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Ethnozoological assessment of animals used by Mon traditional medicine vendors at Kyaiktiyo, Myanmar

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A B S T R A C T

Ethnopharmacological relevance: Wild animals are widely used in traditional Asian medicine but information from Myanmar is lacking. We show that a wide range of animals are used at a pilgrimage site, mostly for their rendered fats and oils to be used in mixed concoctions. The majority of species were sold to be used to treat aching joints, muscle ache and skin diseases.

Aim of the study: To assess wildlife for sale for medicinal purposes, and document their medicinal use at Kyaiktiyo, a pilgrimage site at a 1100 m tall mountain, with many of the pilgrims climbing to the top. In addition we address legal issues relating to the production and sale of traditional medicine that contain legally protected animals.

Material and methods: Four visits were made to Kyaiktiyo, Myanmar, between 2000 and 2017 to quantify animal parts on display and through discussions with vendors to obtain information on medicinal use of these parts.

Results: Twenty-three species, mostly mammals, were recorded to be used for traditional medicine. The most common were Chinese serow *Capricornis milneedwardsii*, Asian elephant *Elephas maximus*, and Asiatic black bear *Ursus thibetanus*. Over 600 bodies or body parts were present. Combined, these parts purportedly provided cures or relief for at least 15 ailments or diseases. The most commonly mentioned treatment was that of using rendered animal fats/oils externally to relieve/cure aching joints or muscles. This treatment allegedly provides instant relief to pilgrims after an arduous climb up the mountain. Purported cures for various skin diseases was the next common use for the animal species on offer. Ten of the species observed for sale at Kyaiktiyo are listed as globally threatened, and 15 are protected and cannot be legally traded. Ambiguities in Myanmar's legislation mean that protected animals or their body parts cannot be traded, however traditional medicines can be made out of them provided rules relating to the manufacturing of traditional medicines are adhered to.

Conclusion: This study indicated that animals and their parts continue to be openly offered for sale at Kyaiktiyo to treat various illnesses. Despite these products potential medical, traditional or cultural importance, solutions have to been found on how to ensure that, in line with Myanmar's laws, use of traditional local medicine does not impede the conservation of imperilled species.

1. Introduction

Traditional medicine using wildlife products is deeply ingrained in many South and Southeast Asian cultures, which have been harvesting a multitude of species for thousands of years (Lee et al., 2014). In Cambodia, for example, wild plants and, to a lesser extent, animals in traditional medicines are widely used (Ashwell and Walston 2008; Chassagne et al., 2016; Starr et al., 2010). Van and Tap (2008) documented the medicinal purpose, body parts used and monetary value of animal parts traded and used in traditional medicine in Vietnam. In southern India, accounts of ethnozoological use for medicinal purposes have been detailed by Vijayakumar (2015a,b) and Chellappandian et al. (2014). Comparatively little, however, has been documented and reported on animals used for zootherapeutic purposes in Myanmar – in part due to ongoing conflicts and decades of international economic sanctions. As Awale et al. (2006) rightly noted, Myanmar is changing rapidly and the people are moving away from using traditional medicine, thus making it all the more urgent and

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important to document this knowledge. At the same time, Myanmar has intensified its trade relationships with neighbouring countries, especially China, leading to an increase in intra/inter-regional trade in wildlife for traditional medicine, and hence, increasing pressure on already imperilled species (Shepherd and Nijman, 2007; Nijman et al., 2012, 2017).

We present an ethnozoological assessment of animals used by Mon traditional medicine vendors in Mon State, Myanmar, based on repeat visits. Specifically, our aim was to assess wildlife for sale for medicinal purposes and document their medicinal use at Kyaiktiyo, a pilgrimage site at a 1100 m high mountain; many pilgrims make the arduous climb to the top of the mountain by foot. In addition, we address legal issues relating to the production and sale of traditional medicines that contain legally protected animals.

