an award for staff to appreciate colleagues who have shown outstanding service to one another. The inaugural Service Hero Award pays tribute to five individual winners and a team winner who have displayed exceptional acts of service heroism in creating guest experiences that exceeded expectations.

These awards have been well received by staff, inspiring them to be a positive influence and create more remarkable guest experiences.



Mr Mike Barclay, Group CEO, presenting the Service Hero of the Year Award to Mr Stefan Ng, Junior Keeper.



Wild Discoverer Tours – Manatee Mania and Amazing Amazonia offer our guests unique hands-on experiences to interact with the manatees and piranhas, among the other Amazonian wonders.

WILD DISCOVERER TOUR

To enhance our guests' in-park experience, two new behind-the-scenes signature tours, Manatee Mania and Amazing Amazonia, were introduced in River Safari, taking participants to restricted areas to feed manatees, piranhas, electric eels and stingrays. Guests also partake in manatee training.

The Wild Discoverer Tours at the other three parks were also revamped to feature even more opportunities for our guests to get up-close with our living collection.

DIGITAL TRANSFORMATION

To provide an omni-channel guest experience across various digital touchpoints, we are building a new Experience Management Platform, the indispensable bedrock of our organisation's digital transformation roadmap.

As the first step to delivering dynamic and personalised guest-facing content through a consolidated system, we unveiled a revamped website in January 2018. With ongoing transformation efforts, the website aims to go beyond a portal that merely drives revenue generation, into a vital asset that deepens brand affinity with guests and advocates biodiversity conservation.





Guest of honour Dr Amy Khor, Senior Minister of State for Environment and Water Resources, receiving a token of appreciation from Mr S Dhanabalan, Chairman, at the opening of RepTopia.

REPTOPIA

Created to bring guests on a journey into the enigmatic and fantastic world of reptiles and amphibians, RepTopia takes the place of the previous Snake House at Reptile Garden. It brings guests to habitats where reptiles and amphibians flourish, from the harsh deserts of Arabia or Sonora; to the tropical forests of the Amazon or the Congo, as well as exotic islands like Madagascar, Salomon, Fiji, or New Caledonia. A total of 50 new herp species are displayed in this new area.

To feature the interconnectedness of all life-forms, different species are displayed side by side in mixed-species exhibits landscaped to replicate the reptiles' natural habitats. The mixed-species habitats provide an immersive experience, encouraging guests to explore and discover a cast of fascinating animals, ranging from the well camouflaged to the brightly colored, from the sky and gentle to the menacing and deadly.

The primary goal of RepTopia is to change perceptions about reptiles. RepTopia keepers conduct daily interactive sessions with guests where they get up close and personal to some of the scaly creatures. Glass panels open like windows, giving a unique peek into the secret lives of reptiles. Guests may alternately get to watch a cobra feeding or take part in alligator medical training.

Keepers share interesting facts as well as threats to their existence in the wild at the same time, in the hope that our guests will walk away with a sense of wonder as well as a renewed understanding that all animals, have a role to play in the ecosystem.



Samuel Tay, Head Keeper, engaging Zhangde Primary School students during a keepers' meet-and-greet session at the RepTopia media preview. Daily Keeper Talks and feeding sessions are immensely popular with guests at RepTopia.

WRS has actively leveraged digital technology to enhance the immersivity of RepTopia's wildlife experience, piloting various new media formats and interpretives to deliver interactive 'phygital' experiences to increasingly tech-savvy guests. We installed a thermal camera to allow guests to see themselves on an infra-red screen, for an idea of how a rattlesnake 'sees' its warm-blooded prey. We also designed an 'X-Ray Machine' interactive screen for guests to play customs officers and work at intercepting illegal wildlife shipments, thus educating guests on the problem of illegal wildlife trafficking that threatens numerous reptile species. RepTopia weaves these and other interactive elements into the guest experience, captivating them with compelling educational content and conservation stories.

Other fun features include a dome built into the regal horned lizard exhibit, which allows kids to come face-to-face with the lizards and imagine themselves in their desert environment.

Children can also try spotting 'snakes' in a bamboo forest, one of the many different habitats snakes live in. By providing opportunities for kids to 'enter' the world of reptiles, we hope they will appreciate how unique these creatures are and know they are to be admired, not feared.

The ranger station places the focus on local reptiles and offers plenty of riveting information about reptiles. There is also a behind-the-scenes facility with a reptile hatchery that can be viewed through glass panels.

LAND OF GIANTS

In the months of November to December 2017, we cast the spotlight on invertebrates – giants of the natural world. Over 20 larger-than-life models of invertebrates – animals without backbone – were installed on the Land of Giants trail in Singapore Zoo, showcasing the amazing adaptations of these creatures. Guests were invited to participate in bug-inspired activities such as the Bug Explorer self-guided trail. There was also an invertebrate macro-photography exhibition featuring the works of our staff, Cham Tud Yinn. Through in-park storytelling and activities, we hope to bring about a better understanding of the often-maligned and feared invertebrates, while heightening guests' awareness of the indispensable role these unsung heroes play in the ecosystem.

Over at River Safari, the focus was on River Giants. Guests were invited to meet real and majestic living giants from the world's iconic river habitats. Activities included meet-and-greet with the Canola mascot, River Tales storytelling performance, River Giants Explorer self-guided trail, as well as special talks and trails by our animal presenters.



Larger-than-life weaver ants working together to weave a nest with leaves.



A school group marvelling at a giant caterpillar.



By magnifying the small and oft-neglected creatures of the invertebrate world, the Land of Giants was a gateway for our guests to understand the importance of these animals to our ecosystem.

WORLD'S RAREST BLUE MACAWS IN SINGAPORE

In November 2017, with the addition of the Spix's macaws and Lear's macaws to the hyacinth macaws already in our collection, the Jurong Bird Park became the only zoological park in the world where members of the public can view all three remaining blue macaw species in one place. The glaucous macaw - the last member of the blue macaw family - has not been sighted since the 1960s.

Back in July 2016, Jurong Bird Park signed a Memorandum of Agreement with partners the Ministry of the Environment of Brazil, the Chico Mendes Institute for Biodiversity Conservation, the Al Wabra Wildlife Preservation, the Association for the Conservation of Threatened Parrots, Parrots International and Fazenda Cachoeira. The agreement commits the parties to providing funding and direct

support to help establish a viable population of Spix's macaws under human care, and ultimately to reintroduce this species into the wild.

The critically endangered Spix's macaw, also known as the little blue macaw, is believed to be extinct in the wild with just over 100 individuals left under human care worldwide. It is the same little blue macaw which inspired the Rio movie series. The Lear's macaw is classified as endangered, due to the illegal bird trade and habitat loss.

The Spix's and Lear's macaws are excellent emblems of our commitment to do our part to protect and conserve global biodiversity. It is an honour to be a partner in this effort to bring the Spix's macaw species back from the brink of extinction, and we hope to eventually reintroduce them to the wild.

Blue Macaws' Exhibit was officially opened on 22 November 2017 by Foreign Affairs Minister Dr Vivian Balakrishnan and Brazilian Ambassador to Singapore HE Flavio Damico. The ceremony was also attended by Mandai Park Holdings Chairman, Mr S Dhanabalan.



A Blue-zilian Carnival featuring all things blue and Brazilian was organised to celebrate the official opening of the Blue Macaws' Exhibit. Guests were treated to captivating capoeira performances that combine acrobatics, music and dance rituals, as well as samba dances. Younger visits enjoyed Brazilian game trails, and families got the opportunity to be a Blue Macaw Keeper for a day.

In 2017, we celebrate 50 years of diplomatic relations between Brazil and Singapore and we are very proud of the strong bilateral ties uniting us. Bringing both countries even closer together, we are happy to be part of the effort to introduce two birds native to Brazil to Jurong Bird Park - the Spix's and Lear's macaws. We look forward to the continuation of this initiative that will allow for the reintroduction of the two species in their natural habitat. This will be an important mark of this golden jubilee. Singapore has every reason to be proud of Wildlife Reserves Singapore's commitment towards the protection and conservation of biodiversity. The macaws are in very good and able hands. I am sure that the public will enjoy this very welcome addition to the park.

- The Ambassador of the Federative Republic of Brazil, His Excellency Flavio Soares Damico

Lear's Macaw

Spix Macaw





PROVIDING WORLD-CLASS ANIMAL CARE

Freshly-accredited by the Zoos and Aquariums Association of Australasia (ZAA) for our animal welfare standards, the Life Sciences team is again working with renewed vigour to attain accreditation from the European Association of Zoos and Aquariums (EAZA), which extends to cover other key aspects of operating of a world class zoo including education, in-situ conservation and operations.

Through the EAZA accreditation, we hope to access capacity building training programmes and further upskill our staff to manage the different taxonomic groups in our living collection in accordance to best practices.

OUR VALUABLE LIVING COLLECTION

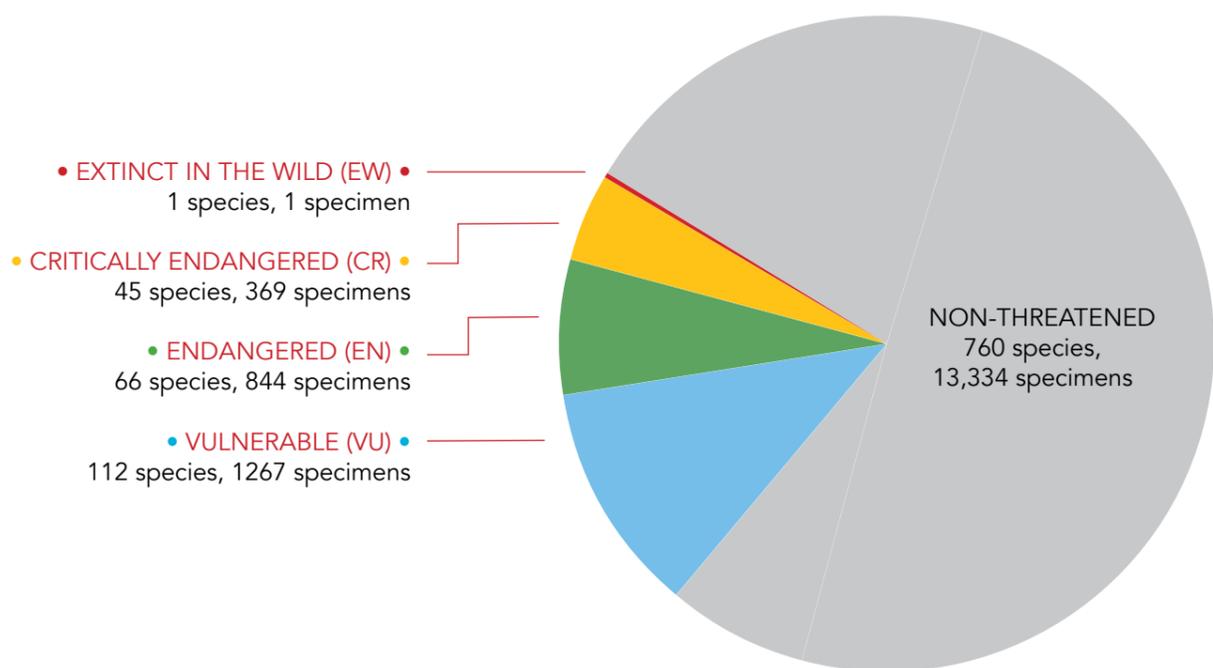
We have one of the most biodiverse living collections in zoological institutions around the world. Of the 984 species we care for, 23% (up 2% from last FY) are threatened in the wild, according to the International Union for Conservation of Nature (IUCN) Red List Assessment. Holding such a valuable collection comes with the responsibility for us to sustain the population of these species. This is achieved through the tireless work of the Life Sciences team members who take care of all aspects of the animals' well-being.

As at 31 March 2018:

TOTAL ANIMAL COLLECTION IN WRS
984 SPECIES, 15,815 SPECIMENS

THREATENED SPECIES*
224 SPECIES, 2,481 SPECIMENS
 (23% of total collection)

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



SAVING SPECIES AT THE GLOBAL LEVEL

In collaboration with zoological institutions around the world, we have played an even greater role in wildlife conservation at the global level. By the end of the reporting period, we had reached a new high with participation in 51 Managed Species Programmes (please refer to page 26 for listing). This is a number that has tripled over the past two years and looks set to increase even further as we strive towards our vision of becoming a world-leading zoological institution and playing a global role in conserving biodiversity.

Through coordinated efforts on the international level, Managed Species Programmes help save severely threatened species by caring for assurance populations and breeding them. They make recommendations for specific individuals to be exchanged among member institutions for breeding with a view to enhance species genetic diversity. Studies of assurance populations under human care also provide insights into species biology which are important for formulating effective in-situ conservation measures. This is in keeping with the common goal among participating zoos to halt the loss of biodiversity globally. By deepening our involvement,

we hope to make a greater impact in saving threatened species beyond the shores of Singapore.

A female red panda, Keta, was imported from Melbourne Zoo in January 2018. This breeding transfer was recommended by the Australasian Species Management Program (ASMP). Keta will be introduced to our male red panda, Karma, in the hope that they will eventually produce offspring to add to their population.

On 3 October 2017, Singapore Zoo sent a male Bornean orangutan, Gunta to Zoo Negara, Malaysia. Our orangutan collection is managed under the International Studbook (ISB) and the Significant Species Management Programme (SSMP) for the species. Gunta was selected because he was genetically compatible with the orangutan collection at Zoo Negara.

Under a recommendation by the European Endangered Species Programme (EEP), a pair of fossa have been slated to arrive in the Singapore Zoo – the male from Marwell Wildlife, United Kingdom and the female from Tayto Park, Ireland. We look forward to welcoming the pair.



One of our rhinos being unloaded from the freighter jet at the John F. Kennedy Airport in the United States.



In the quarantine area at Virginia Zoo

Singapore Zoo as long been very successful in breeding the Southern white rhinoceros and this year, two of our females, Bora and Zina, were sent to Virginia Zoo in the United States. They will be 'match-made' with a male white rhino through the Species Survival Plan (SSP) to start a breeding herd. Bora and Zina present a set of completely new genes to the existing white rhino gene pool in the States. With fewer than 20,000 Southern white rhinos left in the wild, it is hoped that the presence of Bora and Zina will bolster conservation breeding efforts of their species.

