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Jean-Marc Dubost, Eric Deharo, Sysay Palamy, Chithdavone Her, Chiobouaphong Phaekovilay, Lamxay Vichith, Sébastien Duffillot and Sabrina Krief

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Interspecific medicinal knowledge and Mahout-Elephant interactions in Thongmyxay district, Laos

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Introduction

1 There has been a recent surge in research conducted on animal self-medication and on ethnoveterinary practices leading researchers to focus on local convergences of plant use for medicinal purposes between humans and animals (Gradé *et al.* 2009; Greene *et al.* 2020; Krief *et al.* 2006a, 2005; Krief & Brunois-Pasina 2017; Masi *et al.* 2012). From here the question of the origin of these convergences and the possible processes of their emergence was raised. In addition to the hypothesis of a convergent and independent acquisition of medicinal knowledge by different species, Krief et Brunois-Pasina (2017) have formulated two other concurrent hypotheses to account for these uses shared by humans and animals (in this case, chimpanzees living in Kibale Park in Uganda), that of a phylogenesis of behaviors that was already present in an ancestor common to both species, or that of an interspecific transmission of knowledge and know-how using plants. In the latter case, the authors raise the following questions: "...does this transfer of knowledge [...] occur according to mutual communication or observation modalities, unique to the two species? Does it involve mechanisms of mimicry, imitation and borrowing? Does it reflect a relationship of partnership or cooperation that would be the privilege of these two species, suggesting an interspecific genesis of these shared therapeutic behaviors, and beyond that, of the social complexity of the actors?" (Krief & Brunois 2017 –our translation). In this paper we will discuss these questions

regarding the modalities of the emergence of interspecific medicinal knowledge based on the relationship between two species sharing a same environment, namely the mahouts and their elephants in a region of Laos where the elephants are still periodically released into the forest. The choice of this relationship between humans and elephants seemed to us to be particularly appropriate for addressing these issues as mahouts, through the care they give their elephants, stand at the interface between the self-medicating behaviours they observe in their animals, and traditional local medicine. In addition, as elephants and humans have similar life spans, it is not uncommon for a mahout to share several decades of his life with the same animal, allowing him to get to know it well and to observe how it responds to its needs according to its physiological state. Furthermore, elephants have remarkable memory and cognitive abilities which, combined with a complex social life and a propensity for empathy and mutual aid between conspecifics (Lee & Moss 1999; Byrne & al. 2008; Waal 2008; Hart *et al.* 2008; Plotnik *et al.* 2011; Plotnik & Waal 2014), make it possible to consider, such as in the great apes, the possibility of intraspecific transmissions of medicinal knowledge between individuals.

2 We will highlight here the role and nature of human-elephant interactions in the medicinal practices (ethnoveterinary and human) of the mahouts and discuss the possibility of interspecific transfers of knowledge between the two species considered. We will draw on the material collected and presented in two previous studies (Dubost *et al.* 2019, 2021), supplemented here with ethnological data collected on the status of these elephants in the study community, as well as from data collected from local healers, and advances in ethology research on animal self-medication and the role of social learning in this field. We will then see in what way the emerging concepts of hybrid communities and multispecies ethnology are particularly relevant to account for the multiplicity of these human-animal interactions, and to consider the preservation of the resulting co-produced knowledge.

Background

Elephants and humans: a long history of cohabitation

3 The history of the relationship between humans and elephants in Africa and Asia began long before their hunting -which seems to date back at least to the Acheulean period over 400,000 years ago (Ben-Dor *et al.* 2011)- or their domestication. Indeed, elephants (and probably other proboscideans such as mastodons or mammoths) have landscaped vast areas of forest connecting grazing areas, salt marshes, and waterholes through a network of paths that they create and travel (Haynes 2006; Remis & Robinson 2020). Thus, these giants have provided routes into and through the forest that have been used by people and animals since time immemorial, especially as many of these routes lead to vital spots, and are enriched with a wide variety of nutritious species due to the ability of these 'mega-gardeners' (Campos-Arceiz & Blake 2011) to disperse seeds from consumed fruits over long distances (Remis & Robinson 2020). Recent examples of human migration and colonisation along these routes indicate that human settlement in forests, both in Africa (*ibid*) and Asia (Keil 2020, 2016), may have followed these routes, which are still widely used by local people and elephants. Keil (2016) notes that in India a modus vivendi seems to have been established between the two species, who

use them at different times of the day, thus limiting the inconvenience of untimely encounters, and maintain them by regularly clearing any unexpected obstacles that may clutter them.

4 Furthermore, Asian elephant populations reach their highest density along ecotones between forested and cultivated areas, where the species that make up the bulk of their diet are more abundant and accessible (Sukumar 2003; Fernando *et al.* 2005; Fernando & Leimgruber 2011; Yamamoto-Ebina *et al.* 2016). Slash-and-burn agriculture, which maintains a mosaic of open and forested ecosystems and promotes successional vegetation rich in species valued by elephants such as bamboo, is therefore a particularly favourable habitat for elephants (Fernando & Leimgruber 2011). Thus in the wooded hill regions where slash-and-burn is widely practised, if human settlement was able to follow the pathways opened up by elephants in the forest cover, it is likely that the elephants in turn have accompanied the progress of humans in their colonisation of these areas, which they continued to open up through their clearing practices.

Social learning in elephants and feeding behavior

5 Elephants in Asia (*Elephas maximus*) and Africa (*Loxodonta africana, Loxodonta cyclotis)* are highly social animals. Females live in groups resulting from the association of basic units consisting of a female and her offspring (Lee & Moss 1999, 2014; Fernando & Lande 2000; Vidya & Sukumar 2005; De Silva *et al.* 2011). The dependence of juveniles on the group extends until puberty. This slow maturation of juveniles, coupled with a long social dependence on the group, is likely to promote social transfers of knowledge. The baby elephant begins to take solid food at around four months of age, but weaning is gradual and takes place between three and five years of age. Although the majority of calf care is provided by the mother, other females (allomothers) in the group also play an important role (e.g., comfort feeding, protection and assistance) (Byrne *et al.* 2008; Lee, 1987). This dependence on food also extends over a long period of time - up to four years in African elephants (*Loxodonta africana*) due to their size, which limits the diversity of plant parts available to them (Lee and Moss 1999). This is also the case for elephants in Southeast Asia (*Elephas maximus*) which live in wooded areas and whose diet is mainly made up of plant parts that grow high or are difficult to collect (e.g., leafy branches, bark and tree roots), especially during the dry season when the herbaceous layer is poorly developed (Figure 1).

Figure 1: A male in Laos stripping and consuming the bark of a tree

Photo JM Dubost

6 Lee *et al.* (*ibid*) observed in African elephants (*Loxodonta africana*) that this food dependence of the juveniles is the reason why social learning and interaction with adults play such an important role in the construction of their feeding behaviour, noting that "Opportunities to learn about and sample diets depend less on direct experience with food types but are more a function of sampling and observation within a social context". Thus, they observe frequent behaviours of calves inspecting other elephants' food when they eat, and placing their trunks in their mouths to remove plant material, behavior also reported by Sukhumar (2003) in the Asian elephant. It is important to keep these features in mind when considering issues related to intraspecific transmission of possible medicinal knowledge involving the ingestion of plant substances by elephants.

Elephants in Laos

7 The elephant is an emblematic species of Laos, formerly known as Lan Xang or the Kingdom of the Million Elephants. Although enjoying a prominent status in this country, whose foundation is legendarily associated with this animal (Zago 1972; Vo 1993) the population of wild elephants (*Elephas maximus*) in Laos which was estimated at 2000-3000 in 1988 (Phanthavong & Santiapillai 1992) had drastically reduced to only 600-800 individuals in 2009 (Khounboline 2011). The number of domesticated elephants has also declined sharply and is now comparable to their wild counterparts (Khounboline 2011; Suter 2017). In villages, domestic elephants often have several owners within the same family, but usually one of them is particularly responsible for looking after them and is considered their mahout. Globalisation, industrialisation, deforestation and increasing agricultural encroachment, which are reducing the available space where these elephants are let to feed, as well as the increased use of biomedicine, are changing both the relationship between humans and elephants and their management, particularly in relation to elephant care practices (Suter 2010). Laos is currently witnessing a shift from village elephants - which are no longer used for transporting goods and are employed less and less in the now-regulated logging industry - to tourist-oriented elephant resorts where young inexperienced mahouts are often employed (Suter *et al.* 2013; Maurer *et al.* 2020), leading to a breakdown in the transmission of traditional elephant-related knowledge. There is therefore an urgent need to document this knowledge, which is part of the cultural heritage of Laos and could contribute to better management of elephant health and their welfare in these elephant camps.

8 Until quite recently, unlike other domesticated species that make up the Laotian village which breed within the anthropised sphere of which they are a part and are cut off from their wild counterparts, village elephants were recruited by capture, or born from the mating of village females with wild males (Maurer *et al.* 2017). Evidence from mahouts interviewed suggests that reproduction within the village was not really controlled or sought after, particularly as a young elephant does not acquire the strength to perform the tasks required of it until it reaches the age of 15. Thus, females were mostly impregnated by wild males during the release periods. These releases of elephants were the result of a management system based on the seasonality of the tasks assigned to them. Indeed, according to the mahouts, until the recent development of road infrastructure (about 30 years ago for Thongmyxay District) and the advent of

motorised vehicles, elephants were used mainly for transporting goods –predominately rice after the November harvest - and on demand for occasional logging to provide timber for local use. These activities took place during the dry season, from November to April, when the terrain was passable. During this period elephants were simply tethered and left in nearby woodland or tied with a 30-40m long chain and moved once or twice a day to renew their browsing area and allow them to drink. At the beginning of the rainy season (June-October), when all available human resources were taken up by crop growing, the elephants were released in small groups into the forest. They were visited from time to time and sometimes returned on their own at the beginning of the dry season (November-May), otherwise the mahouts would go looking for them and bring them back. Thus these elephants moved seasonally between the forest, where they enjoyed a large degree of autonomy, and the village, where they resumed their status as "domestic animals"[1].

The ritual framework surrounding the mahouts' relationship with their elephants

9 The status of domesticated elephants should be considered in the more general context of the *pa/ban* polarity, where *pa* means 'forest' or 'wild'[2] and *ban* 'village'. Thus, in Laotian, a distinction is made between *sang ban* (village elephants) and *sang pa* (wild elephants). This polarity, which can be found in many cultures and is widely spread in Southeast Asia, also structures the space of the communities in Laos and their relationship with their environment. As wild elephants are under the guardianship of the forest spirits or *phi pa*, when one of them was captured it had to be released from their control and placed under the control of the village spirits or *phi ban*. To this end, the elephant's training is preceded by a ceremony designed to drive away the forest spirits that inhabit the elephant and is concluded by another ceremony that confirms its status as a village elephant or '*sang ban*' (Maurer 2018). This transfer does not seem to be reduced to a simple change of guardianship, but operates a transformation in the animal which thus acquires the ability to be trained, to understand humans and to obey them.

