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THREATS AND CONSERVATION EFFORTS OF THE LAST REMAINING BANTENG (*Bos javanicus lowi*) IN UNPROTECTED AREAS AT BELANTIKAN HULU, CENTRAL KALIMANTAN

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ABSTRACT

Bornean banteng is classified as endangered and found only in Borneo island. The existence of a wild population of bornean banteng in Belantikan Hulu, in the north-western part of Indonesia's Central Kalimantan Province, has been confirmed from the results of camera-trap programme since 2013, but its population size has yet to be determined. The study aimed to identify the threats to the banteng population in Belantikan Hulu and describe the conservation efforts that have already been taken there. Although Belantikan Hulu is now one of the priority habitats for conserving banteng in Kalimantan, the area lies outside the nationally-designated conservation area network. Hunting is one of the greatest threats that can lead directly to failure in their population. Local informants were able to describe the location and number of 24 banteng that were killed over a 65-year period, from the 1950's to 2015. The true number is likely to be much higher, since these data were derived from a sample representing only 30% of the local hunting community, and they did not include information from any outsiders. Logging, mining and shifting cultivation in around banteng habitats are important factors that are currently contributing to the destruction and degradation of their habitats in Belantikan Hulu. Conservation efforts have got a lot of supports from local stakeholders. These efforts have led to a customary regulation being adopted that prohibits hunting of banteng or degradation of their habitats around their key saltlicks and feeding sites, and the creation of local conservation area of 1,700 ha (on land voluntarily released by the logging company) that includes these key sites.

Keywords: bornean banteng, conservation, habitat, hunting, threat

INTRODUCTION

The natural history and conservation needs of many tropical forest ungulates such as banteng are poorly known despite the important functional roles of such species within the ecosystems, such as shaping vegetation structure through herbivory (Djufri and Wardiah 2017). In Huai Kha Khaeng (Thailand), they utilise up to 150 different plant species, such as bamboos, fruits and leaves (Bhumpakphan and McDhea 2011). Wild banteng (*Bos javanicus*) are thought to still survive in Cambodia, Lao DPR, Myanmar, Thailand, Vietnam and the islands of Java, Borneo and possibly Bali; with a global population of about 8000 individuals, of which some 4600 occur in one population in Cambodia and some 800-1500 on Java (IUCN 2016). This is mainly due to poaching and habitat destruction. Since these threats are still on-going, banteng has been categorised as endangered (i.e., in danger of extinction) in the Red List compiled by the International Union for Conservation of Natureal Resources (IUCN 2016).

The bornean banteng (*Bos javanicus lowi*) is considered by some as an endemic sub-species found only on the island of Borneo, though genetic studies to confirm this have yet to be carried out. Its distribution in Borneo is limited to a few small, isolated populations in Kalimantan and Sabah, which are thought to be in steep decline; whilst in Sarawak and Brunei it is thought to be extinct. The total population in Borneo is not known, but possibly far less than 1000 individuals; whilst only one population, in Sabah, might contain more than 50 individuals (Timmins *et al.* 2008).

Quantitative data on the banteng population in Kalimantan, Indonesian Borneo, have only been obtained from two protected areas: Kutai National Park (34 ind in 2003) and Kayan Mentarang National Park (40-50 ind in 2009); whilst data on the total population outside conservation areas are not yet available (Minister of Forestry 2011).

Belantikan Hulu in Central Kalimantan Province has recently been recognised by the Indonesian Ministry of Environment and Forestry as one of the priority habitats for conservation of banteng in Kalimantan. It comprises state forest land designated mainly as Limited Production Forest and currently under active logging and mining concessions operated by private sector companies. The area is also a habitat for the largest population of orangutans (*Pongo pygmaeus wurmbii*) outside conservation areas (Wich *et al.* 2004).

Until now, timber extraction by selective logging and iron ore mining are still being carried out in the Belantikan area. Sapari *et al.* (2019a) found that logging could alter the forest structure resulted in negative effects on the density of the Bornean orangutan population. The remaining degraded forests can still be a valuable resource for the orangutan and other species as bornean banteng. Structure and composition of the vegetation

fulfil the banteng need for cover (Garsetiasih and Heriyanto 2014).

