

WILDLIFE RESERVES SINGAPORE

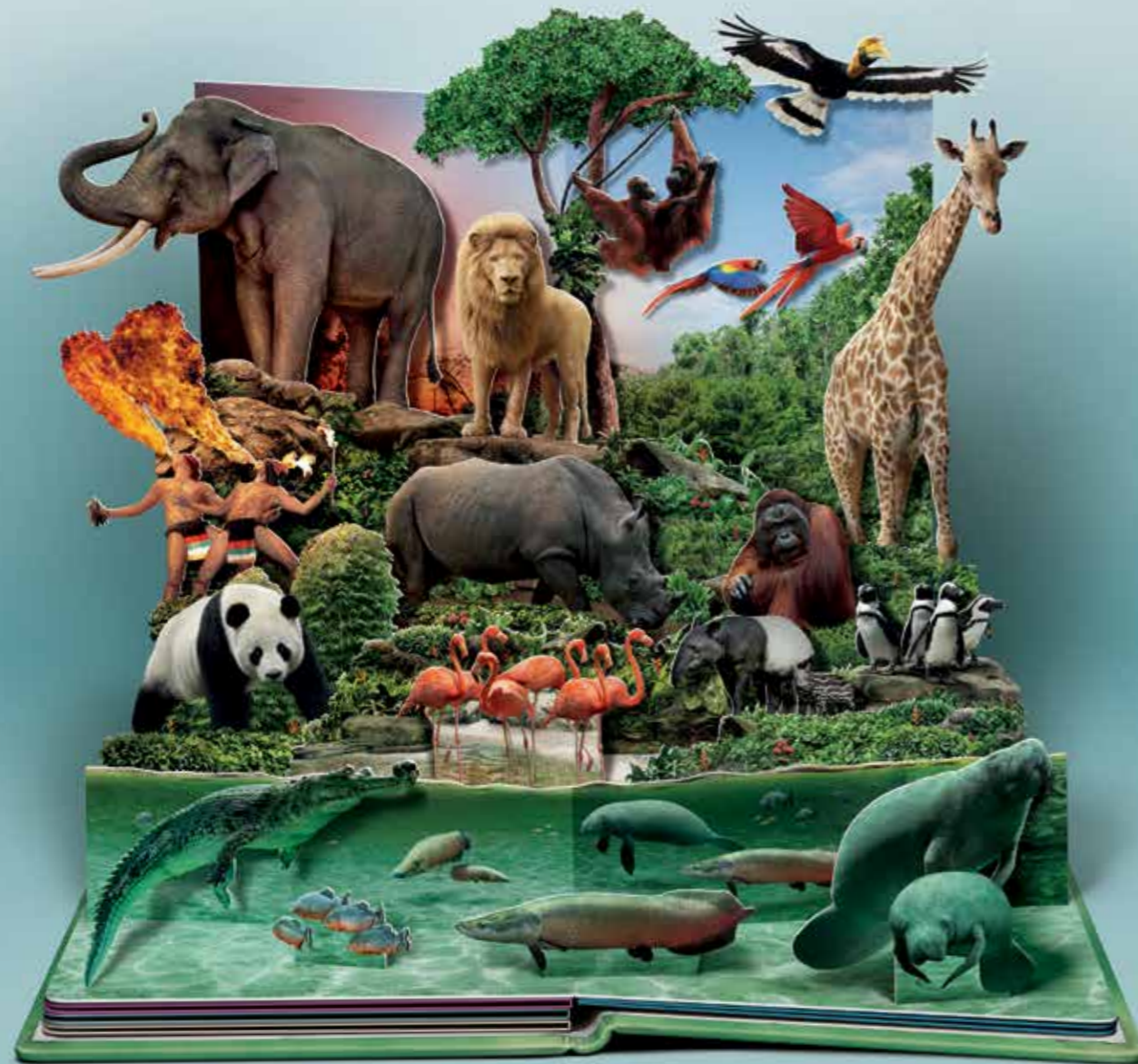
YEARBOOK 2016-17



WILDLIFE RESERVES SINGAPORE

Wildlife Reserves Singapore (WRS) is the operating arm of Mandai Park Holdings, 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. Each year, Jurong Bird Park welcomes over 850,000 visitors, Night Safari 1.1million, Singapore Zoo 1.7 million and River Safari 1 million.



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MESSAGE from Chairman & Group CEO



S Dhanabalan
CHAIRMAN
MANDAI PARK HOLDINGS

FY2016/17 has been another eventful year, marked by milestones that brought us closer to achieving our vision to be a world-leading wildlife institution.

Our plan to refresh the Mandai precinct is taking shape. On 16 January 2017 Mr S Iswaran, Minister for Trade and Industry (Industry), officiated the ground-seeding ceremony, which signalled the start of development work. For many Singaporeans, Mandai brings back fond memories of the time spent with their families and friends appreciating the wonders of nature at Singapore Zoo, Night Safari and River Safari. The rejuvenation of Mandai to include a new bird park, a rainforest park, a nature-themed indoor attraction, accommodation options and public recreational spaces will connect people even closer to nature. For us, it means exciting new opportunities to deliver exceptional wildlife



Mike Barclay
GROUP CEO
MANDAI PARK HOLDINGS

experiences to our guests for generations to come and inspire them to protect biodiversity.

In parallel, our Board has approved a ten-year master plan to ensure our existing wildlife parks are enhanced and integrated with the new development to offer an array of differentiated wildlife experiences. Indeed, the upgrading of exhibits and facilities at WRS parks are on-going. The River Safari entrance was given a facelift to augment the sense of arrival and strengthen the storyline on river ecosystems and their inhabitants. With the departure of the four koalas from Singapore Zoo, the exhibit at Australian Outback was converted into a comfortable home for two endangered tree kangaroos.

We also prioritised strengthening our service culture and our digital capabilities. 700 staff participated

in our 'Heart Service' training initiative, while we drew up a digital transformation roadmap. We plan to leverage on technology and connect people in the digital space to our in-park experiences. The transformation will begin with the implementation of a new Experience Management Platform to enhance guest experience at various digital touchpoints. In addition, we adopted GPS technology to offer a choice of eight languages on our trams at Night Safari and Singapore Zoo.

Animatronic dinosaurs 'invaded' the Singapore Zoo last October. The **'Back To Save The Future – Zoo-rassic Park'** campaign allowed us to draw attention to the on-going sixth extinction event. We sought to raise awareness that many life forms on Earth are threatened by our actions. Through such messaging, we hope to inspire guests to do their part for the environment.

WRS' living collection is amongst the richest in zoological institutions around the world. 22% of the 966 species represented across our four parks are threatened, and four critically endangered species were added to the collection during the year. Holding such a precious collection brings with it the responsibility to help sustain the ex-situ population of these species. We collaborated with zoos from around the world in 31 managed species programmes, which are designed to enhance genetic diversity for the long-term survival of the species. This year we joined 14 additional programmes,

including those for the critically endangered ploughshare tortoise and northern bald ibis.

To cement WRS' commitment in providing world-class care for our living collection, we embarked on our first animal welfare accreditation process conducted by the Australian Zoos and Aquariums Association (ZAA). Additionally, we reviewed our Animal Welfare Code to ensure that it remains relevant in the evolving world of zoo-keeping. The refreshed ethical and behavioural framework provides guidance and clarity to our staff in carrying out their zoo-keeping duties and making decisions in the best interest of their charges.

During the reporting year, WRS ramped up its support for regional conservation and funded 23 projects in various biodiversity hotspots. Besides funding, WRS deepened its engagement in regional conservation work by sending staff members on-site to provide specialist support.

On the home front, the Wildlife Reserves Singapore Conservation Fund (WRSCF) supported 16 local projects featuring a diverse range of taxa. We hosted the Raffles' Banded Langur Conservation Strategy Planning Workshop, which produced the first Species Action Plan to guide and implement a national conservation strategy for Singapore's critically endangered langur. The year also saw WRS taking the leadership to host various specialist workshops and facilitate over 70 research projects.

WRS has also established a framework to drive sustainable best practices in a holistic and structured manner. Now all seafood and palm oil procured by our food outlets comes from sustainable sources. The **'Go Green for Wildlife'** communication platform was launched to reach out to park guests and netizens. To reduce the consumption of bottled water, we have installed a number of water dispensers in our parks, thanks to the generous support of Hyflux.

Our education programmes continue to grow, engaging some 340,000 school children, park guests and members of the public. This would not have been possible without the efforts of our volunteers who collectively spent over 54,000 hours to help us inspire people to value and protect wildlife.

With the staunch support of the Ministry of Education and the Committee to Promote the Chinese Language Learning, we launched 'Wow Wild Learn', an immersive programme to motivate pre-schoolers to learn Chinese with the help of our giant panda ambassadors Jia Jia and Kai Kai. 'Wow Wild Learn' will now be replicated in the Malay and Tamil languages. It is our privilege to be able to support the national drive to promote the learning of mother tongue languages.

To ensure that our parks are accessible to all segments of the society, we offer complimentary admission to beneficiaries of

an array of Volunteer Welfare Organisations (VWOs). During the reporting period, 4,405 beneficiaries from 95 VWOs visited our parks and many were engaged by our young volunteers, the Wildlife Buddies. We are pleased to have contributed to fostering the community spirit through this programme offering.

Our team continues to deliver their best to win industry recognition. Singapore Zoo bagged the AsiaOne People's Choice Award for the Best Local Attraction. In the Excellent Service Awards, a record total of 109 staff members were honoured, with 14 receiving Star awards, 14 Gold and 81 Silver.

We could not have achieved these outcomes without the steadfast support of all our stakeholders. We would like to thank our board members, committee members, partners, adopters, sponsors, volunteers and friends for their tremendous contributions. We would also like to express our heart-felt gratitude to retiring board member, Ms Cheo Hock Kuan, for her invaluable contribution. We look forward to the next phase of our journey as we develop the Mandai precinct to bring people even closer to nature and 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.



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



hospitality
We serve from the heart.



integrity
We are honest and fair in all our dealings.



sustainability
We embrace sustainable best practices.



teamwork
We achieve more together.



strategic thrusts

Create exceptional guest experiences.

•
Grow our revenue to sustain our business.

•
Play a leading role in conserving biodiversity in Singapore and the Region.

•
Provide world-class care for our living collection.