10 The district of Thongmyxay where this study was carried out is mainly populated by the Lao Tai ethnic group. This ethnic group, which is dominant in Laos, is of Buddhist obedience, but many elements from an animist substratum pre-existing the adoption of this religion have been integrated into their religious and ritual practices. Thus, many aspects of daily life are linked to relationships with vital principles called *kwan*, which animate humans and animals, but also certain objects or natural elements and phenomena, and invisible spirits also endowed with subjective agency, the *phi*. The *kwan* have a propensity to wander and can be taken over or misplaced by malevolent *phi*, or leave the body following a shock or illness, disturbing the balance and integrity of the entity they inhabit (Ngaosyvathn 1990; Elliott 2021). Ceremonies called *su kwan* (*su* meaning to welcome, invite, call) are celebrated by a *mo phon*, in honour of the *kwan* of a human individual but also of domesticated animals such as elephants or buffaloes, or of the *kwan* of rice or of important objects considered to be animate, such as drums (Zago 1972). The *su kwan* celebrated for an individual are intended to recall and gather his *kwan*, and to encourage them by honouring them to remain within him (Zago 1972; Ngaosyvathn 1990). These ceremonies (also called *baci*) are very common in Laos. On a

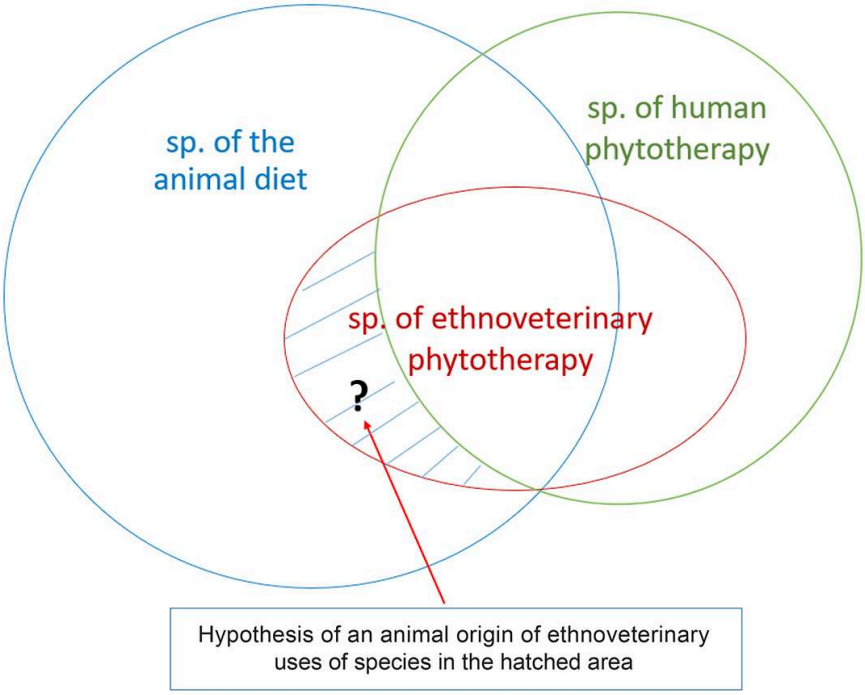
family or village scale, they mark important stages in the life of an individual or group (Zago 1972). We shall discuss later how the care of village elephants fits into these rituals and the concepts that underlie them.

Human-animal convergences of medicinal plant use

11 Studies on ethnoveterinary medicine that discuss the origin of such practices have focused on the overlap between the treatments (materia medica used and indications) given to domestic animals and those used in traditional human medicine. Martínez and Luján (2011), Scarpa (2000) and Souto *et al.* (2011) note in their work carried out in Argentina and Brazil, that the treatments used for animals are largely found in local human medicine. Scarpa as well as Martínez and Luján *(ibid)* thus hypothesise that ethnoveterinary medicine is essentially the result of a transposition of treatments intended for humans applied to animals. However, several studies conducted in other regions show that ethnoveterinary pharmacopoeia doesn't limit itself to a subset of human pharmacopoeia (Pieroni *et al.* 2006; Gradé *et al.* 2009; Carrió *et al.* 2012; Miara *et al.* 2019; Greene *et al.* 2020), raising the question of the origin of knowledge concerning the therapeutic use of plants reserved for ethnoveterinary practices. Gradé *et al.* (2009) in relation to the observations of the behaviour of their domestic animals that Karamojong pastoralists in Uganda interpreted as a form of self-medication, speculate that some pastoralists may have introduced the plants involved in these behaviours into their own ethnoveterinary preparations (*cf.* Fig. 2). They support this hypothesis on the facts that on the one hand some pastoralists did indeed declare that part of their medicinal knowledge came from observing animals, and on the other hand a large proportion (72%) of the material reported to be used by animals in self-medication is found in the local pharmacopoeia (for ethnoveterinary use as well as for human medicine). Greene *et al.* (2020) in their study with the Karen in northern Thailand dealing with the overlap of plant species in elephant diets, ethnoveterinary treatments, and human medicinal practices, similarly argue that a significant proportion of the treatments given by the Karen to their elephants are very likely to be the result of the observation of the elephants' self-medicating behaviour. Thus, if a plant is common to both ethnoveterinary and human traditional medicine but absent from the elephant diet, the authors propose that its use is more likely to be derived from Karen traditional medicine, whereas ethnoveterinary use of a plant that is part of the elephant diet but absent from the human pharmacopoeia will be considered more likely to be derived from elephant knowledge.

12 This hypothesis can be illustrated by the following figure:

Figure 2: Schematisation of the hypothesis of Greene *et al.* of an animal origin of the use of plant items in ethnoveterinary medicine in relation to the overlaps of species consumed by domestic animals, and species used locally in ethnoveterinary and human medicine



13 The authors thus conclude by inference that the use of 8% of the plants present in the Karen ethnoveterinary pharmacopoeia probably originates from self-medicating behaviour of the elephants (here the hatched area in Figure 2).

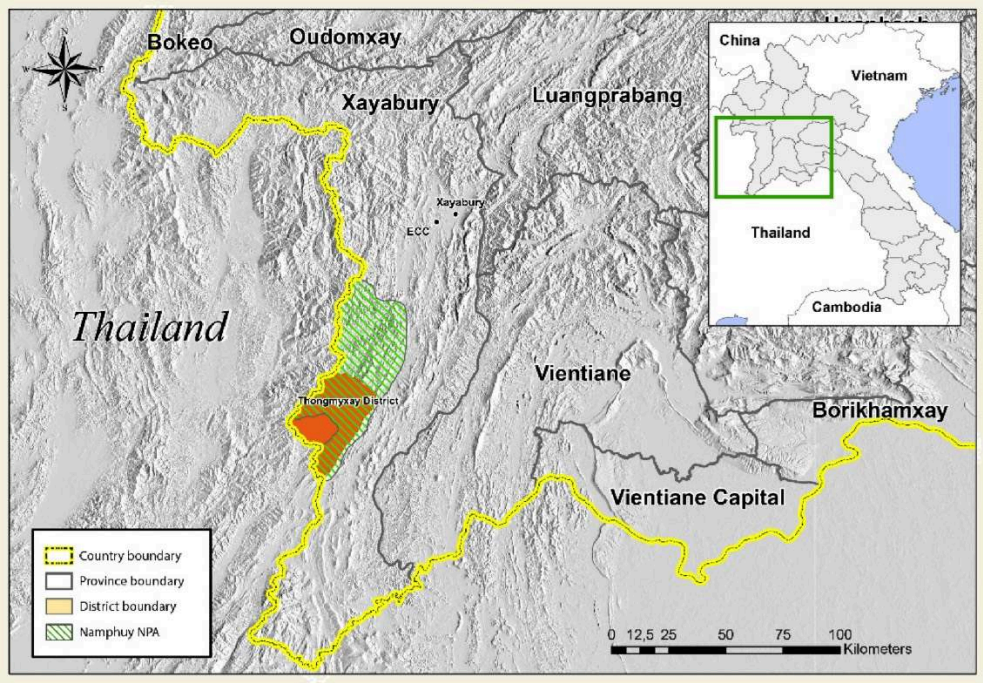
Materials and methods

Study site

14 Laos is characterised by an extensive forest cover and is part of the Indo-Burmese biodiversity hotspot (Myers *et al.* 2000). The country is located in a humid tropical zone and the climate is seasonal, with a rainy season (June to October), a cool dry season (November-February) and a hot dry season (March-May).

15 This study was conducted at two sites in Sayaboury province (Figure 3):
1. At Thongmyxay district (8500 inhabitants in 2015 (Lao Statistics Bureau 2016)), the main study site, which is enclosed within the Namphuy National Protected Area (NNPA) which covers 1912 km2 and is home to the second largest wild elephant population in Laos, estimated at 60-80 individuals in 2009 (Khounboline 2011). The inhabited area is surrounded by forest areas consisting of degraded secondary forests, dipterocarp forests, riparian forests and bamboo clumps.
2. At the Elephant Conservation Centre (ECC) in the north of the province, a centre dedicated to elephant conservation and research in Laos that develops ecotourism activities focused on elephant watching and research programs on wild and domestic elephants where we completed our data.

Figure 3: Context map of Thongmyxay district and the location of the ECC



Juan A. Torres

Data collection

16 Sixty-six mahouts were interviewed in Xayabury province, 37 in Thongmyxay district and 29 in ECC (Xayabury district), of which 13 were also from Thongmyxay, bringing the total number of mahouts interviewed from this district to 50, with the remainder from other districts of Xayabury province (Xayabury district: 7; Piang: 4; Paklai: 3), with the exception of one mahout from Houeyxay province. Fifty-four of these mahouts are from a mahout lineage and 40 are still active. All of them are males (as mahoutship in Laos is a male orientated occupation) of the Tai Lao ethnic group. Semi-structured individual interviews were conducted on elephant management practices and diet, health problems, their needs, the possible care provided to them, and observations regarding the response elephants give to their health problems. Mahouts were also asked whether they use or know about uses of elephant by-products.

17 We carried out an inventory of plants which the mahouts indicated were consumed by elephants, specifying the parts consumed and the context in which they were taken (seasonality, physiological condition etc). Four traditional healers were interviewed and asked which species from this inventory they used for therapeutic purposes. Local vernacular names associated with photos of the specimens on which we had collected samples for identification were used to carry these interviews. The data was complemented by interviews with a specialist in elephant rituals (*mo sang*) and a specialist (*mo phon*) practising the *su kwan* ritual.

18 Ethical approval was obtained from the National Ethics Committee for Health Research (NECHR) under the supervision of the Ministry of Health of the Lao PDR (0894NIOPH/

NECHR). The project complies with the Access and Benefit Sharing (ABS) prior inform consent and mutually agreed term in the light of Nagoya Protocol (N°008/ SABS).

