Monitoring Amur Leopards and Tigers in Northeast China

An Amur tiger investigates a camera trap in Jilin Province, China, May 2017. Photo © WCS China

FINAL REPORT TO THE WILDCATS CONSERVATION ALLIANCE (WCCA)
APRIL 2018

Grant Award: £18,746
Grant Period: January 1, 2017 - December 31, 2017
Report Period: January 1, 2017 - December 31, 2017

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Executive Summary

The Wildlife Conservation Society's (WCS) China Program has, for years, played an important role in conservation of Amur leopards and tigers in northeast China. In 2017, with support from the WildCats Conservation Alliance (WCCA), we continued our monitoring program by deploying 50 pairs of camera traps in Hunchun Nature Reserve (HNR) to cover approximately 450 km^2 of key habitat for Amur tigers and leopards. The camera trap monitoring period covered about 25,000 trap nights and resulted in about 50,000 images and videos of wildlife and human activity, of which 700 images and videos were of 10 leopards and 13 tigers. Seven of these leopards and eight of these tigers were new to our camera traps. By combining data with partners collecting data across the entirety of the park, we identified 20 different leopard individuals (9 males, 5 females, and 6 of unknown sex), and 18 different tiger individuals (5 males, 5 females, and 8 of unknown sex) in HNR. Additionally, we conducted winter track surveys and studied big cat behavior and movement patterns by discovering and following ten tiger trails for a total distance of about 106 km, and concluded that they were made by at least four tigers. We also organized a training workshop for communication and training in theoretical knowledge and field exercise for increasing capacity of staff at protected areas within the boundaries of the Tiger and Leopard National Park (TLNP).

Introduction

Both Amur tigers and Amur leopards are reliant on human interventions to recover their populations in the wild. The future of these big cats in northeast China in particular remains uncertain, even after recent estimates found as many as 27 tigers and 42 leopards in the provinces of Jilin and Heilongjiang. Tiger and leopard conservation has become a prominent issue in China recently as it was included in the latest, federal-level Chinese national development strategy plan. In fact, the Government of China has indicated substantial upcoming investments in big cat conservation in northeast China over the next decade.

In order to evaluate the effectiveness of the conservation plans currently being developed, it is essential to have statistically rigorous monitoring systems in place to objectively quantify the responses of tigers, leopards, and their prey to these interventions. Camera trap monitoring is one such system. With support from WCCA, WCS China and our partners now have four years of continuous monitoring data for the most important big cat entry point into China from Russia: Hunchun Nature Reserve. The data we have collected, and will continue to collect, serve as a gauge by which we can measure the return of these big cats to suitable habitat in northeast China.

Progress toward Goals and Objectives

Project Goal: To improve reliability of population estimates of Amur leopards and tigers in and around Hunchun Nature Reserve

Objective 1. Ensure continuity in camera trap monitoring of Amur leopards and tigers in Hunchun Nature Reserve

Leopard and tiger numbers in HNR
In 2017, we continued to engage in camera trapping at four of the six subunits of HNR: Madida, Yangpao, Banshi, and Jingxin (Figure 1). We deployed camera traps at 50 sites in HNR, covering approximately 450 km^2 and containing key habitat for Amur tigers and leopards. We originally intended to check camera traps four times throughout the grant period, but we were only able to visit all sites twice ourselves due to restrictions imposed by Chinese border guards in this sensitive region. We were able to circumvent some these restrictions by coordinating camera trap checks with HNR management, which we will continue to do in the future as well. We collected nearly 50,000 images over 25,000 trap nights from November 2016 to December 2017. These data resulted in 175 capture occasions of 13 different tigers, and 45 capture occasions of 10 different leopards. The raw data of leopards and tigers received from these camera traps are presented in Table 1.

In the monitoring period, 66 percent of the camera trap sites (N=33) captured leopards or tigers (Figure 1). Leopards were captured at twenty sites, and tigers were captured at seventeen sites (there were four sites where both tigers and leopards were captured). Leopard sites were located mostly in the Jingxin and Banshi subunits, tiger sites were located mostly in the Madida and Yangpao subunits.