SAVING SPECIES AT THE GLOBAL LEVEL |
MANAGED SPECIES PROGRAMMES @ WRS

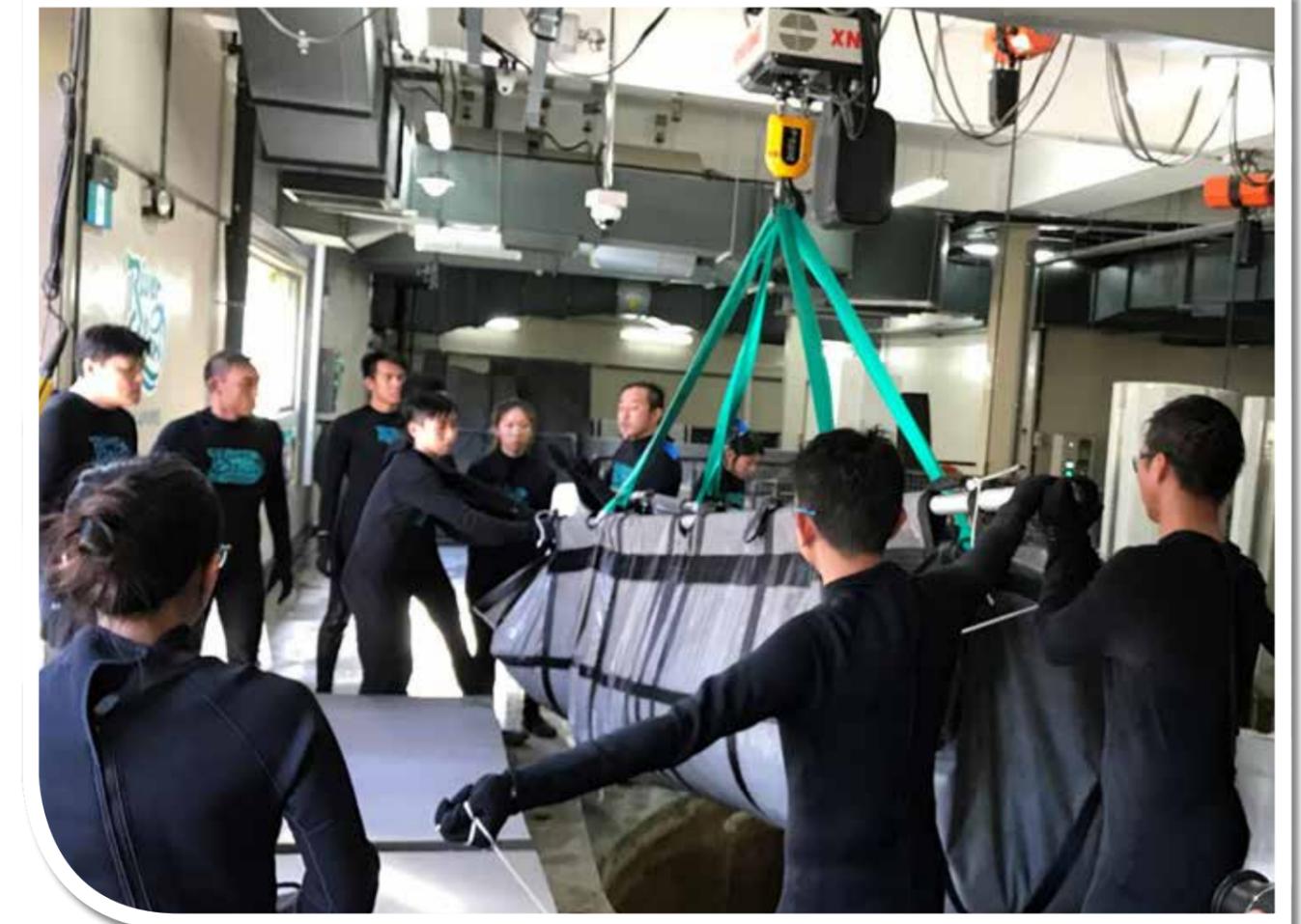
1	China Wildlife Conservation Association/ China Conservation & Research Centre for Giant Panda	<i>Ailuropoda menaloleuca</i>	Giant Panda	VU
2	European Endangered Species Programme (EEP)	<i>Geronticus eremita</i>	Northern Bald Ibis (Waldrapp)	CR
3	European Endangered Species Programme (EEP)	<i>Choeropsis liberiensis</i>	Pygmy Hippo	EN
4	European Endangered Species Programme (EEP)	<i>Cryptoprocta ferox</i>	Fossa	VU
5	European Endangered Species Programme (EEP)	<i>Buceros rhinoceros</i>	Rhinoceros Hornbill	NT
6	European Endangered Species Programme (EEP)	<i>Callimico goeldii</i>	Goeldi's Monkey	VU
7	European Endangered Species Programme (EEP)	<i>Melursus ursinus</i>	Sloth Bear	VU
8	European Endangered Species Programme (EEP)	<i>Panthera pardus kotiya</i>	Sri Lankan Leopard	VU
9	European Endangered Species Programme (EEP)	<i>Probosciger aterrimus</i>	Palm Cockatoo	LC
10	European Endangered Species Programme (EEP)	<i>Pteronura brasiliensis</i>	Giant Otter	EN
11	European Endangered Species Programme (EEP)	<i>Saguinus imperator</i>	Emperor Tamarin	LC
12	European Endangered Species Programme (EEP)	<i>Varanus komodoensis</i>	Komodo Dragon	VU
13	European Endangered Species Programme (EEP)	<i>Amazona lilacina</i>	Ecuador Amazon	EN
14	European Endangered Species Programme (EEP)	<i>Trachypithecus auratus</i>	Javan Langur	VU
15	European Endangered Species Programme (EEP)	<i>Asacornis scutulata</i>	White-winged Duck	EN
16	European Studbook (ESB)	<i>Alouatta caraya</i>	Black Howler	LC
17	European Studbook (ESB)	<i>Tomistoma schlegelii</i>	False Gharial	EN
18	European Studbook (ESB)	<i>Ciccinnurus regius</i>	King Bird-of-Paradise	LC
19	European Studbook (ESB)	<i>Capra falconeri</i>	Markhor	NT
20	European Studbook (ESB)	<i>Leucopsar rotschildi</i>	Bali Starling	CR
21	European Studbook (ESB)	<i>Polyplectron inopinatum</i>	Mountain Peacock-pheasant	VU
22	European Studbook (ESB)	<i>Rhyticeros plicatus</i>	Papuan Hornbill	LC
23	European Studbook (ESB)	<i>Saguinus labiatus</i>	Red-bellied Tamarin	LC
24	European Studbook (ESB)	<i>Nomascus gabriellae</i>	Buff-cheeked Gibbon	VU
25	European Studbook (ESB)	<i>Aythya baeri</i>	Baer's Pochard	CR
26	Global Species Management Plans (GSMP)	<i>Ailurus fulgens</i>	Red Panda	EN
27	Global Species Management Plans (GSMP)	<i>Dendrolagus goodfellowi</i>	Goodfellow's Tree Kangaroo	EN
28	Global Species Management Plans (GSMP)	<i>Dryonastes courtoisi</i>	Blue-crowned Laughingthrush	CR
29	International Studbook Keeper (ISB)	<i>Astrochelys yniphora</i>	Ploughshare Tortoise	CR
30	International Studbook Keeper (ISB)	<i>Leontopithecus chrysomelas</i>	Golden-headed Lion Tamarin	EN
31	International Studbook Keeper (ISB)	<i>Leontopithecus rosalia</i>	Golden Lion Tamarin	EN
32	International Studbook Keeper (ISB)	<i>Myrmecophaga tridactyla</i>	Giant Anteater	VU
33	International Studbook Keeper (ISB)	<i>Ara ambiguus</i>	Buffon's Macaw	EN
34	International Studbook Keeper (ISB) / European Studbook (ESB)	<i>Ara glaucogularis</i>	Blue-throated Macaw	CR
35	International Studbook Keeper (ISB)	<i>Aonyx cinereus</i>	Oriental Small-clawed Otter	VU
36	International Studbook Keeper (ISB)	<i>Chrysocyon brachyurus</i>	Maned Wolf	NT
37	International Studbook Keeper (ISB)	<i>Acridotheres melanopterus</i>	Black-winged Myna	CR
38	International Studbook Keeper (ISB)	<i>Cyanopsitta spixxi</i>	Spix's Macaw	CR (EW)
39	International Studbook Keeper (ISB)	<i>Anodorhynchus leari</i>	Lear's Macaw	EN
40	International Studbook Keeper (ISB)	<i>Bos gaurus</i>	Gaur	VU
41	Significant Species Management Plan (SSMP)	<i>Tapirus indicus</i>	Malayan Tapir	EN
42	Significant Species Management Plan (SSMP) / International Studbook Keeper (ISB)	<i>Pongo pygmaeus</i>	Bornean Orangutan	EN
43	Species Survival Plan (SSP)	<i>Gallicolumba criniger</i>	Minaduo Bleeding-heart	VU
44	Species Survival Plan (SSP)	<i>Pitta sordida</i>	Hooded Pitta	LC
45	Species Survival Plan (SSP)	<i>Paradisaea raggiana</i>	Raggiana Bird-of-Paradise	LC
46	European Studbook (ESB)	<i>Polyplectron malaccense</i>	Malayan Peacock-pheasant	VU
47	European Studbook (ESB)	<i>Rhyticeros undulatus</i>	Bar-pouched Hornbill	LC
48	European Studbook (ESB)	<i>Tockus deckeni</i>	Von Der Decken's Hornbill	LC
49	European Studbook (ESB)	<i>Chilabothrus angulifer</i>	Cuban Boa	NT
50	European Endangered Species Programme (EEP)	<i>Buceros bicornis</i>	Great Hornbill	NT
51	International Studbook Keeper (ISB)	<i>Rhinoceros unicornis</i>	Indian Rhino	VU

SAVING SPECIES AT THE GLOBAL LEVEL |
ENHANCE GENETIC DIVERSITY

On top of globally-coordinated efforts through the various Managed Species Programmes, WRS continued to work with individual zoos on animal exchange programmes to enhance the genetic diversity of the species. During the reporting period, we sent a good number of animals to zoological institutions regionally and farther afield.

One male and two female lion-tailed macaques went to Malaysia's Zoo Negara. Eight of our Hamadryas baboons were sent to Khon Kaen Zoo in Thailand. Two of our female West Indian manatees went to Wroclaw Zoo, Poland.

Transferring and transporting big animals require lots of planning and resources. Months were spent in preparing our manatees for their long journey to Wroclaw Zoo, Poland. No efforts were spared in ensuring their welfare and safety.



BUNDLES OF JOY, BIG AND SMALL

Thanks to the dedication and passion of the animal caregivers on the Life Sciences team, we enjoyed yet another year of significant breeding achievements in our parks.

Our primate collection is one of the most diverse in the world. By providing excellent animal care and a conducive environment, we have succeeded in breeding many primate species that are threatened in the wild.

Right at the start of the reporting period, on 24 April 2017, our Bornean orangutan Anita gave birth to a female, later named Khansa. This brings the number of successful orangutan births at Singapore Zoo up to 46, enabling us to continue to participate in future animal exchange under the Managed Species Programmes. A red-shanked douc langur baby also arrived on the same day.

Six months after the birth of a baby boy chimpanzee in mid-2017, we welcomed another chimpanzee birth in the first month of 2018 – a baby girl this time. In the month of February 2018, we saw the arrival of a baby Eastern black-and-white colobus monkey, as well as a Javan langur baby. The Javan langur is listed as Vulnerable under the IUCN Red List due to habitat loss and degradation. We are on the EEP for this species and the birth is a small but important addition to the programme.

Two critically endangered electric blue geckos hatched in Singapore Zoo's newly revamped reptile exhibit RepTopia. We have also seen successful hatchings of the Australian knob-tailed gecko and the crested gecko from New Caledonia, which was once thought to be extinct.

An endangered baby female pygmy hippo also joined the Zoo family. Named Abina, she is mother Minah's 12th calf to date and the Zoo's 24th pygmy hippo birth. Adding to the cheer was the Zoo's first male white rhino calf in five years. Named Oban, which means "king" in the African Yoruba language, he is mother Donsa's 11th calf and the 21st white rhino born at the Zoo.

Our Asian small-clawed otters at Singapore Zoo and Night Safari collectively raised more than 10 young pups. Night Safari also saw an abundance of nocturnal babies across a range of species, including the spotted

hyaena, Sunda slow loris, hog badger, binturong and bharal.

At River Safari, two manatee calves, both males, were born within three months of each other. The older calf born in September had to be bottle fed thrice daily as it was not observed to be nursing. The younger calf was born head-first, which is not the norm in marine mammals and usually ends sadly as the calf tends to drown. During this particular birth, another adult female assisted the calf to breathe and happily, it pulled through.

River Safari also welcomed the first successful jaguar birth since 2009. Born to first-time mother, Aswa, on 16 November 2017, the cub was named Amor, which means "love" in Spanish. Amor was born with congenital vestibular disease. Her abnormal head tilt first manifested in January 2018 and worsened a week after. It started to affect her movements, causing her to walk with an imbalance. Amor's keepers started doing intensive rehabilitation activities with her for three hours daily and she has shown signs of improvement.

Also at the Amazon River Quest, Lapura, the giant anteater, underwent special medical conditioning to get her used to the ultrasound checks that would come with her pregnancy. Her baby girl was born in March 2018 and named Leona, after the river La Leona in Argentina. The giant anteater is one of the species we manage under the ISB and the birth of Leona promises to rejuvenate the existing gene pool.

Over at the Jurong Bird Park, we had the first successful king penguin hatching in almost 10 years. The chick was named Maru, meaning round in Japanese. We also welcomed five Gentoo penguin chicks, hatched from eggs given to us by Ocean Park Hong Kong. Other significant hatchings include the Asian fairy bluebird, Jambu fruit dove, straw-headed bulbul, hyacinth macaw, and last but not least, the Papuan hornbill, a species managed under the GSMP.

We will continue to improve and expand our expertise in breeding threatened species in our parks. We are certain that together with our efforts in protecting wildlife in their native habitats, we can work towards assuring the survival of these species.



Abina,
the baby pygmy hippo



Electric blue gecko baby



Hog badger
and baby



Javan langur
and baby



Gentoo
penguin
chick



Amor,
the jaguar cub



Our Goodfellow's tree kangaroo joey at Australasia finally took its first step out of her mother's pouch on 4 April 2017, at the age of about 9 months and was observed to be taking bites of solid food. Named Nais, she was born during the last reporting period to mother Blue and father Ziggy. Both her parents are on the geriatric animal plan. WRS participates in the Global Species Management Programme (GSMP) for the species and Nais is a valuable addition.

ZAA ANIMAL WELFARE ACCREDITATION

In September 2017, we received confirmation that WRS has achieved the animal welfare accreditation by the Zoos and Aquariums Association of Australasia (ZAA). This is WRS' first ever formal accreditation by a world class zoo association and it means that the standard of care and welfare we provide for our animals is recognised to be on par with the member zoos in Australasia.

As the external scrutiny on zoos has become more stringent, there are strategic advantages to be gained by seeking accreditation with ZAA, a world-class regional zoo association. We can benchmark and learn from the best in the community and improve in areas where we are lacking. Being an accredited member also allows us to participate in species management programmes in the respective regions, so we may play a bigger role in scientific and collaborative programmes.

Apart from the ZAA accreditation, we have also completed a round of assessment by the European Association of Zoos and Aquariums (EAZA) in November 2017. The initial report has indicated high achievement in all areas except back-of-house areas for animal presentations at Night Safari, River Safari and Bird Park. We were aware of these shortcomings and were in the process of making adjustments. With the accreditation findings we have quickened the pace of improvement based on the feedback. We have provided our immediate corrective actions and the ongoing action plan to the assessment team and we await their final decision.

We have learnt a lot through the accreditation audit processes and are privileged to have been able to share this knowledge with our colleagues in zoos and aquariums in Southeast Asia. Creating an accreditation system suitable for the Southeast Asian Association of Zoos and Aquariums (SEAZA) is a project that is underway and the experience we have gained will help guide the process.



ACCREDITATION 2020 Recognising Positive Animal Welfare

DIETS REVIEWED

To centralise the food preparation process, the Wildlife Nutrition Centre began preparing lunchboxes for the animals. Having a centralized system with dedicated staff promotes work and procurement efficiency, resulting in better monitoring of food intake and reduction in wastage. To uphold hygiene standards, all lunchboxes are collected and cleaned in a central cleaning system. Currently, the lunchboxes are delivered to 80% of the exhibits in Singapore Zoo and operations continue to expand.

The diet change for chimpanzees and orangutans last year to one with higher fibre has resulted in lowered blood glucose levels. Besides improving coat condition, the new diets have also helped in weight management for our troop of 107 baboons. There is now much less difference between the weights of dominant and subordinate baboons than before, which means individuals are approaching optimum body weight. The biggest effect from the baboon diet change was the reduction in illness and deaths due to parasites, especially in the case of their babies.

Following the success of the high fibre diet with the great apes and baboons, our wildlife nutrition team continued to work on extending the diet to other primates, especially those that eat gum in the wild such as marmosets and tamarins.

Gum is necessary for the health of marmosets and tamarins under human care but as was typical of many zoo primates, our tamarins and marmosets were receiving very large amounts of fruit, some vegetables, some bread, pellets and vitamin supplements and, perhaps less typically, chicken egg rice balls. Though large amounts of browse were also given, their diets were still low fibre and high sugar/starch.

Low fibre/high sugar diets contribute to a range of health issues such as obesity, poor dental health and diabetes, and can adversely affect behaviour. Wasting syndromes, dental disease, cannibalism, abnormal behavioural patterns and imbalance in intestinal bacteria have all been linked with inappropriate diets. Many of these problems can be avoided by changing diets to reduce sugar/starch and increase fibre, so the wildlife nutrition team made the decision to remove all chicken egg rice balls, bread and fruit, replacing with germinated

pulses and whole grains, vegetables and more browse. Amounts of insects and gum were also increased. These changes increased fibre, reduced sugar/starch and enhanced many other nutrients, ultimately eliminating the need for vitamin and omega 3 supplements.

Ever since the diet change, we have seen better faecal quality and fewer parasites in our marmosets and tamarins.

Similarly, with diet change, we have seen improved weights, faecal quality, coat condition, dental health and infant survival in the slow lorises and we have managed

to breed them successfully, with two babies born during the reporting period. Institutions worldwide that care for slow lorises are now following our diet.

Even with the douc langurs, which had previously had very little fruit in their diet, its total removal saw improved weights of 'thin and lanky' individuals, a reduction in dental disease and an increase in breeding and infant survival, indicating that even small amounts of sugary food can cause imbalance in intestinal bacteria in these leaf eating monkeys. We have also seen the birth of a red-shanked douc langur baby in the reporting period, the first birth in many years.



Lunchboxes packed and ready at the Wildlife Nutrition Centre.

OPERANT CONDITIONING FOR STRESS-FREE ROUTINE AND MEDICAL CHECKS

With successful operant conditioning, routine checks, transfers, and basic veterinary examinations and procedures can be rendered stress-free. Through sheer perseverance on the part of the Life Sciences team, impressive progress has been made in this area of animal care.