Results and discussion

The ontological status of village elephants in Thongmyxay

19 Before addressing the medicinal practices resulting from the interactions between mahouts and elephants, we must first situate the context of representations linked to the elephant that condition these interactions. Elephants are in fact perceived under the sign of a double hybridity. The first hybridity is linked to their circulation between the wild world of the forest *'pa'* and that of the village *'ban'*. We have recalled that in a traditional management system elephants were periodically released into the forest, a practice that still continues in Thongmyxay (*cf.* 'Background section'). During these releases, it is not uncommon for one of these elephants to return to the wild. This was reported to us by three mahouts in Thongmyxay who mentioned the loss of their elephant while it was on release during the rainy season. One of them even said that he had twice come across his elephant cow, now accompanied by a calf, but that he could no longer approach her. An elephant represents a significant investment of time for its training and management and constitutes a substantial capital, but these feralisations are taken good-naturedly and have always been mentioned to us as part of the nature of this animal, the mahouts assuming that these elephants have been taken over by the spirits of the forest. It should be remembered, as told above, that the village elephants '*sang ban*' are under the guardianship of the '*phi ban*', the village spirits, and the wild elephants under the guardianship of the '*phi pha*', the forest spirits. As reported by Maurer (2018), one mahout said to us that a ceremony could be held at home so that the spirits of the family's ancestors (*phi phu gnai tha gnai* - maternal and paternal grandparents) could regain control of the feralised elephant and so that it could be found and brought back; Another mahout told us that the *phi pa* (forest spirits) are asked to release the elephant and that the spirits of the household -*phi heuan*- and of the village -*phi ban*- are invoked to ask it to come back. When the elephant dies, however, the bond that unites it to the world of humans is broken. This fact has also been reported by Lainé (2017), and by Greene (2021) among the Karens of Thailand. The *mo sang* we interviewed (a specialist in certain rituals related to elephants) explains that during this funeral ritual, he recites an incantation so that the spirit of the elephant leaves the human world and cannot interfere with it. At the end of this ceremony, certain parts of its body can then be taken and the animal buried. This ability of elephants to move from one world to another finds some rationale in a legendary tale reported by Maurer, in which wild elephants were derived from a feralised (i.e. returned to the wild) village elephant: "In ancient times there were only domestic elephants. An elephant was born and could not be caught. He fled into the forest. It's a tale. Before, we did not tie elephants with a rope. They were free. This elephant remained free for 3 months and could not be caught. He became a wild elephant [...] and bred in the forest. [...] So, we captured some wild elephants, brought them back and raised them. They know language like our elephants." (Maurer *et al.* 2021). Thus village elephants have the particularity of being able to move both physically and ontologically between these two worlds, a *sang ban* being able to become *sang pa* again and return to the world of the forest and its spirits and vice versa. This

reversibility of the elephant's condition suggests that the ambivalence of its status, between wild and domestic, reflects more a superposition of states, one actualised and the other always a potential, than an intermediate position on an axis linking the *pa/ban* poles - as also suggested by this tale of mythical times reported by Maurer. It also shows that the *pa/ban* (wild/domestic or village/forest) dichotomy is not perceived in Laos as an inconcilable antagonism[3] as is the case with the domestic/wild or nature/culture opposition developed in the West by the naturalist thinking that emerged from the Enlightenment (Descola 2005, Stépanoff 2018).

20 But beyond this hybrid status as both wild and domestic, the village elephant is distinguished from other domesticated animals by the special status it is given in the mahout's household and as an individual. Greene et al (2020) in their study of Karen and their elephants in Thailand note that many Karen communities have a strong emotional and spiritual bond with their elephants, which are considered full members of the family. Lainé (2017) also reports that the village elephant is seen as a member of the household of its owner, noting that when mahouts go to work in the forest they invoke the spirit of the household whose protection extends to their elephant to protect them as well. Before the training of an elephant calf which takes place around the age of three, and which, by separating it from its mother, integrates it into the social sphere of humans (Maurer 2018), a ceremony practiced in Thongmyxay specifically seals this integration of the calf within the household. This *su kwan* is celebrated after the birth of a calf from a village elephant. The head of the family invokes the spirits of the household and the mo phon makes propitiatory vows. The ceremony takes place in the presence of the mother and her baby elephant, and some relatives may also be invited. Seven mahouts told us about this ceremony, which they said is usually performed within a month following the birth of a village elephant. They report that village elephants are considered members of the household (2 mahouts), and that the pho phi (spirit of the ancestors) are invoked to inform them of the arrival of the newcomer (4 m.), placed under their control to care for it (2 m.) and keep the *kwan* of the mother and child in their bodies (2 m.). This *su kwan* is celebrated so that the mother recovers well from the birth (3 m.), the baby elephant will be healthy and grow well (3 m.), be docile (1 m.) and feel at home in the family (2 m.). This is the same *su kwan* that is made for a woman and her child after birth (2 m.).

21 This last assertion comparing the rituals associated to the birth of a newborn human or calf, leads to other comparisons regarding the post-partum period of village elephants and women in Laos. Indeed, during the first few weeks after giving birth, the elephant is left alone with her calf in the forest; she is only visited by her mahout who regularly comes to ensure that everything is in order (Figure 4).

Figure 4: Mahout visiting a female left in the forest with her one-week old calf

Photo JM Dubost

22 She is then brought back to the house where a *su kwan* is performed to welcome the baby elephant. This measure of isolation of the mother and her newborn baby ensures the quietude of the elephant at a critical moment when she is particularly sensitive to the protection of her calf and is likely to behave aggressively towards intruders. This reason aside, one cannot help but relate this practice to the custom in Southeast Asian cultures in general, including Laos, whereby a woman after childbirth observes a period of confinement during which she receives special care to recover from childbirth (De Boer *et al.* 2011). Additionally in Laos, at the end of this period of relative isolation of the woman, a *su kwan* (cf 2.4) is performed for the woman to mark her return to community life (Pottier 1984). Thus we see a parallel that adds to the proximity of the respective statuses of village elephants and humans, in the same seclusion of the elephant cow in the period following the birth of her calf, followed by a *su kwan* that also seems to mark her return to the village orb and integrates her offspring into the household.

23 Zago (1972) mentions the fact that buffaloes can also be the object of a *su kwan*, but the mo phon we interviewed in Thongmyxay district specifies that these ceremonies are collective and carried out before ploughing for all the buffaloes mobilised in this work, in order to ensure good rice growth. The *su kwan* that follows the birth of an elephant calf, on the other hand, concerns an individual, which is presented as such to the ancestors of the household. In the same way, Maurer (2018) reports that at the end of the ceremony that complete the training of an elephant in Laos, which also marks its integration into the world of humans, the young elephant is given its name, which it chooses by grabbing a sugar cane stick from among several with different names engraved on it. Thus it seems, as Greene (2021) points out, who independently reports the same ritual of choice of name by the elephant among the Karens of northern Thailand, that this integration is achieved through the accession to individuality

conferred by this naming ritual, in which the elephant calf is recognised as having the ability to exercise its own agency.

24 Within the particular and ritualised context that gives the village elephant its status as an individual and member of the household, there are other abilities that are thought to bring the elephant closer to humans. For example, it is said to understand the language of humans (Maurer 2018). Two mahouts we interviewed also emphasised this ability of the elephant and said that it was the basis for training, as the elephant could respond to commands in Lao language that it understood. On the subject of this elephants' ability, Greene (2021) relates a story he heard among the Karen of Thailand in which the first elephant was originally a young man who became an elephant by transgressing a ban imposed by his father-in-law. The elephant then offers to help his father-in-law as a pack animal, but then rebels verbally against him when he takes advantage of the situation. His father-in-law then rips out his tongue and puts it back in his mouth, but upside-down, which explains why elephants have since lost their ability to speak. This story attributing a human origin of elephants, which Greene notes that it somehow legitimises making elephants work, echoes in this sense Maurer's account (see above) where elephants were originally domesticated animals that later became wild. Maurer also notes in these human features of elephants evoked by mahouts, the ability of the elephant to kneel to mark, as humans do, its respect before its master or dignitaries during ceremonies (Maurer 2018). Another mahout we interviewed adds that like us, the elephant carries its food in its mouth and eats rice (that of the offerings prepared during a *su kwan*, for example). These arguments drawing the elephant closer to the human are actually surface indicators to a kinship conceived and experienced as much deeper, as evidenced in other places by Greene's accounts of a human origin for elephants[4]. More generally, in Lao culture, the elephant is endowed with beneficial powers: Maurer (2018) reports a popular practice that consists of passing under the trunk of an elephant to ensure wealth, strength and longevity, and it is not uncommon as well to see a family passing under the belly of an elephant during the Sayaboury Elephant Festival. In the same vein, a mahout in Thongmyxay told us that when a child has a fever it is sometimes showered by passing it under an elephant being showered with water.

25 We have provided here evidence that the elephant enjoys a very special status in the culture of the mahouts, characterised by a double hybridity: wild and domestic on the one hand, and animal and human endowed with agentivity on the other. We shall see that these elements relating to this particular status and the mahouts' perception of these animals cannot be dissociated from the interpretation of self-medication they give to some of their behaviours and from the ethnoveterinary and human medicinal practices arising from their observation.

Interactions with elephants and medicinal practices

Ethnoveterinary practices

26 Regarding questions related to the health of their elephants, the care they receive and their feeding behaviour, 26 mahouts told us about behaviour they interpreted as a form of self-medication on the part of their animals, which according to them particularly consume and seek out certain plant items (mainly bark, roots or woody stems of lianas) when they are suffering from specific ailments or, in the case of females, when they are

in the reproductive phase (gestation, parturition and lactation) (Dubost *et al.* 2019). Twenty species were thus mentioned, representing 30 plant items consumed (*cf.* Appendix 1). In return, when their elephant suffers from particular ailments, some mahouts will take it to an area of forest where the resources they know their elephants consume in these circumstances are available. Other mahouts collect these items themselves to give to their suffering elephant. The latter practice can lead to more elaborate preparations, such as drying and grinding one of these items to have it at hand when needed, or adding palatable elements (salt, rice to form balls) or plant items from the local human pharmacopoeia, chosen according to criteria related to the etiology and nosology of traditional Lao medicine, to reinforce the effectiveness of the resulting preparation (*ibid*) (Figure 5).

