



Implementing wildlife-friendly measures in infrastructure planning and design in Mongolia, 25 – 29 August 2015, Ulaanbaatar, Mongolia

POPULATION ESTIMATES AND FACTORS INFLUENCING DISTRIBUTION OF UNGULATES IN SOUTHERN, MONGOLIA

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Target species



Khulan

Status: Endangered

CMS: Appendix II

Threats: Illegal hunting, habitat fragmentation, direct and indirect habitat loss



Goitered gazelle

Vulnerable

Appendix II

Developments in Southern Gobi



P. Kaczensky

Research goals

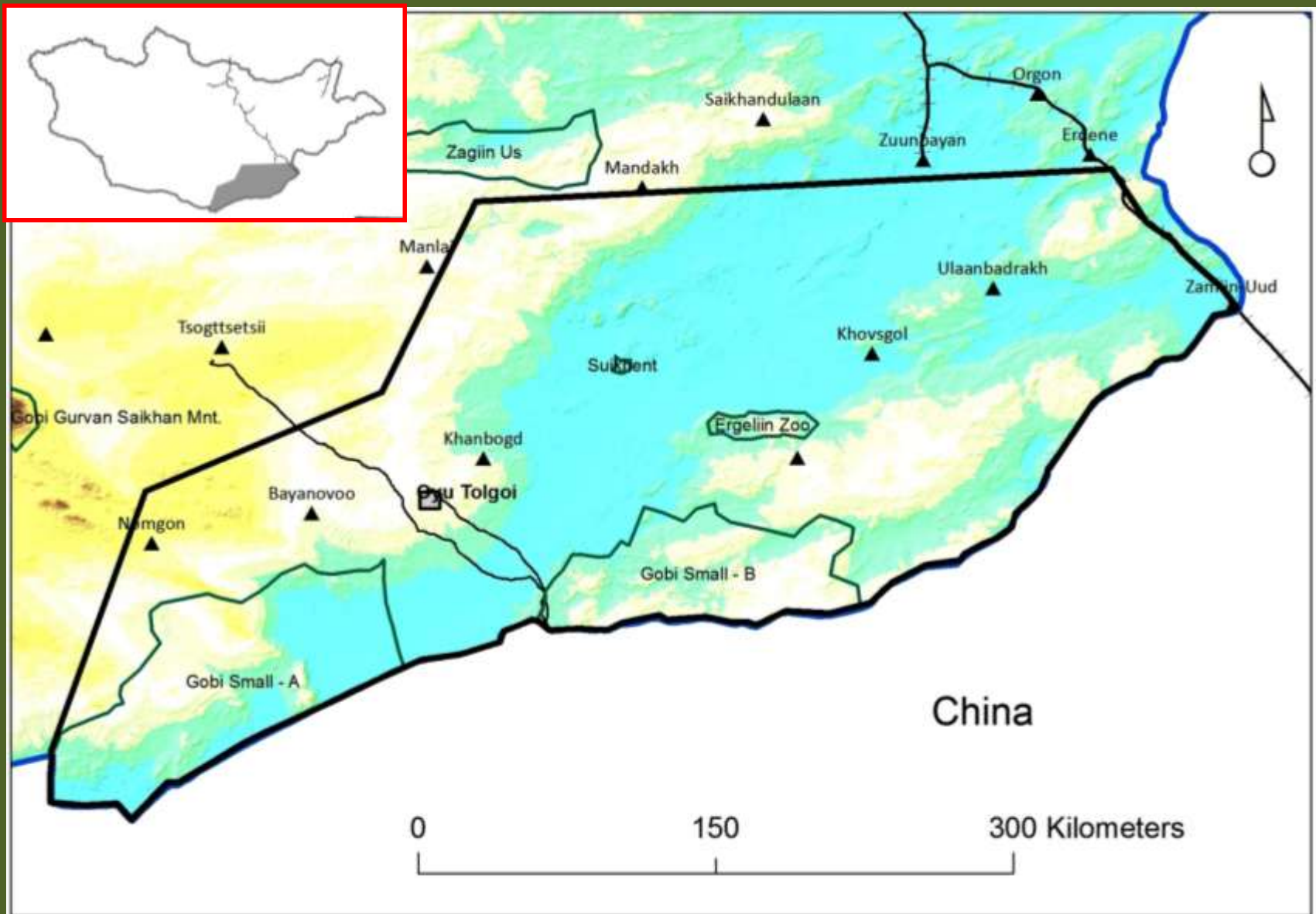
- Estimate density and abundance of ungulates
- Determine factors influencing their spatial distribution



Provide baseline for planning mitigation measures to reduce the impacts of mining related developments

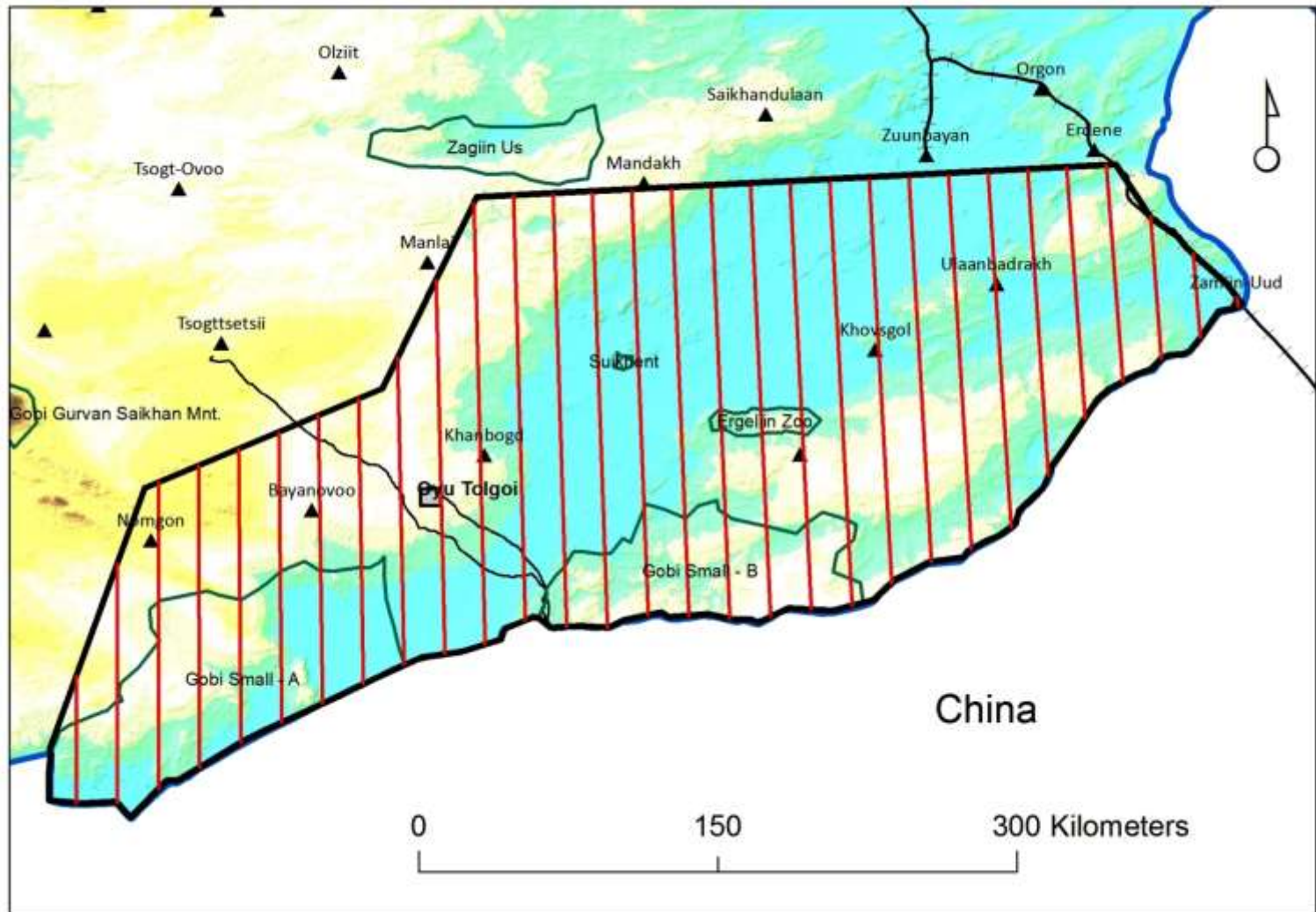


Study area – 98,216 sq.km



Survey transect

(n = 29, spacing 20 km, total length 4,820 km)



