

Workshop on Nature Conservation and Biodiversity for Transboundary Cooperation

Sino-Russian Amur Tiger and Leopard Conservation Cooperation Progress



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01

Amur Tiger/Leopard Conservation Status

In 2019, China and Russia has signed the “Sino-Russia Joint Announcement” indicated that Amur tiger and leopard transboundary conservation is one of mainly cooperation tasks.



2010 Tiger Summit



2019年6月6日

中华人民共和国和俄罗斯联邦关于发展新时代全面战略协作伙伴关系的联合声明（全文）（3）



新华社

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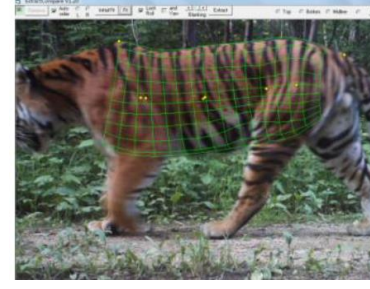
（九）推动两国林业和自然保护部门合作，继续深化东北虎、东北豹等珍稀濒危野生动植物和迁徙候鸟保护合作。加强自然保护区合作，特别是东北虎豹跨境自然保护区合作，联合开展巡护和东北虎豹监测，共同开展生态廊道建设，保障东北虎豹在中俄边界实现自由迁徙。为增进两国人民友谊，中方向俄方提供一对大熊猫，双方将在大熊猫保护、繁育等方面开展合作与联合研究。

02

Amur Tiger and Leopard National Databases



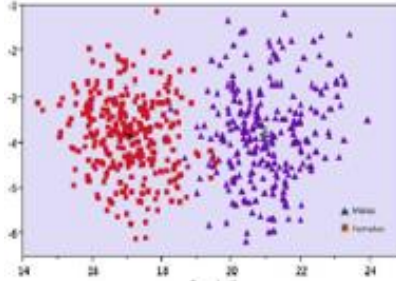
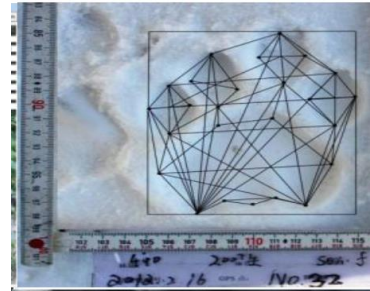
Over 23 years(2000-2024) monitoring, including pattern images, genetics, footprints, prey abundances and information network, i.e., 5 monitoring databases.



Body patterns



■ Tiger and leopard images databases (More than 90 tigers; more than 300 leopards, including North China leopard 222 leopards)



Snow footprint images

■ Distribution information network database (**Information network**)

■ Footprint image databases (**Digital image**)

■ Genetics databases (**Fecal DNA**) (more than 70 tigers)



Fecal DNA Database



■ Prey abundance survey database (**Line transect**)

Amur tiger recovers with Russian population dispersal



Biological Conservation 261 (2021) 109250



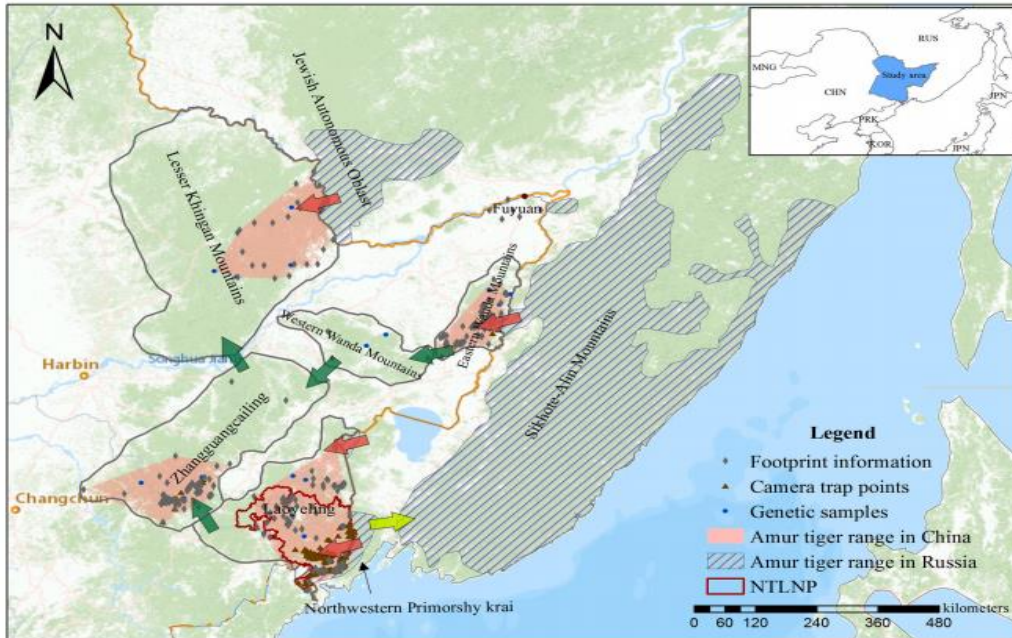
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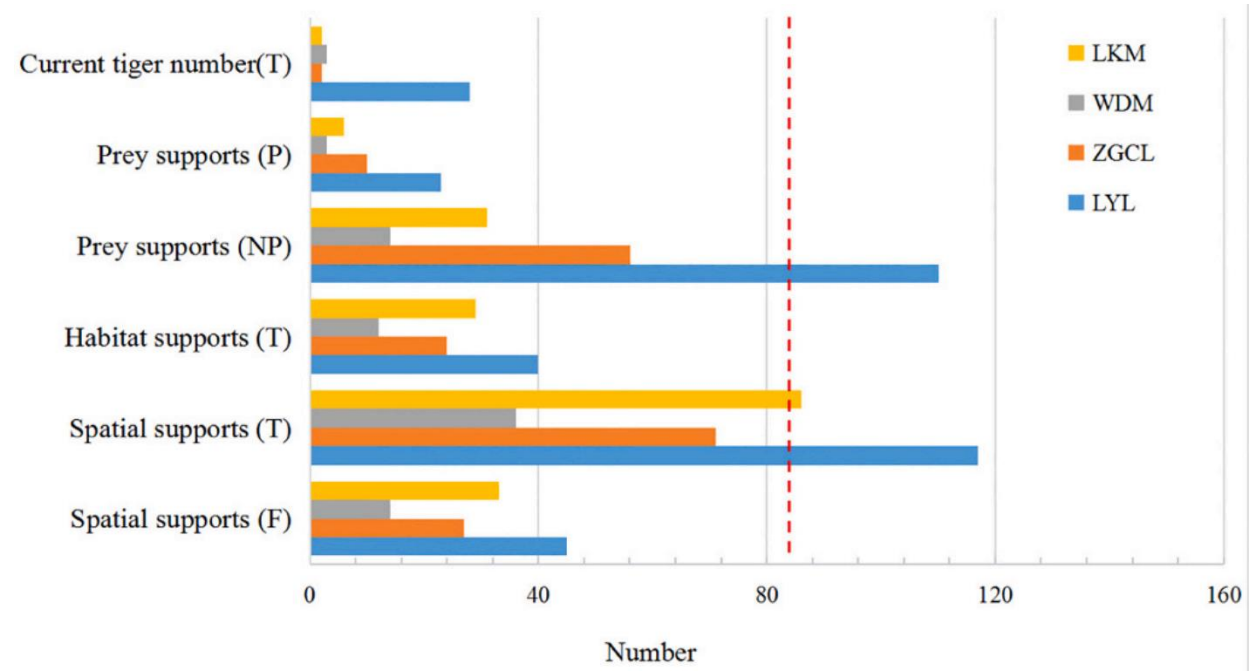