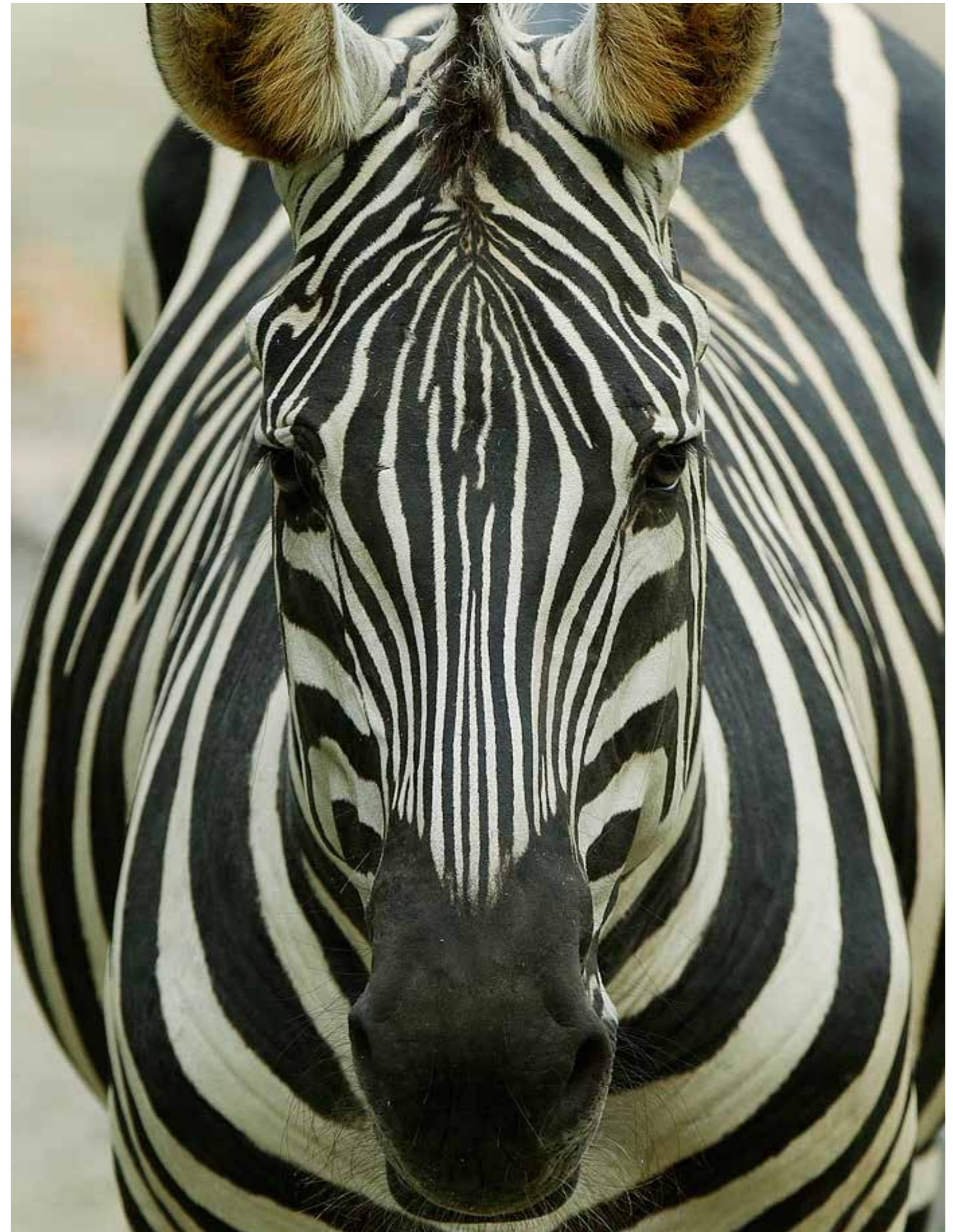
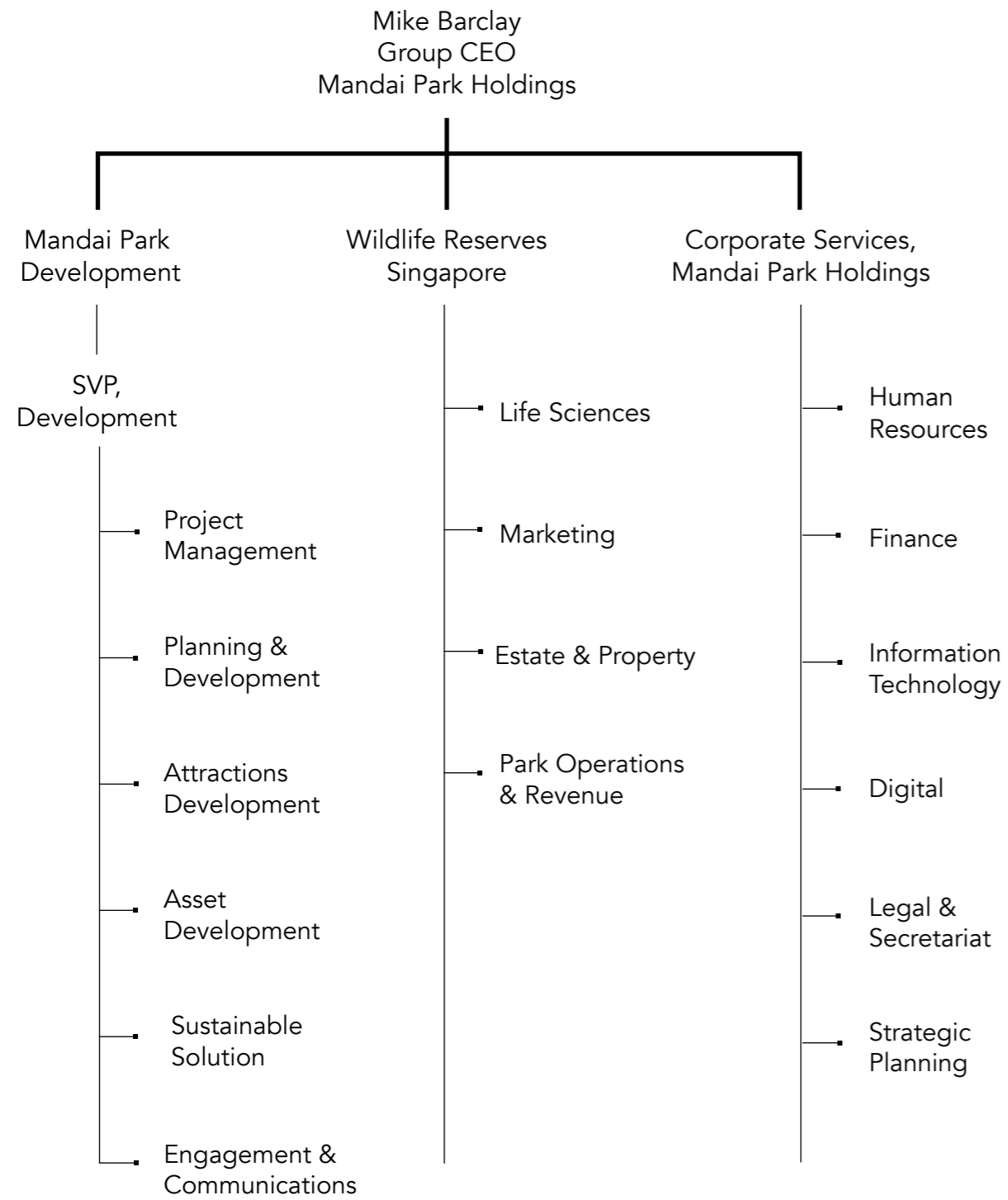
•
Apply leading organisation and human resource practices.

•
Forge A Strong National Love and Pride





Mandai Park Holdings ORGANISATIONAL STRUCTURE





Board of Directors, MANDAI PARK HOLDINGS

(effective 31 March 2017)

CHAIRMAN

Mr S DHANABALAN

Mr S Dhanabalan is also Chairman of Temasek Trust, 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.

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.

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 National Book Development Council of Singapore.

Mr FOCK Siew Wah

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

Mr KEE Teck Koon

Mr Kee is the Non-Executive Chairman of Changi Airports International Pte Ltd, and Alexandra Health Fund Ltd. He also holds directorship positions in CapitaLand Ltd, Raffles Medical Group Ltd, NTUC Enterprise Co-operative Ltd, NTUC Income Insurance Co-operative Ltd, and Lien Foundation.

Mr Dilhan Pillay SANDRASEGARA

Mr Sandrasegara is the Head, Enterprise Development Group and Singapore and the Co-head of Americas of Temasek International Pte Ltd. He serves on the boards of the Singapore Management University, Singapore Institute of Legal Education, Changi Airport Group (Singapore) Pte Ltd, Changi Airports International Pte Ltd, Temasek Life Sciences Ventures Private Limited, Fullerton Financial Holdings Pte Ltd., the National Research Foundation in Singapore, Mandai Park Holdings Pte Ltd, Vertex Venture Holdings Ltd and Ascendas-Singbridge Pte Ltd.

Mr SIM Hwee Cher

Mr Sim is PricewaterhouseCoopers Singapore's Vice Chairman of Operations and the Head of Audit. He is also a member of the PwC Executive Board for Singapore, China, Hong Kong and Taiwan. Mr Sim sits on the Council of the Institute of Singapore Chartered Accountants (ISCA) and is the Honorary General Secretary of National Council of Social Service and Council member of Community Chest. He is also a Member of the National University of Singapore (NUS) School of Accounting Advisory Council.

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.

Professor Leo TAN

Professor Tan is the Chairman of the Garden City Fund, President of the Singapore National Academy of Science, Vice Chair of the Singapore Environmental Council and Chair of the Science Sub-Commission of the Singapore National Commission for UNESCO. He also represents Singapore as Governor on the Asia-Europe Foundation.

Professor TAN Chorh Chuan

Professor Tan is the President of the National University of Singapore and the Chairman of the Board of the National University Health System. He is also the Deputy Chairman of Singapore's Agency for Science, Technology and Research (A*STAR); Senior Advisor to the Governing Board of Duke for Science, Technology and Research (A*STAR); Senior Advisor to the Governing Board of Duke NUS Graduate Medical School; and Member, Board of Directors of the Monetary Authority of Singapore.

Ms NEO Gim Huay

Ms Neo Gim Huay is the Managing Director, Enterprise Development Group and Managing Director, Sustainability of Temasek International Pte Ltd. She sits on the Board of Singapore National Library.





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
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
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
Mr Clarence Lim	Director Park Operations
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



YEAR IN REVIEW

- Mandai ground seeding ceremony officiated by Mr S Iswaran, Minister for Trade and Industry (Industry) and Mr S Dhanabalan, Chairman of Mandai Park Holdings.
- WRS welcomed 4.6 million guests.
- Launch of HEART Service to drive the service culture across WRS.
- Singapore Zoo bagged the AsiaOne People's Choice Award for the Best Local Attraction.
- Opening of Australasia at Singapore Zoo to welcome a pair of Goodfellow's tree kangaroos.
- River Safari Entrance Gallery upgraded to augment a strong sense of arrival.
- Dinosaurs came alive at Zoo-rassic Park in Singapore Zoo.
- A world-first partnership with BlippAR to test-bed Zoo-rassic Park for the use of deep learning computer vision engine and augmented reality interactive games.
- Launch of park icons – Canola for River Safari, Chawang for Night Safari and Sunny for Jurong Bird Park.
- Launch of Mandai Express bus services to enhance connectivity between Mandai and heartland towns.
- Launch of multi-language trams offering eight languages to enhance guest experience.
- Animal Welfare Code refreshed and implemented.
- The first Species Action Plan for the Raffles' banded leaf langur to guide and implement the national conservation strategy for the species.
- Switch to sustainable seafood and certified segregated sustainable oil for all F&B outlets.
- Installation of water dispensers at Singapore Zoo to reduce consumption of bottled water and generation of plastic waste.
- Launch of Go Green For Wildlife sustainability communication platform.
- 10-Year Masterplan for WRS parks delivered for execution.
- Hosted 4,405 beneficiaries from 95 VWOs.
- Launch of Wow Wild Learn, with the support of Committee for Promoting Chinese Language Learning (CPCLL), to motivate pre-schoolers to learn the mother tongue language through giant panda ambassadors Jia Jia and Kai Kai.





SEEDING MANDAI'S FUTURE

For many Singaporeans, Mandai resonates in their hearts with fond memories of the time spent with families and friends appreciating the wonders of nature at Singapore Zoo, Night Safari and River Safari. The transformation of Mandai to include a new Bird Park, a Rainforest Park, a nature-themed indoor attraction and accommodation options will bring people even closer to nature, providing tremendous opportunities to inspire them to protect biodiversity.

The ground-seeding ceremony on 16 January 2017 marked the start of development work for the rejuvenation of Mandai. A few hundred guests witnessed this milestone and the event was officiated by Mr S Iswaran, Minister for Trade and Industry (Industry) and Mr S Dhanabalan, Chairman of Mandai Park Holdings. 12-year old student Aaliyah Elliot gave a heart-warming narration of the special moments spent with her family at the Singapore Zoo, Night Safari and River Safari. She also shared her vision of what Mandai will be to her in the years to come, inspiring many guests at the ceremony.

Master plan of detailing the transformation of Mandai.



Right:
Planting the first seed to symbolically seed Mandai's exciting transformation were (from left)

Mr Mike Barclay, Group CEO, Mandai Park Holdings,

Mr S Dhanabalan, Chairman, Mandai Park Holdings,

Mr S Iswaran, Minister of Trade and Industry (Industry),

Mr Lim Boon Heng, Chairman, Temasek Holdings Pte Ltd

Mr Philip Yim, Senior VP, Mandai Park Holdings.



Below:
Guests were invited to plant a sapling at the vertical garden, symbolically seeding Mandai's future as a sustainable, inclusive and integrated nature and wildlife destination for generations to enjoy.



CREATING EXCEPTIONAL GUEST EXPERIENCES



As one of our key pillars, creating exceptional guest experiences continued to guide WRS along the path to delighting every guest and creating wonderful memories. Exhibits, park facilities and programming are constantly rejuvenated, supported by compelling storylines and content to spark a sense of wonder.

Going back to the basics, tremendous efforts were spent in lending an attentive ear to the voice of our guests through ethnographic research, surveys, focus groups and online discussions. Understanding guest motivations and pain points is crucial to developing orchestrated emotional maps for experience journeys – pre-park, in-park and post-park.



The HEART Service

To drive the service culture across WRS, the Guest Experience Department was transferred from the Park Operations & Revenue Division to the Human Resources Division. This reorganisation reflects the importance of the collective efforts of all staff in creating exceptional guest experiences.

We Serve From The Heart

is the desired behaviour that embodies one of WRS' core values - Hospitality. To align staff and inspire them to embrace the service culture, the HEART service was launched. It aims to drive service behaviours of being Happy, Empathetic, Attentive, Reliable and Timely. It is targeted not just for frontline staff but all at WRS.

The emphasis on internal guest and external guest service was brought to life with the HEART-2-HEART cascade sessions. A total of 36 two-hour sessions were organised to reach out to over 700 full-time and regular part-time staff.

WRS clinched a total of 109 Excellent Service Awards by the Association of Singapore

Attractions. This is an increase of 165% over the previous year, and a validation that the staff lives out the core value of hospitality.



Over 700 full-time and regular part-time staff attended the HEART-2-HEART training, which aims to drive desired service behaviours.



Digital Transformation

"Efforts in customer experience often serve as the heart and soul of digital transformation." - Brian Solis.

Digital is no longer a luxury but a necessity. To fully embrace digital transformation, a team was established to work with stakeholders and leverage on opportunities presented by evolving digital technologies. This strategic direction fully supports WRS' mission to inspire biodiversity conservation through meaningful and memorable wildlife experiences.

Understanding Guests

Beyond in-park surveys and guest feedback, WRS conducted consumer insights research to better understand consumers representing different market segments, and identify social and digital opportunities to elevate the guest experiences.

The first-ever ethnographic research with 27 walk-along sessions in the parks were conducted to observe and study the social interactions and behaviour of our guests.

Two focus groups were conducted with Singapore residents to gain deeper guest insights.

Additionally, seven online discussions were facilitated with users from six different countries to understand motivations to visit as well as pain points.

The outcome of the consumer insights research was identification of key guest personas, which were subsequently adopted to develop the digital consumer journey map aimed at enhancing guest experience from pre-park, in-park to post-park.

Omni-Channel Guest Experience

The omni-channel consumer expects everything to be readily available at his or her convenience. To deliver exceptional and consistent guest experience, digital technologies play an indispensable role.

WRS is building the Experience Management Platform to deliver the omni-channel guest experience. It is the first foundational platform to be forged as part of the digital transformation roadmap. This asset is imperative in governing all guest-facing content and interfaces, and will be seamlessly integrated with the existing backend systems. Through the dynamic delivery of contextual and personalised content across multiple channels,

guest experience will be greatly enhanced at the various digital touchpoints (e.g. website, mobile, in park displays) at the right time, at the right place.

This initiative aims to unfold a compelling omni-channel experience over the next few years that not only delivers functional value and utility, but also deepens emotional connections with guests.

Personalising Guest Experience

Given the diverse guest segments which WRS engages, the need to bring across the right message will be key in accelerating the change in behaviour towards caring for biodiversity. Alongside the Experience Management Platform, WRS has also embarked on revamping its Customer Relationship Management platform to enhance personalisation of products and services for guests.

Leveraging on the Cloud to scale, Customer Relationship Management platform will also allow WRS to capitalise on machine learning technologies to take guest experience to a greater height. When completed, WRS will be able to quickly predict shifts in macro operating trends as well as to make accurate predictions of preferences at an individual level.