WEIGHING IN

Scale training for the Spix's Macaw to monitor its weight.



Most of our Asian lionesses are cooperative and familiar with process and weighing scale.



VOLUNTARY BLOOD DRAW

Blood draw from tree kangaroo Makaia.



Blood draw from bongo 'Specter'



From Apr 2017, giraffes at the Zoo have been weighed regularly as part of the morning husbandry process, which allows keepers to better monitor their condition.



Sugar glider is encouraged to enter a clear acrylic tube which is then placed on weighing scale. Honeyed water or fresh juice is given as reward for a job well done.



ORAL INSPECTION

Brushing of teeth and temperature taking for the orangutans



Night Safari's baby elephant Neha has had a tremendously busy year, and her keepers can proudly boast that the little pachyderm, who turns one year old, has mastered the art of responding to about 10 instructions as part of her ongoing conditioning sessions which began in November 2017.

There is a practical reason for starting elephant lessons early. Neha has reached the at-risk age of contracting the Elephant Endotheliotropic Herpesvirus (EEHV), and her team of caregivers is taking every precaution to ensure they are ready to combat the disease should it strike.

EEHV can result in severe haemorrhagic disease in elephants, and is the leading cause of death for juvenile Asian elephants under human care. Calves of between one and eight years of age are at the highest risk of contracting this often-fatal disease. Currently there is no vaccination available, and medication only serves to suppress the growth of the virus. Death frequently occurs within 1-2 days of the first visible signs, and early diagnosis and treatment are critical to survival.

Neha's older brother Nila Utama succumbed to EEHV in 2013, when he was two years old. He had shown signs of contracting the disease just two days before he passed.

Conditioning Neha from an early age through protected contact makes it easier for her vets and keepers to monitor her closely, and ensure early diagnosis, which is crucial in the management of this disease. Protected contact means that Neha's conditioning sessions take place with barriers in between her and her keepers. This allows for higher quality care and welfare while ensuring a greater degree of safety for the humans working with her.

Neha's daily conditioning sessions are designed as play dates with her keepers, in which she can choose whether to participate. Aside from responding to instructions such as lifting her leg and opening her mouth, Neha already allows her temperature and weight to be taken daily. She is also learning to be comfortable with vets drawing blood from her ear, and to accepting oral and rectal administration of medication. These processes will allow for regular monitoring of her health, and ensure that the team can act swiftly should Neha display any signs of the disease.



Senior Keeper, Mr Arumugam Lachmana, getting Neha to open her mouth to check her tongue for cyanosis, which causes the tongue to turn blue. Cyanosis, a symptom of EEHV, presents itself within 24 hours of disease onset. Once symptoms are detected, the elephant must undergo treatment swiftly or risk losing its life.



Senior Keeper, Mr Arumugam Lachmana (left) and Mr Novendran s/o Suppiah (right), Deputy Head Keeper, conducting visual target training for Neha to present her foot.



Elephant feet are extremely sensitive. Senior Keeper, Mr Arumugam Lachmana, checking Neha's foot for any injuries or abrasions. The sound of the whistle serves as a 'bridge' signal that tells Neha she is doing a good job. Food rewards are given as positive reinforcement when she cooperates with the daily checks.

KEEPING BOREDOM AT BAY

Other than operant conditioning, a good portion of our keepers' time is devoted to designing, implementing and evaluating enrichment activities for their charges. Enrichment activities, engage animals both mentally and physically.

Food-based enrichment activities are most commonly used but the Life Sciences team tries as far as possible to innovate by presenting new objects, sounds or scents. In keeping with technological advancements, the team has also moved into app-based enrichment activities.

DYNAMIC MOVES

Sri Lankan leopard going for a bone suspended on top of a dynamic log in its exercise yard.



Mealworms are hidden in hessian sacking and placed in a ball as food enrichment for the sugar gliders. The device is suspended on a string and rotates when the gliders are on it.



To encourage our fishing cats to be more physically active, fish is wrapped inside hessian sacking, put in a ball and hung up in their den.



Landscape equipment deployed to create sand mounds for our elephants to sleep on and play with.



SEASON'S GREETINGS

The stage was set for some Halloween fun for our elephants. The elephant care staff painstakingly decked the yard out with pumpkin-headed carton box figurines and leaves that the elephants were to make short work of.



Pumpkin given to our Indian wolves. They were seen pushing it around, sniffing and gnawing at it.



During the Chinese New Year festive season, the sloth bear keepers used 'firecrackers' filled with bread and pellets as enrichment for their charges.



SMART ENRICHMENT

New Feedpod stand at our elephant Sang Wira's exhibit. The Feedpod dispenses pellets at the touch of a smartphone and our elephant care staff can control the Feedpod remotely to dispense pellets at random intervals. This serves as a diversion for Sang Wira and helps to minimise stereotypical behaviour.



Our giant otter pawing out a tune on the phone using a piano app. Readily-available and safe smartphone apps like these are increasingly being used as a form of enrichment.



VETERINARY HIGHLIGHTS

WRS holds one of the world's largest zoological collections in the world, with over 15,000 animals representing almost 1,000 species. Providing veterinary care for such a diverse group of animals requires very well-structured healthcare and health monitoring programmes.

VETERINARY HIGHLIGHTS – GERIATRIC ANIMAL PLAN

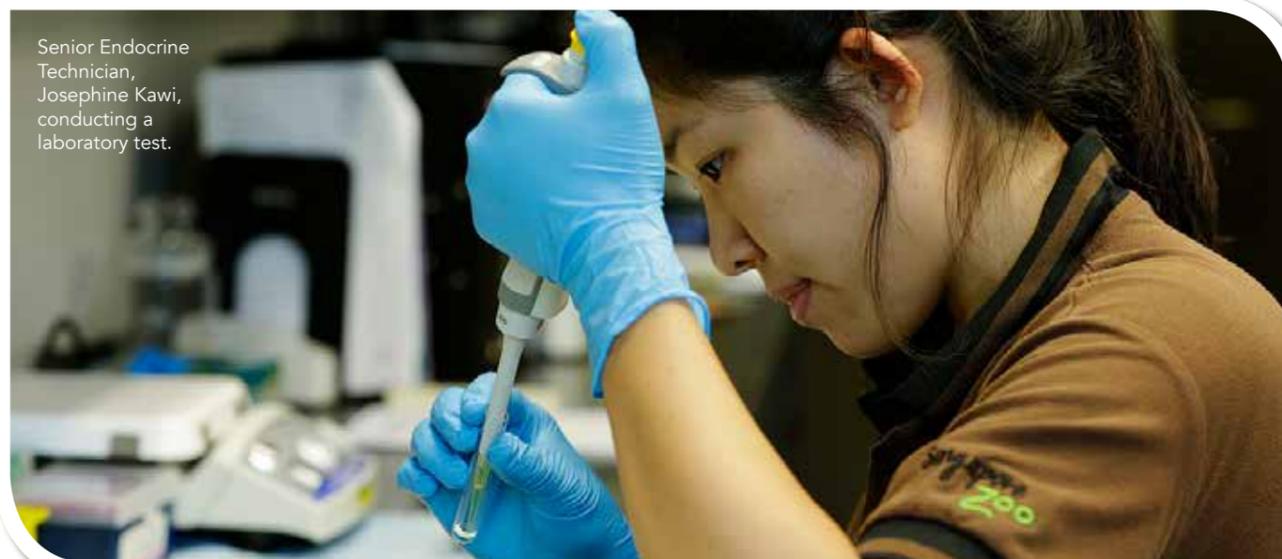
With ongoing advances in zoo medicine, wild animals under human care are now living longer. This requires a proactive vision of geriatric animal management. At WRS the geriatric and chronically ill animals have always been a priority for the veterinary team. To improve the overall management of aging animals and to better prevent the occurrence of health issues, a comprehensive and multidisciplinary geriatric healthcare program was recently developed by curators, keepers, nutritionists and veterinarians.

As a first step, all animals that have reached 75% of their expected life-span are identified as geriatric. Currently 188 animals at WRS fall into this category. All these animals received a preliminary health assessment by the veterinary team, which allowed a categorisation into three health-levels:

1. Green - geriatric without visible health concerns;
2. Yellow - geriatric with minor health concerns and
3. Red - severely compromised, requiring close observation and constant medical care.

Animals under the Green category can be entirely managed by the animal care staff in the Zoology team without requiring continuous medical intervention. The nutritionist may recommend dietary adaptation for preventive care for animals in the green category. Those under the Yellow category require regular veterinary supervision and each individual has an assigned veterinarian who will put together a detailed healthcare plan including annual check-ups. Animals that fall into the Red category have reached the last stages of their life. These individuals are scrutinised under the Quality of Life Assessment (QLA) on a weekly or even daily, in some cases, to evaluate whether they should be euthanised on the grounds of animal welfare. These decisions are made following a scientific and objective welfare evaluation protocol, which then allows the team to identify changes in health or welfare over time.

This proactive programme has already helped us tremendously to better assess, manage and prevent chronic ageing conditions in the animal patients in our collection. It also serves as a tool for the different teams to communicate effectively and arrive at science-based decisions when it comes to the welfare of severely compromised geriatric or chronically ill animals.



Senior Endocrine Technician, Josephine Kawi, conducting a laboratory test.

VETERINARY HIGHLIGHTS – INCORPORATING CT SCANS

Computed tomography (CT) is an advanced diagnostic imaging technique commonly used in human medicine and some of the small animal practices. Up-to-date, the use of CT scanner is still not popular in zoo and wildlife medicine due to the price of the machine and the running cost. In comparison with traditional X-ray images, CT scans provide more detail and allows for reconstruction 3D image from CT scan files. We had two cases where CT scans were used to determine the severity of lesions in the skulls of our animals.

The first animal was a male 17-year-old sealion, which had oral ulceration at the hard palate noticed by the keeper during routine check in mid-2017. Treatment was given over several months without improvement. The lesion then spread to the adjacent molars. The affected teeth were removed and biopsy of the ulceration site was done with the help of a veterinary dentist from Thailand. The biopsy result suggested aggressive cancer growth. In order to understand how extensive the cancer has spread, CT scan was carried out at Veterinary Emergency and Speciality (VES) Hospital. The CT scan result confirmed aggressive cancer growth in the left and right side of the hard palate. Despite all our efforts with great diagnostic ability the animal did not survive.

The second animal to undergo CT scan was a female Caiman lizard. She was found with a big abscess in the mouth by the keeper. Samples taken showed that the wound was infested with an aggressive reptile parasite, entamoeba. To investigate the extent of the infestation a CT scan was scheduled. The 3D reconstructed image showed that though the infestation had not gone too deep in the nose, the bones in the left nostril and the hard palate underneath it had been destroyed. The animal continued to be warded to finish the full course of the treatment. Eventually, the soft tissue of the left nostril grew back and the animal recovered fully.



Above: Dr Abraham Mathew, Assistant Director (Veterinary) and VES staff assisting our sea lion through a CT scan at the Veterinary Emergency and Speciality (VES) Hospital. They are accompanied by VES staff.

Below: The Caiman lizard has recovered from the parasite infestation. She now plays the role of an animal ambassador during RepTopia behind-the-scenes tours.



VETERINARY HIGHLIGHTS – USING CELL CULTURE FOR WILDLIFE HEALTH

To further strengthen our conservation research efforts, we set up a cell culture lab this year. Cell culture refers to the removal of cells from an animal or plant and their subsequent growth in a favourable artificial environment. In most organisms the embryonic stem cells (ESCs) are the only cells capable of developing into different cell types. They are natural pluripotent stem cells (PSCs) that can give rise to all the cell types that make up the body.

In 2006, a discovery was made that allowed specialised cells to be reprogrammed to become pluripotent stem cells, which we call induced pluripotent stem cells (iPSCs). The iPSCs, which can be shaped into any type of cell in the body, can potentially help in organ transplantation; be used as a disease model for diagnostics and drug development; and also for testing of therapies including gene therapy.

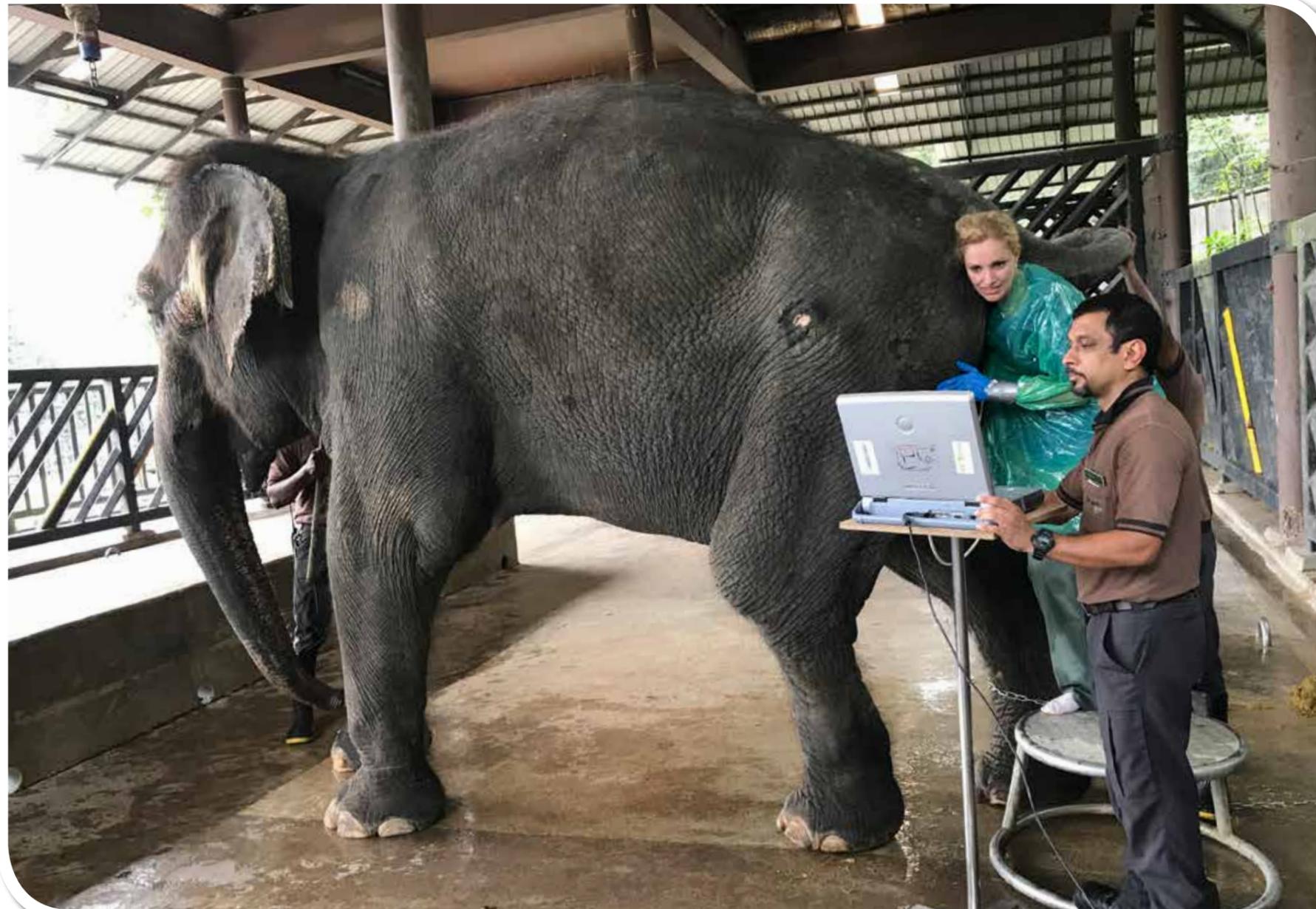
In wildlife healthcare, iPSCs can be used for disease models, and help in conservation, mainly for breeding programmes. With iPSCs, we could provide material to support new opportunities in assisted reproductive technologies.

The first successful case of reprogramming of specialised cells into iPSCs was done in mice using fibroblast cells, the most common cells found in connective tissues. Collection of fibroblast are usually with minimal invasiveness as they can be accessed using a simple ear notch or skin biopsy.

Since the setup of our cell culture lab in May 2017 we have successfully collected and stored fibroblast cells from 12 species, including the Asian small-clawed otter, proboscis monkey and Malayan tiger.

VETERINARY HIGHLIGHTS – VETS ON THE CASE

This year the veterinary team was kept busy with close to 5,000 cases from our collection of animals across the four parks. These cases were diverse in nature covering from simple regular health check-ups to complicated surgeries.



Reproductive tract scan of our elephant by Dr Imke Luders, from Allwetterzoo Münster, expert in reproduction and assisted reproduction technologies, for the conservation of threatened and endangered mammals.

At 60, Jojo, the Bornean orangutan is amongst the world's oldest orangutan under human care. Blind in one eye and suffering from advanced cataract in the other, he had not been able to see clearly for years.

