INTERIM 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

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CONTENTS

Overview:

Protected area assessment

1.1 Man-made interference and land use evaluation in protected areas

By collecting the data of human disturbances and land use types in each protected area, the intensity of human disturbance and the proportion of forest and farmland in each Forestry Bureau was analyzed using ArcGIS10.3 (Table 1).

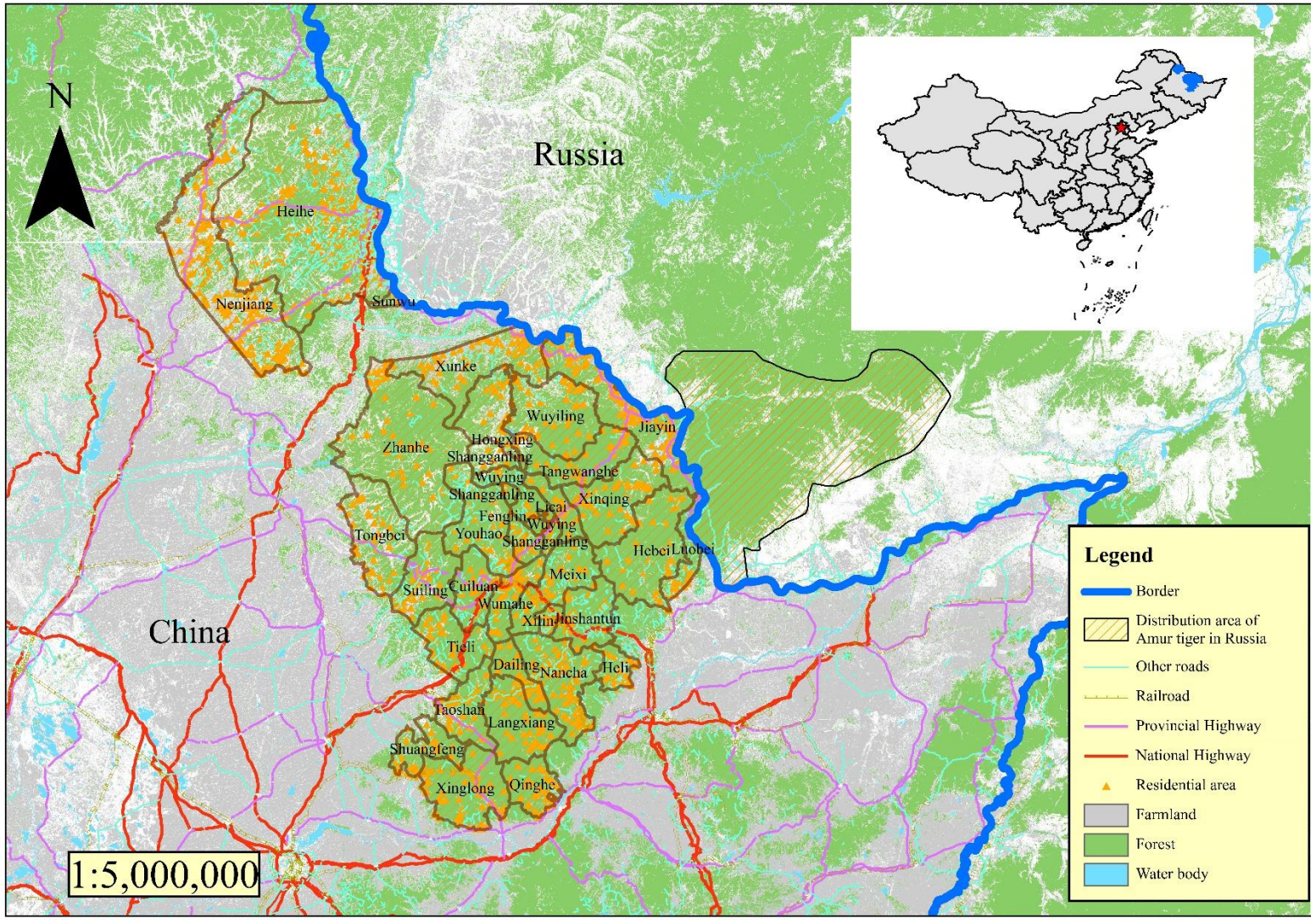


Fig 1 Habitat factor map across the Lesser Khingan Mountains.

1.1 Man-made interference and land use evaluation in protected areas

Forestry Bureau	People Resident density (/100km²)	National highway density (km/100km²)	Provincial highway density (km/100km²)	Railway density (km/100km²)	Other road density (km/100km²)	Proportionof forest area	Proportion of farmland area
Cuiluan	1.806	**10.445**	4.266	1.006	**15.417**	0.968	0.032
Dailing	3.729	0.000	0.000	2.362	3.053	0.914	0.027
Fenglin	1.234	0.000	0.936	**15.262**	0.000	0.985	0.014
Hebei	0.877	0.000	0.000	0.222	5.153	0.772	0.044
Heli	3.233	0.000	0.000	0.000	8.757	0.526	0.202
Heihe	1.985	1.255	2.934	1.103	**17.260**	0.552	0.125
Hongxing	1.585	0.000	0.576	0.874	2.893	0.958	0.042
Jiayin	3.820	0.000	**6.536**	0.000	3.299	0.597	0.252
Jinshantun	1.508	4.007	0.000	1.618	**21.388**	0.782	0.021
Langxiang	1.965	0.000	0.004	1.903	3.503	0.940	0.028
Licai	1.333	0.000	1.848	5.200	0.000	1.000	0.000
Luobei	2.357	0.000	7.627	0.000	14.496	0.703	0.155
Meixi	1.553	1.665	0.000	1.764	12.950	0.821	0.021
Nancha	4.236	0.000	0.000	6.839	11.877	0.655	0.084
Nenjiang	2.580	0.000	2.619	1.803	7.389	0.332	0.295
Qinghe	2.412	0.000	0.073	0.000	1.700	0.838	0.100
Shangganling	2.293	0.000	1.983	3.794	7.871	0.970	0.030
Shuangfeng	2.476	0.000	0.000	0.126	3.453	0.740	0.179
Suiling	1.487	0.000	4.448	4.116	10.380	0.806	0.159
Sunwu	3.617	0.000	**7.946**	0.000	7.864	0.242	0.347
Tangwanghe	2.062	0.000	2.791	2.108	2.908	0.919	0.045
Taoshan	3.259	0.000	3.460	3.819	10.231	0.669	0.193
Tieli	1.506	**7.052**	0.000	0.000	12.140	0.824	0.091
Tongbei	1.229	0.000	1.469	0.000	5.111	0.543	0.260
Wumahe	4.798	2.483	0.771	4.437	11.785	0.843	0.057
Wuyiling	1.422	0.000	0.000	0.223	2.325	0.960	0.043
Wuying	1.962	0.000	1.288	2.007	13.014	0.997	0.003
Xilin	**6.223**	**7.512**	0.000	**11.508**	**21.476**	0.702	0.065
Xinqin	1.837	0.000	0.685	0.971	4.230	0.782	0.049
Xinglong	2.138	0.000	2.280	3.450	3.428	0.840	0.097
Xunke	2.017	0.000	0.941	0.000	5.281	0.652	0.323
Youhao	1.354	0.000	0.445	1.180	**15.712**	0.970	0.022
Zhanhe	0.666	0.000	0.000	0.000	3.262	0.913	0.087

