Monitoring Amur Leopards in Southwest Primorskii Krai, Russia

An Amur leopard passes our camera trap on February 8, 2017 in Land of the Leopard National Park.
Photo © LLNP/WCS Russia

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Executive Summary

Our long-term leopard monitoring project progressed well in 2017, continuing our trend of collecting annual numbers of Amur leopards since 2003. We continued camera trapping in two sectors of Land of the Leopard National Park (LLNP), known as the Nezhinskoe and Northern regions, in 2017. We placed camera traps at 54 locations (33 pairs and 2 single cameras in the Nezhinskoe region, and 18 pairs plus 1 single camera trap in the Northern region). Traps were collected in June 2017, after 8,408 trap days, resulting in 193,879 total images across both sectors. From these, we identified 1,647 photographs of 27 different leopards (10 males, 12 females, 1 cub, and 4 sex unknown). This number—27—is the most we have ever tallied since monitoring began in 2003 (past highs were 16 leopards in 2015 and 15 leopards in 2012). Leopard densities were estimated to be 1.1 ± 0.189 individuals/100 km^2 (using the spatially explicit capture recapture program SPACECAP). These numbers, when coupled with our analyses showing high Amur tiger densities in the region, may be an indication of the success of long-term conservation efforts in the region.

Progress against Goals and Objectives

Objective 1. Re-establish monitoring in Nezhinskoe

An important objective of ours in 2017 was to resume our long-term monitoring work in Land of the Leopard National Park (Figure 1). We set up camera traps from December 27, 2016-January 27, 2017 and removed camera traps from May 29, 2017-June 16, 2017. We placed 68 camera traps (33 pairs and 2 single cameras) in the Nezhinskoe region. Our results for the Nezhinskoe region revealed 788 photographs of 115 capture events of 16 different leopards.

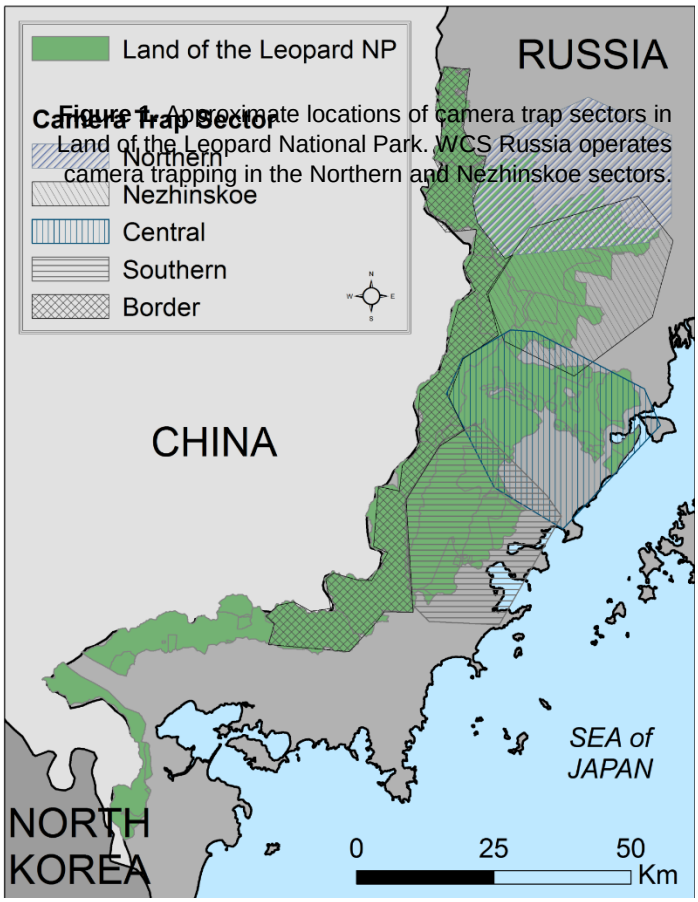

Figure 1. Approximate locations of camera trap sectors in Land of the Leopard National Park. WCS Russia operates camera trapping in the Northern and Nezhinskoe sectors.

Objective 2. Continue to work in the Northern sector.