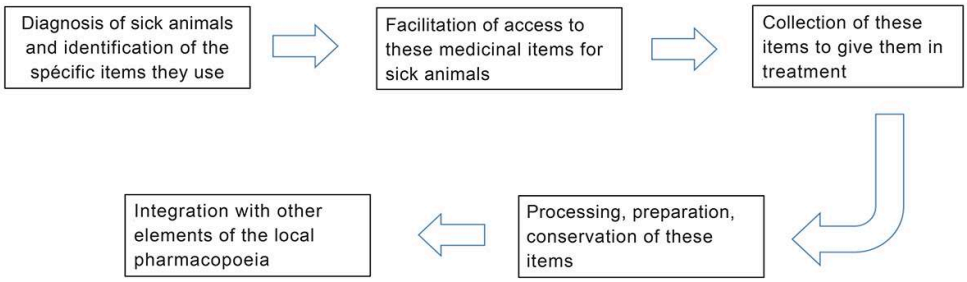
Figure 5: Mahout at ECC preparing a tonic for an elephant cow who has given birth

Photo JM Dubost

27 In the background section, we have outlined the hypothesis put forward by some authors that some of the traditional treatments given to domestic animals are most likely derived from the observation of animal self-medication behaviors (Gradé *et al.* 2009, Greene *et al.* 2020). This hypothesis is based on the analysis of overlaps between treatments given to domestic animals and those locally used in traditional human medicine. The ethnoveterinary practices of the Thongmyxay mahouts that we have documented not only confirm and illustrate this hypothesis of an animal origin of certain ethnoveterinary practices, but they also highlight some of the processes by which these observations on animals can lead to ethnoveterinary practices. Thus, the synchronic elements reported above on the ethnoveterinary practices of the mahouts that we have recorded allow us to reconstruct a possible diachrony of the steps leading

to the emergence of complex ethnoveterinary preparations, which could be arranged according to the following scheme:

Figure 6: Construction of ethnoveterinary practices from the observation of elephants



28 Animal observation comes into play at different levels of this process: firstly in the initial observation and diagnosis of a suffering elephant's condition and the specific behaviours it adopts to remedy that condition, such as unusual consumption of a particular item, and secondly in the observation reported by mahouts who facilitate their suffering elephant's access to their medicinal resources, that these were largely taken and consumed and that their animal's condition rapidly improved (Dubost *et al.* 2019). It is therefore an active observation that is at work, relying on an interaction with the elephants during a care process that builds up from an empirical approach of trials based on observations and resulting interpretations. These interpretations are confirmed and reinforced in a feedback process based on the results of the therapeutic actions mahouts then undertook. This empirical process analysed here according to a hypothetical-deductive approach, differs, however, from a scientific experimental approach in that it is not based on a predefined protocol characterised by a detachment of the experimenters from their object of study. Rather it relies on an attitude that Locke (2017), in his participatory study of interspecific relations between mahouts and elephants in Nepal, defines as *attentive concern*: an attitude that reflects a pragmatic and active *engagement* of the mahouts with their animal (giving to the word *engagement* the meaning that Ingold (2000), challenging the pre-eminence of representations over action, gives to this term to account for the relationships through which participants builds up their experience and their knowledge).

29 This process of construction undertaken with the animal, rather than being limited to a simple transposition of the practices observed in elephants into ethnoveterinary medicine, mobilises and integrates as well the experience and knowledge that the mahouts have of the galenic processes and of the concepts and *materia medica* on which the local medicinal practices they use for themselves are based, thus leading to complex galenic preparations used in ethnoveterinary care (Dubost *et al.* 2019).

30 Lainé (2020) on these plant use relationships between humans and elephants puts forward the idea of knowledge 'co-constructed' by the two species. However, the polysemy of the prefix 'co' merits a closer look at the possible implications of this term, which leaves the field open to different possibilities as to the modalities of participation of the actors in this 'co-construction' process. Indeed, depending on the degree of intentionality of the protagonists and the mutualisation of efforts, these

modalities range from a non-simultaneous nor concerted participation, as in the co-construction of a path that emerges and takes shape through the regular passage of individuals of various species who independently and recurrently use the same itinerary, to active cooperation oriented towards a common goal between actors working on the same project, as in the case of shepherds working with their dogs (Despret & Meuret 2016), or mahouts with their elephants in logging activities (Lainé 2014). In the case in point, this emergence of medicinal practices, in which the knowledge of the elephants seems to be at the origin of the construction of human ethnoveterinary practices, does not at first sight result from a mutual approach of cooperation between the two species, but rather a process based on the attention paid by the mahouts to the behaviour of their elephants, some of which they consider to be a response by the animal to a health problem. The interpretation of self-medication underlying this construction process is, however, based on the implicit recognition of features shared by the two species: that is, the recognition of a common behaviour, in this case to take care of oneself when ill, and the recognition of a state experienced at one time or another by individuals of both species, namely that of being ill. On this last point, in addition to visible physical signs, some mahouts also describe this condition in their elephants by a more general attitude of apathy - "he has no energy" - and "sadness". These terms, which express the mahouts' feelings, reflect the dimension of empathy that contributes to the therapeutic relationship involved in this co-construction of ethnoveterinary practices. Thus the purpose of the mahouts' therapeutic action may be understood by the elephant when it is led to the resources it needs when it is in pain, and through the possible existence of tacit communication and mutual understanding that forms between two beings who have the experience of a longstanding relationship and 'know' that they share certain feelings (keeping in mind that elephants recognise when their conspecifics are in trouble and show empathy towards them (Byrne *et al.* 2008; Plotnik & Waal 2014). This sharing of feelings is part of the relationship of trust established between mahouts and their elephants, which, when it is part of a particular therapeutic context, is likely essential to enable the mahout to overcome a possible reaction of neophobia (Gustafsson *et al.* 2016) towards an unusual item when mahouts introduce items from the human pharmacopoeia into their preparations to treat their elephant.

31 Returning to the status of the elephant, one cannot disconnect these skills and feelings recognised in elephants from the kinship perceived by mahouts between humans and elephants discussed above. This recognition of shared feelings accompanies or stems from this perceived kinship, or conversely has contributed to the conceptualisation of this kinship and of the rituals that stem from it, one naturally not excluding the other.

Convergences of plant use between mahouts and elephants

32 We have seen that some ethnoveterinary practices for elephants are a direct result of the observation of elephant behaviour interpreted as a response to health problems that may affect them. Furthermore, in our study in Thongmyxay district (Dubost *et al.* 2019), we found that mahouts treat themselves with plant species that they believe elephants also use for self-medication. One mahout told us that when he sees his elephant consuming roots, he takes pieces of them to prepare a tonic for his own consumption by macerating these ingredients in alcohol, suggesting the possibility that mahouts may be incorporating some of the uses they observe in elephants into their

domestic medicinal practices. However, when asked in an open-ended question to confirm this hypothesis, the other mahouts mentioned a practice rooted in their family tradition, and none of them explicitly stated that this use came from watching their elephants. These apparent convergences of interspecific uses could be the result of H1) a bias on the part of the mahouts who, as they themselves use these plants for therapeutic reasons, would interpret the consumption of these items by elephants as a medicinal practice (an anthropomorphic hypothesis also considered by Gradé *et al.* (2009), H2) a phylogenetic inheritance from practices dating back to a common ancestor, H3) an independent acquisition of knowledge by two species sharing the resources of the same environment, H4) a transfer of knowledge from elephants to humans, the origin of which is unknown to the mahouts interviewed - these hypotheses naturally not being exclusive but more likely concurrent.

33 The investigations carried out among the four healers (*mo ya* - healers who heals people with remedies) interviewed in Thongmyxay district can shed some light on this issue, although this information must be interpreted with caution, as the number of healers we were able to identify was relatively limited[5]. We presented these healers with an inventory of plants indicated by mahouts as being part of the elephant diet, asking them for each of the 112 ethnotaxons listed (corresponding to 114 identified species - two of the vernacular names given by the mahouts covering each two closely related botanical species) whether they used it, and if so, details of the parts used, their indications and the method of preparation and administration employed (cf. Appedix 2). Seventy-two of these elephant diet plants are used by one or other of the healers (respectively for TH1 to TH4: 59 sp., 19 sp., 25 sp., 14 sp.), but with a significant dispersion on the species used by each of them and their use: only twenty-nine of them are used by at least two of these healers, of which 12 were used for the same conditions and 17 for different conditions. Of the 20 plants indicated by mahouts as being subject to self-medicating behaviour by elephants (cf. Appendix 1), 16 are also used by healers, but only two are used for the same condition or physiological context that mahouts believe elephants use them for. Although there was also a relative dispersion of results among the mahouts, since 11 of these 20 "elephant self-medication species" were cited by only one or two of them (Dubost *et al.* 2019), a strong convergence appears however for the root of *Harrisonia perforata* (Blanco) Merr. allowing a comparison with the uses of our four healers: five mahouts mentioned this root as being sought and consumed by females in the reproductive phase (gestation, postpartum, lactation) and 13 as being sought by elephants suffering from diarrhoea. Of these 13 mahouts, seven used this item themselves in the domestic setting for this same conditions and six were not aware of any human use. For the healers interviewed, the uses they make of *H. perforata* are given in the following table:

Table 1: Use of *Harrisonia perforata* by four healers (TH1 to 4) in Thongmyxay district

Healer	TH1	TH2	TH3	TH4
Part used	root, twigs	root	root	no use
Indications	Fever with cough	Postpartum recovery	Intoxication with sometimes vomitting (kae beua)	
Preparation mode	Decoction drunk	Decoction drunk or taken in shower	Decoction drunk	

34 *H. perforata* root is therefore used by three of the four healers. The indication called *kae beua* (antidote) relates to poisoning by ingestion or contact with toxic substances and is therefore distinct from diarrhoea or indigestion, which may nevertheless occur with poisoning. Similarly, in a study conducted in Bolikamsay province in central Laos on

medicinal plants used in the domestic setting, the use of the same or a closely related species (*Harrisonia* aff. *perforata*) was mentioned once, with the root also being used as an anti-toxic and not included in the plants used for diarrhoea or gastrointestinal problems in the same study (Libman *et al.* 2006). It thus appears that only the female healer TH2 uses this root for an indication that converges (*postpartum*) with one of the indications reported by the mahouts for elephants (*postpartum* or diarrhoea). Concerning diarrhoea, an indication for which seven of the mahouts also use this root, none of the four healers mentioned using this item for this condition.

35 Returning to our hypotheses on the convergence of interspecific uses of medicinal items, concerning the use of *H. perforata* for diarrhoea, the fact that of the 13 mahouts who mentioned the consumption of this root by elephants suffering from this ailment, 6 were not aware of any human use shows that in this case the H1 hypothesis of a projection of their own use of this plant is not decisive in their interpretation of self-medication on the part of the elephants. On the other hand, the fact that half of them use this root for diarrhoea, while the three healers who use it give it for other indications, leads us more towards the H4 hypothesis of a transfer of knowledge from elephants to mahouts, which would make it possible to account for mahouts' knowledge of a medicinal use ignored by the healers we interviewed (whilst acknowledging the limitations of having only a small number of healers that we were able to identify).

36 Five mahouts mentioned the use of the same *H. perforata* root by female elephants during childbirth, which is consistent with the use of the only female healer interviewed who gives it to women during the postpartum period. When asked if this plant was used by humans, the mahouts did not mention this use by women, which is not surprising in itself as among the Tai-Lao, medicinal knowledge about motherhood is mainly transmitted between women (Pottier 2007), whereas the position of mahout is essentially a male prerogative in Laos. Thus, for this use of *H. perforata* by female elephants and women, it is rather the hypothesis H3 of a convergence independently acquired by the two species that seems to prevail. Concerning the H2 hypothesis of a common phylogenetic inheritance, it is necessary to go back more than 103 million years to find an ancestor common to humans and Asian elephants (Murphy *et al.* 2001), so while this hypothesis remains prominent to account for the convergence of uses between great apes and humans, it seems less prevalent in the case we are dealing with here.

37 This discussion shows that the comparative study of the local knowledge of different groups within the same population can provide significant information on this question of the origin of certain interspecific medicinal uses, the examples given showing that the respective pre-eminence of the different hypotheses we have proposed to account for these convergences may vary according to the items at stake and the physiological context of their use.

A higher level of integration of elephant observations into human medicinal practices

38 Beyond these convergences in plant uses between mahouts and elephants, another type of human medicinal practice is linked to elephants in Thongmyxay, it is the therapeutic use of their faeces, either collected fresh and then dried, or by the removal of the egg-laying chamber that a species of beetle, *Heliocopris dominus*, makes with these faeces.