Field surveys

2012 – Autumn (Sep 25-Oct 17)

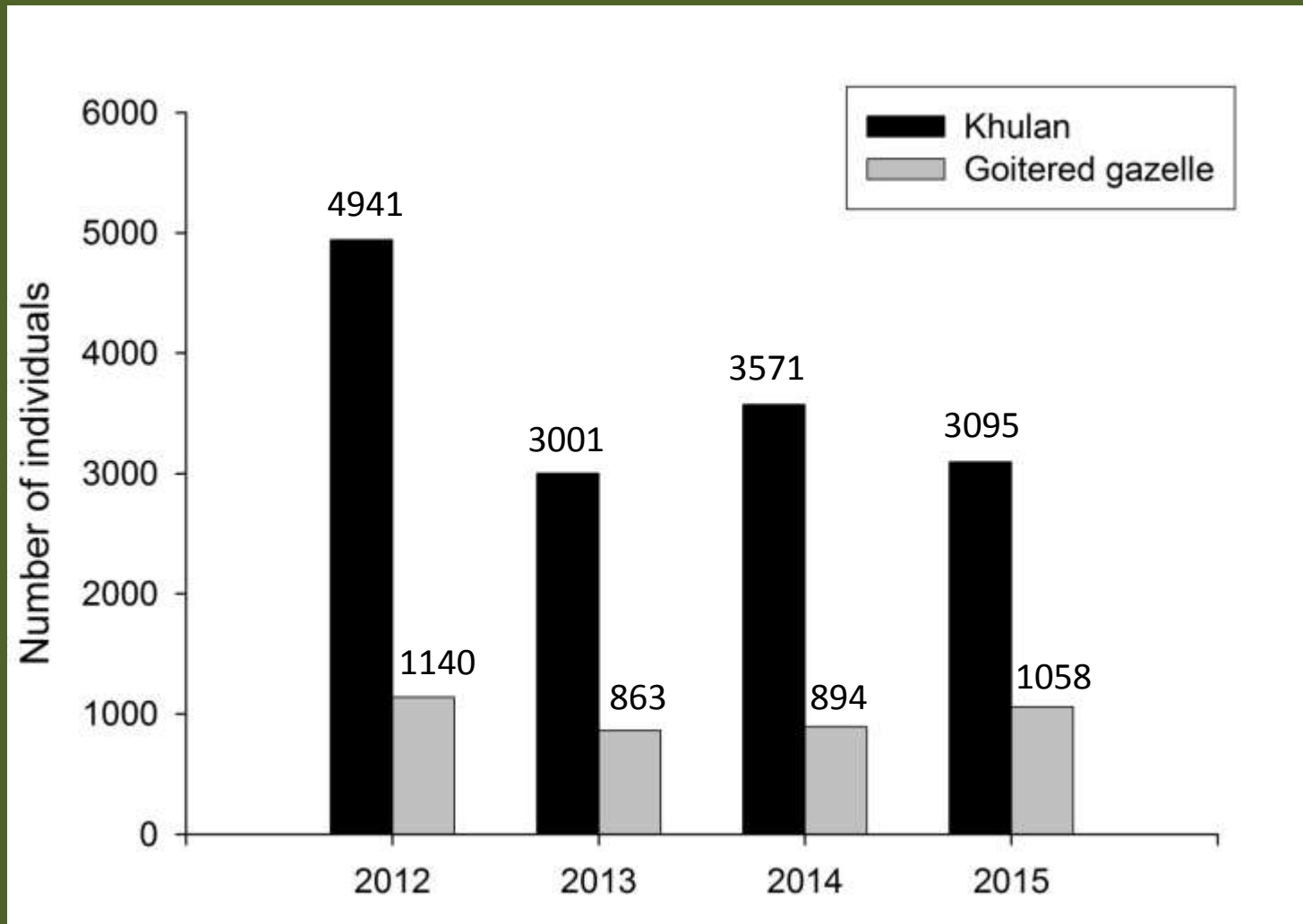
2013 – Spring (May 23 – Jun 07)

2014 – Spring (May 24 – Jun 06)

2015 – Spring (May 23 – Jun 07)



Number of individuals of ungulates observed along the transect lines during 2012-2015



“Distance 6.2” software

The screenshot displays the Distance 6.2 software interface. The main window shows a 'Project Browser' table with columns for Name, Created, Run, # params, Delta AIC, AIC, ES/WEDR, P, D, D LCL, D UCL, D CV, N, N LCL, and N UCL. The table lists various analysis models, with the last row (ID 12) highlighted in blue.