We identified ten different leopard individuals (five males, four females, and one of unknown sex) and thirteen different tiger individuals (four males, three females, and six of unknown sex) by comparing spot and stripe patterns (for leopards and tigers, respectively). Of the ten leopards photographed, three were recorded in the past and the remainder were seen here for the first time. Of the thirteen tigers, five individuals were photographed in the past and eight were new individuals. In Appendix I (showing leopards) and Appendix II (showing tigers), we provide sample images of these animals, as well as maps showing the locations where they were detected.

By combining our analysis with camera trap activities across HNR, 61 camera trap locations resulted in captures of leopards (N=44) and tigers (N=30; Figure 1). Of these, we identified 20 different leopard individuals (9 males, 5 females, and 6 of unknown sex), and 18 different tiger individuals (5 males, 5 females, and 8 of unknown sex) across the whole of the protected area.

Figure 1. Locations of camera trap with leopards and tigers (the diagonal split HNR into two parts, north for HNR management and south for WCS).

Table 1. Information on leopards and tigers from camera trap monitoring by WCS from November 2016 to December 2017

Species	Occasions	Sites Represented	Number of Images/Videos	Individuals
Amur leopard	45	20	177	10
Amur tiger	175	17	518	13

Total number of leopards and tigers in China

In 2017, seven different organizations conducted camera trap monitoring in HNR and adjacent Amur leopard and tiger habitat and, in total, camera traps were deployed at 240 sites. Under the direction of the Forestry Bureau of Jilin Province (FBJP), representatives of these organizations met to discuss results (Figure 3). FBJP summarized unified 2016 data by stating there were 17 leopards (9 males, 6 female, and 2 of unknown sex) and 10 tigers (5 males and 5 females) in Jilin Province in 2016, including Hunchun, Wangqing, and Huangnihe regions. Consequently, the data we collected for HNR represents an increase in leopards (17 in 2016 versus 20 in 2017) and a large increase in tigers (10 in 2016 versus 18 in 2017). This mirrors trends also seen in Russia, where adjacent Land of the Leopard National Park likely has the highest densities of tigers anywhere in Amur tiger range (see 2017 WCS Russia report to WCCA).

Figure 3. Delegates at the 2017 meeting of organizations conducting camera trap monitoring in Jilin Province, China. Photo © WCS China

Human activities and other wildlife in HNR

We collected additional information during our camera trap monitoring, including records of human activities, vehicle information, and captures of other wildlife and livestock. We analyzed these data according to a relative abundance index (RAI), which is defined as the number of capture occasions per species in all camera sites in 100 capture days. The results show that the proportion of human activities is higher than that of wildlife. Human activities (including foot and vehicular traffic) accounted for 39.6 percent of all captures, and were primarily of collection of non-timber forest products, frog breeding, and grazing. Livestock records accounted for 15.5 percent of all captures. Ungulates (wild boar, sika deer, roe deer) represented the highest proportion of wildlife (27.1 percent of all captures), then other animals (13.5 percent), finally tigers (3.2 percent) and leopards (1.2 percent; Figure 4).

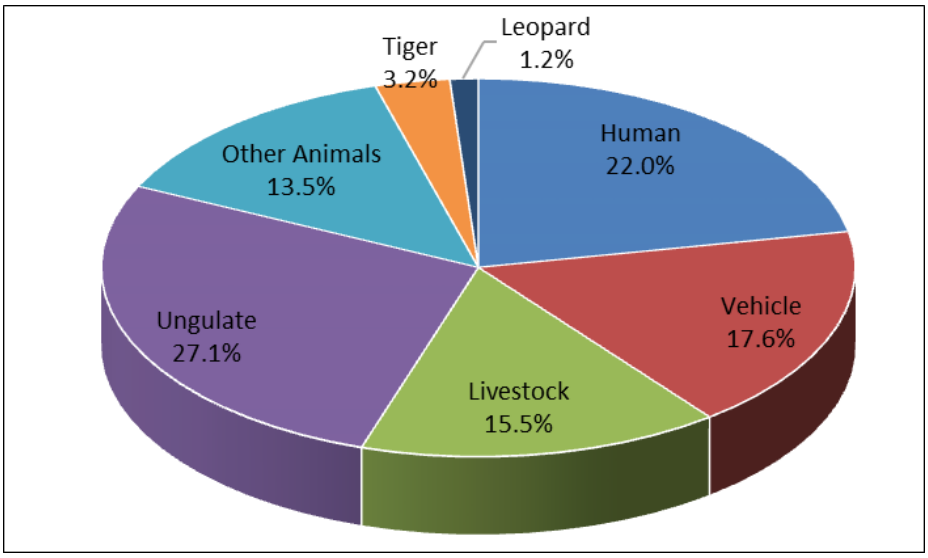


Figure 4. The proportions of each detection category from camera trap in HNR.

