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Photo front page: Kae Kawanishi came across this photo of a strange looking pig amongst the collection of camera-trap photos from their Taman Negara Tiger Project, and was wondering if it might be *Sus barbatus*, a bearded pig, as opposed to *S. Scrofa*. Any opinions?

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Appendix 1: names of specific locations in Togian, Talatakoh, and Batudaka on which Babirusa had been sighted by local villagers

Togian Island:

Lembanato/Motobiai (Tambun, Balelang, Inolibango, Tampale, Urung batang, Tangkutikin); Benteng area (Uesok, Tibondul, Gunung kidi-kidi, Manaya, Langges, slopes of Gunung benteng, Balelang, Lelengkoro, Beko, Sambote, Dali, Bakar); Tumbulawa (Padok, Lombu-lombu, Limpiato, Tongkarang, Melei, Solonsom, Konak, Topaya, Bololiban, Tinangonan)

Talatakoh Island

Melam, Balotongko, Binuan, Polandoa, Towan

Batudaka island

Lolumbu, Kandala**,** Dudurian, Copata**,** Lalantang, Tondo

Communal hunting of wild boars (*Sus scrofa*) as a common practice in West Sumatra, Indonesia

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Summary

Wild boars are ubiquitously distributed and have become serious pests in many locations within Sumatra. Hunting wild boars with trained dogs is a common and legal practice in West Sumatra. It is unknown when this tradition began, but it has continued over the generations and is practically organized. Data were collected during surveys of large mammals across three provinces on the Sumatran mainland, including West Sumatra, Riau and Jambi. We described hunting activities based on direct observation of several hunting events and from direct interviews with the hunters and host farmers. Hunting is mostly located around traditionally cultivated land, which is adjacent to the forest edges. Hunting with dogs is a method to control pests and prevent crop raiding and land damage caused by the boars, complementing snared trapping, poisoning, crop guarding and fencing. At present, many people participate in boar hunts for sport. Bush meat was not a reason for this hunting because people in the region mostly do not eat pork, as a result of religious restriction. This hunting might not have a significant influence on the wild boar populations because the number of boars killed is very few. However, it could be effective in driving the pests temporarily away from cultivated land.

Introduction

In 2003 we began a survey of large mammals in Sumatra and continued in a part of each year until 2006. The survey aimed to evaluate the current distribution and population status of several large mammal species, including wild boars. In 2006, the survey covered three provinces including West Sumatra, Riau and Jambi. A total of 550 locations were surveyed within the three provinces. Each location is separated from the others by between 10 and 15 km distances. From this survey we found that some species (e.g., tiger, leopard, elephant, deer and some primates) have been extirpated at some locations in Sumatra. In contrast, the distribution of wild boars tended to expand even though they are legally hunted and their forest habitat has been rapidly converted for human

purposes. One possible reason for this increase is the disappearance of natural predators over the last decades, such as the Sumatran tiger, leopard (Kinnaird *et al*., 2003) and reticulated python (Auliya, 2003).

Communal hunting by hundreds of people with trained dogs is a common practice in West Sumatra (Munir *et al*. 1993). People consider wild boars as an extraordinary pest species because the economical losses from crop raiding and damage are considerably high. Formerly, the purpose of this hunting might have been to protect crops from damage caused by boars but now even more people are involved. They are not only host farmers but also come from different villages and different types of fieldwork. It is organized into regional and district levels, which involves hundreds and sometimes more than a thousand participants. This communal hunting is always located around cultivated land and adjacent forests. Although this hunting has been done over many generations, its effectiveness has never been evaluated. This study was conducted to describe how people in West Sumatra practice communal hunting on wild boars and generally assess how successful the hunts are. We also discuss boar hunting from the perspective of pest control and population management.

Methods

Study Area

West Sumatra is one of the eight provinces located in the mainland of Sumatra, Indonesia ($0^0$54'N~$3^0$30'S, $98^0$36'E~$101^0$53'E). The area is 36,218.38 km^2 (excluding offshore islands) with the human population from both rural and urban areas at 4.24 million in 2001. About 49.62% of labour is in the agricultural sector. Agriculture is still dominated by traditional croplands although in the few last decades modern plantations have expanded. Forest is still the main vegetation type covering the land (60.59%) but recently deforestation has rapidly increased and abandoned lands have also expanded. About 28.55% of the land is used for agriculture. The main crops are rice, corn, palm oil, rubber plants and various vegetables. Cultivation is possible year round but some land can be planted only during the rainy season between November and March (Statistic Bureau of West Sumatra Province, 2002). Cultivated land located adjacent to forest edges frequently suffers from crop raiding and damage by wild boars, monkeys, elephants, deer and other animals.

Data Collection

We collected data on wild boar hunting during surveys of the distribution of large mammals on the Sumatran mainland (West Sumatra, Riau and Jambi provinces) in March 2003, February-March 2004, April-May 2005 and April-September 2006. Data were collected via direct interviews with hunters (N=400) and host farmers (N=152) in areas where boar hunting took place. A host farmer is a farmer who cultivates the land around a hunting location. To describe hunting activity, we directly observed 17 hunting events at 10 locations during the survey periods. We started observation from the morning until they finished hunting in the afternoon. The number of hunters joining each hunting event was obtained through the group leader of the hunters. The total area covered for each hunting event was obtained by using GPS coordinates and plotted onto a map.

Results

Wild boars were widely distributed over 97.27% (535/550) of the locations surveyed in West Sumatra, Riau and Jambi provinces. People complained of wild boars as a pest species at 71.1% (185/260) of the locations we surveyed in West Sumatra. Wild boars frequently raided crops and caused damage to various cultivated plants such as vegetables, paddies, corns, cassava roots and beans, amongst others. In some areas where crop raiding and damage frequently occurred, local farmers were reluctant to cultivate their lands and had to compensate with other forms of works.

Wild boars were hunted in 46.7% (100/214) of the locations we surveyed in West Sumatra. Hunting locations were mostly distributed through the middle part of the province, around the land of the Minangkabau ethnic group (Fig. 1). Hunting has always been conducted near cultivated lands

adjacent to forests or abandoned lands. The location of the hunting is usually decided by a group leader, from a list of several locations, but sometimes may also depend upon requests from local farmers. However, only several scattered areas have been listed as alternative locations. This means that boars may sometimes only be hunted in one of two adjacent areas. Hunting boars can be done occasionally and/or regularly depending on the group size of the hunters. When a farmer finds a wild boar near his farmland, he will call other villagers and then a small sporadic hunting party from 10 to 15 people will be organized. Occasionally, such a small group is formed in the morning between 06:00 and 09:00.

Regular hunts are organized hierarchically from a regional to a district level. Regional group levels consist of several villages that hunt once a week, and then join other regional groups to form a district group every six months. Regular hunts are conducted all day, lasting from 08:00 to 15:00 Hunting at the regional level might involve between 150 and 500 hunters while district levels involve between 500 and 1200. Group members consist not only of farmers but also people from different fields. The groups are loosely organized and the members are not obligated to participate in all events. We interviewed 400 hunters and found that motivations for hunting were mostly hobby & sport (54%), controlling pests (41%) and the rest (5%) were hunters with special interests such as looking for specific plants or meeting friends. Hunting for bush meat was not a reason since most people in West Sumatra do not eat pork because of their religious beliefs.

Each hunter is accompanied by one or two trained domestic dogs and traditional weapons such as machetes, spears and/or local-made firearms. However, since the 1970s, the central government of Indonesia has prohibited people from keeping firearms. Hunters with their dogs gather at the starting point of a tracking route located near cultivated land and forest edges. Several host villagers who know their area better than other hunters are pointed as seekers. Seekers can be divided into three small groups of between 5 and 10 individuals. Seekers begin tracking by releasing and directing their dogs to trail wild boars through bushes, mixed forest or secondary forest. Other hunters follow seekers from main tracks near cultivated land and forest edges. Fresh wild boar tracks leave a good scent for the dogs to follow. When dogs find a wild boar, they bark continuously and at that moment the other hunters release their dogs to begin the collective chase.

Five dogs can kill one wild boar, but sometimes people help with weapons. There are no selective target animals with hunters killing all age and sex classes of boars. Dogs will eat almost the entire carcass, and compete fiercely amongst themselves. Hunters do not seek out or chase boars deep into the forest. The total area covered for each hunt varies depending on the size of the group of hunters and the accessibility of landscapes.

The average number of participants for each hunting event was 349.17 (N=36) and average size of area covered was 740.28 ha (N=36). The number of boar killed per hunting event varied from 0 to 10 individuals (mean±SD: 3.05±2.44, N=36). Usually, the number of killed boars was higher than average when the dogs successfully found a sow with piglets. There was no significant correlation between the number of boars killed and the number of participating hunters in each event (Pearson Correlation = 0.084, N=36, P>0.05). There was also no significant correlation between the number of boars killed and the area covered by hunters during each event. (Pearson Correlation= 0.148, N=36, P>0.05).

The interviews with 152 host farmers who cultivated land near hunting locations revealed that 60% of the host farmers could not recognize any change in boar population as a result of the hunting. The other 37% have said that the boar population had decreased. However the remaining 3% argued that boar populations might have increased following hunts. They reasoned that the increases occur when boars from neighboring habitats come to their cropland after being hunted. However, many of them (63%) believed that hunting benefited them as a means of pest control. Only 17% believed that hunting was not useful in helping them control pest animals. The remaining 20% of respondents could not recognize any effects of hunting on pest control. When the question was posed as to what benefit the host farmers gained from the hunting, 45% believed that pests were evicted from their land and 36% responded that they benefited from the killing of pests. Some of the respondents (14%) had no answer regarding how they benefited, while 5% thought that they indirectly benefited as their village was visited by many people, which might help them expose local resources.

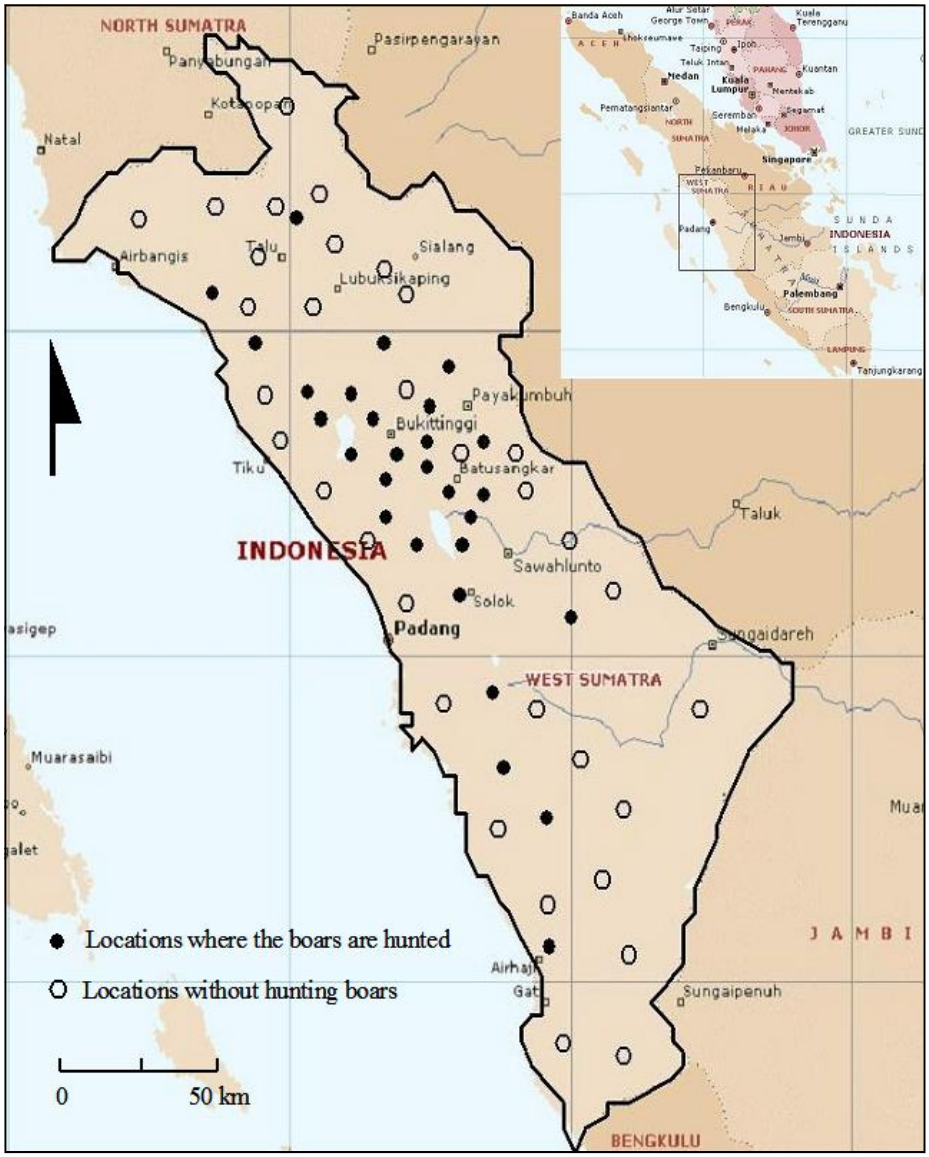

Figure 1: Study site in West Sumatra, showing the distribution of hunting and non-hunting locations