The existence of banteng in Belantikan Hulu has been accidentally confirmed since 2013 through images from camera traps at satlicks (Yayorin 2013). Nevertheless, the total population size is not yet known. Prior to this study, research in Belantikan Hulu had never been conducted on banteng. Therefore, research that provides new information on threats that could lead the extinction of banteng in Belantikan Hulu, and on conservation efforts already undertaken there by various stakeholders, is urgently needed.

The aims of this study are to use the knowledge of local communities to identify what factors could lead to the local extinction of banteng in Belantikan Hulu, and provide recommendation to improve conservation management efforts for banteng in unprotected areas.

METHODS

This study was conducted in five villages in Belantikan Hulu Sub District ($111^0$13'-$111^0$36'E, $1^0$18'-$1^0$34'S): Nanga Matu, Bintang Mengalih, Petarikan, Kahingai and Benuatan (Figure 1). Data collection was conducted in each village from April-September 2017. Belantikan Hulu is located in the upper reaches of the Belantikan River, which is also the largest river in Lamandau District, in the north-western part of Central Kalimantan Province, Indonesia.

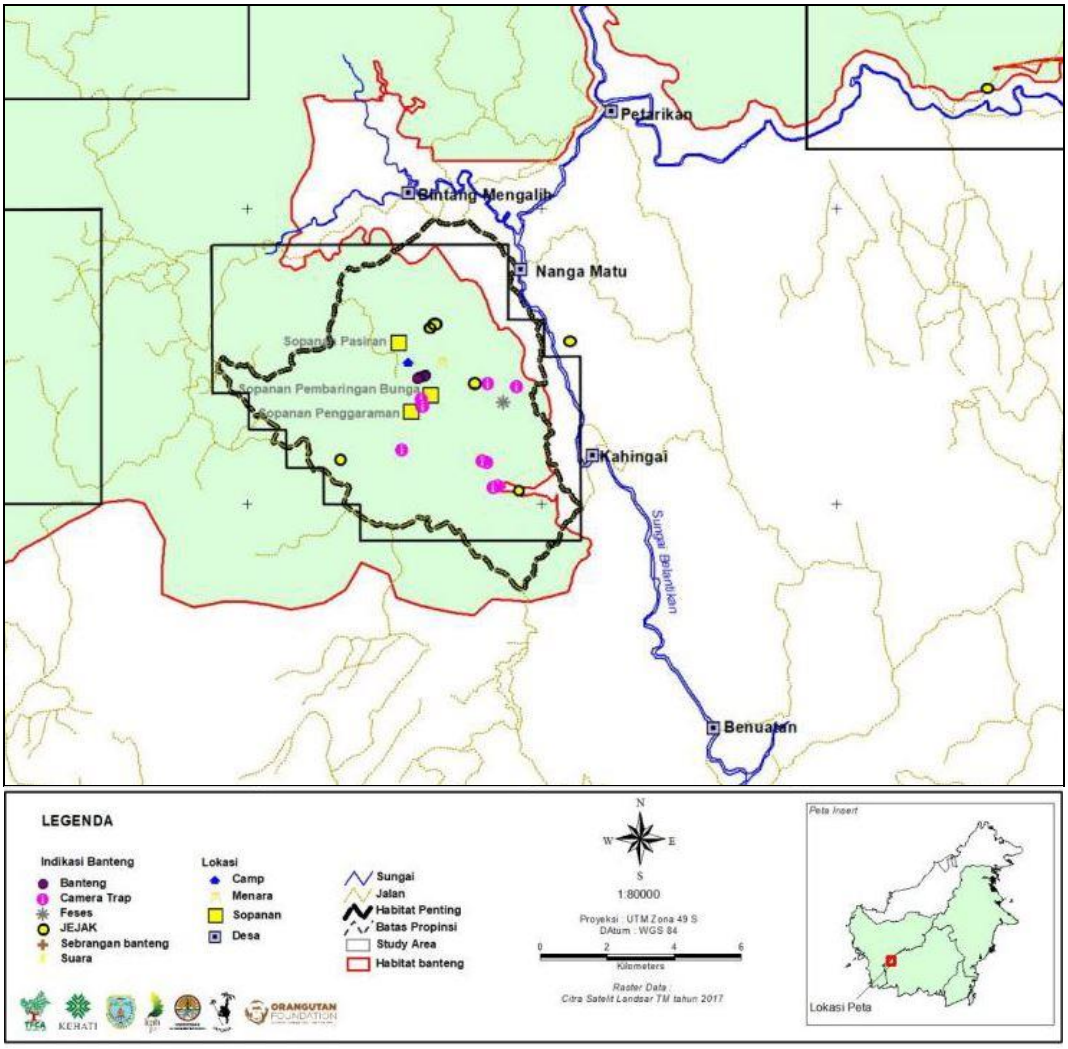

Figure 1 The location of study area (Sapari *et al.* 2019b)

Belantikan Hulu lies within an area of state forest land designated as Limited Production Forest (HPT), which has been granted as a logging concession to PT Karda Traders under a decree of the Minister of Forestry No. 76 / Kpts II / 2000 for Timber Forest Product Utilization Permit in Natural Forest (IUPHHK-HA) with an area of 98,400 ha, which has been in active operation since 2004, with its operational area covering all the villages in Belantikan Hulu (Minister of Forestry 2000). The HPT area is also used for open (surface) mining activities through the Forest Area Licensing Permit (IPPKH) mechanism by two mining companies that have been operating since 2008, namely PT Kapuas Prima Coal (KPC), whose work area is located in Bintang Mengalih Village; and PT Alam Persada Nusantara (APN), whose working area is around the areas of Nanga Matu, Petarikan and Bintang Mengalih villages

The primary data were collected through questionnaires and interviews. Questionnaire sampling used *stratified random sampling* from 30% of the total population (206 respondents), of which 20% male and 10% female with the age range of respondents from 25-65 years old (Suprapto 2013). The questioner method used was semi-open, which comprises a combination of open and closed questions. The quantitative data were analyzed using descriptive statistics based on percentages for each aspect with respect to the total number of respondents.