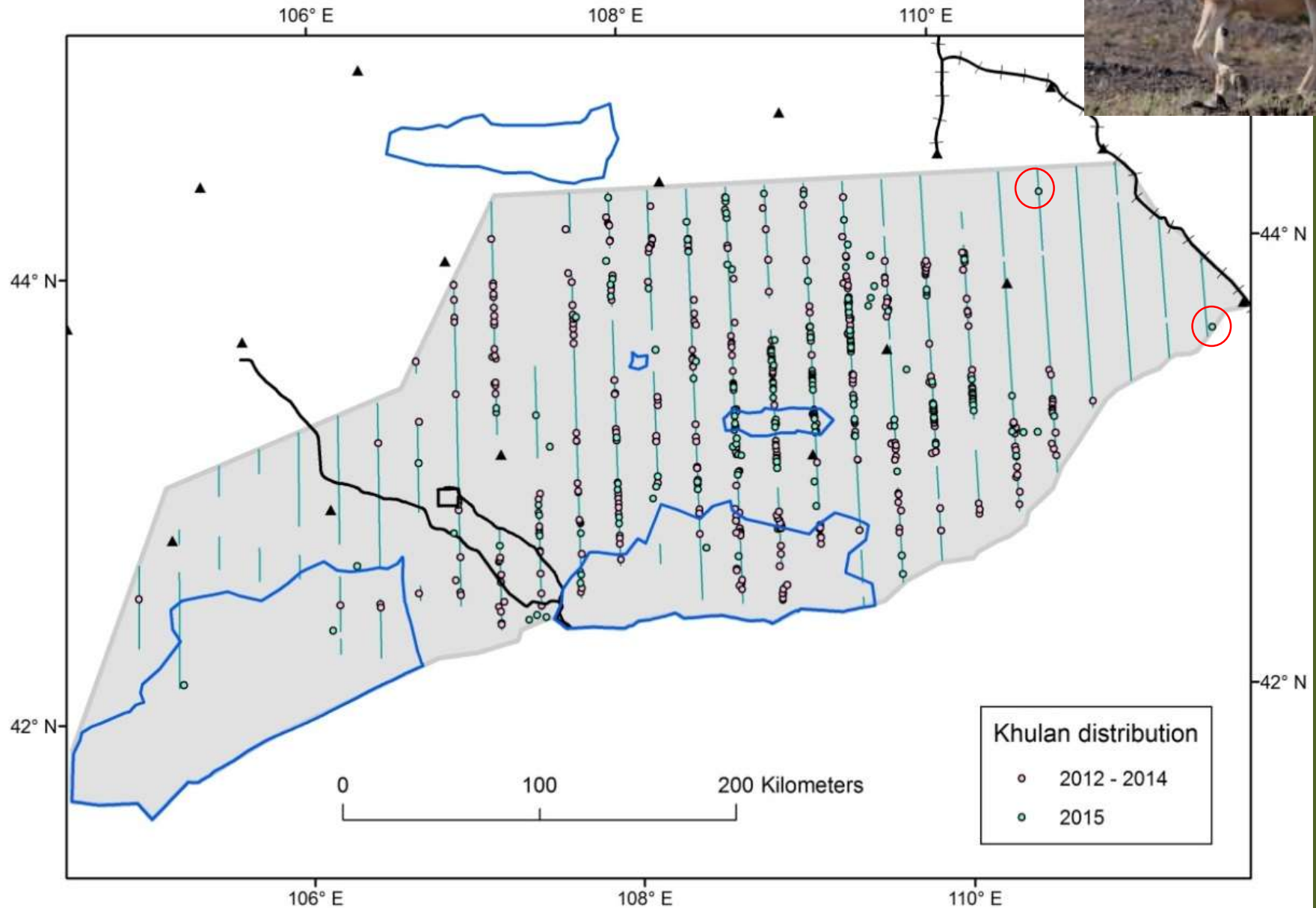
ID	Name	Created	Run	# params	Delta AIC	AIC	ES/WEDR	P	D	D LCL	D UCL	D CV	N	N LCL	N UCL
15	1 5 2 HNorm+10infTrunc1000	11/10/2014 1:55:56 PM	11/10/2014 1:56:27 PM	2	0.00	2063.05	497.53	0.50	0.682	0.364	1.277	0.181	66971	35757	125433
13	1 4 2 HNorm+10infTrunc1500m	11/10/2014 1:52:48 PM	11/10/2014 1:53:56 PM	2	11.70	1967.28	527.91	0.35	0.642	0.266	1.547	0.223	63028	26147	151928
20	1 8 2 HNorm+5infTrunc2000	11/10/2014 2:04:59 PM	11/10/2014 2:06:00 PM	2	15.95	1039.95	559.95	0.28	0.612	0.251	1.492	0.221	60073	24627	146530
18	1 7 2 HNorm+6infTrunc3000	11/10/2014 2:02:28 PM	11/10/2014 2:03:03 PM	2	27.25	917.97	664.89	0.22	0.530	0.203	1.388	0.231	52098	19907	136340
16	1 6 2 HNorm+7infTrunc1400	11/10/2014 1:57:03 PM	11/10/2014 1:57:33 PM	2	9.40	1621.68	523.72	0.37	0.648	0.265	1.589	0.230	63666	25980	156019
14	1 4 5 HNorm3Season+10infTrunc1500m	11/10/2014 1:54:29 PM	11/10/2014 1:55:13 PM	5	0.00	1955.59			0.625	0.237	1.645	0.228	61372	23313	161567
21	1 8 5 HNorm3Season+5infTrunc2000	11/10/2014 2:06:25 PM	11/10/2014 2:06:40 PM	6	0.00	1024.00			0.594	0.298	1.186	0.162	58371	20250	116483
19	1 7 5 HNorm3Season+6infTrunc3000	11/10/2014 2:03:31 PM	11/10/2014 2:03:45 PM	5	0.00	890.72			0.535	0.264	1.083	0.165	52539	25950	106336
17	1 6 5 HNorm3Season+7infTrunc1400	11/10/2014 1:58:21 PM	11/10/2014 1:58:43 PM	5	0.00	1613.00									
8	1 1 6 HNorm(0)2Seasons	11/7/2014 4:02:41 AM	11/7/2014 4:03:41 AM	6	26.25	7589.00									
9	1 2 6 HNorm(0)2SeasonsTrunc10%	11/7/2014 4:04:19 AM	11/7/2014 4:04:43 AM	2	12.06	6419.00									
10	1 3 6 HNorm(0)2SeasonsTrunc5%	11/7/2014 4:06:24 AM	11/7/2014 4:06:44 AM	3	10.59	6926.00									
5	1 1 5 HNorm(0)3Seasons	11/7/2014 3:53:21 AM	11/7/2014 3:55:09 AM	6	0.00	7559.00									
6	1 2 5 HNorm(0)3SeasonsTrunc10%	11/7/2014 3:56:53 AM	11/7/2014 3:57:27 AM	3	0.00	6407.00									
7	1 3 5 HNorm(0)3SeasonsTrunc5%_FINAL	11/7/2014 4:00:24 AM	11/7/2014 4:00:50 AM	5	0.00	6919.00									
1	1 1 2 HNormPooled	11/6/2014 1:08:26 PM	11/6/2014 1:20:37 PM	5	23.26	7583.00									
3	1 2 2 HNormPooledTrunc10%	11/6/2014 1:23:07 PM	11/6/2014 1:23:20 PM	1	10.33	6417.00									
4	1 3 2 HNormPooledTrunc5%	11/6/2014 1:24:04 PM	11/6/2014 1:24:26 PM	2	12.80	6920.00									
11	1 3 7 HRatef(0)3SeasonsTrunc5%	11/7/2014 4:08:21 AM	11/7/2014 4:09:17 AM	6	2.83	6918.00									
12	1 3 8 Unif(0)3SeasonsTrunc5%	11/7/2014 4:11:04 AM	11/7/2014 4:12:10 AM	7	4.42	6920.00									

Two analysis windows are overlaid on the bottom right, showing 'Detection Probability' plots. The left window is for 'Analysis 128' and the right is for 'Analysis 180'. Both plots show a histogram of radial distance in meters (0 to 90) with a fitted curve. The y-axis represents 'Detection Probability' from 0.0 to 1.6. The x-axis is 'Radial distance in meters'.

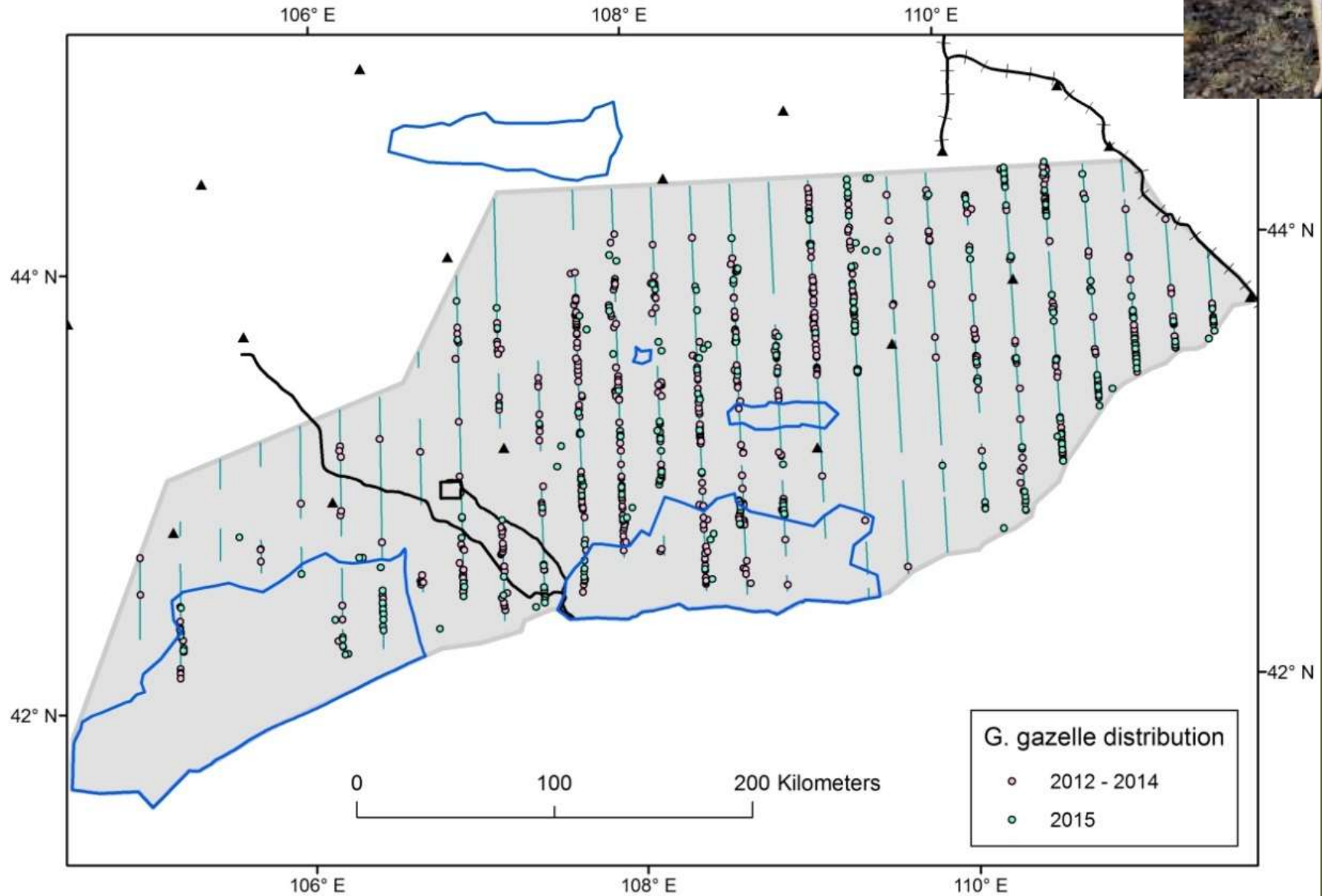
Density and abundance estimates of ungulates during 2012 - 2015