By comparing three years of non-winter data of in the Madida and Yangpao subunits of HNR, we see that human activity was higher than wildlife in any given year, but that all three human-related activities (foot traffic, vehicular traffic, livestock) have decreased each subsequent year of monitoring (Figure 5). The sharp reduction of vehicles especially is likely related to better management of HNR and increased patrolling by border guards. Reduced human disturbance is a key component of tiger and leopard population restoration, so these trends are encouraging. We photographed prey species (wild boar, roe deer, sika deer) from all 50 camera trap locations. Sika deer accounted for 70% of ungulates in the Madida and Yangpao subunits, while accounting for only about 10% percent in the Banshi and Jingxin subunits (Figure 6).

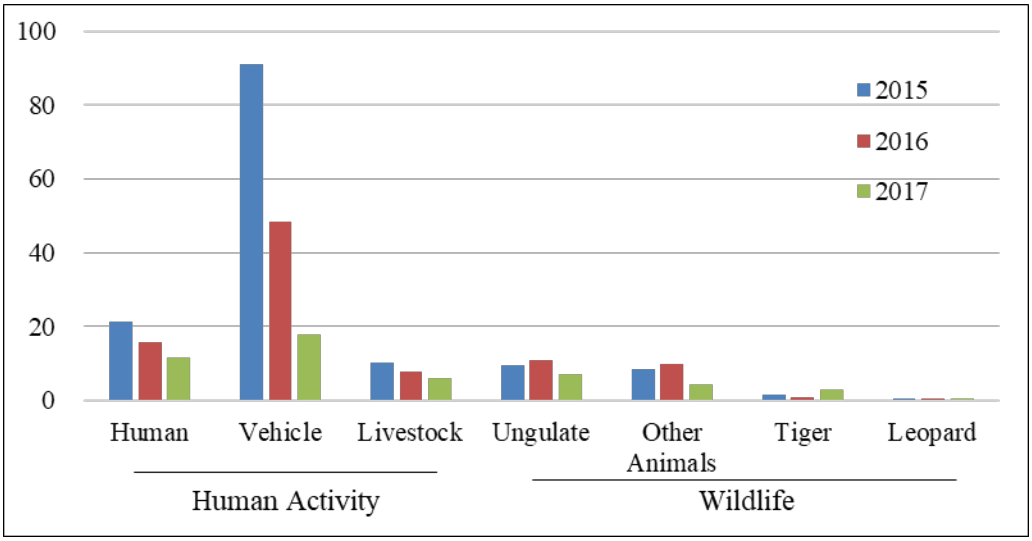


Figure 5. Detection categories from camera trap in different year.