Interview methods used open questions to achieve the desired unrestricted response. Key informants were obtained through snowball method, whereby the first informants determine the next informants deemed to be important. The maximum number of informants was based on similarity of information given by each informer (Suprapto 2013). The interview data were analyzed descriptively. These data from questionnaires and interviews were then clarified and supplemented through discussions with the local community in Belantikan Hulu using Focus Group Discussion (FGD) methods, attended by various stakeholders, including Forest Management Units (KPH), logging concession holders (HPH) and local communities.

RESULTS AND DISCUSSION

1. *Threats to The Population*

Alikodra (2010) stated that wildlife management is a science that manipulates the interaction between wildlife populations and their habitats so they can live and breed normally and be protected from extinction. However, these efforts can be constrained by the activities of communities or outsiders trying to utilize forest resources to improve their welfare. This is the biggest threat to the population decline and habitat quality of banteng in Belantikan Hulu. Based on interviews and discussions, such threats include hunting, logging, mining and shifting cultivation. Rahman (2020) stated that distribution prediction of banteng indicated that habitat variables such as secondary forest, human impacts such as cultivated area and illegal activity are critical to determining the habitat use of banteng. Dasmann (1964) also stated that the extinction of wildlife can be divided into factors that directly reduce populations such as hunting, predation, disease, famine and accidents; and factors affecting habitat quality, i.e., logging, settlement, agriculture and industrial activities.

Hunting is one of threats that results directly in a decline of the banteng population in Belantikan Hulu. Local people are also involved in these hunting activities. Davies and Payne (1982) have argued that hunting has been the primary cause of the decline of banteng for many decades. The hunting could have been caused bythe activity of banteng that frequently occured in the local people fileds (Heriyanto and Mukhtar 2011; Gertiasih 2015). In Belantikan Hulu, local communities usually hunt mammals such as rusa deer (*Cervus unicolor*), muntjak (*Muntiacus muntjak*), mouse deer (*Tragulus javanicus*), bearded pigs (*Sus barbatus*) and also banteng (*Bos javanicus lowi*). As much as 19.01% of respondents said that banteng had been hunted in Belantikan Hulu from the 1950s to 2015; whilst the remaining 80.99% said they did not know. However, they claimed that banteng was not the main target of hunting because its body size is too large for them to carry home, and its meat is not considered to be for consumption. They claimed that banteng were only killed if met by chance during a hunt and the distance to carry the carcass back to their house was not too far. They also said that banteng are very difficult to kill because they are very sensitive and can run away quickly if threatened. Olsen (2002) also stated that banteng in Sabah have the ability to quickly hide inside the forest when they are disturbed.