Season	Year	Density	Abundance	CV
Khulan				
Autumn	2012	0.83	65,739	24.9
Spring	2013	0.46	35,899	18.5
	2014	0.51	39,998	26.8
	2015	0.46	36,298	27.1
Goitered gazelle				
Autumn	2012	0.50	39,602	14.7
Spring	2013	0.36	28,462	14.6
	2014	0.39	30,774	12.9
	2015	0.43	33,627	12.8

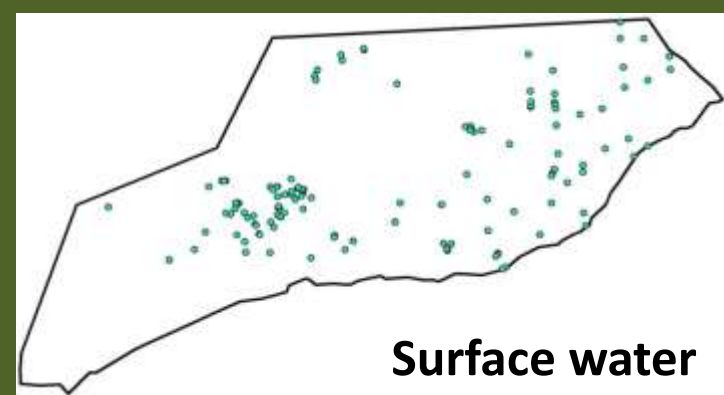
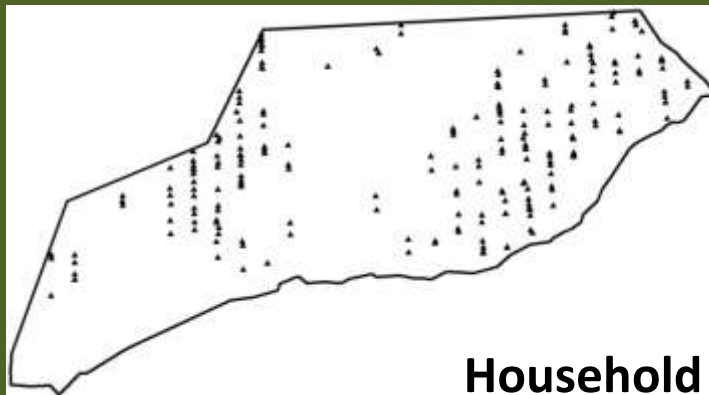
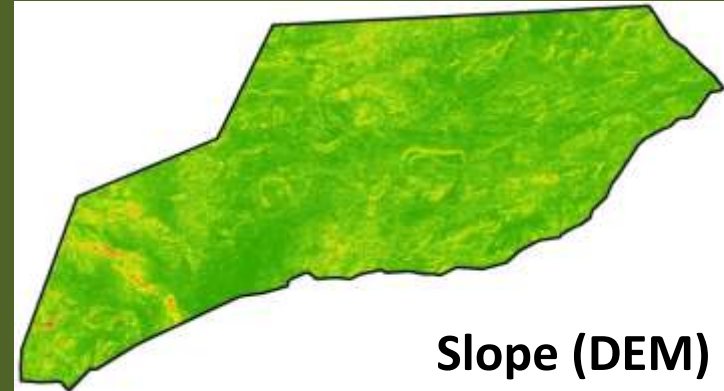
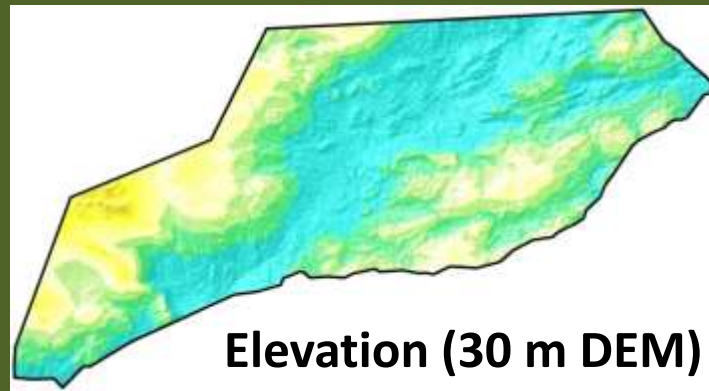
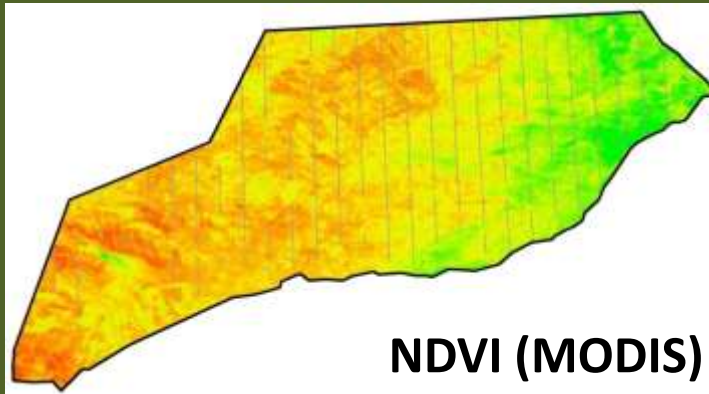
Khulan distribution (2012-2015)



Goitered gazelle distribution (2012-2015)

