REGIONAL SUNDA PANGOLIN *(Manis javanica)* CONSERVATION STRATEGY 2018-2028

IUCN SSC PANGOLIN SPECIALIST GROUP
IUCN SSC ASIAN SPECIES ACTION PARTNERSHIP
WILDLIFE RESERVES SINGAPORE
IUCN SSC CONSERVATION PLANNING SPECIALIST GROUP

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Review process:
Sunda pangolin range state government representatives participated in the workshop in which this strategy was developed. Following compilation of the strategy all workshop participants had the opportunity to review it to ensure it accurately reflects the objectives and actions agreed upon that are needed to conserve the Sunda pangolin in the period 2018-2028.

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◀ **Sunda pangolin in leaf litter. © Laura Benedict.**

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The Species Survival Commission (SSC) is the largest of IUCN's six volunteer commissions with a global membership of 6,000 experts. SSC advises IUCN and its members on the wide range of technical and scientific aspects of species conservation and is dedicated to securing a future for biodiversity. SSC has significant input into the international agreements dealing with biodiversity conservation. www.iucn.org/themes/ssc

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Contents

Acronyms and Abbreviations

ASAP	Asian Species Action Partnership
EIA	Environmental Investigation Agency
CITES	Convention on International Trade in Endangered Species of Wild Fauna and Flora
CPSG	Conservation Planning Specialist Group
ENV	Education for Nature Vietnam
FFI	Fauna and Flora International
IUCN	International Union for Conservation of Nature
IUCN CEESP/SSC SULi	Commission on Environment, Economic and Social Policy/Species Survival Commission Sustainable Use and Livelihoods Specialist Group
LIPI	Indonesian Institute of Sciences
NGO	Non-governmental Organisation
Pangolin SG	IUCN SSC Pangolin Specialist Group
RST	Review of Significant Trade process
SSC	Species Survival Commission
sWEFCOM	south-eastern Western Forest Complex
TCM	Traditional Chinese Medicine
TVM	Traditional Vietnamese Medicine
WCS	Wildlife Conservation Society
WRS	Wildlife Reserves Singapore
WRSCF	Wildlife Reserves Singapore Conservation Fund
WWF	World Wildlife Fund
USAID	United States Agency for International Development
ZSL	Zoological Society of London

Foreword

Jon Paul Rodríguez,
Chair, IUCN Species Survival Commission

During the 17th Conference of the Parties of the Convention on International Trade in Endangered Species of Wild Fauna and Flora (CITES) (Johannesburg, 2016) pangolins were the flavour of the month. There were people in pangolin costumes walking around, pangolin lapel pins and stickers given out, remote-controlled pangolins scurrying among the delegates, stuffed baby pangolins to take back home to one's children. It was impossible not to become aware of the urgent conservation need of the eight species of pangolin. The effort paid off, when CoP17 decided to transfer all pangolins from Appendix II to Appendix I, establishing a total ban on international trade in wild caught pangolins for commercial purposes. The decision fills an important gap, launching much-needed, and practically non-existent, global conservation attention on this highly threatened animal group.

The Sunda pangolin is listed as Critically Endangered, primarily due to overexploitation for its meat and scales. Placing a species on *The IUCN Red List of Threatened Species* is the first step of what the IUCN Species Survival Commission recognizes as the assess-plan-act continuum. Once extinction risk has been determined, threats and conservation actions are established, and a species account is published on-line, we then move to the second stage of planning the necessary steps to address the drivers of population decline and reverse the trend. The workshop to develop a regional conservation strategy for the Sunda pangolin achieved two major objectives: it compiled new data to update the Red List assessment of the species (assess), and set the stage for national action plans that will guide implementation (plan). The key outcome of such plans is a prioritized set of activities, their anticipated costs and benefits, that can then be submitted for consideration by potential donors (e.g. governments, bi- and multi-lateral organisations, and foundations) to trigger implementation (act). During 2017-2020, supporting the capacity of specialist groups to perform Red List assessments, substantially expanding conservation planning efforts, and catalysing conservation action are top priorities for the SSC.

The distinctive feature of this Regional Conservation Strategy for the Sunda pangolin is the collaboration among three SSC groups – the Pangolin Specialist Group, Conservation Planning Specialist Group, and Asian Species Action Partnership – and one SSC partner, Wildlife Reserves Singapore. We envision that this type of inclusive, participatory model will become the standard in SSC's *assess-plan-act* approach. It is the best way to bring together all the relevant stakeholders, for it is cost effective, as it avoids the need to convene successive sessions to address the details that a complex process such as a conservation strategy requires. I congratulate everyone involved for their hard work and creativity, and look forward to seeing all the priorities achieved in the future. Saving pangolins from extinction is our ultimate goal.

Executive summary

The Sunda pangolin *Manis javanica* is one of eight extant species of pangolin (Pholidota: Manidae) and is native to mainland and western island Southeast Asia.

Characteristic of pangolins, the species is covered in hard, overlapping scales comprised of keratin. It occupies a variety of habitats from primary and secondary tropical forest to artificial landscapes and cultivated areas, though its ability to persist (and breed) in artificial habitats requires further research. It is solitary and principally nocturnal. Being semi-arboreal, it is an adept climber and has impressive core strength, making use of its prehensile tail when climbing and foraging for prey in trees. Being myrmecophagous, it predates almost exclusively on ants and termites.

Listed as Critically Endangered on *The IUCN Red List of Threatened Species™* on the basis of past, ongoing and future population reductions, the Sunda pangolin is primarily, and directly, threatened by overexploitation for international use. This involves the trafficking of high numbers of live and dead individuals and parts and derivatives, in particular meat and scales. Local use also appears to pose a threat. Over the past two decades, it has been the species of pangolin most frequently seized in illegal trade, and much of the trafficking by volume is destined for China and Vietnam. The meat is eaten as a luxury dish in high-end urban restaurants in both countries and the scales are used as an ingredient in Traditional Chinese Medicine (TCM) and Traditional Vietnamese Medicine (TVM) to purportedly treat a variety of ailments. Indirect threats include habitat loss and degradation, which open up previously inaccessible areas to poaching, and inadequate conservation action. All of these threats are negatively affecting the viability of wild Sunda pangolin populations.

Pangolins have received little conservation attention historically but this has changed in the last five years. The large scale trafficking of the species has afforded them greater attention, profile and funding. However, to ensure that limited conservation funding is used most wisely on Sunda pangolin conservation, it is important that strategies are developed that articulate what the most urgent actions are, when and where they need to be implemented, and by which stakeholders. While there have been a number of action planning events for pangolins in the last decade, mainly in Southeast Asia, and recommendations formulated have been implemented, there remains a lack of co-ordinated conservation strategies to guide conservation of the species over the next decade and beyond.

In order to meet this need, the IUCN SSC Pangolin Specialist Group, Conservation Planning Specialist Group, Asian Species Action Partnership (ASAP) and Wildlife Reserves Singapore, held a workshop at Wildlife Reserves Singapore on 28-30th June 2017, in order to develop this Regional Conservation Strategy for the Sunda pangolin 2018-2028. It brought together 53 participants from 16 countries and included government representatives, conservation scientists, practitioners and zoo professionals. Using IUCN's One Plan Approach, participants formulated a 25 year vision, a number of goals and objectives, and a range of actions designed to conserve Sunda pangolins over the next decade. The objectives and actions formulated were also cross-referenced with previous recommendations and actions in order to ensure complementarity with existing action plans.

◀ **Sunda pangolin in forest habitat. © Laura Benedict.**

Vision: The Sunda Pangolin is secure and thriving in a variety of habitats across its entire range. Threats have been abated and research has provided a better understanding of this unique species, which is locally and globally appreciated.

Goals: The goals provide broad operational themes for conservation activity over the next 10 years and beyond and for each goal a number of objectives were formulated. The goals and objectives are presented below and details of specific actions can be found in this document:

1. **Change consumer behaviour to reduce demand for pangolin parts and products,** including reducing consumer demand for pangolin products and reducing supply-side influence on consumer demand.

2. **Combatting illegal trade by strengthening policy and law enforcement,** including through reviewing and where necessary strengthening legislation affording protection to pangolins, ensuring that combatting illegal trade in pangolins remains a high priority in international fora, and engaging with key actors (e.g., the transport sector) to reduce trafficking.

3. **Engage local communities to participate in conservation processes,** including ensuring that local communities and indigenous peoples are active partners in Sunda pangolin conservation and prevent poaching at the site level through locally appropriate community-centred interventions.

4. **Identify and protect areas with important pangolin populations,** by identifying sites important for conservation of the Sunda pangolin, and increasing the likelihood of detection of poachers at sites identified as suitable for conservation intervention.

5. **Conduct research to gain a better understanding of Sunda pangolin ecology and behaviour,** in order to develop a comprehensive understanding of Sunda pangolin biology, ecology and behaviour and to improve monitoring of Sunda pangolin populations.

6. **Establish successful systems for rescue, rehabilitation and release of pangolins**, in order to increase capacity and coordination of rescue, rehabilitation and release of trade-confiscated pangolins.

This strategy does not have dedicated resources and its implementation is incumbent on funding being secured to implement the agreed actions. Implementation of this strategy will be monitored by the Pangolin Specialist Group and the results updated on its website (www.pangolinsg.org).

1. Introduction

▲ Sunda pangolin in Singapore. © Wildlife Reserves Singapore

1. Introduction

The Sunda pangolin *Manis javanica* is one of eight extant species of pangolin and is native to mainland Southeast Asia and surrounding islands, and island Southeast Asia west of Sulawesi.

The species geographic distribution extends from central Myanmar, to large parts of Thailand, lowland Lao PDR, central and southern Vietnam and Cambodia to Peninsular Malaysia (Challender et al., 2014a; Corbet and Hill, 1992). It also occurs in Singapore and surrounding islands, Indonesia (Sumatra, Java and adjacent islands) and on Borneo (Malaysia, Indonesia and Brunei Darussalam) and surrounding islands. Wu et al. (2005) report that the species occurs in southwestern Yunnan Province, China, but there is uncertainty over distribution in the country. It occupies a variety of habitats, from primary and secondary tropical forest, including lowland dipterocarp forest, to artificial landscapes and cultivated areas including oil palm and rubber plantations and gardens. However, research into its use of, and abundance in, modified habitats is needed.

Covered in overlapping, epidermal scales comprised of keratin, the Sunda pangolin is solitary and principally nocturnal, resting by day in tree hollows, fallen logs or burrows and is active at night. Being myrmecophagous, it predates almost exclusively on ants and termites. An adept climber, it is semi-arboreal and has impressive core strength, making use of its prehensile tail when climbing and foraging for prey in trees. Although relatively little is understood about the social structure of the species, inferences from the Chinese pangolin *Manis pentadactyla*, suggest Sunda pangolins are polygynous, with the home range of a male overlapping that of several females (Sun, N., *pers. comm.* 2018). Like other pangolins, a single young is born at parturition after a gestation period of approximately six months and maternal care lasts for about 3-4 months (Lim and Ng, 2007; Zhang et al., 2015). Research suggests that breeding is aseasonal (Zhang et al., 2015).

The Sunda pangolin is listed as Critically Endangered on *The IUCN Red List of Threatened Species* on the basis of past, ongoing and future population reductions based on actual or potential levels of exploitation (Red List criteria A2d+3d+4d; Challender et al., 2014a). At CITES CoP17 (Johannesburg, 2016), and with the other seven species of pangolin, it was transferred from Appendix II to Appendix I, bringing about an international trade ban in wild-caught pangolins and their parts traded for commercial purposes. Sunda pangolins have been valued through history by human beings, principally for consumptive use and international trade has involved their meat, scales and skin. However, evidence indicates that such use and trade has been unsustainable in recent decades (Broad et al., 1988; CITES, 1992, 1999). Currently, the Sunda pangolin is listed as a protected species in all but one range state (Brunei Darussalam). Direct threats comprise hunting and poaching for local use and international trafficking in the animals and their meat and scales, which has a number of drivers and facilitating factors. Indirect threats include habitat loss and degradation. These threats, combined with inadequate conservation action, are negatively affecting the viability of wild populations.