Dinosaurs Came Alive At Zoo-rassic Park

T. Rex, stegosaurus, triceratops, spinosaurus and other dinosaurs invaded Zoo-rassic Park at Singapore Zoo in November 2016. Back To Save The Future - Zoo-rassic Park was not just a campaign that capitalised on the popularity of dinosaurs, instead it drew attention to the fifth extinction during which dinosaurs were wiped out and more importantly, the sixth extinction which is in progress at an alarming rate due to human activities. By raising awareness that life forms on Earth are in fact in the midst of the sixth extinction, WRS hopes to inspire urgent actions that help to protect biodiversity and the environment.

To build on the story of extinction and evolution, WRS' living collection was highlighted to

good effect, strengthening the storyline. Guests were invited to go on the 'Same Same But Different' Trail at Singapore Zoo to discover how present day animals such as giraffes, rhinos, bats, peacocks share similar features and behaviours with the relics of the past. Continuing the journey to River Safari, guests were invited to follow the 'Extinction Escapees' Trail to meet living fossils such as the alligator snapping turtle, Indian gharial, giant salamander, etc.

An exclusive, world-first partnership was forged with BlippAR to test-bed Zoo-rassic Park for the use of deep learning computer vision engine and augmented reality interactive games. The objective was to leverage on technology to deliver richer educational content for guests of all ages. In the four-month trial period, the augmented reality game engaged with more

than 5,800 unique users with about 50,000 content interactions. With an average user dwell time of 4.5 minutes, which is higher than industrial average, this pilot proved that using innovative ways to deliver content can help bolster education engagement.

To complete the Zoo-rassic experience, special F&B snacks and beverages with a dinosaur theme were made available to delight guests.



An exclusive partnership with BlippAR allowed WRS to leverage on the digital platform to deliver richer educational content during the Zoo-rassic campaign.



Playing Matchmaker For Tree Roos

After bidding goodbye to the four exceedingly popular koalas, the vacated habitat was upgraded and renamed 'Australasia' to welcome a pair of endangered Goodfellow's tree kangaroos. Makaia, a male tree kangaroo arrived from Adelaide Zoo on 4 July 2016 to pair up with Nupela, another tree kangaroo from Taronga Zoo.

Unlike their ground dwelling cousins, tree kangaroos are relatively unknown to the world. Having a chance to admire the richly coloured, bear-like Goodfellow's tree kangaroos up close never fails to spark a sense of wonderment in guests.

The Goodfellow's tree kangaroo is threatened by unsustainable hunting and deforestation in Papua New Guinea. In the last 50 years, its population has declined by about 50%. To ensure its survival, WAZA* established a Global Species Management Plan (GSMP) for the species. The plan involves co-ordinated efforts of participating zoos around the world to keep Goodfellow's tree kangaroos as an assurance population should there be a

catastrophic decline in the wild population. Matchmaking suitable individuals from participating zoos also minimises inbreeding of related individuals and enhances the genetic pool of the species under human care.

WRS is pleased to play matchmakers for Nupela and Makaia, which were paired up under the recommendation of GSMP. It is hoped that the pair will hit off and produce joeys soon to add to its species population.

Separately, a male tree kangaroo bred in Singapore Zoo by another pair was sent to Zoorasia, Japan for breeding too.

Tamarins and Marmosets

WRS has one of the world's most valuable primate collection, which includes 10 species of tamarins and marmosets. Two new exhibits next to Fragile Forest Tram Station were added, one to house red-bellied tamarins, and the other, a mix of pygmy marmosets and Goeldi's monkeys.

A troop of free-ranging golden-headed lion tamarins now greets guests at Reptile Gardens – being able to watch the antics of these 'mini-monkeys' in an immersive environment, without any barriers, is truly a treat! Over at River Safari, the jaguarundi exhibit was converted to house a group of emperor tamarins.

Tamarins and marmosets are found in the rainforests of South America. These 'mini monkeys' are threatened, some very severely, by deforestation and the illegal pet trade. By highlighting them to guests, WRS hopes to draw attention to the conservation issues affecting these and many other rainforest animals, and inspire guests to take action to help protect them.



*WAZA – World Association of Zoos and Aquariums



Stories Alive

Storytelling is a powerful way to stir emotions and convey desired messages, and stories are best told by those who are passionate about the subject. To shape a compelling emotional map for guests at WRS parks, much thought was put into stationing keepers and volunteers at key exhibits and strategic locations to unravel the mysteries and wonders of nature to all. Guests can enjoy interaction with the animals as well as their keepers at Elephants of Asia, Rainforest KidzWorld, the new Fragile Forest Discovery Outpost, Pangolins along Night Safari Leopard Trail, just to name a few.



Rochelle Ho, Junior Keeper, engaging a guest in Rainforest KidzWorld.



Mandai Express offers direct bus services between heartland towns and the three WRS parks in Mandai.



Sophia Lee, Junior Keeper, sharing fun facts about the often-misunderstood invertebrates at Fragile Forest Discovery Outpost.



At the Breeding and Research Centre, guests get to witness how bird nannies care for newly-hatched chicks, some are among the world's most endangered species.

Mandai Express Bus

NEW! Mandai Express (Khatib)

Pick-up / Drop off Location	Operation Hours	Fare
Khatib MRT Exit A Passenger Pick-up Point	Daily: 8.30am - 7.20pm Weekdays every 45mins Weekends & Public Holidays every 20mins	\$1.00 per passenger *Payment by EZlink/ NETS Cash/ Pay card

Mandai Express (Tampines/Bedok/Sengkang)*

To Mandai		
Pick-up Location	Operation Hours	Fare
Tampines Ave 4 Bus Stop	8.45am, 10.15am	Adult: \$3.00 Child: \$1.00 (3 - 12 yrs old)
Bedok Point Pick Up Point		
Sengkang MRT Exit D Bus Stop		

From Mandai		
Drop-off Location	Operation Hours	Fare
Tampines Ave 4 Bus Stop	3.00pm, 5.00pm	Adult: \$3.00 Child: \$1.00 (3 - 12 yrs old)
Bedok Point Pick Up Point	3.15pm, 5.15pm	
Sengkang MRT Exit D Bus Stop	3.30pm, 5.30pm	

*Service available on weekends, school & public holidays.
Tickets can be purchased online via mandaiexpress.baseline.sg or on board using EZlink/ NETS FlashPay card. Seats will be guaranteed for online bookings.
Pick-up location from Mandai is at Singapore Zoo coach bay.

Launch of Mandai Express

To improve connectivity to WRS parks, heartland buses were relaunched as Mandai Express. Direct bus services are now ply between Mandai and heartland towns including Khatib, Bedok, Sengkang and Tampines. While the Safari Gate and Singapore Attractions Express serve mainly tourists visiting WRS parks, Mandai Express exists chiefly to address the connectivity issue for local residents.

Redefining Tram Ride Experience

One of the most common pain points of overseas guests is the inability to fully comprehend the English tram commentary and this compromises guest experience particularly for Night Safari visit, which is tram-reliant to a large extent. With the installation of multi-language devices which operate on GPS technology, eight different languages can be delivered simultaneously to enhance guest engagement.



Ahmad Syarif, Senior Keeper, impressing young guests with a molar tooth of an elephant.



Claudia Tay, Junior Animal Care Officer, delighting guests with an anecdotal account of her charge, a pangolin.



The multi-language devices allow guests to select tram commentary in eight different languages, greatly enhancing the wildlife experience during the ride.

PROVIDING WORLD-CLASS ANIMAL CARE



To cement WRS' commitment in providing world-class care for its living collection, the Life Sciences Division embarked on the journey to review the Animal Welfare Code and to obtain Animal Welfare Accreditation from Zoo and Aquarium Association (ZAA). Nutritional care for the animals was also reviewed and their diets adjusted to mirror, as closely as possible, those in the wild. Training for the Life Sciences team continued to intensify to broaden domain knowledge, keep abreast with best practices, and to acquire specialised skill sets. All these took WRS yet another step closer to its vision to become a world's leading wildlife institution.

Our Valuable Living Collection

WRS cares for an immensely diverse living collection, which is amongst the richest in zoological institutions around the world. Of the 966 species across the four parks in WRS, 214 or 22% are threatened, and four critically endangered species were added to the collection during the reporting year. Holding such a precious collection comes the responsibility for WRS to sustain the population of these species ex-situ (under human care). This is achieved through a Life Sciences team who works collectively and tirelessly to care for their charges and to breed threatened species for exchange efforts with zoos globally.

LIVING COLLECTION AT WRS

TOTAL SPECIMEN
14,905

TOTAL SPECIES
966

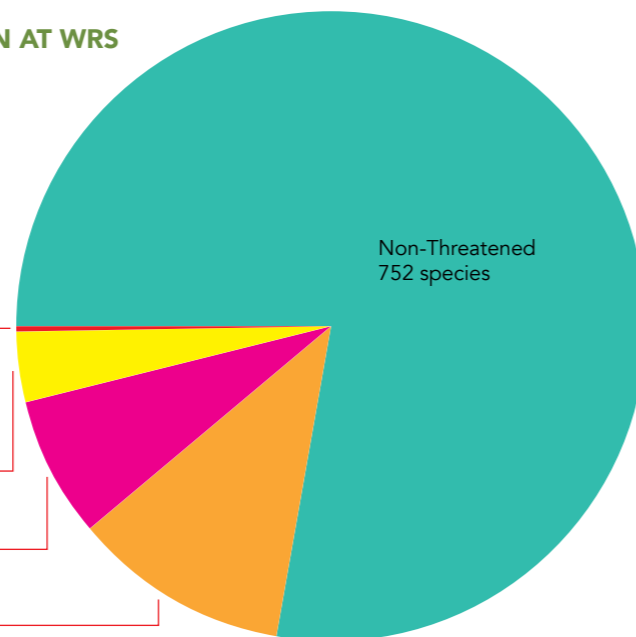
THREATENED SPECIES*
214
(22% of total species)

EW-Extinct in the Wild
1 species
(Scimitar Horned Oryx)

CR-Critically Endangered
34 species

EN-Endangered
72 species

VU-Vulnerable
107 species



* 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

Collaboration with zoos around the world to enhance genetic diversity and protected severely threatened species gained depth and breadth as the number of Managed Species grew to 31, with 14 additional species such as the critically endangered ploughshare tortoise and northern bald ibis, the endangered Malayan tapir, false gharials and more (please refer to listing for details).



Ploughshare tortoise



Northern bald ibis

Managed Species Programmes @ WRS

China Wildlife Conservation Association/ China Conservation & Research Centre For Giant Panda

- Giant Panda

EEP – European Endangered Species Programme

- Emperor Tamarin
- Goeldi's Monkey
- Rhinoceros Hornbill
- Fossa
- Palm Cockatoo
- Sloth Bear
- Giant Otter
- Pygmy Hippo
- Sri Lankan Leopard

ESB – European Studbook Foundation

- Bali Starling
- False Gharial
- Markhor
- Papuan Hornbill
- Black Howler
- King Bird-of-Paradise
- Mountain Peacock-pheasant
- Red-bellied Tamarin

GSMP – Global Species Managed Programme

- Red Panda
- Goodfellow's Tree Kangaroo

ISB – International Studbook Keeper

- Blue-throated Macaw
- Giant Anteater
- Golden Lion Tamarin
- Buffon's Macaw
- Golden-headed Lion Tamarin
- Ploughshare Tortoise

SSMP – Significant Species Managed Programme

- Bornean Orangutan
- Malayan Tapir

SSP – Species Survival Programme

- Hooded Pitta
- Minadiao Bleeding-heart Dove

Managed Species Programmes involve worldwide co-ordinated efforts to care for assurance populations of threatened species and to breed them. The Programmes make recommendations for specific individuals to be exchanged among participating zoos for breeding in order to enhance species genetic diversity. WRS' increased participation reflects its commitment to play a greater role in wildlife conservation at the global level, and the number of Managed Species Programmes is set to increase further.

Based on the recommendations from the Managed Species Programmes, WRS received a male siamang from La Citadelle de

Besancon Museum, France and a pair of golden lion tamarins from Allwetterzoo Munster, Germany. It is hoped that the new arrivals will breed eventually to help boost the genetic diversity of their species.

Four female markhors (the largest of the wild goats) from Helsinki Zoo arrived to join the existing herd in Night Safari. The expanded population for the markhor, which is endangered because of trophy hunting and competition from livestock for food and space. Zoos and conservation institutions keep assurance populations so that threatened species can still thrive under human care while the threats they face in the wild are being mitigated. While under

human care, assurance populations also provide insights into species biology which are important for formulating effective conservation measures.

WRS has had great success in the breeding programme for the pygmy hippo and one of the female offspring was sent to a zoo in Japan.

Apart from participating in globally-coordinated efforts through various Managed Species Programmes, WRS continued to work with individual zoos on species exchange programmes to ensure that the genetic pools of its living collection remains robust. In particular, much efforts were poured in to strengthen WRS' primate collection, one of the world's most valuable, by injecting new bloodlines. After a long wait, a male Celebes crested black macaque arrived from Batu Secret Zoo, Indonesia to join the existing female group in Singapore Zoo. This critically endangered macaque is threatened as a result of hunting, and every addition to the population, wild or under human care, is a precious one. Another critically endangered primate, a female red ruffed lemur was received from Yokohama Zoo, Japan. Also adding to the list was the import of two endangered black handed spider monkeys from Bazel Zoo, Switzerland.

Building on previous years' efforts in turtle conservation, WRS expanded its role as the holder of assurance colonies for severely threatened turtles and added 25 endangered Burmese roofed turtles to its collection. WRS is the only wildlife institution, outside the turtle's native range, to house the species. It, therefore, shoulders the heavy responsibility in helping to ensure the survival of this endangered animal.