During the survey period in 2017, we placed a total of 37 camera traps (18 pairs plus 1 single camera trap) at 19 locations in the Northern region (Table 1). Here we provide unified output from both the Nezhinskoe and Northern sectors. Traps were collected in June 2017, after 8,408 trap days, resulting in 193,879 total images. Of these, we found 1,647 photographs of 27 different leopards (10 males, 12 females, 1 cub, and 4 sex unknown; Figure 2). This is the highest number of different leopards we have tallied since monitoring began in 2003. True, our study area doubled from about 300 km^2 in 2003-2013 to nearly 800 km^2 in 2014 onward, but the 27 individuals surpasses past highs of 16 leopards in 2015 and 15 leopards in 2012. Leopard densities were estimated to be 1.1 ± 0.189 individuals/100 km^2 (using the spatially explicit capture recapture program SPACECAP), which is approximately twice the density estimated in 2015 (Table 2). It is not unusual for there to be occasional major fluctuations in long term data sets of big cats over years, and therefore we are cautious about

speculating too much on these high numbers. In a year or two the significance of this year's results will be clearer. However, most of the change is represented by a large increase in numbers of males. We suspect that this is an unusual case of high survival of young males that is bumping up overall numbers. However, there is a more moderate increase in numbers of females, which may give cause for optimism that this may represent a bump up in overall leopard numbers in our study area.

Using the Bayesian approach to estimating spatially explicit density estimates, it appears that density has increased from our 2015 estimate of 0.65 individuals/100 km^2 to 1.1 individuals per 100 km^2. Again, this appears to be a statistically significant change, but it is best to view this value in relation to estimates both before and after this year. Nonetheless, results are positive.

Table 1. History of camera trapping by WCS in Land of the Leopard National Park.

YEAR	STUDY AREA (km^2)	SURVEY START DATE	SURVEY END DATE	NUMBER OF CAMERA TRAP DAYS	NUMBER OF CAMERA TRAP LOCATIONS	TRAP DENSITY (Traps/100 km^2)
2002-2003	321	24.11.2002	28.01.2003	66	24	7.47
2004	321	25.01.2004	31.03.2004	67	23	7.16
2005	321	25.01.2005	31.05.2005	127	22	6.85
2006	303	01.02.2006	31.05.2006	120	21	6.93
2007	303	15.02.2007	08.05.2007	83	21	6.93
2008	303	10.02.2008	10.06.2008	122	21	6.93
2009	303	10.03.2009	30.06.2009	113	21	6.93
2010	303	30.03.2010	27.06.2010	117	21	6.93
2011	303	01.02.2011	01.06.2011	121	21	6.93
2012	345	18.02.2012	03.06.2012	107	30	8.7
2013	341	20.02.2013	11.07.2013	142	28	8.2
2014	774	04.03.2014	15.07.2014	134	59	7.6
2015	792	13.01.2015	05.07.2015	174	55	6.9
2016	*Data acquired, but still being organized and analyzed*					
2017	791.6	27.12.2016	14.06.2017	148	51	6.4

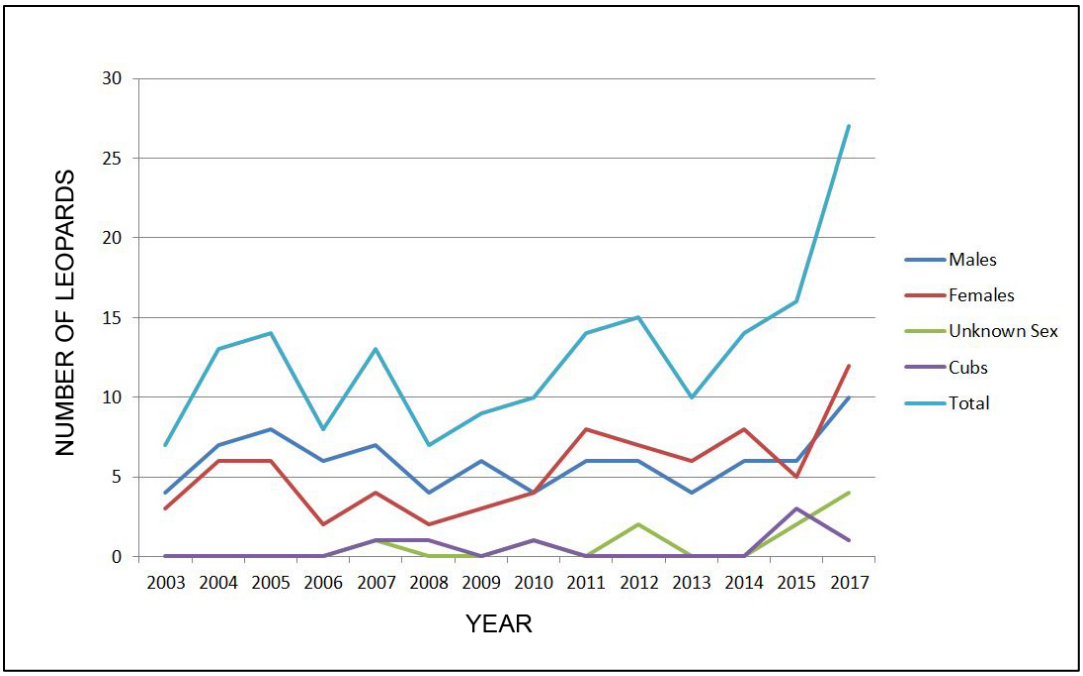

Figure 2. Number of Amur leopards in the study area over time. Data from 2003-2013 includes only the Nezhinskoe sector of Land of the Leopard National Park, whereas data from 2014-present are from the combined Nezhinskoe/Northern sectors.