Discussion

Hunting wild boars with trained dogs is a common practice in West Sumatra. Opportunistic hunting involving small groups of host farmers in their own villages might be the origin of boar hunting in West Sumatra. Formerly, hunting was only meant to kill pest animals but it has since developed a recreational aspect - they enjoy hunting as a hobby and for sport. The number of participant has increased and now involves not only host farmers but people from different fields as well. Hunting has become somewhat conventionally organized in West Sumatra. Hunting wild boars with dogs was also found in various other provinces in Sumatra but has some differences in practice. In some areas in Riau and Jambi provinces, for example, hunts were not necessarily conducted near farmland but more exclusively in the forest and with different hunting techniques. Farmers were not the basis of these hunter groups. Usually, hunters sell the meat at the market or to non-Muslim communities nearby.

Hunting with dogs in West Sumatra might not be effective in controlling wild boar populations because the number of successful kills is considerably lower than their potential population growth. Wild

boar males are sexually mature by 5 to 7 months and females by 4 to 6 months (Brooks & Ahmad 1990). Up to 12 piglets are born after a gestation of 101-130 days, and the minimum birth interval is about 230 days (Diong 1973). This means that a single breeding female could potentially compensate for a hunt. However, the population density of target animals within a hunting area should primarily affect successful kills (Caley & Ottley 1995). It remains unclear whether low population density or poor hunting methods caused the low successful kill rate, since boar population density was unknown in this study. However, inappropriate strategies and lack of effort may result in a small number of boars killed during each event. While hunting, group hunters did not completely encircle the hunting area or corner target animals. The hunters usually concentrated their efforts on one side of cultivated lands, with much space on the forested side still remaining. This would have enabled the target animals to escape to the forest interior.

In addition, the area covered during one day of hunting was smaller than the home-range size of wild boars. This resulted in less effective searching because target animals could hide or move easily within their home range. In this study, one-day hunting events covered from 6.0 to 10 km^2 while home range size for wild boars is reported to be larger. A study by Caley (1997) reported that the mean aggregate home-range size was 33.5 km^2 for males and 24.1 km^2 for females and that the boars were rather sedentary with no tendency to disperse great distances from their initial home ranges. Saunders and Kay (1996) reported that the home range size of male boars was 35.0 km^2 and that of females was 11.1 km^2. Another study by Dexter (1999) reported home-range size for male boars was 7.9-11.6 km^2 and that for females was 4.3-8.0 $km^{2.}$ These results are relatively similar to the area covered while hunting in this study. Another possible reason for the low successful kill rate is that the long history of periodical hunting at the same location could also influence target animals to develop anti-predator behaviors such as escaping or hiding strategies. Mob hunting is always noisy with barking dogs, so wild boars may move away the moment they hear the dogs, well before they are found.

In interviews with the host farmers, most could not identify any change in population even though the boars are periodically hunted. However, some farmers said that boar populations might gradually decrease in hunting areas. Does this hunting benefit the host farmer even though successful kill rates were likely low? Many farmers believed that hunting evicted wild boars temporarily from their cultivated lands. They noticed that wild boars did not come to their farmland within some days following a hunt. If this is the case, periodic hunting may be necessary. Contrarily, McIlroy and Saillard (1989) reported that hunting with dogs does not cause the pigs to disperse from the area. Hunting with dogs is generally not as effective in reducing pig numbers as poisoning with walfarin (Mcilroy & Saillard 1989). Another study by Caley & Ottley (1995) con-

Figure 2: Hunters gather with their dogs where cultivated lands meet the forest edge.

cluded that hunting with dogs is an effective way to remove residual pigs after other forms of control have reduced densities.

Wild boar hunting was conducted in some areas but not in other adjacent areas. This may benefit the host farmers but is a disadvantage for those farmers in the non-hunted adjacent areas. These farmers have to find other methods to kill boars, such as poisoning or trapping. Otherwise, local farmers have to guard their cropland during the night, especially cropland adjacent to the forest edges. Since hunts may not be effective in helping all farmers, we suggest that hunters should realize the potential for hunting to control the pest population. Locations and frequency of hunting should in turn be arranged systematically to avoid neglecting adjacent areas. Moreover, efforts should be made to minimize the effects of hunting on non-target animals, such as deer, mouse deer, primates and birds, which have been accidentally killed or frightened. Finally, a detailed study is necessary to convince hunters of the benefits to host farmers and to illustrate the advantages gained by the latter via hunting.

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"I am fond of pigs. Dogs look up to us. Cats look down on us. Pigs treat us as equals. "

- Winston Churchill