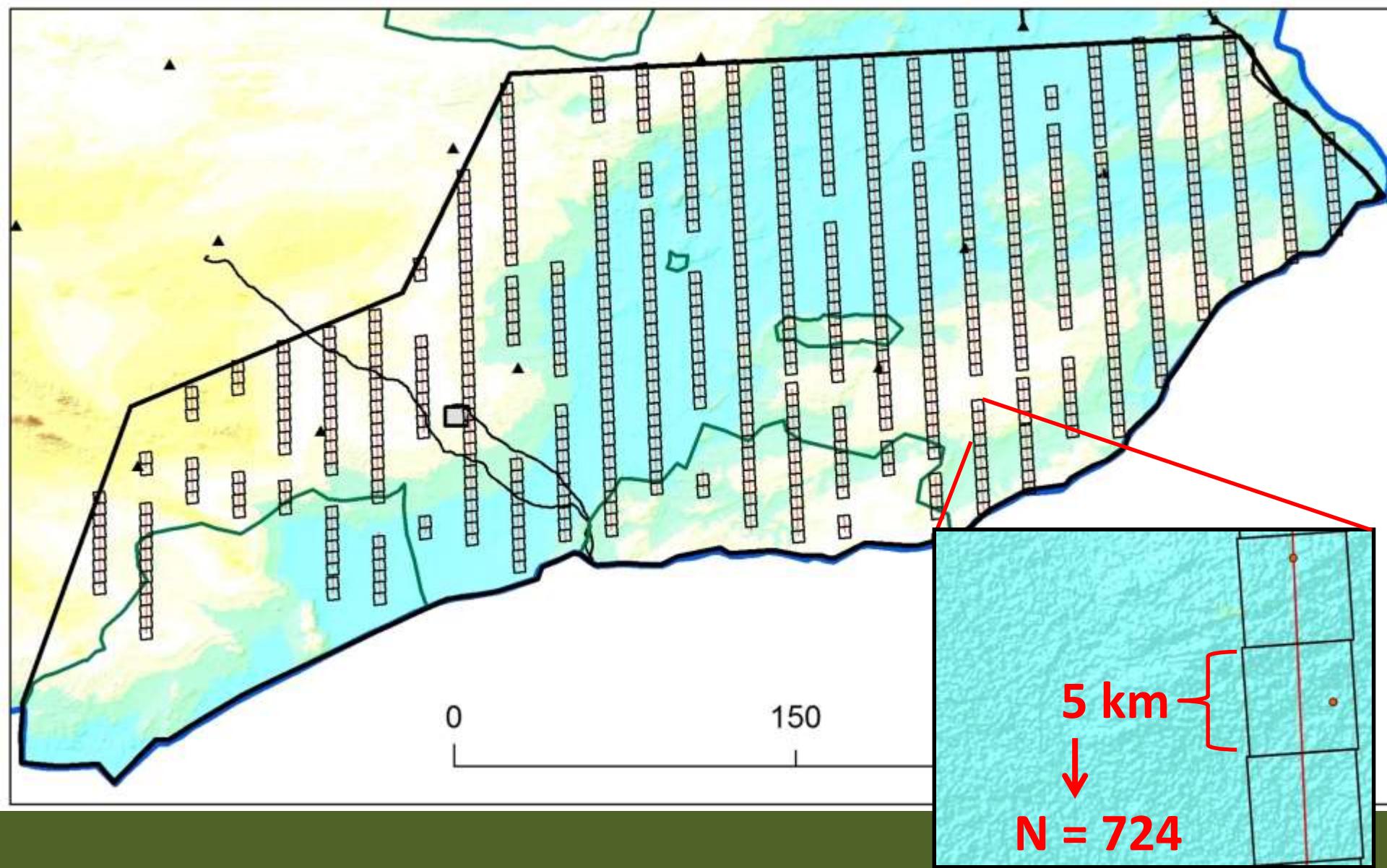


Spatial modelling

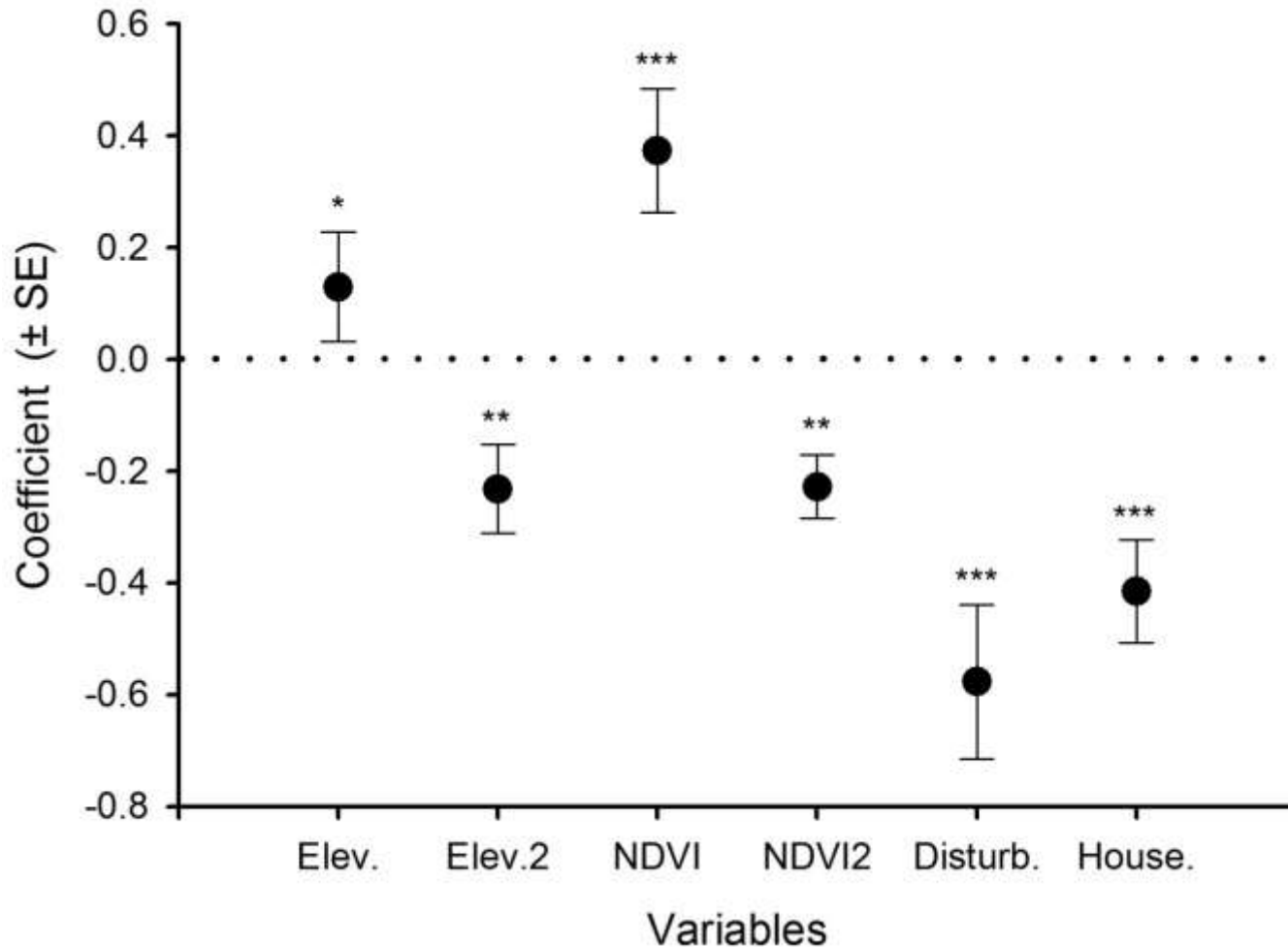


Layers

Spatial modeling

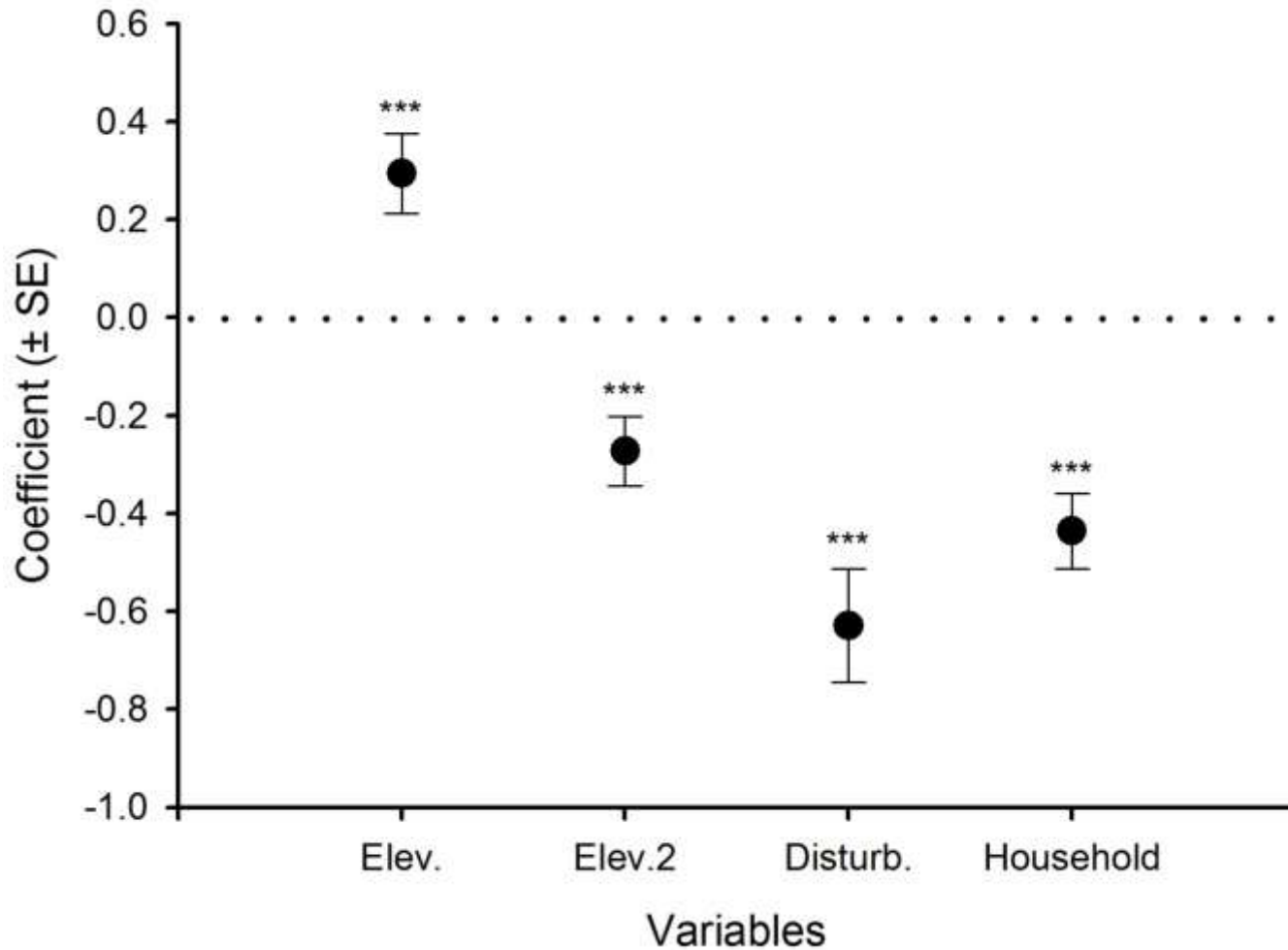


Parameter estimates of spatial model