Twenty-five people (24 mahouts and the daughter of a mahout) reported these practices to us, which we have detailed in a dedicated study (Dubost *et al.* 2021). They are used for two major groups of indications, namely gastrointestinal problems and skin conditions. Mahouts who have expressed a rationale for the use of these animal substances relate their therapeutic efficacy to the diet of elephants, who consume a wide variety of plants, including many species considered to be medicinal. One of the mahouts added that the elephant knows how to look after itself and how to choose the right plants for this purpose, an ability that is linked to the elements that in the eyes of the mahouts give elephants a form of humanity. While awareness of these explicit elements is widely shared among mahouts, other implicit elements certainly contribute to this positive perception of elephant faeces, such as the fact that they observe elephant calves consuming their mother's faeces at the time of weaning (26 mahouts, of which one mahout reports having heard that in southern Laos children are given a decoction of elephant dung to drink so that they become as strong as an elephant), and that in Thongmyxay district elephants still feed in the forest where they eat wild plants; indeed it should be noted that the wild origin of plants in Laos gives them specific virtues, elements from the forest being perceived as endowed with increased vitality and powers that can be assimilated by eating them, and make them still highly valued in the diet (Singh 2010; Strigler 2011). Thus the double hybridity that characterises the elephant in Laotian culture, wild and domestic on the one hand, and animal and human on the other, cannot be dissociated from the therapeutic virtues associated with the medicinal uses of its faeces, virtues which according to the mahouts are the fruit of this ability that elephants share with humans to heal themselves and, as animals of the forest, of their knowledge of the resources present in the wild that are invested with a strong symbolic value.

39 Of all the zootherapy practices (therapeutic use of materials derived from animals) recorded in the dedicated studies, the originality of these uses of elephant faeces by mahouts lies in the fact that here it is not so much the animal material for its own sake that is emphasised, but rather the animal's contribution to its preparation through its recognised ability to choose the right plants to make up its diet and to know how to cure itself. Elliott in her study of traditional Lao medicine introduces the notion of *phisanu*, the vital principle in which the healers believe the healing power of a substance lies. This intrinsic *phisanu* is reinforced by the *phisanu* accumulated by the healer who transfers it to the elements he uses through ritual practices accompanying the gathering of plants and the preparation of remedies (Elliott 2021). The auspicious powers, and benefits in case of illness, attributed to the elephant (cf. *supra*), echo this notion of *phisanu* and are certainly not without relevance to the perceived value of its faeces. We have given above examples showing that the integration of animal behaviours into the ethnoveterinary practices of mahouts was the result of a much more complex process than the simple replication of these behaviours by humans. These practices were nevertheless in line with the use of a specific plant item by elephants, whereas with the use of elephant faeces at Thongmyxay and the justifications given by the mahouts for their therapeutic value, the link between the observation of an animal and a human medicinal practice moves away from a simple reproduction of observed behaviour, to a more abstract level. It is no longer the plant used by the animal to treat itself or maintain good health that is collected and used by the mahouts, but a sort of "medicinal cocktail" produced by the elephant, whose perception of its curative potential is linked to knowledge of its eating habits, of the

responses it gives to its health problems in an environment shared by two species that live in it, know its resources and use them, and of the overall perception of this animal including the representations associated with it and the agency that is attributed to it.

40 In the previous section, we pointed to the fact that the induction of medicinal uses by mahouts did not necessarily seem to be a determining factor in the interpretation given to certain behaviours of their elephants (hypothesis H1 of a possible projection of the medicinal uses of mahouts in their interpretation of elephants' behaviour). Nevertheless, it cannot be excluded that the mahouts' medicinal uses may draw their attention to some of the self-medicating behaviours of these animals. Similarly, the agentivity that mahouts recognise in elephants, linked in particular to their ability to treat themselves, probably also contributes to their perception of such behaviours. Moreover, it is this same recognition of agentivity in individuals of a growing number of animal species that allows ethologists to consider certain animal behaviours as possible forms of self-medication, and this same attention to known medicinal plants that animals may consume or use that sometimes guide their investigations in this direction.

Transfer of medicinal knowledge from humans to elephants?

41 In Thongmyxay, mahouts generally believe that to keep an elephant healthy, it must have access to a wide variety of foods and be able to find what it needs. If it is unwell the mahouts believe the best course of action is to release it into the forest and leave it alone to recover. However this measure, which is presented as an ideal, is not the only option available, since elephants are also the object of ethnoveterinary or veterinary biomedical care (Dubost *et al.* 2019). We have also seen that when their elephant is unwell, some mahouts take it to a forest area where the resources it consumes in this instance are available (case 1). They may also collect and give these resources to their animal themselves (case 2). Experiments conducted on sheep (Villalba *et al.* 2006), and horse (post-gastric herbivores, like elephants) (Williams 2008) have shown the ability of these herbivores to develop learned self-medication behaviours; thus, a taste-marked forage containing the remedy for a previously induced pathological condition is subsequently preferred to a neutral forage when the same pathological condition is induced in these animals again. If we extend to elephants the ability of other herbivores to associate a taste (including associated aromas) with a perceived therapeutic effect and to remember it,[6] these care practices of the mahouts, when addressed to a 'naïve' elephant, can have the effect in case 1, of guiding its choices in the direction of re-acquiring knowledge from its conspecifics, but above all, in case 2, can constitute a form of transmission of knowledge from 'knowing' elephants to naïve conspecifics via humans. Khan *et al.* (2014) report the same type of ethnoveterinary practices whereby humans facilitate an interspecific transmission of knowledge, in this case from wildlife to domesticated species. They are described in communities in Karakorum, Pakistan, where shepherds take wounded animals to pastures rich in plants of the genus *Berberis* or give them a decoction of these plants, as they have noticed that many wild animals feed on these plants in case of injury.

42 In addition, mahouts also include plants from the local human medicinal tradition in their preparations for elephant care (*cf.* above). Consideration of these practices from the point of view of their potential impact in the field of interspecific transmissions which we are exploring here, opens up perspectives that on a hypothetical basis we

think it would be interesting to develop in the light of ethological data highlighted in other mammals (with the caution that must accompany such comparisons), in order to in particular further develop the notion of co-constructed knowledge mentioned above. Thus, similar to the findings of Villalba *et al.* and Williams mentioned above, it is possible that when the subsequent improvement in their condition is sufficiently rapid to be associated with the intake of one of these medicinal items given by the mahouts, the elephants may retain a memory of the therapeutic effect of this item, which would then correspond to an acquisition of human knowledge. In the context of the seasonal release of small groups of village elephants from Thongmyxay, it is then conceivable, given the important role of social learning in the development of food choice behaviour in elephants (Lee & Moss 1999), that knowledge acquired through contact with humans could be passed on between village elephants during these gatherings. In primates, Huffman and Hirata (2004), in an experiment conducted on captive chimpanzees, showed that the spread of the consumption of a new plant element in the group tested occurred through the observation of a pioneering individual by the others. A study of unusual bioactive substance use behaviour in two great ape communities (gorillas and chimpanzees) in their respective habitats shows that chimpanzees observe conspecifics much more frequently when using unusual items, and that these observations are predominantly made by juveniles paying attention to an adult, suggesting a significant role for 'social observations' in new substance use behaviour in young chimpanzees (Masi *et al.* 2012). The same implication of social interactions is found in the foraging behaviour of juvenile savanna elephants in Africa towards adults (Lee & Moss 1999). Huffman and Hirata (*ibid*) hypothesised based on their experiments with captive chimpanzees, that the ingestion of unchewed rough leaves by wild chimpanzees, in whom this practice has a deworming effect, may have arisen opportunistically and then been transmitted as a behavioural tradition of self-medication. In Thongmyxay, mahouts provide ethnoveterinary care for their elephants, thereby exposing their animals to such opportunities, which may lead to medicinal learning that could possibly be passed on to other village conspecifics during release periods when they are grouped together, or even to wild conspecifics through the mediation of village elephants that become wild again.

43 Returning to the question of knowledge co-constructed between humans and elephants, regarding the possibility of transmission of human knowledge to elephants, when mahouts use items from the local human pharmacopoeia to treat their animal, there is no intention on their part to teach elephants the virtues of certain medicinal plants used by humans. Nevertheless, it is an intervention which - to use the terms and analysis of Morizot (2016) on the means of managing human-animal conflicts - may be part of a 'perceptual and cognitive window' intelligible to the elephant (associating the taste and smell of a plant item with a therapeutic effect that may be felt), a window which confers on this intervention a potential communicative effect between humans and elephants. This communicative effect is made possible according to Morizot by the overlap of part of the ethograms of the two species, which in our case share the habit of using plant items to treat a particular physiological condition or a problem affecting their physical integrity. It should be remembered that conversely it is this same sharing of intentional behaviours, contributing as we saw above to the feeling of familiarity felt with elephants by mahouts, that allows the mahouts to attribute a self-medicating value to certain behaviours of their elephants, and more generally to

humans (including ethologists) to detect possible self-medicating behaviours in other animal species.

Conclusion

44 Ethnoveterinary practices are often seen as an extension of human medicinal practices to animal care. However, while animal observation has enriched traditional human pharmacopoeia (Huffman 2003), we have shown here, alongside recent studies (Gradé *et al.* 2009; Greene *et al.* 2020), that this attention given to animal behaviour can also be at the origin of specific ethnoveterinary practices. Moreover, the examples we have documented show the multiplicity of interactions that take place between these two fields of traditional medicine which are mutually enriching.

45 The ethnoveterinary care given to elephants by the mahouts of Thongmyxay integrates plant items that these animals preferentially use when they are suffering, and items from the human medicinal pharmacopoeia, to treat organic disorders described and named in the same emic terms, within the framework of a nosology and etiology that apply equally to the ailments and treatments used for both species. Similarly, mahouts use some of the elephants' plants to treat themselves or to maintain their health. All these elements reflect a perceived physiological continuity between humans and elephants that underlies this continuity between human and ethnoveterinary medicine, a continuity that is also highlighted in a growing number of studies analysing the overlap between these "two" medicines in the traditions of various pastoral cultures (see above). Furthermore, the recognition by Thongmyxay mahouts, or their Karen counterparts in Thailand (Greene *et al.* 2020) of the ability of elephants to heal themselves seems to be linked to this perception of a strong inner affinity between elephants and humans as evidenced by some of the stories and rituals that elephants are the subject of.

46 In the field of study of hybrid communities, the elephants and mahouts at Thongmyxay thus form a rare configuration of a community composed of humans and an animal species represented by both domesticated individuals and their wild congeners, with individuals passing from one domain to the other[7]. These circulations take place in both spatial (village/forest) and ontological dimensions, since a village elephant can become a wild elephant again and vice versa. Since part of the Thongmyxay village elephants are still periodically released and come into contact with their wild counterparts, the domestication space thus constitutes an interface between humans, the forest and wild elephants, an interface that is potentially a place of a two-way exchange where the animal is no longer just a producer of knowledge that humans integrate into their practices (Dubost *et al.* 2019; Lainé 2020) but also a potential learner who can also take on human knowledge. Thus, in this space, while village elephants appear as mediators of knowledge between their wild counterparts and humans (Lainé 2020), mahouts can also act as knowledge mediators between knowing and naive elephants when they treat the latter with plants used by the former, and even potentially between humans and elephants when they treat their elephants with plants from the local pharmacopoeia collected in a forest environment whose resources are shared by both species.