2. Methods

2.1. Study area and site

Mon State is one of Myanmar's 14 administrative divisions, and has a population of just over 2 million people. The Mon have their own language ('Mon'), that once was widely spoken throughout the Indo-Burmese region (Nai Pan Hla, 1992), but nowadays most people in the State use Burmese as their first language. Mon State borders Thailand in the east, and Kyaiktiyo is situated 3.5 h drive from Yangon, Myanmar's economic and cultural centre. During the period from November to April, tens of thousands of pilgrims and tourists visit Kyaiktiyo, Myanmar's third most important Buddhist pilgrimage site. The main object is the Golden Rock, a 7-m large boulder with an equally tall pagoda on top, both covered in gold, that precariously balances on the top of Mount Kyaiktiyo. Pilgrims traditionally walk and climb to the top of Mt Kyaiktiyo from the village of Kinpun (~11 km), but nowadays many take an open-top truck to either the top or to a drop-off point at Yatetaung 1.5 km below the top (and walk / climb the remainder).

2.2. Data collection

Vendors selling animal-based traditional medicines in stalls in Kyaiktiyo were visited four times between 2000 and 2017 (April 2000, February 2006, June 2015, January 2017). Three of the four visits took place during the main pilgrimage season that runs from November to April, and during the June visit many shops were closed. Each survey took no more than two days, and we recorded the volumes of different animals, their body parts and their uses (i.e. what disease/ailment the body part was used for). Wild meats sold in specialised restaurants were excluded from the study because we did not consider them to be traditional medicines sensu stricto (despite allegedly having 'health benefits'). Animal parts sold as trophies and as display material to attract customers were also excluded from the study.

We refer to the participants as 'vendors'; in addition to dispensing medicines and treating customers, they manufactured medicines on site. Interviews with these vendors were mostly conducted in English, with the occasional help of an interpreter. Discussions were held with vendors about the production of traditional medicine, what parts were used for what, and what diseases or ailments each of the body parts were used for. The conversations took the form of a thematic, topic-centred, narrative approach where all aspects of the trade and use of animal parts were covered, but that still had a fluid and flexible structure to allow us to deviate if that was thought to be relevant (cf. Nijman et al., 2017). At the end of the discussion, we repeated key points to ascertain whether we captured the essence of each respondent's opinions and expressions correctly. Respondents did not receive gifts or money for their participation.

Data on the legality of the trade was obtained by conducting a review of Myanmar's primary legislation relevant to what we observed at Kyaiktiyo. Which species can or cannot be traded is covered largely by the Protection of Wild Life and Wild Plants and Conservation of Natural Areas Law (State Law and Order Restoration Council Law No. 583/94.1994) and the trade in traditional medicine is covered by the Traditional Medicine Council Law (The State Peace and Development Council Law No. 2/2000). For all species we list whether or not they are included on Appendix I or Appendix II of the Convention on International Trade in Endangered Species of Wild Fauna and Flora (CITES). Myanmar and its neighbouring countries are Party to CITES. Species (or their parts or derivatives) listed on Appendix I cannot be traded internationally for commercial purposes whereas species listed on Appendix II are subject to strict regulations when traded internationally. Finally, for all species observed at Kyaiktiyo we obtained information on their global IUCN Red List status to gain insight in how this medicinal use affects threatened species (Nijman and Nekaris, 2016).

3. Analysis and statistics

For the analysis, information that was relevant to the present study was extracted and transferred to an Excel database. We used the quantities of each species on display at the stalls, summed for the four visits, as proxies for the abundance of their use for traditional Mon medicine. Quantities were expressed in two ways, the first being items, i.e. the total number of body parts or whole bodies, but excluding derivatives such as oil and fat, and the second being the minimum number of individuals. This was calculated for each visit separately by estimating the minimum number of individual animals that were needed to supply the number of parts offered for sale, and assuming perfect distribution among vendors. For example two canines and a complete skull (with teeth) must have been derived from two animals, whereas a skull and a skin, displayed by one vendor or by two, may have derived from just one single individual (but it could have been two separate individuals, hence the *minimum* number).

The data from the four surveys was pooled for analysis because the number of stalls selling particular body parts in 2000 and 2006 was strongly correlated with the number of stalls selling that same body part in 2015 and 2017, suggesting a high consistency in what vendors sell.

Non-parametric statistics (Spearman rank correlation coefficients and chi-square tests) were used to test for relationships between abundance, number of stalls, and stated medicinal use. Statistics were run in R and we accept significance when $P < 0.05$ in a two-tailed test.

