IMPACT OF NATURE STUDIES TO MAMMALS ON THE NATURE TRAIL IN KHAO YAI NATIONAL PARK, THAILAND

ARPACHAW POONPRACHERT

A THESIS SUBMITTED IN PARTIAL FULFILLMENT OF THE REQUIREMENTS FOR THE DEGREE OF MASTER OF SCIENCE (SUSTAINABLE ENVIRONMENT PLANNING) FACULTY OF GRADUATE STUDIES MAHIDOL UNIVERSITY 2012

COPYRIGHT OF MAHIDOL UNIVERSITY
Thesis entitled
IMPACT OF NATURE STUDIES TO MAMMALS ON THE NATURE TRAIL IN KHAO YAI NATIONAL PARK, THAILAND

Miss Arpachaw Poonprachert
Candidate

Assoc. Prof. Rattanawat Chaiyarat,
Ph.D. (Forestry)
Major advisor

Asst. Prof. Noppawan Tanankanjana
Phongkhieo,
Ph.D. (Recreation Resources)
Co-advisor

Prof. Banchong Mahaisavariya,
M.D., Dip.Thai Board of Orthopedics
Dean
Faculty of Graduate Studies
Mahidol University

Asst. Prof. Piyakarn Teartisup,
Ph.D. (Forestry-Watershed Management)
Program Director
Master of Science Program in Sustainable Environment Planning
Faculty of Environment and Resource Studies,
Mahidol University
Thesis entitled

IMPACT OF NATURE STUDIES TO MAMMALS ON THE NATURE TRAIL IN KHAO YAI NATIONAL PARK, THAILAND

was submitted to the Faculty of Graduate Studies, Mahidol University for the degree of Master of Science (Sustainable Environment Planning) on
November 30, 2012

Miss Arpachaw Poonprachert
Candidate

Asst. Prof. Ronglarp Sukmasuang,
Ph.D. (Forestry)
Chair

Assoc. Prof. Rattanawat Chaiyarat,
Ph.D. (Forestry)
Member

Asst. Prof. Noppawan Tanakanjana
Phongkhieo,
Ph.D. (Recreation Resources)
Member

Prof. Banchong Mahaisavariya,
M.D., Dip.Thai Board of Orthopedics
Dean
Faculty of Graduate Studies
Mahidol University

Assoc. Prof. Kampanad Bhaktikul,
Ph.D. (Civil and Environmental Engineering)
Dean
Faculty of Environment and Resource Studies, Mahidol University
ACKNOWLEDGEMENTS

The thesis was succeeded with many have contributed both directly and indirectly to this work. Firstly, I would like to thank my advisor; Assoc. Prof. Rattanawat Chaiyarat, for him valuable insight, endless patience, and constant support. I greatly appreciate him time and effort on my behalf, and for guiding me throughout this opportunity. Valuable advices and suggestions were also contributed by co-advisor; Asst. Prof. Noppawan Tanakanjana Phongkhieo and Asst. Prof. Ronglarp Sukmasuang. As well, I would like to thank my committee member. I would like to express my highly appreciation to them.

The successful of this study was also resulted the kind support from an authorities of Faculty of Environment and Resource Studies, Mahidol University, Khao Yai National Park, Nakhon Rachasima Province and all household respondents around the site for their collaboration.

Most of all, A very special thanks to my family especially my father and my mother for their encouragement, financial support and helping me to succeed. Finally, I would like to thanks every teacher who provided an experience, knowledge and the best opportunities in my life.

This thesis is partially supported by Graduate Studies of Mahidol University Alumni Association.

Arpachaw Poonprachert
APPENDIX
### Appendix Table 1 Picture of wild mammals from the camera traps

<table>
<thead>
<tr>
<th>Common Name</th>
<th>Scientific Name</th>
<th>Picture</th>
</tr>
</thead>
<tbody>
<tr>
<td>Barking deer</td>
<td><em>Muntiacus vaginalis</em></td>
<td><img src="image" alt="Barking deer" /></td>
</tr>
<tr>
<td>Sambar Deer</td>
<td><em>Rusa unicolor</em></td>
<td><img src="image" alt="Sambar Deer" /></td>
</tr>
<tr>
<td>Asian Elephant</td>
<td><em>Elephas maximus</em></td>
<td><img src="image" alt="Asian Elephant" /></td>
</tr>
</tbody>
</table>
### Appendix Table 1 (Cont.)

<table>
<thead>
<tr>
<th>Common Name</th>
<th>Scientific Name</th>
<th>Picture</th>
</tr>
</thead>
<tbody>
<tr>
<td>Pig-Tailed Macaque</td>
<td><em>Macaca nemestrina</em></td>
<td><img src="image1" alt="Pig-Tailed Macaque" /></td>
</tr>
<tr>
<td>Asiatic Black Bear</td>
<td><em>Selenarctos thibetanus</em></td>
<td><img src="image2" alt="Asiatic Black Bear" /></td>
</tr>
<tr>
<td>Wild boar</td>
<td><em>Sus scrofa</em></td>
<td><img src="image3" alt="Wild boar" /></td>
</tr>
</tbody>
</table>
### Appendix Table 1 (Cont.)

<table>
<thead>
<tr>
<th>Common Name</th>
<th>Scientific Name</th>
<th>Picture</th>
</tr>
</thead>
<tbody>
<tr>
<td>Malayan Porcupine</td>
<td><em>Hystrix brachyura</em></td>
<td><img src="image1" alt="Picture" /></td>
</tr>
<tr>
<td>Gaur</td>
<td><em>Bos gaurus</em></td>
<td><img src="image2" alt="Picture" /></td>
</tr>
<tr>
<td>Dhole</td>
<td><em>Cuon alpinus</em></td>
<td><img src="image3" alt="Picture" /></td>
</tr>
</tbody>
</table>
### Appendix Table 1 (Cont.)

<table>
<thead>
<tr>
<th>Common Name</th>
<th>Scientific Name</th>
<th>Picture</th>
</tr>
</thead>
<tbody>
<tr>
<td>Binturong</td>
<td><em>Arctictis binturong</em></td>
<td></td>
</tr>
</tbody>
</table>
REFERENCES


Choibamroong, T. (2009). *On roles of the local administrations of Thailand in developing tourism under the economic sufficiency theory*. King Prajadhipok's Institute, Nonthaburi. (in Thai)


Senanok, S. (2010). Natural interpretation patterns for youth on natural trail study Srinakarin National Park, Kanchanaburi province, (Master’s thesis), Mahidol University, Nakhonpathom. (in Thai)


CHAPTER V
CONCLUSION AND RECOMMENDATION

5.1 Conclusion

From the hypothesis of the research, the numbers of the tourists are affected to wild mammals. The tourism activities will be limit according to the effect of tourism on wild mammals. The number of tourisms is higher in wet season (May to October). This data is different from the classification of the National Park Research Division (2010) that classified the low season from May to October and high season from November to April.

However, the results found that the high season has the photos of the tourists fewer than the low season whereas there were more photos of the wild mammals in the high season rather than in the low season. As a result of the numbers of the tourist in KYNP vary throughout the year (Kanjansomranwong, 2003). Moreover, from the statistic of the tourist, the number of the tourists who participate in the nature study activities on the nature trails is only the estimated number which cannot separate easily from the statistics’ high season.

In high season, the tourists can found from KY3. They participated in the nature study activities from 7 am to 6 pm. There were eight species of the wild mammals found in the total of 37 photos, mostly at KY1. In low season, the most tourists go to KY3 and KY1.

There are ten species of the wild mammals that were captured by Camera Traps in both high and low season. Gaur (*Bos gaurus*), Dhole (*Cuon alpinus*), and Binturong (*Arctictis binturong*) are among the species that have highest impact. Barking Deer (*Muntiacus vaginalis*), Sambar Deer (*Rusa unicolor*), Asian Elephant (*Elephas maximus*), Pig-tailed Macaque (*Macaca nemestrina*), Asiatic Black Bear (*Selenarctos thibetanus*), Wild Boar (*Sus scrofa*), and Malayan Porcupine (*Hystrix brachyura*) are among the species that have lowest impact. In KY1, the number of
wild mammals is increased when the number of tourists is increase, because in the low season, the foreign tourist is not caused the high impact on the wild mammals.

The tourism activities is active from 7 am to 5 pm and caused the impact to wild mammal activities such as feeding of Barking Deer, Asian Elephant, Asiatic Black Bear, Wild Boar, and Binturong. These animals are avoiding these activities by feeding at night. The usage of the three natural trails by the tourists and the wild mammals were different in both high and low season. The wild mammal avoided the route which was being used for the nature study activities during both high and low season.

The tracks survey taken in high season since November to February known as the dry season found the same kinds of the wild mammals that had appeared on the camera traps. These included Sambar Deer, Wild Boar, Barking Deer, Asian Elephant, and Dhole. However, the variety of the wild mammals was diminished in the low season since June to April when known as the rainy season. As a result of the wild mammal tracks can appear more clearly in the softer soil at that time. In the rainy season, we can see the tracks of Samba Deer, Malayan Porcupines, Wild Boar, and Asian Elephant. These were the same species that appeared on the camera traps. There were tracks of the wild mammal in the soil, but did not appear on the camera traps were Leopards (*Prionailurus bengalensis*) and Dhole.

### 5.2 Recommendation

#### 5.2.1 Recommendation for the next research

The camera traps for wild mammal should be set up on the nature trails throughout the year in order to observe the wild mammal’s behavior and home rang. The camera traps should be mounted along the way next to these trails at the distance of 200 m. To survey the different route of the wild mammal home rang and space, when they come to this area. Set up the camera trap increase from 15 days to 30 days because some wild mammals may appear when there is no camera to record them.
From the wild mammals’ track survey method. There are the wild mammal’s tracks more than the wild mammals that were record in the camera trap so that we should to study tracking cover all of the nature trails.

Should be study in another factor which may be impact to the wild mammals this information to improve and manage for sustainable.

The effect of the number of the tourist on wild mammals should be study. At the present, the research found that the amount of the tourists that approximately 4,000 negatively impact to the appearance of the wild mammals on the nature trails. Therefore, the effects could serve as a starting point to limit the amount of the tourists allowed on the nature trails at the given time.

We should be study the amount of the wild mammals found at a greater distance from the tourists’ activities by the similar methods in order to compare the amount of the wild mammals found in the areas both within and without the tourist activities. This can help determine the impact of the tourists upon the wildlife movement to another perspective.

We should be study more effects of the tourists’ activities, unless to study the nature. For instance activities such as driving speed and times both in and out of the breeding season for the various wild mammals might be worth looking into. Should to study in another animal especially birds which gain the effect from human camping.

5.2.2 Suggestion for KYNP

The organization should control the number of the tourists’ activities in order to lessen the activities’ impact to the wild mammals. For example, the organization should clearly assign times for doing certain activities, should to control the amount of the travel within the forest in order to keep the nature in balancing, the organization could create labels to advise the tourists every nature trail. Moreover Guides, provided by the organization, could be required to take the tourists walking on the nature trails.

The organization should enforce the rules about walking on the nature trails, such as registering and/or asking for permission before going into the forest.
The organization should conduct the survey 15 the kinds of wild mammals found on the nature trails in order to enter them into the database.

From the research, the researcher found that the wild mammal affected from the tourist activities that’s Dhole, Binturong, and Gaur, even though KYNP provided zoning for the tourists’ activities. Therefore, in the zones that have these activities they should advertise that the tourists’ activities impact to the appearance of these three animals. Moreover, Dhole is an endangered species, while Gaur and Binturong have a conservation status of “vulnerable” (IUCN, 2012).

Therefore, walking only on designated trails, reducing noise and various other activities should be enforced to reduce the impact to the wild mammals. Furthermore, the tourists who promote good activities along the trails will have effect on the wild mammals less than the other tourists have had.

In additional, there are some kinds of the wild mammal that are positively affected from tourist activities in their habitat. In high season when less uses of the tourist the nature trails we found that the wild mammals were more likely to appear, particularly Barking Deer, Deer, Asiatic Black Bears and Asian Elephant, as we can see from KY1. As a result of herbivores like the open space to look for plants that prefer to bud new leaves along the open nature trail. Asiatic Black Bears may come to the area because they detect the smell of west food. Therefore, the organization should warn to the tourists to be aware of the danger from the wild mammal cautioning them do not to leave the designated nature trail, do not to leave waste, especially scraps food because these may attract the wild mammal to come nearby to the nature trail and do not feed the wild mammal. When there is sufficient management to reduce the impact to wildlife from the tourist activities the KYNP have to pursue the success and improve the defect.
CHAPTER IV
RESULT AND DISCUSSION

The results from research by the camera traps to take pictures and count the wild mammal track in the high season during December, 2011 to February, 2012 and the low season during June, 2012 to August, 2012 is to observe the impact that occurred from tourist activities on wild mammals in three nature trails. The results are shown as follows:

4.1 The benefits of tourists and the appearance of wild mammals on the nature trails during the high season.

4.2 The benefits of tourists and the appearance of the wild mammals on the nature trails during the low season.

4.3 A comparison of the results between the high and low seasons.

4.1 The benefits of tourists and the appearance of wild mammals on the nature trails during the high season

4.1.1 The number of pictures and tourists in the camera traps

The results from the camera traps on the three nature trails during the high season, 45 days: point, during December 2011 to February 2012 are shown in Figure 4-1 and Table 4-1 as follows:
Figure 4-1 The number of pictures and tourists on each trail during high season, December 2011 to February 2012. (KY1 = Km 33 – Nong Pak Chi Nature Trails, KY2 = Dong Tiew – Mo Sing To Nature Trails, and KY3 = Orchid Campsite – Haew Suwat Nature Trails)

Table 4-1 The number of pictures and tourists on each trail during high season, December 2011 to February 2012

<table>
<thead>
<tr>
<th>Nature Trails</th>
<th>Camera Trap No.1</th>
<th>Camera Trap No.2</th>
<th>Camera Trap No.3</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Pictures</td>
<td>Peoples</td>
<td>Pictures</td>
<td>Peoples</td>
</tr>
<tr>
<td>KY1</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>±SD</td>
<td>22.77±23.94</td>
<td>45.78±44.65</td>
<td></td>
<td></td>
</tr>
<tr>
<td>KY2</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>±SD</td>
<td>29.44±21.65</td>
<td>71.33±58.80</td>
<td></td>
<td></td>
</tr>
<tr>
<td>KY3</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>±SD</td>
<td>91.55±78.64</td>
<td>157.66±133.28</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Total</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>±SD</td>
<td>47.92±56.74</td>
<td>91.59±97.58</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

KY1 = Km 33 – Nong Pak Chi Nature Trails
KY2 = Dong Tiew – Mo Sing To Nature Trails
KY3 = Orchid Campsite – Haew Suwat Nature Trails
Figure 4-1 and Table 4-1 show that the number of tourists that participated in activities on the nature trails, which was obtained from 3 camera traps, the total amount of tourists is 1,294 pictures (47.92±56.74) and the number of tourists are 2,473 (91.59±97.58), which can be divided into the nature trails as follows:

On KY1, there are 205 pictures of tourists (22.77±23.94), which are 412 people (45.78±44.65) categorized into foreigners with 114 pictures from 310 people, and Thai’s with 88 pictures from 102 people.

