Hunting in Indonesian Oil Palm Landscapes: A Case Study in Jambi Province, Sumatra

Evelyn D. Christina

ABSTRACT

With the on-going expansion of oil palm plantations replacing biodiverse tropical rainforests, it is necessary to understand impacts of these practices on conservation. Increased densities of wild boar, *Sus scrofa*, and altered hunting practices are a few of the secondary effects from oil palm that threaten remaining wildlife communities in plantation landscapes. Increased wild boar will negatively affect remaining forests and agriculture. also suggest that demography can potentially be used as a proxy for hunting activity. To better understand the social factors that influence wild meat hunting and consumption, I carried out a study on hunting practices present in Jambi Province of Sumatra, Indonesia. Through interviews with hunters, hunter-follows, and visiting wild meat markets, I explore how hunting is changing with the rise of oil palm. My results suggest that hunting with nets exerts removes the most animals, but almost exclusively capture wild boar. Overall, hunting provided food and income to local people, but was rarely a primary livelihood strategy. Wild boars have been shown to negatively impact forests when their densities are above normal. I suggest that hunting wild boar may be beneficial to both the local ecology and communities. I'm advocating the regulated use of nets as the hunting method that most selectively targets wild boars, minimizing the by catch of more threatened forest wildlife and removing pest boars from plantations. In addition, my results also suggest that demography can potentially be used as a proxy for hunting activity

KEYWORDS

wild boar, wildlife hunting, pest management, ethnicity, wildlife demand

INDTRODUCTION

Wildlife hunting is a primary threat to biodiversity, causing local extinction of mega fauna in many ecosystems throughout the world (Fa 2002, Brashares et al. 2004). Simultaneously, however, hunting may also be an effective method to reduce pest populations, such as the wild boar (*Sus scrofa*) in Southeast Asian agricultural areas. Hunting also provides important provisioning ecosystem services for local communities. It is a means for local communities to gain wild meat and income. In addition, it is also an important cultural activity for many ethnic group. (Robinson & Bennet 2002; Bowen-Jones et al. 2003, Corlett 2007, de Merode et al. 2003). In remote or poverty-stricken areas, wild meat also has the capability to provide essential but otherwise difficult to obtain protein (Bowen-Jones et al. 2003, Corlett 2007, de Merode et al. 2003).

The effects of hunting accompanying oil palm development in the biodiverse rainforest landscape could be either positive or negative, depending on the species taken and sustainability harvests. Studies on Pasoh Forest Reserve indicate that presence of oil palm plantations can result in elevated wild boar densities (Ickes 2001). The increased abundance of wild boar is likely due to the absence of predators in forest fragments and the large and continuously available food resources in oil palm plantations (Ickes 2001). High wild boar densities can negatively affect forest regeneration and agriculture (Ickes et al 2003). Specifically, the wild boar, *Sus scrofa*, and the bearded pig, *Sus barbatus*, are ecosystem engineers, which refers to organisms that has the ability to create or modify habitats, through behaviors such as rooting up soil and snapping young trees (Ickes et al. 2005). Although no scientific studies have attempted to document abundance of wild boars in Jambi, Indonesia, currently on-going studies do suggest wild boar being one of the main cause of agriculture damages in plantation landscapes of Jambi (Luskin, personal communication). Therefore wild boar hunting has the potential beneficial effects of pest control for agriculture, meat and income to local people, and to control damage to the forest ecosystem. However, we do not know of the current status of hunting activities in the province. Thus, no conclusion can be drawn on the benefits or problems on hunting.

In addition to the changing landscape, there are other factors that can influence hunting practices in Jambi. These include wildlife demand, access to markets, access to hunting

technologies, wealth, and ethnicity (Bennett et al. 2007, Bowen-Jones et al. 2003, Clayton et al. 1997, de Merode et al. 2004, Godoy et al. 2009, Persoon 2001, Chin 2001, Shively 1997, Wilcox and Nambu 2007). Jambi, which has received substantial numbers of transmigrants since the 1970s, is a melting pot of different cultures, with some cultures remaining distinct and others beginning to merge. There is not much known on how these cultures have shaped wildlife demand and hunting activities in Jambi Province.

My study aimed to evaluate hunting practices and potential impacts in Jambi in order to inform wildlife conservation. I report on the following:

(1) To identify and compare the different hunting practices present in Jambi.

(2) To identify factors that influence wildlife hunting and demand.