Table 2. Densities of Amur leopards in the Nezhinskoe and combined Nezhinskoe and Northern sectors of Land of the Leopard National Park in 2015 and 2017, estimated using program SPACECAP.

YEAR	AVERAGE DENSITY (Individuals/100 km^2) $\overline{D} \pm S$	95% CONFIDENCE INTERVAL
2015 (Nezhinskoe)	0.64±0.13	0.42-0.89
2015 (Combined)	0.65±0.097	0.48-0.81
2017 (Nezhinskoe)	0.98±0.23	0.52-1.42
2017 (Combined)	1.11±0.189	0.75-1.47

Objective 3. Camera trap previously-unmonitored leopard habitat outside the national park. We have successfully expanded our network of camera traps to include habitat both inside and nearby Land of the Leopard National Park. Our original survey area (Figure 1) contained a portion of the Naval Military Hunting Lease already. By creating and incorporating our Northern sector, we significantly expanded and increased the amount of land surveyed outside the park. This area is important both because it is mostly suitable habitat for leopards, and because it represents habitat leading to the only potential corridor to the southern Sikhote-Alin Mountains. Although the distance between Ussuriskii Zapovednik (in southern Sikhote-Alin Mountains) to Land of the Leopard National Park is only 40km (and the distance between suitable habitat is much less), there has never been a record of leopards in Ussuriskii Zapovednik for the past 50 years. Nonetheless this potential corridor represents the only likely means leopards might naturally disperse into and re-inhabit the Sikhote-Alin Mountains. Monitoring of this region is therefore especially important.

Objective 4. Work with park staff to integrate the database.
Our efforts to combine camera trap databases, not just within Russia but across the border to include Chinese data as well, have been successful. As detailed in previous reports, a unified analysis of Amur leopard numbers throughout their range (in Russia and China) for 2014 and 2015 provided the most statistically-robust of the global population of Amur leopards ever (84, with no significant difference between years). The results of these analyses have been written up and are in review with the journal *Conservation Letters*. We have discussed the results of this joint effort with our Chinese colleagues, and they appear eager to continue the collaboration.

We are also working closely with staff of Land of the Leopard National Park to ensure that their photographic database is maintained. With a key staff member now out on maternity leave, the Director of LLNP has specifically asked our staff member Aleksandr Rybin to help organize and maintain the database, as well as conduct analyses of the data. She greatly values our yearly report to the reserve on results of our efforts (available upon request to WCCA, but is in Russian only). This close cooperation ensures integration of databases and the opportunity for continued cross boundary analyses to monitor the entire population of Amur leopards.

Conclusion

With 2016 data now in hand, we now have a 15-year database on leopard population dynamics, albeit in a relatively small portion of Land of the Leopard National Park. Nonetheless, the overall trend within this core area is one of stability. 2017 represents an interesting deviation from this overall trend, and raises the possibility that leopard numbers may now be increasing even in this core area. Overall, we believed that while numbers in our study area were steady, increases in Amur leopard numbers globally were occurring by leopards expanding into regions where they have not previously occurred (e.g. in China and fringes of LLNP), and hence overall numbers were increasing. The fact that leopard numbers may be increasing even in this core study area is intriguing. Some local biologists fear that the increasing numbers of both tigers and leopards represent a danger – that there are too many large predators that cannot be supported by the existing prey base. Some believe that sika deer numbers are so high that they are reducing the available forage. Such a situation could become catastrophic if a hard winter led to a major die-off of sika deer (the primary prey of both tigers and leopards). Others are concerned that the high numbers of large felids may overharvest the sika deer population, leading to a decline in numbers and a reduction in the prey base for both predators. We are not aware of a documented case in which a large felid predator was responsible for regulating population size of a prey species, even though it has been documented repeatedly for canids (particularly wolves).

We suspect that ungulate numbers are likely recovering with improved protection of the national park (including use of SMART), and that recovery is likely supporting the increase in tiger and leopard numbers. However, the potential of a larger sika deer population to reduce available forage is real, and the potential for a crash in sika deer numbers in harsh winters is also real. Such a change could easily impact both tiger and leopard populations. Such occurrences are part of a natural process but is of concern when dealing with highly endangered populations. Continued monitoring of this situation is clearly needed. We are deeply grateful to the WildCats Conservation Alliance for its continued support of this important Amur leopard monitoring program.

Attachments

- Financial Report