When they succeeded in killing banteng, most respondents said that its horns were used for customary rituals (97.32%) and its meat for consumption (78.52%). Banteng has become a part of the culture of Belantikan Hulu society. Banteng horns are usually used to welcome guests who attend traditional ritual events as a mug to drink tuak (traditional drink of the local community). Banteng horns have a high value to honor guests in traditional rituals. If they don't have banteng horns, however, they can use other horns, such as buffalo horn, cow horn or horn-shaped wood and even elephant tusks. Hedges and Meijaard (1999) reported that banteng in Kayan Mentarang National Park are regularly hunted by local people because they damage their crops. The meat was eaten, and the head used as a trophy to showcase the success of the hunt and embellish hunting stories, as well as a decoration for the home. Some banteng heads even seem to be sold to Peninsular Malaysia. This trade provides an opportunity for local residents to increase their efforts in hunting banteng.

Based on information from interviews, banteng have been hunted since the 1950s-2015 in sopanan (Penggaraman, Pasiran and Pelomodaan); rada (Kerubung, Congkung, Tempisung, Kolangan dan Batu Wangkai); and huma (Flowers). According to them, sopanan is a saltlick area providing a source of mineral salts for wild animals that is surrounded by forest, which is used by banteng as a hiding place from any disturbances such as bad weather, humans and predators; rada is a habitat dominated by shrubs, grass and bamboo, which are important foods for banteng;whilst huma is a local community field where the banteng have been found killed by snare-traps, the aim of which is to prevent loss or damage to their crops by animals including banteng. After year 2015, there is no report about hunting anymore, because of customary regulation being adopted that prohibits hunting of banteng or degradation their habitats.

From the the results of the interviews, the total number of banteng killed was 24 individuals over a period of 65 years, of which 18 individuals were killed by local people and six by outsiders, i.e., soldiers (Table 1). Based on these data, this is equivalent to an overall hunting rate of about 0.37 individuals/year since the 1950's, or 0.51 since the 1970's; or more recently, 0.60 over the past 10 years. The true values are likely to be much higher, however, since the data obtained represents only 30% of the local residents; and not everyone is willing to admit to having ever killed banteng, especially if they have now heard about the need to protect banteng; whilst these figures do not include interviews with hunters from outside the area who also had the chance to kill banteng. The data also show that female banteng were killed more frequently than males (62.5% v 37.5%). This could be because the females often lag behind their group when they run away from hunters. This is likely to cause a decline in the banteng population. This is because an adult female only gives birth once per year, producing at least 21 calves during its lifetime; though in reality, not all adult female mothers are pregnant every year (Hoogerwerf 1970).

Hunters from outside the community use transportation and advanced weapons such as *geren* (sniper rifles), so they can kill and collect more animals on each hunting trip. Their motivation tends to be for entertainment and trade. In contrast, local communities tend to hunt mainly for subsistence, so they will not kill animals without a clear purpose or cause the animals to die in vain. Consequently, they never kill more than one banteng in a single hunt. Based on the interview results, hunting by outsiders was carried since the 1970s, by soldiers who visited their villages to conduct security operations in the region. They managed to kill six banteng using rifles. However, only three of the carcasses were carried away; the remainder were left in the forest. At present, hunters from outside the village are still often encountered by the community. They get access through logging roads and mining roads, one of which is the KPC road opened in 2014. Although they focus on hunting deer or pigs, it is likely they also hunt banteng.