explaining distribution of khulan



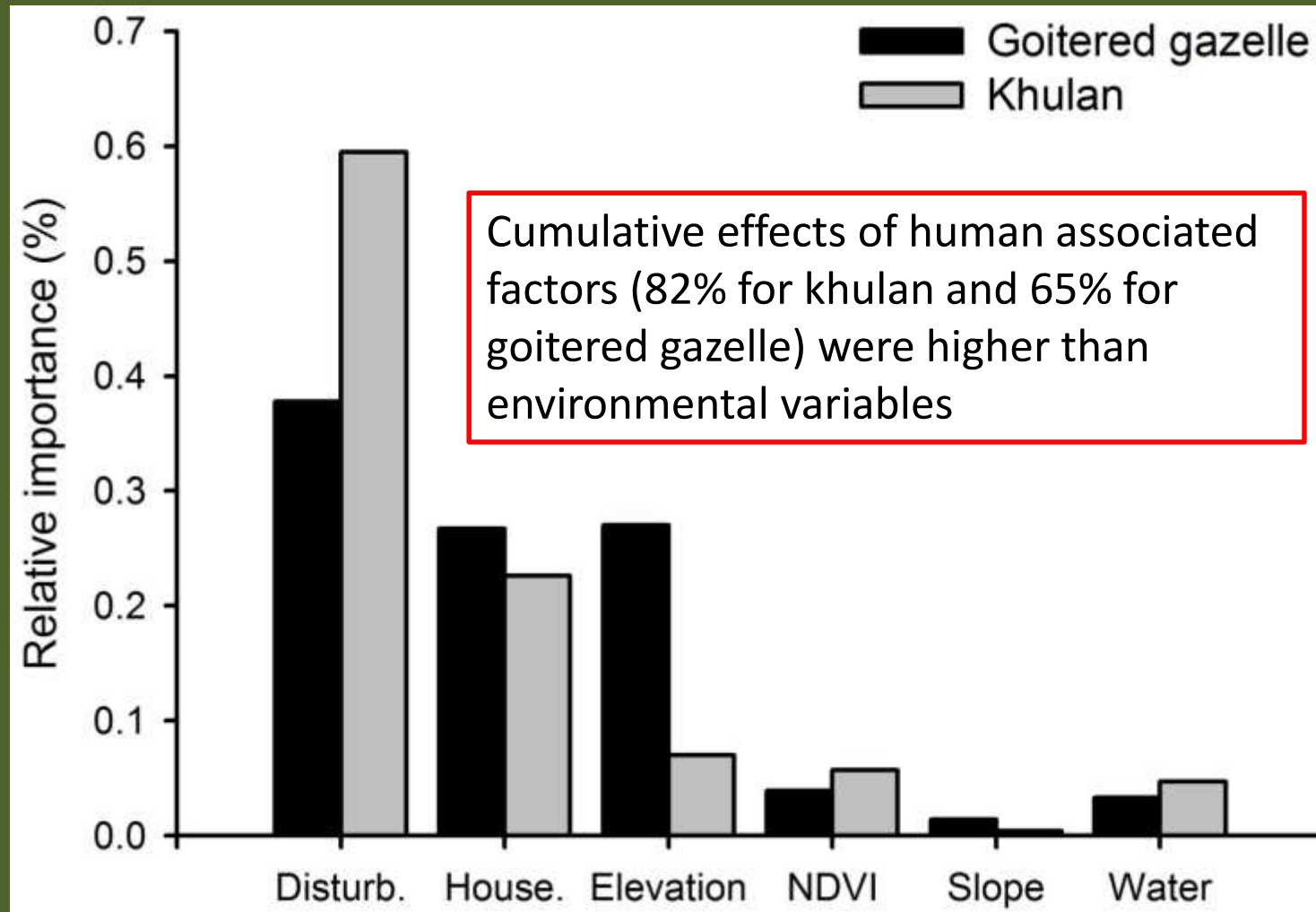
Significance code: * 0.05, ** 0.01, *** 0.001

Parameter estimates of spatial model explaining distribution of goitered gazelles