The results show that the residential density of Xilin Forestry Bureau is the highest, reaching 6.223 / 100km², and the road density of Xilin is the highest, reaching 40.497 km / km².

Table 1 Intensity of human interference and proportion of different land uses in Forestry Bureaus across the Lesser Khningan Mountains.

1.2 Investigation results of line-transect survey on mammals

Table 2 Summary of the frequency of animal occurrence records in the survey

Species	frequency	Species	frequency
Roe deer (*Capreolus pygargus*)	**4330**	Mountain hare (*Lepus timidus*)	17
Wild boar (*Sus scrofa*)	**1374**	Sable (*Martes zibellina*)	16
Manchurian hare (*Lepus mandshuricus*)	833	Least weasel (*Mustela nivalis*)	16
Siberian weasel (*Mustela sibirica*)	658	Eurasian badger (*Meles meles*)	14
Eurasian red squirrel (*Sciurus vulgaris*)	325	Lynx (*Lynx lynx*)	11
Red fox (*Vulpes vulpes*)	309	Mouse (*Rattus norvegicus*)	9
Hazel Grouse (*Tetrastes bonasia*)	71	Siberian flying squirrel (*Pteromys volans*)	7
Red deer (*Cervus elaphus*)	**70**	Himalayan black bear (*Ursus thibetanus*)	5
Yellow-throated marten (*Martes flavigula*)	47	Western chipmunk (*Tamias sibiricus*)	3
Ring-necked pheasant (*Phasianus colchicus*)	46	Eurasian river otter (*Lutra lutra*)	1
Moose (*Alces alces*)	**31**	Raccoon dog (*Nyctereutes procyonoides*)	1

In this survey, the line-transect method was used to investigate the Lesser Khingan Mountains forest region.

The forest area is about 73,440 km^2, with a total sampling area of 21,600 km^2, a sampling intensity of 30 % of the total area.

A total of 150 third-level units were investigated. The footprints, lying marks and feces of all kinds of animals were recorded in the process of line-transect surveys.

1.2 Investigation results of line-transect survey on mammals

Fig 2 Transect survey in the Lesser Khingan Mountains.

1.2 Investigation results of line-transect survey on mammals

Fig 3 The distribution of line-transects .

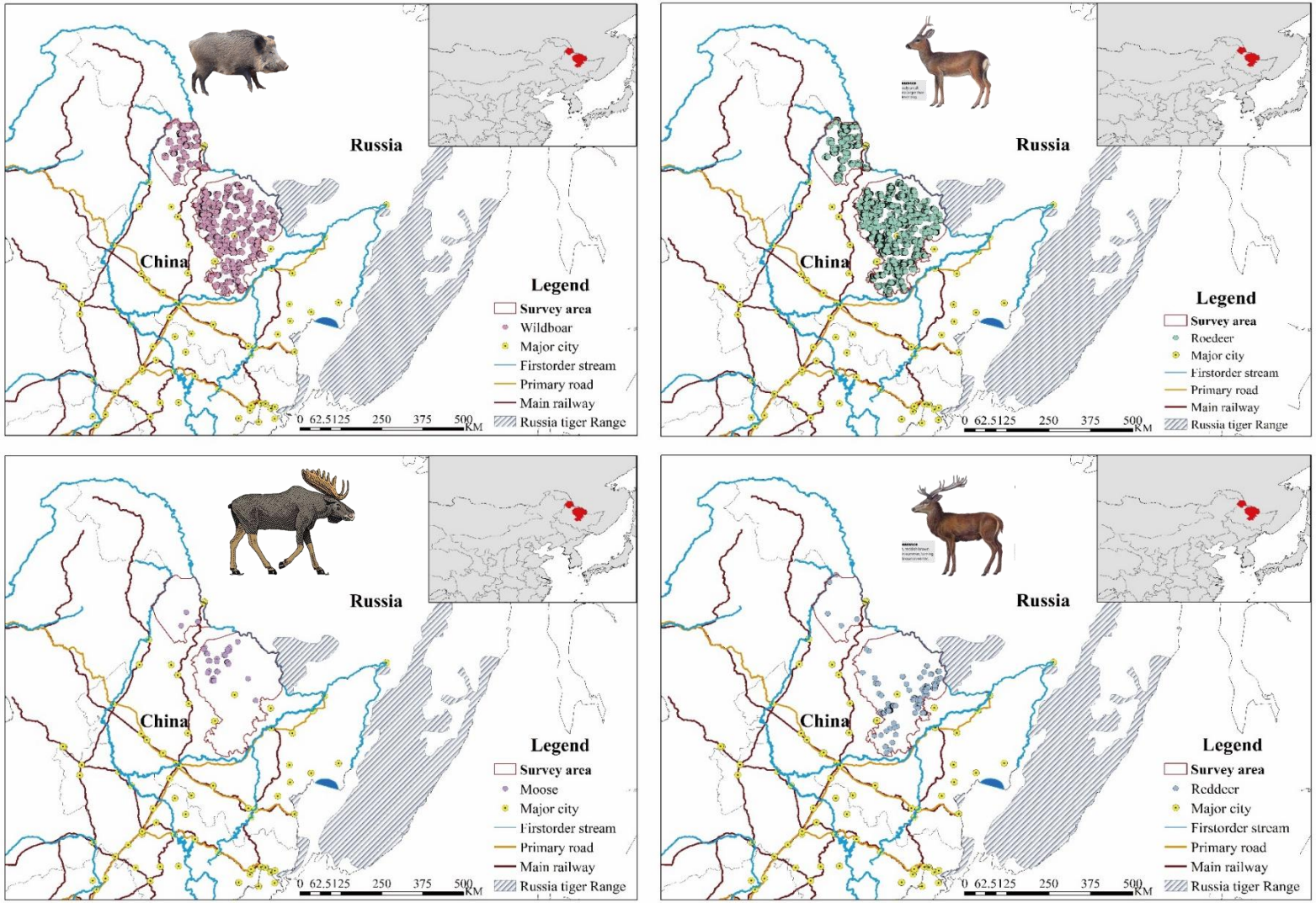


Fig 4 Habitat factor map across the Lesser Khingan Mountains.