4. Results

4.1. Quantitative assessment of animals offered for sale at Kyaiktiyo

Twenty-seven shops sold animal-based medicines in 2000, 24 shops sold these medicines in 2006, nine shops in 2015, and 25 shops in 2017. We recorded 622 bodies or body parts (excluding porcupine quills and bottles of allegedly pure bear fat) from 23 species that were offered for sale as traditional medicines (Table 1) during the study period. All but two species were mammals. The most common species on display in terms of number of items was the Chinese serow (*Capricornis milneedwardsii*) (n=161 items), followed by Asian elephant (*Elephas maximus*) (n=159 items) and Asiatic black bear (*Ursus thibetanus*) (n=82 items) (Table 2).

Skulls were particularly abundant (n=213 items), as were legs or paws (n=113 items), whole heads (sometimes with shoulders) with skin and tissue attached / carcasses (n=88 items), and skins or skin pieces (n=71 items) (Table 2). The most common type of medicine at Kyaiktiyo is a medicinal ointment made from a variety of animal juices, oils and fat (Fig. 1). The oil is rendered from the animal remains, including whole bodies, legs, horns and / or antlers, skulls or other bones, and left to ferment in cauldron on top of a large metal bowl.

Table 1
Overview of animals offered for sale for medicinal purposes at Kyaiktiyo market, Myanmar. Items refer to body parts or whole animals, but exclude derivatives.

Variable	Apr 2000	Feb 2006	Jun 2015	Jan 2017	Overall
Number of stalls	27	24	9	25	> 27
Number of species	18	12	10	16	23
Items	232	143	28	249	652
Mean number of items / stall	8.6	6.0	3.1	10.0	7.7
Protected species in Myanmar	13	10	6	13	18
IUCN globally threatened species	11	9	5	11	14

These cauldrons and bowls are prominently displayed in the front of the shops, and most cauldrons have one or more serow heads on top of all other animal parts. The liquid is sieved through a layer of fat (mostly from Asiatic black bears or serow), herbs, woody mushrooms, citrus fruits and fragrant wood chips. The ointment, often mixed with small Eucalyptus wood chips, is sold in bottles (~100–500 ml, rarely 1 l). According to the vendors, the active ingredients are all derived from the animal parts and not from the plants; plants are only added to enhance the aroma.

There was a strong correlation between the number items and minimum number of individuals on display (Spearman Rank Correlation, r=0.925, n=22, $P < 0.001$). Furthermore, species with a larger number of items on display were sold by more vendors (r=0.929, n=22, $P < 0.001$) (Fig. 2). The number of shops that displayed wildlife differed between years (χ^2=9.63, df=1, P=0.02), as did the number of items on offer in each shop (χ^2=3.98, df=1, P=0.05) but not the number of species that were recorded to be used for medicinal purposes (χ^2=2.85, df=1, P=0.09) (Fig. 3). Apart from 2015 (when the survey was conducted during the non-peak pilgrimage season), 12–18 species were typically on offer, with between 6 and 10 items per stall (Table 1).

Apart from porcupine quills and sambar deer antlers that were potentially shed naturally (though it is more likely these animals were all killed for meat and body parts), all body parts on display at Kyaiktiyo can only be obtained by killing the animal. Some of the skulls and teeth could, in theory, be obtained after the animal has died of natural causes. Ten of the observed species are, according to the IUCN Red List assessments, globally threatened with extinction (i.e. pangolin, gibbon, bear, clouded leopard, leopard, tiger, binturong, elephant, deer, and the dolphin), and 17 species are protected under Myanmar law and cannot be traded legally.

4.2. Diseases, ailments and therapies

The ailments most commonly mentioned as being treated with animal-based medicines are: aching joints (11 species, 15 body parts), muscle ache (9 species, 13 parts), and skin diseases, (whitening of the skin, eczema, boils and piles) (4 species, 6 body parts) (Table 2). Other diseases mentioned were cataracts, broken bones, nosebleeds, headaches and reduction of swellings. As a way to entice pilgrims to purchase medicine, many of the vendors offer leg massages (and less often arms and neck massages) and for this purpose have one or more benches positioned opposite their stalls. Given that many pilgrims have just completed an arduous climb to reach the top of Mt Kyaiktiyo, there is no shortage of willing customers.