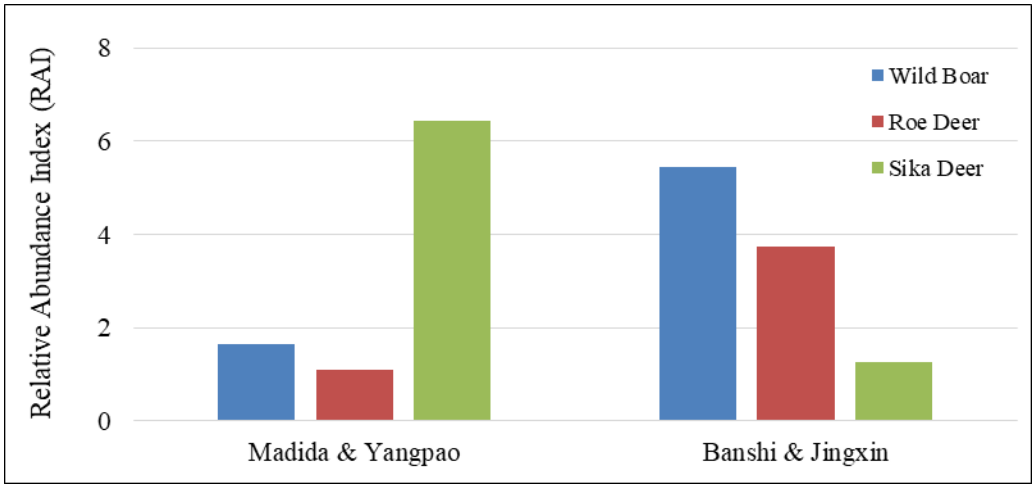


Figure 6. Relative abundance of three ungulates in four subunits of HNR.

Objective 2. Snow track Amur leopards and tigers to glean information about movements and behavior, and to provide information about where to set camera traps.

Snow tracking is an excellent way to gain knowledge of the behavior and movement patterns of big cats. Snow tracking can also help identify quality sites for future placement of camera traps by identifying preferred travel corridors and scent-marking trees. In December 2017 we spent 13 days (488 man-hours) focused primarily on areas outside HNR (Heshan forestry farm; the Erdaogou, Sandaogou, and Sidaogou areas), with only a single survey transect within HNR (Figure 7). We found one tiger trail within HNR (Track No. 2 in Figure 7), but our tracking was curtailed as the tiger crossed the China-Russia border and we could not follow.

We split up into three groups for tracking with three to four people in each group. When we found clear pugmarks along a transect we initiated tracking and recorded behaviors until we lost the trail. In total we tracked 10 trails of tigers for a total distance of about 106 km. We did not find any leopard trails. Table 2 lists the parameters collected.