Hunting activities undertaken by local communities have already undergone a shift. They had already started using a type of shotgun since the 1930's called *dum-duman*. The use of these home-made shotguns increased the chances of success in killing animals compared to traditional weapons such as *doha* (spear) and dogs. Caldecott (1988) states that the hunting using rifles in Sarawak dramatically increased since the 1940s when rifle imports grew. It was probably the high level of illegal hunting during this time that caused the decimation of the banteng population.

Table 1 Cases of hunting banteng in Belantikan Hulu based on interviews

No	Year	Subjects	Location	Female	Male	Total
1	1950s	Local communities	*Rada* Kerubung	1		1
2	1970s	Soldiers	*Sopanan* Penggaraman	4	2	6
3	1970s	Local communities	*Huma* Bunga	1	2	3
4	1970s	Local communities	*Sopanan* Pasiran	2		2
5	1980s	Local communities	*Sopanan* Penggaraman		1	1
6	1980s	Local communities	*Rada* Congkung	4		4
7	1980s	Local communities	*Rada* Tempisung	1		1
8	2005	Local communities	*Rada* Tempisung	1		1
9	2005	Local communities	*Sopanan* Penggaraman		1	1
10	2007	Local communities	*Sopanan* Penggaraman		1	1
11	2008	Local communities	*Rada* Kolangan		1	1
12	2009	Local communities	*Rada* Batu Bangkai		1	1
13	2015	Local communities	*Sopanan* Penggaraman	1		1
		Individuals total		15	9	24

A further threat to banteng comes from interbreeding with closely related species, especially domesticated cattle (*Bos taurus*), which causes genetic erosion in the gene pool and a reduction in the genetic purity of the already dwindling banteng population, with potentially deleterious consequences (Wisesa *et al.* 2012). According to Mohamad *et al.* (2009), crosses between banteng and domesticated cattle can produce viable offspring, but male hybrids are not fertile. Based on information from the interviews, cattle were kept loose by local communities since the 1950s-1990s, and most have been lost; they probably escaped due to stress and lack of food. Whilst most of the people interviewed did not know if they had ever met domestic cattle in the Belantikan Hulu area, some 8.81% of respondents said that they had met domestic cattle since the 1970s-2015 around banteng habitat, such as Rada Batu Bangkai, Bunga, Congkung, Telangka and Lion Beraja; and they were these were domestic cattle because of the presence of wattles hanging around their necks.

Hedges and Meijaard (1999) reported that the banteng population in Kayan Mentarang National Park had been interbreeding with domesticated cattle. This was because the domestic cattele were allowed to roam freely, thereby increasing their chances of interbreeding with banteng. Gardner *et al*. (2014) also reported that the domestic cattle in Sabah in 2012 were often left to graze around banteng habitats, such as along the riverbanks, only 100-200 meters from banteng. Such short distances could result in the transmission of diseases between them. Thus, close proximity with domesticated cattle has at least two deleterious effects on banteng – disease transmission and interbreeding.

2. *Threats to the banteng habitat*

Degradation of banteng habitat in Belantikan Hulu is caused by logging, mining and shifting cultivation, especially when it occurs around specific saltlicks (sopanan) and community fields (rada). In Sabah, banteng are currently threatened by loss of habitat to forest fragmentation, logging, shifting agriculture and conversion of large forested areas (Boonratana 1997). These activities will result in changes to the distribution and abundance of food species, water and minerals sources, as well as the structure and composition of the habitat.

The resulting habitat fragmentation will cause the few remaining populations to become locally isolated from each other. The isolation of such small banteng populations prevents gene flow and renders them highly susceptible to inbreeding, which may result in a lack of genetic diversity and increase their susceptibility to genetic mutations and disease (Gardner *et al.* 2014). In the long term, these small fragmented populations will be unable to persist as a result of this isolation (Boonratana 1997).