There is a positive correlation between the number of species that were used to treat a particular ailment and the mean number of items that are used (Spearman Rank Correlation, r=0.422, n=9, P=0.257), as well as between the number of species and the mean number of items that were observed (r=0.516, n=9, P=0.155) but neither was statistically significant. Hence, the more species are used to treat an ailment, the more items are used in these treatments.

More common species, or at least species that were more commonly on offer, are the ones that were said to cure the largest number of ailments. The number of diseases or ailments each species purportedly cures ranges from 1 to 6. Species that had a larger number of items on display, and are sold by more vendors, cure more diseases (r=0.519, n=22, P=0.01 and r=0.531, n=22, P=0.01 for items and vendors, respectively).

5. Discussion

As far as we are aware, this is the first ethnozoological assessment of animals used by Mon traditional medicine vendors at Kyaiktiyo; additionally Shepherd (2001), and to a lesser degree Martin (1997) gave accounts of wildlife observed at Kyaiktiyo and Shepherd (but not Martin) provided selected accounts of the various uses of animal parts in traditional Mon medicine. While our assessment is comprehensive, similar to what was reported for Lao by Baird (1995) we recognize that even amongst the same ethnic group there can be a considerable amount of variation in traditional medicine usage and trade. In part this depends on living situations, geographical locations of the people concerned, and access to modern medicine. Kyaiktiyo, as a pilgrimage site, is very different than a rural village close to the border with Thailand or one of Myanmar's larger cities. As such it is also very different from where other ethopharmacological studies are normally conducted. We further acknowledge that the Mon have seen considerable change in the past (Nai Pan Hla, 1992) and that recent changes in the economic and political climate in Myanmar will lead to more change to come.

We found that most of the animal-based medicine was used to treat aching joints and muscles, and, to a lesser degree, skin diseases (Table 2). To this end, vendors offer massages of the legs, arms and neck. The preponderance of treatments for aching joints and muscles may be a unique feature of Kyaiktiyo as pilgrims make an arduous climb to the top of the mountain. Data from the four surveys indicate that the composition of species that were on display differed between years (Table 2); however, five species were recorded in all four sampling years and are thus most commonly used for traditional medicine at the pilgrimage site (macaques, Asiatic black bear, Asian elephant, Chinese serow and Malaysian porcupine) (Table 2). More importantly, there was great consistency between years in the diseases and ailments that the vendors listed, and to which the Mon traditional medicine allegedly offered relief (Table 3).

The only other study that systematically documented the use of animals in traditional medicine in Myanmar that we are aware of is Awale et al. (2006). They documented the use of animals in traditional medicine in Sittwe Township, Rakhine State, and listed seven species. These were one unidentified animal listed as *Trigon zegyi* (possibly a skate, Rajidae) and the sea snail (*Cypraea eglantine*) (cures for urinary disorders, wind disorders and gout), the staghorn corals (*Acropora concinna* and *A. brueggemani*) and flowerpot corals (*Goniopora stutchhunyi* and *G. lobata*)(cures for urinary disorders, wind disorders, gout, diarrhoea, fever, headache, indigestion, and food poisoning) and blood of the water buffalo (*Bubalus bubalis*) (cure for fever, bowl disorder, giddiness, heart palpitations, insomnia, jaundice, cold and cough, small pox and measles, heat prostration, and blood and bile disorders).

While each animal or each different part was used often for the treatment of various diseases, there are some commonalities between our findings and that of others in South and Southeast Asia. For instance, researchers in South India report, like us, the use of small Indian civet (*Viverricula indica*) for the treatment of acne, elephant teeth for the treatment of skin diseases and pimples, macaque (*Macaca* spp.) bones for general pain relief, wild pig (*Sus scrofa*) fat to relief muscular pain, and sambar deer (*Cervus unicolor*) antlers for the treatment of fever and cough (Vijayakumar et al., 2015a,b; Chellappandian et al., 2014). In Laos, there are reports of the use of

Table 2
Species body parts and reported uses in Kyaiktiyo market, Myanmar; TP=Totally protected, P=Protected, SP=Seasonally protected (Protection of Wild Life and Wild Plants and Conservation of Natural Areas Law; State Law and Order Restoration Council Law No.583/94.1994). IUCN Red List status: CR=Critically Endangered; EN=Endangered; VU=Vulnerable; NT=Near-threatened. CITES: I=Appendix I; II=Appendix II. Shops refer to the number of shops selling a particular part in 2000, 2006, 2015 and 2017.