In February 2017, our vets teamed up the National Eye Centre's (SNEC) Professor Lee Shu Yen, senior consultant and deputy head of the centre's Surgical Retina Department, and Senior Resident Dr Noor Affizan to perform a cataract surgery on Jojo. The surgery went well and Jojo has been leading a much more active life, resulting from greatly improved vision.





PLAYING A LEADING ROLE IN CONSERVING BIODIVERSITY

During the reporting year, WRS increased its support for conservation work locally, in Southeast Asia and farther ashore. To save the Santa Cruz ground doves, we extended our help beyond the region when we responded to a call from conservation partners in the Solomon Islands to provide veterinary care for 112 birds confiscated from poachers. This constitutes possibly half of the world's remaining birds of this species. We are also honoured to be participating in a Brazilian project to prepare a safe habitat for the Spix's macaw in the hope of eventually reintroducing the critically endangered species back into the wild.

Santa Cruz Ground-dove



SUPPORT FOR REGIONAL PROJECTS

WRS's field conservation efforts provided financial support to 30 conservation projects in the region, seven more from the year before. Southeast Asia is incredibly rich in biodiversity that is amongst the world's most threatened. The selected projects focus on a range of species and biodiversity hotspots in Malaysia, Thailand, Vietnam, Laos, Cambodia, Indonesia and the Philippines. Besides funding, WRS deepened its involvement in regional conservation by sending staff on-site to assist in field work, as well as hosting project teams on study trips at our parks.



INDONESIA

Scaling up mitigation of human-orangutan conflict in agricultural landscapes in northern Sumatra



We support the conservation of the critically endangered Sumatran orangutan through rescue, education, and the implementation of best practises for mitigating human orangutan conflict in agricultural landscapes adjacent to the Leuser Ecosystem through the Human Orangutan Conflict Response Unit (HOCRU) of the Orangutan Information Centre (OIC). This unit provides direct, immediate help to orangutans through rescue efforts in human-orangutan conflict areas. The team also trains local communities to protect crops from orangutan raids without harming the orangutans.

In the last year our support enabled the HOCRU team to rescue 23 orangutans from farmlands and confiscated from illegal owners. We also assisted the second HOCRU team based in Tapak Tuan, South Aceh in becoming operational, with a professional veterinarian joining the team in the last quarter of 2017. The HOCRU is now expanding the activities from rescue, monitoring, awareness, to facilitating communities in developing local regulation (known as 'qanun' in Aceh) at the village level that concerns orangutan protection and Human-Orangutan Conflict mitigation.

Paving the path for repopulation of the Roti Island snake-necked turtle



We support Wildlife Conservation Society (WCS) on the conservation of the Roti Island snake-necked turtle through community education, population surveys and habitat quality assessments for possible future reintroductions. We conducted focus group discussions to spread awareness of the status of the turtle amongst the various stakeholder groups on the island. Natural Resources Conservation Agency of East Nusa Tenggara (BBKSDA NTT) also contributed by sending their staff to introduce the concept of Essential Ecosystem and its potential benefits to the local community. The participants were excited to be involved in saving the turtle, with many committing to supporting the conservation programme. In an effort to further build trust and a strong relationship with the local communities, WCS hired a local staff member to effectively engage with them on specific objectives of the conservation plan.

Throughout the year, surveys on the turtles and monitoring of various sites were undertaken and a habitat suitability ranking for turtles was created. The goal of these surveys was to determine if and where it would be possible to reintroduce captive born turtles onto Roti Island and if any turtles could still be located on the island. The results indicate that the species is now ecologically extinct on the island and could be entirely extinct in the wild. Following the surveys, the project team made a visit to WRS to pick up husbandry skills at our reptile section, where an assurance colony for the turtles are currently being held. The training helped the team in designing protocols for a future captive breeding program on Roti island.

Protecting Sumatran elephant habitats and mitigating human-elephant conflict in Way Kambas National Park



Many Sumatran elephant populations face conflicts with humans as their habitats are converted into human settlements and agricultural areas. The Community for Sumatran Nature Conservation (KHS) Elephant Response Units (ERU) conduct regular patrols and monitor activities in Way Kambas National Park (WKNP) to prevent and mitigate such conflicts. We support the Tegal Yoso Elephant Response Unit which is one of the three Response Units in the National Park. Besides preventing and mitigating elephant-human conflicts, Tegal Yoso ERU also serves as an information and nature conservation learning centre. During the reporting period, the ERU identified and prevented close to 50 cases of illegal activities such as illegal hunting, fishing, logging, cattle grazing and forest fires.

With our support, two new observation shelters have been built on the border of the Way Kambas NP in the Tegal Yoso region. These shelters serve as a base for the ERU teams to conduct community crop guarding. They also work as elevated watch towers for the teams to look out for forest fires and wild elephants inside the National Park.

Population surveys and undercover investigations for the helmeted hornbill in West Kalimantan [New Initiative]



The helmeted hornbill, one of the most iconic species of Southeast Asia, is at risk of going extinct due to overhunting for the red ivory from its casque. Planet Indonesia partners local communities to develop sustainable livelihoods while preserving the natural habitat of the helmeted hornbill. WRS supports Planet Indonesia in this unique approach. The project embraces a bottom-up tactic, helping communities own every step of the planning, implementation, and managing of initiatives, as they understand this to be essential for long-lasting, sustainable change. In addition, the project currently has the largest undercover wildlife investigations team in West Borneo focused on monitoring the illegal hornbill and songbird trade. They have made major strides in the last year by mapping the entire province for markets, transit routes and facilitated confiscations.

In addition to this project, we also supported the 'Range-wide Conservation Strategy and Action Planning Workshop for the Helmeted Hornbill' in Sarawak in May 2017. Our staff helped in the formulation of the Conservation Strategy and Action Plan. Successful implementation of the action plan will require sustained international and interdisciplinary collaboration and communication among a large and diverse coalition of partners. To fulfil this role, the structure of the pre-existing Helmeted Hornbill Working Group was revised and we play an active role in the new Helmeted Hornbill Working Group.

Safe future for Javan gibbon habitats and promoting shade coffee in Java



Through this project, we have enabled the Coffee and Primate Conservation Project Team (CPCP) to work towards enhancing primate and habitat conservation in Central Java, Indonesia. The support since 2015 has ensured protection of the forest area and its wild inhabitants. The forests remain intact while the coffee provides a source of income for local farmers. This project shows that conservation efforts can succeed by working with the community to create a link between local economic gain and ecosystem safeguarding. Project goals were achieved through law enforcement and forest protection, applied research for conservation, conservation education and campaigning, and sustainable economic initiatives.

We were also actively engaged in improving the quality of the coffee beans through capacity building and connecting the project team with the Singapore market as well. Through shade-grown coffee, the team has developed a sustainable conservation scheme to not only to preserve Javan Gibbon and its habitat but also engage local community directly. Through the partnership with us, the team has been able to initiate sustainable business and raise the profile for conservation of Javan gibbon by selling coffee in local markets in Indonesia and Singapore. Our parks serves the shade-grown coffee, branded Owa Coffee, at selected F&B outlets.

Protection of the Nantu Forest in Sulawesi [New Initiative]



The Nantu Rainforest Wildlife Sanctuary (NWS) is one of Sulawesi's few remaining pristine lowland rainforest ecosystems and covers an area of 520 km². It has been described as one of the five most important sites for biodiversity in Southeast Asia. Our collaboration with the Adudu-Nantu Conservation Foundation (YANI), a local NGO registered in Sulawesi, is directly protecting critically-low populations of babirusa and anoa in the wild, as well as many thousands of other threatened endemic species. With our help, the project team implemented 73 days of field protection patrols at two field posts during a reporting period. Efforts by organised forest clearer groups to cut forest inside the NWS were prevented. The team are also working to secure formal protection for a further 61.4 km² of pristine rainforest located immediately east of Nantu.

This project also contributed to building local conservation capacity through a residential field training workshop held at the Adudu field station. The team also hosted a total of 44 students for conservation field learning from 1 November 2017 to 15 January 2018. We visited the project site and accompanied the patrol teams to better understand their needs for further assistance and effective support.

Conservation of the endemic chelonians of Sulawesi [New Initiative]



Chelonians are among the most endangered vertebrate group, with more than half of the species threatened with extinction. We support the Turtle Survival Alliance in Sulawesi to help conserve the two endemic chelonians on the Indonesian island of Sulawesi: the endangered Forsten's tortoise and the critically endangered Sulawesi forest turtle. A total of 11 surveys for Forsten's tortoise were conducted at six different locations that had been identified as appropriate habitat and where the species had been previously observed. The team rescued an adult male Forsten's tortoise that was tied up and being used as a toy for a young child. This will be the first animal to be part of the future breeding programme for its species. The project team has also connected with community members in a few new areas and they have agreed to assist in future surveys. A monitoring system will be implemented during the surveys, as suitable populations are identified. More links between local academic institutes will also be established moving forward.

Collaborative Governance and Monitoring of Biodiversity Impact at Tangkoko Nature Reserve, North Sulawesi



Celebes crested macaques, locally known as 'yaki', are endemic to North Sulawesi. Having experienced a population decline of more than 80% within 40 years, they are now classified as critically endangered. We support the Yayasan Selamatkan Yaki Indonesia in conserving this species and rejuvenating the Tangkoko Nature Reserve, an area rich in biodiversity and one of the last strongholds for crested black macaques. Our funds have been instrumental in developing the SY Forest Conservation Community Forums (Forum Masyarakat Konservasi Hutan, FMKH), and initiating capacity building of nature reserve field guides through the provision of an English course. Outreach is key to fostering behaviour change within the community. By providing local people with the information and capacity to conserve crested black macaques and sympatric wildlife, further species extinction can be prevented. In a two-step approach, the project team first brought junior high school students and priests on board their conservation work. Their 'trainees' in turn became conduits for the conservation message when they reached out to their respective communities.

Looking for the elusive Mentawai dwarf gibbon [New Initiative]



The endangered Mentawai dwarf gibbon is endemic to the four Mentawai Islands – Siberut, Sipora, North Pagai and South Pagai – off the west coast of Sumatra. Despite its decreasing population trend, there has been limited conservation work focused on the species and conservation knowledge and practices are lacking amongst the local community. The gibbon continues to face threats in the wild, in particular hunting, loss of habitat to commercial logging and agriculture and the illegal pet trade. This project aims to conserve the Mentawai dwarf gibbon and its habitat through the initiation of grassroots level activities. Selected forest within the Tololago village in southwest Siberut will be the main site for long-term field work including a study of the gibbon population in the forest of Tololago and collaboration with

the local community to practise sustainable natural resources management and create sustainable forest products e.g. through bee cultivation. With our support, the team from SwaraOwa has been directly assisting the Uma Malinggai (Traditional Mentawai) in conservation fieldwork. Capacity building for forest surveys was completed during the year, as well as community development activities in the villages of Southern Siberut to teach local people how to utilise the natural resources available, while creating sustainable business schemes for the future. A study programme has been initiated and will continue to be funded until the community can independently fund this programme. Successes of this year include increasing scientific capacity of young people within the tribe, as well as training in survey methods offered to members of the community.

Saving the Bali myna through novel breeding programmes



The Begawan Foundation was founded in 1999 with the aim of bringing the critically endangered Bali myna back from the brink of extinction. We funded two aspects of their work: the 'Breeding and Release Programme' and the 'Learning by Doing' education programme. This project gives the villagers the opportunity to breed Bali mynas for release, and teaches them to be accountable for the birds' safety once back in the wild. Begawan Foundation has supplied breeding pairs to ten interested parties, and another ten breeders have been selected in December 2017. During the reporting period, three chicks have hatched. The breeding and release program is complemented by the 10-week programme in local schools to educate students on the importance of conserving their native bird.

Rescue, rehabilitation and release of Bornean slow lorises in West Kalimantan



The Bornean slow loris is sadly victimised by the rampant illegal pet trade. We support International Animal Rescue (IAR) Indonesia on their project to rescue, rehabilitate and release Bornean slow lorises in West Kalimantan. The project team was able to conduct comparative studies and develop an ideal rehabilitation and reintroduction strategy to ensure post-release success of rescued lorises. This tool is critical for the region and can be adopted as best practice by numerous other organisations working on rescue and rehabilitation. The team plans to continue collecting vital data on the behaviour, habitat use, interactions, reasons for survival and death and the use of space in rescued Bornean slow lorises in the coming phases of the project. A total of 13 Bornean slow lorises have been released in Gunung Tarak Forest Reserve during the reporting period. Post-monitoring surveys on the released slow lorises are ongoing. The team has also initiated a database of wild loris food sources with the aim of creating digital references in the future.

Saving the last population of Siamese crocodiles in Indonesia [New Initiative]



The Siamese crocodile is one of the most endangered crocodile species, with its last known population in Indonesia being Lake Mesangat. We support Wildlife Conservation Society (WCS) to ensure a safe future for this population. During the year, WCS conducted a first drone survey, and a ground survey to identify nest sites in Lake Mesangat. In total 35 mounds of vegetation which were similar in construction to nest mounds were found. They observed 17 crocodile signs along 89 kilometres of survey route.

During the course of the year, WCS worked to build relationships with local stakeholders in the area. This is a critical step because Lake Mesangat does not have a protected area status and, therefore, falls under multi-party jurisdiction. Our support also facilitated a local stakeholder training and meeting in which the progress of Lake Mesangat as an Essential Ecosystem Area was discussed. The training aimed to educate stakeholders on Siamese crocodile ecology and the importance of its protection. WCS also facilitated the forum in drafting an action plan for the management of Mesangat and an action plan for the conservation of Siamese crocodile in Indonesia.

Population and feeding ecology of proboscis monkeys in Balikpapan Bay, East Kalimantan [New Initiative]



Proboscis monkeys are endemic to the lowlands of Borneo. Their population is decreasing at an alarming rate due to land conversion. We supported researcher Stanislav Lhota and team on this project to continue long-term population monitoring and modelling in this area. They were also able to investigate nutritional value and food availability for proboscis monkeys in different habitat types. This information has allowed the team to determine which zones of mangroves and surrounding secondary terrestrial forest provide the most valuable food resources for the proboscis monkeys. This is critical to ensure prioritisation of habitat protection for the species amidst land use changes in the area. The team organised several major activities in the environmental education programme such as presentations at rural schools and environmental centres, the "Balikpapan Free from Animal Exploitation" campaign and professional training of Indonesian students and environmentalists. They are also preparing three scientific papers on the results of the population and habitat changes monitoring during the period of 2007-2017, for publication in peer-reviewed journals.

Providing medical support for endangered Indonesian species



The Cikananga Conservation Breeding Centre (CCBC) is part of the Yayasan Cikananga Konservasi Terpadu and was created in 2007 to breed endemic and endangered Indonesian species, with a view on reintroducing these species into available safe habitats in their historical range. CCBC houses 35 Javan warty pigs, the largest group under human care. Our funding has been essential for medical care, biosecurity, nutrition and improvement to the CCBC.

Our support enabled the construction of a new building, which will provide better food storage and improve working environment for the project staff. CCBC started a refurbishment programme for the nearly decade-old fences and walls surrounding the animal enclosures. Our funding has been used to send sexing samples for testing in the LIPI lab in Bogor, and allows the team to continue with breeding programmes. Our staff also visited CCBC and conducted training on veterinary care for the CCBC staff.

VIETNAM

Protecting the Tonkin snub nosed monkey in Khau Ca Forest, Northeast Vietnam



The targeted species of this project is the critically endangered Tonkin snub-nosed monkey. It is presently restricted to as few as four small sites in the northeast of Vietnam, where it is endemic. We provide continued financial support to primatologist Le Khac Quyet and his team of four local research assistants. Monitoring the Tonkin snub-nosed monkey (TSNM) and its habitat has been the top priority for the local research assistants since 2010. During the reporting period, at least five newborns were recorded in Khau Ca. The local research assistants have regularly patrolled the area to check for illegal human activities. Quyet is learning to utilise drones in conservation research namely towards habitat assessment and remote-seeking TSMNs. In supporting the project for six years running, our funding has enabled the gathering invaluable data to address the lack of scientific information on this species. The involvement of local researchers has also ensured better engagement of the local community in monitoring illegal human activities and protecting the monkeys.

LAO PDR

Biodiversity conservation in Nakai-Nam Theun National Protected Area [New Initiative]NAKAI-
NAM
THEUN

Project Anoulak is dedicated to biodiversity conservation in Laos, in particular in the Annamite Mountain range. The project team worked in collaboration with the Law Enforcement section of the Watershed Management and Protection Authority, led by the Lao Wildlife Conservation Association to design a law enforcement strategy for the Protected Area. Our funding covers the monthly salary of the project coordinator and is central to the implementation of Project Anoulak. Our support has also facilitated numerous activities including community patrols and research project coordination. The four patrol teams conducted monthly patrols, covering an area of about 300 km². They were able to gather evidence to prosecute poachers who were apprehended for using hand-made guns to hunt wildlife. The positive results of the patrolling were also shared with the village authorities and community. Locals were also educated on field survey methods such as the use of camera traps.