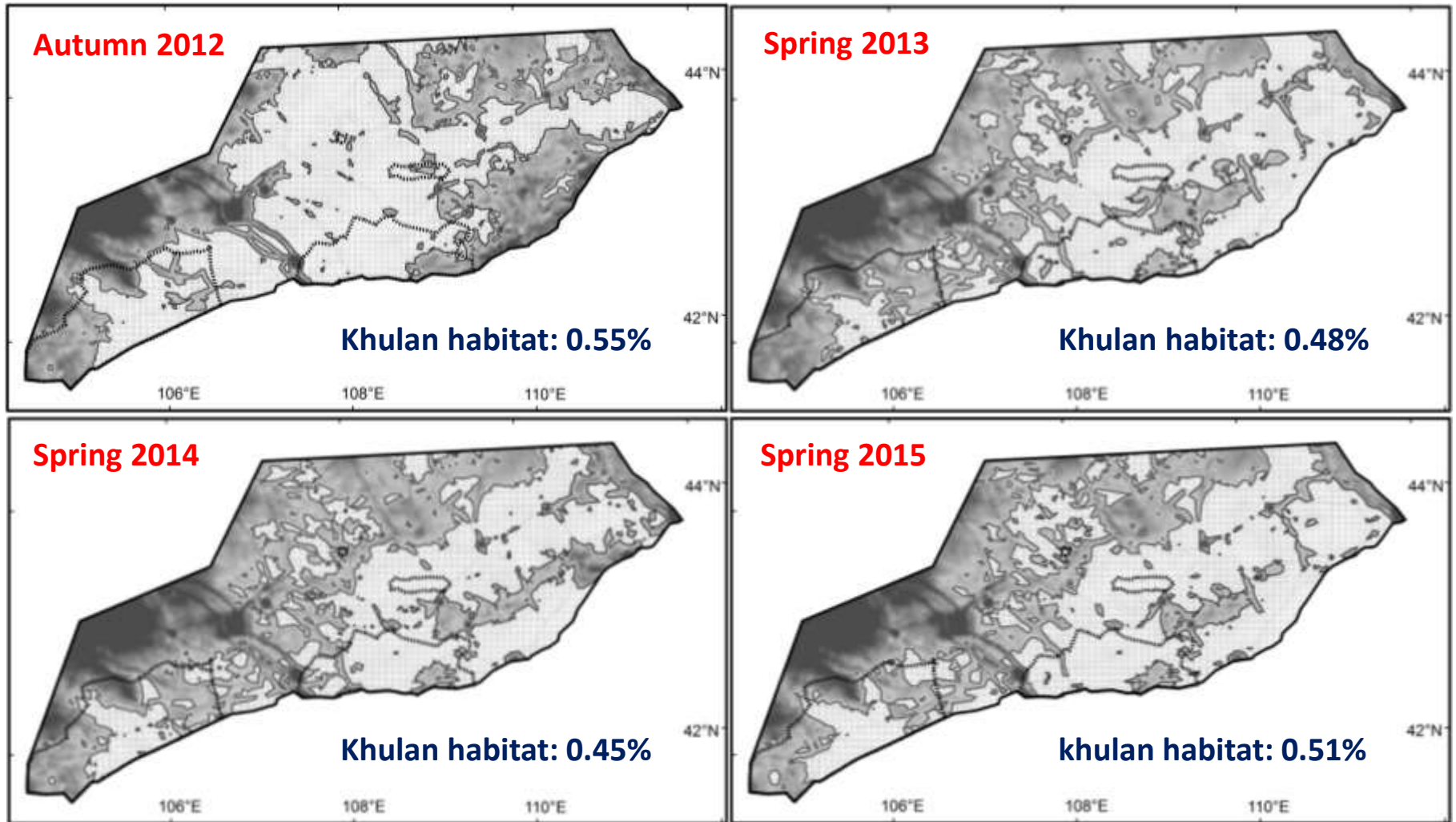


Significance code: *** 0.001

Importance of predictor variables explaining spatial distribution of ungulates



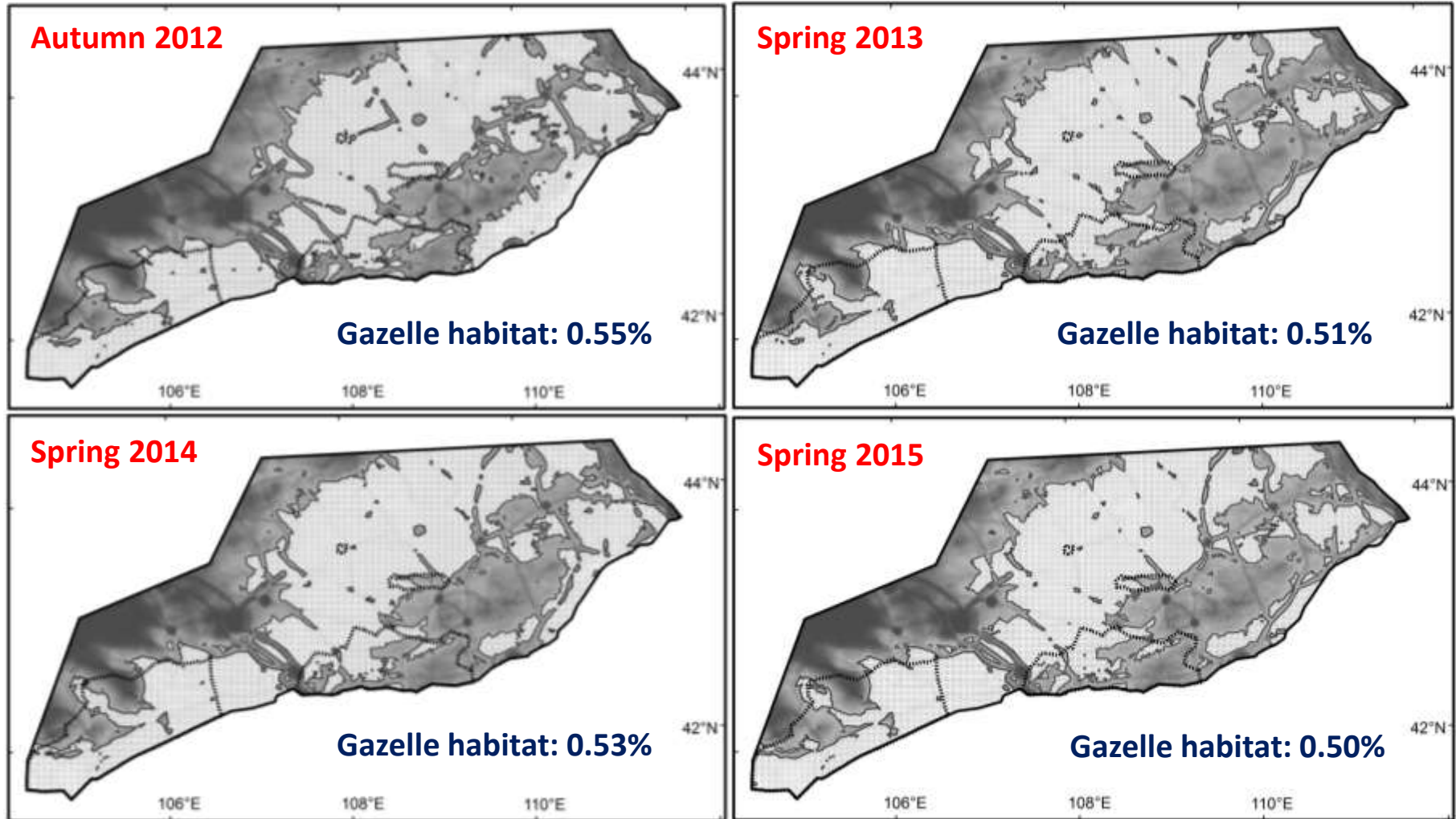
Khulan habitat (probability threshold >0.5) during 2012-2015



During 4 years of study:

- 31% of the study area always classified as khulan habitat
- 32% of the study area never classified as khulan habitat