Pangolins have received little conservation attention historically. This has changed in the last decade and there have been a number of action planning activities for pangolins, especially in Asia. In 2008, TRAFFIC, the wildlife trade monitoring network, organised a

▲ **Sunda pangolin receiving veterinary treatment. © Wildlife Reserves Singapore**

workshop on the trade and conservation of pangolins native to south and Southeast Asia. The workshop resulted in a number of agreed recommendations and priority actions (see Pantel and Chin, 2009), many of which have been partly or fully implemented. Subsequently, the IUCN SSC Pangolin Specialist Group and Wildlife Reserves Singapore organised a conservation conference on pangolins in 2013. This resulted in the first ever global conservation action plan for pangolins, 'Scaling Up Pangolin Conservation' which was published in 2014 and contains a number of urgent conservation actions, some of which have been implemented (Challender *et al*., 2014b). Similarly, in 2015, the U.S and Vietnamese governments convened representatives from pangolin range states in Asia and Africa in Da Nang, Vietnam and developed a series of actions and recommendations to mitigate the threats that pangolin populations face (Anon, 2015). Many of these actions have also been implemented. However, despite development of these recommendations and

implementation of various actions in the last ten years, Sunda pangolin populations remain under threat and there remains a lack of co-ordinated conservation strategies to guide conservation of the species over the next decade and beyond.

The profile of pangolins has increased substantially in the last decade, and in particular, in the last five years. This is because of growing awareness and widening collective concern about the fate of the world's pangolins and the threats they face, especially trafficking of the animals and their parts due to persistent consumer demand. Extrapolating from seizure data suggests that since the year 2000 more than one million pangolins have been trafficked globally (IUCN SSC Pangolin Specialist Group, 2016), and the Sunda pangolin is the species of pangolin most frequently found in illegal trade worldwide (Challender *et al*., 2015). This growth in profile has resulted in more governments, NGOs, scientists and civil society organisations prioritising conservation action for pangolins than ever before. It has also led to an increase in funding for pangolin conservation. However, to ensure that limited conservation funding is used most wisely it is important that strategies are developed which articulate what the most urgent actions are, when and where they need to be implemented, and by which stakeholders.

This Regional Conservation Strategy for the Sunda pangolin was developed at a workshop held at Wildlife Reserves Singapore, Singapore on 28-30th June 2017. A total of 53 participants, comprising government representatives, conservation scientists, practitioners and zoo professionals from 16 countries met with the aim of developing this strategy following IUCN best practice guidelines for species conservation planning (see Byers *et al.*, 2013). Following compilation of the strategy all workshop participants had the opportunity to review it to ensure it accurately reflects the objectives and actions agreed upon that are needed to conserve the Sunda pangolin in the period 2018-2028. These objectives and actions were also cross-referenced with previous recommendations and actions that have been formulated in order to ensure complementarity with existing action plans. This strategy does not have dedicated resources and its implementation is incumbent on funding being secured to implement the agreed actions. Implementation of this strategy will be monitored by the Pangolin Specialist Group and the results updated on its website (www.pangolinsg.org).

2. Status Review

▲ Sunda pangolin rescued from illegal trade in Vietnam. © Dan Challender/Save Vietnam's Wildlife

2. Status Review

Underpinning this strategy is a review of the conservation status of the Sunda pangolin. It includes a historical account of the species, and available information on present distribution, taxonomy, protection status, species biology, values, conservation context and threats.

2.1 Taxonomy

The Sunda pangolin *Manis javanica* (Desmarest, 1822), also known as the Malayan pangolin, is one of eight extant species of pangolin. It resides in the Order Pholidota and Family Manidae, and the genus *Manis*, along with the three other Asian pangolins: the Chinese pangolin *M. pentadactyla,* Indian pangolin *M. crassicaudata,* and Philippine pangolin *M. culionensis Gaubert et al., 2018;* (Gaudin *et al.,* 2009). Populations of pangolins in the Philippines were formerly considered to comprise the Sunda pangolin but were separated by Feiler (1998) and subsequently by Gaubert and Antunes (2005) on the basis on discrete morphological differences. These include total number of scale rows across the back, size of scales in the nuchal, scapular and postscapular regions and, among other characteristics, the ratio of nasal bone to total skull length.

There has been little research on Sunda pangolin taxonomy with the exception of research clarifying the status of *M. culionensis* as distinct from *M. javanica* (Gaubert and Antunes, 2005; though see Gaudin *et al.,* 2009; Hassanin *et al.,* 2015; Tan *et al.,* 2016). However, recent research suggests that three previously unrecognised genetic lineages of Sunda pangolins exist, possibly from Borneo, Java, and Singapore/ Sumatra, and being precautionary, the authors advise that pending further research, the populations should be treated as evolutionarily distinct conservation units (Nash *et al.,* 2018).

2.2 Historical account

The Sunda pangolin has a large natural range and would have once have been found throughout most of mainland Southeast Asia and Southeast Asian islands west of Sulawesi, including Borneo, Java and Sumatra (Corbet and Hill, 1992). This includes large parts of Vietnam, Cambodia, Lao PDR, Myanmar, Thailand, Malaysia (including Malaysian Borneo), Indonesia (including Sumatra, Java and Borneo), Brunei Darussalam and Singapore and surrounding islands. There are uncertain records from Yunnan Province, southwestern China (Wu et al., 2005; Jiang et al., 2015). The Sunda pangolin now occurs in a reduced range principally due to overexploitation, and human and agricultural expansion, especially intensive agriculture. For example, it has reportedly been extirpated from many lowland areas of Myanmar, Thailand and Lao PDR and parts of Vietnam (Challender *et al.,* 2014a).

Much other knowledge of the species is based on historical trade data, with inferences about the impact of overexploitation of populations confirmed by local communities and indigenous peoples. In Asia, the commercial trade in pangolins can be traced back to at least the early 20th century and which more than likely involved the Sunda pangolin, though such trade likely took place much earlier as well. Reports describe the export of industrial quantities of scales from Java in the 1920s to meet demand for scales for use in Traditional Chinese Medicine (TCM) in China (Herklots, 1937), and from Sarawak (Malaysia) to Indonesia and subsequently to Singapore and Hong Kong and likely China (Harrisson and Loh, 1965). Similarly, during the 1950s to the 1970s at least 60,000 pangolins were killed each year in Southeast Asia for the Taiwanese leather industry, which again likely involved this species (CITES, 1992, 1999).

Following the inception of CITES in 1975, the Sunda pangolin was listed in Appendix II. According to CITES trade data, between 1975 and the year 2000, approximately 500,000 Sunda pangolin skins were exported from Southeast Asia, mainly from Indonesia, Thailand, Lao PDR, Malaysia and Singapore, and largely destined for the U.S and Mexico for the manufacture and retail of leather goods (e.g., wallets, belts and handbags) (Heinrich *et al.,* 2016; Challender and Waterman, 2017). This equates to a mean of 21,000 animals a year traded in this period (Challender and Waterman, 2017). Sunda pangolin skin tanning operations were also observed in Southeast Asia during this period (Nash, 1997; Nooren and Claridge, 2001). Despite international trade in skins being reported to CITES, implying that non-detriment findings (NDFs) had been made by exporting countries thus ensuring trade was not unsustainable, insights from local communities and indigenous peoples in the region on perceived abundance suggests it was detrimental to populations, with populations declining over time (CITES, 1992, 1999).

Based on concerns about volumes of international trade in the species and its impact on populations, the Sunda pangolin was included in the CITES Review of Significant Trade (RST) process in 1988, 1992 and 1999. The RST process is the CITES species-specific non-compliance mechanism through which remedial measures are formulated where trade in Appendix-II species is deemed problematic. The reviews conducted as part of this process documented hunting-driven population declines in many parts of the Sunda pangolin's range (Broad *et al.,* 1988; CITES, 1992, 1999). For example, although unverified, interviews with villagers in parts of Lao PDR in the 1990s suggested populations there had declined by up to 99% between the 1960s and 1990s due to overexploitation (Duckworth *et al.,* 1999).

Apart from trade in skins, pangolin scales were also traded internationally between 1975 and the year 2000. This involved the Sunda pangolin and amounted to scales from approximately 50,000 animals which largely took place during the 1990s (Challender *et al.,* 2015). However, both the trade in skins and scales were dwarfed by illegal trade that was not reported to CITES during this period, most of which originated in Southeast Asia and likely involved the Sunda pangolin. For example, China illegally imported tens of thousands of pangolins annually during the 1990s (Li and Li, 1998; Wu and Ma, 2007), while Taiwan (P.R. China) and South Korea imported up to 13 tonnes of scales annually throughout the 1980s, and China imported 95 tonnes of scales between 1990 and 1995 (Broad *et al.,* 1988; CITES, 1992, 1999). Challender *et al.* (2015) estimated that this trade represented at minimum, an additional 500,000-900,000 pangolins, beyond trade reported to CITES.

Ongoing local use and trade in Sunda pangolin parts (e.g., meat and scales; CITES, 1992), and international trade in skins and scales, combined with illegal trade, evidently negatively impacted populations of the Sunda pangolin between 1975 and 2000 (CITES, 1992, 1999). The magnitude of the legal trade, the growing cross-border illegal trade, mainly destined to China, and the shifting patterns in harvesting from Indonesia and Thailand to Lao PDR, Malaysia and other range states,

and the likelihood that this was due to overexploitation, are evidence that this was the case. International concern about the status of Asian pangolin populations at the end of the 20th century, including the Sunda pangolin, led to a number of range states proposing that the Asian pangolin species be transferred from CITES Appendix II to Appendix I at CoP11 in the year 2000. This proposal was rejected (partly because the species were in the RST process) and instead Asian pangolins were retained in Appendix II but with zero export quotas for all range states, effectively banning international commercial trade in wild-caught Asian pangolins and their parts.

Although this measure appears to have led to the decline of legal exports of Asian pangolin skins, and scales (e.g., to China and the Republic of Korea), illegal trade in pangolins globally between 2000 and the first half of 2017, involved a minimum estimate of 279,000 animals (Challender and Waterman, 2017) and involved pangolins (i.e. the animals themselves), their meat and scales (Challender *et al.,* 2015; EIA, 2017). Whilst it is difficult to determine accurately which species were involved in this trade, and in what number, based on reported origins, exporting countries and seizure data, a large proportion of this illegal trade undoubtedly involved the Sunda pangolin (see Challender *et al.,* 2015).

▲ **Sunda pangolin © Angus Chaplin Rogers.**

Extrapolations from seizure data suggest that more than one million pangolins may have been trafficked globally since the year 2000 (IUCN SSC Pangolin Specialist Group, 2016). The depletion of China's native pangolin populations by the mid-1990s (see Zhang, 2009), and population declines in neighbouring countries, such as Vietnam and Lao PDR, led to the growth in illegal trade of pangolins, their meat and scales from Sunda pangolin range states including Indonesia, Malaysia and Myanmar in recent decades (Newton *et al.,* 2008; Challender *et al.,* 2015). An increasingly wealthy population in China and Vietnam, with greater purchasing power, is one of the main factors currently driving demand for pangolin parts (Drury, 2011; Shairp *et al.,* 2016). This demand, combined with poor enforcement of applicable laws and regulations (EIA, 2016), and facilitated by questionable law enforcement practices (e.g., the auctioning of confiscated pangolins back in to trade up until 2016), and absolute and relative poverty in source areas combined with prices for the animals, has led to population declines across the Sunda pangolin's range. This is evidenced and corroborated by reported declines among local communities and indigenous peoples groups (Challender *et al.,* 2014a and references therein), and perhaps inferred from the source of pangolins,

▲ **Figure 1. Sunda pangolin** *Manis javanica* **distribution. Source: Challender et al. 2014a.**

and scales in particular, switching to India and Nepal (e.g., Mohapatra *et al.,* 2015) and more recently to a range of African countries (Challender and Hywood, 2012; 2017; Heinrich *et al.,* 2017; Ingram *et al.,* 2018). Demand for pangolins, observed patterns of harvesting and probable overexploitation in many parts of its range, the ease with which the animals are poached, and the inability of populations to recover following overexploitation (i.e. densities are so low in places that individual animals cannot find mates) were the main justifications for the transfer of this species from CITES Appendix II to Appendix I in 2016.