Integrated assessments call for establishing a sustainable meta-population of Amur tigers in northeast Asia

Jinzhe Qi^{a,b,1}, Jiayin Gu^{a,1}, Yao Ning^{a,1}, Dale G. Miquelle^{c,1}, Marcel Holyoak^d, Dusu Wen^a, Xin Liang^a, Shuyan Liu^a, Nathan James Roberts^a, Eryan Yang^e, Jianmin Lang^f, Fuyou Wang^g, Cheng Li^h, Zhuo Liangⁱ, Peiqi Liu^j, Yi Ren^e, Shaochun Zhou^k, Minghai Zhang^a, Jianzhang Ma^a, Jiang Chang^l, Guangshun Jiang^{a,*}



More than **90 Amur tigers** exist in China now, and about **310 tigers** may be supported in northeast China, will establish the one **matapopulation** of tigers with Russian tiger population.



| 严谨 RIGOROUS | | 勤奋 DILIGENT | | 求实 REALISTIC | | 创新 INNOVATIVE |



Kang Weimin
Chief executive



Qiu Shuaihui
Managing director



Jiang Guangshun
Director



Viacheslav Rozhnov
Academician



Direktor Naidenko
Director of institute



Transboundary Cooperation Main Directions of Sino-Russian Joint Lab



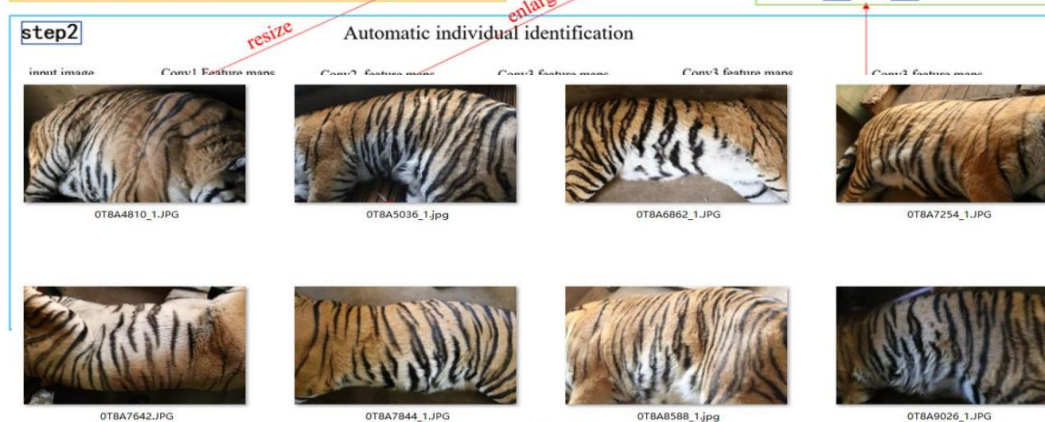
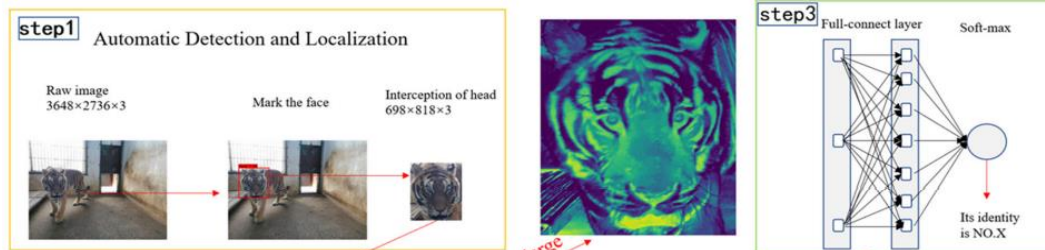
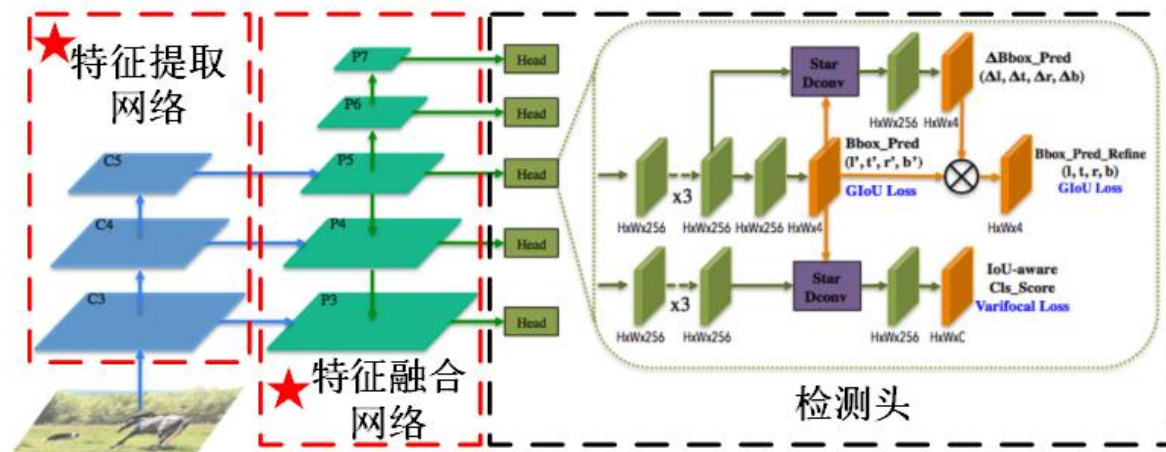
- 1. Conduct **genetic research** and establish the Sino-Russian common genetic database;
- 2. Conduct the trail research on captive tiger breeding and **rewilding**, and explore to release into wild based on scientific methods;
- 3. Conduct wildlife **disease** and parasite research, and explore disease infect other wildlife;
- 4. Conduct research on **human tiger conflict** mechanism, and expore effective technology for controlling the conflicts.