Protecting saola now and for the future in Lao PDR

The saola is a critically endangered ungulate, and one of the most threatened large mammals in the world. It is found only in the Annamite Mountains of Lao PDR and Vietnam, where it is distributed in several subpopulations, none of which are secure. Though the species has little value in the wildlife trade, the main threat it faces is extensive illegal trade-driven snaring in its range. Improved protection, particularly snare removal, in areas with the most important saola subpopulations must be done to keep saola from slipping irreversibly to extinction. This project's goal was to work towards 'zero threat' in key saola areas of Xe Sap National Protected Area. With our funding, the project team was able to establish one new Xe Sap patrol team as well as improve supervision of the two existing teams. All patrol teams were equipped and trained in order to complete effective forest patrols. The three teams were also able to complete quality checks and compilation of SMART reports.

MALAYSIA

Citizen Action for Tigers: Engaging people to value and protect tigers and their habitat in Malaysia

The Citizen Action for Tigers (CAT) programme was initiated by the Malaysian Conservation Alliance for Tigers (MyCAT) in 2010 to suppress poaching of the Malayan tiger. The CAT Walk is an anti-poaching and anti-deforestation surveillance walk conducted by citizen conservationists. Our funding has enabled the CAT Walk to continue in 2017/2018. Since 2010, a total of 1,554 volunteers from 33 countries have participated in CAT Walks, protecting 2,743 km of forest and removing 156 snares.

The MyCAT team also worked towards restoring 52 hectares of the Sungai Yu watershed, an important wildlife corridor for the tigers. A nursery was set up and CAT Walkers are encouraged to buy saplings to plant them under the viaducts as part of the Citizen Action for Tigers programme. On 26 October 2017, MYCAT held joint replanting events with the local government offices, planting more than 100 tree seedlings in the Sungai Yu Tiger Corridor.

In addition to this, we also supported 27 staff to go on the CAT walks, as a way to encourage individuals across all departments to be actively involved in our organisation's conservation efforts.

Cryptic diversity: Two morphologically similar species of invasive apple snails in Peninsular Malaysia [New Initiative]

Invasive freshwater apple snails of the genus *Pomacea* have spread throughout much of Central and Southeast Asia, and are major pests of wetland agriculture, especially rice. The snails' invasion of natural wetlands is expected to alter this valuable ecosystem and cause declines in native snail communities. Knowledge of the snails' distribution, patterns of invasion, and the associated environmental factors is necessary for their effective management. In 2017, a research team from Sunway University conducted a phylogeographic study using snails collected at sample sites in Peninsular Malaysia to verify species and identify likely sites of introduction and pathways of invasion. With our funding, the team confirmed the presence of two of the most invasive species of *Pomacea* in Peninsular Malaysia using a molecular technique. They found that *P. canaliculata* is the more widespread species.

THE PHILIPPINES

Feeling at home: Measures to improve husbandry and translocation of the Palawan Forest Turtle

The Palawan forest turtle is a critically endangered freshwater turtle threatened by over exploitation for the international pet trade, habitat destruction and exploitation for local consumption. Katala Foundation Inc. (KFI) holds the only assurance colony of the species, which is endemic to Palawan. We support KFI in their captive breeding efforts for this species, which has never been successfully bred under human care so far. During the year, small changes in husbandry practices were made - individuals in the assurance colony were fed a diverse diet three times a week and at 5% body weight weekly. The health status of turtles was checked during monthly monitoring visits. Our funds were used to ensure enclosures were maintained and repaired where needed. With these improvements, it is hoped that KFI will lead the way to be the first to breed the Palawan forest turtle under human care.

Understanding nutrition of the Philippine Pangolin [New Initiative]

The Philippine pangolin is threatened by over-exploitation and habitat destruction. The lack of data on the biology and ecology of the species are a limiting factor in the implementation of conservation measures. To address this, WRS-funded Katala Foundation Inc. (KFI) conducted research that provided the first baseline data on how to monitor populations. The project team estimated population sizes and home range through a telemetry study. These studies have provided some information on the feeding habits of the Philippine pangolin. However, information is lacking on these types of ants and termites which the pangolin feeds. Such information is important for the management of rescued pangolins in human care and for in-situ conservation of the species. In Narra, this project established three sites for camera traps along trails and near potential food sources. Camera trapping data was further supported by interviews of locals and direct and indirect signs of pangolin activity.

THAILAND

From being persecuted to protected - king cobra in rural Northeast Thailand



The king cobra is the largest venomous snake in the world. An apex predator, it plays a critical role in ecosystem processes. This understudied species is vulnerable to persecution as they tend to spend significant time in around human habitation. 2017 marked the fourth year of our funding for the Sakaeret Conservation and Snake Education Team (SCSET), Suranaree University of Technology, to study how king cobras use human-dominated areas. The team was able to radio-track four king cobras – two males and two females. An exciting discovery was made of a nesting site of one of the radio-tracked females. Using the equipment funded by us, the team could closely monitor the nest and subsequently test a protocol for radio-tracking juvenile king cobras.

SCSET also provided educational talks to national school groups on a weekly basis. The focus of these presentations is to expose the younger generation to the importance of snakes as apex predator and snake ecology. Furthermore, the community was taught how to live alongside snakes and how to respond when they encounter snakes in their environment. Local outreach efforts in the form of university internship, educational seminars and non-lethal snake removal workshops continue to strengthen relationships with local communities and improve public perception of king cobras. Our staff also visited the project site in the last year to share knowledge and experiences in radiotracking snakes to help improve and potentially expand the scope of future work.

CAMBODIA

Conservation of the southern river terrapin in Koh Kong landscape, Cambodia



The southern river terrapin was thought extinct in Cambodia until it was rediscovered in 2001 by Wildlife Conservation Society (WCS) and the Cambodian Fisheries Administration (FiA). Since then, WCS and FiA have been working with the local community to ensure the safety of this population. With the help of our funding, conservation efforts are being implemented in the turtle habitats in the Sre Ambel River system. The project tagged and released 25 sub-adult southern river terrapins into the river. At the same time nest protectors have been busy guarding the turtles at the soft-release enclosure. The Koh Kong Reptile Conservation Centre (KKRCC) was officially opened in the presence of many government officers. More than 60 turtles were released into the newly constructed pond in this centre. As part of our continued support towards capacity building, a group of turtle experts from around the world was invited to conduct a technical workshop and a retreat workshop in KKRCC in November 2017 for the local staff.

Recovering the Siamese crocodile population in the Sre Ambel River, Cambodia [New Initiative]



Siamese crocodile populations have declined over the years in Cambodia as a result of widespread habitat destruction, over-collecting to stock crocodile farms, and illegal hunting. With our funding, a team consisting of staff from Wildlife Conservation Society (WCS) and the Cambodian Fisheries Administration (FiA), along with two local community members have conducted monthly patrols in riverine habitats and wetlands that are used by Siamese crocodiles. These patrols have been effective in preventing illegal activities such as sand dredging in the area.

The project team also conducted surveys at six wetlands in the Sre Ambel river system to monitor the presence of crocodiles. On 26 June 2017, a Siamese crocodile nest containing of 19 eggs was found at Kean Tok wetland by the patrol team and the eggs were safely relocated to Koh Kong Reptile Conservation Center (KKRCC). The project staff conducted three awareness and outreach events at villages located near the wetlands inhabited by the crocodiles. In addition, educational signboards have been installed at the wetland habitats of the crocodiles. The team also continues to build capacity at the KKRCC to support the care of hatchlings transferred there.

OTHER PROJECTS IN THE REGION

COMBATING ILLEGAL WILDLIFE TRADE

Southeast Asia's rich biodiversity is under severe threat because of rampant illegal and unsustainable wildlife trade. As a result, over 160 animal species in the region are now classified as 'Critically Endangered' by the IUCN Red List of Threatened Species. We work with TRAFFIC, the wildlife trade monitoring network, to address the increasing threat of trade to species in Southeast Asia. Information collected through various research surveys will be used to bring attention to conservation issues and advocate improvements in regulatory processes. In the last year, numerous issues were tackled through this project, including the Asian Songbird Trade. Activities in this area included coordination and attendance at various meetings and creating a Bali bird inventory. The team also attended the freshwater turtle and tortoise Red List workshop in Singapore. Other targets included the ivory market survey in the Philippines, through which the team was able to identify antique shops and auctions connected with the trade.



Bali Myna

LOCAL FIELD PROJECTS SUPPORTED BY WILDLIFE RESERVES CONSERVATION FUND (WRSCF)

Back in Singapore, Wildlife Reserves Singapore Conservation Fund (WRSCF) supported nine local projects featuring diverse taxa. WRSCF was set up with the clear mission to protect Singapore's threatened native wildlife and their habitats through education, outreach and research. Each field conservation project funded by WRSCF is selected based on its ability to make a substantial and lasting contribution to local biodiversity conservation. WRS also provides platforms for conservation specialists and the wider nature community to share, learn and collaborate on conservation issues. Most notably, we were instrumental in the formation of the first Asian Songbird Trade Specialist Group, a group formed specifically to combat the illegal and unsustainable cage bird trade.



Species Action Plan for the Conservation of Raffles' banded langur in Singapore

The Raffles banded langur is a leaf-eating monkey that was first collected from Singapore, and described. It is the largest non-human primate in Singapore and one of the rarest in this city state. The species is listed as 'endangered' on the global IUCN red-list, and 'critically endangered' in Singapore. It is threatened because of its small population size of 40-60 individuals with low genetic variability. WRSCF supports Dr Andie Ang on this project which constitutes the first and second phases of the Species Action Plan for the conservation of the Raffles' banded langur. Phase 1 involved engaging all major stakeholders in a roundtable discussion and workshop, as well as completing two conservation objectives: to clarify species status of the Raffles' banded langur; and to carry out population, distribution, and ecological studies of the species in Singapore and Malaysia. The workshop saw the development of a 'langur facial recognition app' in partnership with DataKind and Google to assist in individual langur identification for population census, as well as the Species Action Plan for the Conservation of Raffles' banded langur in Malaysia and Singapore.



Population ecology, breeding and conservation of mangrove horseshoe crabs in Singapore

The mangrove horseshoe crab, is one of two native marine crab species in Singapore whose biology and ecology remain largely unknown. Land reclamation, coastal development and poor fishing practices have resulted in population decline, and consequently, low genetic diversity. WRSCF supports Dr Laura Yap from Republic Polytechnic in a study on this species. Acquired knowledge on the species would enable the development of an effective conservation programme to manage its population and habitats (e.g. sanctioning their breeding/spawning grounds as a nature reserve). This study aims to gain further insights into the biology and ecology of horseshoe crabs in the Kranji-Mandai mudflats, and to rear horseshoe crabs under human care to better understand their biology and to advise future reintroduction programs. Adult horseshoe crabs have been successfully reared in captivity. More work on rearing crab larvae from 4th to 5th instar stages is required.



Biology and distribution patterns of bamboo sharks in Singapore

Records show that Singapore's coastal waters are home to a number of sharks and rays, but little is known about many locally occurring species. The lack of information, impedes the development of appropriate management or conservation strategies. Anecdotal evidence suggests that bamboo sharks are amongst the most commonly caught fish by recreational fishers, and observed by scuba divers. All bamboo sharks in Singapore are classified as Near Threatened under the IUCN Red List. There are concerns that fishing pressure and habitat degradation may push them towards Vulnerable status. WRSCF supports Dr Neil Hutchinson from James Cook University, Singapore on a study to gather vital information on life history and ecology of bamboo sharks, with the overall aim of informing stakeholder groups including the Singapore Government, NGOs, recreational fishers and the general public to enable the sustainable management of the fish. Various public awareness activities have been carried out and these include public presentations, social media and a web resource, the latter functions as a 'citizen science' platform for the public to share bamboo shark sightings. Diet examination from market-sold sharks, as well as student training in fieldwork techniques have commenced.



An investigation of the dispersal movement, home range and habitat selection of local Sunda pangolin with VHF and GPS tracking devices

WRSCF supports Helen Nash, a researcher at the National University of Singapore, in gathering critical information on the elusive Sunda pangolins in Singapore. This project aims to further the understanding of dispersal movement, home range and habitat selection of Sunda pangolin in Singapore, to enhance conservation management plans for this species. The work will help inform pangolin population estimates, as well as enhance the understanding on the potential interaction of pangolins with roads and provide insights into management options that will minimise pangolin roadkill. The tracking of pangolins done in this study complements the existing camera trap project by the National Parks Board (NParks) for pangolin population estimation. Furthermore, by tracking female pangolins, valuable insights into habitat selection for breeding and maternal care in the wild can be gained. Lastly, connectivity between pangolin habitats is important for population viability. Therefore we need to better understand pangolin dispersal and home range sizes for the different pangolin sexes. To date, nine pangolins have been radio-tracked and valuable data have been collected.



Diet and behaviour of dog-faced fruit bats in Singapore

Singapore, despite being highly urbanised, is home to some 20 bat species. Bats provide valuable ecosystem services, such as seed dispersal in many environments, but whether they do so in cities remains unknown. WRSCF supports Dr. Joanna Coleman from National University of Singapore on a study of the dog faced fruit bat in Singapore. This study will be the first attempt to document ecosystem services provided by urban bats, such as seed dispersal of plants of conservation significance. This will involve looking at the diet of bats via their droppings, identifying fruiting and flowering plants near roost sites, and determining the impact of urbanisation on reproductive phenological status. The work will help advise management strategies for wildlife habitats in Singapore. Moreover, communicating the findings of the study to the public can help dispel some of the myths and negative attitudes that undermine public support for bat conservation.



Assessing the population status and ecological niche of the critically endangered yellow-crested cockatoo in Singapore

Poaching for the international pet trade and habitat loss have led to the severe decline in yellow-crested cockatoo populations. The species is now classified as Critically Endangered on the IUCN Red List. There is an established feral population in Singapore, but little information is available on the population dynamics and the impact of the species on native biodiversity. WRSCF supports a study by Dr. Caroline Dingle from the University of Hong Kong for this project. This study hopes to estimate population size of the species in Singapore and determine distribution and habitat usage across the city state. It will also investigate the ecological role, if any, of the yellow-crested cockatoo in Singapore and the factors that limit or promote its population growth.



An investigation into sharks and rays landed at Singapore ports to uncover characteristics of this fishery and understand shark and ray biodiversity in the region

Many shark and ray species are threatened with extinction globally, with overfishing cited as the main threat to these animals. In Singapore, there has been no prior assessment or study on shark and ray catch. WRSCF supports Naomi Clark Shen from The Dorsal Effect to get information on sharks and rays fished around Singapore, by comparing those being caught in local waters with those caught from regional waters and landed in Singapore. Insight from this study is necessary not just to inform policies in the country, but also contribute to global data. This study hopes to produce data on the characteristics and scale of shark and ray fishing and landing in Singapore, and by doing so, uncover shark and ray biodiversity in Singapore and the wider region. So far, 36 surveys have been carried out across two fishery ports – data from 900 sharks belonging to eight species, 5028 rays from 13 species, and 352 wedge-/guitar-fish from five species have been collected.



Automated acoustic monitoring of amphibians: Assessing the impact of invasive species on the occurrence of endangered species

Acoustic techniques have been used worldwide to collect information of vocalising animals such as amphibians. It can be used to assess species persistence in a landscape as well as monitoring species populations. Automation of these techniques allow for remotely-collected calls to be automatically classified to species, facilitating long-term monitoring of amphibians. WRSCF supports Eva Catharina Madelene Karlsson from the National University of Singapore on this project. The survey stations in this study also automatically collect abiotic data such as temperature and humidity to study their effects on amphibian calling behaviour and population dynamics. The stations are able to provide long-term information on population fluctuations, including effects of invasive species on native amphibians, and shed light on necessary management actions. Data collection from this study has been completed, and the data for target species – *Pelophryne signata*, *Rhacophorus cyanopunctatus*, *Limnonectes plicatellus*, *Limnonectes paramacrodon* and *Megophrys nasuta* are currently being classified and studied.



Competitive interactions between scleractinian corals and macroalgae in Singapore's heavily impacted urbanized reef system

Corals and macroalgae both influence habitat complexity and overall reef community structure and composition. Scleractinian corals, for example, are key ecosystem engineers of shallow tropical coral reefs. Human and environmental stressors have led to the decline in live coral. While some reefs are able to recover, others are overgrown by fleshy macroalgae or seaweed and this impacts marine biodiversity. As such, understanding the spatio-temporal variations of interactions between corals and macroalgae, two of the primary benthic groups associated with Singapore's reefs, is important.