Species	Status	IUCN Red List status	CITES	Body parts	Number of parts**	Shops	Medicinal use according to vendors
Pangolin *Manis* spp (Linnaeus, 1758)	TP	EN/CR	I	Scales	12	0/0/0/1	Reduces swellings; cure for boils
Pangolin				Skin	3	1/0/0/0	Reduces swellings; cure for boils; cure for children's diseases
Macaque *Macaca* spp. (Lacepede, 1799)	P	NT/VU	II	Skull	74	5/5/2/17	Rendered; oil for treating aching joints; muscle ache
Langur *Trachypithecus* spp. (Reichenbach, 1862)	P	NT/VU/EN	I/II	Skull	20	0/0/0/8	Rendered; oil for treating aching joints; muscle ache
Gibbon *Hoolock* spp. (Mootnick and Groves, 2005)	TP	VU/EN	I	Skull	2	0/1/0/1	Rendered; oil for treating aching joints; muscle ache
Asiatic black bear *Ursus thibetanus*** (Cuvier, 1823)	P	VU	I	Skull	24	4/6/2/6	Made into paste; treatment for children's mouth diseases
Asiatic black bear				Paws	58	4/6/1/2	Rendered; oil for treating aching joints
Asiatic black bear				Fat	80+ bottles	10/5/3/11	Improves hair condition; applied on skin to whiten skin blotches
Sun bear *Halearctos malayensis* (Horsfield, 1821)	TP	VU	I	Paws	2	0/1/0/0	Aphrodisiac
Binturong *Arctictis binturong* (Raffles, 1822)	P	VU		Carcass	3	1/1/0/0	Rendered; oil for treating aching joints
Binturong				Paws	5	0/2/0/0	Aphrodisiac
Small Indian civet *Viverricula indica* (Hodgson, 1838)	P			Skin	1	0/0/0/1	Rendered; oil for treating muscle ache; acne
Otter *Lutra* spp. (Brunnich, 1771) or *Aonyx* spp. (Lesson, 1827)	TP	NT/VU/EN	I/II	Carcass	1	1/0/0/0	Charred; rendered; oil for treating aching joints
Otter				Penis	3	0/1/0/0	Stimulates the sex hormones
Leopard *Panthera pardus* (Linnaeus 1758)	TP	VU	I	Penis and testes	1	1/0/0/0	Aphrodisiac; stimulates sex hormones
Leopard				Skull	16	2/0/0/3	Rendered; oil for treating aching joints
Clouded leopard *Neofelis nebulosa* (Griffith, 1821)	TP	VU	I	Skeleton	4	1/1/0/0	Rendered; oil for treating aching joints
Clouded leopard				Paws	7	1/1/0/0	Aphrodisiac
Tiger *Panthera tirgris* (Linnaeus, 1758)	TP	EN	I	Bones, skull	32	1/1/0/1	Rendered; oil for treating aching joints
Asian elephant *Elephas maximus* (Linnaeus, 1758)	TP	EN	I	Skin pieces	65	4/7/3/7	Cure for fungal skin infections; bruising; eczema
Asian elephant				Soles of feet	11	3/0/0/1	Paste applied to skin to cure hernia
Asian elephant				Leg bones	3	2/0/0/0	Turned into paste; cure for piles; bruising; skin infections
Asian elephant				Molars	48	5/7/2/12	Made into paste; reduces acne and bruises; whitens skin blotches
Wild pig *Sus scrofa* (Linnaeus, 1758)				Skull	9	2/0/2/4	Rendered; oil for treating muscle ache
Sambar deer *Cervus unicolor* (Kerr, 1792)	P	VU		Feet	5	0/0/1/2	Rendered; oil for treating muscle ache
Sambar deer				Antlers	7	0/0/0/4	Fever; cold
Muntjak *Muntiacus* spp. (Rafinesque, 1815)	SP			Skull + antlers	23	4/0/5/2	Rendered; oil for treating aching joints; muscle ache
Chinese serow *Capricornis milneedwardsii*** (David, 1869)	TP	NT	I	Head + horns	56	7/5/2/17	Rendered; oil for treating aching joints; muscle ache
Chinese serow				Skull + horns	32	1/3/5/13	Rendered; oil for treating aching joints; muscle ache
Chinese serow				Horns	30	0/0/3/11	Rendered; oil for treating aching joints; muscle ache; cataract
Chinese serow				Tongue	2	1/1/0/0	Cure for broken bones
Chinese serow				Legs	36	1/6/0/2	Rendered; oil for treating aching joints; muscle ache
Giant flying squirrel *Petaurista* spp. (Link, 1795)				Carcass	1	1/0/0/0	Charred; rendered; oil for treating aching joints
Asian brushtailed porcupine *Atherurus macrourus* (Linnaeus, 1758)				Carcass	1	0/0/0/1	Quills stop nose bleeds
Malayan porcupine *Hystrix brachyura* (Linnaeus, 1758)				Quills	50+ bundles	11/6/2/12	Dipped in lime; to cure headaches
Irrawaddy dolphin *Orcaella brevirostris* (Owen in Grey, 1866)		VU	I	Skin, fins, fat	2	2/0/0/0	Rendered; oil for treating aching joints
Great hornbill *Buceros bicornis* (Linnaeus, 1758)	TP	NT	I	Skin	2	1/0/0/0	Applied on skin to whiten skin blotches
Python *Python* spp.* (Daudin, 1803)	P		II	Carcass	24	4/3/2/5	Rendered; oil for treating aching joints