AI application on species and individual identification platform for camera trap datasets



- Collect 3500 000 image/video datasets from northeast and north China by camera trap
- Labelled 28 mammal species with more than 1000 000 images for AI calculations
- Species and individual identification accuracy more than 90%, can remove 95% blank pictures, 1T data can be calculated with one day by one computer.



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RESOURCE ARTICLE

MOLECULAR ECOLOGY
RESOURCES WILEY

A simple and effective method to enrich endogenous DNA from mammalian faeces

Liang Yu Cui^{1,2} | Bo Yang Liu^{1,2} | Hai Meng Li^{3,4} | Yi Xin Zhu^{3,4} |
Yong Heng Zhou^{1,2} | Chang Su^{1,2} | Yin Ping Tian^{1,2} | Hai Tao Xu⁵ | Dan Liu⁵ |
Xiao Ping Li^{3,6} | Yue Ma^{1,6} | Guang Shun Jiang^{1,6,7} | Huan Liu^{3,6} | Shu Hui Yang^{1,6} |
Tian Ming Lan^{3,6} | Yan Chun Xu^{1,2,6}

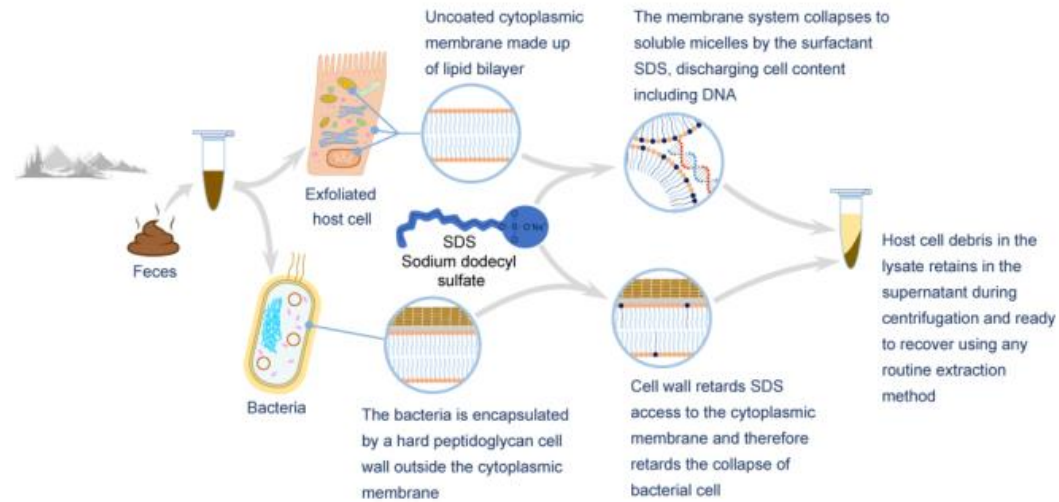


FIGURE 1 The working principle of peri-extraction enrichment of endogenous DNA using SDS (PEERS).

- The success of molecular marker genotyping and genome resequencing can be predictable by **sufficient enrichment of endogenous DNA** in the total faecal DNA of mammals.