Despite decades of chronic human disturbances and large-scale coastal urbanisation in Singapore, research suggests the persistence of coral dominance on reefs with no evidence of phase-shifts to macroalgae. It remains unclear, however, as to why macroalgae have not displaced corals on Singapore's reefs as observed on other heavily impacted reefs systems. WRSCF supports Jenny, a PhD candidate from National University of Singapore in their work to answer this question. This research will determine the extent of coral-macroalgal interactions on Singapore's reefs, and determine how these interactions vary over spatial and temporal scales. This research will also examine the importance of chemical mechanisms in coral-macroalgal interactions, and whether potent macroalgae secondary metabolites affect coral health and larval settlement. Outcomes from this study will provide reef managers with a new matrix to assess reef health and better understand reef recovery and replenishment processes. This will help identify individual reefs in Singapore that are more vulnerable to phase-shifts and require conservation interventions.

WORKSHOPS, CONFERENCES AND RESEARCH

We continued to take the leadership in providing platforms for colleagues from the wildlife conservation arena to share, learn and collaborate. In hosting the workshops and conferences, we brought specialists from different parts of the world together to work towards a shared vision and common goals of protecting the world's precious biodiversity.

Regional and national Sunda pangolin conservation action planning workshop

The Sunda pangolin is one of the two Asian pangolin species classified as Critically Endangered on the IUCN Red List. The species is widely distributed across Brunei Darussalam, Cambodia, Indonesia, Lao PDR, Malaysia, Myanmar, Thailand, Vietnam and are also native to Singapore. Current populations are still decreasing due to the tremendous pressure caused by illegal wildlife trade. In Singapore, the species is not threatened by poaching but habitat loss and urban development. We co-organised and hosted a 4-day Regional Action Planning Workshop, followed by a 3-day National Action Planning Workshop for Singapore. This was a collaborative effort between WRS, the IUCN-SSC Pangolin Specialist Group, Asian Species Action Partnership and Singapore National Parks Board.



Sunda Pangolin

Both national and regional conservation action plans for the Sunda pangolin identified various priorities, which were listed and endorsed by the relevant government agencies. These include:

- A) Identified gaps for site-based conservation action such as surveys, sites for increased protection, critical nodes along the trade chain targeted for increased law enforcement efforts.
- B) Approaches for increasing awareness along the trade chain across local communities, enforcement agencies and the private sector.

The action plans will facilitate and direct national conservation measures for the Sunda pangolin in Singapore and contribute to the forthcoming IUCN SSC Pangolin Specialist Group's global strategy for pangolin conservation. Both national and regional workshops looked at rescue, rehabilitation and release. The focus for the national workshop was on habitat and connectivity; communications, collaborations and awareness; as well as urban planning and development. The regional workshop, on the other hand, looked more closely into local community engagement and site-based protection; demand reduction; on top of trafficking, enforcement and policy. The action plans are being drafted and targeted for completion in late 2018.

IUCN Red List Workshop for Tropical Asian Tortoises and Freshwater Turtles

A number of Asian tortoise and freshwater turtle species are among the rarest and most threatened on Earth. The ongoing trade in wild-caught turtles and turtle products, habitat loss, and pollution leave many species on the brink of extinction. The IUCN Red List of Threatened Species provides the most comprehensive assessments of global conservation status of species and is an important tool for conservation planning, management and decision-making. We hosted a 5-day Red List Workshop for Asian tortoises and freshwater turtles in March 2018, bringing together 27 specialists from 16 countries to look at species originating from all countries from South and Southeast Asia. 20% percent of the species were assessed for the first time during this workshop. Of the 89 species assessed, 47% were considered critically endangered, 19% endangered, 10% vulnerable, 5% near threatened, 15% least concern and 5% data deficient. There was an alarming 37% increase on the number of species rising into higher categories of threat (e.g. from endangered to critically endangered). The level of knowledge regarding the conservation status of the assessed species increased substantially after the workshop.



Fly River Turtle



Asian Giant Pond Turtle



Asian Softshell Turtle

During the course of last year, other workshops and conferences that our staff attended and actively participated in include:

- Courses on Animal Welfare Science, Ethics & Law at St Catharine's College, Cambridge, UK
- Joint Meeting of Ichthyologists and Herpetologists 2017 at Renaissance Hotel, Austin, Texas
- Range-wide Conservation Strategy and Action Planning Workshop for Helmeted Hornbill at Sarawak, Malaysia
- Conference on Regional Wildlife Trafficking between Wallacea and the Philippines at Tasikoki Wildlife Rescue Centre, North Sulawesi, Indonesia
- Asian Captive Elephant Working Group Meeting at Chiang Rai, Thailand
- Elephant Welfare, Enrichment and Training Workshop at Chiang Rai, Thailand
- Orangutan Veterinary Advisory Group Workshop 2017 at Yogyakarta, Indonesia
- Asian Pangolin Rescue, Rehabilitation and Captive Management Workshop at Khao Keow Open Zoo, Thailand
- 25th SEAZA Conference 2017 at Manila, Philippines
- Wildlife anaesthesia and assisted reproductive technique workshop at Taipei, Taiwan
- Conference of Asian Society of Conservation Medicine at Kuchin, Sarawak, Malaysia
- 9th Wild Animal Rescue Network (WARN) Conference 2017 at Cu Phuong National Park, Hanoi, Vietnam
- Wildlife Conservation Society - Turtle Survival Alliance (WCS TSA) Meeting at Koh Kong Turtle Conservation Retreat, Phnom Penh, Cambodia
- 3rd Elephant endotheliotropic herpesviruses (EEHV) Asia Working Group Meeting at Kasetsart University, Bangkok, Thailand
- 6th Asian Captive Elephant Working Group Meeting at Chiang Mai University, Thailand
- Malaysian Association of Zoological Parks & Aquaria (MAZPA) Training Course at Malacca Zoo, Malaysia
- Parrot Rehabilitation and Release Centre Discussion at Seram, Indonesia
- Avian Symposium at Dubai, UAE

RESEARCH PROJECTS

WRS staff took the lead or facilitated a total of 87 research projects involving subject specialists and students. The research work led to 15 oral and poster presentations in workshops and conferences, as well as 43 publications. 24 projects were completed at the time of report, the rest still ongoing. These projects are:

01. Milky stork conservation genetics
02. Investigation of lung flukes in black-winged starlings at Jurong Bird Park
03. Diet and nutrition of Colobine monkeys: Fodder browse laboratory analysis
04. Determining cortisol levels in male orangutans of different ages at the Singapore Zoo
05. Determining hormonal levels in male and female Indian rhinoceros post-administration of the gonadotropin-releasing hormone (GNRH) vaccine
06. Otter Cognition: Are Otters Smarter than Dogs?
07. Monitoring the behavioural and physiological effects of a naturalistic diet change in great apes
08. Seasonal nutrient selection of the giant panda
09. Marsupial Glider Nutrition: Understanding from within
10. Investigating the prevalence of Marmoset Wasting Syndrome (MWS), risk factors and outcomes of treatment/management of this disease in WRS collection
11. Investigation of nematode larval presence on exhibit and back of the house yard of douc langurs, cheetah, Asiatic lion, markhor and giraffe (Night Safari)
12. Prevalence of Wasting Symptoms, and Possible Causes, in Captive Nycticebus species
13. To determine prevalence and seasonality of *Burkholderia pseudomallei* and *Burkholderia multivorans* in selected sites of the Singapore Zoo premises
14. Genomic protection measures for 4 song bird species: the black-winged myna (*Acridotheres melanopterus*), Asian pied starling (*Gracupica contra jalla*), hill myna (*Gracula religiosa*) and Oriental White-eye complex (*Zosterops palpebrosus*).
15. The study of long-tailed macaque ecology in WRS Parks and the surrounding environs to formulate a pre-emptive management plan
16. Ideal Free Distribution in Captive Manatees
17. Does the southern cassowary (*Casuarius casuarius*) exhibit fruit colour preferences?
18. Diet and behaviour of dog-faced fruit bats in Singapore
19. Home range, activity pattern and conflict of macaque troops in the environs of Wildlife Reserves Singapore
20. The measurement of stress in Humboldt penguins, (*Spheniscus humboldti*), via analysis of metabolites of avian stress hormone, corticosterone in faecal material
21. Effect of diet change on the behaviour of the common squirrel monkeys (*Saimiri sciureus*) in River Safari
22. Production of on-grow artemia for ornamental fish nutrition
23. Evaluation of calcium oxalate nephrolithiasis in WRS Asian small-clawed otter (*Aonyx cinereus*) after diet alteration
24. The role of spatial memory and olfactory cues in the foraging behaviour of captive Sunda pangolins (*Manis javanica*)

LOCAL BIODIVERSITY SURVEYS AT WRS PARKS

The objective of this object was to deepen the understanding of Singapore fauna. The data from the surveys will help land managers better maintain and enhance local biodiversity, thereby contributing to native wildlife conversation. The strong involvement of volunteers for the surveys was a way to empower Singaporeans to contribute to protecting local biodiversity.

The three surveys counted 89 bird, 11 amphibian, 14 reptile and 5 mammal species. It is heartening to know that our efforts in creating suitable habitats for native species have paid off – an amazingly diverse number of native species thrive in our parks, which they call home.



Straw-Headed Bulbul



Oriental Whip Snake



Long-Tailed Macaque

TOGETHER FOR WILDLIFE

Volunteer For Wildlife

During the year, a total of 2,277 volunteers devoted 46,242 hours to help WRS to care for the living collection, engage park guests through in-park activities and connect with the public through outreach programmes.

Started in 1997, the volunteer programme crossed the 20-year mark in 2017. We took the chance during our annual Volunteer Appreciation Night to fête our longest-serving volunteer, Auntie Johanna, who has from our pioneer batch of volunteers. This sprightly octogenarian still comes in faithfully for her docent duties at Rainforest KidzWorld and pitches in for other outreach events, whenever she can.

In 2017, we ran a pilot of the Volunteer Aquarist programme with our regular volunteers. The programme has since been extended to the public.

A group of youth volunteers from our Conservation Ambassador programme also teamed up with our conservation partner, Wildstars.TV, to produce an awareness video on the pangolin. The video has been watched by more than 10,000 viewers on Facebook.

Launched last year, the Corporate Wildlife Buddies Programme, which allows companies the chance to give back to society, is slowly but surely gaining traction this year.

Group CEO Mr Mike Barclay dressed for the occasion in a bee costume, presenting an award to Auntie Johanna, our longest-serving volunteer, during the annual Volunteer Appreciation Dinner. The event was a celebration of the tireless hard work put in by our dedicated volunteers.



Left: Auntie Johanna engaging a young guest with the help of a bunny animal ambassador.



Deputy Chairman Mr Tan Chuan Jin (extreme left) and Group CEO Mike Barclay (extreme right) were joined by 200 Little Wildlife Heroes on a 'walk for wildlife' to launch our wildlife conservation initiative 'Together For Wildlife'.

Walk for Wildlife

On 3 March 2018, which was also World Wildlife Day, over 200 'Little Wildlife Heroes' from Kinderland and NurtureStars Preschool took resolute little steps around Singapore Zoo on a 'Walk for Wildlife'. The event marked the launch of a new conservation campaign 'Together for Wildlife', which calls on communities, businesses and individuals to come together to protect the future of wildlife in Singapore and around the world. Through various events and activities in-park, we encouraged the community to act for wildlife. We engaged social media influencer and garnered over 12,000 participating Instagram posts to 'Turn Things Around' for wildlife.

through their sharing on the plight of cassowaries and their rainforest home.

The Children from NTUC My First Skool, Boon Lay chose to help the penguins. Through our education programmes and training, they learnt about penguins, the threat of overfishing and sustainable seafood. The school held a Sports Carnival to raise funds for the penguins. The children, acting as Little Wildlife Ambassadors, seized the opportunity to engage their families and friends at the carnival about penguins and how overfishing is depleting their food resources in the wild. The Little Wildlife Ambassadors did a show-and-tell presentation to exhort the audience to buy seafood that is certified to be from sustainable sources.

Empowering School Community

To empower the school community to act for wildlife and engage the children in a meaningful manner, we forged partnership with three pre-schools. The objective of the engagement was to raise awareness on selected species, the threats that these animals face and the actions that one can take to help.

Some 550 children from Kinderland Preschool enjoyed a rare opportunity to get up-close and personal with the otters and meet their keeper when they visited the Zoo. Having learnt about the otters, the children got together to hold a carnival to raise funds for otters and spread the message of keeping our waterways clean of plastic and other litter.

PCF Sparkletots Braddell Heights focused their efforts on the cassowary and its rainforest habitat. They learnt about the cassowary during their visit to Jurong Bird Park and also invited Dr Squawk, the popular host of our Bird Park Flies to School, to the 'All About Cassowary' carnival. The children and their teachers and parents participated actively in the carnival to raise funds for the cassowary. Some children underwent training by our education staff to be Little Wildlife Ambassadors. These Ambassadors and their teachers went on to engage 14,500 guests at the annual Early Childhood Conference



Little Wildlife Ambassadors from NTUC My First Skool delivering a presentation to their peers.

VOLUNTEER PROGRAMMES	NO. OF ACTIVE VOLUNTEERS	NO. OF HOURS
Docents	292	7774
Conservation Ambassadors	326	6166
Wildlife Buddies Training	637	3822
Wildlife Buddies (Corporate) Training	320	640
Work Experience Programme	77	6160
Teachers Work Attachment Programme	2	160
Conservation & Research Volunteers	9	1960
Education Volunteer	5	1600
Vet Volunteers	63	5320
Zoology Keeper Volunteers	28	4368
Volunteer Aquarist	3	115
WRS Events/Projects	515	8158
TOTAL	2277	46243

Wildlife Rescue

Besides caring for our living collection, our veterinary team also cares for local wildlife outside of our parks, playing an active role in health evaluation and rehabilitation of rescued local wildlife brought in to our Wildlife Health and Research Centre almost daily. Over the last year, we received 1,851 individuals across various species of native reptiles, birds and mammals, almost double the number received the year before. Two special cases are highlighted here.

Medical treatment for wild smooth coated otter: Operation Free Aquarius

On 25 October 2017, a nine-month-old female otter named Aquarius from the Pasir Ris-Changi group was spotted with deep laceration on the body. The wound was initially believed to have been caused by a wire that was coiled on its body. Multiple attempts were made to capture the otter to treat her but it was not an easy task. Initially, the conventional method of netting her was attempted and proved to be impossible. A decision was made between WRS, National Parks Board (NParks) and the Otterwatch group to build a corral for both Aquarius and her family. In this way, Aquarius could be chemically immobilised without the risk of her going into the water half-sedated, which may lead her to drown. The corral was built at the end of the Pasir Ris Beach at an area frequented by the group.

On 15 November, the Pasir Ris-Changi otter group was spotted approaching Pasir Ris Beach where the corral was set up. Spraint (otter faeces) and recordings of otter calls were used to lure the group into the corral. Once Aquarius and her family were safely inside the corral, our vets darted Aquarius with the sedative drug. After Aquarius was sedated, the corral door was opened and her family was allowed to leave the area. To avoid prolonged separation from her family members, Aquarius was treated on-the-spot for the wound on her body. The object that led to the wound – thought to be wire – was actually a plastic O-ring. The wound was treated, samples for testing were collected and the drug for the reversal of the sedative was administered.

Within an hour, operation Free Aquarius was completed. Aquarius continued to be monitored and was observed to have made a speedy recovery.

This operation was the first of its kind in Singapore for the charismatic wild otters here and is testimony to how like-minded individuals from various organisation, with the same common goal, can successfully work together to achieve results that may not had been individually possible.



Rescue and rehabilitation of wild hawksbill turtle hatchling: Swim Strong Schooling

On 5 September 2017, the National Parks Board (NParks) rescued a live hawksbill turtle hatchling from a naturally excavated nest site at Sisters Island Marine Park. The hatchling, still within its partially broken shell, was brought to us for supportive care. The hatchling, which weighed a wee 11g, was carefully removed from the egg and placed in an incubator controlled for temperature and humidity. It was also provided with supportive therapy as it appeared lifeless at this point.

By the following day, the hatchling had perked up. It was transferred into a holding tub with shallow marine water. Still weak and unable to swim well, it was observed to be mainly staying afloat. Besides daily supportive therapy which included oral electrolytes, the hatchling was hand-fed. It started getting more active after Day 5, as was evident from its swimming. It was at this time that we realised that we had a fighter on our hands and the hatchling was named 'Schooling', after Singapore's Olympic champion Joseph Schooling. Schooling the turtle was then placed in much larger holding tank to provide it with more space to swim. To encourage swimming and proper muscle development, a pump was used to create water flow and resistance within the tank. Soon, Schooling started recognising its food and would eat readily when the food was placed in the water. Efforts were also made to encourage foraging behaviour by hiding the food within the holding tank.