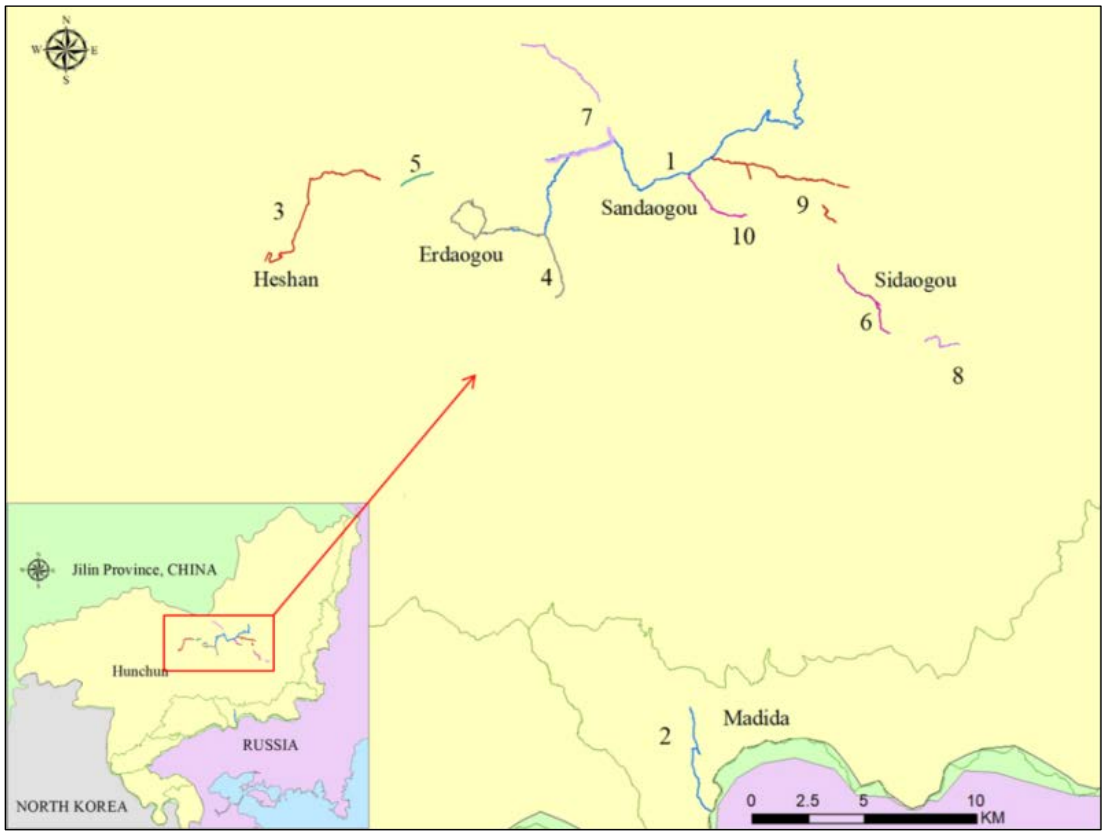


Figure 7. Locations of survey routes (numbers 1-10 represent different tiger tracks).

Table 2. Parameters of the tiger tracks in Figure 7.

TRACK NUMBER	DATE	LOCATION	TRACKING DISTANCE (km)	FRONT PAD WIDTH (cm)	HIND PAD WIDTH (cm)	STEP DISTANCE (cm)
1	2017/12/6,8-9	Erdaogou	37.76	9.0	8.7	120
2	2017/12/12	Madida	6.60	-	7.6	110
3	2017/12/15-16	Heshan	10.12	11.5	10.1	134
4	2017/12/16-17	Erdaogou	13.94	9.5	9.0	127
5	2017/12/18	Erdaogou	2.01	-	9.0/6.7	128/-
6	2017/12/17	Sidaogou	5.77	-	9.1	126
7	2017/12/18-19	Sandasogou	11.74	9.2	8.8	129
8	2017/12/19	Sidaogou	2.51	-	8.9	125
9	2017/12/20-21	Sandaogou	10.50	10.0	9.5	117
10	2017/12/22	Sandaogou	4.92	-	9.5	124

During tracking, we made note of tiger behavior such as bounding, bedding, scraping, urination, and scat deposits (Figure 8). Ground scrapes represented the most-observed tiger behavior, followed by urination. Tree scrapes represented only one percent of observed behavior (Figure 9). We found no evidence of tigers stalking or killing prey during our surveys.

Figure 8. Various behavioral markers left by tigers in Jilin Province, China. Photos © WCS China

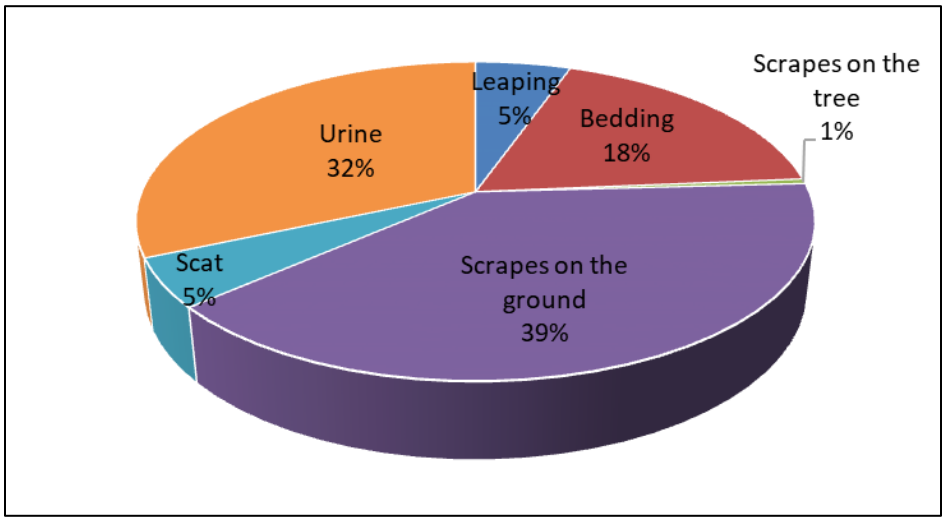


Figure 9. The proportion of tiger behaviors observed over 13 days of tracking in December 2017, in Jilin Province, China.

We concluded that the ten tracks we followed belonged to at least four tigers: three outside HNR and one inside HNR. We stopped tracking two animals prematurely: the first was a female tiger (Track 2), who we followed until she crossed the China-Russia border. The second track we stopped following (Track 5) was an adult female with one or more cubs; we stopped tracking when the tracks became very fresh and we were worried about encountering the tigers themselves. This track is of note because, in December 2016, we found evidence of two tigers engaging in courtship in this same general area. Therefore, the observed tracks of one or more cubs in 2017 may be the result of this pairing.

