



Pileated Gibbon (*Hylobates Pileatus*) in Samkos Wildlife Sanctuary. Do They Have a Future?

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Abstract— *Samkos is a Wildlife Sanctuary gazetted through Royal Decree which means strictly protected. It covers approximately 331.000ha of which approximately 235.000 ha is tall evergreen forest considered as Pileated Gibbon (*Hylobates pileatus*) habitat. The Pileated Gibbon is listed as “vulnerable” by the IUCN red list but the number of Pileated Gibbons is very high in Samkos Wildlife Sanctuary where the population is believed to number approximately 6100 individuals. However, human activities such as illegal hunting, habitat degradation and infrastructure development pose serious threats to the long term survival of the Pileated Gibbon. If these activities continue at the current level in the future it is believed that the population of Pileated Gibbon will decrease to critical low levels within the next 10-20 years.*

Keywords— **Habitat fragmentation, Infrastructure development, Pileated gibbon.**

1. INTRODUCTION

The Pileated Gibbon (*Hylobates pileatus*) is the most common of Cambodia’s two gibbon species. It is listed as vulnerable on the IUCN red list whereas the yellow cheeked crested gibbon (*Nomascus gabriellae*) is listed as Data Deficient (Long & Swan ,2005).

Cambodia is considered a global stronghold for the Pileated Gibbon (Daltry, 2000). It is estimated that Thailand contains approximately 7500 groups of Pileated Gibbon (Tunhikorn *et al*, 1994) whereas Cambodia contains more than 30.000 individuals (Duckworth *et al*, 1999; Traeholt *et al.*, 2005). Phnom Samkos Wildlife Sanctuary (PSWS) is part of the large block of forest in south-western Cambodia known as the Cardamom Mountains. It borders Central Cardamom Protected Area to the east and Southern Cardamom Mountains to the south. It covers approximately 331.000 ha of which about 235.000 ha is tall evergreen forest. It constitutes an important part of the Cardamom Mountain Ecoregion, an area spanning over 1 million hectares of relatively undeveloped forest, wetland and mangrove habitat. PSWS takes its name from the mountain, “Samkos”, which is the second highest (1717 meters) mountain in Cambodia. It is mostly covered in dipterocarp woodland and evergreen forest.

A large part of PSWS consists of ideal habitat for Pileated Gibbons as well as many other wildlife species. However, PSWS is also a target for illegal logging, agricultural encroachment and infrastructure development whereas wildlife is threatened by hunting, habitat loss and/or fragmentation (Traeholt, *et al.*, 2005). Loss of Pileated Gibbon habitat in 2004 was 0.4%-4% in concession areas and between 7.2-98.3% in protected areas higher than in 1997, which lost only 1.7 % of evergreen and semi evergreen forest which is a typically

preferred by gibbons(Coleridge *et al.*, 2005)

According to UNDP (2004), 90 percent of Cambodia’s population, approximately 13.1 million, live in rural areas and depend on natural resources to support their livelihoods. Hunting for meat or pets for the national and international trade has provided significant additional revenue to local communities and appears to be the largest threat to primates (Daltry & Momberg, 2000).Hunting can remove many individuals that are still reproductively active and subsequently result in a population decrease of a species (Daltry & Traeholt, 2003). Species, like Pileated Gibbons, with extended reproductive cycles are particularly vulnerable to hunting. Apart from local community encroachment for agricultural production many people chose to resettle in remote forested areas where land is either cheap or free (Daltry & Momberg, 2000).

Development, such as road construction (e.g. Phnom Penh to Koh Kong) across the Cardamom area and hydropower dams, are planned for the future (Paley & Hammond, 2002)

In this study, I used Pileated Gibbons in PSWS as an indicator of habitat “health”. The aim of this study is to analyze the effect, if any, on the population of Pileated Gibbons in Phnom Samkos Wildlife Sanctuary and, based on various human activities, predict possible future population trends. Since Pileated Gibbons require relatively undisturbed forest habitat, the presence of Pileated Gibbons are also a reasonable indicator for possible population trends of other and more threatened species.