Schooling was monitored closely and his body weight and length were taken daily. Regular health assessments which included blood examinations and faecal examinations for parasites were also conducted to monitor health. Schooling was under our care for almost 5 months and had attained a body weight of 483g before it was assessed to be fit for release. On 24 January 2018, Schooling was released back into the wild, in collaboration with NParks, at the same nest site where it was found.



TOWARDS A SUSTAINABLE FUTURE

The reporting period marks the first time we are aligning our strategic thrusts with some of the Sustainable Development Goals (SDGs) adopted by world leaders at the United Nations Sustainable Development Summit in 2015. The SDGs most applicable in our organisational context include providing quality education, working towards sustainable cities and consumption, protecting life on land and below water, using affordable and clean energy, and forging partnerships to achieve the goals.

As in previous years, we continue to boost our performance and ensure financial sustainability through a combination of innovative marketing initiatives, aggressive sales efforts and compelling wildlife experiences. Adopting the triple bottom line approach, financial viability will enable us to focus, in a sustainable manner, on doing right by both people and planet.



Wildlife Buddies programme at the orangutan exhibit

SOCIAL SUSTAINABILITY

On 25 August 2017, we hosted the Community Chest Sharity Day at River Safari for the second year running. Sharity Elephant was joined by students from both mainstream and special education schools on a journey of caring and sharing. More than 250 volunteers were trained under the Wildlife Buddies programme to befriend and guide some 950 students and beneficiaries on a learning journey about River Safari. Students also stepped up as event emcees and facilitators for experiential activities, helping their peers to understand the challenges that persons with disabilities face and encouraged them to be more caring. The event, in support of SG Cares, celebrated the coming together of our community partners, corporate volunteers, and students from both mainstream and special schools, in hope of teaching the next generation that everyone can play a part in building a caring, compassionate, and more inclusive community.

To encourage staff to learn more about dementia and how we could all play a part in supporting the community, we invited the Agency of Integrated Care to give an awareness talk titled "Knowing Dementia: Creating a Dementia-Friendly Singapore". With a dementia-friendly society, everyone can look out for and support persons with dementia to help them live dignified lives. We aim to be part of a community that enables people to live well and age gracefully.

To ensure that our parks remain as accessible and inclusive as possible, we offered complimentary admission to 4,000 beneficiaries from 61 Volunteer Welfare Organisations (VWOs). Many were accompanied by our Wildlife Buddy volunteers. Specially curated programmes to cater to guests with special needs and the disadvantaged are in the pipeline to ensure that we provide meaningful experiences for the beneficiaries of VWOs. Staff will undergo special training to facilitate appropriate service delivery.



Wildlife Buddies guiding in action

ENVIRONMENTAL SUSTAINABILITY

Guided by the sustainability framework established the previous year, we forged ahead to deepen our commitment in embracing sustainable best practices. Efforts were focused on resource optimisation and sustainability advocacy, in line with the United Nations Sustainable Development Goals (SDGs) which we have adopted to work towards having sustainable cities and consumption.

WALKING THE TALK FOR SUSTAINABILITY

Following the success of the Hyflux water dispensers implemented in Singapore Zoo and River Safari in November 2016, similar dispensers were installed in Jurong Bird Park and Night Safari in Oct 2017, bringing the total number of dispensers across our four parks to 27. By the end of FY17/18, over 1.3 million 500 ml bottles worth of water had been dispensed, and our sales of plastic bottled water had also been reduced by over 20%.

In June 2017, we began converting our single-use plastic bottled water to drinking water in paper cartons, to offer our guests an eco-friendly option for packaged water. Single-use plastic bottled water was completely phased out of our parks by end March 2018.

At the same time, we also stopped giving out carrier bags with purchases at our retail and F&B outlets. Guests are encouraged to use their own reusable bags for their purchases. Alternatively, they have the option of purchasing a non-woven or Cornware bag for a nominal fee, with all proceeds going towards our conservation fund. This initiative resulted in a saving of 15,000 carrier bags a month.

Our staff were encouraged to bring their own cups for refreshments at all internal training sessions. By the end of February, we had successfully phased out the use of disposal cups at these sessions. This has the potential to save WRS about 8,000 disposal cups a year.

WRS also engages partners to join our sustainability journey. We reached out to our F&B partner Curry Gardenn to encourage them to minimise their use of disposable dining ware by switching to reusable ware instead. As a result, Curry Gardenn converted many of their dining ware items to stainless steel options, reducing more than one ton a year in disposable waste.

NURTURING WILDLIFE AND SUSTAINABILITY ADVOCATES

We continued to engage and motivate our staff, guests and Singaporeans to lead a sustainable lifestyle, with the aim of bringing about behavioural change beyond our parks and inspiring the community to be our advocates and sustainability champions.

In October 2017, we ran our annual sustainability campaign to raise awareness of the devastating impact of plastic waste, and to rally our guests and local community to reduce usage of single-use plastic in their everyday lives. 'The Deadliest Monster' campaign cast a spotlight on plastic waste as the deadliest monster of our waters, one that kills over a million animals annually.

To engage young minds, 'The Deadliest Monster' art competition was specially developed for pre-schools, and drew hundreds of creative entries from enthusiastic pre-schoolers.

In just one month, the campaign reached out to some 300,000 guests across Singapore Zoo, River Safari and Jurong Bird Park. Over 10,000 of them visited our education booth and watched our Animal Presentation to find out how they can do their part to reduce plastic pollution. We also engaged more than 34,000 people online with our sustainability messaging.

Our teams also continued to reach out to thousands of people and schools on the impact of plastic waste at out-of-park roadshows and community events throughout the year, including Clean & Green Singapore 2017, Global Youth Summit 2018, Gardener's Day Out by the National Environmental Agency and the Tingkat Heroes Roadshow at National University of Singapore.

Within WRS, staff field trips, lunchtime talks and training sessions on various sustainability topics were specially organised to strengthen our corporate culture of embracing sustainable best practices.

BUILDING OUR SUSTAINABILITY REPUTATION

We made significant milestones in building our sustainability reputation and credentials in Singapore and beyond. In September 2017, we were ranked #2 and recognised as 'Leading the Way' in the region in WWF's Palm Oil Buyer's Scorecard 2017 for Malaysia and Singapore. We also became a signatory to the Singapore Packaging Agreement (SPA)

Our Group CEO, Mr Mike Barclay, was appointed Chairman of the World Association of Zoos and Aquariums (WAZA) Environmental Sustainability Committee. Mr Barclay was also invited to join the Climate Action SG Alliance, a group of 17 NGOs and business leaders formed with the aim of advocating climate action and raising public awareness on climate issues. This ground-up initiative is supported by the Ministry of Environment and Water Resources (MEWR) and Senior Minister of State Dr Amy Khor acts as the Advisor.



Above: One of the creative entries submitted for 'The Deadliest Monster' art competition

Below: Volunteers at our outreach booth for 'The Deadliest Monster' sustainability campaign.



FINANCIAL SUSTAINABILITY

In FY17/18, our guest attendance surpassed the 5-million mark for the first time ever. This is largely attributable to the strong growth of 18% in our tourist attendance, mirroring the growth in Singapore's tourist arrivals. To ensure financial sustainability, we will continue to build on our strong brand equity and drive new initiatives to penetrate non-traditional market segments to grow revenue.

REELING IN THE CROWDS

Over the past year, we have invested in extensive media coverage to promote the visibility of the WRS brand, both locally and in the top five tourist markets of India, China, Japan, Australia and Korea. To keep guests visiting and returning to our parks, we have redoubled our efforts to attract repeat visits through bundled offers and members' specials, as well as to grow existing and new markets through innovative marketing, strategic sales partnerships and excellent media relations.

In conjunction with Singapore's 52nd birthday, a 52% discount on admission fees was offered in the month of August 2017. The bundled discount was valid for a two-park combo ticket purchase – either Singapore Zoo and River Safari, or Singapore Zoo and Jurong Bird Park.

Guests who fancied visiting Jurong Bird Park more than once a year could also sign up for a one-year membership at the price of a one-day full priced ticket. Over the June holidays, both new and existing Friends of Bird Park and Friends of Wildlife members got to enjoy a members' extravaganza with a series of specially curated treats and activities. Besides coming 'face-to-beak' with our adorable African penguins, members were also invited for an exclusive behind-the-scenes opportunity on the Be-A-Parrot-Keeper programme. By experiencing a day in the life of our avian keepers, members got to learn different aspects of caring for parrots, from preparing food and enrichment to understanding how our avian veterinarians conduct health checks. Members' benefits also included an exclusive 20% off the Western menu at Hawk Café and Birdz of Play.

Over at the Night Safari, also in the month of June, Jungle Rotisserie was unveiled, further extending the variety of dining options available. Guests enjoyed the opening special of a complimentary meal worth up to \$15.80 with every paid admission after 8.15pm.

With the continued growth of travel and evolving travel preferences, tourists are inclined to look for unique experiences. We have successfully introduced special experiences such as educational programmes and multilingual trams in Night Safari to cater to our international guests.

To drive attendance and spending in-park among Free Independent Travellers (FITs) from China, we partnered AliPay, a major online payment gateway in China, to launch the payment service onsite and collaborated on a marketing campaign in China and also in-park at Singapore Zoo and River Safari. Among several other in-park activations, AliPay users were given the chance to take part in a Treasure Hunt 'hunt and scan' activity to win cash prizes. They were also encouraged to contribute to conservation by participating in token feeding activities at Singapore Zoo and uploading their activity photos to AliPay social channels. Over 350 China FITs participated in the Treasure Hunt and 500,000 China users read AliPay Weibo articles on WRS parks. Other than AliPay, Wechat Pay is another cashless payment option available.

Following the success of the Inaugural Campaign with AliPay in August 2017, we went on to sign a 3-year memorandum of understanding (MOU) with both Alipay and Global Smart Tourism Ecosystem Summit. In January 2018, a similar MOU for joint marketing and sales campaigns was signed with Thomas Cook, one of the market leaders in India.

Working closely with in-market trade partners on promotions and sales collaborations, the Sales Team leveraged on both online and offline channels in different countries to achieve above-target outcomes. The Jurong Bird Park Vietnam Market Campaign, organized with two key travel agents, Golden M and LC Travel, attracted some 39,000 Vietnamese guests. In addition, over 8,000 Dual Park Packages were sold during the Greater China Summer promotion period of May to October 2017.

To drive in-market awareness and itinerary inclusion, we organised trade and media sessions in the cities of Chengdu, Jakarta, Guangzhou, Mumbai and Tokyo. These have been well-attended by in-market and Singapore travel agents. We also participated in major trade shows like the SATTE India and ITB Asia in key markets.

By captivating audiences with narratives of our world-class animal care and conservation efforts, we have generated tremendous publicity and top-of-the-mind awareness.

Increasingly, to gain the competitive edge, the team is also finding it fruitful to explore the use of digital and social media platforms to attract non-traditional market segments.

In May 2017, we publicised Neha the elephant's first birthday through a media event and our social media channels. By showcasing Neha's medical conditioning, we strengthened our messaging as a wildlife institution that provides world-class care for our animals.

On 26 September 2017, the well-loved Sesame Street character, Elmo, paid a visit to Singapore Zoo, generating video content for Sesame Street, Mashable Asia and WRS' Facebook page. The post on Elmo's Facebook page was viewed over 370,000 times.

A similar viral effect was created through a photo release and media photo opportunity with the 21st white rhino calf born in Singapore Zoo. By working with news wire Agence France-Presse (AFP) on a story announcing his name and his first day out in exhibit, media interest was sustained through to October. Via a syndicated news feature with AFP, we also cast international attention on our care for geriatric animals, which generated nearly 100 pick-ups worldwide.

We are proud for River Safari to be included in Singapore Airlines' inflight video, which garnered 763,000 views on the airline's YouTube channel and over 4.5 million views on their Facebook page. Such extensive reach provides great visibility for the park. The launch was also recorded in several media articles, which made mention of River Safari.

River Safari continued to hog the limelight with a double birthday celebration for Kai Kai and Jia Jia. The celebration was also streamed live on Facebook to engage fans worldwide.

Elmo from Sesame Street at Singapore Zoo.





OUR PEOPLE

In the past fiscal year, the Human Resources Division was restructured to provide dedicated focus for each of the pillars articulated in our HR strategy. The new structure provides the additional capacity to monitor workforce engagement and integrate the Guest Experience team to drive a guest-centric mindset.

GETTING THE "RIGHT TALENT"

The Employee Referral Scheme was launched to incentivise employees to refer qualified candidates for open positions in the Company. As our employees are our ambassadors, candidates referred to us are usually more in-sync with the WRS organisational culture, understand our work better and tend to have similar work ethics as the referrer.

At the national level, we partner with SkillsFuture on two fronts – validating the Skills Framework for Human Resource Profession and developing the Tourism Industry Competency Roadmap. Through this engagement, we hope to help professionalise both the human resources and tourism fields and raise the standing of the WRS employer brand.

We reviewed the competitiveness of our salary ranges and remuneration, and conducted an organisation-wide alignment of job titles. This is to ensure that we remain competitive all-round, both to reward and recognise our incumbent staff, and to attract good talents to join us.

PEOPLE DEVELOPMENT

Over 80% of our employees have clocked in 16 or more hours of training. This was a concerted effort by line managers to drive the importance of learning. As the foremost institution in Singapore driving wildlife protection and care, it is of utmost importance that we continuously upskill and extend the competencies of our keepers. To this effect, we reviewed the existing keepers' curriculum and developed a new framework

to ensure knowledge, skills and abilities are regularly updated. To allow staff to have more hands-on involvement in regional conservation projects, we introduced a new sponsorship scheme to defray costs for staff who are interested to do their part for regional conservation projects. Earlier this year, we saw about 30 staff sponsored for a project in Malaysia to help in the conservation of the Malayan tiger.

Furthermore, the talent management framework was developed to ensure business continuity. The succession planning process identifies high potentials and scaffolds them into developmental roles for key leadership positions. This year's leadership development focused on supporting managers to be effective leaders. The "7 Habits for Highly Effective People" course was rolled out to senior management and managers. The "Situational Leadership" course was also introduced to empower senior leaders to adjust their style to engage their staff. In addition, the Managers' Charter was set in place to cultivate a "People First" mind-set in all staff taking on supervisory and managerial roles.

To establish a more targeted development at the individual level and reward strong performances, revisions were made to the Performance Management Framework. Firstly, the structure and components of performance appraisal forms were finetuned to aptly represent the values and competencies required of the various levels of appointments. Secondly, the performance band was revised to have a more distilled categorisation of the five levels of performance ratings.

STAFF ENGAGEMENT

As a follow-up to the 2017 Employee Engagement Survey, focus group discussions were held across all departments to deep-dive into people and engagement matters, and effective initiatives were developed. One of the key initiatives rolled out was to strengthen organisational communication by using technology and introducing skip-level dialogue sessions. Yammer, an online social network which allow employees to post and share information with colleagues, was launched. Multiple interest topic groups have since been initiated by staff. These topics include zoological updates and knowledge, environment health safety, and even workplace motivation and positivity. With over 85% of staff already using the platform, we look forward to driving more company-wide updates through Yammer. In August 2017, "Live Chat with CEO", a platform for direct staff engagement with the CEO, was launched. Work concerns can be anonymously sent in over SMS, providing a safe environment for these issues to be addressed.

We value the spirit of tripartism and collaborates with our unions and the government to ensure that progressive HR practices and policies are adopted. With the aim to develop collective terms of agreement for all WRS staff, regardless of union and membership boundaries, we have managed to align the Collective Agreement terms with our two unions – the Attractions, Resorts and Entertainment Union (AREU) and the Singapore Manual & Mercantile Workers' Union (SMMWU). This signifies strong faith and trust between the two independent Unions. As part of this renewal, WRS introduced two days of Family Care Leave as an enhancement to our employees' work-life balance.



Zaid Harithsah Bin Abdul Majid
Junior Keeper



Nur Syaima'a Binte Md Lazim
Guest Relation Officer



Mohd Hirman Bin Jainudin
Service Crew



Mohammah Rafi Bin Mohammad Amin
Tram Captain



THE YEAR AHEAD

Looking to the future, plans are underway to transform Mandai into an integrated wildlife and nature precinct, and this is rooted in our core mission of wildlife conservation. Our vision is for the Mandai precinct to be a place that connects guests with wildlife, inspires them to care for biodiversity and provides opportunities for participation in wildlife and environmental conservation activities

In parallel with the project to transform Mandai, we will continue to upgrade and refresh our existing parks.