Objective Three: Work with WCS Russia to promote transboundary big cat conservation between China and Russia.

In late December 2017, we organized a small skills training workshop in Hunchun and invited staff from WCS Russia to help facilitate. More than 40 people took part in the two-day training, representing three

protected areas within the boundaries of the larger TLNP (Hunchun Nature Reserve, Wangqing Nature Reserve, Huangnihe Nature Reserve), two forestry bureaus (HMFB, Wangqing County Forestry Bureau), the Jilin Provincial Academy of Forestry Science, and others (Figure 10). We spent one day learning relevant theoretical knowledge and one day practicing in the field. Specifically, Aleksandr Rybin (WCS Russia) led trainings in camera trapping, snow tracking, and track identification (Figure 11). WCS China staff gave presentations on SMART anti-poaching management and related software (GPS, map-making software, etc.). This workshop was meaningful and provided basic training for TLNP staff. It laid the foundation for the improvement of the technical capacity of each bureau and of park management.

Figure 10. Delegates at the skills training workshop in Hunchun, China. Photo © WCS China

Figure 11. Aleksandr Rybin of WCS Russia leads a multi-organizational team to look for tiger and leopard signs in HNR. Photo © WCS China

Conclusion

The WCS China Program is devoted to wildlife conservation in northeast China. With support from the WildCat Conservation Alliance, we have made important strides in our work to monitor Amur leopards and tigers in and around HNR. Population monitoring is an important part of conservation, as evidenced by our role in protected area creation. First, our initial surveys in the late 1990s helped lead to the creation of HNR in 2001. More recently, our long-term monitoring has documented a rebound in tiger and leopard numbers in China (to 20 leopards and 18 tigers last year in HNR alone), data that the Government of China used to justify creation of the 15,000 km^2 Tiger and Leopard National Park in 2017. We thank the WildCat Conservation Alliance for its role in helping make this happen, and look forward to continued cooperation in the future.

Attachments

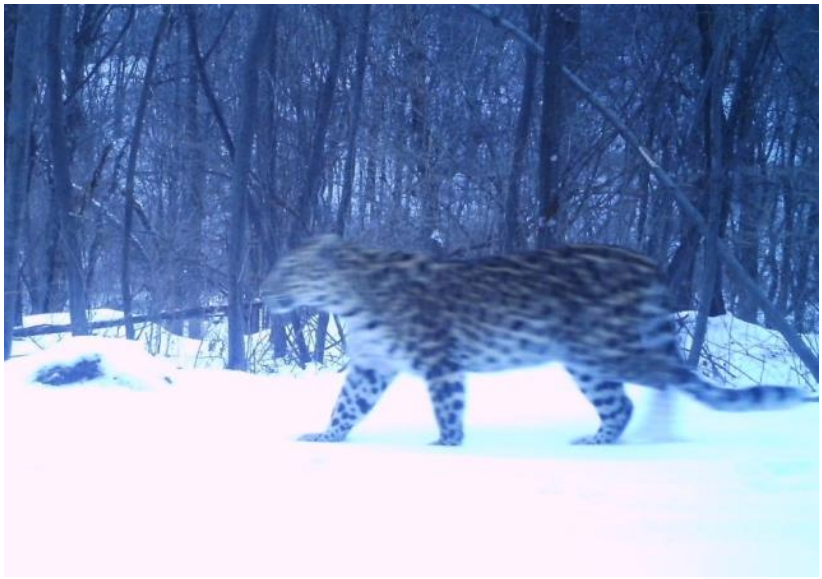
- Appendix I: Leopard Camera Trap Images and Distribution Maps
- Appendix II: Tiger Camera Trap Images and Distribution Maps
- Financial Report

Appendix I: Leopard Camera Trap Images and Distribution Maps

Note: Leopard IDs are based on numbering assigned by the Forestry Bureau of Jilin Province. Therefore, some numbers are skipped as other partners' record leopards not found by WCS China.