METHODS

I conducted 63 semi-structured interviews with hunters and oil palm and rubber workers and 9 semi-structured interviews with wild meat butchers and distribution centers, locally called "shelters". Shelters act as the middlemen in wild boar meat supply chain; buying from hunters and selling in urban marketplaces or exporting it to other regions. I conducted my interviews within approximate 120km (or within 4 hours drive) of Jambi City (1° 36' S, 103° 39' E), mainly in Jambi City, Muaro Jambi, Bungo, Tebo and Batanghari regencies. (See Fig. 1 for general location of the province).

Figure 1. Map of Indonesia. Jambi province is located in Sumatra Island, colored in red.
Source: http://indonesianoutlook.blogspot.com/2009/06/opportunities-in-jambi-at-glance.html

Participant observations

From June to August 2010, I followed several hunter expeditions to better understand the different hunting methods; 1 team of PORBBI hunters, 1 team of hunters who are carrying out drive hunts and 1 hunter with snares. On two different Sundays I visited PORBBI's (Persatuan Olah Raga Buru Babi Indonesia) organized hunting event. I took note of how hunting was carried out, its location, harvest rates and other relevant information. I also followed a snare hunter, but was not able witness a successful hunt. I was not able to follow hunters who use nets due the extended duration of hunts. Instead, I visited their homes and equipment store and was given detailed explanation of their methods. I also accompanied drive hunt, taking note of both hunting methods and species encountered. All of this personal observation was in addition to the semi-structured interviews.

Interviews

There were few hunters in Jambi province and I had difficulties locating hunters whose information is not readily available. Due to these difficulties, I collected my interview data using "snowball sampling". "Snowball sampling", or chain sampling, is a non-random technique where existing interview subjects are used to recruit future subjects from among their acquaintances. This allowed me to find substantial number of respondents, but limits the use of statistical analysis due to subjects' interdependence. I also trained two field staff who carried out interviews with me when there was more than one hunter present at the same place, for example, during group hunting activities. I used the following strategies to obtain the first groups of subjects:

(1) I interviewed personal acquaintances that hunted and asked them to recruit their acquaintances to participate in the study.

(2) When I visited 'shelters', I would ask the owner to introduce me to the hunters that sell meat.

(3) Through the PORBBI organization, I was given permission to participate in the hunting events, whereupon I interviewed hunters throughout the day

(4) I also contacted several smallholder and large holder plantation managers whom I had previously acquainted with to allow me to interview their laborers who hunt or introduce me to any other hunting team that they knew.

(5) I located lapun net hunters through the store owner to made nets.

(6) Finally, I opportunistically interviewed farmers along the main road with the help of village chief or leader.

During the semi-structured interviews, I asked the hunters questions on where, when, what and how, they hunt. I also asked much they earn from hunting and reason for hunting and many other relevant question in regards to their hunting activity. I also asked questions about their culture, where they are from, monthly wages, race/ethnicity, religion, and other socioeconomic parameters. Lastly, I asked questions on their consumption pattern as a possible predictor of hunting behavior and wild meat consumption (See the complete lists of interview questions in Appendix A).

Additionally, I also interviewed owners of wild boar 'shelters' in Jambi City. I asked questions on the amount of meat they received from hunters weekly, the amount they sold, the demographics of their regular customers and other relevant questions regarding wild meat sales (See the complete list of interview questions in Appendix B)

There are only a few known 'shelters' in Jambi Province. I visited marketplaces and identified these owners as they sold their wild meat. I interviewed them either in the marketplace itself or visited them at the 'shelter' later on, or make appointments to talk to them at later time. I was able to identify most of the 'shelter' owners in the marketplace and interviewed all who were willing to participate. was also able to identify several other 'shelters' that did not carry out sales in the market, but export the wild meat they obtain from hunters.

Analysis

I summarized the data I collected using Stata 12.0. I generated graphs and charts based on the summaries.