2.3 Present distribution

The Sunda pangolin persists in all known range states, being native to Brunei Darussalam, Cambodia, Indonesia, Lao PDR, Malaysia, Myanmar, Singapore, Thailand and Vietnam (Challender *et al.,* 2014a) (Fig. 1). There is uncertainty over the distribution of the species in China. However, there is a poor understanding of its altitudinal limits. There is also a poor understanding of its conservation needs, which has hampered the identification of priority sites for its conservation. The Sunda pangolin appears to be intolerant of colder temperatures; captive Sunda pangolins north of their known distribution range often die due to exposure (Carnivore and Pangolin Conservation Programme, unpubl. data; Hua *et al.,* 2015). Most records of this species in mainland Southeast Asia are below 1000 m asl (above sea level; see Section 2.5.3). If 1000 m asl represents the approximate altitudinal limits of this species in mainland Southeast Asia, then this will impact the ability to secure sites for its conservation; many lowland areas within this species' range are severely affected by the illegal wildlife trade (CEPF, 2012). Typically, most protected areas within its range that have been afforded some protection from poaching and/or habitat conversion are relatively inaccessible, i.e. occur at higher altitudes and/or with steep terrain. Information on distribution within each range state is presented below.

Bangladesh

A number of sources suggest that the Sunda pangolin occurs in Bangladesh (Khan 1985, 2008, 2010; CITES, 2016), but recent research found no evidence to support this, and the species' existence in Bangladesh remains unverified and questionable (Trageser *et al.,* 2017).

Brunei Darussalam

The species has been reported in all four districts of Brunei Darussalam (Brunei Muara, Tutong, Kuala Belait and Temburong) but little is known about its status there (Fletcher, 2016).

Cambodia

The Sunda pangolin is widely distributed in Cambodia. It has been recorded from sea-level to 830m asl (Gray *et al.,* 2017a) and historically occurred throughout deciduous forest, low land and hill evergreen forest and secondary forest, prior to the extensive hunting driven declines which have occurred in the past 10–20 years. Extensive camera trapping since 2002 (though none targeted at Sunda pangolins) has generated only a few records, for example, there are no camera trap records of the Sunda pangolin from Cambodia's Eastern Plains Landscape despite more than 100,000 trap-nights of effort (Phan *et al.,* 2010; A. Olsson, *pers. comm.*). However recent camera-trapping in a remote part of Southern Cardamom National Park detected the species from 11 of 67 camera-trap stations when setting camera-traps randomly (Gray *et al.,* 2017a). This suggests that camera-trapping as conventionally practiced in Indochina (i.e. targeted hotspots likely to detect large mammals) may have low probability of detecting pangolins.

The species has been confirmed in a number of forest reserves in Cambodia: the Cardamom Mountains (Gray *et al.,* 2017a), the Elephant Mountains, Central Cambodian Lowland Forests (Prey Long), Eastern Plains Landscape, Northern Plains (Songkom Thmey district; G. McCann in *litt.* 2017), Chhep Wildlife Sanctuary (Suzuki *et al.,* 2017), wildlife sanctuaries (e.g. Peam Krasop; Thaung *et al.,* 2017) and national parks (e.g. Virachey NP, which might be nationally important due to less poaching than other parks and its vulnerable protection status; McCann and Pawlowski, 2017), Southern Cardamom National Park and Botum Sakor National Park (Gray *et al.* 2017a), where it inhabits evergreen, semi-evergreen deciduous forest and coastal mangroves. Populations are thought to be declining and it is understood to occur in low numbers, and to have been extirpated from many areas due to hunting (see Challender *et al.,* 2014a and citations within).

Recent records (e.g. in central Phnom Penh) likely involve individuals that have escaped from illegal trade (T Gray, *pers. comm.* 2018). Between 2001 and 2015 the national Wildlife Rapid Rescue Team of Wildlife Alliance seized 360 live pangolins from 91 cases across 19 of the country's 25 provinces with an additional 22 cases of pangolin meat or scales being traded.

China

Wu et al. (2005) recorded the species as present in China based on specimens held at the Kunming Institute of Zoology, but there is uncertainty over the provenance of these specimens. It is uncertain whether the Sunda pangolin occurs naturally in China.

Indonesia

The Sunda pangolin has a widespread distribution in Indonesia including Sumatra, Java, Borneo, Kiau and the Linngga archipelago, Bangka and Belitung, Nias and Pagi islands and Bali and adjacent islands (Corbet and Hill, 1992). It is also reported to occur on the Great Bunguran Islands (Natuna Islands) off the northwest coast of Borneo (Phillips and Phillips, 2018). Its abundance is thought to be low in the peat-swamp forests of east and central Kalimantan (Indonesian Borneo) (see Challender *et al.,* 2014a) though this habitat has not been well monitored for Sunda pangolins to date. Local people from Ubud, central Bali, report that thirty years ago pangolins would wander into

household gardens whereas now it is hard to find them (H. Nash, *pers. comm.* 2017). Anecdotal information from residents suggests that pangolins may be slightly more abundant in northern parts of Bali, although they remain rare (H. Nash, *pers. comm.* 2017). There are recent records from secondary forest and plantations at 360-900 m asl in Tanggamus and Lampung Barat districts of West Java (Wirdateti and Semiadi, 2013).

Lao PDR

Although presumably widespread historically in Lao PDR, there are records of varying reliability from many areas below c. 600 m asl altitude, and it is possible that in Lao PDR the species is restricted to the Mekong plain and adjacent foothills up to c. 900 m asl, with a possible occurrence on the Bolaven Plateau, north from Xe Pian National Biodiversity Conservation Area in the south at least as far north as Nam Kading (Duckworth *et al.,* 1999). Unverified interviews with villagers in parts of Lao PDR in the 1990s suggested populations there had declined by more than 90% between the 1960s and 1990s due to overexploitation (Duckworth *et al.,* 1999) and Nooren and Claridge (2001) reported that populations in Lao PDR have been severely reduced as a result of hunting for consumption and trade. A total of 3383 camera trap days in Nakai-Nam Thuen in 2016 produced 6 trigger events at 6/49 stations (Coudrat, 2017). These events were recorded as *Manis* sp. because Chinese pangolins could also be present and it was not possible to confidently determine species. All pangolin records came from 720 to 970 m asl (C. Coudrat, *pers. comm.* 2017).

◀ **Top image: Pangolin carcasses being buried in Indonesia © Paul Hilton for WCS. Bottom left: Seized pangolin scales © WCS. Bottom right: Seized pangolin organs © WCS.**

Malaysia

The Sunda pangolin has a wide distribution in Peninsular Malaysia (including on the island of Penang) and occurs in tropical forests, including in national parks and wildlife reserves (e.g., Pasoh Forest Reserve, the Kenyir Wildlife Corridor), but also gardens and oil palm and rubber plantations (Medway, 1977; Numata *et al.,* 2005). Although described as common in some areas up until the 1990s, and while still present in oil palm plantations (e.g., in Selangor and Negeri Sembilan) interviews with plantations workers suggest the species is declining due to poaching for trade (Azhar *et al.,* 2013; Ickes and Thomas, 2003). In Peninsular Malaysia, Orang Asli and local community members in Kelantan, Pahang, Terengganu and Johor, report that the species is present but that populations are declining (Challender *et al.,* 2014a; Chong *et al.,* 2016). In 2014, a total of 4,364 and 3,453 camera trap-nights in Kelantan and Terengganu respectively, produced just a single record of Sunda pangolins (Jambari *et al.,* 2015). The Sunda pangolin is widely distributed in Malaysian Borneo, from sea level to 1,700 m asl on Mount Kinabalu in Sabah (Payne *et al.,* 1985; Phillips and Phillips, 2018). In Malaysian Borneo, it has been recorded in mixed dipterocarp forest, riverine forest (Azlan and Engkamat, 2013) as well as remnant forests (Giman *et al.,* 2007). In Sabah, the species is widely distributed though is purportedly mainly distributed in central Sabah, but seldom seen (see Davies and Payne, 1982). It was previously considered common though there is little data on the species' status. It is present in a number of forest reserves, wildlife reserves and wildlife sanctuaries. Camera trap surveys conducted between 2000 and 2017 confirmed presence of the species in the Maliau Basin and Imbak Canyon (Bernard *et al.,* 2013), Sipitang Forest Reserve, Tabin Wildlife Reserve, Ulu Kalumpang Forest Reserve, Ulu Padas, Malua Forest Reserve, Danum Valley, Sepilok-Kabili Forest

Reserve and Lower Kinabatangan Wildlife Sanctuary and unprotected forest adjacent to Universiti Malaysia Sabah (E. Panjang, unpubl. data). Interviews with local communities and plantation workers living nearby Sepilok-Kabili Forest Reserve (2011-2015) and the Lower Kinabatangan Wildlife Sanctuary (2016-2017), suggests pangolins are rarer today compared to 20-30 years ago (E. Panjang, *pers. comm.* 2018). The species is also present in Sarawak (Wilson, 2006). Surveys in 2005 recorded its presence at Bintulu, and though apparently absent from the extensive peat swamp forests in this state (CITES, 2000) there has been little monitoring effort for the species in this habitat. It was recorded in the locale around Mount Penrissen (on the Sarawak-Kalimantan border) at elevations up to 1200 m between 2015 and 2017 (Kaicheen and Mohd-Azlan, 2018). There is otherwise little information on the distribution and status of the Sunda pangolin in Sarawak, though it does appear in bushmeat trade in Kuching, Sibu and Kapit (J.L. Chong, *pers. comm.* 2017).

Myanmar

In Myanmar, the Sunda pangolin is distributed in central and southern parts of the country, but has reportedly been extirpated from lowland areas due to hunting and agricultural expansion (Challender *et al.,* 2014a). However, in recent years it has been recorded in Tanintharyi region in the south of the country (see Challender and Waterman, 2017) and recent observations of *Manis* spp. in Karen state most likely refer to the Sunda pangolin (Moo *et al.,* 2017).

Singapore

This species is found in the wild in Singapore and on adjacent islands including Pulau Tekong and Pulau Ubin (Lim and Ng, 2007). It is breeding in Singapore (Chan, 2017),) but population trends are not known. Records from public sightings, rescue and roadkill reports, and camera trap surveys in nature reserves and adjacent nature parks are being analysed to better understand pangolin distribution and threats in Singapore. Over the years Wildlife Reserves Singapore (WRS) received an average of 20 wild Singaporean pangolins per year. Over 80% have been successfully rehabilitated. WRS also manages a captive breeding program for Sunda pangolins, has developed husbandry guidelines and conducted and supported many research projects on pangolins in Singapore, which ultimately led to the development of a National Conservation Strategy and Action Plan for Sunda Pangolins. (Lee *et al.,* 2018).

Top left: caption: Sunda pangolin undergoing a health check © Wildlife Reserves Singapore. Middle left: Juvenile Sunda pangolin rescued from a wildlife trafficker © WCS. bottom left: Frozen pangolins © WCS. Top right: Descaled pangolins © Paul Hilton for WCS, Bottom right: Pangolin fetus in wine © WCS.

Thailand

In Thailand the Sunda pangolin has a broad distribution, and historically occurred throughout the country (Legakul and McNeely, 1977), but has reportedly been lost from much of the lowland areas within its range due to hunting and agricultural expansion (see Challender *et al.,* 2014a). Although reportedly increasingly rare, it has been detected in a number of national parks in the last decade (see Challender and Waterman, 2017). This includes confirmation of presence in the south-eastern Western Forest Complex (sWEFCOM), Khlong Naka Wildlife Sanctuary and Khao Yai National Park (W. Sodsai, *pers. comm.* 2017; 'Lynam *et al.,* 2006 in Newton et al. 2008). Sunda pangolins have also been photographed in the Kaeng Krachan Forest Complex, (W. Sodsai, *pers. comm.* 2017).