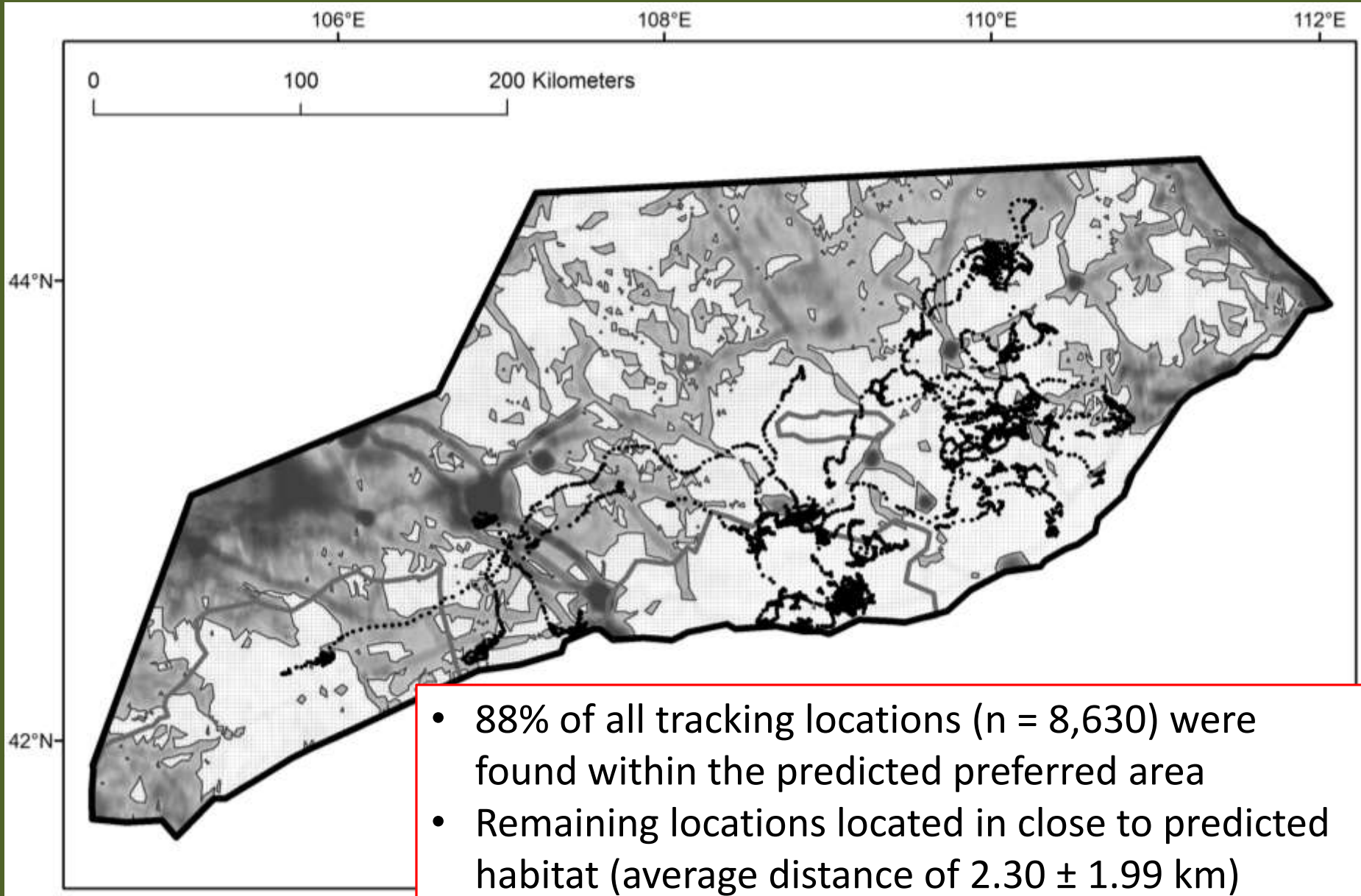
Goitered gazelle habitat (probability > 0.5) during 2012-2015



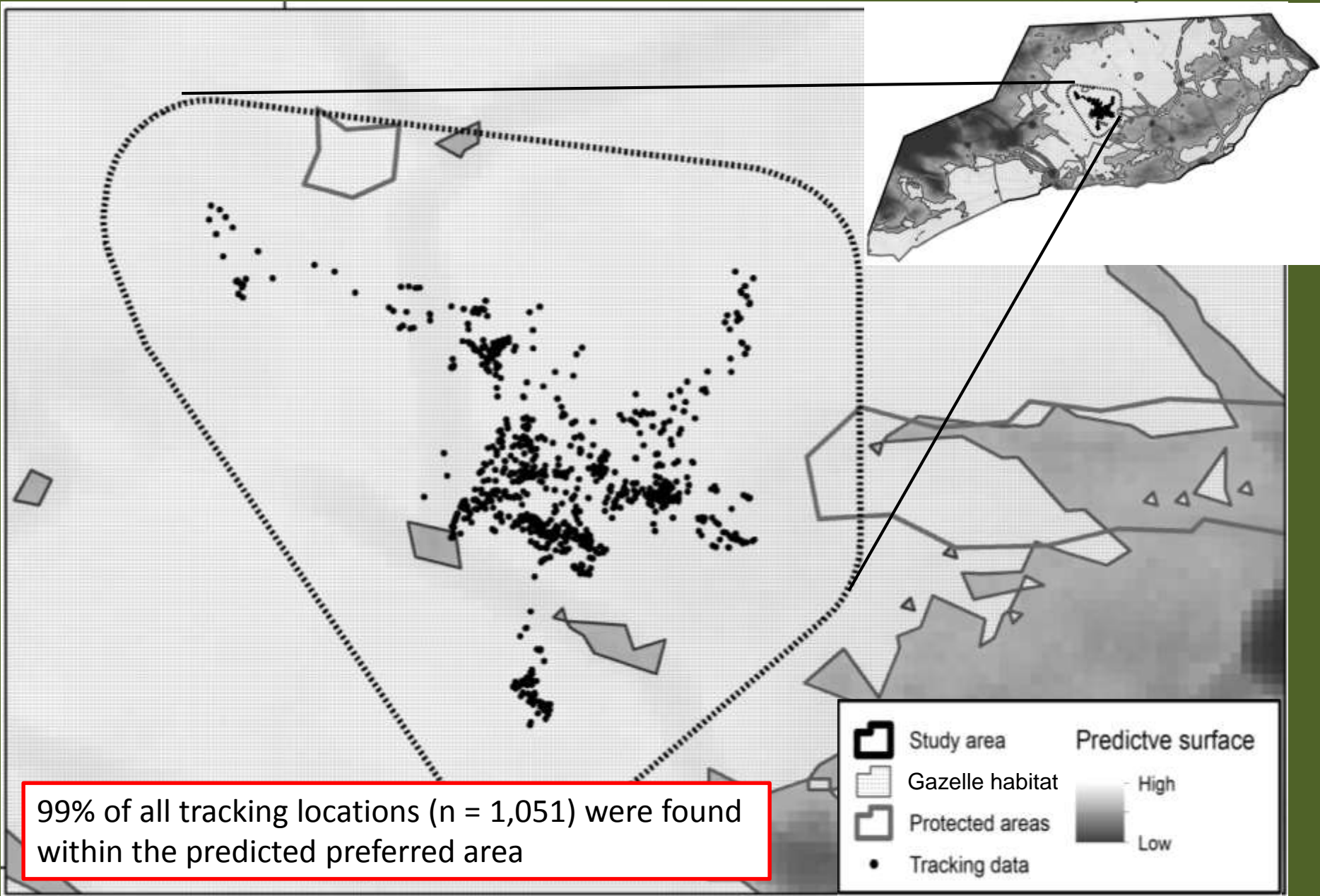
During 4 years of study:

- ❑ 46% of the study area always classified as gazelle habitat
- ❑ 40% of the study area never classified as gazelle habitat

Model validation: Khulan habitat + tracking data



Model validation: Gazelle habitat + tracking data



Summary

- Mongolia's Gobi supports the largest population of khulan and goitered gazelle in the world
- It's challenging to reliably detect changes in the population over the short-term, other population parameters, recruitment and mortality rates, should be studied
- Human associated factors were more important than environmental variables to influence the distribution of the two species

Acknowledgement

Oyu Tolgoi

Sustainability East Asia

- ❑ Institute of Biology, Mongolian Academy of Sciences
- ❑ Dornogobi Environmental Protection Agency
- ❑ Oyu Tolgoi LLC



Thanks!