On KY2, there are 265 pictures (29.44±21.65), which are 642 people (71.33±58.80) categorized into foreigners with 136 pictures from 170 people, and Thai’s with 129 pictures from 472 people.

On KY3, there are 824 pictures (91.55±78.64), which are 1,419 people (157.66±133.28) categorized into foreigners with 152 pictures from 333 people, and Thai’s with 674 pictures from 1,086 people.

The trail that has the most pictures of tourists is KY3, accounting for 57% (157.66±133.28). The second is KY2, which has 26% (29.44±21.65). The last is KY1, which has 17% (22.77±23.94).
4.1.2 The number of pictures and amount of wild mammals that appeared in the camera traps during high season

The results are shown in Figure 4-2 as illustrated below:

![Figure 4-2: The number of pictures and amount of wild mammals that appeared in the camera traps during high season during December 2011 to February 2012 categorized by trail. (KY1 = Km 33 – Nong Pak Chi Nature Trails, KY2 = Dong Tiew – Mo Sing To Nature Trails, and KY3 = Orchid Campsite – Haew Suwat Nature Trails)](image)

From discovering wild mammals in the nature trail, it is found that the nature trail where wild mammals were found most frequently was KY1 (4.11±8.58). The second and third were KY3 (1.88±2.76) and KY2 (0.44±0.88), respectively. The reason for this is that in the first trail is on flat land, which is also forested. This is different from the second trail where there is a waterfall and a steep walk way. The last trail goes along a canal. The numbers of wild mammals are categorized as below:

During KY1, the camera traps took 37 pictures of wild mammals, which can be categorized into 8 types. The most frequently seen were Wild Boars (*Sus scrofa*), 23 units or 42%. In second place were Gaurds (*Bos gaurus*), 6 units or 16%, Samber Deers (*Rusa unicolor*), 4 units or 10%, Pig-Tailed Macaques (*Macaca nemestrina*), 4 units or 8%, Asian Elephants (*Elephas maximas*), 2 units or 5%, Dholes
(Cuon alpinus), 2 units or 5%, and Binturongs (Arctictis bonturong), 1 unit or 3%, respectively as shown in Figure 4-3:

**Figure 4-3** Percentage of wild mammals that could be seen on the nature trail Km33 to Nong Pak Chi during high season from December 2011 to February 2012

On KY2, there are two types of wild mammals that were found. These are four Barking Deers, or 64%, and two Asian Elephants or 33%, which is shown in Figure 4-4:
Figure 4-4 Percentage of wild mammals that were seen on the nature trail Dong Tiew and Mo Sing To during high season from December 2011 to February 2012

On KY3, there are 16 pictures of wild mammals, which can be categorized into 5 types. The most frequently seen were 9 Barking Deers or 56%. The second were 2 Pig-Tailed Macaques or 19%, 3 Sambar Deers or 13%, 1 Asian Elephant and 1 Binturong 6%, respectively, which is shown in Figure 4-5:

Figure 4-5 Percentage of wild mammals on the nature trail Orchid Campsite to Haew Suwat during high season from December 2011 to February 2012
After analyzing the results from the camera traps from all the nature trails, 405 trapnights, it was found that there are 8 types from 37 pictures or 59 wild mammals. Comparing this with research from Jenks et al (2011), who set the camera traps in KYNP during 2003 to 2007, with 6260 trapnights and 217 points all around the area of KYNP, the pictures showed 650 pictures with 29 wild mammals such as Sambar Deers, Wild Boars, Pig-Tailed Macaques, Malayans, Porcupine Asiatic Black Bears, and Dholes, respectively. The results now are that 8 wild mammal types will be used to evaluate the impact from tourists on each nature trail.

The results of the abundance calculation for each wild mammal are shown in Table 4-2:

**Table 4-2 The number of pictures and abundance of wild mammals during high season**

<table>
<thead>
<tr>
<th>Common Name</th>
<th>Scientific Name</th>
<th>Number(IND)</th>
<th>Sum</th>
<th>Rank</th>
<th>RAI</th>
<th>RF</th>
<th>Abundance</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>KY1</td>
<td>KY2</td>
<td>KY3</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Barking Deer</td>
<td>Muntiacus vaginalis</td>
<td>4</td>
<td>4</td>
<td>9</td>
<td>17</td>
<td>1</td>
<td>3.37</td>
</tr>
<tr>
<td>Asian Elephant</td>
<td>Elephas maximus</td>
<td>3</td>
<td>1</td>
<td>1</td>
<td>5</td>
<td>5</td>
<td>0.79</td>
</tr>
<tr>
<td>Sambar Deer</td>
<td>Rusa unicolor</td>
<td>4</td>
<td>0</td>
<td>3</td>
<td>7</td>
<td>3</td>
<td>1.38</td>
</tr>
<tr>
<td>Pig-Tailed Macaque</td>
<td>Macaca nemestrina</td>
<td>3</td>
<td>0</td>
<td>2</td>
<td>5</td>
<td>5</td>
<td>0.99</td>
</tr>
<tr>
<td>Binturong</td>
<td>Arctictis binturong</td>
<td>1</td>
<td>0</td>
<td>1</td>
<td>2</td>
<td>6</td>
<td>0.20</td>
</tr>
<tr>
<td>Dhole</td>
<td>Cuon alpinus</td>
<td>2</td>
<td>0</td>
<td>0</td>
<td>2</td>
<td>6</td>
<td>0.20</td>
</tr>
<tr>
<td>Wild boar</td>
<td>Sus scrofa</td>
<td>15</td>
<td>0</td>
<td>0</td>
<td>15</td>
<td>2</td>
<td>3.17</td>
</tr>
<tr>
<td>Gaur</td>
<td>Bos gaurus</td>
<td>6</td>
<td>0</td>
<td>0</td>
<td>6</td>
<td>4</td>
<td>1.19</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td></td>
<td>38</td>
<td>5</td>
<td>16</td>
<td>59</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

KY1 = Km 33 – Nong Pak Chi Nature Trails  
KY2 = Dong Tiew – Mo Sing To Nature Trails  
KY3 = Orchid Campsite – Haew Suwat Nature Trails

From table4-2, by considering the abundance of wild mammals from the camera traps and the amount of tourists during high season, groups can be formed. The first is the very common group such as Barking Deers (*Muntiacus vaginalis*) and Asian Elephants (*Elephas maximus*), which has 100% of abundance. Also, they can be seen in all three nature trails and are less influenced by the nature study. The second is the common group such as Sambar Deers (*Rusa unicolor*), Pig-Tailed Macaques (*Macaca nemestrina*), and Binturongs (*Arctictis binturong*), which has 66.66% of abundance. They can be seen on the first nature trail and the third nature trail. This
group could be affected by the nature study at a common rank. The last group is the uncommon group, which has 33.33% of abundance, such as Dholes (Cuon alpinus), Wild Boars (Sus scrofa), and Gours (Bos gaurus). They can only be found on the first nature trail and get affected from the nature study at the highest rate during the high season. However, the appearance of wild mammals could be involved with natural resources, behaviors that affect the recording and avoiding the enemies. It was also discovered that tourists used the nature trails less frequently in low season when compared to high season. Therefore, the conclusion of the nature trails and the wild mammals for only one season is not complete and cannot gain the best results.

To compare the abundance of wild mammals from the tracking of track on each nature trail, it was discovered as highlighted in Table 4-3.

**Table 4-3 The abundance of track that were found on the nature trails during high season**

<table>
<thead>
<tr>
<th>Nature Trails</th>
<th>Common Name</th>
<th>Scientific Name</th>
<th>Tracks I</th>
<th>Tracks II</th>
<th>Tracks III</th>
<th>RF (%)</th>
<th>Abundance</th>
<th>Rank</th>
</tr>
</thead>
<tbody>
<tr>
<td>KY1</td>
<td>Sambar Deer</td>
<td>Rusa unicolor</td>
<td>0</td>
<td>2</td>
<td>6</td>
<td>66.66</td>
<td>common</td>
<td>1</td>
</tr>
<tr>
<td>KY2</td>
<td>Wild boar</td>
<td>Sus scrofa</td>
<td>20</td>
<td>0</td>
<td>0</td>
<td>33.33</td>
<td>uncommon</td>
<td>2</td>
</tr>
<tr>
<td>KY2</td>
<td>Sambar Deer</td>
<td>Rusa unicolor</td>
<td>4</td>
<td>20</td>
<td>18</td>
<td>100</td>
<td>very common</td>
<td>1</td>
</tr>
<tr>
<td>KY2</td>
<td>Barking Deer</td>
<td>Muntiacus vaginalis</td>
<td>8</td>
<td>2</td>
<td>0</td>
<td>66.66</td>
<td>common</td>
<td>4</td>
</tr>
<tr>
<td>KY3</td>
<td>Asian Elephant</td>
<td>Elephas maximus</td>
<td>4</td>
<td>6</td>
<td>1</td>
<td>100</td>
<td>very common</td>
<td>3</td>
</tr>
<tr>
<td>KY3</td>
<td>Dhole</td>
<td>Cuon alpinus</td>
<td>0</td>
<td>0</td>
<td>3</td>
<td>33.33</td>
<td>uncommon</td>
<td>5</td>
</tr>
<tr>
<td>KY3</td>
<td>Sambar Deer</td>
<td>Rusa unicolor</td>
<td>2</td>
<td>1</td>
<td>3</td>
<td>100</td>
<td>very common</td>
<td>1</td>
</tr>
<tr>
<td></td>
<td><strong>Total</strong></td>
<td></td>
<td><strong>38</strong></td>
<td><strong>31</strong></td>
<td><strong>31</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

KY1 = Km 33 – Nong Pak Chi Nature Trails
KY2 = Dong Tiew – Mo Sing To Nature Trails
KY3 = Orchid Campsite – Haew Suwat Nature Trails

Table 4-3 shows that track from all the nature trails during high season from December 2011 to February 2012:

KY1 provided the track of only one wild mammal, Sambar Deers, which has the common.

KY2 provided that Sambar Deers has Very Common, Barking Deers has common, and Wild boars has uncommon of abundance.

KY3 had a Very common of Asian Elephants and Sambar Deers. However, one that has uncommon was Dholes.
The consistency test of track from each nature trail using the Chi-square Test found that there is no significant relationship in the statistic ($\chi^2 = 6.22$, df = 8, $p = 0.622$)

Comparing the track from all nature trails where 5 wild mammals were found, Sambar Deers, Wild Boars, Asian Elephants, Barking Deers, and Dholes were found respectively and from the pictures during high season which showed that 8 wild mammals were found considering the 5 track such as Binturongs, Pig-Tailed Macaques, and Gours. It also showed that the rank of frequency in each method does not relate, which means that different ways of studying could affect the evaluation of the amount of tourists that impact upon the appearance of wild mammals. However, the collecting of information from camera traps could provide two sides of information, which are the amount of wild mammals and tourists. Therefore, we decided to evaluate by only using the information from the camera traps because the information can identify the behavior and time accurately.

4.1.3 The relationship between tourists and the amount of wild mammals during the nature study in high season

The results identified the amount of tourists that participated in activities on all nature trails at different times. The results are shown in figure 4-6 as follows:
Figure 4-6  The relationship between the amount of tourists and the period of time for conducting activities on each nature trail. (KY1 = Km 33 – Nong Pak Chi Nature Trails, KY2 = Dong Tiew – Mo Sing To Nature Trails, and KY3 = Orchid Campsite – Haew Suwat Nature Trails)

KY1 had tourists visiting from 07.00am until 06.00pm. The peak period was from 12.00am to 01.00pm with an average of 3 people per hour.

KY2 had tourists visiting from 06.00am until 06.00pm. The peak period was from 11.00am to 12.00am with an average of 5 people per hour.

KY3 had tourists visiting from 06.00am until 06.00pm. The peak period was from 11.00am to 12.00am with an average of 6 people per hour.

From the above information, it can be seen that from 07.00am to 06.00pm, the peak time would be between 11.00am and 01.00pm due to safety conditions.