Babies Big And Small

WRS received a jumbo bundle of joy, 149kg to be exact, on 12 May 2016. Sri Nandong, one of the female elephants in Night Safari, gave birth to a female calf, which was subsequently named Neha – meaning 'love' in Hindi. This was WRS' first elephant birth without any human intervention.

The primate collection at WRS is amongst the most diverse in the world. By providing excellent animal care and conducive environments, WRS has succeeded in breeding many severely threatened primates. During the

reporting period, 16 primate births further expanded the collection, creating added opportunities for exchange programmes with other zoological institutions to facilitate ex-situ species conservation. Most noteworthy were the birth of three baby proboscis monkeys. A fastidious leaf-eater, the proboscis monkey has been a challenge for most zoos to care for. Singapore Zoo is home to 11 proboscis monkeys and the only institution in the world, outside the monkey's native range in Borneo, to hold such a large colony. The ability to breed this endangered monkey is testimony to the high standards of animal care provided.

Herculina, a female cheetah gave birth to a litter of three cheetahs. Unfortunately, being a first-time mother, she failed to raise her cubs. The Animal Care team stepped in and managed to hand-raise one cub, named 'Deka'. A lion cub was born, adding to the list of carnivore births.

A Goodfellow's tree kangaroo joey was a valuable addition to the globally managed programme for threatened species.

The year saw great success in breeding two species of critically endangered freshwater turtles.

Nine painted terrapins and two Southern river terrapins were hatched, strengthening the assurance colonies of these species under WRS' care.

Invertebrates though spineless are not insignificant. In fact, invertebrates represent 95% of all species on Earth. To educate guests on the important roles these creatures play, the invertebrate collection in Fragile Forest was expanded. First-time success in breeding the dead-leaf mantis and water scorpion was recorded.

At River Safari, two manatee calves, a male and a female, joined the herd in Amazon Flooded Forest.

Over 380 birds were hatched in Jurong Bird Park. Aligned with Jurong Bird Park's focus on threatened songbird conservation, greater resources were directed to develop breeding programmes for songbirds. First-time breeding success was achieved for greater leafbird, fairy bluebird, green honeycreeper and coledo. A total of 23 coledo chicks were hatched and Jurong Bird Park now has the largest population of this species under human care, outside its native range in the Philippines.

Apart from successes in breeding songbirds, the world's first documented breeding of the long-tailed mockingbird under human care was achieved. The critically endangered Bali myna and grey-rumped myna produced chicks to add to their declining populations. The Mindanao bleeding-heart dove also bred, enabling Jurong Bird Park to continue to contribute to its conservation through the Species Survival Programme. After a two-year break, the blue-eye cockatoo started to breed again – a significant event since as this species is rarely kept under human care and it faces severe threats in the wild.



Elephant calf
– Neha



Cheetah cub
– Deka



Proboscis monkey



Honeycreeper



Tree kangaroo



Painted terrapin



Manatee



Refreshed Animal Welfare Code & ZAA Accreditation

In line with WRS' desire to provide world-class animal care for its living collection, the Animal Welfare Code was reviewed and updated to ensure that it remains relevant in the evolving world of zoo-keeping. This refreshed ethical and behavioural framework provides guidance and clarity to WRS staff in carrying out their zoo-keeping duties and making decisions, in the best interest of their charges.

External validation through accreditation is important to ensure that standards are met and sustained. WRS embarked on its first accreditation process on animal welfare by Zoos and Aquariums Association (ZAA) in January 2017. This important event marked a milestone for WRS and signalled its strong commitment in advancing animal welfare to the highest standards. Review is on-going and WRS looks forward to obtaining the accreditation in the later part of 2017.

Diets Reviewed

A major review on animal diets was carried out and changes were made to replicate, as closely as possible, the natural diets.

Significant changes were made to the diets for orangutans and chimpanzees with the reduction of fruits to a lower-sugar, higher-fibre diet. The primates reacted positively to the change – they are observed to be more active, and display abnormal behaviour such as regurgitation and re-ingestion less frequently. There is also a reduction in negative

social behaviours. The new low-sugar diet will help to prevent the orangutans and chimpanzees from developing diabetes.

A switch to a high fibre diet was also implemented for the baboons. Their body and coat conditions have improved significantly with the change.

Inuka's diet was adjusted as part of his geriatric care programme. The quantity of food is also reduced on days when he does not swim. This helps to prevent unwanted gain weight, especially with his age-related slow metabolism. The pangolins now enjoy an ant

egg-based diet instead a meat-based diet previously. The new diet is more calorific, and desired weight gain has been observed in the pangolins.

The diets for the sun bears and black bears were changed to reflect the difference in their feeding ecology in the wild. An insectivorous diet with ant eggs, silkworm larvae, meat and plants is provided for the sun bears, and an omnivorous diet for the black bears. Their overall condition has improved and the new diets will hopefully also help to prevent common tooth problems.



Malayan Sun Bear



Sunda Pangolin

Operant Conditioning For Stress-Free Routine and Medical Checks

Successful operant conditioning facilitates stress-free routine checks, transfers, and basic veterinary examinations and procedures. Impressive progress has been made in this area of animal care, achieved through the perseverance of the keepers and other Life Sciences team members.

All the giraffes at WRS have been successfully conditioned for weight taking. Dobeni, a female Rothschild's giraffe at Night Safari responds consistently well to training for voluntary blood draws. These are noteworthy achievements as giraffes are known to be challenging to condition.

Other herbivore species such as the bongos and Malayan tapirs have also been undergoing medical operant conditioning, and many of them can now receive injectable medicines with minimal stress.

The kangaroos and wallabies have been successfully trained for weight taking and pouch inspection for joeys.

With operant conditioning, keepers are able to perform foot care routine for female elephants Komali, Intan and Aprila, under protected contact condition. Intan has also been conditioned for voluntary blood draw. Over at Night Safari, baby elephant Neha shows extremely encouraging progress since she started operant conditioning at six months old.

Inuka, the polar bear, continued to undergo operant conditioning, which allows keepers to monitor his health and respond accordingly



An orangutan presenting its finger for blood draw to monitor blood sugar level.

to meet his special needs as a geriatric animal. The sun bears and Asiatic black bears have been conditioned for oral inspection to monitor teeth problems for preventive care.

Building upon the learning and success in performing voluntary blood draws for tigers, the Carnivore keepers have begun similar medical training for cheetahs and leopards. The Indian wolves responded well to medical operant conditioning and they are able to receive their yearly vaccines with minimal stress.

Following a switch to a low sugar, high fibre diets for the orangutans and chimpanzees, blood sugar of these primates are being monitored as part of the evaluation of the diet change. A few of the orangutans and chimpanzees have been successfully trained for voluntary blood draw for blood sugar readings. With conditioning, weight taking and transfers for tamarins and marmosets can now be carried out with minimal stress to the animals.

Operant conditioning for the manatees continued to show excellent progress. They are now able to present their flippers for voluntary blood draw and lift



Through operant conditioning, keepers are able to check the teeth and oral cavity of orangutans.

their head out of water for buccal swab. The females have also been trained successfully to present their belly for ultrasound scanning to detect and monitor pregnancy.

Adding to the list of animals that have been successfully conditioned are the freshwater stingrays and white spotted bamboo sharks – another remarkable achievement for WRS as operant conditioning for fish is an entire new challenge for the River Safari team. The aquarists are able to recall the female freshwater stingray into the holding tank consistently while the male still requires more training. One of the three bamboo sharks in Touch Pool is now able to swim into a transfer container voluntarily, minimising stress during transfers.



Keeping Boredom At Bay

Apart from operant conditioning, the Life Sciences team spends a good portion of their time designing, implementing and evaluating enrichment activities for WRS' living collection. Enrichment activities, often mimicking situations in the wild, engage the animals mentally and physically. Food-based enrichment activities are most commonly used but the team tries as far as possible to involve other elements such as housing appropriate social groups and introducing new objects, sounds or scents.

The guiding principle for food-based enrichment activities is to vary the diet, food presentation and feeding intervals. Pellets,

seeds and ant eggs are scattered in the exhibits or the yards to encourage the animals to forage as they would in the wild. Meat is hidden in boxes, wrapped in cloth or hung in trees to provide opportunities for the carnivores to 'hunt' for their meals.

Feeding boxes and rattan boxes are stuffed with hay, grass and leaves to make the herbivores work harder for their food rewards. Technology comes in handy too – through the use of an App, elephant keepers are able to control remotely the timing and quantity of feed dispensed from the two newly installed FeedPods (auto feeders) in the elephant stable. This has helped to drastically reduce the stereotyping behaviour of the elephants in Night Safari.



Keepers wrap meat in hessian cloth packages for our big cats to explore and tear open.



Kai Kai sniffs the plastic balls for hidden treats.



Keepers make ice blocks packed with bananas and apples so that our elephants have to work hard to get to the yummy treats.

Veterinary Highlights

Black and White Baby In The Making

On 30th March 2017, female giant panda, Jia Jia came into peak oestrus. To encourage natural breeding, male giant panda Kai Kai was mixed with her. However, he was too boisterous and Jia Jia became afraid and ran off. As the pair failed to mate, artificial insemination had to be carried out. By 7.30pm that evening, Kai Kai was anaesthetised for fresh semen collection. Two hours later, Jia Jia was anaesthetised for insemination with a combination of fresh and frozen semen. Jia Jia and Kai Kai recovered from anaesthesia uneventfully after their procedures. Fingers crossed as everyone waited in anticipation of the good news. Meanwhile, the vets and keepers watched over Jia Jia closely and monitored her hormonal levels daily.



Cholecystectomy For Rattlesnake

In January 2017, cholecystectomy (gall bladder removal) was performed on a female Western diamondback rattlesnake. Swelling was observed on her abdomen and investigation reviewed a grossly enlarged gall bladder, resulting from a bacterial infection. The condition caused blockage to the bile duct and prevented bile from flowing normally. After the removal of the infected gall bladder, the snake was placed on antibiotics and supportive care for two weeks. She recovered well.



Cataract Surgery for Orangutan

In February 2017, a geriatric 60-year-old male Bornean orangutan, Jo Jo was anaesthetised for a health check and cataract surgery on his right eye. He had been blind in his left eye for many years due to corneal scarring. The surgery was successful and with a clear vision, Jo Jo's quality of life has improved greatly. The life span of an orang utan is between 35 and 45 years - Jo Jo is amongst the oldest orang utans in the world, under human care. As a geriatric animal, Jo Jo receives special care in housing and a modified diet to ensure that he ages comfortably.

Tusk Trimming

Female elephant, Jati fractured her left tush (incisor tooth, the equivalent of a tusk in male elephants) while having a mild tussle with another female elephant. The sharp edges of the fractured tooth cut into the soft tissue of her mouth, resulting in an infection. In December 2016, Jati was anaesthetised for treatment of her broken tooth. Loose fragments of the tooth were removed and the remaining portion filed down. The procedure went well and Jati woke up from anaesthesia smoothly.

Specialist Support For Dental Extraction

Apart from providing veterinary care for the living collection, WRS also responded to the Borneo Rhino Alliance's call for specialist support in the dental extraction of a Sumatran rhino, Puntung. Dr Abraham Mathew, Senior Veterinarian and Clara Yeo, Veterinary Nurse travelled to Tabin Wildlife Reserve, Sabah where Borneo Rhino Alliance cares for the last three surviving Sumatran rhinos in Malaysia. They worked with a team of veterinarians and assisted in the administration of anaesthesia during the complex extraction procedure. There are fewer than 100 Sumatran rhinos left in the world and every effort, no matter how small, is important to help save the species from extinction.





PLAYING A LEADING ROLE IN CONSERVING BIODIVERSITY

During the reporting year, WRS ramped up its support for regional conservation and funded 23 projects in various biodiversity hotspots. Besides funding, WRS deepened its engagement in regional conservation works by sending staff members on-site to provide specialist support.

On the home front, Wildlife Reserves Singapore Conservation Fund (WRSCF) supported 16 local projects featuring diverse taxa. The year also saw WRS taking the leadership to facilitate over 70 research projects and host various specialist workshops.



Support for regional projects

The year saw WRS directing most of its resources, financially as well as in specialist skills, to support the regional projects that it has funded in previous years. This is to build upon past learnings and achievements to enhance sustainability and success of the projects. Already, some have made good progress, promising rays of hope in conserving some of the region's severely threatened biodiverse hotspots and the wildlife that are found there.





MALAYSIA

Citizen Action for Tigers (CAT) by Malaysian Conservation Alliance for Tigers (MYCAT)



MYCAT initiated the reforestation programme named 'Rewilding Yu' by planting saplings bought from local nurseries. Its aim is to restore the severely degraded forest at Sungai Yu watershed, which is also the habitat of the Malayan tiger. WRS' support ensured that volunteers are able to assist forest rangers in monitoring the Sungai Yu River Wildlife Corridor through the CAT walk programme. Three WRS keepers from the Carnivore Section also participated in MYCAT's Realm of the Tiger programme, which serves as an inspiration for the keepers when they share anecdotes with WRS guests.

THAILAND

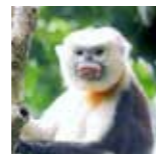
Conserving the king cobra in rural Northeast Thailand by Sakaeret Conservation and Snake Education Team (SCSET), Suranaree University of Technology



2016 marked the third year of WRS' support, with more funds provided to study how king cobras use human-dominated areas. Local outreach efforts in the form of university internship programmes, educational seminars and non-lethal snake removal workshops continue to strengthen relationships with local communities and improve public perception of king cobras. The team's work was featured in the BBC 2 series 'Thailand: Earth's Tropical Paradise'. The series also showed WRS' deputy head keeper, Jose Pedro participating in a king cobra rescue at the reserve.

VIETNAM

Conserving the Tonkin snub-nosed monkey in Khau Ca Forest, Northeast Vietnam by primatologist Le Khac Quyet



In supporting the project for five years running, WRS' funding enabled primatologist Le Khac Quyet and his team to continue monitoring the critically endangered snub-nosed monkey population in its Khau Ca forest habitat. The data generated from the research have been invaluable in addressing the lack of scientific information on this species. The involvement of local researchers ensured better participation of the local community in monitoring illegal human activities and protecting the monkeys.