Key progress and findings:

Distribution of Amur tiger and evaluation of suitable habitat and density of its prey

02

2.1 Distribution of Amur tiger

At present, about six cross-border Amur tiger individuals are active in Taipinggou Nature Reserve of Heilongjiang Province in the northwest of Lesser Khingan Mountains.

The occurrence points of Amur tiger activities in Lesser Khingan Mountains in recent years are shown in Fig. 5 .

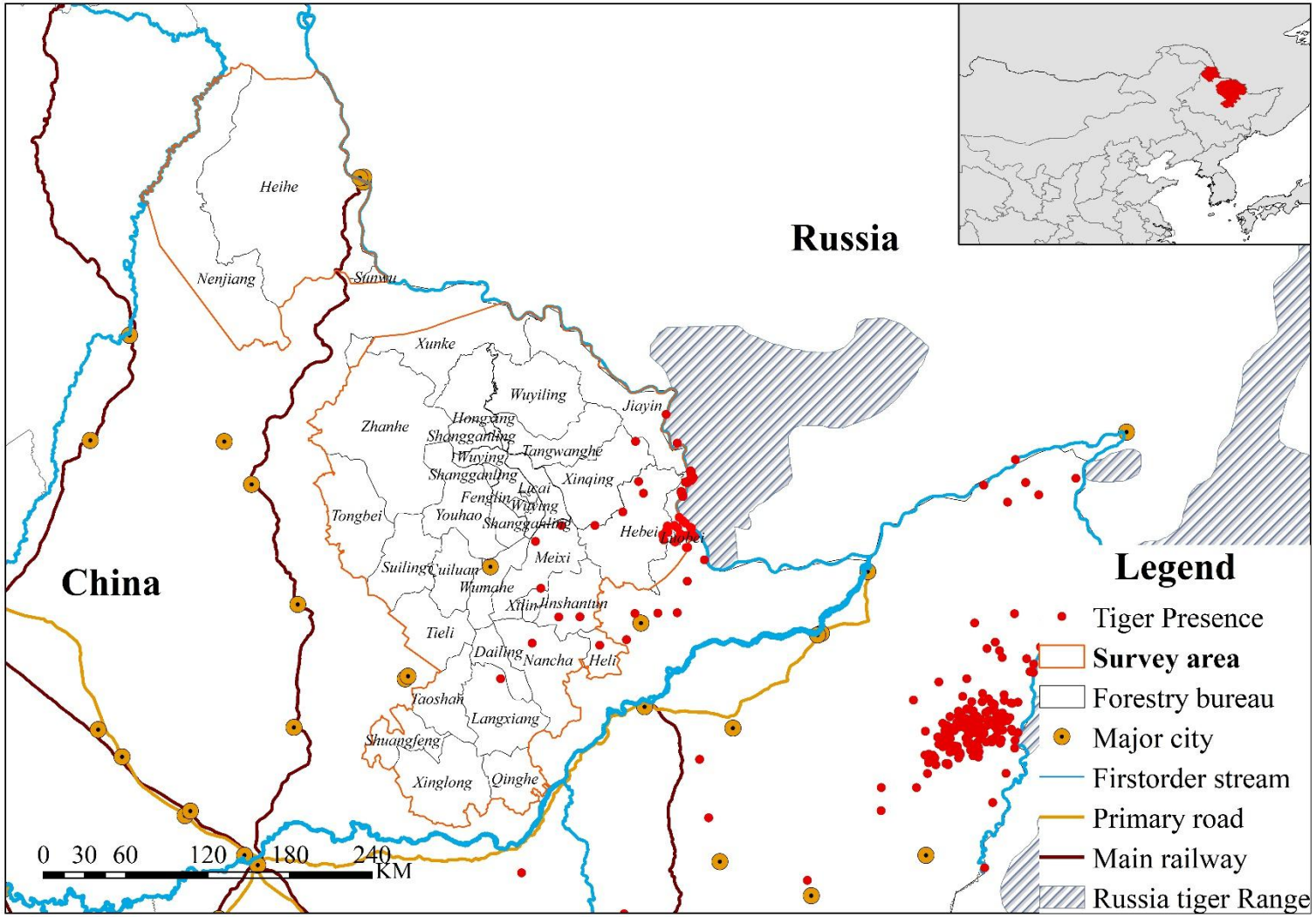


Fig 5 Recent years information map of Amur tiger activities in Lesser Khingan Mountains

2.2Evaluation of suitable habitat for wild ungulates

In this survey, the forest area of Lesser Khingan Mountains is about 73,440 km2, and the suitable habitat area of roe deer is 34,726.6 km², accounting for 47.28 % of the whole study area.

The suitable habitat area of wild boar is 32,608.04 km², accounting for 44.40 % of the whole study area.

The suitable habitat area of red deer is 14,527.64 km², accounting for 19.78 % of the whole study area.

The suitable habitat area of moose is 14,800.52 km², accounting for about 20.15 % of the whole study area.