RESULTS

Results from participant observations and hunter interviews

In Jambi province, Sumatra, Indonesia, hunting is carried out as a mean to control wild boar pest and a source of livelihood, however, it may also harm wildlife conservation if other species are killed, such as local endangered species including sun bears, Sumatran elephants and Sumatran tiger. The majority of hunters primarily sought wild boars, but would take other animals opportunistically. I identified five major hunting methods carried out around oil palm plantations. The different hunting practices, in order of number of hunters practicing, are (1) large traditional Minang Kabau wild boar hunts using dog hunts with 100-300 people. This is a social hunting event for people of the Minang Kabau tribe from West Sumatra that is carried out each Sunday, (2) wild boar drives by full-time commercial Chinese hunters from oil palm plantations into wire "lapun" nets traps, (3) snare hunting, usually done by full-time commercial hunters along major inter-province roads or farmers in nearby forests and rubber plantations , (4) air rifles, used on foot, usually at night, and primarily for subsistence hunting in which hunters seek mouse deer in rubber plantations or forest for consumption, and (5) overnight drive hunts using shotguns or rifles by wealthy people, usually members of the state sport hunting group, PERBAKIN. (See Table 1 for summary) The respondents who didn't hunt were primarily Javanese immigrants (87%) who worked as oil palm harvesters (60%) or rubber tappers (27%). I was only able to identify a few hunters who hunt with snare and drive hunts, thus, I could not make some conclusion regarding racial and income distribution.

The following are descriptions on how different hunting practices are carried out.
In the descriptions, I will be writing about hunting method and location in detail, socioeconomic status of participants, harvest rates (see Figure 2 for comparison of harvest rates), how each method deters pest damage and costs involved. (Note: US$1 ~ 9,800 rupiah, and the poverty line for a family of 4 in Jambi is 1.050 million rupiah)

Table 1. Hunter Demography. Summary of hunter demography for the different hunting practices

Hunting Practice		Racial Distribution	Income Distribution
Hunter with dogs	PORBBI organized hunting events	Majority of hunters are from West Sumatra or associated with the Minang Kabau Tribe.	Hunters come from all income levels
	Small sub units of 5-6 members within PORBBI	Majority of hunters are from West Sumatra or associated with the Minang Kabau Tribe.	Hunters come from all income levels
Full-time commercial hunter with nets		90% of the hunters are Chinese people	All hunters interviewed are above poverty line
Hunter with Snare	Full-time commercial hunter with snare	Sample too small	Sample too small
	Farmer hunter with snare	Sample too small	Sample too small
Subsistence hunting with air rifles		Hunters come from all racial background	87.5% earn 2.5 million rupiah or less (generally lower income)
Sport Drive Hunts with Guns		Sample too small	Wealthy individuals

*Note: The poverty line for Jambi Province for a family of 4 is 1.050 million rupiah

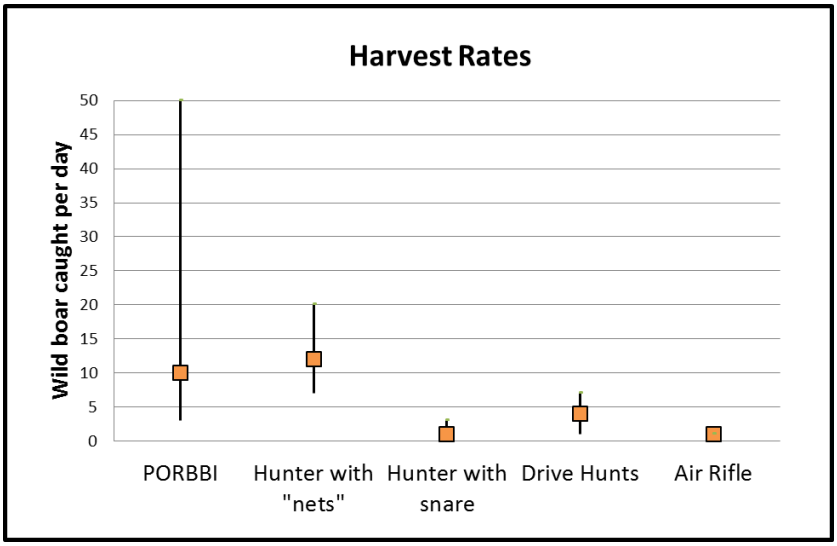

Figure 2. Graph of Harvest Rates. Graph of average, maximum and minimum catch oer day based on the different hunting practices.