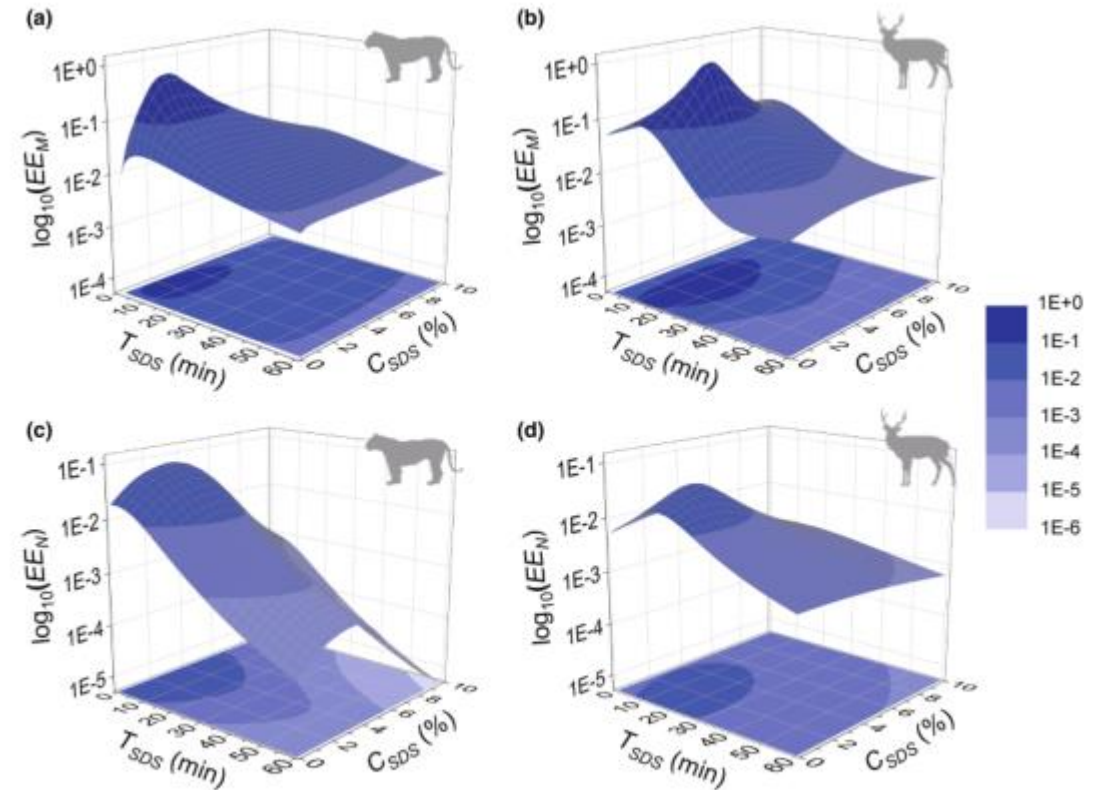
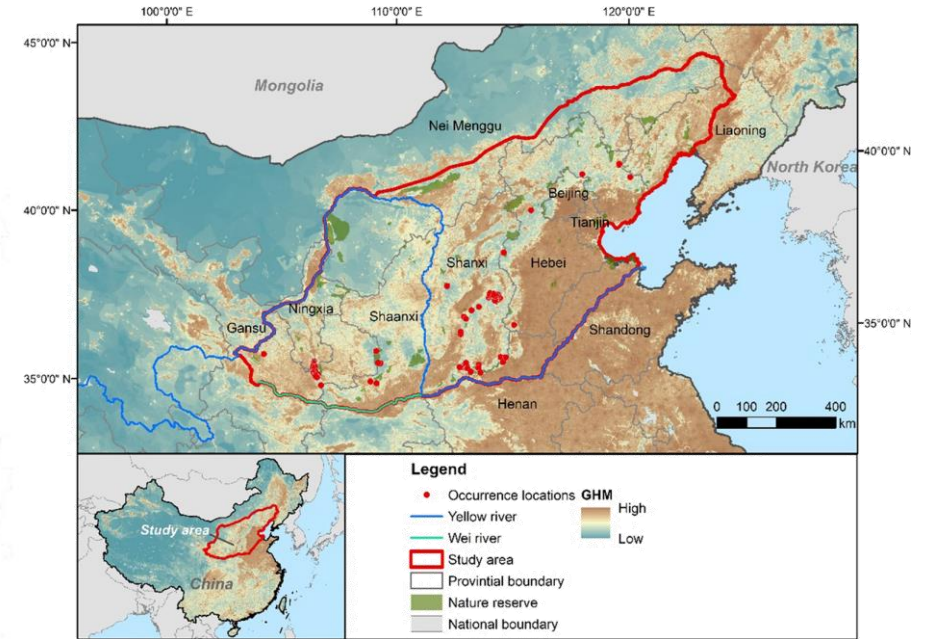
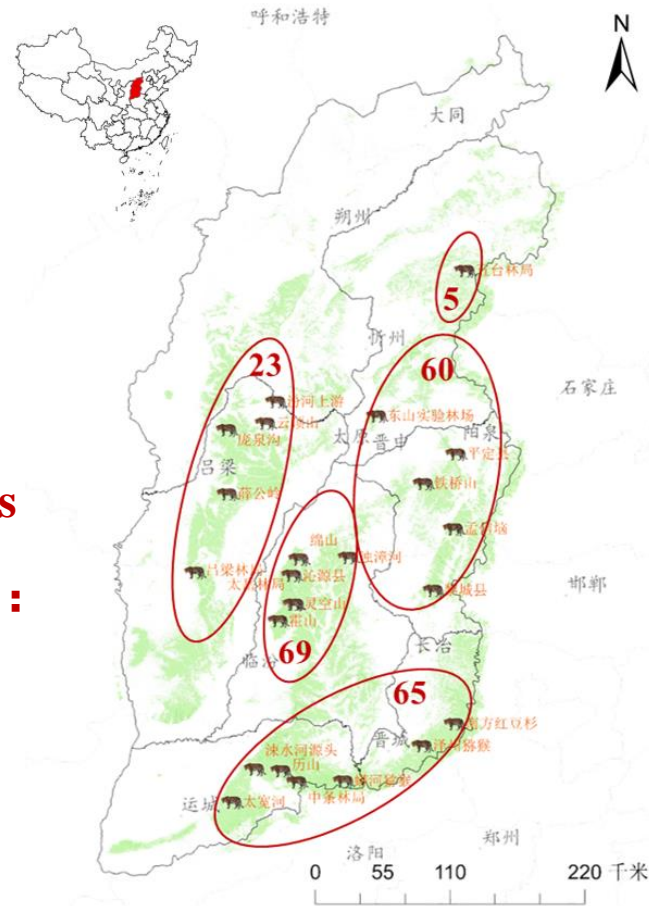


FIGURE 2 The dynamics of enrichment efficiency of endogenous mtDNA (EE_M) and nuDNA (EE_N) in total faecal DNA of an Amur tiger (AF7) representing carnivores and a sika deer (SD8) representing herbivores under PEERS schemes with different SDS final concentrations (C_{SDS}) and treatment time (T_{SDS}), including (a) EE_M of AF7; (b) EE_M of SD8; (c) EE_N of AF7; (d) EE_N of SD8.

The growth of the North China leopard population provides a new perspective for the recovery of the Northeast leopard population



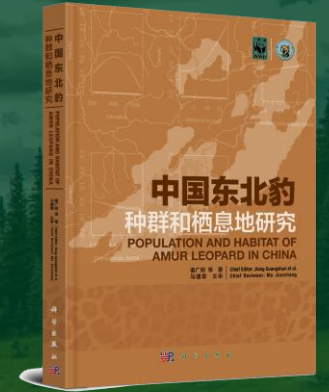
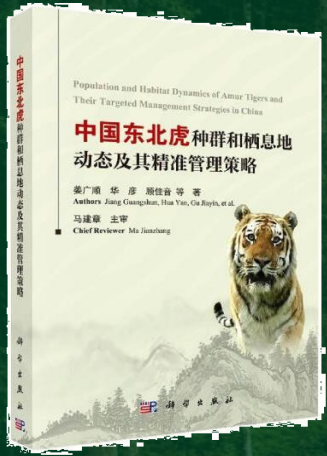
- Number of study areas: **35**
- Monitoring area: **5 707km²**
- Sampling area/Forest area: **21.7%**
- Number of camera traps: **2 413**
- Camera working days: **811 784 days**
- Number of identified populations : **222**
- Predicted population size : **680±84**



The occurrence locations (N = 196) of North China leopard in North China (2014–2020). (WANG Y, et al. 2024)

Connecting the habitats of North China leopard and Northeast leopard through ecological corridors to promote the sustainable survival of both populations.