CAMBODIA

Conservation of the southern river terrapin in Cambodia



The southern river terrapin is one of the rarest turtles in the world. It was presumed to be extinct in Cambodia until the re-discovery of a small population along Sre Ambel River. WRS supports the efforts of the WCS field team to restore the terrapin's population in its natural habitat. In a leap forward, 25 sub-adult turtles have been planned for release in April 2017. A monitoring survey on a group released in 2015 revealed that more than 85% of the turtles survived. Studies and outreach efforts to increase protection of the turtles' habitats are ongoing.

Preventing health issues in captive bears using nutritional management by Free the Bears



Sun bear populations have decreased by more than 30% mainly due to habitat loss, fragmentation and the illegal wildlife trade. Rescued sun bears are housed in wildlife sanctuaries and rehabilitation centres but keeping these bears is a challenge due to ineffective captive diets. Dr Francis Cabana, Wildlife Nutritionist from WRS, helped 'Free The Bears' team to develop a suitable diet for the bears. Studies are ongoing to monitor the bears' transition to the new diet.

LAOS

Protecting the saola in Lao PDR by IUCN SSC Saola Working Group and Global Wildlife Conservation



The saola is endemic to the Annamite Mountains of Lao PDR and Vietnam with fewer than 250 individuals in the wild. This hoofed animal has little value in the wildlife trade but is often caught in snares intended for wild boars and deer. WRS' timely financial support ensured smooth operations for Xe Sap patrolling teams who help collect snares and arrest poachers. In 2016, more than 58 poacher camps were destroyed and 1,758 snares were removed at Xe Sap National Protected Area. WRS provided further support to the saola working group to coordinate and plan conservation efforts.



INDONESIA

Conserving Javan gibbon habitats and promoting shade-grown coffee in Java by Coffee & Primate Conservation Project Team (CPCP)



Shade-grown coffee trees thrive under forest canopies. The forests remain intact while the coffee provides a source of income for local farmers. With the support from WRS since 2015, the project team is able to continually engage the village chiefs and farmers in Sokokembang village to produce shade-grown coffee and improve on the quality of the final product. WRS now serves the shade-grown coffee, branded Owa Coffee, at selected F&B outlets.

Preliminary studies on the pollination of shade-grown coffee have also shed light on the varieties of bees and their living patterns in the Javan gibbon's forest home. This provides the possibility of including sustainable harvesting of honey as another avenue of forest-friendly income for the locals. Community outreach efforts such as conducting Kopi Owa Eco-Tours and developing a Primate Pocket Guide App are also in the works.

Mitigating human-orangutan conflict in Sumatra by Orangutan Information Centre (OIC)



The Human Orangutan Conflict Response Unit (HOCRU) is the flagship unit 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 humanely protect crops from orangutan raids. The veterinarian internship programme was introduced in 2016 to provide young Indonesian veterinarians frontline training in rescue operations. A total of 19 orangutans were rescued between April and December 2016. The team also supported the Nature Conservation Agency (BKSDA) of Aceh and North Sumatra in rescuing other wildlife including gibbons, slow lorises, siamangs and Sumatran elephants.

Apart from continued funding, WRS deepened its engagement in the project by sending Head Keeper Kumaran to work with HOCRU in its rescue operation for orangutans.

Conserving the Bornean slow loris through rescue and rehabilitation by Yayasan International Animal Rescue Indonesia (YIARI)



WRS supports YIARI in its work as the first rescue and rehabilitation facility for slow lorises in Indonesia. As part of the team's systematic reintroduction project for Bornean slow lorises, WRS Wildlife Nutritionist, Dr. Francis Cabana provided his expertise in implementing a new diet for the slow lorises in YIARI's rescue centre. This aided the reintroduction of 17 slow lorises in Gunung Tarek between April 2016 and March 2017. 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.

Conserving the Roti Island snake-necked turtle by Wildlife Conservation Society (WCS)



WRS set up an assurance colony of Roti Island snake-necked turtles in the Singapore Zoo in support of WCS' plan to establish a viable wild population of this critically endangered turtle species through reintroduction on Roti Island. Additional support from WRS has also enabled the team to conduct intensive population and habitat suitability surveys at lakes where the turtles were historically reported. Zookeepers from the WRS Reptile section shared extensive knowledge on captive husbandry and breeding protocols with the WCS' turtle team.

Preserving critically endangered Indonesian birds with adequate breeding facilities by Cikananga Conservation Breeding Centre (CCBC)



WRS sponsored the construction of a new facility block in support of the CCBC's breeding programme for the black-winged myna and the Javan green magpie. The new facility includes larger CCTV-equipped breeding cages with natural landscape, along with specific improvements to increase security for the rare birds. These contributions strengthen the CCBC team's breeding efforts.

Community outreach, breeding and conservation of the critically endangered Bali starling and grey-rumped myna by Begawan Foundation



As part of its holistic approach to conserving the critically endangered Bali starling and grey-rumped myna, the Begawan Foundation sought to educate and win over different community groups including adult hobbyists who collect songbirds, youths who enjoy hunting birds. Support from WRS had enabled the team to organize local outreach activities and initiate a training programme for bird lovers in 2017. Funds from WRS were also channeled to facilities maintenance and care of the birds at the Sibang centre.

Building local capacity to save the critically endangered Sulawesi crested black macaque in North Sulawesi by Yayasan Selamatkan Yaki Indonesia (SY)



WRS continued to support the SY team's Education and Awareness Raising Strategy (EARS) Education Project that aims to provide the local community with the knowledge and capacity to foster behaviour change for macaque conservation. Junior high school students and religious leaders were trained under the Local Ambassador Programme

to reach out to their respective communities. A total of 2,850 students and 68 teachers were recruited in 2016. A Sunday school syllabus called the 'Green Gospel pilot project' was also developed and conducted during the reporting period.

Protecting Sumatran elephant habitats and mitigating human-elephant conflict in Way Kambas National Park by Community for Sumatran Nature Conservation (KHS)



Many Sumatran elephant populations face conflicts with humans as their habitats are converted into human settlements and agricultural areas. Elephant Response Units (ERU) conduct regular patrols and monitor activities in Way Kambas National Park (WKNP) to prevent and mitigate conflict cases. WRS supports the Tegal Yoso Elephant Response Unit (ERU), which is one of the three Response Units in the National Park. Besides preventing and mitigating elephant-human conflicts, Tegal Yoso ERU also serves an information and nature conservation learning centre. Since the start of the project in 2011, occurrences of wild elephants reaching farmlands have been reduced by over 70% and loss of crops has reduced by more than 90%.



MYANMAR

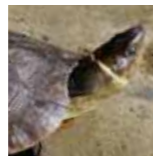
Rescue operation of confiscated big headed turtles



In November 2016, some 800 endangered big-headed turtles were confiscated from a pet trader in Myanmar. The turtles were in extremely poor state of health and the mortality rate was high. Urgent specialist and veterinary care was needed to save them. WRS responded swiftly by sending a veterinarian and a herpetologist to Myanmar to work with Turtle Survival Alliance (TSA) Myanmar and Wildlife Conservation Society (WCS) team in the rescue operation. Thanks to the collaborative efforts and hard work of the teams, about 100 turtles were nursed back to health, for future release back to the wild.

THE PHILIPPINES

Conservation of the Palawan forest turtle through ex-situ and in-situ measures by Katala Foundation Inc



WRS-funded research indicated that the critically endangered Palawan forest turtle loses fertility under human care if environmental conditions are not sufficiently replicated its natural habitat. WRS Director of Conservation and Research, Dr. Sonja Luz made recommendations to improve the Katala Foundation's enclosure design. These changes will hopefully enhance the captive turtles' fertility. WRS also provided funding, specialist assistance on-site with the rehabilitation and release of 3,379 rescued turtles, between June 2015 and December 2016.

Citizen science and conservation education for the Philippine cockatoo and its habitat by Katala Foundation Inc



As part of the project's goal to protect the Philippine cockatoo and its Rasa Island habitat, the Katala Foundation organised educational field excursions for the locals of Narra to Rasa and the Katala Institute (KI). WRS' support provided bird-watching equipment that were essential for the team's outreach efforts.

For more information on our regional projects, please visit: <http://conservation.wrs.com.sg/regional/regional.html>.



Other Projects

The role of modern genomic approaches in combating bird extinctions in Southeast Asia by Frank Rheindt, National University of Singapore



Many Asian songbirds are threatened due to the illegal wildlife trade. To help the population of these birds to recover, knowledge on genetic lineages is important. During the Songbird Crisis Summit held in Jurong Bird Park in 2016, four bird species were identified for urgent protection – the hill myna, oriental white-eye, black-winged myna and Asian pied starling. Besides funding for crucial equipment to carry out genomics studies, WRS also supported the initiative by making available fresh tissue samples from the birds at Jurong Bird Park (JBP). JBP also collaborated with partner institutions such as Bali Bird Park and Cikananga Wildlife Centre on sampling captive birds. Analysis and further studies are ongoing.

Publication support for 'Gajah' by Asian Elephant Specialist Group

Asian elephants are poorly studied compared to their African counterpart due to their cryptic nature, poor visibility in their forest habitat and active avoidance of humans. Thus, there is an urgent need to build scientific capacity in their range countries through publishing data from relevant studies, management experiences and field observations. Funding support from WRS covered all fees for printing and postage of Gajah publications to its subscribers. WRS staff also contributed to Gajah by working with authors on articles and reviewing manuscripts submitted to the peer review section.

IUCN Species Survival Commission Chair's Office; core support by Dr. Simon Stuart, IUCN SSC

WRS funds the SSC Chair's Office and other members of the funding consortium for the SSC Chair's Office. This allows the SSC Chair to remain as a full-time position when greatly enhanced conservation action is needed to combat critical loss of biodiversity.

Combating wildlife trade by TRAFFIC Southeast Asia (TSEA)

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 have been assessed as 'Critically Endangered' by the IUCN Red List of Threatened Species. WRS recognizes that the need to combat wildlife trade in the region is more urgent now ever. Funds provided by WRS were directing to conducting research, monitoring and analysing work on threats with a special focus on otters, Indonesian songbirds, helmeted hornbills, freshwater turtles and tortoises. The funds were also used to attend relevant conferences and meetings, at which TSEA presented on project outputs or recommendations. The TSEA-WRS partnership, and the 'You Buy, They Die' campaign were promoted at every opportunity.

WRS Conservation and Research Officer, Paige Lee and TSEA staff Oi Ching also conducted a joint survey of the sale of elephant and mammoth ivory, nautilus and dugong in Bali in August 2016. The resulting paper was published in the Raffles Bulletin.



Local Field Projects Supported By Wildlife Reserves Conservation Fund (WRSCF)

WRSCF was set up with the clear mission to protect wildlife and its habitats through education and public outreach, the breeding of endangered animals and conducting research and field conservation projects. Each project is selected for funding based on its ability to make pragmatic, substantial and long-lasting contributions to local biodiversity conservation.

Conservation of the Raffles' banded langur in Singapore by Andie Ang



The Raffles' banded langur (leaf monkey) was on the verge of extinction in Singapore in the 1990s, with only about 20 individuals left in the Central Catchment Nature Reserve. Today, its population has approximately doubled but shows low genetic variability. To improve genetic variability, translocation of individuals from genetically compatible populations in Johor, Malaysia may be considered. However, before translocation can be carried out, in-depth research is needed. Fieldwork should provide insights into the feasibility of the translocation and assess risks such as disease introduction

and compatibility of the banded leaf monkeys locally and those in Johor. This project will also form the basis to develop a national conservation action plan to manage and ensure the long-term survival of a critically endangered species in Singapore.

In addition to providing funds through WRSCF, WRS also hosted the Raffles' Banded Langur Conservation Strategy Planning Workshop in August 2016. The workshop, facilitated by IUCN SSC Primate Specialist Group, was well attended by 31 stakeholders, representing 15 organisations including NParks, Department of Wildlife and National Parks Peninsular Malaysia, NGOs and universities. The two-day workshop produced the first Species Action Plan to guide and implement the national conservation strategy for the langur. The strategy was launched on 12 August 2016 with Ambassador-at-Large Professor Tommy Koh as the patron of the initiative.

The Species Action Plan for the Raffles' banded langur detailed immediate priorities which include:

- Habitat enhancement by establishing green corridors and planting food plants based on dietary requirements of the Raffles' banded langur.
- Studies to establish taxonomy, distribution and population size of the langur.
- Establishment of a Raffles' Banded Langur Working Group. The group would be chaired by Dr Andie Ang. WRSCF is funding the implementation of the action plan, including engagement of Dr Ang, in the next two years.

Please visit www.cpsg.org/content/species-action-plan-conservation-raffles-banded-langur-2016 for details of the Species Action Plan.



Photo: James Chua

Conserving The Raffles' Banded Langur – A Perspective From Dr Andie Ang



Photo: James Chua

Every day for nearly 10 years, primatologist Dr Andie Ang wakes up at the crack of dawn to venture into the Central Catchment Nature Reserve in search of the elusive Raffles' banded langur.

Andie is one of the few local researchers who have dedicated their life to wildlife conservation. Funded by the Wildlife Reserves Singapore Conservation Fund (WRSCF), her work involves surveying local forests to record langur population sizes, observing their natural behaviours and

collecting their faeces. Andie explains faeces contain tons of valuable information about the langurs. She has been able to identify at least 60 plants that the langurs eat from studying the faecal samples. Studying the samples has also revealed a surprising find – the langurs are most likely inbreeding.

Due to their small population size, the langurs usually end up mating with related individuals and this may result in birth defects and a shorter lifespan. Andie said, "we have to track the development of infants to see if they survive till adulthood or if there're any deformities... like a missing limb or finger."

Collecting information on the banded langurs was no easy feat. When the project started, not much was known about the species. People thought they were

extinct in Singapore. It took her two months of grueling daily trips to the forest before she finally caught the first sight of the langurs.