MANDAI REJUVENATION

The Mandai Rejuvenation Project will add two new parks, a Bird Park and Rainforest Park, to our existing cluster of wildlife parks at Mandai. Come 2023, our wildlife and nature precinct will also offer exciting accommodation options including a resort, a nature-themed indoor attraction as well as green public spaces. Our development work is guided by an Environmental Impact Assessment (EIA), which sets guidelines to help us construct in a sensitive manner and to mitigate the impact of this work on the surrounding wildlife. In addition, we engage in regular consultation with key government agencies, relevant experts and members of the nature community to fine-tune our planning and development work.

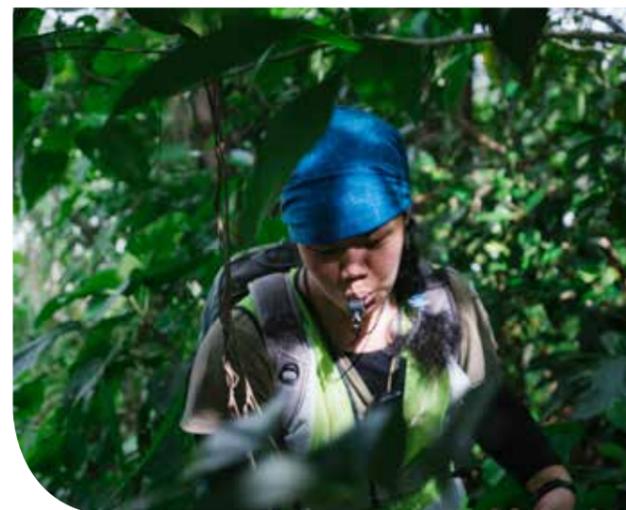
Construction of the Eco-Link bridge across Mandai Lake Road, the new Bird Park and the public space serving the Bird Park commenced in 2017. Infrastructure and road works are also underway along Mandai Lake Road. Priority is placed on having the Eco-link bridge ready by late 2019 to re-connect the parts of the Central Catchment Nature Reserve that have been divided by Mandai Lake Road for over 50 years. This will provide a safe crossing point for native wildlife.

DEVELOPING SENSITIVELY

The Mandai Rejuvenation Project is being carried out on impacted land that once housed a village, the former Mandai Orchid Garden, as well as WRS's current back-of-house facilities.

Special steps are taken in consideration of flora and fauna in this area during the development phase. To minimise disturbance to the surroundings, about 20% of project land has been set aside as buffer zones between development areas and the nature reserve, where construction and human activity are prohibited. Regular construction works are also restricted to daylight hours to avoid light and sound impact at night.

During the year, a wildlife shepherding programme was carried out at the Bird Park and West Arrival Node project sites, before the areas were hoarded up. This involved trained staff and volunteers forming a line and walking through each zone systematically, using human activity to encourage movement of wildlife away from the development areas. As an additional measure to ensure safety of native wildlife, tree inspections were also conducted by specialists to ensure that no active nests or animals were present, prior to any tree-related works. To ensure environmentally responsible practices on-site, and to strengthen understanding of appropriate behavior around wildlife, all workers for the Mandai project were also given biodiversity awareness training.



Staff and volunteers trained in wildlife shepherding forming a line and walking systematically through the development zone, in a bid to 'guide' wild animals away from the areas to be developed.



FACILITATING WILDLIFE CONNECTIVITY

In the longer term, we are designing the Mandai precinct to be a conducive place for native fauna to thrive. Across the whole precinct, trees will be planted to provide a continual canopy connection for local wildlife movement. The Eco-Link bridge will span Mandai Lake Road and will carry tree and shrub species native to Singapore planted in, to cater to the needs of different wildlife species.

To ease wildlife connectivity across Mandai Lake Road in the interim, the concept of aerial connectivity aids was mooted and further developed, in collaboration with the nature community. The aerial crossing aids would help arboreal wildlife species move safely across the road.

To help reduce wildlife road incidents, the speed limit for most parts of Mandai Lake Road has been reduced to 40km/h. Other speed reduction measures include speed humps, speed regulating strips, speed signs and speed radar panels. In addition, there are wildlife crossing signs placed at multiple locations along the road and carpark entrances, to remind drivers to slow down and pay attention to wildlife crossings.



CONSERVING FLORA AND ENHANCING THE HABITAT

Across the project site, saplings suitable for transplantation were also salvaged and transplanted within the development. Trees of invasive species and those in poor condition were removed, and will be replaced by native trees that make for conducive habitats for wildlife.

Efforts were also made to preserve trees of conservation value. Trees on site were surveyed and tagged by arborists based on species, health, size and conservation status. Before works commenced, trees of conservation value were identified to be preserved for incorporation into park designs where possible, or transplanted into other parts of the development. During construction, trees that are to be retained on site have a tree protection zone erected around it to minimise damage, and regular maintenance checks are conducted by arborists.

Workers transplanting a 6-metre tall native fig tree to the buffer zone. As part of habitat enhancement efforts, salvaged trees and saplings are planted into the buffer zone, which is a designated area between the development and nature reserve, to minimise disturbance to the flora and fauna.



RESORT IN MANDAI

In October 2017, MPH announced the appointment of Banyan Tree Holdings as the operator of an eco-friendly resort in the Mandai precinct. The vision is for a resort, seamlessly integrated with Mandai's natural surroundings, to provide guests with an immersive stay close to nature, and offer unique experiences which inspire sustainable behaviour and care for biodiversity.

Below:
Mr Ho Kwon Ping, Executive Chairman of Banyan Tree Holdings and Mr Mike Barclay, Group CEO, Mandai Park Holdings, unveiled a specially commissioned botany artwork to mark the partnership between the two organisations, to jointly create a sustainable and eco-friendly resort in Mandai. A media conference was held in October 2017 to announce Banyan Tree as the appointed operator for the resort.



WRS MASTER PLAN

The Master Plan seeks to differentiate existing parks from the new Mandai attractions to enhance the distinctiveness of each of our existing parks, by addressing opportunities for creating more immersive exhibits, while scaling the delivery of memorable wildlife encounters.

To formulate key strategic plans to revitalise and bolster the weaker areas and enhance the strengths of the existing parks, the planning process was kickstarted in a series of discussions over the course of a year, including four weeks of focused workshops with a panel of participants. Taking on inputs from staff members and the WRS Board, ideas were developed, tested, vetted and challenged in workshop settings to arrive at a physical plan that addressed current and future land use and circulation needs. It was a goal of this Master Plan to create a unique balanced vision for WRS that would reassess the three existing parks located at Mandai: Singapore Zoo, Night Safari and River Safari. With a view on enhancing what is working well while remedying what is not, the Master Plan represents an amalgamation of the achievable yet innovative solutions and concepts that have been prioritised, as well as costing and implementation options and strategies. It is our hope that Master Plan provides a balanced vision for WRS, putting the three zoological attractions on a road to growth and stability for the next 10-20 years.



SINGAPORE ZOO:

Building on Singapore Zoo's global reputation as an open and immersive zoo, larger and more immersive exhibits will be created to better elicit the natural behaviour of our living collection and to deliver compelling wildlife experiences to guests. We will also incorporate more cool zones and sheltered areas in the Zoo to improve guest comfort while boosting revenue opportunities through more F&B and retail spaces.

We have plans to develop a new habitat for the elephants on the land currently occupied by Rainforest KidzWorld. This vast area will provide added space for our herd of elephants to interact and forage.

With the upcoming development for a new elephant habitat, which will displace the current KidzWorld, a new kids' zone will be constructed. This new 'family favourite haunt' will take the strengths of the current KidzWorld and will be enhanced with an interactive area that allows for a new animal collection and redefines how children connect with the animals. Food offerings will give guests a great café setting with a panoramic view of the reservoir while keeping an eye on their children at the water play area.



NIGHT SAFARI

As the world's first nocturnal wildlife park, Night Safari is highly differentiated from the other WRS parks, and the master plan will serve to further enhance the unique wildlife experiences it offers. While the tram experience is a key feature of Night Safari, the more intimate walking trail experience allows for guests to discover the magic and mystery of the rainforest at their own pace. The walking trail experience will be enhanced to encourage guest exploration, with Fishing Cat Trail to be the first on the list for upgrading. An interactive ranger station, where keepers share stories about their charges, and guests can have up close and personal encounters with nocturnal creatures, will be added to the Trail.

The elephant exhibit needs to be enlarged and transformed into a protected contact elephant management facility. As such the elephant habitat will be expanded into areas currently occupied by sambar deer and Indian wolves. Bull elephants, now kept separately from the female elephant herd will finally be able to socialise with the females.

Giants of Asia will amplify Night Safari's main experience of the tram ride by introducing a mixed-species exhibit to the park. When completed, guests on trams will be able to view the elephants in a larger habitat shared with other hoofed animals.

The enhancements to the Safari Tram Ride will also help to further improve capacity management at NS, allowing for more guests to enjoy their experience. Last, but not least, a bigger 1,000pax NS Amphitheatre will allow for a better NS show that has been a tourist highlight.

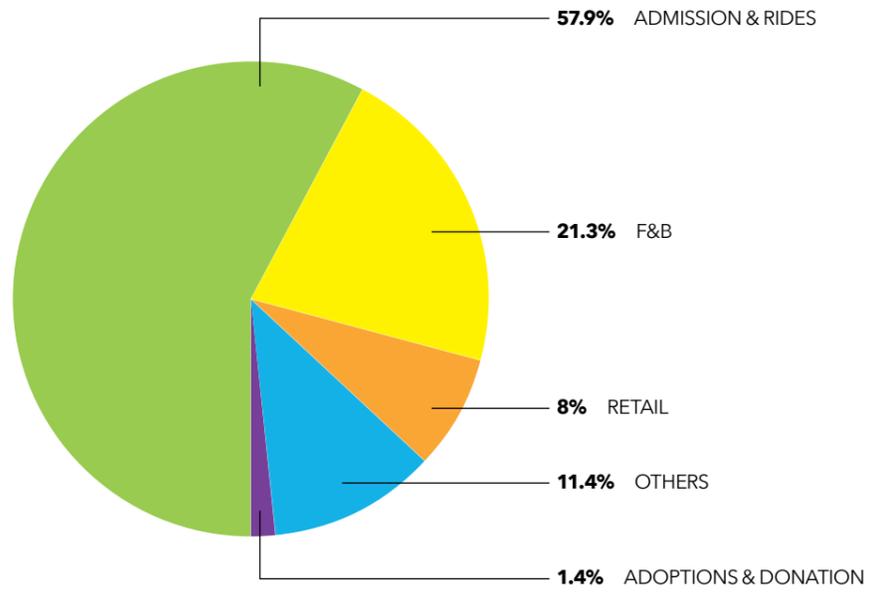


RIVER SAFARI

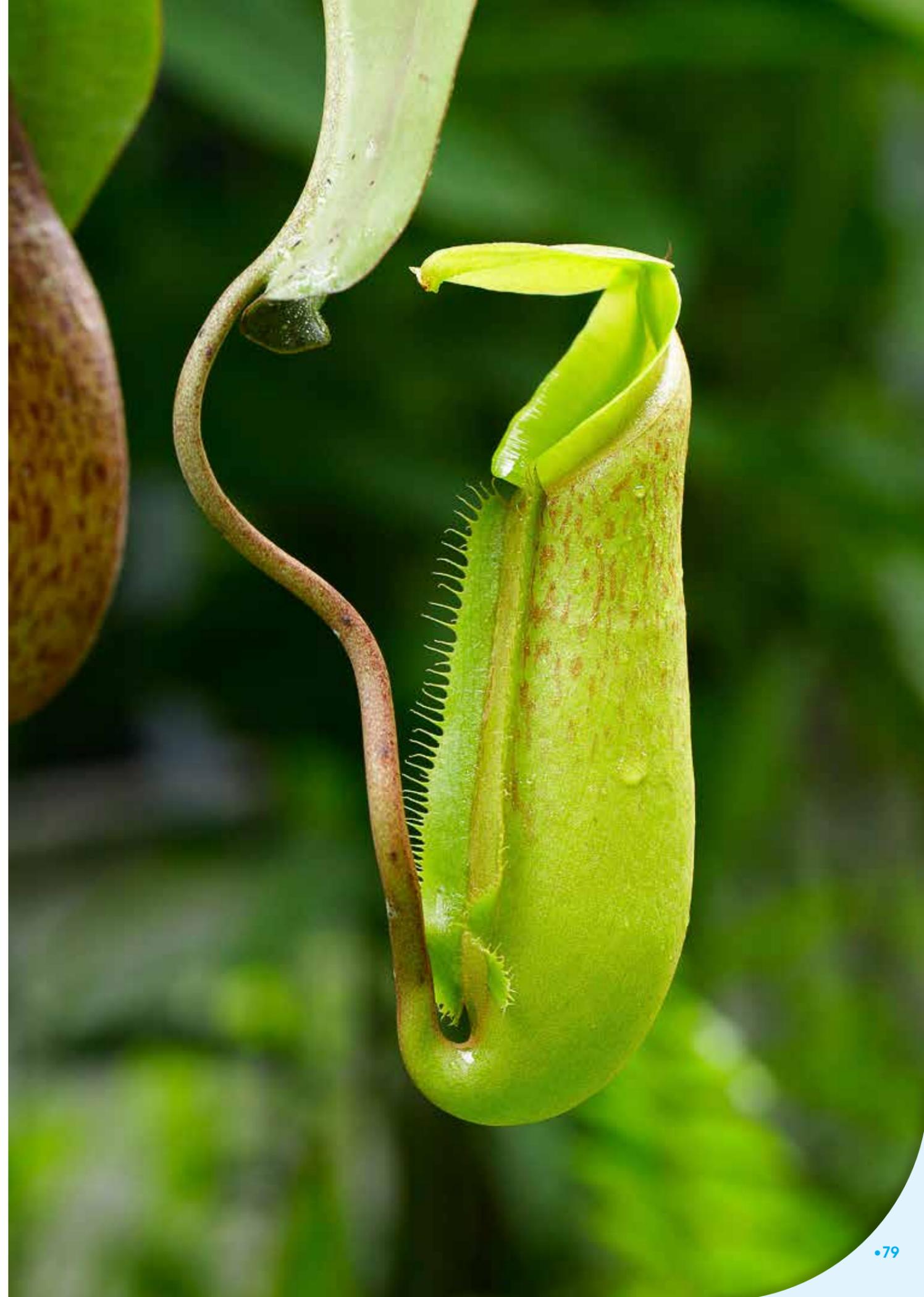
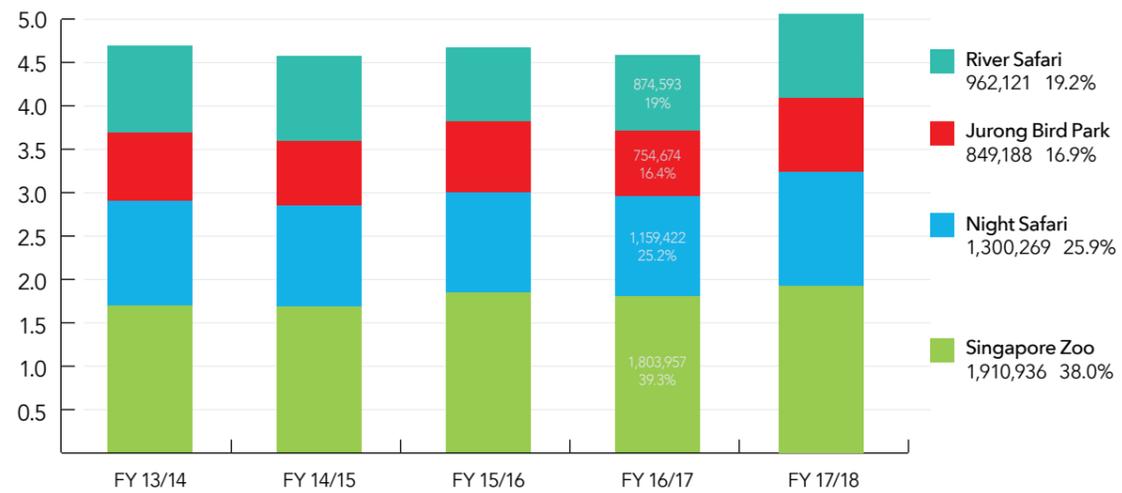
River Safari is distinctly themed from all other Mandai parks due to its River theme. Through the Master Plan, we seek to enhance the Amazon River Quest to create a more leisurely boat ride experience so that guests will enjoy a better experience of viewing the animals along the 'river'. We will also seek to expand the Mekong and Amazon Flooded Forest habitats to improve guest viewing experience and animal welfare.

FINANCIAL HIGHLIGHTS FY17/18

TOTAL REVENUE FY17/18 **\$163,278,075**



TOTAL VISITORS **5,022,514**



Wildlife Reserves Singapore Group



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