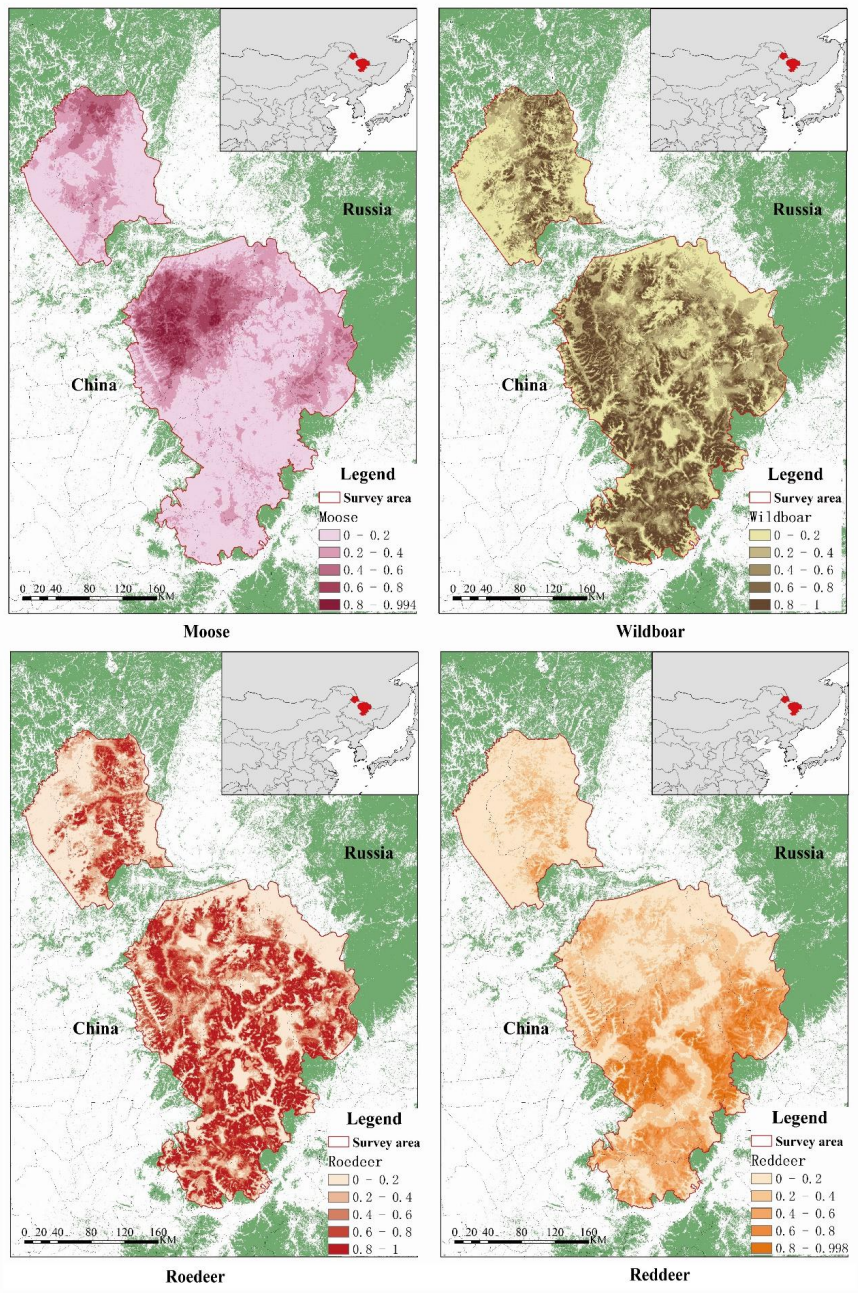


Fig 6 Habitat suitability maps of ungulate species across the Lesser Khingan Mountains

2.3 Density and abundance of wild ungulates

Fresh ungulate footprints were recorded within 24 hours. Based on this, The population density (Table 3) and abundance of roe deer, wild boar, red deer and moose in Lesser Khingan Mountains was calculated.

For red deer and moose, because of their small distribution area, the observed frequency is not enough for modelling, so the average density of each secondary unit, that is, the average density of the line-transect within the Forestry Bureau, is used as the density of the Forestry Bureau.

Table 3 Estimated densities of ungulates in all Forestry Bureaus in Lesser Khingan Mountains.

Forestry Bureau	Roe deer(/km²)	Wild boar(/km²)	Red deer(/km²)	Moose(/km²)
Cuiluan	2.024±0.138	0.148±0.020		
Dailing	1.499±0.199	0.069±0.021		
Fenglin	1.301±0.436	0.049±0.039		
Hebei	1.430±0.131	0.107±0.016	0.059±0.046	
Heli	1.650±0.333	0.092±0.033		
Heihe	2.771±0.116	0.206±0.016	0.015±0.026	0.0133±0.016
Hongxing	1.984±0.191	0.117±0.021	0.0595±0.0468	
Jiayin	1.916±0.181	0.116±0.014		
Jinshantun	1.199±0.157	0.059±0.011	0.158±0.158	
Langxiang	1.257±0.104	0.063±0.011	0.008±0.017	
Licai	1.422±0.647	0.044±0.072		
Luobei	1.414±0.311	0.097±0.026		
Meixi	1.532±0.187	0.080±0.018	0.014±0.029	
Nancha	1.183±0.129	0.050±0.010		
Nenjiang	3.047±0.139	0.163±0.014	0.049±0.06	
Qinghe	1.338±0.198	0.092±0.024		
Shangganling	1.970±0.234	0.126±0.029		0.3182±0.693
Shuangfeng	1.773±0.116	0.157±0.024		
Suiling	2.098±0.192	0.165±0.037	0.02±0.042	
Sunwu	2.358±0.590	0.185±0.048		
Tangwanghe	1.524±0.199	0.082±0.024		
Taoshan	1.598±0.124	0.113±0.028		
Tieli	1.722±0.079	0.123±0.017	0.077±0.086	
Tongbei	3.008±0.150	0.300±0.043		
Wumahe	1.919±0.174	0.106±0.022	0.309±0.655	
Wuyiling	2.065±0.214	0.152±0.025		
Wuying	1.718±0.191	0.096±0.028		
Xilin	0.855±0.202	0.029±0.015		
Xinqin	1.568±0.143	0.091±0.018	0.045±0.075	
Xinglong	1.523±0.102	0.134±0.024	0.021±0.031	
Xunke	2.250±0.183	0.154±0.019		0.021±0.046
Youhao	1.981±0.111	0.115±0.022		
Zhanhe	2.504±0.126	0.196±0.033		0.068±0.074
Average density	2.135±0.033	0.150±0.003	0.024	0.02

2.3 Density and abundance of wild ungulates

After modelling and prediction by determining important influencing factors (Table 4), the density distribution map of roe deer and wild boar were produced (Fig. 7).