Belantikan Hulu is designated as a limited production forest area, currently under license as a timber concession to a logging company, whilst also used for open mining activities through a forest area use licence (IPPKH). When the granting of permits by the government to each concession holder is not accompanied by proper supervision and control of the company's performance, this can become a problem. According to informants, the construction of a network of roads by the logging and mining companies to transport their produce has led to the opening up of the forest. Such road access has facilitated an increase in illegal activities such as poaching, illegal logging and illegal mining. Gardner and Goossens (2015) also reported that old logging roads in the Kuamut Protected Forest in Sabah had opened up access for poachers. In Belantikan Hulu currently, even shifting cultivation has expanded to follow these access roads into the forest. In addition, the noise caused by the engines of heavy equipment used by the companies for their extraction and transporation activities can disturb and stress wildlife in the surrounding area, including banteng. According to Olsen (2002), these stress levels are an important indicator of banteng fertility rates.

Logging in Belantikan Hula has directly decreased the quality of banteng habitats: 14.44% of respondents said they knew information about logging around the saltlick areas. These logging activities were reported to have been carried out about ± 1-5 km from the three main saltlicks of Penggaraman, Pasiran and Pelomodaan. The forests around these saltlicks not only provides sources of food, water, and minerals, but also shelter and hiding places from disturbances. As a result of such logging, therefore, the banteng would need to change their pattern of activity or move away. Alikodra (2010) stated that banteng are highly sensitive to disturbances. 10.92% of respondents also stated that outsiders are known to conduct illegal logging activities around the saltlicks. They are from Nanga Bulik (Lamandau District), Kumai and Pangkalan Bun (Kotawaringin Barat District), and West Kalimantan. According to informants, there has even recently been illegal logging around the Pasiran saltlick carried out by local people. The involvement of the local community is strategy of the outsiders to weaken the prevailing customary law, so often the problem can only be solved by a customary deliberation process.

According to 29.93% of respondents, the tree species usually logged are ulin (*Eusideroxylon zwageri*); meranti (*Shorea parvifolia*); bengkirai (*Shorea laevis*); and others like nyatuh (*Palaquium beccarianum*) and tangkawang (*Shorea pinanga*). Ulin is currently classified as Vulnerable according to the Red List (IUCN 2016). Nevertheless, ulin wood is still the main focus of timber harvesting by both local communities and outsiders. 9.51% of respondents stated that the timber they got from logging activities was used to fulfill subsistence needs, such as home materials, jurung (barns for storing rice) and kelotok (type of motorised boat). 8.80% of respondents stated that most of the wood was

sold, at a price of Rp 1,500,000/m3 for ulin wood and Rp 800,000/m3 for meranti wood (equivalemt to about US $112 and $60, respectively).

Shifting cultivation also poses a threat to banteng habitat. This is because cultivated areas have encroached to within about 2km from banteng habitats such as rada fields (Mata, Congkung, Kolangan, Batu Bangkai, Molan, Telangka and Semurun) and around saltlicks (Pasiran, Penggaraman, Pelomodaan, Lanyau and Silingan Bungsu). Most of the respondents (98.94%) stated that the system of cultivation used in Belantikan Hulu is shifting cultivation. The people here still adhere to a shifting cultivation system because most land tenure is temporary. In addition, limited availability of investment capital, poor mineral content of the soils, and free access to forest land have become driving factors for them to continually have to move on from one area of cultivation to another, where they burn the land to enrichen the soil. This shifting cultivation system uses a rotating pattern whereby, after an area has been opened and cultivateded by the community for several years [?], it will then be left fallow for several years before being cultivated again (Mahar 2013).

Most respondents (93.31%) said that the shifting of cultivations to new areas is done every year, with area size of each field being > 1 ha. Such a rapid, continuously shifting process of converting large areas of land close to wildlife habitats will directly reduce the extent of wildlife home ranges. In particular, it will reduce the availability of food for wildlife species, including banteng (Meijaard *et al*. 2006). Alikodra (1993) also states that encroachment, including shifting cultivation, can lead to changes in the distribution and abundance of animal foods, chaning the micro-climate, and reducing their sites for breeding and hiding from disturbances.

One cycle of the shifting cultivation system of local communities in Belantikan Hulu consists of: nebas (process of clearing the land of bushes and shrubs); nebang (land clearing process to remove the remaining large trees through logging); nyucul (process of burning the felled trees to fertilize the soil); nugal (planting out rice); and harvesting. Such cultivation practices with land burning, in addition to the potential of triggering widespread forest fires, will also indirectly change the micro-climate, including increasing average temperature and decreasing humidity, which can disturb the ecological conditions for wildlife (Laurance 1991).

According to the repondents, mining activities by companies in Belantikan Hulu will open access roads for both local people and outsiders to conduct illegal mining activities. Illegal mining is mainly for gold, using a spray hydraulic system in main rivers, such as the River Belantikan. This hydraulic system uses a floating pontoon boat with high-pressure jets of water to dislodge riverbed material, then sucks up the mud to filter out the gold. Unfortunately, the gold miners use mercury to separate out the gold. Mercury can contaminate the lands and water where gold processing occurs, and is highly toxic, causing serious illness and death in humans and animals (Authman *et al.* 2015). The Belantikan River is a major source of water for both local communities and wildlife, including banteng. The mercury can be carried in stream runoff and absorbed into the soil so that it contaminates the groundwater, potentially also seeping into the mineral licks that are important for banteng and other wildlife species. If the illegal gold mining continues, it could have a major deleterious effect on wildlife, including banteng.

3. *The conservation acts of banteng kalimantan*

Conservation is the management of natural biological resources and ecosystems to ensure continuity of its supply and maintenance of its diversity, carried out through protection, preservation and sustainable use (President of RI 1990). PT Karda Traders as one of holder logging concession area in Belantikan Hulu has to cooperate with government (especially local government), local communities and NGOs for carrying out conservation planning surrounded concession area. The role of local government is making regulation to protect bornean banteng. The NGOs have a role to make conservation programme like campaign about bornean banteng. And the role of local communities is supporting the regulation and carrying on the conservation programme.

Most of the respondents (92.61%) stated that they had heard about banteng conservation since 2000-2017 through socialization carried out by the government, NGOs and local communities. Large billboards promoting banteng conservation that were installed in each of the villages of the study area have been an effective medium to build public awareness about banteng conservation. Most of the respondents (88.38%) said they were interested and willing to be involved in banteng conservation efforts. Their responses were sufficiently encouraging to be able to invite them to participate in carrying out the programme. They realize that banteng are endangered, so they hope banteng can become a tourism icon in Belantikan Hulu that can increase the income of local communities.

According to the respondents, the government has already taken several conservation actions, such as issuing orders prohibiting hunting banteng, prohibiting burning land, and prohibiting shifting cultivation, as well as the establishement of a banteng conservation area, and development of banteng ecotourism. Based on Law No. 5 of 1990 on the conservation of natural resources and their ecosystems, it is prohibited to injure, kill, catch, keep, possess, care for, transport or trade in protected wildlife, either alive or dead. Whosoever intentionally violates the provisions shall be liable to punishment by imprisonment up to a maximum of 5 years, and a fine up to a maximum of 1 billion rupiahs (President RI 1990).

Based on this law, the local communities formulated a draft village regulation (Raperdes) in 2015.

This was based on an agreement among the three villages of Nanga Matu, Bintang Mengalih and Kahingai, where banteng were known to exist. The regulation prohibits hunting banteng or destroying their habitat, intentionally or unintentionally, in three specified saltlick areas (Sopanan Pasiran, Penggaraman and Pembaring Bunga). Even though the regulation is still a draft awaiting legal process by the district goevernment, it has been validated under customary law since 2015, with punishment by fine up to a maximum of 25 million rupiahs. The regulation also has been supported by the logging concessionaire PT Karda Traders, who have released 1,700 ha from their concession, covering the above three mineral licks, which has now become a local conservation area based on a decree of the Head of the Lamandau District Government.

According to the interviewees, the government has already socialized the prohibition of shifting cultivation to the community. Besides destroying the natural ecosystem and wildlife habitats, shifting cultivation makes it more difficult for local communities to aquire land rights (Meilantina 2006). Only a few of the interviewees had property licences (SKT) for their houses and fields. This is because most of their cultivated fields are in state forest land, classified as Limited Production Forest (HPT); whereas according to Act No. 5 (President RI 1960), community property rights in the form of land certificates (SKT) must be located outside state forest land in areas designated for other uses (known as APL). Establishng community land rights is very important so that the use of land by the community becomes more sustainably focused.

According to the interviewees, the goverment has also socialized the prohibition of burning forests based on Forestry Act No. 41 of 1999, which states that all persons are prohibited to burn forests with violations punishable by imprisonment up to a maximum of 15 years and a fine up to a maximum of 5 billion rupiahs (President RI 1999). It is feared that small-scale burning of fields can trigger extensive forest fires. However, it is difficult to change the local communities behaviour in Belantikan Hulu to carry on their cultivation without burning, since they have been doing it for so long in the past it has become a cultural activity; and it is seen to be one of the most effective, quick and cheap ways to clear the land. In addition, the type of soils in Belantikan Hulu are less fertile and require more minerals, which they can get through burning the top layer of vegetation.

Further efforts to support banteng conservation undertaken by the district government include the construction of a 10 m high towere to monitor the presence of banteng. This tower was erected in 2016 in the middle of the three saltlick areas (Penggaraman, Pasiran and Pembaring Bunga). It is hoped the tower will also become a tourist attraction, thereby improving the local economy. Currently, an access road to the tower has been constructed for 4.5 km from Nanga Matu Village. The communities hope that the road can also be constructed from Kahingai and Bintang Mengalih villages.

In addition to providing access for ecotourism, the construction of the road to the tower is also intended to facilitate the monitoring of the saltlick areas by the community against illegal activities. The development of banteng as a tourist icon is also supported by the formation of Tourism Awareness Groups (*Pokdarwis*) as local institutions in each village to provide better management of the tours. Currently, a Pokdarwis group has been newly formed in Nanga Matu Village, and the other villages are expected to follow later.

In addition to the efforts of the government, efforts to conserve banteng have also been carried out by some communities and companies. Based on the results of the discussions with comminities, hunting of banteng has never happened again in Belantikan Hulu since the customary prohibition was socialized in 2015. The local communities have also tried not to destroy banteng habitat by limiting logging to only cutting trees in accordance with their needs. They have also started to rehabilitate former cultivation fields by letting them lie fallow for 1-10 years, with the aim of restoring the land and vegetation conditions by planting productive trees. They are more likely to take care of these tree seedlings so in the near future the fruit can be sold to provide additional income. According to repondents, rehabilitation activities have also been carried out by both logging and minng companies on their former production areas, by replanting a variety of timber trees such as *ulin* and *meranti*, as well as fruit trees.

CONCLUSIONS

Hunting is one of the threats that directly leads to a decline in the banteng population of Belantikan Hulu. Whilst local people have also been involved in hunting, their primary motivation is to meet their subsistence needs for protein. Whereas hunters from outside the village hunt for sport and trade. The minimum number of banteng killed over a 65-year period from 1950-2015, as compiled from interviews, was 24 individuals, comprising 15 females and 9 males. Destruction and degradation of banteng habitat in Belantikan Hulu is caused by logging, mining and shifting cultivation, especially around the saltlicks (*sopanan*) and scrublands (*rada*). These activities change the habitat structure and composition, leading to changes in the distribution and abundance of their food, water and mineral resources. Efforts to conserve banteng in Belantikan Hulu have received a positive response from stakeholders. One such action was the enactment of a joint law by three villages that prohibits hunting banteng and prohits destroying their key habitats in and around their saltlicks and scrublands.

RECCOMENDATIONS

1. The local conservation area granted under a decree by the Head of the Lamandau District Government (covering 1,700 ha), should be protected through a formal agreement (Memorandum of Understanding) with the related local communities, and in particular include a prohibition on logging and cultivating (*berladang*) activities within 5 km of banteng habitat.
2. Improve the protection of banteng habitat through a participative monitoring programme agreed between the company concessionaires and local communities that will allow the prompt detection of illegal activities.
3. Improve the quality of banteng habitat in the newly designated local conservation area through replanting trees around the three main saltlick areas, as a means of proving banteng with shelter form disturbances.
4. Follow up the processing of the draft joint villages regulation so that it becomes a formal district regulation.
5. Improve the capacity of the village Tourist Awareness Groups (*Pokdarwis*) in the management of educational tours based on conservation and customary culture.

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