**Pooled from four visits.

* Both *P. reticulatus* and *P. molurus* skins were observed; the identity of the carcasses could not be established. ** Parts that were identifiable to the species-level were consistent with the species listed here, but we acknowledge that some less-identifiable parts may be derived from other, related, species.

Fig. 1. Traditional Mon medicine for sale at Kyaiktiyo, Myanmar. Left: Mixture of animals used for the production of traditional Mon medicine, including leopard, muntjak, macaque and Chinese serow (2000); Right, from top to bottom: Production of serow oil, with the rendered far and oil being collected in the metal bowl and empty bottles ready to be filled (2000); Bowl and cauldron with remains of Chinese serow, macaques, and pythons, with the bottled end-product surrounding them (2017); Mon vendor offering various Asian elephant parts for sale for medicinal use (2000).

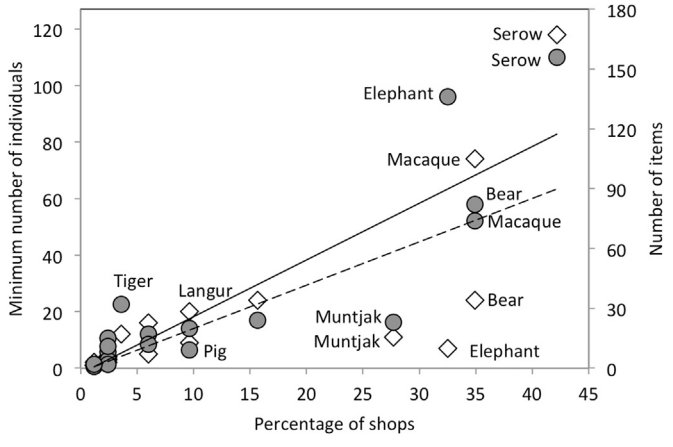

Fig. 2. Prevalence of wild animal species used for medicinal purposes at Kyaiktiyo, Myanmar expressed as the percentage of shops offering the species. Diamond is the minimum number of individuals and circles is the number of items. The continuous regression line is for the number of items and the dashed regression line is for the minimum number of individuals.

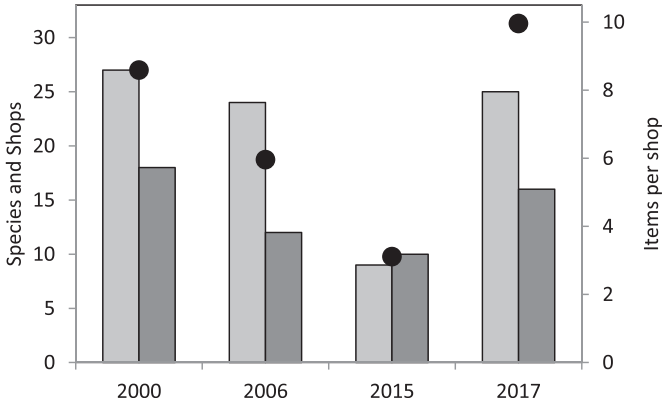

Fig. 3. Number of stalls (light grey bars), number of species (dark grey bars) and average number of items displayed per stall (black dots) at Kyaiktiyo, Myanmar during four surveys between 2000 and 2017.