First most common method I found was hunting with dogs. The dog hunts are organized by the hunting association PORBBI, which is exclusively made up of Minangkabau men which I identified through the common Minang language they use during their hunts. They hunt every Sunday except during Ramadan. Hunters from Jambi city and other smaller towns, bringing their dogs, will gather each Sunday to specified locations to hunt. Hunting with dogs has been part of the Minang Kabau tradition to deter pest. However, in Jambi, organized PORBBI hunts serve as recreation with pest deterrence as a side effect. These hunters either hunt in rubber plantations or in oil palm plantations in close proximity with rubber plantations. Smaller subunits of PORBBI hunters hunt in groups of 5 to 6 in their own plantations or farms to drive wild boars away. They rarely catch any wild boars themselves. A few members of the forestry department are part of the organization as well, and thus, the events are well-monitored. Therefore, its probability in harming other wildlife is very limited. The success of these hunting group varied, averaging 10 wild boars in a day, but yielding as little as 3 and upwards of 50. Most of the hunters live in Jambi city and would travel up to 5 hours to the designated hunting site. A small group (2-5) of Batak people will accompany these parties to collect the wild boars and sell them to butchers or Batak restaurants. If a large Sambar deer is caught the Minangkabau hunters will split up the meat. Nonetheless, hunters occasionally let loose their dogs, giving them chances to harm small mammals such as mousedeers. In addition to removing wild boar from plantations, hunting with dogs also deters pest damage by driving wild boar pests away from hunting site. A farmer reported that this method could shift wild boar from one plantation to another or pushed the wild boar back into the forest. Lastly, the cost of each dog could be as little as 100,000 Rupiah to up to 10 million rupiah.

The second most common hunting I found was hunting with nets. Hunters who use nets are usually full-time commercial Chinese hunter who hunts in groups of 4-5. The hunters usually come from Jambi city and would travel up to 6 hours to their hunting site. Unlike normal snares, because the animal is heavily restrained, it is possible to safely tie up take the animal alive, increasing its market value. The nets are set on wildlife trails around midnight with the mouths facing oil palm plantations at oil palm-forest edges or oil-palm rubber edges. Hunters then will herd the wild boars from the oil palm plantations into the nets either by making noises or using dogs when it is dawn. The total time taken including travel will approximate to a full 24-hr long

trip. Hunters with nets regularly encounter rare species along forest edges and may opportunistically capture these rare wildlife species such as bears, leopard cats and civets. The success of these hunting group varied, averaging 12 wild boars in a day, but yielding as little as 7 and upwards of 20. This hunting practice removes wild boar from plantations and if dogs are used could have similar effects to PORBBI hunt events. The nets costs 60,000 rupiah each and 120-150 are set up for each hunt. Therefore, this hunting practice requires much more capital than hunting with snares.

The third most common method of hunting I found was hunting with snares. Snares are set by both full-time hunters and common farmers. Full-time hunters usually set up their snares at oil palm-rubber plantation edges or at forest edges from early morning to sunset. These types of hunters are present along major inter-province roads and hunt close to where they live. However, this hunting practice is very risky for the hunter. It is difficult to kill wild boars that have been snared and even getting close to the snare may put the hunter in danger. Furthermore, even though the size of the snare is adjusted to trap boar, there is probability for the snare to trap other wildlife. In addition, snared wildlife may be left for hours before found by hunters and thus might have died. Thus, hunters may unintentionally harm rare wildlife species when hunting with snares. The success of this hunting practice is fairly slim, with harvest rate of about 1 or 0 per day and about 3 each week. Snares are usually useful for farmers to prevent wild boar from getting into their plantation. Using snare is the cheapest way to hunt and protect crops from wild boars. The rope required to hunt with this method only costs 30,000 rupiah per kg, which could be used to set up several traps.

The fourth most common hunting method found was hunting with air rifles in predominantly rubber plantation areas. I also found hunting with air rifles to be commonly practiced in the rural areas. Air rifles are commonly used to hunt macaques and mouse deer which are preferred by Muslims for consumption. Rubber plantation owners sometime provide laborers with air rifles to hunt down macaques. Air rifles are fairly expensive, and seemed to be used by people of relatively lower income though above poverty level. Hunters may hunt during the day or night depending on their target species. Hunters usually encounter common species and occasionally deer. This hunting practice usually yields one animal per day. The cost of an air rifle is approximately 1.7 million rupiah.

The least common method of hunting is night drive hunts using shotguns or rifles. Shotguns and rifles are fairly expensive. Hunters also have to pay 1 million rupiah each month for permission to carry guns for hunting. Therefore, drive hunts are commonly practiced only by wealthy people. Drive hunts are carried out in the middle of the night along paved roads and plantation roads. Drive hunts cover large areas and therefore does not significantly reduce wild boar within a given area and thus, may not be very effective in dealing with wild boar pests. Species encounters by hunters who carry out drive hunt are similar to species encountered by hunters with air rifles. Furthermore, guns are relatively powerful weapon, thus preventing hunter to catch smaller mammals which will get severely damaged from gunshots. This hunting practice yields an average of 4 wild boar per night and a minimum of 1 and maximum of 7 wild boars. A gun usually costs around 7 million rupiah.