Considered with the appearance of wild mammals on each nature trail from the camera traps, the results are shown in figures 4-7 to 4-10 as below:
Figure 4-7 The relationship between the type of wild mammals and the period of activity in KY1 during high season

Figure 4-8 The relationship between the type of wild mammals and the period of activity on the nature trails Dong Tiew to Mo Sing To during high season
**Figure 4-9** The relationship between the type of wild mammals and the period of activity on the nature trails Orchid Campsite to Haew Suwat during high season

**Figure 4-10** The relationship between times spent on activities by tourists and wild mammals for each nature trail during high season
Considering each nature trail, it was found that in KY1 tourists started activities from 06.00am to 06.00pm, which had a peak period between 11.00am to 01.00pm, while the wild mammals came out from 00.00am to 10.00pm. In the statistical test, there is a significantly positive relationship at 59.8% \((p = .002)\), which means the appearance of animals increased along with the amount of tourists in 24 hours. This is related when we considered the specific time period during 07.00am to 06.00pm, it was also found that the appearances increase when the amount of tourists increase on these nature trails. \((r = 0.623, p = 0.041)\)

In KY2 the tourists conducted activities from 07.00am to 06.00pm, with a peak period of between 10.00am to 12.00am, while the wild mammals came out from 00.00am and 05.00 pm to 09.00pm. In the statistical test, there is an insignificant relationship at 17.8%. \((p = 0.405)\)

In KY3 the tourists conducted activities from 06.00am to 07.00pm, with a peak period of between 09.00am to 03.00pm, while the wild mammals came out from 0.00am to 05.00am and 02.00pm to 11.00pm. In the statistical test, there is an insignificant relationship at 36.9%. \((p = 0.076)\)

Considering the information from figure 4-10, which show the period that the 8 wild mammals came out to use the nature trails, it could be divided into Sambar Deers from 11.00am to 02.00pm, Gaur from 0.00am to 06.00am, Barking Deers from 05.00am and 05.00pm to 07.00pm, Asian Elephants at 10.00pm, Pig-Tailed Macaque from 12.00am to 03.00pm, Dholes and Binturongs at 07.00pm, and Wild Boars from 03.00am to 11.00pm. In the statistical test to find the relationship, there is an insignificantly low relationship. \((r = 0.052, p = 0.808)\)

4.1.4 The amount of tourists and wild mammals during high season

From studying the amount of tourists and wild mammals on the nature trails during high season, the information is illustrated in figure 4-11:
Figure 4-11 The numbers of picture, tourists, and wild mammals during high season on the three nature trails. (KY1 = Km 33 – Nong Pak Chi Nature Trails, KY2 = Dong Tiew – Mo Sing To Nature Trails, and KY3 = Orchid Campsite – Haew Suwat Nature Trails)

From figure 4-11, KY3 has the highest amount of tourists (157.66±133.28), and the least amount of pictures of wild mammals as the second position (1.88±2.76) KY2 has a lower amount of tourists (71.33±58.80), but the least amount of wild mammals (0.44±0.88), and KY1 has the lowest amount of tourists (45.78±44.65) but the highest amount of wild mammals (4.11±8.58), which might be because KY2 has a steep trail of around 800 metres, meaning wild mammals can not live there. KY3 has an area beside the waterfall, which is steep, so the wild mammals will only come out where the area is flat. However, KY1 is the area where wild mammals are found most frequently because the end of the trails is Pong Nong Pak Chi, which is a flat area.
4.2 The benefit of tourists and the appearance of wild mammals during low season

4.2.1 The numbers of pictures and tourists that appeared in the camera traps

From setting the camera traps on the nature trails during low season with a total amount of 45 days per point, which are 405 Traps night, from July 2012 until September 2012, the results are shown in figure 4-12 and Figure 4-4 as follows:

Figure 4-12 The numbers of pictures and tourists that appeared in the camera traps during low season from July 2012 until September 2012. (KY1 = Km 33 – Nong Pak Chi Nature Trails, KY2 = Dong Tiew – Mo Sing To Nature Trails, and KY3 = Orchid Campsite – Haew Suwat Nature Trails)
Table 4-4 The numbers of tourists and the average per camera during low season on the nature trail study

<table>
<thead>
<tr>
<th>Nature Trails</th>
<th>Camera Trap No.1</th>
<th>Camera Trap No.2</th>
<th>Camera Trap No.3</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Pictures</td>
<td>Peoples</td>
<td>Pictures</td>
<td>Peoples</td>
</tr>
<tr>
<td>KY1</td>
<td>308</td>
<td>804</td>
<td>144</td>
<td>545</td>
</tr>
<tr>
<td>±SD</td>
<td>82.33±42.86</td>
<td>255.33±153.40</td>
<td></td>
<td></td>
</tr>
<tr>
<td>KY2</td>
<td>122</td>
<td>249</td>
<td>87</td>
<td>306</td>
</tr>
<tr>
<td>±SD</td>
<td>36.22±17.51</td>
<td>103.77±73.96</td>
<td></td>
<td></td>
</tr>
<tr>
<td>KY3</td>
<td>281</td>
<td>504</td>
<td>204</td>
<td>483</td>
</tr>
<tr>
<td>±SD</td>
<td>89.22±50.15</td>
<td>180.55±104.74</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Total</td>
<td>711</td>
<td>1,557</td>
<td>435</td>
<td>1,334</td>
</tr>
<tr>
<td>±SD</td>
<td>69.25±44.81</td>
<td>179.88±127.57</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

KY1 = Km 33 – Nong Pak Chi Nature Trails
KY2 = Dong Tiew – Mo Sing To Nature Trails
KY3 = Orchid Campsite – Haew Suwat Nature Trails

Figure 4-4 and Figure 4-12 show the numbers of pictures and tourists that conducted activities on the nature trails. The three camera traps could capture 1,870 pictures (69.25±44.81) and could count as 4,875 tourists (179.88±127.57), which can be categorized from the nature trails as follows:

KY1 showed 741 pictures (82.33±42.86), which can be counted as 2,298 tourists (255.33±153.40) with 543 pictures of foreigners or 1,769 people with 194 pictures of Thai people or 529 people.

KY2 showed 326 pictures (36.22±17.51), which can be counted as 934 tourists (103.77±73.96) with 93 pictures of foreigners or 203 people with 233 pictures of Thai people or 730 people.

KY3 showed 803 pictures (89.22±50.15), which can be counted as 1,625 tourists (180.55±104.74) with 495 pictures of foreigners or 2,026 people with 308 pictures of Thai people or 599 people.

From Figure 4-2 and Figure 4-9, it is discovered that the trail that showed the pictures of travelers most frequently was the nature trails Orchid Campsite to Haew Suwat (89.22±50.15). The second was the nature trail Km33 to Nong Pak Chi (82.33±42.86), and the last one was the nature trail Dong Tiew to Mo Sing To (36.22±17.51). If we consider from the numbers of travelers, we will find that the
nature trail Km33 to Nong Pak Chi has the highest number (255.33±153.40). The second is the nature trail Orchid Campsite to Haew Suwat (180.55±104.74) and the nature trail Dong Tiew to Mo Sing To (103.77±73.96), respectively.

The reason is that, in the nature trail Km33 to Nong Pak Chi, travelers often visit in group and the average of travelers ($\bar{X}$) is 3 people per picture. Also, in the low season, which is raining season, this nature trail is the flat area, which makes it safe and comfortable for travelers rather than using the other trails. In addition, this trail is the closest to Pak Chong (Praphan, 2008). In the nature trail Orchid Campsite to Haew Suwat, travelers usually visit alone, which has the average ($\bar{X}$) of 2 people per picture.

From report of Praphan (2008) found that the numbers of tourists on each nature trail from June to September 2006 were:

KY1 had 342 tourists who used the trail with an average of 51 people per day. KY2 had an average of 32 people per day who used the nature trail and an average of 21 people per day who utilized it. KY3 has an average of 88 people per day and an average of 36 people per day who utilized it.

When we compared the average amount of tourists from the three nature trails to the impact of the utilization (the percentage is PCC), it is found that these three nature trails have a low impact < 50% (Below CC).

4.2.2 The numbers of pictures of wild mammals that appeared in the camera traps during low season

The study found that the nature trail that captured the pictures of wild mammals most frequently was KY3 (1.89±2.42). The second was KY1 (0.78±1.09), with the last being KY2 (0.22±0.44). The place that found the highest number of wild mammals was KY3 (2.11±3.29). The second was KY1 (0.88±1.36), and the last one was KY2 (0.22±0.44) as shown in Figure 4-13:
Figure 4-13 The numbers of pictures and wild mammals in the three nature trails. (KY1 = Km 33 – Nong Pak Chi Nature Trails, KY2 = Dong Tiew – Mo Sing To Nature Trails, and KY3 = Orchid Campsite – Haew Suwat Nature Trails)

The camera traps captured wild mammals separately on each nature trail as follows: KY1 found 5 wild mammal types as shown in figures 4-14, and will show the percentage of wild mammals from 7 pictures, 8 wild mammals. Sambar Deers (3) were seen most frequently, 38%. The second were Wild Boars (2), 25%. The next one was 1 Asiatic Black Bear, 13% and the last was 1 Asian Elephant and 1 Barking Deer, 12%, respectively.
The wild mammal that could find in KY2 is 1 Pig-Tailed Macaque, 100%.

The wild mammals that were found in KY3, 17 pictures, are of 4 different types. The first one were 8 Malayan Porcupines (Hystrix brachyuran), 37%. The second were 7 Pig-Tailed Macaques, 32%. The next one was 5 Sambar deers, 28%. With the last being 1 Asian Elephant, 5%. (Figure 4-15)

When we compare the study of Praphan (2008) and the group of Kanchanasaka (2009), which studied Dongpayayen to KhaoYai, The important wild
mammals such as Asian Elephants, Gours, Asiatic Black Bears, Dholes, Sambar Deers and Barking Deers can be found, which is similar to the three nature trails that we studied. For example, we found Sambar Deers, Barking Deers, and Malayan Porcupines with the camera traps.

The nature trail Orchid Campsite to Haew Suwat had 3 groups of travelers because of the steep way near to the waterfall and the resource of wild mammals (Tawee, 1991; Robinson and Bolen, 1989; Deal, 1998). The nature trail Km33 to Nog Pak Chi has flat area, so travelers like to go there. The nature trail Dong Tiew to Mo Sing To is the way that wild mammals rarely use though it has few travelers because the travelers are in big group, and it links to the other nature trails, which will force the wild mammals to adapt themselves a lot (Shinha, 2001).

The discovery of wild mammals with the camera traps in the three nature trails shows the abundance of the wild mammals as shown in Figure 4-5:

Table 4-5 Types and amount of abundance of wild mammals during low season from the camera traps

<table>
<thead>
<tr>
<th>Common Name</th>
<th>Scientific Name</th>
<th>Number(IND)</th>
<th>Sum</th>
<th>Rank</th>
<th>RAI</th>
<th>RF</th>
<th>Abundance</th>
</tr>
</thead>
<tbody>
<tr>
<td>Barking deer</td>
<td>Muntiacus vaginalis</td>
<td>1</td>
<td>0</td>
<td>0</td>
<td>1</td>
<td>4</td>
<td>33.33</td>
</tr>
<tr>
<td>Asiatic Black bear</td>
<td>Selenarctos thibetanus</td>
<td>1</td>
<td>0</td>
<td>0</td>
<td>1</td>
<td>4</td>
<td>33.33</td>
</tr>
<tr>
<td>Wild boar</td>
<td>Sus scrofa</td>
<td>2</td>
<td>0</td>
<td>0</td>
<td>2</td>
<td>3</td>
<td>33.33</td>
</tr>
<tr>
<td>Malayan Porcupine</td>
<td>Hystrix brachyura</td>
<td>0</td>
<td>0</td>
<td>7</td>
<td>7</td>
<td>2</td>
<td>33.33</td>
</tr>
<tr>
<td>Sambar Deer</td>
<td>Rusa unicolor</td>
<td>3</td>
<td>0</td>
<td>5</td>
<td>8</td>
<td>1</td>
<td>66.66</td>
</tr>
<tr>
<td>Asian Elephant</td>
<td>Elephas maximus</td>
<td>1</td>
<td>0</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>66.66</td>
</tr>
<tr>
<td>Pig-Tailed Macaque</td>
<td>Macaca nemestrina</td>
<td>0</td>
<td>1</td>
<td>6</td>
<td>7</td>
<td>2</td>
<td>66.66</td>
</tr>
<tr>
<td>Total</td>
<td></td>
<td>8</td>
<td>1</td>
<td>19</td>
<td>28</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

KY1 = Km 33 – Nong Pak Chi Nature Trails
KY2 = Dong Tiew – Mo Sing To Nature Trails
KY3 = Orchid Campsite – Haew Suwat Nature Trails

From Figure 4-5, the frequency of finding wild mammals with the camera traps and RAI value tells the abundance of wild mammals as having a common such as with Sambar Deers, Asian Elephants, and Pig-Tailed Macaques (66.66%), which were found in two nature trails such as KY1 and KY3 and a uncommon such as Barking Deers, Asiatic Black Bears, and Wild Boars, which were only found in KY1 and Malayan Porcupines could only be found in KY3 (33.33%)
Table 4-6 The numbers of tracking and abundance on each nature trail during low season.

<table>
<thead>
<tr>
<th>Nature Trails</th>
<th>Common Name</th>
<th>Scientific Name</th>
<th>Tracks I</th>
<th>Tracks II</th>
<th>Tracks III</th>
<th>Sum</th>
<th>Rank</th>
<th>RF (%)</th>
<th>Abundance</th>
</tr>
</thead>
<tbody>
<tr>
<td>KY1</td>
<td>Sambar Deer</td>
<td>Rusa unicolor</td>
<td>11</td>
<td>0</td>
<td>0</td>
<td>11</td>
<td>3</td>
<td>33.33</td>
<td>uncommon</td>
</tr>
<tr>
<td>KY1</td>
<td>Malayan Porcupine</td>
<td>Hystric brachyura</td>
<td>46</td>
<td>1</td>
<td>0</td>
<td>47</td>
<td>2</td>
<td>66.66</td>
<td>common</td>
</tr>
<tr>
<td>KY1</td>
<td>Barking Deer</td>
<td>Muntiacus vaginalis</td>
<td>22</td>
<td>0</td>
<td>0</td>
<td>22</td>
<td>6</td>
<td>33.33</td>
<td>uncommon</td>
</tr>
<tr>
<td>KY1</td>
<td>Leopard Cat</td>
<td>Prionailurusbengalensis</td>
<td>9</td>
<td>0</td>
<td>0</td>
<td>9</td>
<td>4</td>
<td>33.33</td>
<td>uncommon</td>
</tr>
<tr>
<td>KY1</td>
<td>Wild boar</td>
<td>Sus scrofa</td>
<td>190</td>
<td>227</td>
<td>128</td>
<td>545</td>
<td>1</td>
<td>100</td>
<td>very common</td>
</tr>
<tr>
<td>KY1</td>
<td>Asian Elephant</td>
<td>Elephas maximus</td>
<td>0</td>
<td>0</td>
<td>3</td>
<td>3</td>
<td>5</td>
<td>33.33</td>
<td>uncommon</td>
</tr>
<tr>
<td>KY2</td>
<td>Asian Elephant</td>
<td>Elephas maximus</td>
<td>4</td>
<td>0</td>
<td>0</td>
<td>4</td>
<td>5</td>
<td>33.33</td>
<td>uncommon</td>
</tr>
<tr>
<td>KY2</td>
<td>Wild boar</td>
<td>Sus scrofa</td>
<td>20</td>
<td>40</td>
<td>0</td>
<td>60</td>
<td>1</td>
<td>66.66</td>
<td>common</td>
</tr>
<tr>
<td>KY3</td>
<td>Sambar Deer</td>
<td>Rusa unicolor</td>
<td>0</td>
<td>0</td>
<td>30</td>
<td>30</td>
<td>3</td>
<td>33.33</td>
<td>uncommon</td>
</tr>
<tr>
<td>KY3</td>
<td>Leopard Cat</td>
<td>Prionailurusbengalensis</td>
<td>30</td>
<td>0</td>
<td>0</td>
<td>30</td>
<td>4</td>
<td>33.33</td>
<td>uncommon</td>
</tr>
<tr>
<td>KY3</td>
<td>Asian Elephant</td>
<td>Elephas maximus</td>
<td>3</td>
<td>19</td>
<td>0</td>
<td>22</td>
<td>9</td>
<td>66.66</td>
<td>uncommon</td>
</tr>
</tbody>
</table>

KY1 = Km 33 – Nong Pak Chi Nature Trails  
KY2 = Dong Tiew – Mo Sing To Nature Trails  
KY3 = Orchid Campsite – Haew Suwat Nature Trails

From the track survey during low season from June to August, 2012, track could be easily found due to the rain and there was no significant difference in the statistics ($\chi^2 = 5.500$, df = 10, $p = 0.855$).