02



NEASPEC Project Outcomes



NEASPEC Project-Study on Transborder Movement of Amur Tigers and Amur Leopards Using Camera Trapping and Molecular Genetic Analysis (2013-2016)



Figure 9: Consistent individual identification of leopard specimens in *Extract-Compare* software

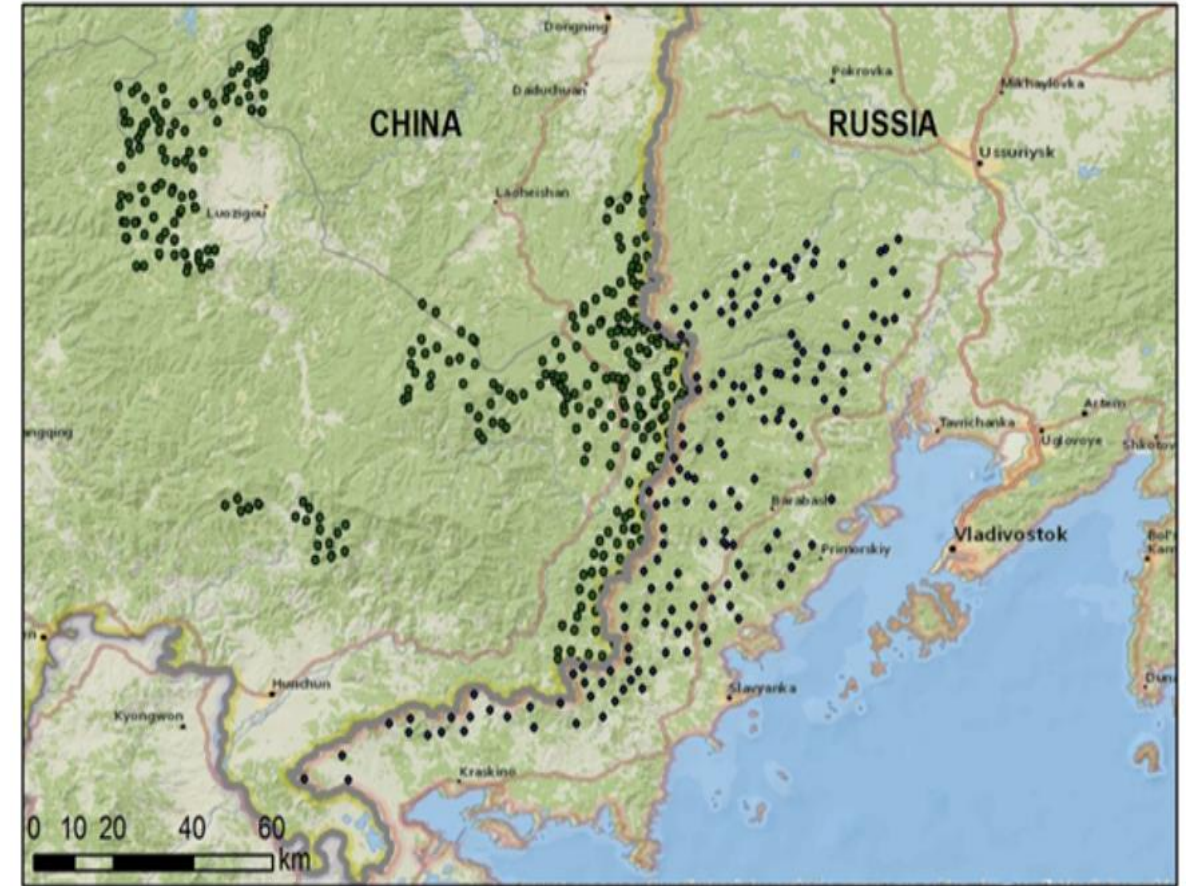
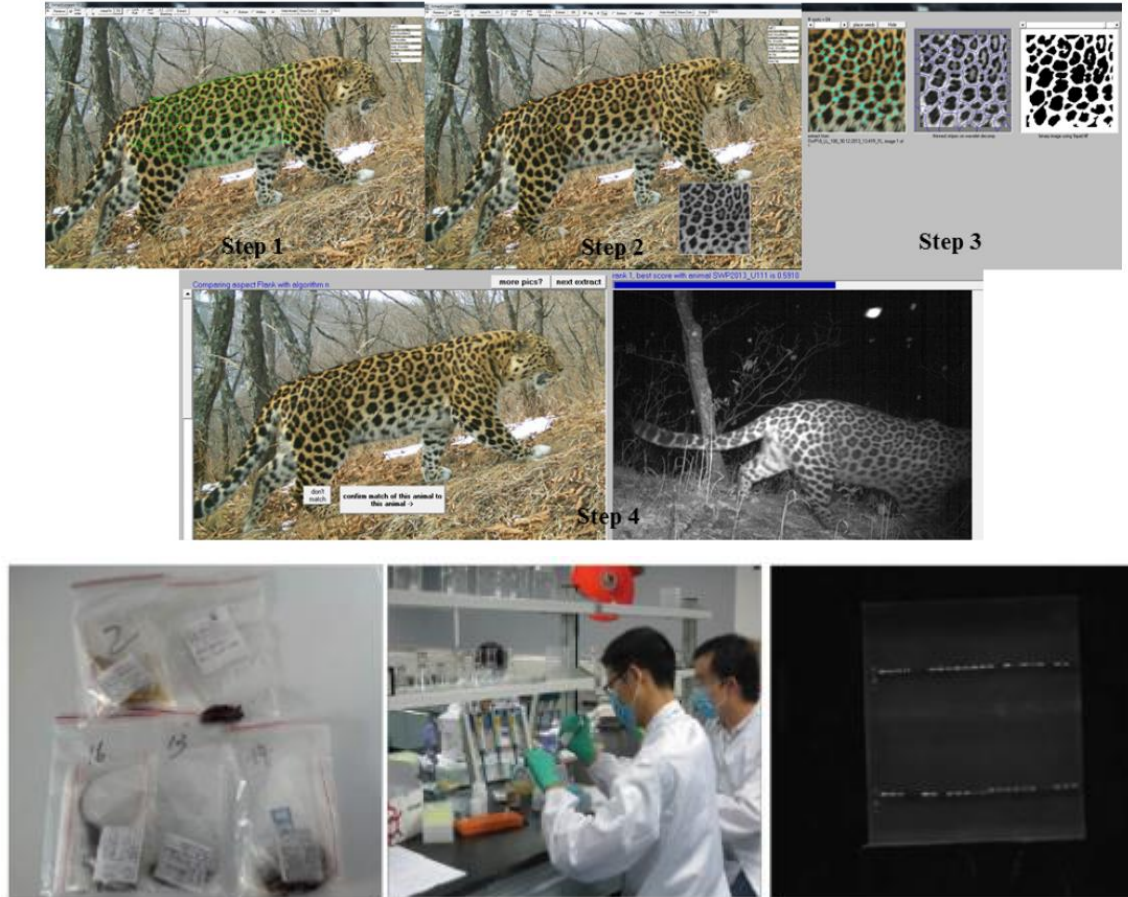