2. METHOD

This review is based on data retrieved from earlier publications and reports. In order to predict future population trends of Pileated Gibbons I set up three criteria as variables, which can directly and indirectly result in population change,

1) **Change in habitat:** The amount of suitable gibbon habitat can increase or decrease for various reasons (agriculture, logging, replanting and protection). The trends in habitat loss, or gain, were measured by analyzing forest cover between 2000 and 2006.

2) **Hunting:** It is not possible to measure the exact number of hunters and/or hunted Pileated Gibbons in PSWS. Instead, I used the data in 2004 -2006 trends in hunting activity based on a) number of confiscated individuals, b) number of apprehensions, c) number of court cases/convictions, d) number of protection rangers, and e) the scale of wildlife trade in general. By comparing these components from two, or more, different time periods it is possible to get a relative indication of possible future scenarios in hunting activity.

3) **Infrastructure development:** Large development projects, such as construction of highways, hydropower dams, and urban areas often results in severe habitat loss and/or fragmentation. I measured the possible impact on PSWS from infrastructure projects with number of roads, hydropower dams, and resettlement schemes. The additional effect associated with, for example, roads is often increased accessibility to, previously, remote areas, which often results in increased illegal hunting, logging and mining activities too. A review of the planned infrastructure projects will provide a good indication of how PSWS will appear in geophysical perspective in the future.

I used the population density of Pileated Gibbons in PSWS estimated by Traeholt *et al.* (2005), who also undertook a population simulation exercise of the species in PSWS (Traeholt *et al.*, 2005). They predicted that Pileated Gibbons are in risk of declining to critically low number in 40-50 years. However, this simulation was based on habitat loss/gain trends from 1997-2002 and because the simulation programme used for this prediction (VORTEX) considers habitat loss linearly, it may result in a different prediction should the rate of habitat loss decrease non-linearly post 2002. By adding, additional information falling under the three criteria, it is possible to elaborate even more on the future population trends of Pileated Gibbons in PSWS.

3. RESULT

Pileated Gibbon in Samkos

Recently, Pileated Gibbon population densities were estimated to number approximately 3,102 groups (6,100 individuals). The survey showed a heavy bias toward single males (Traeholt *et al.*, 2005). One of the sites in PSWS recorded seven single males out of eight groups and three out of nine recordings were single males in the second site. Based on the habitat data from 1998-2005 and with the moratorium on logging activities from 2000, it is likely that the habitat scenario in Samkos appears slightly different today.

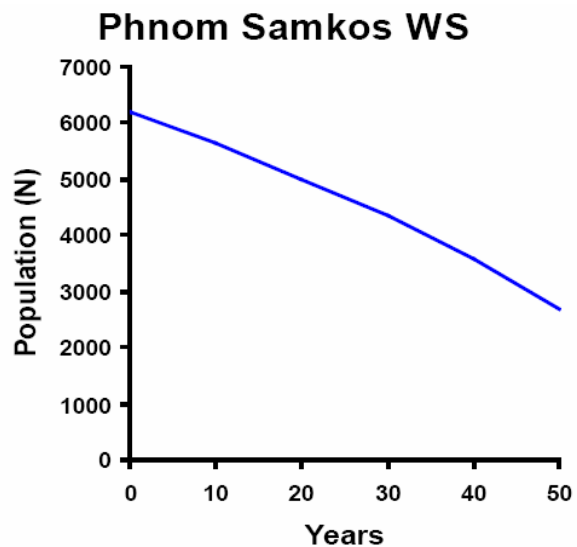


Fig. 1. *H.pileatus* population trend (blue line) in Phnom Samkos WS using VORTEX input to predict its trend. Source: (Traeholt *et al.*, 2005)

1. Hunting

Hunting is an enormous threat to survival of animals within the forest in the lower Cardamom Mountains. This activity is usually done by rural people for food, medicine and wildlife trade. Snare and guns are used to hunt large mammals and fast escaping mammals. Indeed, at O RATKRAH market, Samlaut District, wild animal products and meat were sold daily (Paley & Hammond, 2002). Wildlife populations are likely therefore to be under considerable threat and some species may have been reduced to population levels that are no longer viable. It is not just local people who pose a threat to the wildlife and forests. As a remnant of the civil war combined with PSWS's position on the border with Thailand, there are significant numbers of Cambodian Army troops stationed in Samlaut District, including some inside the protected areas. However, the level of hunting of Pileated Gibbons appears to be low since its meat is not popular and they are fast, usually escaping from pursuing hunters but raising them as a pet is more common. Pileated gibbons are primarily collected from the forest to sell as pets. A baby gibbon costs \$120 and \$59 for adult females. One study found that some people in PSWS kept at least 3 gibbons as pets (Bansak *et al.*, 2000). These have probably been collected by the hunters after they killed the mother. Because reproduction in female gibbons starts at 8 years with an average of 1 progeny per year, killing female gibbons is a serious ecological problem, because it removes the baby as well as a reproductive individual. Meanwhile, as access to wildlife sanctuary improves and collectors switch from other species whose populations are becoming depleted, threats to gibbons will increase within Southeast Asia (FFI, 2001). The number of resident hunters appears to have decreased slightly (table 1) while the number of rangers have increased from 5 rangers in 2000 to 48 rangers in 2006. The collaboration

between Non Government Organization (NGO) and the Ministry of Environment (MoE) and Ministry of Agriculture, Forestry and Fisheries (MAFF) resulted in improved prevention of illegal activities and subsequently protection of wild animals in PSWS. However, the number of traps confiscated in 2006 was higher than in 2004 and 2005. In May, 2004 to March 2005, the number of traps seized reached 336 whereas the number of traps seized was 1317 in 2006 (FFI & MoE, 2005, 2006). This suggests that either hunting activities have increased or ranger patrols have become more frequent and efficient. Furthermore, the number of dead wildlife recorded in 2004-2005 was six, which increased to 17 in 2006. Most of the wild animals were Bear claw, Sambar, Monitor lizard, monkey and Pangolin (FFI & MoE, 2005).

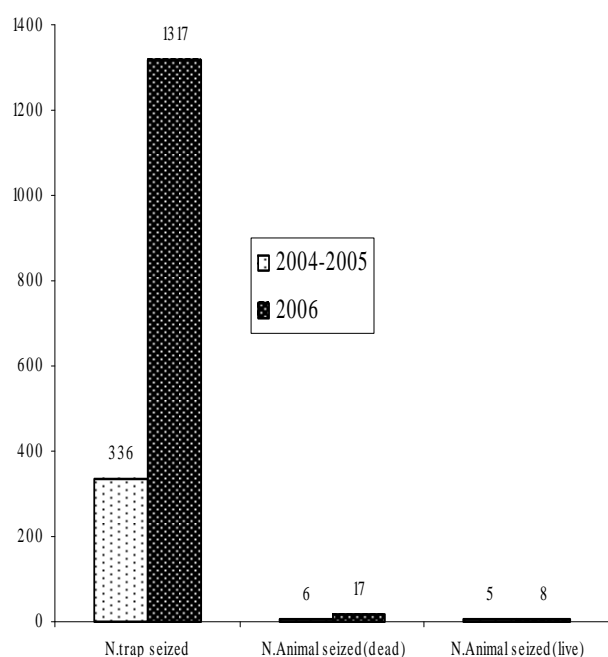


Fig. 2. Different years of trap confiscation (May, 2004 to March, 2005 and 2006 (1-11). Source: (FFI & MoE, 2005)

2. Habitat loss and fragmentation

A part from the mountain areas at Phnom Samkos and Phnom Aural, the habitat type in PSWS is not significantly different from the rest of Cardamom mountains, with a major vegetation type occurring across this ecoregion being dominated by dipterocarp forest that covers the low lying basic area and altitudinally zoned evergreen forest on the mounting slope and peak (Daltry, 2000). In 2000, a survey in PSWS showed that the density of evergreen forest cover was approximately 876 individuals per hectare and dry deciduous forest cover approximately 720 individuals per hectare. The abundance of the forest surrounding Cardamom Mountains has been exploited by opposing political factions in Cambodia that used timber to finance campaigns/ The logging activities have had significant social and ecological consequence for local communities and wildlife. In 1999, logging activities were much more

tightly controlled, 20-30 sawmills were shut down and the trade was ceased, however, local powerful sectors continued to organize illegal operations, often facilitated by the police and the army (Global Witness, 2002). In 2000, illegal logging occurred in both PSWS and Phnom Aural (PA) wildlife sanctuaries and in logging concessions in Thmar Bang District as well as along the Thai border (Alonson *et al*, 2002). In 2002, two large areas in PSWS were given to companies as logging/agricultural concessions by local authorities. The District Governor denied knowledge of one of them (Pheapimex company) and claimed the other was inactive (Youri Sako company). However, in other parts of Cambodia logging companies have shown little compunction in logging illegally within protected areas, and are still actively in violation of a government moratorium (Paley & Hammod, 2002). In November 2001 Global Witness exposed illegal logging and that the export of timber to Thailand took place (Global Witness, 2002). At that time, 19 Thai loggers were incarcerated for six month after that they were released (Global Witness, 2002). Since 2004, 65 forest crimes were record by rangers of which more than 25% were soldiers in PSWS (Claridge *et al*, 2005). Locations of military development zones have yet to be disclosed, and the development of these areas is often associated with logging operations and violence against local communities (Paley & Hammod, 2002).

Table 1. Decreasing of violator from 2004 to 2006. The PA resident appears to decrease from 2004-2006. Source: (FFI&MoE,2005)

Type of violators (include Forest crime and illegal hunters)	2004-2005 (May to March)	2006 (Jan-Novem)
Army	39	1
Police	13	0
Military Police	39	0
PA resident	90	25
outsider	1	44
Local Authority	0	1
Commercial company	2	2
other(CMAC)	0	1
Total	184	74

World Bank estimated forest in the Cardamom Mountains would be commercially logged out by 2003. Illegal forest activities appeared to decrease dramatically after forest concessions were banned by Prime Minister Hun Sen combined with an increased presence of rangers. In 2006 (from January to November) Forest Crime decreased compared to 2004 and 2005 (Figure 3). Only 84 cases were reported, of

which 26 cases were illegal NTFP factories (Mreah Prove Factories), 5 cases were brought to court, 35 cases were non re-offence contracts signed, 9 cases were information sign posted and 9 cases were successful prosecution (FFI & MoE, 2006).

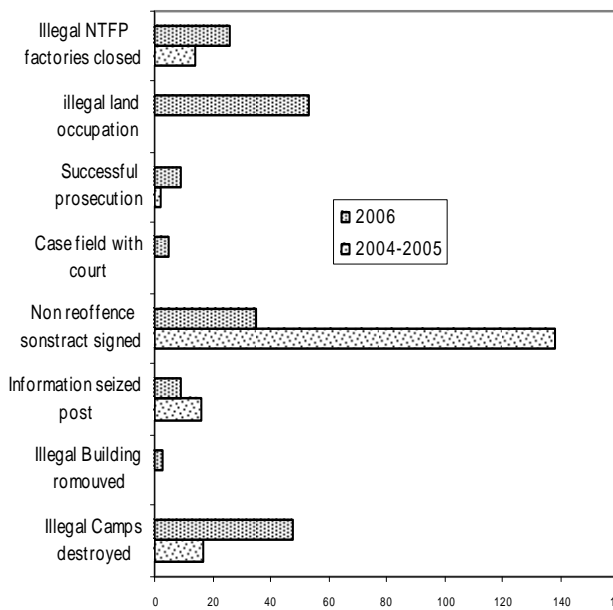


Fig. 3. Number of forest crime and land encroachment in 2004-2005 and 2006. Source: (FFI & MoE, 2005)

However, Land encroachment for agriculture and settlement increased from 2004 to 2006. The amount of illegal land clearing is 1 plot in 2004 compared to 53 plots in 2006, which corresponds to approximately 316.04 ha (FFI, 2006).

Fragmentation of forests in PSWS has occurred, as a result of agricultural land, logging areas, settlement, and road construction which depleted biodiversity (FFI, 2000). Migration is increasing from day to day, disturbing wildlife habitat (Daltry, 2002). Human populations in Veal Veng District located in Samkos mountain are increasing every year (FFI & MoE, 2005). Lutheran World Federation (LWF) supported by the United Nation’s High Commission for refugee’s (UNHRC) and World Food Program (WFP) developed infrastructure such as roads, health centers, wells and schools as well as systems for agricultural extension. In 1999 the total population in Veal Veng District was approximately 39 families (Bansak *et al*, 2000) During 2000, the population doubled to 5025 people as emigrant families returned to the area. In 2005 the population has increased to 10516 people in PSWS (FFI & MoE, 2005).

3. Infrastructure development

Road construction and the development of hydropower dams can also lead to habitat loss and/or degradation. Although building roads in Wildlife Sanctuaries is not strictly illegal it can result in negative impact on wildlife, because of habitat fragmentation and possible disturbance of sensitive habitat. The primary concern is

that building roads can divide an area into two parts and, in some cases, reduce its conservation value. So far, one main road has been constructed spanning approximately 200km. A new road was constructed crossing the mountain range and opening up the area for the first time. One road was constructed by GATT international logging company through the middle of the Cardamom mountain range from Koh Kong to Pursat via Thmar Bang (located in Samkos mountain), but it was banned by the department of forestry in 2001. In addition, You Risar Kor Company was extending the road from its concession north of Samkos mounting to Koh Kong via OSom. The other two major roads were constructed in 2003 linking Koh Kong directly with Phnom Penh. In addition, 50km of the road has been constructed for national security reasons in the part of PSWS adjoining the Thai border in the north of Thmar Da village (Table 2). Currently, three hydroelectricity plans are under consideration in Samlaut District (Paley & Hammond, 2002).

Table 2. A number of road developments in the different places adjacent to and within PSWS. Source: (FFI & MoE, 2005)

Number of roads development	Location
1	Cross mount range
1	Cross PSWS
1	Middle of Cardamom mountain
1	North of PSWS
2	Linking Koh Kong with Phnom Penh
50km	Part of mount samkos

4. DISCUSSION AND CONCLUSION

The results presented in this paper indicate that if hunting, habitat loss and infrastructure development continue, the Pileated Gibbon and/or other wildlife species are likely to suffer population disturbance and possible decrease within the immediate future.

Forest disturbance is a major reason for population decline of many wildlife species. Species, such as gibbons that depend on tall evergreen forest as food sources are particularly affected by forest disturbance and clearing. Previous logging activities often disregarded sanctuary boundaries since law enforcement was limited and inefficient. During the civil war, parts of the forest were clear cut in some parts of PSWS, which is extremely detrimental to the forest because its ability to regenerate from clear felling is limited and requires long time to recover. Even though illegal logging activities were common in 1999 pristine forest remained in large tracts of Cardamom Mountains and PSWS.