KY1 found track of Wild Boars is very common. The second is Malayan Porcupines with a common. Those of uncommon are Sambar Deers, Barking Deers, Leopard, and Asian Elephants.

KY2 found a common abundance of Wild boars and found a uncommon of Asian Elephants and Sambar Deers.

KY3 found only two types, which are Asian Elephants as a medium abundance and Leopards as an uncommon.

When we compare track from low season to the wild mammals that were captured by the camera traps, it was found that the numbers of wild mammals that were there from the track was higher than the pictures that were taken by the camera traps. The wild mammals that were seen in both camera traps and track are Asian Elephants, Wild Boars, and Sambar Deers. The wild mammals whose tracks were only found were Leopards. When we computed the statistics by using Chi-square, it showed that there is no significant difference ($\chi^2 = 4.614$, df = 7, $p = 0.707$).
When we compared the discovery by track and camera traps, there is no significant difference. ($\chi^2 = 8.954$, df = 10, $p = 0.537$) The track survey is another way of research that gives high accuracy.

4.2.3 The relationship between the numbers of tourists and wild mammals and the period of activities on the nature trail during low season

The period for doing activity on the nature trail by tourists during low season on the three nature trails is shown in figure 4-17:

Figure 4-16 The relationship between the numbers of tourists and the time taken doing activities on the three nature trails during low season. (KY1 = Km 33 – Nong Pak Chi Nature Trails, KY2 = Dong Tiew – Mo Sing To Nature Trails, and KY3 = Orchid Campsite – Haew Suwat Nature Trails)

Figure 4-16 shows that the results of the activities during low season are shown below:

KY1 has tourists that conduct activities from 07.00am to 05.00pm. The peak time is between 12.00am and 01.00pm, which has an average of 16 people per hour.
KY2 has tourists that conduct activities from 07.00am to 05.00pm. The peak time is between 10.00am and 11.00am, which has an average of 8 people per hour.

KY3 has tourists that conduct activities from 07.00am to 05.00pm. The peak time is between 12.00am to 01.00pm, which has an average of 5 people per hour.

From the information above, the three nature trails have tourists that come from 07.00am to 05.00pm, which the peak time being between 10.00 am and 01.00 pm.

When we consider the time that wild mammals come to use the nature trails where we set up 9 camera traps, we found that Barking Deers come from 07.00am to 08.00am, Asian Elephants from 06.00pm to 07.00pm and 11.00pm to 12.00pm, Porcupines from 08.00pm to 12.00pm, Pig-Tailed Macaques from 08.00am to 09.00am and 01.00pm to 05.00pm, Asian Black Bears from 07.00pm to 08.00pm, Wild Boars from 11.00pm to 02.00am, 04.00am to 05.00am, 11.00am to 12.00am, 07.00pm to 08.00pm.

Figure 4-16 shows the relationship between the appearance of tourists and the amount of wild mammals at different times by using the statistical relationship. It is found that there is an insignificant relationship. \( r = 0.108 \), \( p = .615 \)

![Figure 4-17 The time period of participating in activities on the nature trails during low season of wild mammals](image_url)
After considering it separately, the results are shown in figure 4-18:

Figure 4-18  The relationship between each wild mammal and the period of participating in activities on KY1 during low season

Figure 4-19  The relationship between each wild mammal and the period of time of participating in activities on KY 2 during low season
Figure 4-20  The relationship between each wild mammal and the period of time of participating in activities on KY3 during low season

Figure 4-21  The relationship between tourists and each wild mammal and the period of time spent conducting activities on the three nature trails during low season
From Figure 4-19 to 4-21, show the time that the nature trails were used by tourists and by the wild mammals. KY1 has tourists coming from 07.00am to 05.00pm, and the peak time is between 11.00am and 01.00pm. The time for wild mammals is from 07.00pm to 01.00am, 06.00am to 07.00am, and 10.00am to 11.00am. After statistical calculation, there is an insignificant relationship at 18.7%. (r = 0.187, p = 0.382)

KY2 has tourists coming between 07.00am and 05.00pm, and the peak time is from 10.00am to 12.00am. The time for mammals is from 07.00pm to 11.00pm and 00.00am to 05.00am. After statistical calculation, there is an insignificant relationship at 0.3%. (r = 0.003, p = 0.989)

KY3 has tourists taking part in activities from 07.00am to 05.00pm. The peak time is from 09.00am to 03.00pm. The time for wild mammals is from 08.00am to 09.00am and 08.00pm to 12.00pm. After the statistical calculation, there is an insignificant relationship at 15.8%. (r = 0.158, p = 0.462)

4.2.4 The numbers of tourists and wild mammals during low season

After studying the amount of tourists that took part in activities on the nature trails and the wild mammals on the nature trails, the results are shown in figure 4-22:

![Figure 4-22](image)

**Figure 4-22** The numbers of pictures and amount of tourists and wild mammals during low season on each nature trail. (KY1 = Km 33 – Nong Pak Chi Nature Trails, KY2 = Dong Tiew – Mo Sing To Nature Trails, and KY3 = Orchid Campsite – Haew Suwat Nature Trails)
From Figure 4-22, KY3 has the highest numbers of pictures of tourists (89.22±50.15). The second is KY1 (82.33±42.86), with the last being KY2 (36.22±17.51). However, after considering the numbers of tourists from the three nature trails, it is can be seen that KY1 has the highest amount of tourists (255.33±153.40) at an average of 3 people per picture. The second is KY3 (180.55±104.74) at an average of 3 people per picture. Last is KY2 (103.77±73.96) at an average of 2 people per picture.

For wild mammals, KY3 found the highest amount of wild mammals (1.89±2.42) With KY1 being second (0.78±1.09) and finally KY2 (0.22±0.44).

4.3 The comparison of the result during high season and low season

4.3.1 The difference of numbers of tourists and wild mammals on the nature trails by using ANCOVA method

4.3.1.1 The fluctuation of tourists on the three nature trails during high season.

The results show that the numbers of tourists during high season who use the nature trail have a significant difference in statistics. ($f_{\text{ancova}} = 11.737$, df = 8, $p = 0.000$)

After consideration, it is found that the nature trails that has different amounts of tourists are KY1 and KY3, which has a significant difference ($p = 0.009$) and KY2 and KY3 ($p = 0.010$). When we test the numbers of tourists separately during two seasons by using t-test, it is found that the numbers of tourists in both seasons has no significant difference ($t = -1.462$, df = 22, $p = 0.156$).
Figure 4-23  The numbers of pictures and tourists during high season and low season. (KY1 = Km 33 – Nong Pak Chi Nature Trails, KY2 = Dong Tiew – Mo Sing To Nature Trails, and KY3 = Orchid Campsite – Haew Suwat Nature Trails)

After considering each nature trail, it is found that there is a difference in the numbers of tourists in KY1 ($t = 3.242, df = 8, p = 0.012$).

4.3.1.2 The mutual fluctuation of tourists on the three nature trails during high season

The numbers of tourists during high season on the three nature trails is statistically significant ($f_{ancova} = 6.477, df = 8, p = 0.001$).

After separating each nature trail, the nature trails that are different in the numbers of tourists are KY1 and KY2 ($p = 0.007$) and KY2 to KY3 ($p = 0.010$).

4.3.1.3 The mutual fluctuation of tourists on the three nature trails during high season and low season

The numbers of tourists in both seasons has a significant statistical difference ($f_{ancova} = 5.308, df = 8, p = 0.000$). When we test each trail, it is found that two of the nature trails are different, KY1 and KY3 ($p = 0.009$) and KY2 and KY3 ($p = 0.010$).
From 10 species of wild mammals from the camera traps during high and low season, the results are shown below:

**Table 4-7 Types of wild mammals during high and low season**

<table>
<thead>
<tr>
<th>Common Name</th>
<th>Scientific Name</th>
<th>Seasonal *</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>High season</td>
</tr>
<tr>
<td>1. Barking deer</td>
<td>Muntiacus vaginalis</td>
<td>X</td>
</tr>
<tr>
<td>2. Sambar Deer</td>
<td>Rusa unicolor</td>
<td>X</td>
</tr>
<tr>
<td>3. Asian Elephant</td>
<td>Elephas maximus</td>
<td>X</td>
</tr>
<tr>
<td>4. Pig-Tailed Macaque</td>
<td>Macaca nemestrina</td>
<td>X</td>
</tr>
<tr>
<td>5. Asiatic Black bear</td>
<td>Selenarctos thibetanus</td>
<td>O</td>
</tr>
<tr>
<td>6. Wild boar</td>
<td>Sus scrofa</td>
<td>X</td>
</tr>
<tr>
<td>7. Malayan Porcupine</td>
<td>Hystrix brachyura</td>
<td>O</td>
</tr>
<tr>
<td>8. Gaur</td>
<td>Bos gaurus</td>
<td>X</td>
</tr>
<tr>
<td>9. Dhole</td>
<td>Cuon alpinus</td>
<td>X</td>
</tr>
<tr>
<td>10. Binturong</td>
<td>Arctictis binturong</td>
<td>X</td>
</tr>
</tbody>
</table>

*X = presence  O = absence*

Figure 4-7 shows the types of wild mammals that were found during high and low season such as Barking Deers, Sambar Deers, Asian Elephants, and Pig-Tailed Macaques. The wild mammals that were found during high season were Gaus, Dholes, and Binturongs. The wild mammals that we found during low season were Malayan Porcupines, and Asiatic Black Bears. From the test, the difference in species of the wild mammals during high season is higher than low season. There is no difference in the statistics. \( t = -1.094, \text{df} = 26, \ p = 0.284 \) From Figure 4-7, the wild mammals that were not found during low season were 3 types such as Gaus, Dholes, and Binturongs. These are wild mammals that could have been influenced by tourists more than the other types because there are more than 4,874 tourists during high season using the nature trail while 2,473 people were using it during low season. When we test for the mutual fluctuation of the three nature trails, the results are as follows:

4.3.1.4 The mutual fluctuation of wild mammals on the three nature trails during high season

The numbers of wild mammals during high season from the three nature trails are statistically significant \( f_{\text{ancova}} = 11.737, \text{df} = 8, \ p = 0.000 \). When
we consider each trial, there is no difference in the numbers of wild mammals during high season.

4.3.4.5 The mutual fluctuation of wild mammals on the three nature trails during low season

The numbers of wild mammals during low season on the three nature trail are statistically significant ($f_{\text{ancova}} = 6.477$, df = 8, $p = 0.001$). When we consider each trail, there is no difference in the numbers of wild mammals on the three nature trails during low season.

4.3.4.6 The mutual fluctuation of wild mammals on the three nature trails during low and high season

The numbers of wild mammals in both periods are statistically significant ($f_{\text{ancova}} = 5.308$, df = 8, $p = 0.000$). When we separately consider each nature trail, there is no difference.