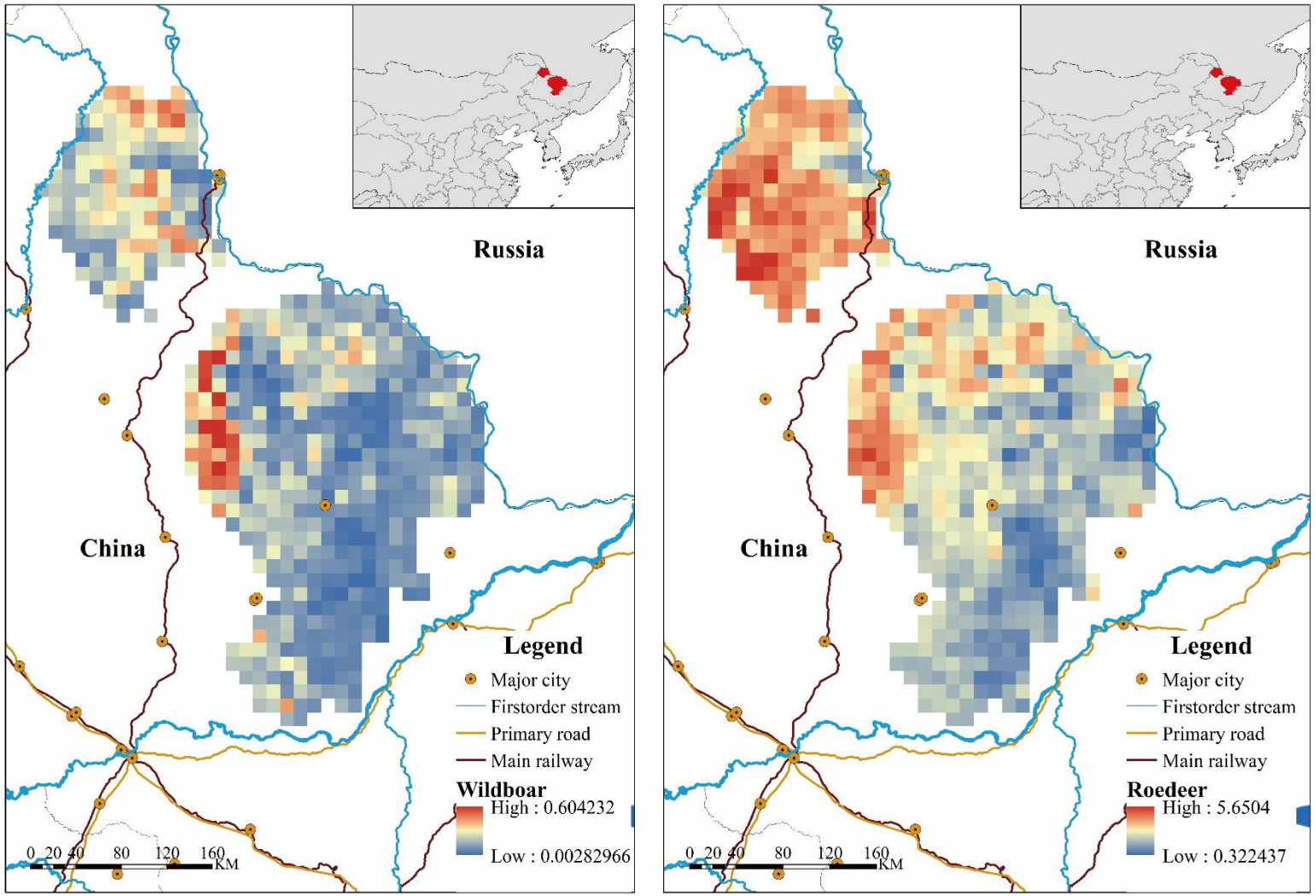


Fig 7 Hierarchical distribution map of roe deer(right) and wild boar(left) population density (individuals/km2) in Lesser Khingan Mountains.

2.3 Density and abundance of wild ungulates

Table 4 Influencing factors for density of roe deer and wild boar.

Variables of roe deer	Coefficient	Variables of wild boar	Coefficient
Intercept	1.103	Intercept	4.737
Altitude	0.128	Regional probability sum	0.273
Slope	-0.234	Slope	-0.568
Distance to wetland	-0.066	Distance to coniferous forest	-0.397
Distance to farmland	0.080	Distance to village	-0.339
Distance to mixed forest	-0.083		

It can be seen that altitude and distance to farmland are positively correlated with roe deer density, while slope, distance to wetland and distance to mixed forest are negatively correlated. Wild boar density was positively correlated with the sum of the occurrence probability of the regional wild boar, and negatively correlated with slope, distance to coniferous forest and distance to village.

Key progress and findings:

Construction of a joint cross-border protection area for amur tigers

03

3.Construction of a joint cross-border protection area for amur tigers

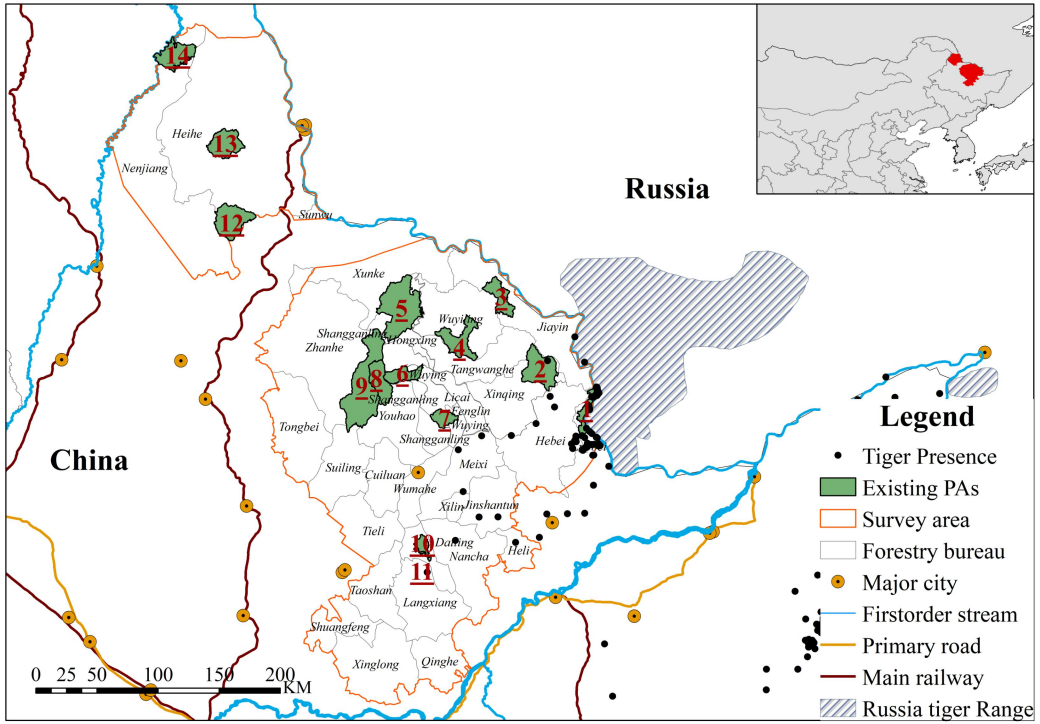


Fig 8 Location map of each protected area.

Table 5 Basic situation of each protected area.

Existing protection area	Protected area type	Shape Area(Ha)	Creation time	Time to upgrade to State Forestry Administration	Longitude range	Latitude range
Taipinggou National Nature Reserve	Forest ecology	21979	2009	2014	130°31'12"～130°50'11"E	48°02'48"～48°20'19"N
Xinqing Hooded Crane National Nature Reserve	Wild animals	63854	2004	2011	129°58′29″～130°23′07″E	48°19′21″～48°40′20″N
Maolangou National Nature Reserve	Forest ecology	35822	1999	2013	129°32′50″～129°54′46″E	48°52′00″～49°10′09″N

3.Construction of a joint cross-border protection area for amur tigers

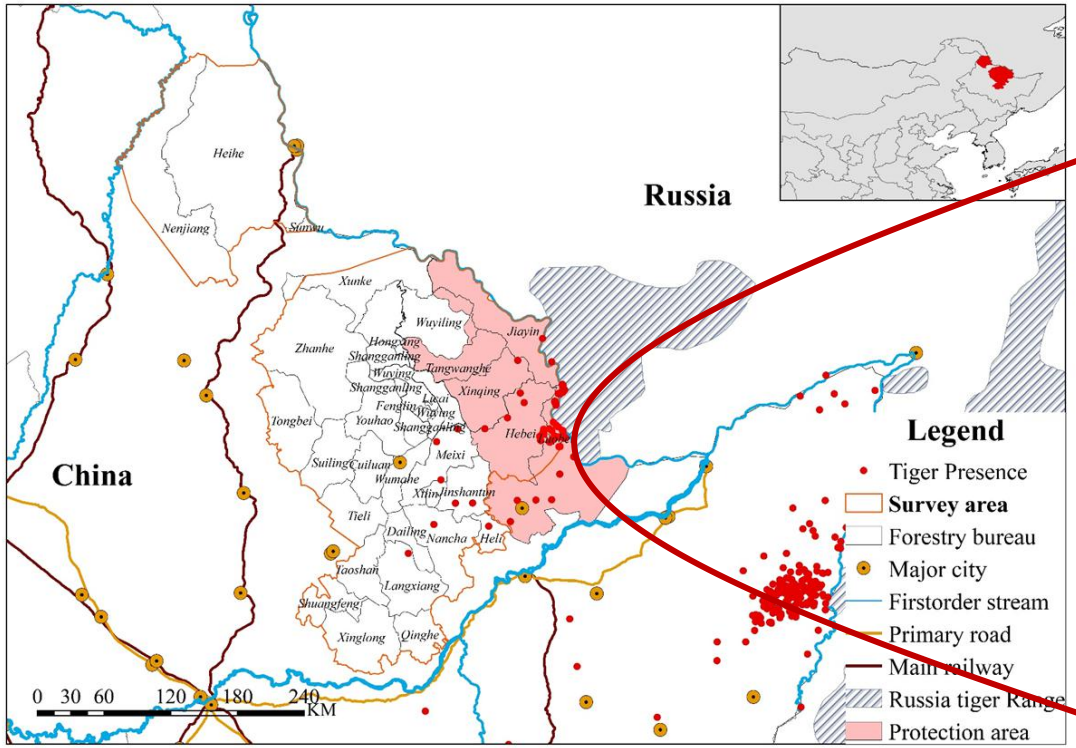
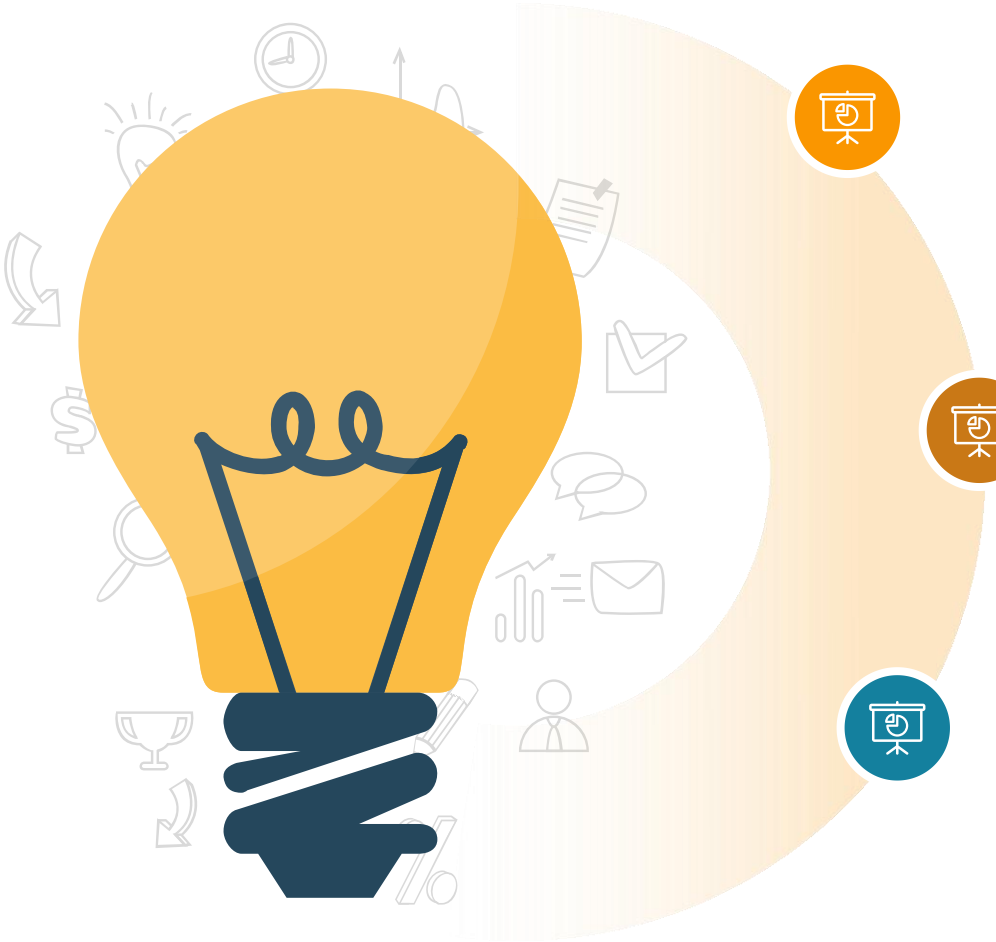