47 The question we have been discussing of whether possible convergences in the therapeutic uses of plants between mahouts and elephants are the result of

independent acquisition by the two species or of knowledge transfer from elephants to humans, thus loses somewhat of its relevance in the face of this perspective of a possible reciprocity of knowledge exchanges between the two species, in a space where this knowledge circulates between humans and elephants. On the other hand, an interspecific practice independently acquired by both species can be reactivated or reinforced in a group of humans by the observation of its use by animals. It therefore becomes more relevant to consider these convergences as evidence of a set of interspecific knowledge whose construction results from multiple interactions involving human and animal actors, a view that falls within the concepts that have been emerging for several decades of hybrid communities and multispecific cultures considered and studied as a whole (Brunois 2005; Fuentes 2010; Kirksey & Helmreich, 2010; Münster 2016; Parathian 2018; Greene 2021), providing a framework to account for this knowledge production that stems from interactions between different species. This vision of a community of village elephants and humans is culturally assumed in Thongmyxay in rituals that attribute individuality and agency to village elephants and establish their kinship within their mahout's household. We have highlighted a set of human and ethnoveterinary medicinal practices that derive from the proximity of life that unites mahouts and their elephants, the relationship in which mahouts engage with them in the care of their health, and from the knowledge - interfering with their own medicinal practices - that they have of the elephants' use of the resources from a shared environment. This combination is indeed part of an interspecific culture in the sense that it becomes difficult to distinguish what belongs to each of the two species which form a 'hybrid community' (Lestel *et al.* 2006; Locke 2013) that should therefore be addressed as such in the conservation issues to which this knowledge or the species in question may be the subject off. In fact, knowledge that is precious for the health and well-being of humans and elephants in Laos is threatened by the reduction of the forest cover that harbours the resources at play, and by the relocation of village elephants to tourist resorts. This relocation leads to a breakdown in the transmission of knowledge between generations of mahouts (Suter *et al.* 2013; Maurer 2018) (Fig. 7), but also between the elephants, who in these resorts are most often fed and no longer benefit from the periods of release in groups that used to punctuate their lives in a traditional management.

Figure 7: A teenager in Thongmyxay learning to harness an elephant

Photo JM Dubost

48 Thus the conceptual framework of interspecific cultures and hybrid communities should lead, as in Parathian *et al.* (2018), to re-examine the problems of conserving this traditional knowledge by integrating all the protagonists who construct it and their relationships. Preserving the medicinal knowledge of elephants and humans related to the use of forest resources in Thongmyxay therefore requires maintaining the conditions for their interspecific transmission, particularly here, as formulated by Lainé (2020), 'this circulation of village elephants between the different village and forest spaces'. This is the same issue that Krief & Brunois-Pasina (2017) have raised in pointing out that the exclusion of Battoroos populations from Kibale National Park in Uganda cuts them off from the source of their knowledge about the uses of forest plants -uses shared with other species in this previously common environment- and from the possibility of continuing to use these resources to benefit their own health. Thus emerges the need to think of the conservation of these intangible heritages represented by the knowledge of hybrid communities in terms of *dynamic interspecific heritages*, implying not only to find forms that allow to preserve the ecosystems sheltering the resources mobilised in these knowledge, but to maintain or conceive new conditions that allow the different interacting species to use, build and transmit them. [8]

49 The World Health Organisation (WHO) has placed the "One Health" concept, in which the vitality of ecosystems and the health of animals and humans are conceived as inseparable, at the center of its policy against the risks of zoonotic transmissions. From this perspective, the study of the human and animal medicinal knowledge of populations that have co-evolved in the same environment takes on its full relevance. It is indeed a major issue to evaluate the contribution of this knowledge to the resilience

of species in contact with each other in the face of infestations of pathogens that they may share.

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APPENDIXES

Appendix 1

Table of plants mentioned by mahouts as being the object of self-medication behaviorus by elephants

Family	Botanical name	Voucher	Vegetal Type	Parts eaten	EUR (nb mahouts)	Mahout medicinal use
Fabaceae	*Acacia caesia* (L.) Willd.	JMD 1127	C	r	diarrhoea: r and s (1)	yes (1)
Fabaceae	*Acacia concinna* Willd. A.DC.	JMD 1149	C	r, l	motherhood: r (1)	no
Zingiberaceae	*Amomum schmidtii* K.Schum. Gagnep.	JMD 1113	H	r, wp	diarrhoea: wp (1)	yes (1) (flatulence*)
Zingiberaceae	*Amomum schmidtii* K.Schum. Gagnep.	JMD 1113	H	r, wp	tonic: r (1)	no
Fagaceae	*Castanopsis indica* Roxb. ex Lindl. A.DC.	JMD 1151	T	r, b	motherhood: r: (2)	no (2)
Fagaceae	*Castanopsis indica* Roxb. ex Lindl. A.DC.	JMD 1151	T	r, b	diarrhoea: r (1) r and b (1)	yes (1) no (1)
Guttiferae	*Cratoxylum formosum* Jack Dyer	JMD 1096	T	l, s, t, b, r, sh	motherhood: r (1)	no (1)
Guttiferae	*Cratoxylum formosum* Jack Dyer	JMD 1096	T	l, s, t, b, r, sh	diarrhoea: r (2)	yes (1)
Moraceae	*Ficus hispida* L.f.	JMD 1134	T	b, t, sh, r	diarrhoea: r (1)	yes (1)
Moraceae	*Ficus racemosa* L.	JMD 1002	T	r, b, l, sh, f	diarrhoea: r (1) r + b (1)	yes (1)
Rubiaceae	*Gardenia sootepensis* Hutch.	JMD 963	T	l, t, r, b	diarrhoea: b (1)	yes (1)
Simaroubaceae	*Harrisonia perforata* Blanco Merr.	JMD 1144	Sh	r, sh	motherhood: r (5)	no (4)
Simaroubaceae	*Harrisonia perforata* Blanco Merr.	JMD 1144	Sh	r, sh	diarrhoea: r (13)	yes (7) no (6)
Araliaceae	*Heteropanax fragrans* Roxb. Seem.	JMD 957	T	b, r, t, sh	motherhood: r (3), b (1)	no (4)
Araliaceae	*Heteropanax fragrans* Roxb. Seem.	JMD 957	T	b, r, t, sh	diarrhoea: r (1), s (1)	yes (2)
Fagaceae	*Lithocarpus auriculatus* (Hickel & A.Camus) Barnett	JMD 1150	T	r	motherhood: r (4)	no (3)
Fagaceae	*Lithocarpus auriculatus* (Hickel & A.Camus) Barnett	JMD 1150	T	r	diarrhoea: r (3)	no
Moraceae	*Maclura cochinchinensis* Lour. Corner	JMD 972	Sh	l, s, b, sh	diarrhoea: r (3)	yes (1) no (2)
Fabaceae	*Mucuna pruriens* (L.) DC.	JMD 1112	C	s, r	diarrhoea: r (1)	no
Euphorbiaceae	*Phyllanthus emblica* L.	JMD 1142	T	f, b	diarrhea: b (1)	yes (1) (cough*)
Euphorbiaceae	*Phyllanthus reticulatus* Poir.	JMD 995	T	l, r, sh	diarrhea: r (3)	no (3)
Theaceae	*Pyrenaria* sp.	JMD 958	T	r, b, s, l, sh	motherhood: r and b (1)	no
Dipterocarpaceae	*Shorea siamensis* Miq.	JMD 1148	T	r, b, s	diarrhoea: r (1)	yes
Anacardiaceae	*Spondias pinnata* L.f. Kurz	JMD 1115	T	b, sh, b, r	diarrhoea: r (2)	yes (1) no (1)
Combretaceae	*Terminalia mucronata* Craib & Hutch.	JMD 1108	T	s, b, r	diarrhoea: r and b (2), b (1)	yes (2) no (1)
Menispermaceae	*Tinospora crispa* L. Hook.f. & Thomson	JMD 1126	C	s, r, l	diarrhoea: r (1)	yes (1)
Menispermaceae	*Tinospora crispa* L. Hook.f. & Thomson	JMD 1126	C	s, r, l	tremor: s (1)	no
Menispermaceae	*Tinospora crispa* L. Hook.f. & Thomson	JMD 1126	C	s, r, l	fever, (apathy + appetite loss): r and s (1)	no

6th column indicates the context of elephant use of the item and the part of plant selected, with in brackets the number of mahouts reporting this use; 7th column gives the number of mahouts using the item for the same ailment in their household (* indication have been specified when different from elephant use). EUR = Elephant Use Report, b = bark, f = fruit, r = root, l = leaves, s = stem, sh = shoots, t = twigs, wp = whole plant.

Appendix 2

Traditional healers' uses of plants consumed by elephants (TH1 à TH4)

Voucher	Family	Botanical name	Vegetal Type	Part eaten by elephant	TH1		TH2		TH3		TH4	
					Part	Indication	Part	Indication	Part	Indication	Part	Indication
JMD 1065	Fabaceae	*Acacia caesia* (L.) Willd.	L	r	t (b + e)	kidney and bladder stones, urinary problems						
JMD 936	Fabaceae	*Acacia concinna* (Willd.) A.DC.	L	r, l	fr	kidney and bladder stones, urinary problems						
JMD 982	Fabaceae	*Acacia pennata* (L.) Willd.	L	b, s, l							t, fe	nervous problems with fatigue and difficulty to sleep
JMD 978	Fabaceae	*Albizia lucidior* (Steud.) I.C.Nielsen	T	r, b, s, t, l								
JMD 1121	Anacardiaceae	*Allospondias lakonensis* (Pierre) Stapf	T	s, t, l					b	postpartum		
JMD 933	Zingiberaceae	*Alpinia galanga* (L.) Willd.	H	wp	r	abdominal pain after eating						
JMD 1047	Zingiberaceae	*Alpinia* sp.	H	wp	r	abdominal pain after eating			r	anemia		
JMD 943	Apocynaceae	*Amalocalyx microlobus* Pierre ex Spire	L	s, l	r	kidney and bladder stones, urinary problems						
JMD 1110	Amarantaceae	*Amaranthus spisus* L.	H	wp	wp	strengthen the heart, snake bite						
JMD 901	Zingiberaceae	*Amomum schmidtii* (K.Schum.) Gagnep.	H	r, s							r	Bleeding caugh
JMD 1137	Zingiberaceae	*Amomum villosum* Lour.	H	s								
JMD 1054	Vitaceae	*Ampelocissus martini* Planch.	L	b, s, l			r	diarrhoea				
JMD 1013	Vitaceae	*Ampelocissus* sp.	L	s, l			l	Skin rash				
JMD 1008	Annaceae	*Amianthus dulcis* (Dunal) J.Sinclair	T	r, b, s, t	b	oedema						
JMD 1064	Thymelaeaceae	*Aquilaria* sp.	T	r, b	r	loss of appetite					r	muscle, back or leg pain