4.3.5 The difference of period of using by tourists and wild mammals during high and low season on each trail by using t-test

4.3.5.1 The difference of periods of tourist activities on the nature trails during high and low season

During high season, tourists came on the three nature trails with a total of 2,498 people while 4,843 people attended during low season, which will be shown separately on each trail in Figure 4-8:
Table 4-8 The numbers of tourists during each period for each nature trail

<table>
<thead>
<tr>
<th>Hour</th>
<th>HKY</th>
<th>HKY1</th>
<th>HKY2</th>
<th>HKY3</th>
<th>LKY</th>
<th>LK1</th>
<th>LKY2</th>
<th>LKY3</th>
</tr>
</thead>
<tbody>
<tr>
<td>7.00 - 8.00</td>
<td>35</td>
<td>5</td>
<td>1</td>
<td>29</td>
<td>43</td>
<td>13</td>
<td>13</td>
<td>17</td>
</tr>
<tr>
<td>8.00 - 9.00</td>
<td>92</td>
<td>11</td>
<td>13</td>
<td>68</td>
<td>36</td>
<td>15</td>
<td>14</td>
<td>7</td>
</tr>
<tr>
<td>9.00 - 10.00</td>
<td>202</td>
<td>12</td>
<td>32</td>
<td>158</td>
<td>244</td>
<td>103</td>
<td>52</td>
<td>89</td>
</tr>
<tr>
<td>10.00 - 11.00</td>
<td>431</td>
<td>64</td>
<td>198</td>
<td>169</td>
<td>724</td>
<td>235</td>
<td>368</td>
<td>121</td>
</tr>
<tr>
<td>11.00 - 12.00</td>
<td>562</td>
<td>85</td>
<td>224</td>
<td>253</td>
<td>961</td>
<td>547</td>
<td>216</td>
<td>198</td>
</tr>
<tr>
<td>12.00 - 13.00</td>
<td>350</td>
<td>108</td>
<td>27</td>
<td>215</td>
<td>1067</td>
<td>726</td>
<td>101</td>
<td>240</td>
</tr>
<tr>
<td>13.00 - 14.00</td>
<td>289</td>
<td>48</td>
<td>50</td>
<td>191</td>
<td>721</td>
<td>474</td>
<td>40</td>
<td>207</td>
</tr>
<tr>
<td>14.00 - 15.00</td>
<td>248</td>
<td>41</td>
<td>75</td>
<td>132</td>
<td>324</td>
<td>94</td>
<td>20</td>
<td>210</td>
</tr>
<tr>
<td>15.00 - 16.00</td>
<td>154</td>
<td>25</td>
<td>11</td>
<td>118</td>
<td>431</td>
<td>52</td>
<td>66</td>
<td>313</td>
</tr>
<tr>
<td>16.00 - 17.00</td>
<td>110</td>
<td>11</td>
<td>42</td>
<td>57</td>
<td>227</td>
<td>22</td>
<td>36</td>
<td>169</td>
</tr>
<tr>
<td>17.00 - 18.00</td>
<td>18</td>
<td>3</td>
<td>1</td>
<td>14</td>
<td>57</td>
<td>5</td>
<td>6</td>
<td>46</td>
</tr>
<tr>
<td>Total</td>
<td>2498</td>
<td>413</td>
<td>674</td>
<td>1411</td>
<td>4843</td>
<td>2286</td>
<td>932</td>
<td>1625</td>
</tr>
</tbody>
</table>

HKY1 = The nature trail Km33 to Nong Pak Chi in the high season
HKY2 = The nature trail Dong Tiew to Mo Sing To in the high season
HKY3 = The nature trail Orchid Campsite to Haew Suwat in the high season
LKY1 = The nature trail Km33 to Nong Pak Chi in the low season
LKY2 = The nature trail Dong Tiew to Mo Sing To in the low season
LKY3 = The nature trail Orchid Campsite to Haew Suwat in the low season
HKY = The three nature trails in the high season
LKY = The three nature trails in the low season

Figure 4-8 shows the tourists coming on the nature trails during high and low season. If we consider the time in hours, there is a significant difference (t = 2.536, p = 0.018), which means that the activity of tourists during low season is more than during high season. The reason for this may be that the tourists who like to walk to study the nature trails are in groups to study nature rather than participate in other activities. Therefore, they avoid other groups. Also, they like to take part in activities such as camping and observing the nature trails, so the numbers of tourists increase.

However, after comparing the numbers of tourists during high and low season separately in hours and periods for each nature trail, there is only one nature trail that is different, KY1, and there is a significant difference (t = 2.237, p = 0.035).

4.3.5.2 The difference of the period of time that wild mammals come to use the nature trails during high and low season
The numbers of wild mammals hourly for both seasons found that there is a significant difference ($t = 2.612, p = 0.016$).

From the camera traps, there is only one nature trail that has a difference of periods for using the area, KY1, which has a significant difference ($t = 3.265, p = 0.003$).

4.3.6 The use of the nature trails in the KYNP area by tourists and wild mammals by using cluster analysis

4.3.6.1 The analysis of the relationship of tourists on the nature trails by using Cluster Analysis for finding the relationship of the activities by tourists on the three nature trails during high and low season

From the analysis, the tourists will be divided into groups of relationships. The first group is the Clear Relationship, the nature trail in High season’s tourist in KY1 (HKY1), the nature trail in Low season’s tourist in KY1 (LKY1), and the nature trail in Low season’s tourist in KY3 (LKY3). At 90% of the relationship, HKY1 and LKY1 are related to tourists more than LKY3, and the second group is the nature trail in High season’s tourist in KY2 (HKY2), the nature trail in High season’s tourist in KY3 (HKY3), and the nature trail in Low season’s tourist in KY2 (LKY2), which are 100% related.
Table 4-9 The numbers of wild mammals using the nature trails hourly

<table>
<thead>
<tr>
<th>Hour</th>
<th>KY1</th>
<th>KY2</th>
<th>KY3</th>
<th>HKY</th>
<th>LKY1</th>
<th>LKY2</th>
<th>LJY3</th>
<th>LKY</th>
</tr>
</thead>
<tbody>
<tr>
<td>0.00-1.00</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>3</td>
<td>1</td>
<td>0</td>
<td>1</td>
<td>1</td>
</tr>
<tr>
<td>1.00-2.00</td>
<td>0</td>
<td>0</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>0</td>
<td>0</td>
<td>1</td>
</tr>
<tr>
<td>2.00-3.00</td>
<td>1</td>
<td>0</td>
<td>0</td>
<td>1</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>3.00-4.00</td>
<td>1</td>
<td>0</td>
<td>0</td>
<td>1</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>4.00-5.00</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>2</td>
<td>2</td>
</tr>
<tr>
<td>5.00-6.00</td>
<td>3</td>
<td>0</td>
<td>1</td>
<td>4</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>6.00-7.00</td>
<td>2</td>
<td>0</td>
<td>0</td>
<td>2</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>7.00-8.00</td>
<td>2</td>
<td>0</td>
<td>0</td>
<td>2</td>
<td>1</td>
<td>0</td>
<td>0</td>
<td>1</td>
</tr>
<tr>
<td>8.00-9.00</td>
<td>2</td>
<td>0</td>
<td>0</td>
<td>1</td>
<td>0</td>
<td>0</td>
<td>1</td>
<td>1</td>
</tr>
<tr>
<td>9.00-10.00</td>
<td>1</td>
<td>0</td>
<td>0</td>
<td>1</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>10.00-11.00</td>
<td>2</td>
<td>0</td>
<td>0</td>
<td>2</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>11.00-12.00</td>
<td>1</td>
<td>0</td>
<td>0</td>
<td>1</td>
<td>2</td>
<td>0</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>12.00-13.00</td>
<td>11</td>
<td>0</td>
<td>0</td>
<td>10</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>13.00-14.00</td>
<td>3</td>
<td>0</td>
<td>0</td>
<td>3</td>
<td>0</td>
<td>1</td>
<td>0</td>
<td>1</td>
</tr>
<tr>
<td>14.00-15.00</td>
<td>3</td>
<td>0</td>
<td>0</td>
<td>3</td>
<td>0</td>
<td>5</td>
<td>5</td>
<td></td>
</tr>
<tr>
<td>15.00-16.00</td>
<td>11</td>
<td>0</td>
<td>0</td>
<td>10</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>16.00-17.00</td>
<td>2</td>
<td>3</td>
<td>3</td>
<td>8</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>17.00-18.00</td>
<td>1</td>
<td>2</td>
<td>4</td>
<td>1</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>1</td>
</tr>
<tr>
<td>18.00-19.00</td>
<td>5</td>
<td>0</td>
<td>4</td>
<td>9</td>
<td>1</td>
<td>0</td>
<td>1</td>
<td>2</td>
</tr>
<tr>
<td>19.00-20.00</td>
<td>1</td>
<td>0</td>
<td>0</td>
<td>1</td>
<td>0</td>
<td>0</td>
<td>2</td>
<td>2</td>
</tr>
<tr>
<td>20.00-21.00</td>
<td>0</td>
<td>1</td>
<td>0</td>
<td>1</td>
<td>0</td>
<td>0</td>
<td>2</td>
<td>2</td>
</tr>
<tr>
<td>21.00-22.00</td>
<td>1</td>
<td>0</td>
<td>1</td>
<td>2</td>
<td>0</td>
<td>0</td>
<td>2</td>
<td>2</td>
</tr>
<tr>
<td>22.00-23.00</td>
<td>1</td>
<td>0</td>
<td>2</td>
<td>3</td>
<td>1</td>
<td>0</td>
<td>4</td>
<td>5</td>
</tr>
<tr>
<td>23.00-24.00</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>Total</td>
<td>46</td>
<td>6</td>
<td>16</td>
<td>66</td>
<td>8</td>
<td>1</td>
<td>21</td>
<td>27</td>
</tr>
</tbody>
</table>

HKY1=The nature trail Km33 to Nong Pak Chi in the high season
HKY2=The nature trail Dong Tiew to Mo Sing To in the high season
HKY3=The nature trail Orchid Campsite to Haew Suwat in the high season
LKY1=The nature trail Km33 to Nong Pak Chi in the low season
LKY2=The nature trail Dong Tiew to Mo Sing To in the low season
LKY3=The nature trail Orchid Campsite to Haew Suwat in the low season

In HKY1, LKY1, and LKY3, high density of tourists visited because of the convenience and the fact that it is an interesting place. For HKY2, HKY3, and LKY2, there are only a few tourists because the trail is short and steep for KY2, shown in figure 4-24.
HKY1 = The nature trail Km33 to Nong Pak Chi in the high season  
HKY2 = The nature trail Dong Tiew to Mo Sing To in the high season  
HKY3 = The nature trail Orchid Campsite to Haew Suwat in the high season  
LKY1 = The nature trail Km33 to Nong Pak Chi in the low season  
LKY2 = The nature trail Dong Tiew to Mo Sing To in the low season  
LKY3 = The nature trail Orchid Campsite to Haew Suwat in the low season

**Figure 4-24 The relationship of travelers in each trail (PCA)**

4.3.6.2 The analysis of the relationship of wild mammals on the nature trails

The analysis of the relationship of wild mammals on the three nature trails by using Cluster Analysis to find the relationship of the activities of wild mammals on the three nature trails during high and low season

From the analysis, the wild mammals will be divided into 2 groups from the camera traps. The first group includes Barking Deers, Wild boars, Gours, and Binturongs.

The second group includes Sambar Deers, Dholes, Malayan Porcupines, Asian Elephants and Pig-Tailed Macaques. These groups come from the use of the areas and the numbers in those areas.

The discovery of wild mammals on the three nature trails allowed us to find Barking deers in all trails in the high and low season. Also more than 2 Wild Boars and Gours were found in KY1. The last group consists of Sambar Deers, Dholes, Malayan Porcupines, Asian Elephants, Pig-Tailed Macaques and Binturongs. Mostly, the average is 1, as shown in Figure 4-25.
4.3.7 The correlation analysis of tourists and wild mammals

The correlation analysis is the analyses of relations on the trails for tourists both positively or negatively on wild mammals. We will analyze the relationship of tourists and wild mammals during low season.

4.3.7.1 The correlation analysis of tourists in high and low seasons

From the Correlation Analysis, the graph shows that there is a negative relationship of $r$ value of tourists and wild mammals during high season ($r = 0.125, p = 0.533$), which means that tourists have a relationship at 12.5% (Kraiwan, 2010), which affect the numbers of activities of wild mammals during high season.
4.3.7.2 The Correlation of travelers and wild mammals in the low season (Figure 4-27)

From the analysis, there is a positive relationship between tourists and wild mammals, which $r$ of tourists and wild mammals during low season ($r = 0.302$, $p = 0.125$), which means that the tourists and wild mammals during low season are related at 30.2% insignificantly (Kraiwan, 2010). From the study, the high season has more numbers of tourists than the low season due to the benefits of using the nature trail does not depend of the numbers of tourists that come to the area, which affects the appearance of wild mammal positively but insignificantly.
Figure 4-27  The trend of numbers of tourists (log) and wild mammals (log) in the low season

4.3.7.3 The correlation analysis of tourists and wild mammals during high and low season (Figure 4-28)

Figure 4-28  The trend of information of tourists (log) and information of wild mammals (log) during high and low season

From the Figure 4-28, when we compute the relationship of the graph, there is a negative relationship\( (r = -0.113, \ p = 0.415) \), which means that the numbers of tourists and mammals have a negatively low relationship. However, there
are 4,875 tourists on three nature trails during low season, which is higher than during high season with 2,473 tourists. The increasing amount of tourists during low season affected the numbers of the wild mammals.

From computing the relationship of tourists and wild mammals over all periods, there is a low relationship, and the graph showed that there is a negative relationship, which means that the increasing amount of tourists will result in the wild mammals appearing less frequently, so the numbers of tourists is the factor that affects the appearance of wild mammals, but there are still other factors, too.

4.3.8 The correlation analysis of tourists and wild mammals on the three nature trails to find ordination value by using principal component analysis (PCA)

4.3.8.1 The correlation analysis of tourists and wild mammals on the three nature trails during high season (Figure 4-29)
Figure 4-29  The group of wild mammals by using numbers during high season (Ordination)

From figure 4-33 shows the grouping by pictures and numbers during high season, we could identify the relationship of tourists and wild mammals as follows:

There are three groups. The first group includes Wild Boars, Pig-Tailed Macaques and Asian Elephants. The second group includes Dholes, Gaur, Binturongs and Sambar Deers. The last group was Barking Deers.
The highest area where tourists were found was the high season on KY3’s nature trails (HKY3) and the wild mammals in group 2 were found, which has no relationship with the tourists because of the different time of living. The first group has a relationship with the tourists, which have to adapt to tourists. The third group, Barking Deers, could be found in all areas, High season’s tourist on KY1’s nature trails (HKY1), High season’s tourists on KY2’s nature trails (HKY2), and HKY3 but were mostly found on HKY2.