Consumption results from Interviews with hunters and farmers

From the interviews with hunters and farmers, I found that among these groups of people, wild boar meat and pork are mainly consumed by Batak people and Chinese people. (See Figure 3 for comparison of wild boar and pork consumption across race)

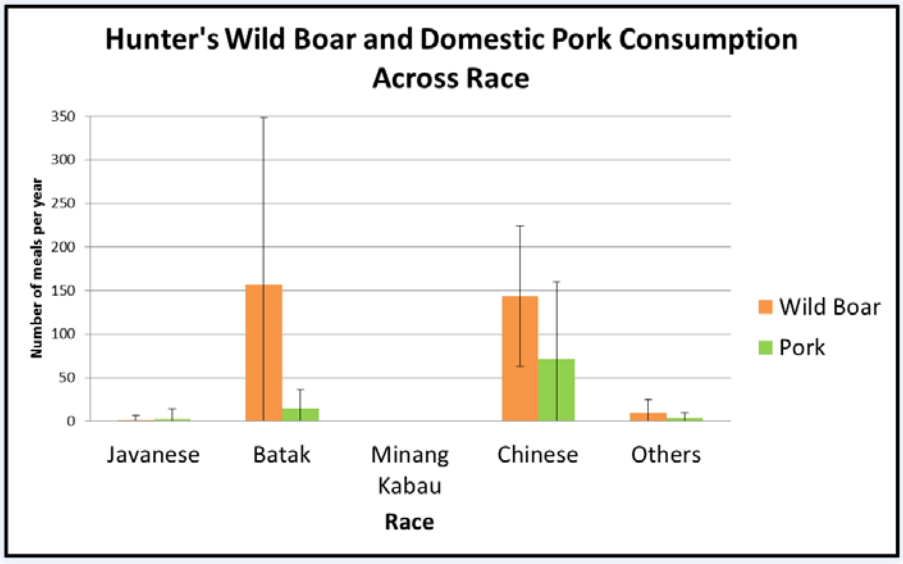

Figure 3. Hunter's Wild Boar and Domestic Pork Consumption Across Race. A plot of average number of meals per year

Results from Interviews with 'shelter' owners

I interviewed a total of nine 'shelter' owners, seven of which sold their wild meat in the marketplace and the other two exported wild meat to other regions. I found that there is a supply chain that underlies the wildlife demand in the Province.

Wild meat Supply Chain

I find that wild boars are bought from hunters by two types of 'shelters'. One is a 'shelter' whose owner sells the wild boar in the marketplace and the other is a 'shelter' whose owner exports wild boar to other islands and provinces. A whole live wild boar is bought by the first type of shelter, on average, for 5,000 rupiah/kg. Dead wild boar is also bought at the same price rate. However, the boar has to be gutted and the head and the legs of the boar have to be cut off before weighted. In addition, shelter owners also buy bearded pig at half the price of wild boar. The second type of shelter only buys meat with ribs and skin from hunters. The parts altogether are bought for 10,000 rupiah/kg.

I found that wild boar meat is over 3 times cheaper than domestic pig meat. Wild boar, on average, is sold for 10,000 rupiah/kg while domestic pig costs 35,000 rupiah/kg. When live wild boar is brought to the 'shelters' whose owner sells wild boar in the marketplace, the shelter owner or butcher will insert a tube into the boar's heart and pump water throughout the entire wild boar's body. This increases the overall weight of the boar by approximately 7% and lightens the color of the boar meat. This meat is then sold for between 10,000 to 15000 rupiah/kg while meat that has not had water added is sold for 15,000-20,000 rupiah/kg.

In the Jambi city, wild boar meat is supplied by 'shelters'. 'Shelters' collect wild boars from hunters and sell them in the marketplaces. From the interviews with 'shelter' owners, I found out that there are about 14 shelters within Jambi city. Twelve of them are sellers in the marketplaces, 11 are Chinese, while 1 is Christian from East Timor. The other 2 shelters are exporter shelters, both are Batak. Each shelter, on average, sells 600kg of wild boar meat each week. The main consumers are Chinese and Batak with occasional Floresian.

All 'Shelter' owners reports that majority of their consumers are Batak People and Chinese, and occasionally Floresian. The people in these ethnic groups are known to have a

greater tendency to be non-Muslims and therefore have no dietary restrictions on wild boar and pork. 'Shelters' also reported on the consumption of wild boar by Batak people during festive events and family gathering. In addition, wild boar is known to be used on a traditional Batak delicacy called 'saksang'.