Voucher	Family	Botanical name	Vegetal Type	Part eaten by elephant	TH1		TH2		TH3		TH4	
					Part	Indication	Part	Indication	Part	Indication	Part	Indication
JMD 903	Palmae	*Arenga pinnata* (Wurmb) Merr.	P	l	r	tonic, loss of appetite						
JMD 976	Poaceae	*Bambusa bambos* (L.) Voss	B	t, l	t	malaria, lver						
JMD 935	Poaceae	*Bambusa tulda* Roxb.	B	t, l	r	anemia						
JMD 1021	Fabaceae	*Bauhinia malabarica* Roxb.	T	b, s, t, l								
JMD 1033	Euphorbiaceae	*Bischofia javanica* Blume	T	b, s, t, l	l	for young buffaloes presenting white droppings						
JMD 931	Moraceae	*Broussonetia papyrifera* (L.) L'Hér. ex Vent.	T	b, s, t,	rx,b	anemia						
JMD 954	Palmae	*Calamus rhabdocladus* Burret	P	l								
JMD 1125	Palmae	*Calamus solitarius* T. Evans et al.	P	l								
JMD 1058	Burseraceae	*Canarium subulatum* Guillaumin	T	r, b, s, l	e	fever			e	for buffaloes: irritated eyes		
JMD 1011	Lecythidaceae	*Careya sphaerica* Roxburgh from checklist	T	f					e	burns		
JMD 1151	Fagaceae	*Castanopsis indica* (Roxb. ex Lindl.) A.DC.	T	r, b								
JMD 1129	Poaceae	*Centotheca lappacea* (L.) Desv.	H	ap							wp	Muscles or back pains
JMD 921	Poaceae	*Cephalostachyum pergracile* Munro	B	t, l								
JMD 964	Fabaceae	cf. *Dalbergia oliveri* Gamble	T	b, s, t								
JMD 1063	Tiliaceae	*Colona floribunda* (Kurz) Craib	T	r, b, s								
JMD 960	Tiliaceae	*Colona merguensis* (Planch. ex Mast.) Burret	T	b								
JMD 1014	Asteraceae	*Crassocephalum crepidioides* (Benth.) S.Moore	H	wp			r	nerve problems (senpasa)				
JMD 924	Guttiferae	*Cratoxylum formosum* (Jack) Dyer	T	l, s, t, b, r								
JMD 1009	Fabaceae	*Dalbergia rimosa* Roxb.	L	r, b, s	b	oedema						

Voucher	Family	Botanical name	Vegetal Type	Part eaten by elephant	TH1		TH2		TH3		TH4	
					Part	Indication	Part	Indication	Part	Indication	Part	Indication
JMD 977	Poaceae	*Dendrocalamus brandisii* (Munro) Kurz	B	t, l								
JMD 934	Poaceae	*Dendrocalamus membranaceus* Munro	B	t, l	t	anemia						
JMD 1012	Fabaceae	*Desmodium* sp.	T	b, s	r	joint problems						
JMD 1091	Dilleniaceae	*Dillenia aurea* Sm.	T	f								
JMD 1079	Dilleniaceae	*Dillenia indica* L.	T	f							e	caugh
JMD 1010	Dilleniaceae	*Dillenia obovata* (Blume) Hoogland	T	f								
JMD 1038	Dilleniaceae	*Dillenia parviflora* Griff.	T	b, s, f								
JMD 1071	Asparagaceae	*Dracaena angustifolia* (Medik.) Roxb.	T	s, l, t	r, b	diabetes	l	diabetes				
JMD 1067	Asparagaceae	*Dracaena fragrans* (L.) Ker Gawl.	H	s, l								
JMD 1089	Zingiberaceae	*Etlingera* sp.	H	wp	r	bloating, constipation						
JMD 1124	Fabaceae	*Entada glandulosa* Pierre ex Gagnep.	L	s	t (b + e)	nerve problem (senpasa)	t	malaria				
JMD 969	Moraceae	*Ficus heterophylla* L. f.	T	b, s, l	t (b + e)	frequent urination (male or lmale)						
JMD 1020	Moraceae	*Ficus hispida* L.f.	T	b, t, r	r	lver, to strengthen the heart						
JMD 1102	Moraceae	*Ficus microcarpa* L.f.	T	b, s, t, l								
JMD 965	Moraceae	*Ficus racemosa* L.	T	r, b, l, f	r	lver, to strengthen the heart			b	lver		
JMD 1025	Moraceae	*Ficus religiosa* L.	T	b, s, t, l	b	malaria, lver						
JMD 938	Moraceae	*Ficus semicordata* Buch.-Ham. ex Sm.	T	r, s, t, l								
JMD 963	Rubiaceae	*Gardenia sootepensis* Hutch.	T	l, t, r, b	b	tonic (lack of energy)	b	Blood in faeces				
JMD 927	Poaceae	*Gigantochloa albociliata* (Munro) Kurz	B	t, l								
JMD 925	Anacardiaceae	*Gluta cambodiana* Pierre	T	r, b, s, t								
JMD 1026	Annaceae	*Goniothalamus laoticus* (Finet & Gagnep.) Bân	T	b, s	b	joint problems	b	postpartum	b	joint problems		

Voucher	Family	Botanical name	Vegetal Type	Part eaten by elephant	TH1		TH2		TH3		TH4	
					Part	Indication	Part	Indication	Part	Indication	Part	Indication
JMD 914	Simaroubaceae	*Harrisonia perforata* (Blanco) Merr.	T	r	r,rx	lver with cough	r	postpartum	r	Intoxication with sometimes vomitting (kae beua)		
JMD 910	Araliaceae	*Heteropanax fragrans* (Roxb.) Seem.	T	b, r, t	e	tonic			r	anemia, lack of energy		
JMD 961	Apocynaceae	*Holarrhena pubescens* Wall. ex G.Don	T	r, b, s, t, l								
JMD 962	Euphorbiaceae	*Homonoia riparia* Lour.	T	s, l	r	lver					r	baby lver
JMD 1109	Rubiaceae	*Hymedictyon orixense* (Roxb.) Mabb.	T	r, s, l	b	oedema						
JMD 1043	Poaceae	*Imperata cylindrica* (L.) Raeusch.	H	wp	r	malaria, lver	r	vertiges	r	Baby lver	r	kin rash
JMD 1061	Irvingiaceae	*Irvingia malayana* Oliv.	T	f	b	stomach aches					b	œdema
JMD 1031	Araceae	*Lasia spinosa* (L.) Thwaites	H	wp	r	cough	r	postpartum	r	to fatten buffaloes too slim		
JMD 1051	Sapindaceae	*Lepisanthes rubigisa* (Roxb.) Leenh.	T	r, s, f	r	malaria, lver	r	postpartum				
JMD 996	Fabaceae	*Leucaena leucocephala* (Lamk.) de Wit	T	s, t, l			r	lver with convulsions	l, fr	Eyes problems		
JMD 1150	Fagaceae	*Lithocarpus auriculatus* (Hickel & A.Camus) Barnett	T	r								
JMD 928	Moraceae	*Maclura cochinchinensis* (Lour.) Corner	T	l, s, b								
JMD 1044	Euphorbiaceae	*Mallotus barbatus* Müll.Arg.	T	r, b	l	Teeth ache			r	diarrhoea		
JMD 1099	Anacardiaceae	*Mangifra caloneura* Kurz	T	t, l								
JMD 991	Poaceae	*Microstegium ciliatum* (Trin.) A.Camus	H	wp	t	lver						
JMD 1030	Fabaceae	*Mimosa pudica* L.	H	wp	r	oedema	r	Stomach ache, joint problems	r	lver with oedema	r	skin reash
JMD 1136	Hypoxidaceae	*Molineria capitulata* (Lour.) Herb.	H	wp								
JMD 998	Fabaceae	*Mucuna pruriens* (L.) DC.	L	s, r					r	caugh		
JMD 915	Rubiaceae	*Neonauclea purpurea* (Roxb.) Merr.	T	f	b	anemia						

Voucher	Family	Botanical name	Vegetal Type	Part eaten by elephant	TH1		TH2		TH3		TH4	
					Part	Indication	Part	Indication	Part	Indication	Part	Indication
JMD 1053	Vitaceae	n.i	L	s								
JMD 1062	Poaceae	n.i	H	ap					r	lver		
JMD 1056	Fabaceae	n.i	T	b, s, t								
JMD 1019	Euphorbiaceae	n.i	T	f	r, t (young)	postpartum					r	tonic
JMD 1059	Bigniaceae	*Oroxylum indicum* (L.) Kurz	T	s	l, b, e, r	diarrhea, stomach ache ; oedema			e	anemia, lack of energy		
JMD 1049	Rubiaceae	*Paederia foetida* L.	T	s, l	r	malaria, fever	r	bloated stomach (thong kud)	r	stomach aches	r, t	intoxication with chemicals
JMD 932	Poaceae	*Pennisetum polystachion* (L.) Schult.	H	wp								
JMD 993	Poaceae	*Phragmites australis* (Cav.) Trin. ex Steud.	H	ap	r	oedema						
JMD 922	Marantaceae	*Phrynium pubinerve* Blume	H	wp								
JMD 1142	Euphorbiaceae	*Phyllanthus emblica* L.	T	f, b	b	hypertension	fr, e	f: cough b: diarrhea, hypertension	e, b	hypertension, caugh	fr	caugh
JMD 995	Euphorbiaceae	*Phyllanthus reticulatus* Poir.	T	l, r	b	kidney and bladder stones	r	postpartum	r	skin rash	r	Baby skin rash
JMD 1007	Euphorbiaceae	*Phyllanthus* sp.	L	b, s, l	t (b + e)	swollen legs of the elderly						
JMD 951	Poaceae	*Pseudostachyum polymorphum* Munro	B	t, l								
JMD 1068	Fabaceae	*Pterocarpus macrocarpus* Kurz	T	r, b	b	tonic	e	diarrhea				
JMD 1035	Fabaceae	*Pueraria montana* var. *lobata* (Willd.) Sanjappa & Pradeep.	L	b, s, l	t (b + e)	tonic						
JMD 958	Theaceae	*Pyrenaria* sp.	T	r, b, s, l	b	cough						
JMD 944	Fagaceae	*Quercus kingiana* Craib	T	r, b, s								
JMD 994	Poaceae	*Rubus pluribracteatus* L.T.Lu & Boufford.	T	s, t, l								
JMD 1045	Poaceae	*Saccharum arundinaceum* L.	H	ap								
JMD 906	Poaceae	*Schizostachyum blumei* Nees	B	t, l	r	anemia						
JMD 920	Cyperaceae	*Scleria ciliaris* Nees.	H	wp	r	malaria, fever			r	fever		