Leopard # 10 (male)

Leopard # 12 (male)



Leopard # 14 (male)

Leopard # 15 (male, new)

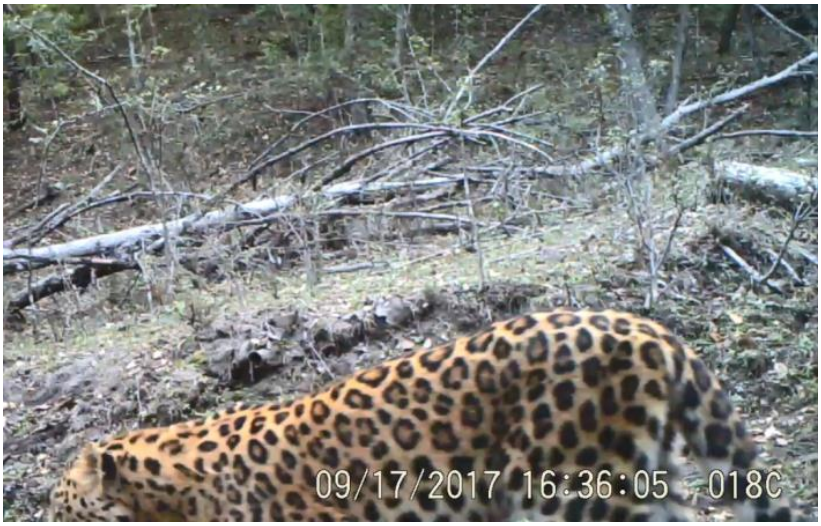
Leopard # 16 (female, new)

Leopard # 17 (female, new)

Leopard # 18 (female, offspring of Leopard # 16, new)

Leopard # 19 (female, offspring of Leopard # 16, new)

Leopard # 20 (male, new)



Leopard # 21 (sex unknown, new)

Appendix II: Tiger Camera Trap Images and Distribution Maps

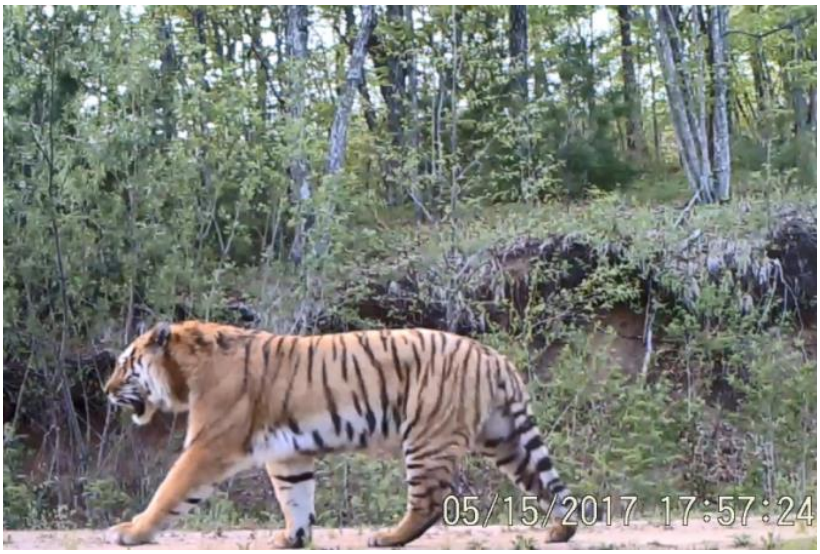
Note: Tiger IDs are based on numbers assigned by the Forestry Bureau of Jilin Province. Therefore, some numbers are skipped as other partners' record tigers not found by WCS China.

Tiger # 1 (female)

Tiger # 3 (female)

Tiger # 14 (male)

Tiger # 18 (male)



Tiger # 22 (sex unknown)

Tiger # 20 (sex unknown, new)

Tiger # 25 (male, new)

Tiger # 26 (male, new)

Tiger # 28 (sex unknown, offspring of Tiger # 3, new)

Tiger # 30 (sex unknown, new)

Tiger # 31 (sex unknown, new)

Tiger # 32 (sex unknown, offspring of Tiger # 1, new)

Tiger # 33 (sex unknown, offspring of Tiger # 1, new)