4.3.8.2 The analysis of the relationship of tourists and wild mammals on the three nature trails during low season

![Diagram showing the grouping of wild mammals by pictures during low season](image)

<table>
<thead>
<tr>
<th>CODE</th>
<th>Mean</th>
<th>CODE</th>
<th>Mean</th>
</tr>
</thead>
<tbody>
<tr>
<td>Mu_v_ind</td>
<td>Barking deer (picture)</td>
<td>F_peo</td>
<td>Female travelers</td>
</tr>
<tr>
<td>Sus_ind</td>
<td>Wild boar (picture)</td>
<td>M_peo</td>
<td>Male travelers</td>
</tr>
<tr>
<td>Ab_ind</td>
<td>Binturong (picture)</td>
<td>HKY</td>
<td>High season</td>
</tr>
<tr>
<td>Ru_ind</td>
<td>Sambar Deer (picture)</td>
<td>LKY</td>
<td>Low season</td>
</tr>
<tr>
<td>Bg_ind</td>
<td>Gaur (picture)</td>
<td>HKY1</td>
<td>Km33 to Nong Pak Chi</td>
</tr>
<tr>
<td>Ma_n_ind</td>
<td>Pig-Tailed Macaque(picture)</td>
<td>HKY2</td>
<td>Dong Tiew to Mo Sing To</td>
</tr>
<tr>
<td>Ca_ind</td>
<td>Hiana(picture)</td>
<td>HKY3</td>
<td>Orchid Campsite to Haew Suwat</td>
</tr>
<tr>
<td>Em_ind</td>
<td>Asian Elephant (picture)</td>
<td>TourT_ind</td>
<td>Thai travelers</td>
</tr>
<tr>
<td>Hb_ind</td>
<td>Porcupine(picture)</td>
<td>TourF_ind</td>
<td>Foreign travelers</td>
</tr>
</tbody>
</table>

**Figure 4-30** The grouping of wild mammals by pictures during low season
From figure 4-30, the grouping by numbers during low season could tell the relationship of tourists and wild mammals as follows:

There are 2 groups. The first group is Sambar Deer, Asian Elephant, Malayan Porcupine, and Pig-Tailed Macaque, which could be found in Low season’s tourist in KY3 nature trails (LKY3) and found tourists. The second group is Binturong, Wild Boar, and Asiatic Black Bear.

The wild mammals in the first group is found in the area LKY3, and the wild mammals in group2 could be found in Low season’s tourist in KY1 nature trails (LKY1), which could adapt to tourists at the medium rate by avoid coming out as the same time as the tourists, but the group2 did not adapt well to tourists.

From the relationship, the nature trail in Low season’s tourist in KY2 (LKY2) is steep and has many Thai tourists using. Also, most of the activities are the camping, which are in group and could be noisy, but LKY1 and LKY3 have small groups, which most are families that could affect the result of study in the low season, which are the index that could measure the behaviors of tourists that affect wild mammals more than the high season.
CHAPTER III
METHOD

The aim of this research is to study the impact of tourists in three nature trails of KYNP: KY1, KY2, and KY3 on the abundance of wild mammals by using camera traps.

3.1 Study Area

This research uses 3 nature trails that are different in surface, shape, number of tourists, and have an abundance and diverse amount of wild mammals in the nature trails (Olson et al., 1996; Martin & Reale, 2008; Salvador et al., 2010). We choose the nature trail KY1, KY2, and KY3 (picture 3-1).
Figure 3-1  A map showing the three nature trails KYNP; KY_1 = Km33 to Nong Pak Chi nature trail, KY_2 = Dong Tiew to Mo Sing To nature trail, KY_3 = Orchid Campsite to Haew Suwat nature trail.
3.1.1 The characteristic of the nature trails

In this study, researchers choose 3 nature trails that were different in physical characteristics (National Reserve Khao Yai Organization, 2001; Mahdayani, 2011):

KY1: The distance 3 kilometers. The beginning is on Kilometers 33 of the main road (Route 3077). This trail provides quite picturesque landscape from green rainforest to grassland area by passing elephant salt lick before arriving to Nong Pak Chi observation tower. The observation tower is facing the lake where boar, lizards, and birds play in the area

KY2: The length is 2.7 kilometers. The beginning is opposite to the KYNP Visitor’s center. This trek was cross the grassland and secondary forest before reaching Sai Sorn Reservoir

KY3: The length is 3 kilometers. The beginning is at the Orchid Campsite to the beginning of Haew Suwat, down to the river before reaching the waterfall and passing the bamboo forest

3.2 Materials


2. The Map of Royal Thai Survey Department, scale 1:50000, Version L7018, area 5237I and area 5238II, and the map of nature tails of KYNP.

3. The Camera trap, Moultrie Game Spy D-55IR Camera from USA, resolution of 5.0 mega pixel, be able to use day and night, sensor for taking photos from 50 feet, will be set in the three trails to compare the amount of tourists and wild mammals 45 days per point high 0.45 meters and will be angled at the nature trail (Grassman, et al., 2006).
3.3 Data collection

Methods for data collection are divided as follows:

1. Survey and selected nature trails as the study sites in KYNP.

2. By setting the camera traps in the three selected nature trails, which are KY1, KY2, and KY3. choose the site for setting the camera trap by areas that have wild mammal tracks, numbers of wild mammals, traveling activities and numbers of tourists using the areas. (Martin & Reale, 2007; Salvador et al., 2010). Setting three camera traps per nature trails each at 0.45 meters on the trees (Grassman et al., 2006; Rovero & Marshall, 2009; Wang & Macdonald, 2009).

3. Mammal tracks are survey in all of the three nature trails along the nature trails. The numbers of species and tracks are counted and record in the distance of 100 meters line, and the next line is located in another 100 meters apart (Pattanawiboon et al, 2002; Silveira et al., 2003; Kanchanasaka et al., 2007). We divide the species of wild mammals from the disturbing tracks and the numbers of tourists in quantitative research in order to compare the numbers of tourists with the amount of appearances of wild mammals. Also, taking note for types and numbers of wild mammals in the nature trails.

4. Collecting the information, changing memory card, battery from the camera traps every two weeks. Setting the battery in order to protect information in the card and bring information.

3.3.1 Process after research

1. Bring the pictures from the camera traps and information from site study survey to make in set of numbers of tourists and wild mammals from camera traps and a number of footprint of the wild mammal in high-season and low-season (Silveira et al., 2003; Rovero & Marshall, 2009; Kolowski & Alonso, 2010). After that, bring the information to find the relationship between the amount of wild mammal and tourists by using formula as follow:

1.1 Calculated Percentage and Relative Frequency (RF) of wild mammals and footprint from the modifying formula of Pettingill (1970) to find the abundance level of wild mammals from the camera traps.
RF (%) = \frac{\text{Usable camera} \times 100}{\text{Total camera}}

When
- 0 – 33.33% means uncommon
- 33.33 – 66.66% means common
- 66.66 - 100% means very common

1.2 Calculated Relative Abundance Index (RAI) from pictures of wild mammals from the camera traps by formula

\[ \text{RAI} = \frac{\text{Traps success} \times 100}{\text{Trap - night}} \]

2. Bring the information of present or absent of wild mammals in each trail to test the difference in both difference of trail and tourists by using T-test (0.05% significant level)

3. Bring the information to evaluate the proper plan of KYNP current managing plan and present the way to manage the effect of the nature study to the behaviors of wild mammal such as limit the amount of tourists or set the period of activities (Martin & Reale, 2007)

3.4 Analysis of information and statistic

This analysis uses statistics as follows:

1. Analyze the quantity of the wild mammals from camera traps in each trail (White et al., 1982; Otis et al., 1987; Kolowski & Alonso, 2010) Compare the amount of wild mammals and compare the amount of tourists in the high season and low season by using t-test for computing.

2. Analyze the difference of tourists and wild mammals hourly (White et al., 1982; Otis et al., 1987; Kolowski & Alonso, 2010) in the high season, low season, and both seasons by using t-test for computing.

3. Analyze the different amount of the tourists and the wild mammals that walk into the camera traps in 3 trails by using ANCOVA for computing.

4. Analyze the relationship of tourists and wild mammals, and the benefits of each trail by using Ordination Value by Principal Component Analysis (PCA).
5. Analyze the relationship of tourists and wild mammals, and the benefits of each nature trail by using Cluster Analysis.

6. Correlation Analysis and Regression Analysis of number of tourists and number of wild mammals see the relationship between the amount of wild mammals that appeared and tourists, compare between high and low season using a significance level of 0.05%.
CHAPTER II
LITERATURE REVIEW

The content of literature review and relevant this research as following:

2.1 Effect of tourism on wild mammals
2.2 Camera traps and track count
2.3 Nature tourism
2.4 Nature trails

2.1 Effect of tourism on wild mammals

2.1.1 Habitat selection

The basic needs of the wild mammal are food, cover, water and living space. Wild mammals will choose their living space for escaping, breeding and surviving (Nootong, 1982; Robinson & Bolen, 1989; Deal, 1998)

All living things need food as the source of energy for living. Most of wild mammals selected habitat close to their food sources. For example, Woodland deer mice selected forest habitat, while, prairie deer mice selected grassland (Deal, 1989)

The food will contain of energy such as carbohydrate, protein, vitamin, macronutrients and micronutrients (Robinson and Bolen, 1989)

Food stated that the wild mammals’ food will contain of main factors as following (Nootong, 1982):

1) The appearance or disappearance of food in the habitat of those wild mammals.

2) Quantity and quality of food in the habitat.

3) Difficulties and ease to reach the food in the habitat.
4) The utilization of wild mammals in the habitat such as palatable vegetables that consume by wild mammals will be scare and could not grow well enough to match with demand because wild mammals will come to eat all the time, but the unpalatable vegetations that wild mammals do not eat will common.

5) The ability to digest which can identify the wild mammals that live in the area.

Cover is the most important factor. It is protected animals from predator or unsuitable environment such as rain, snow, and heat etc. In additional, it can be the place to take care of their baby. Therefore, it is very important for survival the dead rate will increase if no more cover. Though the food is furnished the wild mammals like to choose the place safety place first. For example, deer in KYNP find food in the field but live in the forest to avoid the predators, and the food also relates. The safety place can have leaves, flowers, fruits, and seeds as food for wild mammals, but when the condition changes like leaves fall or the trees are removed, the hidden place is gone, so the wild mammals have to find the new place to live.

Water Another factor for living organisms is the water. All living things cannot survive without it. Some wild mammals live in water to survive while some lay in the water such as bear, deer, and bull. These wild mammals drink water 2 or 3 times a day in the late morning and late night. However, some wild mammals drink at night. The frequency of drinking depends on the heat and the changing of the temperature that is why the wild mammals have to live nearby the source of water. (Nootong, 1982).

Living space: The area is important for the wild mammals to live and hide. Where is the place to lay eggs, treat baby, and find food also (Nootong, 1982). Sometimes, there might be other wild mammals to use the area which do activities will be different depending on size. If the large size such as wolf or lion, they will want larger area while the small one such as rabbit will demand only 1 or 2 achier (Deal, 1998). The wild mammal population that lives in the certain area will depend on the quantity of water. Some wild mammals will find the place that suits for their biological and physical. The area for do any activities can identify furnish of their food. The different areas will have the difference in the higher level from the sea level.
such as steepness, line of plants, thickness of plants, territory, home range, and cruising radius.

From the information above, the living area will be related to 4 factors such as food, safety place, water, and place to do activity because each factor will be important equally. If one factor is missing or decreasing, it could be the extinction of those wild mammals. Therefore, the wild mammal management has been considered with these factors.

2.1.2 Adaptation of wild mammal behavior on the tourism activities

According to the research documentation, the activity of mammals could be influenced from tourists as following:

Gakahu (1992) studied the impact of tourism vehicles on cheetah, leopard and lion at the Maasai Mara Reserve in Kenya. These included walking or running away from a vehicle, observation of vehicles, and hiding. Cheetah and lion in the unvisited areas exhibited a "high response" to vehicles, compared to those in visited areas. It was not uncommon for animals in undisturbed (not visited) areas to flee vehicles immediately after having sighted them. No leopards were sighted in the areas not frequented by visitors. For studying cheetah in the no tourist area, cheetah will come out in the morning until late morning. However, they will come out when there is no tourists. For lions in both areas, they do not get impact from tourists because they come out at night. The research found that the range to observe the wild mammals is at least 5 meters, which is the proper range that could influence the behavior such as breeding and living.

Olson et al. (1996) studied the effect from human on Brown Bear in Brook River from Brook Lake until Naknek Lake, Alaska where is the immigrant route of salmon which is a food for Brown Bear. The result found that the travelling activity from human affect s Brown Bear to catch salmons slower than usual for about 17 days. Also, the disturbance of human stimulates Brown Bear to stays in small groups.

Orams (2001) studied the effect from feeding by the tourists on the changing behavior. That found it affect to the behavior and the number of population. Moreover, it could make the wild mammals get used to human and could hurt the other wild mammals. Also, it could affect their health.
Sinha (2001) studies the wild mammal adaptation with human, which has two forms such as short-term and long-term. In the short-term, the death rarely occurs if they do not get direct impact from the tourists. Mostly, wild mammals tend to adapt in the long-term such as immigration to the new area, where has the lower disturbance.

Salvdor et al. (2010) studied about the flourish and the variety of wild mammals, which live in Amazon Forest and eco-traveling, where found that mammals will move season by season and immigrate to the area that has the lower disturbance from human.

Sangjun et al. (2006) studied the effect of the activities in KYNP on the area that deer are living. The different between high and low tourists on spotlight and tracking activities, it is found that the activity could affect the deer such as the time that the wild mammals stop eating because they notice human, or the behavior to keep the range between deer and vehicles, more footprints can be found when there are few tourists.

Ngoprasert et al. (2007) studied about effects arising from road construction and other development in Kaeng Krachan National Park has affect to changing behavior of The Asiatic leopard (Panthera pardus). The Camera trapping was used to assess the influence of human disturbance along forest edges on leopard behavior and habitat used. There found four male and two female leopards in the study area. A Park access road bisecting the study area was not a barrier to leopard movement but movements and activity were affected by human traffic inside the Park. A regression model showed that leopard habitat use increased with distance from human settlements at the forest edge.

Croft et al. (2010) studied the behavior of Red Kangaroo (Macropus rufus) and (M. robustus erubescens) to observed the reaction of the two types within different conditions such as time, date, speed of wind, and other factors such as genders and groups. The result is that kangaroo will react to the disturbance by running away if the human invade their area.

Cunha (2010) studied the negative effect of traveling in Brazilian Atlantic forest National Park in the preserved area, Atlantic Forest hotspot, and found that the variety of types and flourish of large mammals and the number of birds decrease significantly with the route that tourists come in.
From the research, it is found that all mammals will change their living behavior to avoid facing human or move to the place that has lower disturbance.

2.2 Camera traps and track count

The method of survey and evaluation are varied such as direct method for direct observation and tracking footprint by using trap, transect survey, and indirect method by interview people or staffs of national park (Department of National Park, Wildlife and Plant Conservation, 2006).