Fig 10 Schematic map of the scope of cross-border tiger protected areas

Fig9 Lazovka (top) and his two cubs (down).

3.Construction of a joint cross-border protection area for amur tigers



(1) The suitable habitat of Amur tiger is faced with the obstruction of diffusion corridors, the habitat area is narrow and degraded, and this poses a risk of limiting population recovery and the heightening risk of inbreeding in some areas.

(2) Human interference activities such as poaching in most Amur tiger habitats still lack scientific control.

(3) There is a lack of scientific spatial allocation of protected land resources, and an effective protected area network has not yet been formed.

3.Construction of a joint cross-border protection area for amur tigers

(4) The large prey species and population abundance of Amur tiger cannot meet the basic needs for effective breeding and diffusion.

(5) The settlement and reproduction of female Amur tiger has not been found in Lesser Khingan Mountains area.

(6) There is still a lack of an effective cooperation mechanism in the construction and management of an Amur tiger nature reserve between China and Russia. This hinders the construction of an international ecological corridor for Amur tiger cross-border migration..

3.Construction of a joint cross-border protection area for amur tigers

Therefore, the establishment of a cross-border tiger national park is the necessary step to protect the safety of Amur tiger cross-border activities and ensure the basic conditions for cross-border tiger survival.

By connecting the activity traces of cross-border tigers in China and the distribution area of Amur tigers in Russia, it is suggested that the cross-border protected area of Amur tiger should be established as shown in Figure 11. This design proposes to establish a cross-border protected area for Amur tiger with a total area of 20,515 km^2, including the China-Russian border.

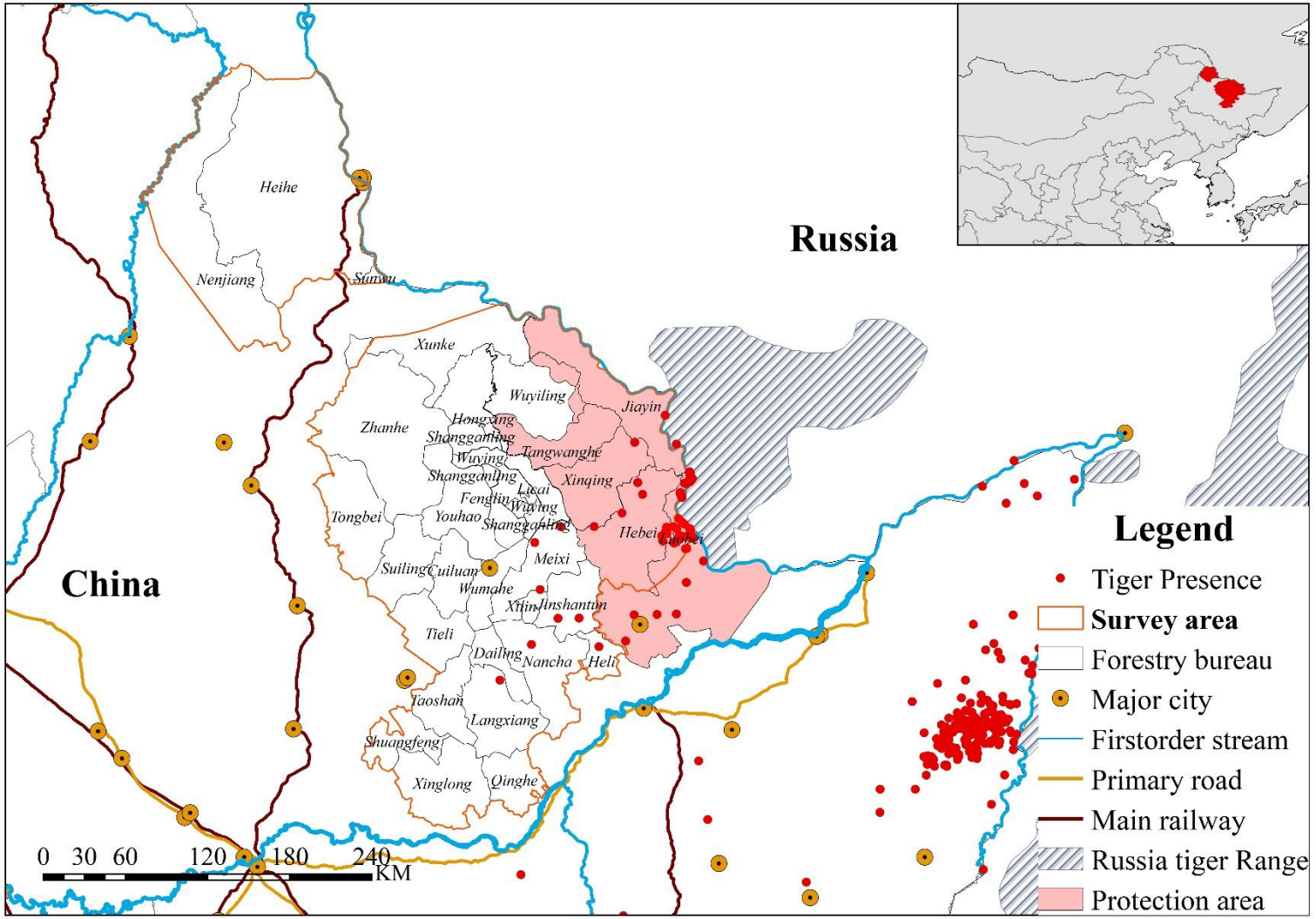


Fig 11 Schematic map of the scope of cross-border tiger protected areas

3.Construction of a joint cross-border protection area for amur tigers

At the same time, it is suggested that the international ecological corridor should be built in the area of Taipinggou Nature Reserve in Heilongjiang Province. The location of the international ecological corridor and the landscape elements of each corridor are shown in Figure 12.