Photo: James Chua

Dr Ang also records roadkill. The information is useful to the authority for implementation of preventive measures.



Photo: Andie Ang

There are only about 40 Raffles' banded langurs left in Singapore. These primates will disappear in our lifetime unless we take urgent actions to save them.



Herbivorous fish on urbanised coral reefs in Singapore by Andrew Bauman

Coral reefs worldwide are increasingly degraded because of climate change and pollution. These disturbances have also encouraged the proliferation of macroalgae which compete with corals for space. This study aims to identify and monitor key groups of herbivorous fish that feed on macroalgae. Data will be used in prioritizing herbivorous fish species for urgent conservation to control the excessive growth of macroalgae and maintain the balance to prevent corals from being displaced.

Urban ecology of bats in Singapore by Benjamin P. Y. H. Lee

Land-use change in Singapore has decreased fruit and insectivorous bat species by 60% and 75% respectively. To understand the full impact of urbanisation on bats, this research looks at which bat species persists in urban environments, the effects on major roads and crossings on bat activity and pathogens found in urban bats. The results of this study will be used to recommend better urban planning for biodiversity. This study also aims to build a local community of bat enthusiasts that will assist with building ecological knowledge of local bat species.

Territories and multi-nest structure of colonies of the giant ant in Singapore by Christian Peeters

Giant ant (*Camponotus gigas*) colonies feature one queen ant and thousands of workers and soldiers that live in multiple nests spaced 10 to 20 metres apart. While this ant species has been found to coexist with 500 varied species of ants in Sabah's forests, the *C. gigas* populations in Singapore are relatively few and isolated. This marks them as a species that requires conservation. This study aims to better understand its reproduction biology and to develop a conservation plan for local populations. It is hoped that a colony will eventually be featured in the Singapore Zoo to further the project's outreach efforts.

Automated acoustic monitoring of amphibians by Eva Catharina Madelene Karlsson

Conservation planning depends on having good estimates of species populations. When it comes to amphibians, monitoring amphibian calls are an established way to estimate population size. Automated acoustic monitoring stations can help classify calls according to amphibian species, facilitating long-term studies. The survey stations can also collect data on temperature and humidity on an automated mode and analyse their effects on amphibian calling behaviour and population dynamics. In the process of developing these survey stations, this project will assess the effects of habitat structure on the audibility of calls and the accuracy of population number estimates based on acoustic data.

An ecological and genomic conservation assessment of selected species threatened by the songbird trade in Singapore by Frank Rheindt

This study aims to provide updated data on the ecology and genetic health of selected birds threatened by the songbird trade in Singapore. The species include the straw-headed bulbul, common hill myna, oriental magpie-robin and oriental white-eye. This research will facilitate appropriate future conservation actions and identify pure non-hybridised individuals for breeding and reintroduction programmes.

Wildlife response to recreational trail use in Singapore's forested nature reserves by Marcus A. H. Chua

As Singapore's population numbers are projected to rise, increased recreational use of the Bukit Timah Nature Reserve (BTNR) and Central Catchment Nature Reserve (CCNR) might be a cause for concern. To better understand how local nature reserve visitorship impacts wildlife, the comparative study will determine the response of diurnal mammals and birds when trails are opened and closed. The results will be used to promote visitor etiquette through public outreach efforts.

Biology and movement patterns of bamboo sharks in Singapore by Neil Hutchinson

While bamboo sharks are some of the most commonly observed species by recreational fishers and scuba divers, very little information exists on these endangered fish. The study aims to understand the biology and ecology of the sharks. All information gathered will be used to raise public awareness for bamboo sharks and the effects of fishing pressure and habitat degradation on their dwindling population.

During the reporting year, WRSCF also continued to provide funding for the following projects:

- Saving the Singapore Freshwater Crab from Extinction – Daniel J. J. Ng
- Understanding Local Sunda Pangolins using VHF and GPS Tracking Devices – Helen Catherine Nash
- Population Ecology, Breeding and Conservation of Mangrove Horseshoe Crabs in Singapore – Laura Yap
- Use of Training Dogs for Conservation of Sunda Pangolins – Louise Fletcher
- Spatial Ecology of the Reticulated Python – Mary-Ruth Low
- Wildlife Biodiversity Surveys at Wildlife Reserves Singapore – Paige Lee
- Using Next-Generation-Sequencing for conservation management: Ecology and genetics of the Sunda pangolin – Amrita Srivathsan

For more information on our local projects, please visit: <http://www.wrscf.org.sg/our-projects.html>.

An Extraordinary Journey for Kai and Junior

On 8 August 2016, two male manatees Kai and Junior made a 35-hour journey from Singapore to their new home in Grand Cul-de-sac Marin Nature Reserve, Guadeloupe. Another 13 manatees would eventually join them to form a founding group for a reintroduction programme. Some 100 years ago, the manatees in Guadeloupe were hunted to extinction and the reintroduction programme offers hope for the species to populate the Caribbean waters once again.



Custom-made open-top crates for Kai and Junior. The thick foam prevents injuries during the journey. Throughout the journey, the accompanying vets and aquarist sprayed water on Kai and Junior to keep their skin moist.





Workshops, Conferences And Research

WRS 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, WRS 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.

Specialist workshops and meetings

Besides hosting and participating in specialist workshops, WRS met regularly with working groups that saw cross-agency collaboration and engagement of various stakeholders including National Parks Board (NParks), Agri-food and Veterinary Authority of Singapore (AVA), Lee Kong Chian Natural History Museum (LKCNHM), Nature Society Singapore (NSS), Animal Concerns Research and Education Society (ACRES), universities and relevant specialist groups. These meetings are crucial in providing direction and mapping strategies for conservation action plans.

- Nepal Otter Network meetings
- Asian Species Action Partnership Governing Council meeting
- Helmeted hornbill workshop
- Singapore Pangolin Working Group (SPWG) meetings
- Singapore Freshwater Crab Conservation Working Group meetings
- Singapore Python Working Group meetings

- 13th International Otter Congress of the IUCN-SSC Otter Specialist Group
- WAZA Zoo and Aquarium Accreditation Summit
- 15th International Elephant & Rhino Conservation and Research Symposium
- Singapore Alliance for Sustainable Palm Oil – Leaders' Summit
- Songbird Crisis Summit

Research projects

WRS staff took the lead or facilitated a total of 72 research projects involving subject specialists and students. 32 projects were completed at the time of report. These projects are:

- Investigation of nematode larval presence in exhibits and back-of-the-house yard of douc langur, cheetah, Asiatic lion, markhor and giraffe
- Effects of seasonal changes, in a climate-control exhibit on the oestrus cycle of a captive giant panda at River Safari

- Semen analysis, semen cryopreservation and DNA fragmentation study of the proboscis monkey (*Nasalis larvatus*)
- The missing ecosystem - sources, function and ecology of microbes in urban air: indoor air microbiome of Jurong Bird Park
- Freshwater crabs (*Johora singaporensis*) in Singapore: Comparing the microbiome diversity of water from the captive breeding facility at Wildlife Reserves Singapore and natural stream habitats
- Nasalisation by *Nasalis*: long nose characterises long call acoustics in proboscis monkeys
- The role of spatial memory in the foraging behaviour of captive Sunda pangolins (*Manis javanica*)
- Phasing of captive Asian elephant management from free to protected contact: monitoring changes in social group dynamics and animal-keeper conflict
- Positive reinforcement training and memory retention in the African dwarf crocodile (*Osteolaemus tetraspis*)

- Investigating the impact of a change in management schedule on the display of stereotypic behaviour by a captive polar bear
- Does personality have an impact on the problem-solving abilities of chimpanzees (*Pan troglodytes*) at Singapore Zoo?
- Effects of visitor presence and noise levels on the behaviour of a captive red panda (*Ailurus fulgens*) at River Safari
- Testing of Veterinary Samples (specifically for primates on the presence of the Malaria pathogen)
- Morphologic and molecular study of hemoparasites in wild birds in Singapore
- The survey of prevalence of blood parasites in greater flamingo and lesser flamingo in Jurong Bird Park
- Distribution and autecology of the introduced Gunther's frog (*Hylarana guentheri*) in Singapore
- Java's trade-driven extinctions: Conservation genomic tools to rescue the black-winged myna (*Acridotheres melanopterus*)

- Nuclear and mitochondrial data reveal a distinct and endangered hill myna complex in the Barusan Islands of Indonesia
- Phylogenetic affinity of the oriental white-eye (*Zosterops palpebrosus*) and its status in Singapore
- Evaluation of diet on kidney stone formation in Asian small-clawed otter
- Meta-analysis of nutrient requirements for avian growth
- Managing human-macaque conflict: investigating waste management systems in Singapore Zoo
- Nutrient intake of lory and lorikeet species in Jurong Bird Park
- The prevalence and causes of chronic diarrhoea among callitrichid species in Wildlife Reserves Singapore
- Research on the improvement of feeding techniques and diet of (*Polyodon spathula*) to induce growth
- Project report on the research of (*Himantura chaophraya*) growth and development in relation to its diet

- Colobine monkey nutrition: moving towards a naturalistic diet and its implications on the gut microbiome, health and behaviour
- Genetic analysis of Sunda pangolin (*Manis javanica*) using Restriction Site Associated DNA markers sequencing (RADseq)
- Microscopy investigation of polar bear's fur
- Population assessment and genetic investigation for conservation of the vulnerable smooth-coated otter (*Lutrogale perspicillata maxwelli*) endemic to Mesopotamia
- Semen analysis, semen cryopreservation and DNA fragmentation study of the Proboscis Monkey (*Nasalis larvatus*)
- Zoo Soil Surveillance – Environmental surveillance for *Burkholderia pseudomallei* and *Burkholderia multivorans* in Singapore Zoo



Together For Wildlife

“Together We Can Do Great Things” – these words of wisdom from Mother Theresa certainly resonate with WRS as it embarks on a journey to empower the community, the volunteers and park guests to act for wildlife through collective efforts. Major initiatives undertaken to deepen community engagement included ‘I Love Pangolins’, Sharity Day 2016, Vote For Wildlife and Corporate Wildlife Buddy programme.

Volunteer For Wildlife

During the year, a total of 2,810 volunteers devoted 54,278 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. It is heartening to note that volunteer hours have climbed 22% compared to the previous year and the volunteer community has expanded in representation from permanent residents, signalling deepened community involvement in wildlife conservation.

FY16/17

Volunteer Programmes	No. of volunteers	No. of volunteer hours
Docents	188	4922
Conservation Ambassadors	343	9604
Wildlife Buddies Training	1290	7740
Work Experience Programme	109	8720
Teachers Work Attachment Programme	1	400
Conservation & Research Volunteers	2	320
Education Volunteers	3	480
Avian/Zoology Keeper Volunteers	47	7520
Vet Volunteers	52	4160
WRS Events/ Projects	775	10412
Total	2,810	54,278

‘I Love Pangolins’ – Conservation Outreach By Kinderland & WRS

The Sunda pangolin is one of the last few mammalian species in Singapore. An important part of our nature heritage, this scaly creature is relatively unknown to Singaporeans. It is highly threatened by destruction of its forest habitat due to rapid urbanisation. Displaced pangolins are often victims of road accidents.

‘I Love Pangolins’ was the first collaborative effort between Kinderland and WRS to promote community involvement in conserving native wildlife. Some 500 Kinderland pre-schoolers and their teachers attended training sessions by WRS to learn about pangolins and enjoyed the rare opportunity to meet Pangolina and her keeper. Back in their centres, they put together their creative minds and hands to create a dazzling variety of handicraft, which were sold at a fund-raising carnival held at Singapore Zoo on 27 August 2016. The carnival was graced by Mr Tan Chuan Jin, Minister for Social and Family Development.

Apart from getting to know more about the pangolins, the pre-



Left: Kinderland students met Pangolina during the training session. This pangolin was nursed back to health by WRS after sustaining injuries from a road accident.

Below: Mr Tan Chuan Jin, Minister for Social and Family Development interacting with a Kinderland student at ‘I Love Pangolins’ fund raising carnival held in Singapore Zoo on 27 August 2016.



schoolers gained tremendous social experience by taking on the responsibility of ‘little ambassadors’ to man the stalls at the carnival and share the plight of pangolins with members of the public. This project was community involvement at its best – pre-schoolers and their principals, teachers, parents, siblings and grandparents came together to celebrate local wildlife while enjoying family bonding time.



A keeper volunteer feeding the cotton-top tamarins and engaging Zoo guests at the same time.



Kinderland students present a cheque to Mr Mike Barclay, Group CEO, Mandai Park Holdings (far right). The fund raised will be used for conservation of the Sunda pangolin, a threatened local species.



Sharity Day 2016 at River Safari was graced by Guest-of-Honour, Mr Ng Chee Meng, Acting Minister for Education (Schools) and Senior Minister of State, Ministry of Transport (2nd row, fifth from the right).

Sharity Day 2016

On 30 September, WRS hosted 840 children at River Safari for the first time in celebration of Sharity Day. It was a day of great fun as Sharity Elephant and Friends entertained the young crowd with a skit and songs to celebrate diversity in the community and promote wildlife conservation. Corporate volunteers and children from mainstream schools acted as buddies for children with special needs. Together, they enjoyed

meaningful interactions while learning about diversity in the natural world and the animals in River Safari.

Corporate Wildlife Buddies

Many companies want to involve their staff in community work and fulfil their corporate social responsibility by hosting visits for the disadvantaged, persons with special needs and the elderly at WRS parks. To ensure that the staff are well-equipped to facilitate meaningful and

memorable visits, WRS launched the Corporate Wildlife Buddy programme. Familiarisation tours around the parks are provided for the Corporate Wildlife Buddies and training is offered to help them plan simple yet engaging activities for their beneficiaries. This programme has received very encouraging feedback from the participants. For WRS, it is yet another avenue to promote the appreciation of the natural world to the community.



Empowering Zoo guests to take action for wildlife conservation by voting for one of the projects supported by WRS.