2.2.1 The Camera traps

The Camera traps suit for large mammals like predator, which come out at night, and the hidden wild mammals. This technique makes the information of appearance or disappearance of wild mammals, abundance of population more accurate, and the usage of the area to evaluate the abundance for presence or absence. The way it works is to set on the trees which wild mammals will walk past, the area that is difficult to reach, water, and ground that wild mammals often pass. When wild mammals walk past, the sensor will activate, and the camera will capture automatically. In the present, the digital camera will cost expensively. The information from the camera traps is credible and high accurate, which can categorize the type and behavior clearly, and the information from the camera will be used to plan the management of preservation effectively (Treves et al., 2010).

2.2.2 Track count

This is the subject for the detective, the hunter, and the nature study who is the professor. Footprint is the entity that could tell the existing of that wild mammal which could be from observation by walking. That footprint does not tell only type of wild mammals but can identify gender and behavior also. The most concrete footprint is on the soft such as mug near pool, which could show the claw and the footprint easily. Footprint tracking could make by measure size of the footprint and compare to the widest one. The footprint is taking by using mortar which is not easy to carry and
walk. When we get tracks, we will bring it to expert for check again (Kanjanavanit, 1997).

2.3 Nature tourism

2.3.1 The meaning of Nature tourism

Tourism activity occurs from the natural resource which the eco-traveling occurs from the tourists who want to experience the real nature activity such as walking, observing or diving. The traveling has to be the responsible to the environment and respect the culture of people in that area (Figure 2-1) The eco-tourism could separate into points as followed: (Laarman & Durst, 1987; UN-ESCAP, 1995; Tourism New South Weles, 2010; Texas Park & Wildlife Foundation, 2012):

![Diagram](image)

**Figure 2-1  Factors of Nature-tourism (Tourism New South Wales, 2010).**

The four factors of eco-traveling of Nature as following (Tourism New South Wales, 2010; Alternative Transportation in Parks and Public Lands, 2009):

1) Soft Adventure is the traveling activity that is not dangerous to tourists who like the adventure that is safe such as observing. For the motivation, they will find the new experience by avoiding the normal activity.
2) Hard Adventure is the traveling activity that is risk and challenging. Tourists want the new features and experience in the real nature which the tourists will have to be ready with their physical condition such as hiking, diving and kayak.

3) Eco-tourism is the traveling that depends on the natural resources to do activity responsively and tend to preserve the environment. All eco-system and culture of people will support the people in the community to join, take care, and manage the natural resources. (TIES, 1990; Buckley, 1995; IUCN, 1996; The Tourism Authority of Thailand., 1998; Jittangwattana, 2005).

4) Special Interest is the nature traveling could be divided by interest of tourists which each group will have specific interest. Groups like this will have high financial power high degree and need their own interest of the traveling. Also, they have clear marketing group which most tourists will travel in order to reach for their own goal and could categorize the traveling as following: Sport tourism, Training Camp, Business tourism; Event tourism; Study tourism; Health and wellness tourism; Youth culture tourism; Marine tourism. (Gold Coast City Council, 2003)

2.3.2 Sustainable Tourism

It consists of community, places, and natural resource, which require the plan to manage the resource to be efficient and make it balance in order to remain in the long-term for supporting the economy, society, and culture with the biological variety and other important system such as plants, wild mammals, and humans. Also, it can make the collaboration of stakeholders and provide income to people (Sindhavananda, 2003).

The principal of sustainable Tourism can be included as following (Choibamroong, 2009):

Preserve the natural resource, historical resources, cultural resource, and other resources in traveling by using the resources efficiently in the long-term with the purpose of economy, culture, environment during the traveling and improving plans.

Evaluate the effects of the tourism, make the criteria for evaluation, consider of the limitation of resource, the remaining of natural resource and culture, and develop people in education and other parts.
Make the collaboration among groups of stakeholders and cooperation between care taker and business parts.

Remain the satisfaction of tourists for the traveling and make it still popular in order for the future marketing.

2.4 Nature Trails

2.4.1 The nature trail

Royal Forest Department (1992), according to Senanok (2010) gave the meaning of nature trail that it is the tools of studying, which provide the understanding to people about nature and environment in order to be able to manage to be in the national reserve, museum, center of nature studying, and other reserved forests. The trail could have variety such as walking, horse riding, and biking. Each trail will have different purpose and interest but tend to allow people to observe the view and the exercise. The nature trail has the special objective for tourists to gain the knowledge to understand the concept of the natural resource preservation.

Rattana (1998), according to Senanok (2010) stated that the nature trail is the tools for education that provide the knowledge to people and each trail have the purpose and difference interesting. It relate to different meaning carefully to give the proper content.

The nature trail has the purpose to be the center of the environment and resource studying to understand the cause result of the human and the environment. Furthermore, understand the problem of the resource management by preserving and have chance to relate to nature closely to advice beginners systematically. In additional, it can motivate and increase the experience because it can stimulate and build up the impression that could affect to the sense of responsibility for protecting and preserving the natural resource and environment (Department of National Parks, Wildlife and Plant Conservation, 2006).

Therefore, the meaning of the nature trail is the trail to study the natural resource in each direction closely and have purpose to learn about the environment
and ecosystem in each trail which have the different characteristic and have sign board for tourists clearly.

2.4.2 Characteristic and type of the Nature Trail

Ashbangh & Kordish (1971) according to Jittangwattana (2005) divided the type of the nature trail into three types as following:

1) The close-range trail: the range is not more than 1.5 kilometers and spends no more than 45 minutes to walk around and tend to give the meaning systematically in order to provide the knowledge easily to the tourists which divide into 2 types such as the trail that have translator and no translator.

2) The far-range trail: the trail will taken care and decorated in order to support the need of interesting without disturbing from the tourists and do not give some meaning.

3) The special benefit trail: it is built to support the necessity of the users, main purposes and could be the trail that gives benefits to study about the nature. The building does not depend on the environment such as bicycle lane, horse lane, under-water trail, ship trail, and handicap or elder lane, also.

In conclusion, the three nature trails have the different characteristics in meaning and purposes. The role and main purpose is support to the activity for the tourists to study and close to the nature which make the tourists learn and understand the value of the nature and the environment more.

The nature trail is the destination may. It passes the trail that gives meaning and has to operate carefully. In order to plan the trail, rules and conditions of area, meaning, type, numbers of users, facilities and security of the tourists have to be considered (Department of National Parks, Wildlife and Plant Conservation, 2006).

Department of National Parks, Wildlife and Plant Conservation (2006) separated the form of the nature trail into 2 linear forms, which are linkage from start, which could be parking to the end, which could be waterfall, view point to shelter, shelter to eating zone. This form could be used in the long range and close range. Sometimes, it could separate from the main trail, which could have the same way back and link between two points such as the trail link between two shops or two villages by having the reverse like Figure 2-2:
The second type is the loop, which have single loop and connected loop. These two forms are similar because they have one starting point and will not go back to the same way. The difference is they have many ways, which users can choose the way they feel happy for. The positive point is they will not see the same view, will not make the damage to the trail, and will not be too crowded.

The average time for walking is 1 hour which is 3.3-4.8 kilometers and takes one more hours for the further height of 30 meters. The factor is 1) the interesting point should be in the first half because the interest will decrease gradually by way and time 2) age of users 3) range. Generally, the interesting point should separate and name properly to attract people to come. The name should be about the outstanding story of area or specialty (Senanok, 2010).
CHAPTER I
INTRODUCTION

1.1 Background and Significance

The tourism industry is the important income of Thailand. This income has increased from 2.53 to 14.12 billion baht since 1999 to 2009 (Cabinet, 2010). In 2009, World economic Forum has ranked Thailand in to 39th out of 124 countries from the comparison in the tourism latency, So that Thailand was accepted about Tourism Industry, Nature, Culture, and Human Resource. (Ministry of Tourism and Sports, 2011). However, before 1993 the promotion of the tourism industry in Thailand was focused on the amounts of tourists and income (Jittangwattana, 2005). In additional, the tourism operators’ behaviors mainly gain their benefits without considering the limitation of tourist carrying capacity (Ministry of Tourism and Sport, 2011). From these reasons, the natural resource’s recreation sites were destroyed and degraded by the tourism activities. Besides, the negative impacts on ecosystems and diversity of wild mammals were considerable (Salvador et al., 2010).

Khao Yai National Park (KYNP) is the first national park of Thailand. Moreover, KYNP is a part of the second Natural World Heritage of Thailand and the third largest National Park of Thailand (Mark & Wedel, 1994; Werly & Bowring, 2009). There are more than 40 species of wild mammals living in KYNP and various tourism activities such as night spotlight and tracking along the nature trails. Beside these activities, the tourists can enjoy and study the environment and ecology by visiting the unique natural resources (The Tourism Authority of Thailand, 2001). KYNP contains 13 nature trails including Km33 to Nong Phak Chi (KY1), Dong Tiew to Mo Sing to (KY2), and Orchid Campsite to Haew Suwat (KY3), etc. These nature trails are popular among the tourists (Wangyaichim, 1997; Foundation for Khao Yai National Park Protection, 1999; Srikosamatara & Troy, 2004; National Parks, Wildlife and Plant Conservation Department, 2006).
Since 2012 to 2016, the National Tourism Development Plan has mentioned that the tourists prefer to visit the natural attractions (Ministry of Tourism and Sport, 2011) including the study of nature trails. Furthermore, the benefits of tourism activities on the nature trail are able to raise tourists’ awareness of the nature. Nevertheless, there are both direct and indirect impacts on wild mammals and those following impacts also influence their personal behaviors such as the changing foraging time the foraging, reproduction, reducing the herd size and migration to the new habitats that are lower volume of human activities (Salvdor et al., 2010; Martin and Réale, 2008; Orams, 2001; Font and Tribe, 2000; Shacklew, 1996; Olson et al., 1986). Furthermore, which activity can change behaviors of wildlife such as hunting, migration and habitat selection? These activities cause the declining of the wild mammals and finally become extinct (The Tourism Authority of Thailand, 2009).

This research aims to study the impact of the nature study activities on the wild mammals and suggest the management strategies to reduce the impact of the tourisms on wild mammals. The additional purpose is to be able to control the eco-tourism activities and promote the protection of the natural resources, especially to ensure the wildlife conservation in KYNP.

1.2 Objective of research

To study the impact of the nature study activities on wild mammals in the nature trails of KYNP.

1.3 Research Hypothesis

The number of tourists directly affects the species and the abundance of wild mammals’ assemblage in the nature trails.
1.4 Scope of research

The purpose of this research is for extent as the following:

The scope of area

This study was done on 3 nature trails in KYNP, including KY1, KY2, and KY3, which have the same plant community. In the past, these areas were the home range of large mammals. However, there are significant differences in the number of the carrying capacity (CC) of the tourists per the nature trails; The KY3 4,725 of tourist per day, KY2 675 of tourist per day per day and KY1 900 of tourist per day (Praphan, 2008) capacity is depending on the distance of the natural trail and the head quarter of the travel or the recreation place (Salvador et al., 1996; Martin and Reale, 2008).

The scope of content

This study involves the impact of the nature study activities in the three natural trails of KYNP and compares the frequency of the tourist activities in the nature trails between high and low seasons that affect to the wild mammals.

The scope of population

Population in this research consist of the tourists who travel in three nature trails of KYNP and the wild mammals which foraging in the area.

The scope of duration

This research was conducted in the high season (December 2011 to February 2012) and the low season (June to August 2012).
1.5 Conceptual Framework

Figure 1-1 Conceptual framework
1.6 Specific Definition

**Nature study** refers to any tourism activities such as, trekking, hiking, bird watching and natural studying in the three nature trails of KYNP.

**Tourist** refers to a person who doing any the Nature studies’ activities in the three nature trails to travel and learn about the nature study in KYNP.

**Wild Mammal** refers to a group of large wild mammal that pass through the camera traps and that hides to capture wild mammal

- **KY1** refers to km. 33 to Nong Phak Chi nature trails.
- **KY2** refers to Dong Tiew to Mo Sing To nature trails.
- **KY3** refers to Orchid Camsite to Heaw Suwat nature trails.
CONTENTS

ACKNOWLEDGEMENTS iii
ABSTRACT (ENGLISH) iv
ABSTRACT (THAI) v
LIST OF TABLES vii
LIST OF FIGURES viii
CHAPTER I INTRODUCTION 1
CHAPTER II LITERATURE REVIEW 6
CHAPTER III METHOD 16
CHAPTER IV RESULT AND DISCUSSION 22
CHAPTER V CONCLUSION AND RECOMMENDATION 63
REFERENCES 67
APPENDIX 74
BIOGRAPHY 79
# LIST OF TABLES

<table>
<thead>
<tr>
<th>Table</th>
<th>Description</th>
<th>Page</th>
</tr>
</thead>
<tbody>
<tr>
<td>4-1</td>
<td>The number of pictures and tourists on each trail during high season, December 2011 to February 2012</td>
<td>23</td>
</tr>
<tr>
<td>4-2</td>
<td>The number of pictures and abundance of wild mammals during high season</td>
<td>28</td>
</tr>
<tr>
<td>4-3</td>
<td>The abundance of track that were found on the nature trails during high season</td>
<td>29</td>
</tr>
<tr>
<td>4-4</td>
<td>The numbers of tourists and the average per camera during low season on the nature trail study</td>
<td>37</td>
</tr>
<tr>
<td>4-5</td>
<td>Types and amount of abundance of wild mammals during low season from the camera traps</td>
<td>41</td>
</tr>
<tr>
<td>4-6</td>
<td>The numbers of tracking and abundance on each nature trail during low season</td>
<td>42</td>
</tr>
<tr>
<td>4-7</td>
<td>Types of wild mammals during high and low season</td>
<td>50</td>
</tr>
<tr>
<td>4-8</td>
<td>The numbers of tourists during each period for each nature trail</td>
<td>52</td>
</tr>
<tr>
<td>4-9</td>
<td>The numbers of wild mammals using the nature trails hourly</td>
<td>54</td>
</tr>
</tbody>
</table>
# LIST OF FIGURES