Wild boar is exported from Jambi province to other islands and provinces, predominantly, Jakarta, Batam Island, and North Sumatra Province. In general, all three areas have significant populations of Chinese, Batak and Christians. Exports to Batam might also be exported to Singapore.

I found that exports to the North Sumatra are mainly to Pematang Siantar area, where there is a large population of Batak people. I found that along one of the inter-province roads, there were eight wild boar 'shelters' who sells their wild boar to one importer from North Sumatra. One 'shelter' that I interviewed was able to produce 1 ton of wild boar meat each week.

DISCUSSIONS

Looking through the results from the interviews, there seems to be underlying factors that shape the degree to which different hunting methods harm other wildlife, deter wild boar pests and improve rural livelihood. From the descriptions of the different hunting practices we can find several factors that affect hunting sustainability and wildlife demands.

Factors affecting hunting sustainability

The degree in which a hunting practice can harm other wildlife species seem to be explained by three main factors, which are (1) the species encountered by hunters, (2) specificity of the hunting method, in that, highly specific methods have few by-catches while methods with low specificity have many by-catches and (3) the hunter target species. Timing of the hunt (e.g. whether during the day or at night) and proximity to forests will affect the species encountered. Snares are the most indiscriminant harvesting method, followed by hunting with dogs (Scillitani et al. 2010). Other methods are relatively specific, or at least put the choice in hunter's hands as hunters can actively select their catch. Lastly, hunter's target species would probably depend on the hunter's religious and ethnic background, their motives for hunting and their socioeconomic

status. Full-time commercial hunters will only seek commercially-valued wildlife while subsistence hunter will hunt edible wildlife. Based on the three criterions, hunting with snare may be the most threatening to wildlife conservation, followed by dog hunts with nets.

Factors affecting the hunting for pest control

Hunting for pest control requires the harvest or deterring of pest species in areas where they are a concern. In Jambi, this is primarily wild boar in all agriculture and to a lesser degree, macaques in rubber. Therefore hunting activities that are carried out in oil palm plantations will generally be favorable. Hunts with nets and snares generally remove the most wild boars from agricultural areas. Hunts with air rifles have very low yield of wild boar and thus is less capable to control pest. Drive hunts even though are conducted in agricultural setting, it is spread out over very large areas and thus, the wild boar yield per unit area is also very low. Therefore, it is also less capable of deterring pest. However, if the drive hunts are carried out repeatedly over the same area, the number of wild boar per unit will be relatively high and thus, it can be a decent hunting practice. Otherwise, the harvest per unit area is too small to have deterring effect. Hunting with dogs may drive large number of boars from hunting site, however it may only shift the agricultural problem of one plantation to the other and thus, may not be as effective.

Factors affecting wildlife demand

Results from interviews point towards wild boar being consumed mainly by Chinese and Batak people. Therefore, presence of Chinese and Batak people in the province may potentially be used to estimate the wild boar demand in the population.

High wildlife demand is likely to increase wild meat prices and thus increasing the benefit of wildlife hunting by full-time commercial hunters. Previous studies have also supported this hypothesis that the amount of hunting carried out in a region is positively correlated with price of wild meat, especially relative to other protein sources (Brashares et al 2004, Damania et al 2005). In Jambi province, the high benefit of hunting has encouraged hunting to be carried out even hundreds of kilometers away, a likely outcome which has been previously found by Clayton et al. (1997) in a study in Sulawesi, Indonesia. Wild boar demand does not only exist in

the city but also extends to inter-provincial roads that are accessible medium to large size transportation to pick-up wildlife and bring them to other cities for exports. The inter-provincial roads seem to increase wildlife demand by adding urban wildlife demand on top of the local wildlife demand. This finding is also consistent with another study which hypothesized that the linking of rural wildlife demand to urban wildlife demand to be a major cause of wildlife demands (Chin 2001). This, suggest that demography of an area might only affect local demand for wildlife when there is little access or no access to the larger market.

Conclusions and implications on conservation efforts

Hunting in Jambi is still very loosely regulated, while wildlife sales are only slightly better enforced (Paskalis, pers. communication). Only hunting with gun requires official permission (Jambi Forestry Department). It will best if hunting yields were reported and regulated for management objectives, such as reduced wild boar populations but no hunting of threatened and endangered species.

Hunting with nets overall may be better than the other hunting methods because of its highest yield of a non-threatened target species, wild boar. To improve hunting across the province, perhaps snare hunters could be persuaded to use nets. This could be promoted by giving subsidies for nets or snare for net exchanges.

The results suggest that there is association between socioeconomic status, in particular, ethnicity and wealth, and hunting activity. This further indicates the potential use of demography to predict not only how much hunting is carried out in the region but also what type of hunting to be present. This concept can potentially be applied throughout Sumatra Island.

Limitations

The sample for this study is a small and non-randomized sample of hunters. Therefore statistics cannot be applied to many parts of this study. Numbers in this study serve as rough estimate but are not capable of testing or establishing any hypothesis. The short period of time to build trust made it hard to gain hunter trust to disclose information on by-catches as hunting of

protected wildlife is illegal and may put hunters in danger. Due to time logistical limitations, I was not able to follow all hunting trips

Future Directions

For future studies, I would recommend a randomized household survey on wildlife hunting and consumption. I would also recommend on following hunters and participating in hunting activities to get more accurate descriptions. More "undercover" work would be helpful in documenting the more illicit wildlife hunting and trade. In addition, having participants to keep diaries may provide more detailed insights on how location could affect hunting, species caught, methods, and many more aspects of hunters day to day operations..

This study serves as excellent stepping stone for future research on wildlife hunting and conservation in oil palm landscape. A random and larger sample on consumption of wildlife may want to be carried out to provide statistically significant resi;ts. My study was able to shed some light on how hunting is carried out, but future research may want to focus more on the real impacts of the different hunting practices on wild boar and other wildlife populations.

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Appendix A

Part A. Hunter Information

1. **Kecamatan, Regency where data is collected: _____**Gender:_____
2. **Which Kecamatan do you live at? _____ Which regency do you live at?_____**
3. **How long have you lived there? _____**
4. **Which kecamatan did you live before?_____ Which regency? _____**
5. **Which province and regency were you born? _____What is your religion? ____**
6. **What is your race/tribe?_____**
7. **How old are you? _____**
8. **How many people are you responsible for? _____**
9. **Are you married? Y N**
10. **How many children do you have?_____**
11. **Activity Table**

No.	What are your jobs? List from most time spent on to least	How many years have you been doing each job?	Each month, how much money do you make at each job for the last

12. What do you do before oil palm introduction? _____

13. What is your highest education level? _____

Part B. Hunting Activity

14. Over the last year how many times do you hunt each week/month/year ? _____

a. during dry season? _____ b. During wet season?_____

c. Any particular month/s? _____, specify occasion: _____

15. How many times do you hunt in a week/ month/ year 5 years ago? Why do you hunt more or less now?

_____

_____

_____

16. What is your role in the hunting party (do you shoot, look for pigs, helping?)

_____

_____

17. a. Do you own hunting equipment? Y N

b. Are you hired or do you hire others? Employee Employer

c. Are you paid? Y N

d. How is the reward split? _____

Hunter#_____ Date:_____ Location:_____

18. Where do you hunt <u>the last 1 year</u>? If forests, what are their name? if plantations, what plantations ?

Hunting methods **a. how many people is in your hunting party and how many shooters?** **b. what and how many hunting equipment do you bring?** **c. what time do you start and end, what is the proximate car speed** **d. When you hunt, do you hunt at the edge, or within the forest, how far within?** **Edge (0-100m)** **100m-1km from edge** **>1km into the forest** **e. what types of roads do you travel on?** **f. what animals do you trapped or catch but you don't take it back with you** **g. what factors affect hunting yield?**	**Hunting Location** **a. region name** **b. size of forest or plantation** **c. distance from home**	**How many times do you hunt in the location per month within the last year?**	**Site description** **a. what is around the hunting location** **b. are there houses or ranches** **c. what plantations are there, what proportions of each plantation. What is the proximate age of plantation and size of plantation**

Hunter#_____ Date:_____ Location:_____

Hunter#_____ Date:_____ Location:_____

19. What kind of traps, bait do you use and how many times do you set up in a week for the last year?

Trap	**Bait**	**How many traps do you set up in a week/year/month**	**Any difference between dry and wet seasons?**

20. How much money do you gain from hunting in a <u>month for the last year</u>:

…from selling meat? _____

…from plantation payment? _____

…other? _____

21. Who do you sell your animals to in the last year?_____

22. How far is this place from your home?_____

Hunter#_____ Date:_____ Location:_____

Animal	**How do you hunt this?**	**Where do you hunt this?**	**Number caught in the last trip/ month/ year for the last year**	**When do you hunt this? Any occasion or season?**	**What do you use it for and how much to each activity?**	**Other Comments Is there a few or many of these animals left?**

Hunter#_____ Date:_____ Location:_____

What animals do people in this area catch?	**How do people in this area hunt this animal?**	**Where do people in this area hunt this animal?**	**How much of this animal do you think is caught each week/month/year in this area?**	**When do people in this area hunt this animal? Is there certain seasons or event or while waiting for harvest?**	**What do people do to this animal? Do they eat it, give it to dogs or is there certain beliefs?**	**Komentar lainnya** **A) selling price/kg** **B) Is there a lot or a few of these animals in this area?** **C) When was this animal last seen/caught?**

Hunter#_____ Date:_____ Location:_____

Consumption Pattern

23. Who buys the meat for the family? _____

24. How much of these did you buy last week/month/year?

Animal	Livestock or bought	Amount of money spent/ Amount kg	How many times did you eat it last week?
Chicken			
Beef			
Duck			
Pork			
Eggs			
Fish			
Seafood			

25. What hunted animal do you eat? How often? When do you eat it

Animal	Do you or your family hunt or buy it?	How many times per month/year?	When do you eat it (any occasion?)

Hunter#_____ Date:_____ Location:_____

26. Do you prefer wild boar meat or pork? And why? _____

_____

_____

Farming Activities and Pig's Damage

27. Do you or your family own a farm? Family Self Company none

28. Do you work there? _____

29. How big is your own farm?_____

Crops Grown (the last year)	**Area Proportion**	**In what season/month is the crop harvested?**	**% produce sold**	**Revenue each harvest/ month**

30. Do animals ever damage your crops or at the farm you work? Which crop, how do they damage the crop? Problem rank.

Animal causing damage	**Crop or livestock damaged**	**How, how many times a year, and when does it damage this crop (snap, root. Etc?) or livestock**	**Problem Rank based on damage**

Hunter#_____ Date:_____ Location:_____

31.

How do you protect your crops and animals	**How much money do you use**	**How effective is the method? What is effective against and how long does keep the animal away?**

32. How many times do you use poison for the last year? _____

33. Which poison do you use?_____

34. What do you mix the poison with?_____

35. Where do you place it?_____

<u>Health</u>

36. What diseases are you aware of in association with wildlife? _____

_____

_____

Hunter#_____ Date:_____ Location:_____

37. Are you concerned about diseases?

_____

_____

38. What do you do as a precaution?

_____

_____

Appendix B

Part A. Shelter/Seller Information

1. Kecamatan, Regency where data is collected: _____Gender:_____

2. Which Kecamatan do you live at? _____ Which regency do you live at?_____

3. How long have you lived there? _____

4. Which kecamatan did you live before?_____ Which regency? _____

5. Which province and regency were you born? _____What is your religion? _____

6. What is your race/tribe?_____

7. How old are you? _____

8. How many people sleep in your house? _____

9. Are you married? Y N

10. How many children do you have?_____

11. Activity Table

No.	What are your jobs?	How many years	Each month, how much money do you

Hunter#_____ Date:_____ Location:_____

	List from most time spent on to least	**have you been doing each job?**	**make at each job for the last**

12. What do you do before oil palm introduction? _____

13. What is your highest education level? _____

14. Buying Activities

What animals do you collect	**Where do you get them, employees or free hunters**	**Do you know where they hunt? Where?**	**How many times do they come each week?**	**How much do you get each week, kg or head**	**Are there any differences in the meat you collect at certain seasons?**	**How much do you pay for the animal you collect? (note price differences for dead/live, gender)**

15. **How many employees do you have?_____**
16. **Does your employee bring their kill to you or to anyone else as well?_____**
17. **What do you do before you sell your meat**

Process	**Purpose**

18. **Do you sell meat at the market? Y N**
19. **How many times do you sell your meat each week?_____**
20. **How many times do buyers come to your house each week within the last year?_____**
21. **Those who come to your house are they small-scale or large-scale buyers?_____**
22. **For the animals you sell**

Animal(and part)	**gender**	**Quality(pumped/unpumped)**	**Price/kg**	**Amount sold each week**	**Buyer's description**

23. **How many regulars do you have?**

    _____
24. **How many of your regulars are local Indonesian, chinese, batak, etc**

Race/religion	**Number of regulars**

25. **Are there certain months with higher or lower sales?_____**
26. **How do you meet the consumer's demand during months with higher demand?_____**
27. **What animals do people usually eat**

animal	Who usually eats it	When do they eat it	What do they use it for	Other comments

Health

28. **What diseases are you aware of in association with wildlife? _____**

_____

_____

29. **Are you concerned about diseases?**

_____

_____

30. **What do you do to take precaution?**

_____

_____