Figure 8: Camera traps installed in China and the Russian Federation

NEASPEC Project-Study on Transborder Movement of Amur Tigers and Amur Leopards Using Camera Trapping and Molecular Genetic Analysis (2013-2016)

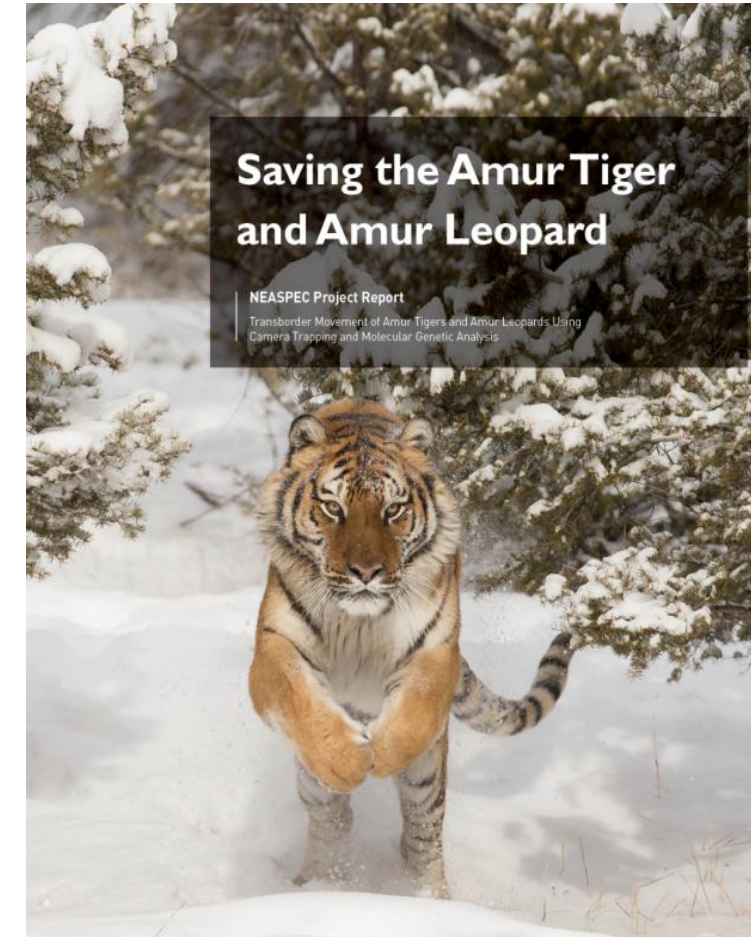


Table 5: Minimal number of Amur tiger individuals (adult) by camera traps during 2013-2015

	Total	Female	Male	Unknown
China and/or Russia	45	20	15	10
China	22	9	8	5
Russian Federation	42	18	15	9
Observed in both countries	19	8	8	3
China only	3	1	0	2
Russian Federation only	24	10	7	7

Table 8. Minimal number of Amur leopard individuals (adult only) captured by camera traps during 2013-2015

	Total	Female	Male	Unknow sex
China and/or Russia	89	41	37	11
China	23	9	10	4
Russian Federation	81	40	34	7
Observed in both countries	15	8	7	0
China only	8	1	3	4
Russian Federation only	66	32	27	7



NEASPEC Project-Transboundary cooperation on the conservation of Amur tigers, Amur leopards and Snow leopards in North-East Asia(2020-2021)

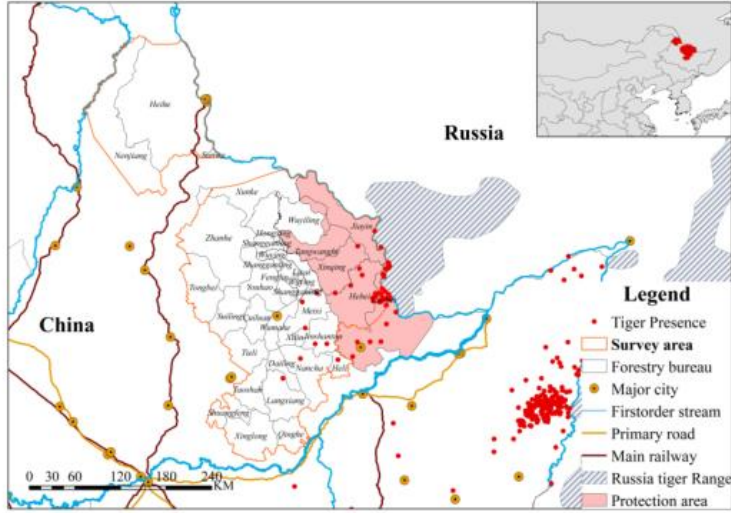


Fig 11 Schematic map of the scope of cross-border tiger protected areas

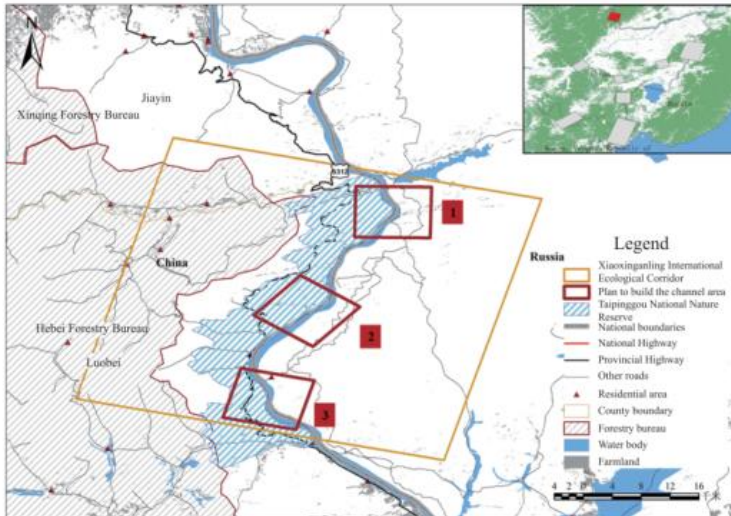


Fig 12 Construction design of the proposed international ecological corridor for Amur tigers in Lesser Khingan Mountains