Logging seldom takes place as isolated activities. Workers hunt for food as well as opportunistically

collect and capture tradable plants and wildlife species in order to supply their meager salary with additional income. and much of the Pileated gibbon were hunted for both food and for the pet trade, which is likely to have resulted in a population decline over the past decade. Since adult gibbons are unsuitable as pets females are often killed and eaten, while infants were taken and sold as pets. Such practice results in a double blow to the gibbon population, because it effectively removes more than two individuals from the population. This may explain the skewed gibbon sex ratio recorded by the FFI-primate team during surveys in 2004 (Traeholt et al., 2005).

Although the number of forest crimes have decreased significantly from 2004-2006 the number of trap confiscation has increased. This indicates that whereas the number of illegal hunters may have decreased the hunting pressure has increased, or, the enforcement patrols have become better and more efficient in detecting, discovering and confiscating traps. There is evidence that local settlers have stopped illegal hunting activities, probably because they wish to remain in the area and therefore tend to adhere to whatever law that is implemented as long as it makes common sense, and there is a chance that they will benefit from not breaking it. However, outsiders are still involved with illegal activities and a major part of illegal activities is associated with outsiders. The primary problem caused by local people appears to be related to shifting cultivation practices. Whereas slash and burn practices may stimulate crop growth and, eventually, increase the yield of a field, such fires are rarely monitored by the farmers who started them, and much less controlled. The result is that many of these fires spread as wildfires to surrounding tall evergreen forest with extremely detrimental consequences. For gibbons the burning of prime habitat obviously has very negative consequences, because their primary food sanctuary disappears into smoke. Resident gibbons may not have the opportunity to flee into neighboring areas, because these are often occupied with a dominant pair. If the habitat is not burned, gibbons may be disturbed by the heat and smokes generated by a fire and avoid settling in areas close to human settlement, even if some areas are ideal habitat for them

One of the most critical development aspects of PSWS is the considerable infrastructure development that has taken place during the past 5-8 years. The development of several roads has resulted in habitat fragmentation and since gibbons are reluctant to descend to and walk on the ground roads can form a formidable barrier to gibbons. Fortunately, pileated gibbons have been observed to cross roads on several occasions and as such roads are not necessarily a serious obstruction to gibbon distribution. However, roads create easy access for illegal loggers, hunters and settlers and this is probably the most serious negative impact of road construction. Even if local communities refrain from undertaking illegal activities, outsiders have easier access to remote ranges of PSWS and can rapidly extract wood, trophies and the other goods.

Another infrastructure development that has serious

impact on biodiversity conservation in PSWS is the development of hydropower dams, because it will inundate large areas of the sanctuary. In addition building a hydropower dam will require additional road construction, particularly during the construction phase, which often encourages more settlers to enter the area. The impact of three proposed hydropower dams in PSWS may result in negative impact on pileated gibbons unless such side effects (increased settlers, illegal logging, hunting) are controlled properly. Whereas hydropower dams may also affect several species by inundating important habitats, it is uncertain to what extent inundation can impact gibbons, because it depends on the size of the inundation area.

In Cambodia most people are often extremely poor and lack income opportunities in urban areas. Therefore, many people tend to migrate to protected areas, including PSWS, to find fertile farmland, which in many cases end up being free of charge. The immigration of people into PSWS is still increasing (Daltry, 2003), and there is a risk that the use of natural resources in and around current settlements will become unsustainable if alternative options are not found. the birth rate in Cardamom Mountains is 2.7% (Daltry, 2003) and the increasing human population is likely to increase the pressure on land in PSWS. In spite of the positive initiatives taken to station ranger patrols and enforce the forestry laws, the escalating pressure on pristine habitats from infrastructure projects, new settlers and outside traders is likely to condemn much more habitat and many more gibbons to oblivion in the nearby future. It is uncertain, however, if gibbons will continue to thrive in PSWS in general, but considering the vast size of PSWS, there is a good chance pileated gibbons will continue to exist in the area, although in much smaller numbers.

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