Vote For Wildlife

To communicate WRS' involvement in wildlife conservation and enhance guest engagement through interactivity, Vote For Wildlife was rolled out. Guests are invited to cast their votes for their favourite wildlife projects as a show of support.



Wildlife Rescue

Besides taking care of the living collection and participating actively in global efforts to protect biodiversity, WRS is also deeply involved in wildlife rescue, rehabilitation and release work. During the reporting year, it received a total of 1,977 rescued animals, largely from the illegal pet and bushmeat trade. A mega confiscation by AVA saw over 200 black pond turtles being donating to WRS. As the number is massive, WRS is looking to rehome some of these turtles in other zoological institutions.

Exotic species were absorbed into WRS' collection, where appropriate, and the rest were rehomed or in the process of being rehomed. It is saddening to know that despite the best possible veterinary care given to the rescued animals, close to 40% of all the confiscated wildlife had to be euthanized because of their appalling state of health, which had resulted from the ordeal. To smuggle wildlife across borders, traders stuffed them in plastic tubes and travelling bags, taped them to prevent movements and detection, and deprived them of water and food. WRS has strengthened its conservation communication platforms through education outreach with strong messaging and the campaign 'You Buy, They Die' to empower the public to help fight the illegal wildlife trade by reporting known cases and not buying or consuming wildlife.



HAND-RAISING SANDSHREW, THE BABY PANGOLIN

On 16th January 2017, a male baby Sunda pangolin was rescued from a construction site along Lentor Avenue and brought to WRS. As he was only one and half months old, he cannot fend for himself in the wild. A decision was made to hand raise him and release him back into the wild when appropriate. Named Sandshrew eventually, he was solely bottle-fed on milk for a few weeks before being introduced to ant eggs. By May 2017, he weighed 1.5kg and would be conditioned and tagged for release.



TOBY'S RESCUE – A HEART-WARMING STORY OF COMMUNITY EFFORTS

On 9 May 2016, a six week-old smooth-coated otter pup almost drowned after it fell into a canal near Fort Road. Mr Patrick Ng, a member of the public, dived in to fish it out of the waters. After a long wait, the pup's family did not return for it and the otter watchers decided to send it to WRS. Dr Serena Oh, Assistant Director, Veterinary dewormed the pup and gave it a Vitamin B injection. Named Toby by the staff, the pup was bottle-fed regularly. After ten days of loving tender care by Dr Serena, Toby was strong enough to be released back into the wild. Attracted by Toby's calls, his family joined him - it was a happy reunion, made possible by collective community efforts.



A NEW HOME FOR ILLEGAL PET

Kept as an illegal pet, this young female white-handed gibbon was confiscated and brought to Singapore Zoo. She was absorbed into Singapore Zoo's collection.



JOURNEY TO SUSTAINABILITY

Strengthening the sustainability growth pillar, WRS took a huge step forward to walk the talk and launched new initiatives to embrace sustainable best practices. At the same time, the team sharpened WRS' competitive edge to ensure financial sustainability through innovative product offerings, unique wildlife experiences with compelling storylines and strategic marketing and sales efforts.

Environmental Sustainability

The year saw the establishment of a sustainability framework to drive sustainable best practices in a holistic and structured manner, with a focus on sustainable sourcing and social engagement.

Sustainable Sourcing

The switch to sustainable seafood, and to using certified segregated sustainable oil for cooking in all F&B outlets was a milestone for WRS in its sustainability efforts. WRS also affirmed its commitment by being a founding member of the Singapore Alliance for Sustainable Palm Oil (SASPO), which is a group of companies that work together to encourage more companies to use sustainably-produced palm oil.

Social Engagement

A key focus in WRS' sustainability framework is to continually educate and inspire the community to embrace a sustainable lifestyle. A sustainability communication platform 'Go Green for Wildlife' was launched to reach out to park guests and netizens.

'Go Green for Wildlife' was unveiled with the inaugural annual October Sustainability Campaign, which was digital-led to integrate online communication and in-park programming.

The key message of the Sustainability Campaign was that we need to focus on making the Earth a safe playground for babies of all life forms – humans and animals included. The campaign weaved sustainability and wildlife conservation into one story, and empowered the community to vote online and channel funds to their favourite conservation project. Downloadable eco games encouraged children and their family to live sustainably and protect wildlife by taking small and simple actions. The campaign microsite garnered over 100,000 visits and more than 20,000 votes were cast for the three conservation projects featured. The campaign was also supported by a promotion to invite children to visit WRS parks for free, and robust in-park programming with Unusual Babies Booth, Furry Zoo Babies Encounter and Baby Animal Trail. The overwhelming response helped to push local attendance up by 64%, enabling WRS to reach out to the community in greater breadth and depth.

Reduce Bottled Water Consumption

Single-use plastic waste, created to a large extent by the consumption of bottled water, is a serious threat to the environment and wildlife. In November 2016, WRS launched an initiative to encourage park guests to reduce the consumption of bottled water by using refillable

water bottles. To ensure effective call to action, 13 customised ultrafiltration water dispensers were installed, through the generous support by Hyflux, at strategic locations in Singapore Zoo and River Safari to provide water points for guests. The water dispensers also feature messaging on the harmful effects of plastic waste to motivate park guests to reduce plastic waste through simple actions.

Adding to guest convenience, refillable water bottles, co-branded by WRS and Hyflux, are available for purchase at retail shops, F&B outlets and vending machines. A few months after the launch of the campaign, the consumption of bottled water showed a decline of 20%, exceeding the target by 10%.



Water dispensers with strong messaging to encourage guests to use refillable water bottles and reduce plastic waste.



Above and below: Winners of the Creative Trash Recycling Competition at the prize-giving ceremony. This competition reached out to many pre-schoolers, their teachers and parents, and encouraged them to embrace sustainable living.

Creative Trash Recycling Competition

To engage young children and empower them to do their part for the environment, Creative Trash Recycling Competition was organised. The response was overwhelming with close to one hundred entries submitted by pre-schoolers from over 40 schools. The prize-giving ceremony was held as part of the media event for the Reduce Bottled Water Consumption Campaign.



Trash Busters Go To Schools

A new Zoo Goes To School programme 'Trash Busters' was developed to strengthen the sustainability messaging. Ranger Splash visits schools and 'take' the children on an adventure to learn about the harmful effects of plastic waste and what they can do to make a positive difference. This programme was extended to pre-schools on a complimentary basis in October as part of the sustainability campaign.



Trash Busters, a new Zoo Goes To School programme, was launched to motivate children to reduce plastic waste as action for wildlife.



Financial Sustainability

Guest attendance for WRS parks totaled 4.59million, a 1.7% decline compared to the record of 4.67million in the previous year. The dip is considered modest against the backdrop of a challenging global economic landscape, demonetization in India and the Zika virus scare at home. Doubling its efforts to attract repeat visits, grow existing markets and penetrate new segments through innovative marketing and sales initiatives have helped WRS arrest what would have been a steeper decline.

Reeling In The Crowd

Throughout the year, different admission promotions, often with strategic partners, were rolled out to ensure that WRS parks remain affordable to local residents. Bundle pricing with innovative programming provided a compelling reason for multi-park visits by locals and tourists alike. Strong partnership with tour agents, visibility of the WRS brand in overseas trade missions and extensive media coverage helped to keep guests coming to the parks.

Working with The Sunday Times, a promotion was launched to offer a free adult/child admission ticket for every paid adult ticket for WRS parks. It enjoyed overwhelming response with some 18,000 redemptions over a three-month period.

Taking another step to encourage local residents to visit Night Safari, an off-peak promotion offering 50% discount on Night Safari admission after 9.15pm was launched during the June

school holidays. The encouraging response prompted a similar promotion (30% off admission) in partnership with NTUC, in September and October. In March 2017, the promotion (50% off admission) was made even more attractive with earlier admission after 8.15pm and a 20% off ala-carte food items and Asian buffet.

The Sales Team continued to expand the top five tourist markets in India, China, Japan, Korea and Australia through trade partner engagement and sale missions. Working with tour operators, WRS created packages that offer unique wildlife, culinary and retail experiences as a holistic approach to cater to the increasingly sophisticated consumers. Curry Garden, which replaced Bongo Burger at Jurong Bird Park in February 2017, offers a much welcome 'taste of home' for the Indian tourists. A memorandum of understanding inked with Hanatour was a great step forward for WRS to gain even stronger foothold in the Korea tourist market. Aggressive sales efforts were also poured in growing Southeast Asian markets including Vietnam, the Philippines and Indonesia. Corporate Communications supported with media junkets, hosting key media representatives from these countries.

Engaging media stories and strong media relations helped WRS garnered yet another year of extensive coverage both local and overseas. Apart from publicity and top-of-the-mind awareness, many of the stories were built on the narratives of WRS' world-class animal care and conservation efforts in the region so as to inspire people to care and act for

wildlife. Among the stories that captured extremely keen media attention were baby elephant Neha, manatee reintroduction programme in Guadeloupe, mating season of giant pandas Kai Kai and Jia Jia, and proboscis monkey, Cyrano as the 6000th species featured in National Geographic's Photo Ark.

Park Icons Unveiled

As part of the programming for the June and December school holidays, Canola, Chawang and Sunny were unveiled as icons for River Safari, Night Safari and Jurong Bird Park respectively. These icons, together with Zoo icon Ah Meng, enable WRS parks to leverage on their power as wildlife ambassadors to create emotional connection between people and animals. Among the slew of in-park programmes organized to support the unveiling of the icons, Manatee Madness at River Safari was most popular and oversubscribed. Participants enjoyed a close up and personal encounter with Canola and her friends behind-the-scenes. They also had the opportunity to witness River Safari aquarists conditioning the manatees for health checks.



Celebrating 45 Years of Living Colours

JBP celebrated her 45th anniversary with a myriad of activities during the June school holidays, starting with 'Home Tweet Home' – an event that involved WRS volunteers and Bird Park guests to paint 45 nest boxes, which were subsequently sent to Begawan and Cikananga Foundations, Indonesia for breeding the critically endangered black-winged starlings and Bali myna.

Guests were also treated to a special edition of the High Flyers Show featuring Big John, the cockatoo which is a pioneer of the Park's bird shows. The Birthday Baby Trail invited guests to embark on a journey to discover Year 2016 avian chicks, and to visit the Breeding and Research Centre where they can witness the life cycle of birds and watch 'bird nannies' hard at work to provide the babies with tender loving care.



WRS volunteers painting nest boxes, which were subsequently used for breeding the threatened black-winged starlings and Bali myna.





OUR PEOPLE

To deepen staff engagement and manage talent, WRS embarked on a journey to become a choice employer. Among the many initiatives, HR Division was restructured to drive strategic changes and an employee engagement survey carried out to help align HR best practices with employees' career aspiration.



Caring and Growing

Training programmes to sharpen generalist and specialist skills were offered to facilitate the desired outcomes for staff with different job functions. Life Sciences team continued to gain knowledge and learn best practices through in-park specialist training and overseas attachment. All these efforts have resulted in 73% of WRS staff fulfilling at least 16 training hours in the reporting year.

For the first time, team building sessions were organised for the entire company to foster stronger bonds and camaraderie. The sessions also served effectively as a platform to cascade WRS' refreshed vision, mission and values to staff for better alignment.

An employee engagement survey was rolled out and garnered excellent response rate of 90%. The result reviewed an engagement score of 69% which is 10% above country norm. Structured follow-up sessions with individual departments to address employees' pain points will feature the next phase of employee engagement.

Talent Management

A talent management framework was developed to identify and develop high potentials in the organisation for succession planning and to facilitate

deepening of domain knowledge and specialist skill sets.

Embarking on the next level of leadership development, a set of leadership competencies unique to WRS was derived. This serves as a framework for leadership standards, and a guide for identifying and developing high performing individuals to progress to leadership positions.

Staff benefits were reviewed, with various medical and dental benefits enhanced to ensure comprehensive coverage. Re-employment of staff up to 67 years old was adopted 6 months ahead of legislature timeline.

A Safe and Healthy Workplace

Committed to providing a safe and healthy workplace for the staff, WRS reviewed the safety standards for various processes and infrastructure. The efforts resulted in the attainment of BizSAFE Level Star certification by Workplace Safety & Health Council (WSHC).

To encourage staff to take ownership of their own safety and health, a '100-Day Incident-Free' campaign was launched. At 31 March 2017, the campaign contributed to 35% reduction in workplace injury compared to the year ago.

Redesigning HR Structure

The Human Resource Division was restructured to provide dedicated focus on internal customers, grow capabilities, and attract and retain talent. The HR Business Partners Unit was reorganised to strengthen direct support to the respective departments. The Learning and Development team was augmented to anchor talent management, leadership development, succession planning and organisational development. To drive the service culture across the whole organisation, the Guest Experience Department was moved from the Park Operations & Revenue division to the Human Resources Division.

45 YEARS OF DEDICATED SERVICE

ALAGAPPASAMY, affectionately known as Sam, joined Singapore Zoo even before its official opening in June 1973. He was assigned to look after orangutans and that ignited his lifelong passion for these creatures. When the late Ah Meng was donated to Singapore Zoo, he became her favourite keeper. Over the years, Sam has amassed deep knowledge of caring for orangutans. He has contributed significantly to building Singapore Zoo's renowned reputation in breeding orangutans, and being the first in the world to provide free-ranging habitats for the apes. Today, Sam provides specialist guidance to his team of orangutan keepers. He continues to share his knowledge to help develop enrichment programmes for the physical and mental well-being of the apes, which he regards as part of his family.

MAIDIN leads a team to ensure that water filters and pumps in WRS parks are functioning well to provide clean water for the living collection and everyone in the parks. He is a dedicated leader who goes the extra mile in his work and is ever ready to guide and develop his team in their skills.