Table 6 Estimated ungulate abundance in all Forestry Bureaus in Lesser Khingan Mountains

Forestry Bureau	Roe deer	Wild boar	Red deer	Moose
Cuiluan	3032.335±48.918	229.908±3.88	0.000	0.000
Dailing	1449.183±38.864	51.286±1.465	0.000	0.000
Fenglin	119.106±25.22	1.812±0.282	0.000	0.000
Hebei	5204.478±24.984	394.24±2.455	223.127	0.000
Heli	969.144±44.032	46.948±2.443	0.000	0.000
Heihe	37943.9±28.099	2927.914±2.85	209.947	176.241
Hongxing	5580.56±38.149	321.919±2.7	26.985	365.585
Jiayin	5881.659±26.943	326.373±1.616	0.000	0.000
Jinshantun	2213.993±30.052	116.972±1.87	290.832	0.000
Langxiang	3041.238±23.592	153.382±1.389	21.962	0.000
Licai	109.576±66.271	4.668±4.197	0.000	0.000
Luobei	1188.346±27.858	73.072±1.636	0.000	0.000
Meixi	3320.749±31.653	164.525±2.183	32.069	0.000
Nancha	3262.048±20.103	137.583±1.159	0.000	0.000
Nenjiang	18998.796±30.917	973.92±2.06	301.950	0.000
Qinghe	1573.039±28.128	99.128±2.204	0.000	0.000
Shangganling	2974.347±44.526	175.956±3.485	0.000	452.868
Shuangfeng	2314.534±37.036	235.878±4.523	0.000	0.000
Suiling	4214.394±38.813	326.383±3.676	42.523	0.000
Sunwu	252.269±70.048	23.444±7.188	0.000	0.000
Tangwanghe	3130.609±30.38	169.743±2.569	0.000	0.000
Taoshan	2725.937±35.96	195.727±3.24	0.000	0.000
Tieli	3399.496±37.025	260.985±3.405	155.542	0.000
Tongbei	9021.491±56.176	982.275±7.355	0.000	0.000
Wumahe	2409.62±50.151	144.961±4.051	378.854	0.000
Wuyiling	6579.943±46.12	539.98±4.281	0.000	0.000
Wuying	1897.724±33.171	102.27±2.401	0.000	0.000
Xilin	262.726±31.437	7.798±0.733	0.000	0.000
Xinqin	4747.288±33.202	268.147±2.372	129.913	0.000
Xinglong	4564.464±29.005	438.767±4.039	64.074	0.000
Xunke	5818.813±32.243	400.325±2.566	0.000	55.303
Youhao	5634.498±39.748	297.592±2.901	0.000	0.000
Zhanhe	17914.011±33.702	1432.40±4.422	0.000	498.356
Total individuals	165931.5±2563.46	11625.627±196.41	1877.77±37.3	1548.352±46.371



FINAL REPORT of FRC-NFGA

on the implementation of the final stage ESCAP Study on Transboundary cooperation on the conservation of Amur tigers, Amur leopards and Snow leopards in North-East Asia



Main Authors: Guangshun Jiang Xin Liang Feifei Yang

Feline Research Center of National Forestry and Grassland Administration (FRC-NFGA), College of Wildlife and Protected Area, Northeast Forestry University, Harbin, 150040, China



- ◆ 1) Based on the transboundary camera trap and fecal DNA monitoring results of NEASPEC project for Amur tiger/leopard (2013-2016), new conservation problems may be revealed by 10 years' dataset comparison with the monitoring data of Amur tiger/leopard (2023-2026) for the 2 national parks across Sino-Russia border areas, or even two countries' datasets
- ◆ 2) Based on the priority protected areas identification, the transboundary **protected areas network** has not been promoted, and central or local **government cooperation mechanisms** have not been established.





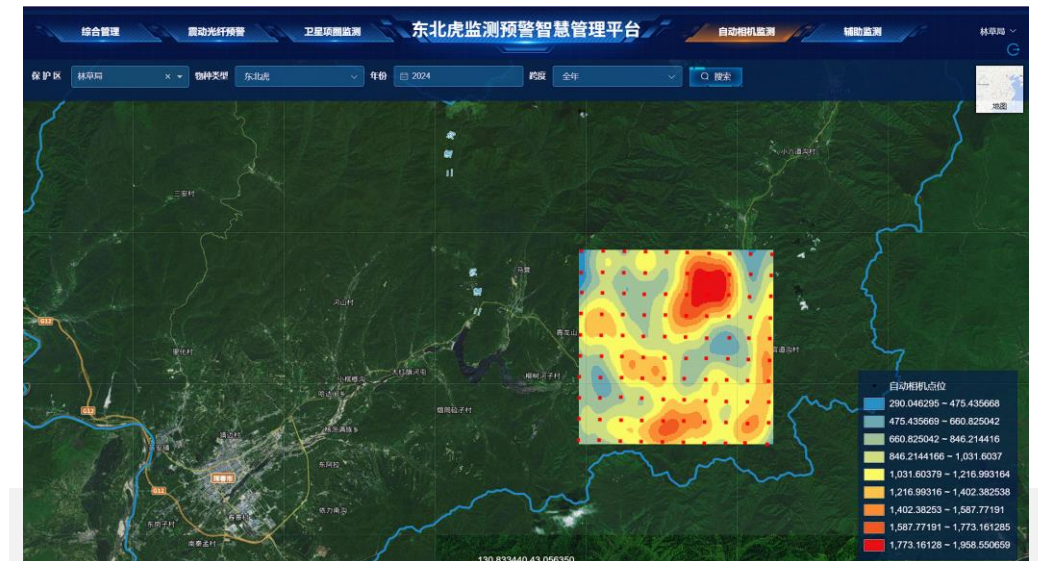
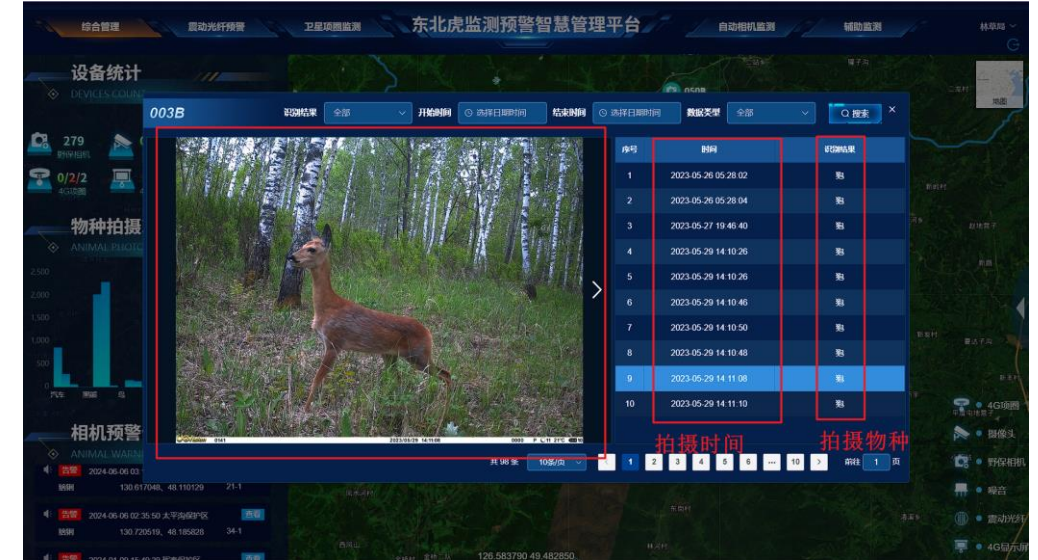
03