Vietnam

In Vietnam, the Sunda pangolin is distributed in central and southern parts of the country though records vary in reliability due to the difficulties in distinguishing it from Chinese pangolin records based on unverifiable interview data and confiscation records. There are older records from Kon Tum Province, Tay Ninh Province and Quang Nam Province (Bourret, 1942), with more recent records (summarised by Newton 2007) from: Ha Tinh Province (Timmins and Cuong, 1999); Kien Giang and Ca Mau Provinces (in U Minh Thuong National Park; CARE, 2004); Dong Nai, Bin Phuoc and Lam Dong Provinces (Cat Tien National Park; Murphy and Phan, 2001); Quang Binh (Le *et al.,* 1997a) and Dak Lak (Le *et al.,* 1997b). Recent research suggests the species is present but rare in central and southern Vietnam (MacMillan and Nguyen, 2013; Nuwer and Bell, 2013). It was recorded in 2013 in Cat Tien National Park (Save Vietnam's Wildlife, unpubl. data). In 2008, it was recorded in U Minh Ha National Park (Willcox *et al.,* 2017). Surveys using trained detection dogs have recorded the species in Cat Tien National Park and camera-trapping has recorded it in Pu Mat National Park (Save Vietnam's Wildlife, unpubl. data), though it is unknown whether these were released animals. A Sunda pangolin was observed at night during reptile and amphibian surveys in Pu Mat National Park in 2014 (S. Trageser, *pers. comm.* 2018). It has been camera-trapped in Bach Ma National Park (A. Wilting, *pers. comm.* 2017). There are recent camera trap records from Thua Thien Hue and Quang Nam Saola Reserves in central Vietnam (T. Gray, *in litt*. 2017; A. Wilting, unpubl. data) though it is unknown whether these were released animals. There are also records of the species from Nghe An Province in recent years (see Challender and Waterman, 2017).

2.4 Protection status

The Sunda pangolin is listed as Critically Endangered on *The IUCN Red List of Threatened Species* on the basis of past, ongoing and future population reductions based on actual or potential levels of exploitation (Red List criteria A2d+3d+4d; Challender *et al.,* 2014a). Previous assessments categorised the species as Endangered (Duckworth *et al.,* 2008), and prior to that as Lower Risk/near threatened (LR/nt) (IUCN, 1996). The change in status to Critically Endangered in 2014 was a non-genuine change made on the basis of new information being available on the magnitude of threats the species faces, in particular levels of poaching and trafficking, and the impact overexploitation has had and is having on populations.

The Sunda pangolin is listed in CITES Appendix I. It was transferred from Appendix II to Appendix I at CoP17 (Johannesburg, 2016) with the other seven species of pangolin, which brought about an international trade ban in wild-caught pangolins and their parts and derivatives traded for commercial purposes. This ban came into force on 2nd January 2017. Additionally, CITES also adopted a Resolution on pangolins, *Res. Conf. 17.10, Conservation of and trade in pangolins* (CITES, 2017), which urges pangolin range states to, among other things, implement comprehensive national legislation, or where applicable, review existing legislation to ensure deterrent penalties are in place to address illegal trade in pangolins, ensure that enforcement of such regulations are strictly enforced, and to work with local communities to sustainably manage pangolin populations.

With one exception, the Sunda pangolin is listed as a protected species in all range states. National wildlife legislation typically prohibits exploitation of the species (e.g., hunting, capturing, killing, etc.), except under scientific licence from the appropriate government body (Table 1). The exception is Brunei Darussalam where the Sunda pangolin receives broad protection under the Forestry Act (2002), Wildlife Protection Act (1981), and the Wild Fauna and Flora Order (2007), which implements CITES in the country, but it is not listed as a protected species (Challender et al., 2014a; CITES, 2016).

In Vietnam, the Sunda pangolin is included in Decree 160 (160/2013/ND-CP), which is the country's highest protection level. It was previously listed in Group IIB of Decree 32, making it legal to sell confiscated pangolins back into trade, but the species' inclusion on Decree 160 means that this is no longer the case.

However, non-native species of pangolin are typically not included in national wildlife legislation that protects Sunda pangolins. Several Sunda pangolin range states act as transit/point-of-sale countries for pangolin scales trafficked from Africa but which are not readily recognised (e.g., Lao PDR; see Gomez *et al.,* 2016). In theory, this could facilitate the trafficking of Sunda pangolin scales that have been mislabelled or misidentified as African pangolin scales.

Range state	Legislation	Protection status
Brunei Darussalam	Wildlife Protection Act (1981), Forestry Act (2002), Wild Fauna and Flora Order (2007).	Not listed as a protected species
Cambodia	Forestry Law (2002), Sub-decree No. 53 on International Trade in Endangered Species of Wild Fauna and Flora (2006).	Listed as Rare in 2003
China*	Protection of Wildlife Act (1989), Regulations on the Implementation of Protection of Terrestrial Wild Animals (1992), Regulations on Management of Import and Export of Endangered Species of Wild Fauna and Flora (2006).	Not listed as a protected species but is considered a State Category II Protected species
Indonesia	Act No. 5/1990 (Conservation of Living Natural Resources and Ecosystems), Government Regulation No. 7/1999 (Conservation of Fauna and Flora).	Protected species
Lao PDR	Wildlife and Aquatic Act (2007).	Listed in the 'Prohibition' category
Malaysia (Peninsular)	International Trade in Endangered Species Act (2008), Wildlife Conservation Act (2010).	Totally Protected
Malaysia (Sabah)	Wildlife Conservation Enactment (1997).	Totally Protected
Malaysia (Sarawak)	Wildlife Protection Ordinance (1998).	Protected
Myanmar	The Conservation of Biodiversity and Protected Areas Law (2018)	Completely Protected
Singapore	Wild Animals and Birds Act (1995; amended 2000), Wild Animals and Birds (Composition of Offences Act) Order 2005; Endangered Species (Import and Export) Act (2006; amended 2008). Also, Parks and Trees Act (2005; amended 2017).	Protected
Thailand	Wild Animals Reservation and Protection Act B.E. 2535 (1992).	Protected Wild Animal
Vietnam	Decree No. 160/2013/ND-CP; Vietnam Penal Code (as amended 2018).	

Table 1. National wildlife legislation affording protection to the Sunda pangolin in its range states

*China promulgated two judicial interpretations in 2000, which defined criteria for punishing crimes involving pangolins specifically. A notification issued by national Chinese agencies in 2007 strengthened regulation for species used in traditional medicines, including pangolins, meaning among other things, existing stockpiles of pangolin scales are to be subject to verification, certification and subject to retail only through designated hospitals.

The Sunda Pangolin is also listed in Annex A of the EU Wildlife Trade Regulations (Commission Reg. (EU) No 2017/160 of 20 January 2017).

2.5 Species biology

Pangolins are relatively understudied compared to many other mammals and other species. However, knowledge of Sunda pangolin biology and ecology is presented below including information on current numbers, population dynamics, life history and ecological role (including habitat, diet and movements), disease and genetics. This knowledge and information underpins the vision, goals, objectives and actions presented in Section 3.

2.5.1 Current numbers

There are few quantitative population estimates for pangolins at any level and there are no estimates of Sunda pangolin populations sub-nationally, nationally or regionally. An exception is Singapore where the population has been estimated at around 1000 individuals (see Nash *et al.,* 2019). The species is rarely observed, both because it is primarily nocturnal and solitary, secretive and elusive, and because of its increasing rarity. Hunting-, poaching- and trade-driven declines have been reported or are inferred, based on accounts from local community members and indigenous peoples and the magnitude of exploitation in many parts of its range, including Cambodia, Lao PDR, Malaysia, Myanmar, Thailand and Vietnam (see Section 2.3; CITES 1992; 1999; Challender *et al.,* 2014a).

It is now extremely rare in the northern part of its range in Indochina where there have been massive declines (Nooren and Claridge, 2001; Challender *et al.,* 2014a). In three areas of Vietnam where interviews were conducted (Khe Net Protected Area, Ke Go Nature Reserve and Song Thanh Nature Reserve), 95% of hunters believed pangolins populations have declined severely in recent decades as a consequence of hunting pressure, but particularly since 1990 when commercial trade in pangolins began to escalate (Newton *et al.* 2008). In each of these areas, the species was described as now being extremely rare. Vietnam categorised the species as Endangered in its Red Data book in 2007. The situation is similar in other range states including Cambodia (T. Gray, *pers. comm.* 2017), where the species was listed as 'Rare' in 2003. The species was listed as Vulnerable in the Red List of Mammals for Peninsular Malaysia in 2010 and Critically Endangered in 2017. In Sabah, East Malaysia, it was listed as Vulnerable in 2012 (E. Panjang, *pers. comm.* 2018), and in Thailand (Challender and Waterman, 2017). In Myanmar, the Sunda pangolin has reportedly been eradicated from lowland areas due to hunting and agricultural expansion, and while there are no recent data on status, seizures of the species in China indicate origins of Myanmar and suggest that populations of the species here are under threat (Challender *et al.,* 2015). The species is present and breeding in Singapore (Chan, 2017) but population trends have yet to be established. Revision of the National Red List assessment in Singapore resulted in the species being categorised as Critically Endangered (Davison *et al.,* 2008).

Evidence from seizures involving this species indicate that it occurs in some number in Indonesia (Sumatra, Java and Kalimantan), though the magnitude of international trade originating from Indonesia suggests populations are or could be in severe decline. This is difficult to state categorically. However, the estimated generation length of seven years (see Challender *et al.,* 2014a), the indiscriminate nature of poaching (both sexes and all life stages are targeted), and the magnitude of illegal trade supports this assertion. Takandjandji and Sawitri report high numbers of Sunda pangolins trafficked from Indonesia between 2002 and 2015, mainly to meet demand for meat and scales in China.

In conjunction with other knowledge and information (see above and Sections 2.2 and 2.3), Sunda pangolin population declines can be inferred from the source of illegal trade switching to other regions and countries. For example, the sourcing of scales from India, Nepal and Pakistan (e.g., Mohapatra *et al.,* 2015), as well as a range of African countries (Challender and Hywood, 2012; EIA, 2017; Gomez *et al.,* 2016).

2.5.2 Population dynamics

Pangolins generally have low fecundity. Like the other seven species, the Sunda pangolin typically gives birth to one young at parturition (Nowak, 1999; Lim and Ng, 2008a; Zhang *et al.,* 2015), though there are unverified reports of pangolins having two, or even three offspring though these incidents are understood to be uncommon. Gestation period in the Sunda pangolin lasts approximately 6 months (~150 days Challender *et al.,* 2014a; Nguyen *et al.,* 2014). Zhang et al. (2015) suggest the gestation period may last up to 207 days (range = 106-207 days), while Wildlife Reserves Singapore estimate the gestation period to comprise 175-189 days (Wildlife Reserves Singapore, unpubl. data). Research suggests that the Sunda pangolin does not have a specific breeding season but breeds all year round (Lim and Ng, 2008a; Nguyen *et al.,* 2014; Zhang *et al.,* 2015). The period of maternal care in this species has been estimated to be around 3-4 months (Lim and Ng, 2008a; Challender *et al.,* 2012). Population recruitment rates are unknown in the wild, though research suggests that Sunda pangolins may breed continuously, with trade-confiscated nursing females also known to be pregnant (see Zhang *et al.,* 2015), but giving birth to only one young a year. In the northern parts of its range where there is a stronger winter season, breeding might be seasonal, due to reduced activity among prey, specifically ants.

There is little information available on the population structure of the Sunda pangolin, though individuals probably fall into one of three categories: juveniles, for young pangolins up to the point of weaning and leaving their mother (3-4 months; Lim and Ng, 2008a); sub-adults, for pangolins that have become independent but are not yet sexually mature (3-4 months – 1 year old), and adults, for sexually mature animals (1 year +). Zhang et al. (2015) report that some Sunda pangolins may reach sexual maturity at 6-7 months old. Yang et al. (2010) suggest four categories of life stage - cub, sub-adult, adult and senior animals.

Survival and mortality rates are largely unknown and the population biology of the species commands further research. However, mortality rates are likely high based on the indiscriminate nature of poaching and trafficking, which targets both sexes and animals of any age. Many animals do not survive the unsanitary condition of illegal trade or the periods of time being trafficked. Although some animals are released following confiscation from the trade, there is a lack of evidence on survival rates and what proportion of animals survive or how long they persist once they have been released. Little is known about the prevalence of stochastic environmental effects such as disease (see Section 2.5.4) or season.

2.5.3 Life history and ecological role

The Sunda pangolin is terrestrial and arboreal, resting by day in tree hollows, fallen logs or burrows and active at night. An adept climber, it has impressive core strength, making use of its prehensile tail when climbing and foraging for prey in trees. It has been recorded in a wide variety of habitats including grasslands, peat swamp forest, primary and secondary tropical forests, palm oil and rubber plantations, and urban areas, including gardens and cultivated landscapes (Payne *et al.,* 1985; Lim, 2007; Lim and Ng, 2008a; Azhar

▲ **Sunda pangolin being radio-tracked in Singapore © Wildlife Reserves Singapore**

et al., 2013; Wearn, 2015; Fletcher, 2016; Willcox *et al.,* 2017). In Malaysian Borneo, the species was recorded more frequently in modified habitats than in primary forest, but it is unclear whether the species was more abundant in those habitats or was merely easier to detect (Davies and Payne, 1982). Records of the species in modified habitats, including evidence of breeding (e.g., in Singapore) suggests that it is adaptable to different habitat types and modification, providing there remains a prey base (i.e. ants and termites) and populations are not unduly persecuted. However, research is needed on the comparative use of, and abundance in natural habitats and artificial landscapes, including the species' ability to persist in isolated blocks of monoculture plantations (e.g., oil palm) assuming poaching can be controlled.

This species is predominantly nocturnal though there are records of diurnal activity (e.g., Lim, 2007). Like other species of pangolin, it is also solitary, except when mating and rearing young (Nowak, 1999; Lim and Ng, 2008a). The only detailed published study on Sunda

pangolin ecology remains Lim (2007), parts of which were published in Lim and Ng (2008a). In Lim (2007), four adult male pangolins were tracked for 6-7 days, for which the mean 100% MCP (Minimum Convex Polygon) home range estimate was 41 ha. In Lim and Ng (2008a), a female pangolin that gave birth during the study used three natal dens (all associated with trees/tree hollows with DBH > 50cm), had a 100% MCP home estimate of 7 ha, and a maternal care period of 3 to 4 months. Based on Lim and Ng (2008a) females may have some dependence on tree hollows around parturition and during maternal care. Additionally, eleven genera of ant were recorded being foraged upon, with ants accounting for 67% of time spent foraging and termites 33%. Territorial behaviour has also been recorded between males (Lim, 2007); wild-caught confiscated males have also exhibited territoriality when housed together in captivity (Carnivore and Pangolin Conservation Program, unpubl. data).

The Sunda pangolin performs an ecosystem service by regulating social insect populations. It is understood to be myrmecophagous, predating on ants and termites, but is also known to ingestant larvae, bees (pupas), flies, worms, crickets and other insect larvae (Hua *et al.,* 2015). Sand and grass may also be ingested when eating. There has been an observed preference for *Oecophylla* ant species (weaver ants) and for *Anoplolepis gracilipes* (the Yellow Crazy Ant) in Singapore (Lim, 2007). It has also been observed feeding on *Oecophylla* species in U Minh Ha National Park, Vietnam (Willcox *et al.,* 2017) and will take this species readily in captivity (Nguyen *et al.,* 2014). Sunda pangolins will also eat *Crematogaster* sp. ("heart-shaped" ants) in captivity, though Lim (2007) reported an apparent avoidance of this genus in his study.

Predators include tigers, leopards, clouded leopards (Phillips and Phillips, 2018) and likely sun bears (Hedges and Aziz, 2013), as well as pythons (e.g., reticulated python *Malayopython reticulatus*; Lim and Ng, 2008b).

The altitudinal limits of this species' across its range are not well understood. However, it has been suggested that there might be an altitudinal limit in mainland South-east Asia, with the species found mainly in the lowlands and lower hills, below 600 m asl in Lao PDR (Duckworth *et al.,* 1999).

Sunda pangolins are probably more adapted to wetlands and riverine ecosystems than is initially apparent based on their morphology. The U Minh wetlands in Vietnam are seasonally inundated for a large part of the year (Willcox *et al.,* 2017) and the species' seems to enjoy going into pools of water in captivity (Nguyen *et al.,* 2014). In 2018, a GPS-tagged Sunda pangolin was recorded crossing the Kinabatangan River (with a width of about 105 m; E. Panjang, unpubl. data), and there is also a record of a released Sunda pangolin swimming well in a stream with a strong current in Vietnam (Save Vietnam's Wildlife, unpubl. data 2017). There are records of other pangolin species apparently swimming large distances (Yang *et al.,* 2007).

2.5.4 Disease

There is generally little knowledge of disease regarding pangolins or the impacts of disease on wild populations. However, a number of endo- and ecto-parasites are known to be associated with the Sunda pangolin. They include protozoans *(Eimeria tenggilingi),* helminths *(Brugia malayi, B. pahangi, Necator americanus and Gendrespirua sp.),* and in terms of ecto-parasites, ticks *(Amblyomma cordifeum, A. javanense, Aponomma varanensis)* and mites *(Mycoplasma sp.)* (Kollars and Sithiprasasna, 2000; Hassan *et al.,* 2013; Mohapatra *et al.,* 2016). Pangolins in illegal trade are known to pick up external parasites as well as diseases, including bacterial dermatitis beneath the scales, and suffer from gastric and oesophageal ulceration (Clark *et al.,* 2009). Although health checks are conducted as a matter of best practice by some organisations when releasing trade-confiscated animals back into the wild, this is not always the case and there is a risk of transmission between released and resident animals (see IUCN/SSC 2013).

2.5.5 Genetics

The genetic population structure of Sunda pangolins has recently been investigated across insular Southeast Asia and distinct population level lineages were revealed for Borneo, Java and Sumatra/Singapore (Nash *et al.,* 2018). These population genetic results were only apparent using a large number of genome-wide markers and could not be detected by mitochondrial DNA markers alone. The genetic diversity and population viability of these subpopulations was not thoroughly investigated due to a lack of available samples of wild pangolins of known origin. Non-invasive sampling is challenging for Sunda pangolins: scat is difficult to find, even with trained detection dogs; the DNA yield of hair is low; scales can be useful but often only if tissue at the base of the scale is still attached; blood drawn by trained staff is typically necessary for detailed population level analysis; and sample collection permits and CITES permits are always required. Despite these hurdles, there was some evidence of genetic admixture between the three distinct populations across insular Southeast Asia, which might possibly be due to human-mediated transport of Sunda pangolins via illegal trade and the release of live seizures into alien habitats (Nash *et al.,* 2018).

Full mitogenomes are being sequenced for a broader range of Sunda pangolin samples (P. Gaubert, *pers. comm.* 2018) from northern range states, including Thailand and Vietnam, as well as Indonesia. Given the large geographic range of Sunda pangolins, such research might uncover additional population-level, or even subspecies or species-level differentiation. Studies of morphology will be needed to complement genetic analyses.

Many Sunda pangolin populations are now fragmented and possibly small, which could potentially cause inbreeding and low genetic diversity. Local research has not yet been conducted to better understand these issues. Ideally there would be baseline genetic information before fragmentation and population size reduction for comparison with current states, but this has not been collected.

2.6 Values

The Sunda pangolin has been, and is valued by a range of different peoples and consumers, both locally and internationally, mainly for consumptive use purposes, though many uses and values are not well documented. Historically, the species has been valued as a local source of protein across its range, with the meat of the animal being consumed for subsistence purposes including in but not limited to, Indonesia, Lao PDR, Malaysia, Myanmar, Thailand and Vietnam (e.g. Corlett, 2007). The scales have also been used, for example to protect communities from bad omens and spirits (e.g., in parts of Malaysia CITES, 1992), to deter pests from damaging crops (Puri, 2005), as amulets and in jewellery (CITES, 1992; Duckworth *et al.,* 1999), and in traditional medicines in number of range states (CITES 1992, 1999; Nguyen, 2016).

The use of Sunda pangolin scales in traditional medicines includes use at a local level in range states (i.e. household, local community level), as well as internationally, having been exported, both legally and illegally, to East Asian countries (CITES, 1999; Challender and Waterman, 2017). This includes use of the scales as an ingredient in Traditional Chinese and Vietnamese Medicines to purportedly help lactating women produce milk, and to improve blood circulation and cure skin diseases (Chinese Pharmacopeia Commission, 2015). However, recent reference sources on managing cancer using Traditional Chinese Medicine (TCM) refer to the use of scales as an ingredient in medicines to help alleviate conditions associated with breast cancer and lymphoma (Yu and Hong, 2016). Furthermore, despite regulations on the use of pangolin scales in China research suggests that at present it is largely Sunda pangolin scales that are being used in the manufacture of patented Chinese medicines (Liu *et al.,* 2015), though given limitations to this study further research is needed to determine if this is the case.

Despite the range of consumptive uses of Sunda pangolin parts, available evidence suggests the species is now uncommonly used for local medicinal and cultural uses in range states; most demand is for luxury meat in urban centres in Vietnam and for the pharmaceutical industry (for traditional medicine) in China. Exceptions include the use of old scales that are stored locally (e.g., within households) for which possession may confer protection (as detailed above), ongoing consumption for subsistence purposes (e.g., in central and eastern Kalimantan and West Java, Indonesia) and the sale of scales on occasion (Challender *et al.,* 2014; Partasasmita *et al.,* 2016).

Many local uses have now been supplanted by international demand for pangolin meat and scales (MacMillan and Nguyen, 2013; Nuwer and Bell, 2013) due to the high prices pangolins fetch in illegal trade (Challender *et al.,* 2015). Evidence indicates that the price of pangolins in trade has increased in recent decades (e.g., in Vietnam; Newton *et al.,* 2008) while retail prices in China for pangolin meat and scales are also reported to have been increasing in recent years (Challender et al., 2015), likely as a result of increasing rarity of the animals and seemingly increasing demand (e.g., Drury, 2011). Many areas within the species' range are likely to have experienced a shift like that experienced in parts of Vietnam (e.g., Pu Mat National Park) where, from the late 1990s to the early 2000s, market forces and dwindling populations of other traded wildlife meant international trade in pangolins increased rapidly resulting in the cessation of local, subsistence use of pangolins (SFNC, 2003 in World Bank, 2005).

Key consumer markets for pangolins and their parts, currently comprise China and Vietnam, and to a lesser degree, other Asian and Southeast Asian nations (Shairp, 2016; Xu *et al.,* 2016; Challender and Waterman, 2017). Pangolin meat is consumed as a luxury good in high-end urban (and in some cases more rural) restaurants and scales are used as in ingredient in traditional medicines to treat a variety of ailments in China and Vietnam (Shairp *et al.,* 2016; Xu *et al.,* 2016). China introduced a certification system to control the trade and use of pangolin scales in 2007. This comprised measures to manage stockpiles of scales and includes a quota of scales from stockpiles being released onto a legal market each year in China. Since 2009, an average of 26.6 tonnes of scales have been released on this market annually (China Biodiversity Conservation and Green Development Foundation 2016), but uncertified scales (i.e., being sold illegally) remain widely available in China (Xu, 2009; Xu *et al.,* 2016).

In Indonesia, there is a rumour that pangolin scales can be used in the manufacture of drugs including crystal meth. In 2016, Indonesian police arrested a drugs dealer in Jambi and found tonnes of pangolin meat and scales; the traffickers confessed that pangolin scales were being used in the production of premium quality crystal meth (WCS Targeted Intelligence Report, 2017). This claim centres on the notion that pangolin scales contain Tramadol which is factually incorrect; Tramadol is a synthetic opioid drug and does not occur in nature.

Beyond consumptive uses, Sunda pangolins provide an ecosystem service by regulating social insect populations by predating on large numbers of ants and termites. This can result in reduced crop damage, hence Sunda pangolin may provide a means of 'pest control' to local people and communities. Exact figures are not available for the Sunda pangolin, but it is known that Temminck's pangolin *Smutsia temminckii* will consume 300-400g of termites in one sitting (Coulson, 1989). However, little research has been conducted on the extent to which local communities are aware of, value or support this ecosystem service. Similarly, through burrowing behaviour for making dens, nesting sites or as part of foraging behaviour, Sunda pangolins are understood to aerate soil and potentially support nutrient cycle function (see CITES, 2016).

Additionally, Sunda pangolin burrows are also likely to be used by a number of other species: Burmese python *Python bivittatus,* elongated tortoise *Indotestudo elongata*, East Asian porcupine *Hystrix brachyura* and monitor lizards *Varanus* sp., while civets have been recorded using Chinese pangolin burrows in Bangladesh (S. Trageser, *pers. comm.* 2017).

2.7 Conservation planning to date

There have been three conservation action planning exercises to date that are relevant to the Sunda pangolin as detailed below. The 2008 TRAFFIC workshop focused on the trade and conservation of pangolins native to South and Southeast Asia. The output was a publication which synthesised current knowledge on Asian pangolins, including the Sunda pangolin, and set out a series of research and conservation priorities, including: research on pangolin ecology and biology; increased education and awareness-raising among a range of audiences (e.g. law enforcement, business, donors and youth); husbandry and rehabilitation research; knowledge sharing and capacity building; and improved legal protections and law enforcement. A number of these have been implemented since the recommendations were published (see Pantel & Chin, 2009).

The IUCN SSC Pangolin Specialist Group published the first global pangolin conservation action plan, 'Scaling up Pangolin Conservation Action' in 2014 (see Challender *et al* 2014b). This action plan built on recommendations made at the IUCN SSC Pangolin Specialist Group's 2013 global pangolin conservation conference and TRAFFIC's 2008 workshop, both of which were hosted by Wildlife Reserves Singapore. The action plan outlines priorities for pangolin conservation in four main categories: conservation research (including ecological monitoring, husbandry, rescue, rehabilitation and release, behaviour and ecology, and genetics); protecting pangolin strongholds (including identifying strongholds, patrol-based monitoring and community engagement); policy recommendations (including CITES, legislation and enforcement); and demand reduction, behaviour change and awareness-raising. These actions remain critical to the conservation of pangolins globally, and are intended as a high-level guide for the development of more detailed regional and national conservation strategies.

The First Pangolin Range States meeting was held in Da Nang, Vietnam, in 2015. It was jointly hosted by the governments of Vietnam and the United States, and organised by Humane Society International (HSI) with financial support from the U.S. Fish and Wildlife Service, International Fund for Animal Welfare, HSI, Natural Resources Defence Council and the Freeland Foundation. The meeting was attended by 95 participants, including 56 representatives from 29 African and Asian range States. Its purpose was to foster collaboration between pangolin range states, consuming countries, and other stakeholders, share information on pangolin status and trade and develop a suite of recommendations to mitigate the threats to pangolins from overexploitation as a result of international trafficking. The recommendations include addressing gaps in knowledge of pangolin biology and ecology, legal and illegal harvest and trade, care and husbandry of pangolins in captivity, scientific assessment under CITES and effective law enforcement. The full suite of recommendations was presented as a unified pangolin conservation action plan in to the 66th meeting of the CITES Standing Committee.

▲ **Sunda pangolin foraging for prey © Jeremy Holden**

2.8 Threats and their drivers

There are three main threats to the Sunda pangolin as identified at the workshop. They comprise the direct threat of **poaching, primarily for international trafficking,** which is resulting in the overexploitation of pangolin populations (i.e. more deaths than births); and indirect threats comprising **habitat loss and degradation,** which is facilitating poaching and may be having a direct negative affect on Sunda pangolin populations if the species cannot persist in isolated blocks of monoculture plantation, and the current **conservation response** which, due to a combination of factors, is proving inadequate in the face of these huge and complex threats (Figure 2).

▲ **Sunda pangolins rescued from a house in Indonesia. © WCS.**

2.8.1 Poaching

The Sunda pangolin has been exploited historically for consumptive use locally and internationally which the best available evidence indicates has led to widespread declines in populations of this species (see Section 2.2 and 2.3). Currently, poaching primarily takes place to supply international markets, principally China and Vietnam, with pangolin meat and scales.

A number of factors facilitate poaching. Poaching takes places in both a targeted as well as opportunistic manner across the species' range. This is to meet, in part, the income needs of local people, who in some cases live in absolute or relative poverty and have few livelihood options, and thereby a strong incentive to poach. However, it also involves 'hobbyists', who are otherwise employed but poach pangolins for additional income, and organised criminals that operate with extensive networks of poachers and traffic Sunda pangolins in pursuit of profits from illegal trade. This is facilitated by pangolins being relatively easy to capture once they have been found (e.g., with the assistance of hunting dogs, nets etc.), and by a lack of human resources and capacity among enforcement agencies to effectively tackle trafficking (see below). The development of pangolin farming could in theory lead to increased poaching of animals to stock farms.

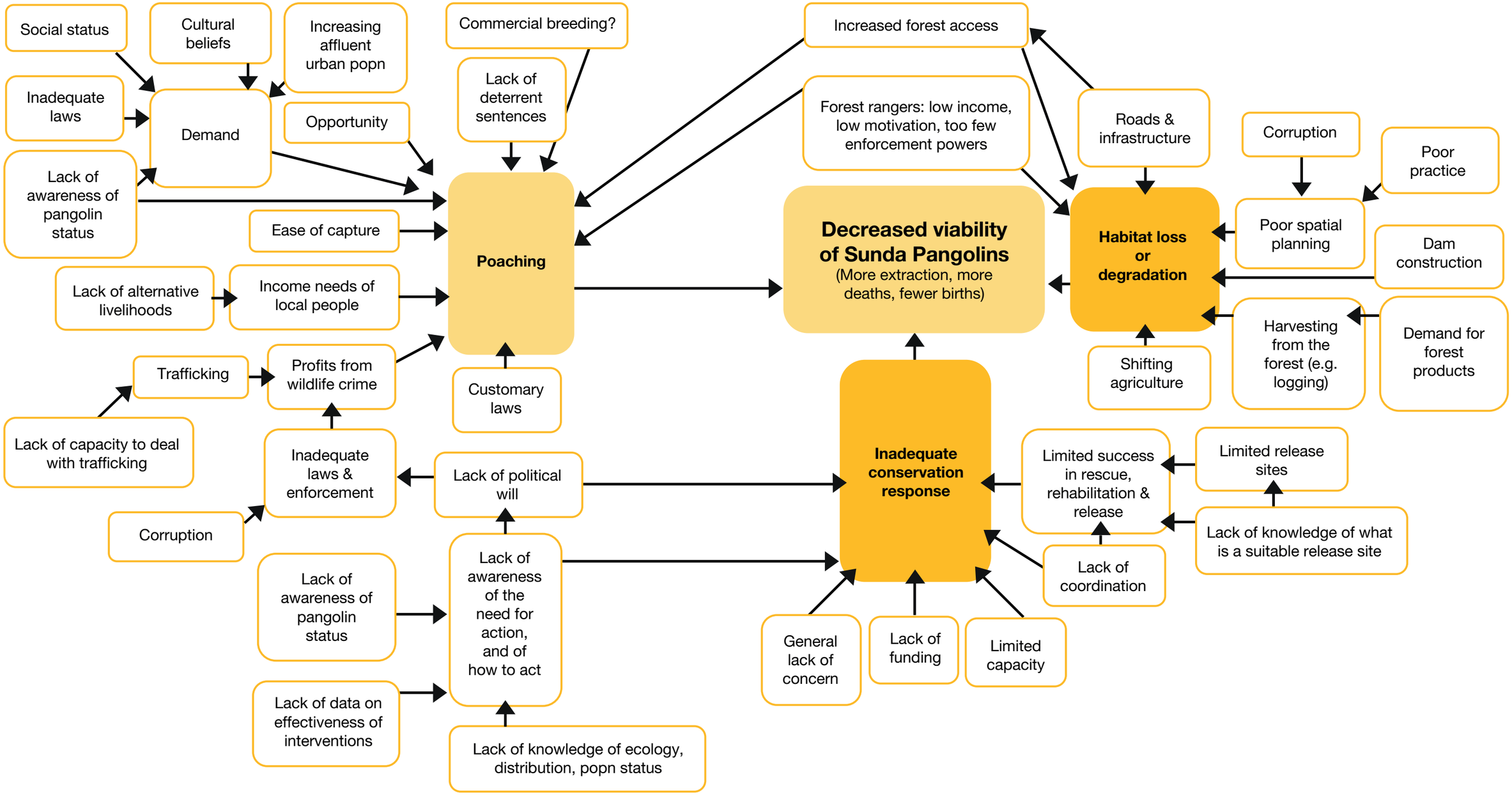
Although customary hunting by indigenous peoples likely occurs across the species' range, the extent to which this is having an impact on pangolin populations is unclear, but it may comprise an additive pressure on populations where the Sunda pangolin is subject to targeted poaching for international trafficking.

International (and national) demand for pangolin products, principally meat and scales, largely in China and Vietnam, but also in other Southeast Asian countries (e.g., Malaysia, Thailand) also drives poaching. The U.S. was also recently highlighted as a destination for pangolin products traded illegally (Heinrich *et al.,* 2017). Available evidence suggests meat consumption takes place among increasingly affluent consumers in urban centres in China and Vietnam at high-end, luxury restaurants. It occurs among kin or peer-based groups and among business associates, for instance when celebrating the signing of business contracts, and in some cases the animals are consumed by government officials (Shairp *et al.,* 2016). Meat consumption is related to reinforcing social status which is important in Confucian societies, and demonstrating wealth, and pangolins can be the most expensive meat on the menu in restaurants in China and Vietnam (Challender *et al.,* 2015) and thereby perform an important social function of reinforcing social status.

Pangolin scales are also in demand primarily in China and Vietnam, despite regulation prohibiting the use of pangolin scales sourced illegally in both countries (Challender and Waterman, 2017; Heinrich *et al.,* 2017). The scales are used as an ingredient in Traditional Asian Medicine (TAM) as they have been for thousands of years, and which is culturally deeply embedded in both countries. Official pharmacopeia in China and Vietnam prescribe scales in medicines for curing skin diseases (e.g., psoriasis), improving blood circulation and for stimulating milk production in lactating women (Chinese Pharmacopeia Commission, 2015). However, evidence suggests that the scales are also used in medicines to treat cancer (Yu and Hong, 2016).

Although official pharmacopeia prescribe scales from the Chinese pangolin only, Sunda pangolin scales are known to be used in medicines in China (Liu *et al.,* 2015). The sale and consumption of certified medicines containing scales in China is permitted and the Chinese government has released an average of 26.6 tonnes of scales onto a legal market in China annually since 2009 for use in traditional medicine (Chinese Biodiversity Conservation and Green Development Foundation, 2016). Despite the certification mechanism, ongoing illegal sale of scales occurs in China, as well as Vietnam (Challender *et al.,* 2015; Xu *et al.,* 2016).

Although there has been a rapid shift towards targeting populations of other pangolin species to supply markets in China and Vietnam in recent years, for example populations in India, Nepal, Pakistan, Bangladesh, Sri Lanka, as well as various African countries, there remains substantial illicit trade in Sunda pangolins



▲ **Figure 2. Known and assumed threats to the viability of Sunda pangolins and their underlying causes, identified by participants at the 2017 regional planning workshop.**

▲ **Sunda pangolin. © Wildlife Reserves Singapore.**

(Challender and Waterman, 2017). Whilst this change in trafficking dynamics might be due to more effective enforcement (i.e. in South Asia and Africa), it could also indicate that traffickers are now harvesting Sunda pangolins from previously inaccessible areas that have opened up, and/or that market forces and demand are causing the trade to shift to areas previously considered too costly to harvest pangolins.