ALAGAPPASAMY CHELLAIYAH, Zoologist Specialist



MAIDIN, Supervisor, Water Control



Chow Hon Yien,
Junior Animal Care Officer



Jose Pedro,
Deputy Head Keeper



Kim Sim,
Education Executive



Teo Yiang Eng,
F&B Service Crew



Prakash Naidu,
Senior Keeper



Jayce Chua,
Assistant Curator



Nür Amalina,
Tram Captain



Chandramohan Ramalingam,
Supervisor, Animal Presentation



Nicole Tan,
Senior Guest Relations Officer



Josephine Kawi,
Endocrine Analyst



Vanessa Lee,
Animal Care Officer



Anil Bisht,
Quarantine Management Officer



Jasmine Ng,
Retail Associate

THE YEAR AHEAD

The road ahead is challenging as it is exciting. As development work for the new Mandai precinct gains momentum, disruptions are inevitable and the team has to provide creative solutions to mitigate impact on guest experiences and the living collection in the existing parks. Meanwhile, WRS continues to strengthen its strategic pillars to do well and do good. To gain the competitive edge, the team constantly explores novel guest experiences and digital platforms to attract non-traditional market segments while staying on the path to be a world-leading zoological institution that inspires people to value and conserve biodiversity. The parks continue to play their role as living classrooms for all to get close to Nature and learn to respect and care for her while the team creates something even more wondrous at the new Mandai precinct.

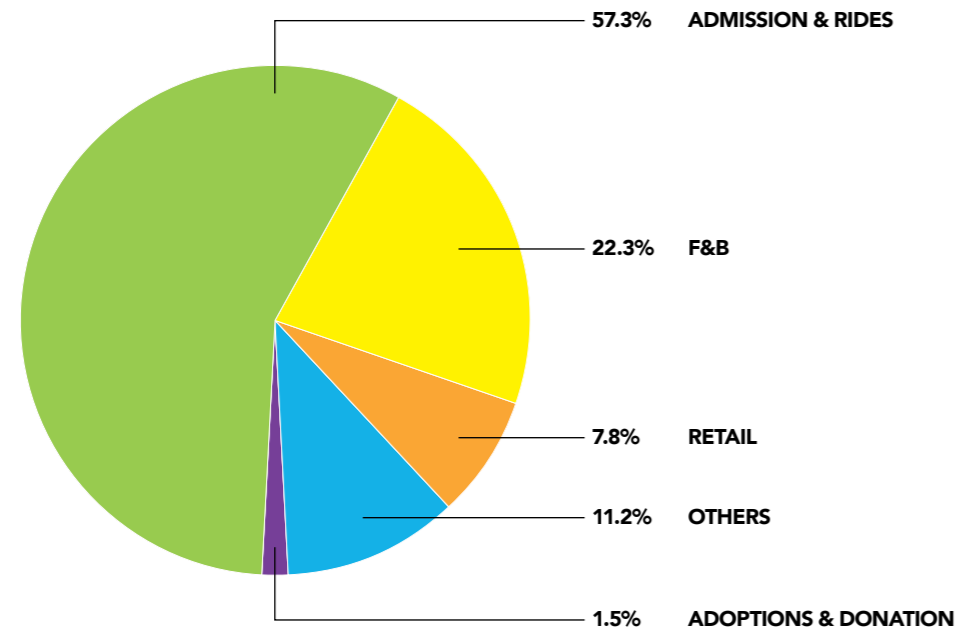


Like this chrysalis, which will transform into a striking black and white tree nymph butterfly, the transformation of Mandai holds the promise of something beautiful and wondrous for all to enjoy.

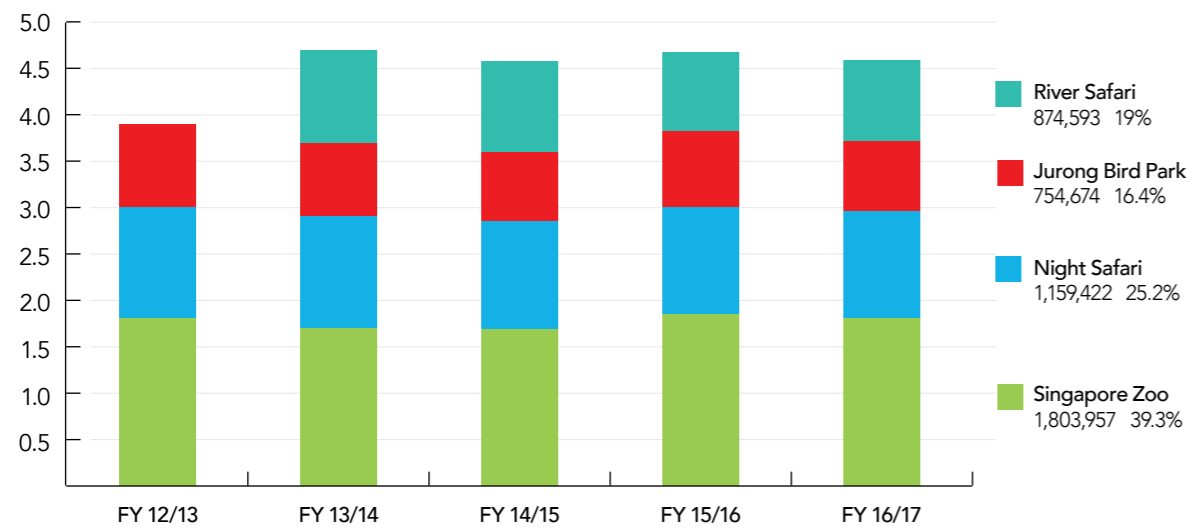


FINANCIAL HIGHLIGHTS FY16/17

TOTAL REVENUE FY 15/16 \$154,041,027



TOTAL VISITORS 4,592,646





ADOPTERS & SPONSORS

Wildlife Reserves Singapore (WRS) would like to thank adopters and sponsors for their staunch support. With their encouragement, WRS is able to strengthen wildlife conservation efforts and protect biodiversity in Singapore and the region.

JURONG BIRD PARK

Borden Company Pte Ltd	American Bald Eagle, Sue Allen & Eagle Statue
Goodwood Park Hotel Limited	Brahminy Kite, Ronnie II
Hong Leong Foundation	Flamingoes from the High Flyers Show
Lady Yuen Peng McNiece	Bali Mynah
Lee Foundation Singapore	Penguin Coast
M1 Limited	Malayan Fish Owl, Tupa
M1 Limited	Great-Pied Hornbill
Ms Isabella Loh	A Pair of American Toucans, Mr & Mrs Axel
Ms Isabella Loh	Barn Owl, Aedric
Protek Chemicals & Engineering Pte Ltd	White-collared Kingfisher
RMZ Oilfield Engineering Pte Ltd	Toco Tocan
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

RIVER SAFARI

CapitaLand Limited	Presenting Sponsor & Conservation Donor of Kai Kai & Jia Jia
JTB Pte Ltd	Red Panda
M1 Limited	Jewel Tank
Mitsui & Co. (Asia Pacific) Pte Ltd	Mekong Giant Catfish
Singapore Airlines Ltd	Official Airline of the Giant Panda Programme
SPH Foundation Ltd	Amazon Flooded Forest
The Shaw Foundation Pte	Manatee Feeding Program

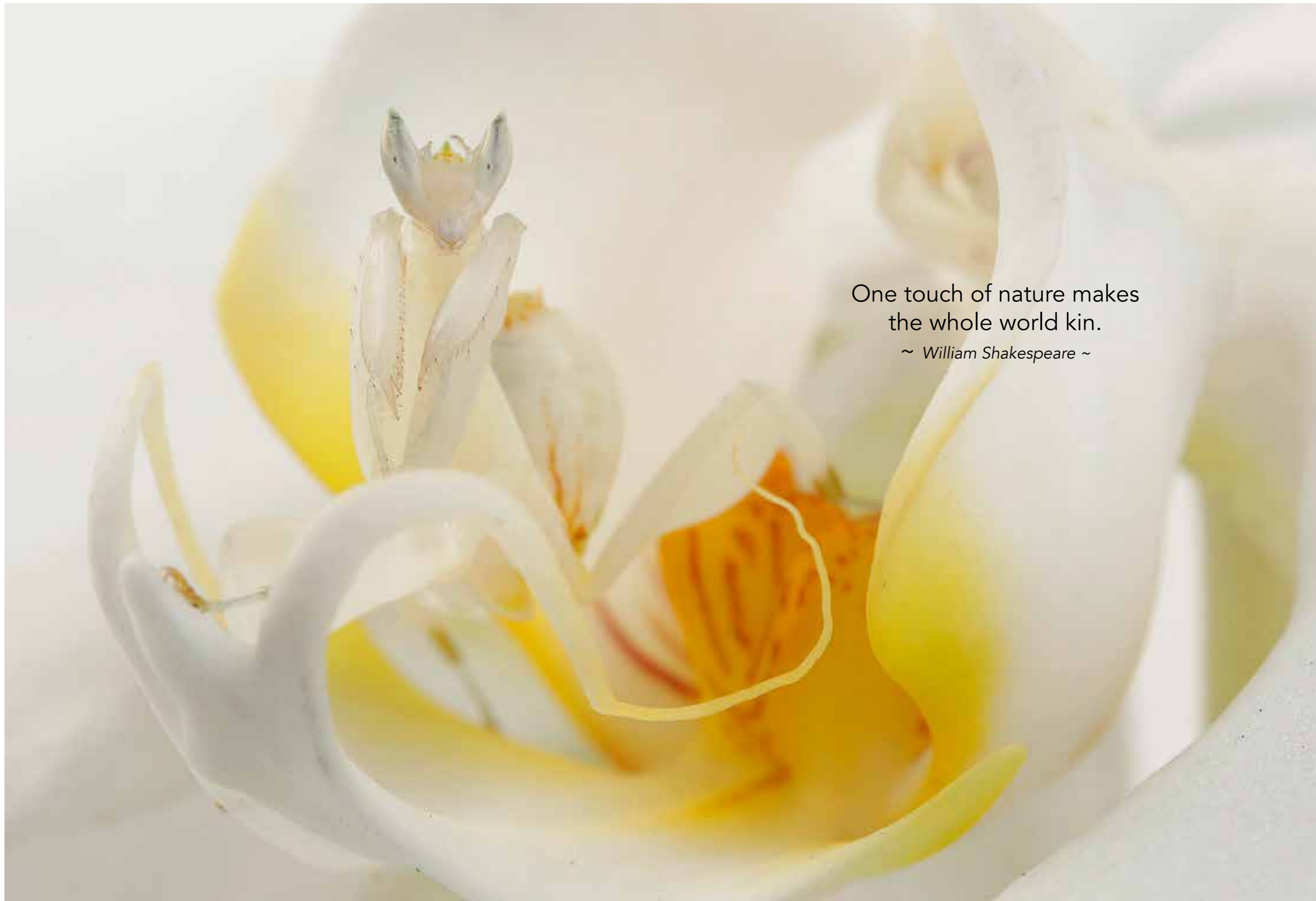
NIGHT SAFARI

Chemical Industries (Far East) Ltd	Malayan Tiger Viewing Shelter
Goodwood Park Hotel Limited	Fishing Cat Trail
Haw Par Healthcare Limited	Malayan Tiger
JTB Pte Ltd	Lion
JTB Pte Ltd	Sambar Deer & Elephant
JTB Pte Ltd	Baby Elephant, Neha
Khoo Teck Puat Foundation	Fishing Cat Trail
Kinderland Educare Services Pte Ltd	Pangolin
M1 Limited	Giraffe
Mitsui & Co. (Asia Pacific) Pte Ltd	African White Lion
Mr & Mrs Lim Soo Peng	The Greater Flamingo
Mr Martin Storey	Babirusa
Singapore Refining Company Pte Ltd	Marsh Bird
Singtel Mobile Singapore Pte Ltd	Ankole
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

SINGAPORE ZOO

Abbott Laboratories (S) Pte Ltd	Giraffe, Growie & Jubilee
Australia And New Zealand Banking Group Limited	Australasia
Cheng Kim Loke Foundation	Malayan Tapir
Dimension Data Asia Pacific Pte Ltd	White Rhinoceros
Haw Par Corporation Ltd	Leopard
Henkel Singapore Pte Ltd	Chimpanzee, Gangga
Hong Leong Foundation	Fragile Forest
Industrial And Commercial Bank Of China Limited	Cotton-Top Tamarin
Ingredion Singapore Pte Ltd	Orang Utan, Putra
Kentucky Fried Chicken Management Pte Ltd	Zebra
Lee Foundation Singapore	Orang Utan, Chomel
Lee Foundation Singapore	Tropical Crops
M1 Limited	Amhara Stone Village
M1 Limited	Orang Utan, Endah
Mitsui & Co. (Asia Pacific) Pte Ltd	Elephants at Work & Play Show
Mrs Christina Ong	Orang Utans, Binte & Saloma
Ms Kay Kuok	Asian Elephant, Aprila
Ms Nicola Barrett	Memorial Bench
Protek Chemicals & Engineering Pte Ltd	Chimpanzee, Susie
Sesami (Singapore) Pte Ltd	Chimpanzee, Jengo
Singapore Petroleum Company Ltd	Lion
SPH Foundation Ltd	Polar Bear, Inuka
SPH Foundation Ltd	Proboscis Monkey Exhibit at SPH Conservation Centre
Starhub Mobile Pte Ltd	Orang Utan, Natu
Starhub Mobile Pte Ltd	Red Langur
State Bank Of India (Singapore)	Asian Elephant, Gambir
Thai Airways International Public Co. Ltd	Asian Elephant, Intan
The Little Skool-House International Pte Ltd	Chimpanzee, Ida
The Norinchukin Bank, Singapore Branch	Hamadryas Landscape
The Shaw Foundation Pte	The Shaw Foundation Amphitheatre
The Society of Remisiers (Singapore)	Babirusa
Union Energy Corporation Pte Ltd	Orang Utan, Joko
Wuthelam Holdings Pte Ltd	Rabbit





One touch of nature makes
the whole world kin.

~ *William Shakespeare* ~

WILDLIFE RESERVES SINGAPORE
YEARBOOK 2016-17

Wildlife Reserves Singapore Group



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