Voucher	Family	Botanical name	Vegetal Type	Part eaten by elephant	TH1		TH2		TH3		TH4	
					Part	Indication	Part	Indication	Part	Indication	Part	Indication
JMD 1039	Dipterocarpaceae	*Shorea siamensis* (Miq.) Kurz	T	r, b, s	b	tonic						
JMD 918	Fabaceae	*Spatholobus parviflorus* (DC.) Kuntze	L	b, s, l								
JMD 923	Anacardiaceae	*Spondias pinnata* (L.f.) Kurz	T	r, b, s, t	e,rx	malaria, fever			r, fr	abscesses, pustules on the chest		
JMD 953	Marantaceae	*Stachyphrynium placentarium* (Lour.) Clausager & Borchs.	H	wp	r	hemostatic						
JMD 966	Stemonaceae	*Stemona tuberosa* Lour.	H	wp								
JMD 997	Moraceae	*Streblus asper* Lour.	T	b, s, l								
JMD 955	Moraceae	*Streblus* sp.	T	b								
JMD 1060	Combretaceae	*Terminalia mucronata* Craib & Hutch.	T	s, b, r	e	diarrhoea	e	diarrhoea	e	diarrhoea	e	stomach ache
JMD 990	Poaceae	*Thyrsostachys siamensis* Gamble	B	t, l	l	blood in the faeces: decoction with other plants drunk						
JMD 911	Poaceae	*Thysalaena latifolia* (Hornem.) Honda	H	s, l		anemia			r	baby liver		
JMD 1126	Menispermaceae	*Tinospora crispa* (L.) Hook.f. & Thomson	L	r, s, l	t (b + e)	malaria, fever			t	liver		
JMD 1004	Burseraceae	*Toona* sp.	T	r, b, t, l	e	fever	e	dizzyness				
JMD 1029	Ulmaceae	*Trema orientalis* (L.) Blume	T	b					r	postpartum		
JMD 908	Araliaceae	*Trevesia palmata* (Lindl.) Vis.	T	b, s								
JMD 1048	Verbenaceae	*Vitex trifolia* L.	T	r, b, s, t								
JMD 1017	Apocynaceae	*Wrightia arborea* (Dennst.) Mabb.	T	b								
JMD 1023	Rhamnaceae	*Ziziphus jujuba* Mill.	L	s	r	tonic					r	tonic

VT = Végétal Type (T = Tree, B = Bamboo, H = Herb, L = Liana, P = Palm tree)
Part = Part used : ap = aerial parts, b = bark, f = fruits, l = leaves, r = root, s = stem (for trees saplings stems) splingst = twigs, wp = whole plant)

NOTES

1. Although we cannot strictly speak of elephant 'herds', the traditional management of these animals is close to a form of pastoralism characterised by seasonal release in small groups and uncontrolled reproduction, which is one of the five forms of herding distinguished by Stepanoff (2017) according to the degree of autonomy left to the animals, the one he calls 'seasonal freedom', practised, for example, by the Evens with horses and reindeer in Kamchatka (*ibid*).
2. like the French word *sauvage* which comes from the Latin *silva* - forest
3. Maurer *et al.* (2021) show, however, that the socio-ecological system of natural and anthropised spaces is undergoing a radical transformation resulting in a segregation of human and "natural" spaces linked to conservation policies and the transformation of agriculture.
4. In the same publication, the author relates two other traditional African stories, one among the Nuer of Sudan and the other among the Masai, in which elephants are the offspring of a human who has become an animal also as a result of the transgression of a prohibition in the first, and the birth of a monstrous daughter who assumes her condition by voluntarily changing into an elephant in the second.
5. Indeed, it was not easy at first to identify healers in Thongmyxay district, which has a population of just over 8,500 (Lao census 2015). In the context that seems to prevail a decline in traditional medicinal uses (as illustrated by the remark of one of the mahouts who notes that the practice of planting medicinal species around the houses to have them on hand in case of need is being lost), the people we asked in the villages if they could point us to a mo ya, explained to us that they no longer knew of one, as they had now turned instead to modern medicine and dispensary drugs. We finally obtained the contact details of four healers from a doctor at the district dispensary, reported by his patients who were asked during consultations if they had

ever started treatment themselves or consulted someone before, but we do not know what proportion this sample represents of all the healers in the district.

6. in addition to their remarkable cognitive and memory abilities (Hart et al., 2008), elephants have a particularly well-developed olfactory apparatus and capacity (Sukumar 2003), which is involved in the selection of plant elements that are always carefully brushed and sniffed with the trunk before being collected.

7. Stepanoff (2017) describes a similar pattern among the Kamchatka Evens, who use horses for carrying or riding in the summer months and are released together at the first snow. In both cases these animals have an individual relationship with their owner and an intermittent existence within a group of conspecifics, and in both cases also some of these animals also feralise and return to freedom.

8. Nor is it a question of falling into a naive idealism that would like to freeze things in a previous state that is undoubtedly past and does not take into account the difficult-to-reverse evolution of lifestyles and mosaic of local ecosystems, nor the real aspirations of the populations concerned - see on this subject (Duffillot 2019; Suter 2020; Maurer et al. 2021), but as much as possible to work with the human actors concerned to find forms that are compatible with these developments and that would allow the dynamics of these interspecific exchanges to be maintained in one form or another rather than trying to turn them into museum objects.

ABSTRACTS

The mahouts and the elephants of Thongmyxay district in Laos form an original hybrid community composed of humans and an animal species represented by both wild and domestic animals (elephants). We investigated in particular the interactions between mahouts' observation of elephants and their own medicinal practices (human and ethnoveterinary), which have been the subject of two previous publications. Based on this material, supplemented by data collected on the status of domestic village elephants and interviews with four local healers, we discuss here with a multispecies approach combining ethnographic data and ethological knowledge, the modalities of construction and possible exchanges of medicinal knowledge between the two species.

Elephants have a status characterised by a double hybridity: wild and domestic on the one hand (with ontological circulations from one state to the other), and animal and human on the other. The part of humanity attributed to the elephants is reflected in particular in the self-agency that is recognised in their ability to heal themselves when they are suffering, which leads to the therapeutic use of their dung by Mahouts. The mahouts include in their ethnoveterinary care of the elephants plants that they see the elephants use when they are ill. The medicinal uses they make of some of these plants in their households are more consistent with their observations of these elephant behaviours than it is with the use of the same items by local healers, suggesting a transfer of medicinal knowledge from elephants to mahouts.

Since some of the village elephants in Thongmyxay are still periodically released and come into contact with their wild counterparts, the domestication space forms an interface between humans, wild elephants and the forest, and we discuss conversely the possibility of knowledge transfer from mahouts to village elephants through the ethnoveterinary care they receive.

This knowledge which is precious for the health and well-being of people and elephants in Laos is threatened by the reduction of the forest cover sheltering the resources used, and by the

relocation of village elephants to tourist centres. Thus, emerges the need to think the conservation of the intangible heritage represented by the knowledge of hybrid communities in terms of interspecific heritage, implying that along with the preservation of the ecosystems that host the resources involved in this knowledge, care must be taken to maintain their access to all the populations (human and animal) that use them.

Les cornacs du district de Thongmyxay au Laos et les éléphants forment une communauté hybride originale composée d'humains et d'une espèce animale représentée à la fois par des individus domestiques et sauvages. Nous avons étudié plus particulièrement les interactions entre l'observation des éléphants par les cornacs et leurs propres pratiques médicinales, humaines et ethnovétérinaires, qui ont fait l'objet de deux publications. A partir de ce matériel, complété par les données collectées sur le statut des éléphants domestiques de village et les interviews de quatre guérisseurs locaux, nous discutons ici dans une approche multispécifique associant données ethnographiques et connaissances éthologiques, les modalités de constructions et d'échanges possibles de savoirs médicinaux entre les deux espèces.
Les éléphants ont un statut caractérisé par une double hybridité : sauvage et domestique d'une part, avec des circulations ontologiques d'un état à l'autre, et animal et humain d'autre part. Cette part d'humanité se traduit notamment par l'agentivité qui leur est reconnue dans l'aptitude à se soigner lorsqu'ils sont souffrants, et qui conduit à une utilisation thérapeutique de leurs crottins.
Les cornacs intègrent dans leurs soins ethnovétérinaires des plantes qu'ils voient les éléphants utiliser lorsqu'ils sont malades. Les usages médicinaux qu'ils font de certaines de ces plantes au sein de leur foyer correspondent davantage à leurs observations de ces comportements d'automédication qu'à l'utilisation de ces mêmes items par les guérisseurs locaux, suggérant un transfert de connaissances médicinales des éléphants vers les cornacs.
Du fait qu'une partie des éléphants de village de Thongmyxay est toujours périodiquement relâchée et se retrouve au contact de leurs congénères sauvages, l'espace de domestication constitue ainsi une interface entre les hommes, la forêt et les éléphants sauvages et nous discutons inversement la possibilité de transferts de savoirs des cornacs vers les éléphants de villages à travers les soins ethnovétérinaires qu'ils reçoivent.
Ces savoirs précieux pour la santé et le bien-être des hommes et des éléphants au Laos sont menacés par la réduction du couvert forestier abritant les ressources utilisées et par la relocalisation des éléphants de village vers les centres à vocation touristique. Ainsi émerge la nécessité de penser la conservation de ces patrimoines immatériels que représentent les savoirs issus de communautés hybrides en termes de *patrimoines interspécifiques*, impliquant de prendre en compte avec la préservation des écosystèmes abritant les ressources mobilisées dans ces savoirs, le maintien de leur accès à toutes les populations (humaines et animales) qui les utilisent.

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Mots-clés: cultures multispécifiques, savoirs interspécifiques, éléphants, médecine ethnovétérinaire, médecine traditionnelle
Keywords: multispecies cultures, interspecific knowledge, elephants, ethnoveterinary medicine, traditional medicine

AUTHORS

JEAN-MARC DUBOST

PhD Ethnobiologie – UMR 7206, Muséum National d'Histoire Naturelle, Paris, France. jm.dubost@gmail.com (correspondant)

ERIC DEHARO

HDR, Pharmacologue – Maladies Infectieuses et Vecteurs : Ecologie, Génétique, Evolution et Contrôle (MIVEGEC), Université de Montpellier, IRD 224 39 Av. Charles Flahault, 34090 Montpellier

SYSAY PALAMY

PhD, Head of Department – Department of Pharmaceutical Sciences, Faculty of Pharmacy, University of Health Sciences, Lao PDR Samsenthai Road P.O. Box 7444 - Vientiane - LAO PDR

CHITHDAVONE HER

PhD, Lecturer – Department of Pharmaceutical Sciences, Faculty of Pharmacy, University of Health Sciences, Lao PDR, Samsenthai Road P.O. Box 7444 - Vientiane - LAO PDR

CHIOBOUAPHONG PHAEKOVILAY

PhD, Lecturer – Department of Pharmaceutical Sciences, Faculty of Pharmacy, University of Health Sciences, Lao PDR, Samsenthai Road P.O. Box 7444 - Vientiane - LAO PDR

LAMXAY VICHITH

PhD, Lecturer – Department of Biology, Faculty of Natural Sciences, National University of Laos, Dongdok campus PO box 7322 Vientiane capital Lao PDR

SÉBASTIEN DUFFILLOT

Elephant Conservation Center – Ban Nonsavanh, nam tien reservoir, Sayaboury Province, Lao PDR

SABRINA KRIEF

HDR Professeur – UMR 7206 - Muséum National d'Histoire Naturelle, Paris, France