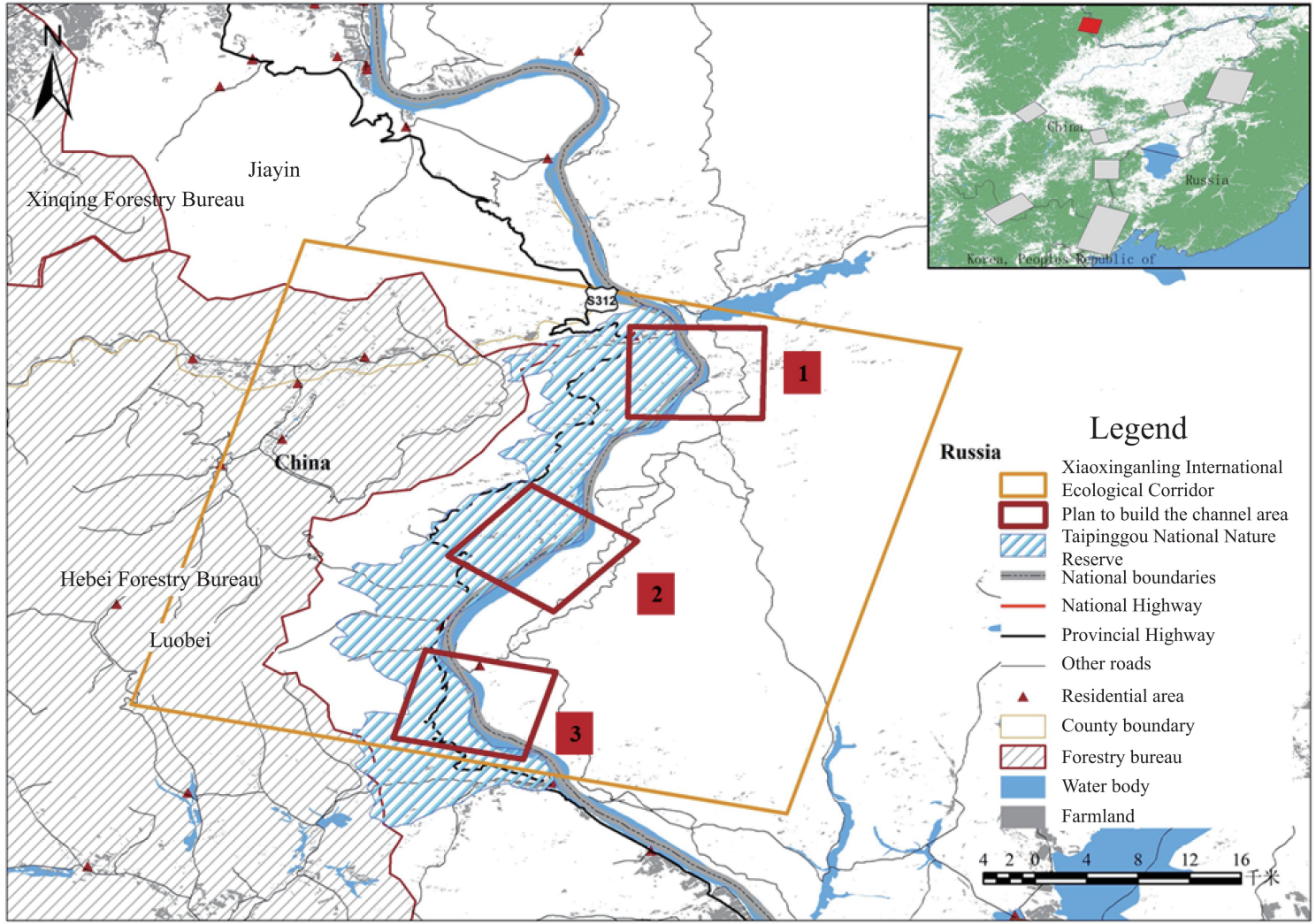


Fig 12 Construction design of the proposed international ecological corridor for Amur tigers in Lesser Khingan Mountains

Recommendations for policy makers:

Corridors policy recommendations

04

Therefore, the following suggestions are put forward in the joint protection of Amur tigers between China and Russia:

I

- Chinese and Russian management and scientific research departments at all levels cooperate with each other.
- China and Russia have respectively established an Amur tiger monitoring information platform (database) in cross-border nature reserves, established effective information exchange channels, and jointly assessed the effects of physical obstacles to the spread of Amur tiger.

I

- Aim to gradually realize the action plans such as the removal and reconstruction of the military fence in the ecological corridor of the Amur tiger, the construction of safe animal passage by way of road tunnels or viaducts, and the conversion of farmland to forest.

Therefore, the following suggestions are put forward in the joint protection of Amur tigers between China and Russia:

II

- Realize an international ecological corridor to connect Xiaoxinganling in China with the distribution area of Amur tiger in Russia, and preliminarily realize the connection between habitat patches.

III

- Promote the construction and development of Amur tiger cross-border nature reserve in China and Russia.

Therefore, the following suggestions are put forward in the joint protection of Amur tigers between China and Russia:

Ⅳ

- China and Russia effectively promote the ecological restoration project of habitat based on the concept of Amur tiger-friendly coexistence of human and tiger, including returning farmland to forest, prey population and habitat restoration, and wild animals crossing highway passageways, etc., so that the existing habitat area of Amur tiger is significantly increased.

Ⅴ

- China and Russia unify technical standards in various technical schemes and engineering settings, and implement them at the same time.

Ⅵ

- China and Russia jointly carry out scientific research on major scientific issues of Amur tiger protection, and establish an information platform for the effective monitoring and management of Amur tiger resources, so as to effectively improve the ability of long-term monitoring, cross-border control and management of Amur tiger cross-border protected areas.

THANKS!