deer antler as a cure for colds and fever, elephant bone for skin diseases and elephant skin for back ailments, tiger (*Panthera tigris*) bone for rheumatism, langur (*Trachypithecus* spp.) bones, python (*Python* spp.) oil and serow oil as a cure for tendon pain, and pangolin

Table 3
Seven most common ailments for which traditional medicine are offered at Kyaiktiyo, Myanmar according to Mon vendors. For types of body parts (e.g. skin, skulls, teeth) see Table 1.

Ailment / disease	Species (% total)	Types of body part (% of total)	Items (% total)
Aching joints	11 (47.8)	15 (39.5)	409 (65.8)
Muscle ache	9 (39.1)	13 (34.2)	291 (46.8)
Skin diseases (incl. whitening, eczema, boils)	5 (21.8)	7 (18.4)	119 (19.1)
Aphrodisiac	5 (21.8)	5 (13.2)	16 (2.5)
Reduction of swellings	1 (4.3)	2 (5.3)	15 (2.4)
Headaches	1 (4.3)	1 (2.6)	50 (8.0)
Broken bones	1 (4.3)	1 (2.6)	2 (0.1)

(*Manis* spp.) scales as a cure for children's diseases (when the mouth and the tongue are white) (Baird, 1995). Similarly, for Viet Nam there are reports of parts of macaques and tigers being used for the treatment of back ache or arthritis, and pythons for back ache (Van and Tap, 2008). Finally in Cambodia researchers report serow to be used for the treatment of broken bones (Chassagne et al., 2016). However, the same or similar species may be used for a wide variety of other ailments as well and species not recorded at Kyaiktiyo may be used to treat a range of similar diseases and ailments.

In recent years the Myanmar government has developed policies to encourage, standardize and regulate the use of traditional medicine in the country (Anonymous, 2015). Traditional medicine can, and according to the government perhaps should, be used alongside, in harmony, with modern medicine. The manufacturing and trade in traditional medicines have to adhere to the Traditional Medicine Council Law, and licences are required to sell and to manufacture traditional medicine in Myanmar (Anonymous, 2015). All traditional medicines have to be registered with the Ministry of Health and manufacturing has to follow specific standards. The Department of Traditional Medicine is tasked with regulation of production of licenced manufacturers, and it monitors the advertisement of traditional medicine drugs. It is highly unlikely that any of the vendors at Kyaiktiyo are licenced to produce traditional medicine (none displayed licences) and production is not standardised. Traditional medicines that are not registered are not allowed to be manufactured and are not allowed to be sold; offenders can be fined up to MMK30,000 (USD30) and / or face up to 3 years imprisonment.

Within Myanmar legislation, there appears to be ambiguity on how to deal with the manufacturing and trade of traditional medicine made out of legally protected animals. The Protection of Wildlife and Wild Plants and Conservation of Natural Areas Law of 1994 makes it illegal to kill, poses, or trade in protected species (fines can total MMK30,000–50,000, i.e. USD30-50 and/or between 3 and 5 years imprisonment). However, the possession, use, sale and transport of drugs made out of (parts of) protected wildlife is exempt. The export of traditional medicine containing rare and protected wildlife, specifically those that are listed on CITES, has to be accompanied by appropriate paperwork, and needs to be reported annually to the CITES Secretariat. Between 2010 and 2016, i.e. over the duration of our study, Myanmar has not reported the export of any (medicinal) extract or derivative, or medicine, of a CITES-listed species.

Recent political and economic changes in Myanmar have resulted in an increase in trade, especially from and to China and Thailand, and many more foreign visitors now visit the country. In the absence of regulation, the renewed demand for traditional medicine, in a country with some 55 million people, can have serious implications for the conservation of the wild plant and animals that are harvested to meet the medicinal demand.

Author contributions

Initiated the study: CSR, VN; Data collection: CSR (2000, 2006), VN (2015, 2017); Data analysis: VN; Wrote paper: VN, CSR.

Disclosure

The authors have no conflict of interest to declare.

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