Inadequate enforcement of applicable laws facilitates poaching, as does inadequate numbers of law enforcement personnel, lack of other resources (e.g., equipment), lack of intelligence systems and poorly motivated and remunerated personnel. Inadequate enforcement is linked to a number of factors including a lack of political will to prioritize wildlife crime and pangolin trafficking, corruption, and a lack of awareness among enforcement personal and judiciaries of the legislative protection afforded to the Sunda pangolin. The absence of an effective deterrent from legislation and applicable penalties locally in many parts of the Sunda pangolin's range, means that poaching and trafficking takes place largely unabated.
As a result of these factors most enforcement action on pangolin trafficking comprises seizures that result in an administrative fine only, and where prosecutions do occur, they are usually of actors low down the illegal trade chain as opposed to 'kingpins' (EIA, 2016). Exceptions include instances in China where high level traffickers have been arrested, prosecuted and convicted and have received suspended death sentences for trafficking high numbers and quantities of pangolins and their parts. The lack of convictions is concerning because it occurs while criminal syndicates are increasingly organised (D. Adhiasto, *pers. comm.* 2018). The volume of Sunda pangolins being traded, the use of warehouses as sorting deports/processing areas, and multiple countries being involved, are all strong indicators of the ongoing role of organised crime in Sunda pangolin trafficking. Research on Chinese-led wildlife crime syndicates, operating in Africa and East Asia, suggests that the pangolin trade is increasingly attractive; it is has high profits, and it is considered as low-risk because it is relatively easy to conceal pangolin and their parts, and because enforcement attention on illegal pangolin trade remains low compared to other illicit wildlife trades (e.g. ivory, rhino horn).

2.8.2 Habitat loss and degradation

The Sunda pangolin has been recorded in a wide variety of habitats including grasslands, peat swamp forest, primary and secondary tropical forests, palm oil and rubber plantations, and urban areas, including gardens and cultivated landscapes (Payne *et al.,* 1985; Lim, 2007; Lim and Ng, 2008a; Azhar *et al.,* 2013; Wearn, 2015; Fletcher, 2016; Willcox *et al.,* 2017). Habitat loss is in indirect threat. It results in previously inaccessible areas being opened up making the species more susceptible to hunting and poaching.

Observations of a single female in secondary forest in Singapore (Lim and Ng, 2008a) suggests that large tree hollows are potentially important for breeding Sunda pangolins. Multiple records of Sunda pangolins in U Minh Ha National Park (Willcox *et al.* 2017), perhaps offers proof of this species' habitat adaptability; this is a seasonally-inundated mosaic of grasslands, open swamp and Melaleuca-dominated peat swamp forest.

There are unlikely to be many tree hollows in this habitat (most of the forest is former plantations), and the relatively large number of records in Willcox et al. (2017) suggest that, at least in 2008, that the population was 'likely still breeding. Similarly, in two former palm oil plantations near the Kinabatangan river in Sabah, Malaysia, plantation workers have observed pangolins

resting in branches of palm oil trees *(Elaeis guineensis)* which is also evidence of the species' adaptability (E. Panjang, unpubl. data).

However, further research is needed on the comparative use of, and abundance in natural habitats and artificial landscapes, including the species' ability to persist in isolated blocks of monoculture plantations (e.g., oil palm) long term, assuming poaching can be controlled.

The expansion of roads and commercial concessions (e.g., for mining, hydro-power dams, logging, plantations), opens up previously inaccessible, or relatively hard to access, forested areas which facilitates poachers and traffickers capturing and trafficking pangolins. This type of habitat loss is not restricted to unprotected areas; protected areas in Lao PDR, Cambodia and Indonesia, have experienced significant losses due to the granting of commercial operations and development projects inside protected areas. Shifting agriculture is also a problem where it results in the loss of habitat. Poor spatial planning, often linked to corruption, is an underlying factor to habitat loss and degradation. There is large-scale forest loss through conversion, fragmentation and degradation, with massive forest loss to agriculture (oil palm, rubber, and pulp and paper plantations) particularly in Indonesia, Malaysia and Southern Thailand, and impacts from the growing number of hydropower projects being developed in the region.

2.8.3 Inadequate conservation action

Until recently, there has been an inadequate conservation response to address the threats facing the Sunda pangolin. This has largely been due to a general lack of concern for pangolins among the international conservation community due to a lack of awareness of the status of the species, lack of knowledge about it, a lack of capacity among agencies within range states, and a lack of funding for Sunda pangolin conservation. Fortunately, this has changed in recent years with a growing focus and attention on the trafficking of pangolins and there is now a greater interest in funding pangolin conservation action among international donors. However, there remains a lack of co-ordination and co-operation among different stakeholders and agencies within range states and a lack of agreed priority conservation actions.

3. Conservation Strategy and Action plan

▲ Sunda pangolin rescued from illegal trade in Cambodia. © Wildlife Alliance

3. Conservation Strategy and Action Plan

The following section outlines a range-wide conservation strategy for the Sunda pangolin, for the period 2018 – 2028. This brings together the results of targeted discussions by workshop participants at the 2017 Sunda Pangolin Conservation Planning Workshop and the recommendations for action that arose from those discussions.

Over the three-day planning workshop, and following a series of scene-setting presentations, participants worked collaboratively on:

- A VISION for the long-term future of Sunda pangolins;
- Broad operational GOALS for conservation activity aimed at achieving the Vision;
- A detailed analysis of the ISSUES currently impacting on the viability of the species across its range or impeding effective conservation action;
- A series of OBJECTIVES aimed at addressing these issues;
- ACTIONS to be taken in pursuit of these objectives, including recommendations on where and how action should be taken and who would be ideally placed to take it.

The following pages summarise the outputs of these discussions and the Vision, Goals, Objectives and Actions agreed.

Audience

The Sunda pangolin range stretches across several countries. The species exists both inside and outside protected areas, in forested areas under varying types and intensities of human use, and around agricultural and urban environments. Though a large and diverse group of stakeholders was present at the planning workshop, including national government representatives, it was not possible to include everyone involved in Sunda pangolin conservation and there were gaps in representation at the local and sometimes national levels. However, it is intended that this initial broad-based planning process will trigger further national and local planning in which additional key stakeholders will have an opportunity to define local actions that align with this strategy. With this in mind, this range-wide conservation strategy includes both broad action recommendations designed for further consideration and delegation by in-country agencies as well as more specific action recommendations already committed to by those present at the workshop.

This document is intended as a resource to be used by:

- workshop participants, as a record of the actions, initiatives and collaborations discussed;
- range state governmental agencies, to help guide and inform the development of national or local action plans and initiatives;
- individuals, institutions and ex situ facilities working with Sunda pangolins, to help inform their priorities;
- non-governmental conservation organisations and community groups, to guide and inform their priorities and work plans;
- the IUCN SSC Pangolin Specialist Group, to help in directing conservation-related research and actions, and tracking and supporting progress with the directions and priorities agreed for Sunda pangolins; and
- donor organisations, to guide priority actions for funding support.

Implementation

The implementation of actions in this plan will be monitored and reported on by the Pangolin Specialist Group, primarily through its website (www.pangolinsg.org). People and organisations carrying out projects and actions will be encouraged to notify and communicate their progress to the Specialist Group.

3.1 Vision and Goals

25 year vision for the Sunda pangolin

The Sunda Pangolin is secure and thriving in a variety of habitats across its entire range. Threats have been abated and research has provided a better understanding of this unique species, which is locally and globally appreciated.

Goals

The following goals provide broad operational themes for conservation activity over the next 10 years and beyond.

GOAL 1: Change consumer behaviour to reduce demand for pangolin parts and products.

GOAL 2: Combat illegal trade by strengthening policy and law enforcement.

GOAL 3: Engage local communities to participate in conservation processes.

GOAL 4: Identify and protect areas with important pangolin populations.

GOAL 5: Conduct research to gain a better understanding of Sunda pangolin ecology and behaviour.

GOAL 6: Establish successful systems for rescue, rehabilitation and release of pangolins.

◀ **Top and bottom: Sunda pangolin receiving veterinary care © Wildlife Reserves Singapore.**

3.2 Objectives and Actions

The objectives and actions developed by planning workshop participants are described below, grouped by the relevant goal. Where a specific location is not given in the following tables, the action prescribed applies across the species range.

GOAL 1: Change consumer behaviour to reduce demand for pangolin parts and products.

Demand for pangolin parts and products, primarily scales and meat, is driving poaching and the complex supply chain of traffickers, traders and consumers. Changing consumer behaviour to reduce demand for pangolin parts and products, as well as reducing supply-side influence on demand, is essential to combat illegal trade. Key actions include understanding consumer demand to develop informed behaviour change interventions; supporting law enforcement to reduce the ability of consumers to purchase pangolin products; and understanding trafficking chains to effect behaviour change along the supply chain.

Note that implementation is not expected to be confined to the leads, collaborators and partners listed in this table, this is representative only of the organisations present at the workshop.

Objective 1.1: Reduce consumer demand for pangolin products						
No.	**Action**	**Location**	**Responsibility**	**Timeline**	**Measurable**	**Collaborators / Partners**
1.1.1	Undertake research to understand the full range of pangolin uses, motivations for use and key target audiences, to inform the prioritisation and development of appropriate behaviour change interventions.	China, Vietnam, Malaysia, Indonesia, the U.S. and other existing and emerging key markets.	Save Vietnam's Wildlife, USAID Wildlife Asia, WCS-Indonesia	5 years	Research undertaken and results published.	Universities, TRAFFIC, ZSL, and other NGOs
1.1.2	Develop and implement evidence-based, targeted behaviour change interventions to reduce specific types of demand for pangolin parts (e.g. 'status-enhancing consumption' of pangolins, medicinal use).	China, Vietnam and other existing and emerging markets.	USAID Wildlife Asia, TRAFFIC, WWF-Vietnam, USAID Saving Species, ENV	5 years	Interventions funded, designed, implemented, evaluated and results reported.	ZSL, Save Vietnam's Wildlife, other universities and NGOs
1.1.3	Develop a framework for monitoring and evaluating the impact of behaviour change campaigns on reducing demand for pangolins.	Global	TRAFFIC, USAID Saving Species, USAID Wildlife Asia, WCS	5 years	Working Group formed to develop framework; Monitoring and Evaluation Framework developed.	ZSL, University of Oxford
1.1.4	Identify and implement ways to work with law enforcement agencies to reduce the ability of consumers to purchase/access pangolin products.	China, Vietnam, and other existing and emerging markets.	TRAFFIC, WCS, USAID Wildlife Asia (China), Save Vietnam's Wildlife, ENV	5 years	Strategies developed, implemented, evaluated and reported.	Universities, NGOs, other stakeholders

Objective 1.2: Reduce supply-side influence on consumer demand						
No.	**Action**	**Location**	**Responsibility**	**Timeline**	**Measurable**	**Collaborators / Partners**
1.2.1	Undertake research to identify and understand all actors in the supply chain and the scope of their influence on consumers.	All stages of the supply chain.	Wildlife Alliance (Cambodia)	5 years	Research undertaken and results published.	TRAFFIC, ZSL, and universities and other NGOs
1.2.2	Design and implement strategies to effect behaviour change among key actors in the pangolin supply chain (e.g. medicinal practitioners and pharmaceutical sector, transport sector, hospitality sector, business sector) in order to reduce their influence on consumer demand.	All stages of the supply chain.	Wildlife Alliance (Cambodia) Save Vietnam's Wildlife, ENV, TRAFFIC, USAID Saving Species, WWF-Vietnam (Vietnam) USAID Wildlife Asia (China)	5 years	Strategies funded, designed, implemented, evaluated and reported.	Universities, NGOs, other stakeholders
1.2.3	Identify and implement ways to work with law enforcement to reduce supplier ability to sell/ market pangolin products.	China, Vietnam and other existing and emerging markets	TRAFFIC, WCS, USAID Wildlife Asia, Save Vietnam's Wildlife, ENV	5 years	Strategies developed, implemented, evaluated and reported.	Universities, NGOs, other stakeholders

GOAL 2: Combat illegal trade by strengthening policy and law enforcement.

The Sunda pangolin is severely threatened by high levels of trafficking. Combatting pangolin trafficking in range, transit and consumer countries is often a low priority and lack of capacity and resources impede effective enforcement. Existing legislation is often not applied fully and there is a need to ensure the implementation of international agreements, including CITES, to combat trafficking. To address this threat it is necessary to raise the priority of combatting wildlife trafficking, including pangolins, in range, transit and consumer countries. It may be necessary to increase the legal protection for the Sunda pangolin (as well as all other species of pangolin). There is also a need to increase the profile and knowledge of Sunda pangolins within responsible authorities, particularly the threat from trafficking and potential solutions to this problem. This could be achieved by supporting range states to build capacity to enforce laws effectively, by developing and disseminating a "pangolin trafficking resource kit", and by communicating achievements through the Pangolin SG and its networks.

Objective 2.1: Review and where necessary strengthen, legislation affording protection to pangolins					
No.	**Action**	**Responsibility**	**Timeline**	**Measurable**	**Collaborators / Partners**
2.1.1	Identify gaps in national legislation protecting pangolins (identified priorities include: Indonesia, Lao PDR, Thailand and Vietnam).	Pangolin SG, WCS	2 year	Resources secured; report published on gaps and suggested amendments.	Legal atlas, legal experts
2.1.2	Provide support, where necessary, to range states to amend legislation affording protection to pangolins.	All range states, other CITES Parties, qualified experts.	On-going	No. of agenda items on legislation in pangolin range states at CITES meetings; no. of range states that CITES is providing support to on legislative reform; no. of pieces of national legislation amended.	ZSL, Save Vietnam's Wildlife
2.1.3	Develop pangolin trade resource kit, including; identification guide; sampling guide for large seizures of scales; best practice guidelines on handling, rescue and rehabilitation; guidance on immediate and long-term placement of animals; catalogue of suitable housing facilities for short- and long-term placement.	TRAFFIC, USAID Saving Species, USAID Wildlife Asia, WCS, Pangolin SG	2 years	Resource kit developed and shared with CITES Parties.	ZSL, USAID
2.1.4	Support range states to build capacity, where needed, within front line enforcement agencies.	TRAFFIC, WCS	On-going	No. of training/capacity building events held.	TRAFFIC, WCS
2.1.5	Improve judicial responses and capacity in range, transit and demand States.	TRAFFIC, EIA, and WCS.	On-going	No. of training/capacity building events held.	Pangolin SG
Objective 2.2: Ensure combating illegal trade in pangolins remains a high priority in international fora					
2.2.1	Monitor countries and celebrate successes (e.g., major seizures and convictions) to ensure continued international attention on the pangolin trafficking crisis.	ENV, WCS, TRAFFIC	On-going	No. of successes.	Pangolin SG
2.2.2	Review and identify existing and potential key actors and initiatives (e.g., WCO, IWT Conference process) in order to develop and implement initiatives to maintain pangolins as species of high priority.	EIA, TRAFFIC, Pangolin SG	On-going	No. of initiatives developed; appropriate measures of implementation.	
Objective 2.3: Engage with key actors to reduce trafficking					
2.3.1	Engage with existing initiatives designed to combat wildlife trafficking in non-traditional sectors (e.g., financial crime, transport sectors).	EIA, TRAFFIC, WCS, IUCN, Pangolin SG	Immediate and on-going	No. of sectors engaged; no. of companies engaged (through policies, statements, codes of conduct, enforcement activities).	United for Wildlife Transport Task Force and Financial Taskforce

GOAL 3: Engage local communities to participate in conservation processes.

Preventing poaching at the site level and effectively conserving Sunda pangolins requires the support and active participation of local communities and indigenous peoples. Genuine, long-term buy-in across the species' range is needed, which requires locally appropriate community-focused interventions.

Research into the dependence of local communities and indigenous peoples on the Sunda pangolin, an understanding of local context regarding awareness of legislation, customary rights (e.g., hunting rights), attitudes and behaviour towards pangolins, and local livelihood aspirations, will be needed to support the development of partnerships and programmes with local people.

Objective 3.1: Ensure local communities and indigenous peoples are active partners in Sunda pangolin conservation and prevent poaching at the site level through locally appropriate community-centred interventions.

No.	Action	Responsibility	Timeline	Measurable	Collaborators / Partners
3.1.1	Determine the most appropriate means of securing the long term and genuine buy-in of local communities to Sunda pangolin conservation at sites across its range and develop and implement programmes.	Programs for doing this developed and implemented by stakeholders and organisations who are working at a site with field based programmes.	On-going	No. of projects with long-term and genuine buy-in of local communities to Sunda pangolin conservation at sites across its range.	IUCN CEESP/ SSC SULi
3.1.2	Conduct research to determine the dependence of local communities on the Sunda pangolin, their attitudes and behaviour towards pangolins, and awareness of relevant legislation in order to guide future actions.	Programs for doing this developed and implemented by stakeholders and organisations who are working at a site with field based programmes.	3 years	No. of studies conducted; no of studies published.	Wildlife Asia, WCS, FFI, WWF, Save Vietnam's Wildlife, ZSL
3.1.3	Facilitate targeted youth education programs in local communities within Sunda pangolin's range	NGOs	2 years	No. of students who have taken part in education programs.	Local partners, community organisations

GOAL 4: Identify and protect areas with important pangolin populations

Many sites that contain Sunda pangolins are not adequately protected (e.g., from poaching). A key objective of this strategy is to increase the likelihood of detection of poachers at priority sites for the Sunda pangolin. To do so, a number actions need to implemented within a short time-frame.

These include: ensuring that resources are secured to protect sites at which the Sunda pangolin occurs, and where it could occur (e.g., through release of trade-confiscated animals); and identifying poaching hotspots where enforcement efforts can be targeted on a regional level. It also includes generating support for conserving the species within and around protected areas and among stakeholders (e.g., wildlife rangers and local communities).

Objective 4.1: Identify sites important for conservation of the Sunda pangolin

No.	Action	Responsibility	Timeline	Measurable	Collaborators / Partners
4.1.1	Identify sites important for conservation of the Sunda pangolin.	Pangolin SG, Universities, NGOs	2 years	Research to determine important sites for Sunda pangolin conducted; research published.	Universities, NGOs, other stakeholders
4.1.2	Identify poaching hotspots at national and regional levels.	Wildlife Alliance, WCS, ZSL	On-going	No. of reports produced over time identifying poaching hotspots.	Pangolin SG, organisations and sites using SMART and similar systems
Objective 4.2: Increase the likelihood of detection of poachers at sites identified as suitable for conservation intervention					
4.2.1	Adequately protect sites where the Sunda pangolin occurs or likely occurs.	Wildlife Alliance, WCS, WWF, Wildlife Asia, ZSL	On-going	Number of sites supporting Sunda pangolin meeting IUCN Green List or Conservation Assured Tiger Standards. METT (Management Effectiveness Tracking Tool) scores for protected areas supporting Sunda pangolin.	Range state governments, organisations with field based programmes
4.2.2	Ensure site-based enforcement staff have adequate training, resources, capacity, and appropriate incentives to do their job well.	Wildlife Alliance, WCS, WWF, Wildlife Asia, ZSL	5 years	Number of fully trained, adequately paid and equipped and insured law enforcement rangers patrolling key protected areas supporting Sunda pangolin across the species' range.	Range state governments, organisations with field based programmes

GOAL 5: Conduct research to gain a better understanding of Sunda pangolin ecology and behaviour.

There remain important gaps in our knowledge of the biology, ecology and behaviour of the Sunda pangolin and there are no standardised protocols for monitoring the status of the species or its populations.

Further research is needed to fill these gaps, including but not limited to: home range size in different habitats, comparative abundance in natural vs. artificial habitats, and the ability of the species to persist in isolated blocks of monoculture plantations.

Objective 5.1: Develop a comprehensive understanding of Sunda pangolin biology, ecology and behaviour					
No.	**Action**	**Responsibility**	**Timeline**	**Measurable**	**Collaborators / Partners**
5.1.1	Undertake research to fill knowledge gaps on Sunda pangolin biology, ecology and behaviour.	Range state governments, universities, NGOs, organisations with field based programmes.	On-going	No. of research projects initiated; no. scientific papers/reports published.	Universities, NGOs, organisations with field based programmes
Objective 5.2: Improve monitoring of Sunda pangolin populations					
5.2.1	Develop guidance on monitoring methods for the Sunda pangolin.	Pangolin SG	1 year	Guidance document developed	SG members, other individuals with appropriate expertise
5.2.2	Develop long-term monitoring projects at sites where Sunda pangolin occur.	Range state governments, field-based conservation organisations and stakeholders, NGOs, universities, academics.	On-going	No. of projects initiated; no. of scientific papers/reports published; no. of monitoring protocols published.	Sabah Wildlife Department, University of Cardiff, Save Vietnam's Wildlife, ZSL, National University of Singapore, Katala Foundation Incorporated

GOAL 6: Establish successful systems for rescue, rehabilitation and release of pangolins.

The confiscation of illegally acquired Sunda pangolins is an important area of law enforcement. A network of centres able to accommodate, rehabilitate and where appropriate release, trade-confiscated Sunda pangolins, will provide essential support to this work. The current network of centres is not adequately equipped to fulfil this role. Key areas for development are: increased coordination, capacity-building, staff training and the development of standard protocols for care and management, including release. Inevitably, some pangolins will be unsuitable for release to the wild. Currently there is no consensus on the role (if any) that these animals could play in supporting pangolin conservation. Clarification, in form of a comprehensive ex situ needs assessment, would be helpful especially to those involved in the management of confiscated Sunda pangolins.

Objective 6.1: Increase capacity and coordination of rescue, rehabilitation and release of trade-confiscated pangolins					
No.	**Action**	**Responsibility**	**Timeline**	**Measurable**	**Collaborators / Partners**
6.1.1	Create a captive task force within the Pangolin SG.	Pangolin SG	1 year	Task force created	Save Vietnam's Wildlife, Wildlife Reserves Singapore
6.1.2	Develop standard protocols to guide rescue, rehabilitation and release of trade-confiscated pangolins.	Pangolin SG, Save Vietnam's Wildlife, Wildlife Reserves Singapore	1.5 years	Protocol developed; protocol disseminated to CITES Parties	
6.1.3	Develop a catalogue of suitable facilities for the short- and long term housing of Sunda pangolins within range states and key transit and destination countries. Seek government endorsement of rescue centres.	Pangolin SG, Wildlife Reserves Singapore	1.5 years	Catalogue developed; catalogue disseminated to CITES Parties	Save Vietnam's Wildlife
6.1.4	Develop materials for training and capacity-building workshops, with translation into local languages.	Wildlife Reserves Singapore, Indonesian Institute of Sciences (LIPI), One Stop Borneo, Sabah Wildlife Department, South China Normal University, Taipei Zoo, Wildlife Alliance, Ministry of Natural Resource and Environmental Conservation (Myanmar).	2 years	Training material developed; training modules developed; no. of training events held	Pangolin SG

Objective 6.1: Increase capacity and coordination of rescue, rehabilitation and release of trade-confiscated pangolins					
No.	**Action**	**Responsibility**	**Timeline**	**Measurable**	**Collaborators / Partners**
6.1.5	Build capacity in rescue centres in range states and along major trafficking routes, as needed.	Wildlife Reserves Singapore	On-going	Capacity building plan developed; no. of training events held.	Pangolin SG, Save Vietnam's Wildlife
Objective 6.2: Identify and fill knowledge gaps in the areas of rescue, rehabilitation and release of pangolins					
6.2.1	Identify and fill priority gaps in knowledge of pangolin husbandry (including biology, physiology and behaviour, health issues and nutrition).	Wildlife Reserves Singapore	3 years	Report on priority knowledge gaps.	Pangolin SG, National University of Singapore, National Pingtung University, South China Normal University, Nanyang Technological University, Singapore
Objective 6.3 Explore conservation needs and benefits for managing and breeding of Sunda pangolins in ex situ facilities.					
6.3.1	Conduct ex situ needs assessment for Sunda pangolins.	Wildlife Reserves Singapore	1 year	Needs assessment conducted.	Taipei Zoo, Conservation Planning Specialist Group

4. References

▲ Sunda pangolin about to be released in Singapore. © Wildlife Reserves Singapore.

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▲ **Sunda pangolin consuming preye. © Wildlife Reserves Singapore.**

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