Follow Up Activity
Recommendations

Amur tiger/leopard population transboundary monitoring cooperations

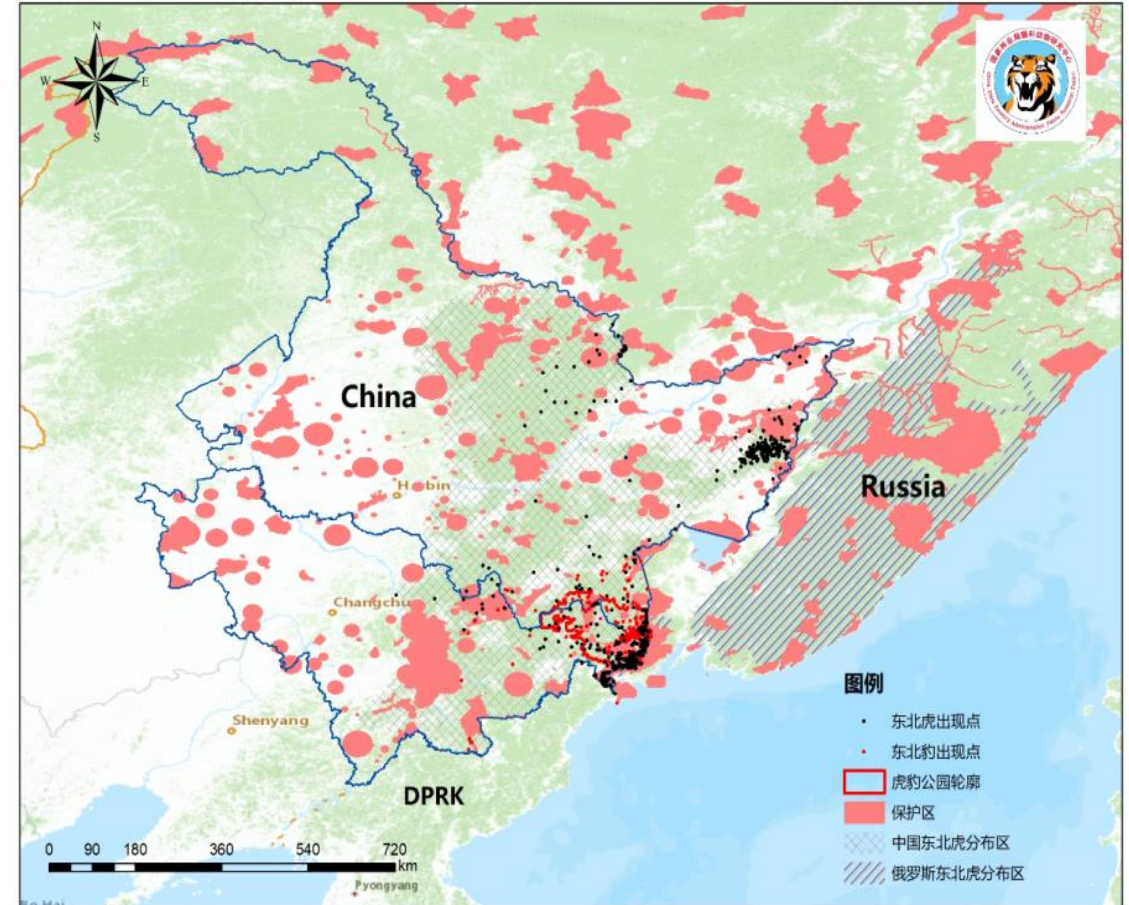


- ✓ Set up Sino-Russian tiger/leopard monitoring technology standards
 - 1) **Camera trap** monitoring technology standards
 - 2) **Fecal DNA** monitoring technology standards
 - 3) **Prey population monitoring** technology standards
- ✓ Establish Sino-Russian tiger/leopard monitoring technology platform
 - 1) Share the species and big cats individual AI identification software platform and compared with past 10 years data **between Land of leopard NP and China park**
 - 2) Share **big cats and other endangered species genetics databases**, North China leopards may prompt small population of Amur leopard rescue genetics
 - 3) Share big cats **diffusion and conflict informations**
 - 4) Share the big cats and prey disease or **parasite risk** assement information





- ✓ **Transboundary protected network should be establishment**
 - 1) Bilateral **Central governments** (NFGA and Russian counterpart) should be prompted to specify the cooperations items on the transboundary protected areas activities
 - 2) Bilateral **provincial governments** should sign the cooperation agreements on tiger protections
 - 3) Bilateral national and provincial **protected areas** should communicate and sign the agreement for the implication of conservation activities
- ✓ **Transboundary ecological corridors should be prompted to be dredged or new construction**
 - 1) Sino-Russian tiger **corridor** should be designed by biliteral wildlife scientists
 - 2) Provide the recommendations for biliteral national tiger conservation **corridor master plan**



Thanks for your attentions



东北林业大学
国家林业和草原局猫科动物研究中心