<table>
<thead>
<tr>
<th>Figure</th>
<th>Description</th>
<th>Page</th>
</tr>
</thead>
<tbody>
<tr>
<td>1-1</td>
<td>Conceptual Framework</td>
<td>4</td>
</tr>
<tr>
<td>2-1</td>
<td>Factors of Nature-tourism</td>
<td>11</td>
</tr>
<tr>
<td>2-2</td>
<td>The liner form of nature trail</td>
<td>15</td>
</tr>
<tr>
<td>3-1</td>
<td>A map showing the three nature trails KYNP</td>
<td>17</td>
</tr>
<tr>
<td>4-1</td>
<td>The number of pictures and tourists on each trail during high season,</td>
<td>23</td>
</tr>
<tr>
<td></td>
<td>December 2011 to February 2012</td>
<td></td>
</tr>
<tr>
<td>4-2</td>
<td>The pictures and numbers of wild mammals that appeared in the camera trap</td>
<td>25</td>
</tr>
<tr>
<td></td>
<td>during high season during December 2011 to February 2012 categorized by trail</td>
<td></td>
</tr>
<tr>
<td>4-3</td>
<td>Percentage of wild mammals that could be seen on the nature trail Km33 to</td>
<td>26</td>
</tr>
<tr>
<td></td>
<td>Nong Pak Chi during high season from December 2011 to February 2012</td>
<td></td>
</tr>
<tr>
<td>4-4</td>
<td>Percentage of wild mammals that were seen on the nature trail Dong Tiew</td>
<td>27</td>
</tr>
<tr>
<td></td>
<td>and Mo Sing To during high season from December 2011 to February 2012</td>
<td></td>
</tr>
<tr>
<td>4-5</td>
<td>Percentage of wild mammals on the nature trail Orchid Campsite to Haew</td>
<td>27</td>
</tr>
<tr>
<td></td>
<td>Suwat during high season from December 2011 to February 2012</td>
<td></td>
</tr>
<tr>
<td>4-6</td>
<td>The relationship between the amount of tourists and the period of time for</td>
<td>31</td>
</tr>
<tr>
<td></td>
<td>conducting activities on each nature trail</td>
<td></td>
</tr>
<tr>
<td>4-7</td>
<td>The relationship between the type of wild mammals and the period of activity</td>
<td>32</td>
</tr>
<tr>
<td></td>
<td>in KY1 during high season</td>
<td></td>
</tr>
<tr>
<td>Figure</td>
<td>Description</td>
<td>Page</td>
</tr>
<tr>
<td>--------</td>
<td>-----------------------------------------------------------------------------</td>
<td>------</td>
</tr>
<tr>
<td>4-8</td>
<td>The relationship between the type of wild mammals and the period of activity on the nature trails Dong Tiew to Mo Sing To during high season</td>
<td>32</td>
</tr>
<tr>
<td>4-9</td>
<td>The relationship between the type of wild mammals and the period of activity on the nature trails Orchid Campsite to Haew Suwat during high season</td>
<td>33</td>
</tr>
<tr>
<td>4-10</td>
<td>The relationship between times spent on activities by tourists and wild mammals for each nature trail during high season</td>
<td>33</td>
</tr>
<tr>
<td>4-11</td>
<td>The numbers of picture, tourists, and wild mammals during high season on the three nature trails</td>
<td>35</td>
</tr>
<tr>
<td>4-12</td>
<td>The numbers of pictures and tourists that appeared in the camera traps during low season from July 2012 until September 2012</td>
<td>36</td>
</tr>
<tr>
<td>4-13</td>
<td>The numbers of pictures and wild mammals in the three nature trails</td>
<td>39</td>
</tr>
<tr>
<td>4-14</td>
<td>The percentage of wild mammals on the nature trail Km33 to Nong Pak Chi during low season from June to August 2012</td>
<td>40</td>
</tr>
<tr>
<td>4-15</td>
<td>The percentage of wild mammals that were found on the nature trail from Orchid Campsite to Haew Suwat</td>
<td>40</td>
</tr>
<tr>
<td>4-16</td>
<td>The relationship between the numbers of tourists and the time taken doing activities on the three nature trails during low season</td>
<td>43</td>
</tr>
<tr>
<td>4-17</td>
<td>The time period of participating in activities on the nature trails during low season of wild mammals</td>
<td>44</td>
</tr>
<tr>
<td>4-18</td>
<td>The relationship between each wild mammal and the period of participating in activities on KY1 during low season</td>
<td>45</td>
</tr>
</tbody>
</table>
# LIST OF FIGURES (cont.)

<table>
<thead>
<tr>
<th>Figure</th>
<th>Description</th>
<th>Page</th>
</tr>
</thead>
<tbody>
<tr>
<td>4-19</td>
<td>The relationship between each wild mammal and the period of time of participating in activities on KY 2 during low season</td>
<td>45</td>
</tr>
<tr>
<td>4-20</td>
<td>The relationship between each wild mammal and the period of time of participating in activities on KY3 during low season</td>
<td>46</td>
</tr>
<tr>
<td>4-21</td>
<td>The relationship between tourists and each wild mammal and the period of time spent conducting activities on the three nature trails during low season</td>
<td>46</td>
</tr>
<tr>
<td>4-22</td>
<td>The numbers of pictures and amount of tourists and wild mammals during low season on each nature trail</td>
<td>47</td>
</tr>
<tr>
<td>4-23</td>
<td>The numbers of pictures and tourists during high season and low season</td>
<td>49</td>
</tr>
<tr>
<td>4-24</td>
<td>The relationship of travelers in each trail (PCA)</td>
<td>55</td>
</tr>
<tr>
<td>4-25</td>
<td>The relationship of wild mammals on the three nature trails (PCA)</td>
<td>56</td>
</tr>
<tr>
<td>4-26</td>
<td>The numbers of log number tourists and log number of wild mammals during high season</td>
<td>57</td>
</tr>
<tr>
<td>4-27</td>
<td>The trend of numbers of tourists (log) and wild mammals (log) in the low season</td>
<td>58</td>
</tr>
<tr>
<td>4-28</td>
<td>The trend of information of tourists (log) and information of wild mammals (log) during high and low season</td>
<td>58</td>
</tr>
<tr>
<td>4-29</td>
<td>The group of wild mammals by using numbers during high season (Ordination)</td>
<td>60</td>
</tr>
<tr>
<td>4-30</td>
<td>The grouping of wild mammals by pictures during low season</td>
<td>61</td>
</tr>
</tbody>
</table>
IMPACT OF NATURE STUDIES TO MAMMALS ON THE NATURE TRAIL IN KHAO YAI NATIONAL PARK, THAILAND

ARPACHAW POONPRACHERT 5336532 ENEP/M

M.Sc. (SUSTAINABLE ENVIRONMENT PLANNING)

THESIS ADVISORY COMMITTEE: RATTANAWAT CHAIYARAT, Ph.D. (FORESTRY), NOPPAWAN TANAKANJANA PHONGKHIEO, Ph.D. (RECREATION RESOURCES)

ABSTRACT

The research aims to study the impacts of the nature study on wild mammals, between the high season and low season on three nature trails: 1) Km 33 – Nong Pak Chi (KY1), 2) Orchid Campsite – Haew Suwat (KY2), and 3) Dong Tiew – Mo Sing To (KY3). Camera traps were employed to study wild mammals in the three locations per nature trail at one kilometer after the entrance, the middle of the trail, and one kilometer before the exit in both high season (December 2011 to February 2012) and low season (June to August 2012) total of 810 traps night. In the High season, 1,353 photos were taken. Eighty-three percent were of tourists (seventy-one percent of Thais and twenty-nine percent of foreigners) and seventeen percent were wild mammals. During the low season, 1,902 photos were taken ninety-eight percent were tourists (thirty-nine percent Thais and sixty-one percent foreigners) and two percent were of wild mammals. Most tourists were found on KY3 in both seasons (high season: eighty-two percent Thais and eighteen percent of foreigners, low season: thirty-nine percent Thais and sixty-one percent foreigners) while wild mammals were photographed most at KY1 in the high season, and at KY3 in the low season. A total of 10 species of wild mammal were found. During the high season, there were Gaur (Bos gaurus) Dhole (Cuon alpinus) and Binturong (Arctictis binturong). During the low season, there were Asiatic Black Deer (Selenarctos thibetanus) and Malayan Porcupine (Hystrix brachyuran). The species found in both seasons were Barking Deer (Muntiacus vaginalis), Sambar Deer (Rusa unicolor) Asian Elephant (Elephas maximus) Pig-Tailed Macaque (Macaca nemestrina), and Wild boar (Sus scrofa). The mammals impacted by tourists were Barking Deer, Asian Elephant, Asiatic Black Deer, Wild boar and Binturong. The relationship between wild mammals and tourists was negative ($r = 0.113$, $p = 0.415$). The suggestion of the study is to reduce the impacts by controlling the number of tourists and providing ecotourism training program for the tourists.

KEY WORDS: IMPACT/ TRACKING ACTIVITIES/ WILD MAMMAL/ KHAO YAI NATIONAL PARK

79 pages
ผลกระทบจากการกิจกรรมศึกษาธรรมชาติต่อสัตว์ป่าบนเส้นทางศึกษาธรรมชาติในอุทยานแห่งชาติเขาใหญ่ประเทศไทย

IMPACT OF NATURE STUDIES TO MAMMALS ON THE NATURE TRAIL IN KHAO YAI NATIONAL PARK, THAILAND

อาภาเชาว์ พูลประเสริฐ 5336532 ENEP/M

บทคัดย่อ

การศึกษาครั้งนี้มีวัตถุประสงค์เพื่อศึกษาผลกระทบที่เกิดจากกิจกรรมการเดินป่าบนเส้นทางศึกษาธรรมชาติในอุทยานแห่งชาติเขาใหญ่ได้แก่ เส้นทางศึกษาธรรมชาติ กม.33 ถึงหนองผักชี (KY1) เส้นทางศึกษาธรรมชาติถึงป่าต้อง (KY2) และเส้นทางศึกษาธรรมชาติจากตลาดด่านยาวไปจนถึงค่ายทหารสุรศักดิ์ (KY3) ต่อสัตว์ป่าในฤดูกาลท้องที่ย้าย (มี.ส. 2554-ก.พ. 2555) กับช่วงฤดูกาลท้องที่ย้ายหนัก (มี.ส. 2555) โดยใช้กล้องดักถ่ายภาพสัตว์บนเส้นทางศึกษาธรรมชาติทั้ง 3 พื้นที่ ได้แก่ ระยะทางจากทางเข้า 1 กิโลเมตร บริเวณกลางเส้น และก่อนทางออก 1 กิโลเมตร รวมทั้งหมด 810 คืน พบสัตว์ป่าในฤดูกาลท้องที่ย้าย 1,353 ภาพ ได้แก่ เชิงเป็นนักท่องเที่ยว 83% (ไทย 71% ต่างชาติ 29%) สัตว์ป่าในฤดูกาลท้องที่ย้าย 1,902 ภาพ คิดเป็นนักท่องเที่ยว 98% (ไทย 40% ต่างชาติ 60%) สัตว์ป่าในฤดูกาลท้องที่ย้าย 2% พบสัตว์ป่า 10 ชนิด ได้แก่ เชิง (Muntiacus vaginalis) ทางป่า (Rusa unicolor) ช้างป่า (Elephas maximus) ลิงกัง (Macaca nemestrina) และหมูป่า (Sus scrofa) พบทั้ง 2 ฤดูกาลท้องที่ย้าย (Bos gaurus) หมี (Arctictis binturong) และหมีควาย (Selenarctos thibetanus) และมีเนื้อ (Hystrix brachyura) พบเฉพาะตลอดฤดูกาลท้องที่ย้าย นักท่องเที่ยวใช้ KY3 มากที่สุดในช่วงฤดูกาลท้องที่ย้าย 66% (ไทย 82% ต่างชาติ 18%) และตลอดฤดูกาลท้องที่ย้าย 50% (ไทย 39% ต่างชาติ 61%) นักท่องเที่ยวเห็นสัตว์ป่าในช่วงฤดูกาลท้องที่ย้าย และเดินได้ต้องระวาง และนักท่องเที่ยวใช้ KY1 มากที่สุดในช่วงฤดูกาลท้องที่ย้าย 67% เนื่องจากเข้าป่าถึงแหล่งน้ำและธรรมชาติ นักท่องเที่ยวใช้ KY3 มากที่สุดในช่วงฤดูกาลท้องที่ย้าย 68% เนื่องจากใกล้แหล่งน้ำและธรรมชาติ นักท่องเที่ยวใช้ KY2 มากที่สุดในช่วงฤดูกาลท้องที่ย้าย 62% และสัตว์ป่าในช่วงฤดูกาลท้องที่ย้าย ได้แก่ เชิง ช้างป่า หมี หมูป่า และหมีควาย ความสัมพันธ์ของนักท่องเที่ยวและสัตว์ป่าในช่วงฤดูกาลท้องที่ย้ายเป็นความสัมพันธ์ในเชิงลบ ($r = -0.113, p = 0.415$) ข้อเสนอแนะในการลดผลกระทบจากการกิจกรรมครั้งนี้คือ การลดจำนวนนักท่องเที่ยว และการจัดโครงการฝึกอบรมเกี่ยวกับการท่องเที่ยวที่มีนิเวศใหม่ให้กับนักท่องเที่ยว
BIOGRAPHY

NAME: Miss Arpachaw Poonprachert

DATE OF BIRTH: 6 August 1987

PLACE OF BIRTH: Bangkok, Thailand

INSTITUTIONS ATTENDED:
- King Mongkut's University of Technology North Bangkok, 2006-2009
  Bachelor of Business Administration
  (Tourism and Hotel Industry Management)
- Mahidol University, 2010-2012
  Master of Sciences (Sustainable Environment Planning)

RESEARCH GRANTS: This thesis is partially supported by
- Graduate Studies of Mahidol University Alumni Association

HOME ADDRESS: 44 Nongkhangphu SubDistrict, Nongkhame District, Bangkok
Tel. 0805850242
E-mail: arpachawggift@gmail.com

EMPLOYMENT ADDRESS: Faculty of Environmental and Resources Studies, Mahidol University
999 Puthamonthol 4 Road, Salaya, Puthamonthol, Nakorn Pathom

PUBLICATION / PRESENTATION: