

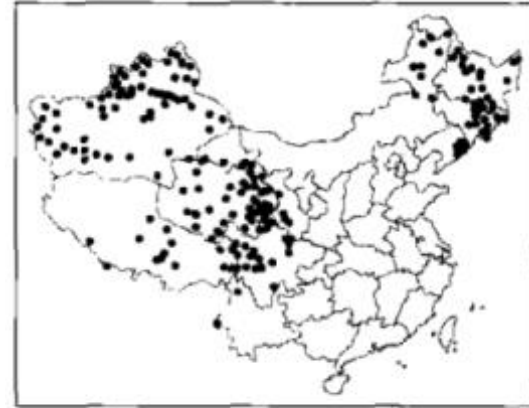


Identify critical knowledge gap and conservation needs of large mammals through high-resolution mapping, a case study of Asiatic Black Bear, China

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Peking University

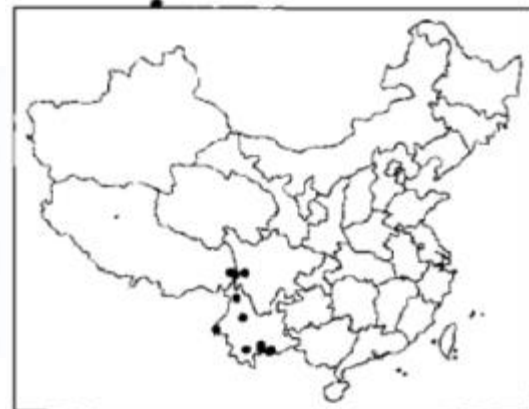
Bears of China- Distributions ~1950s



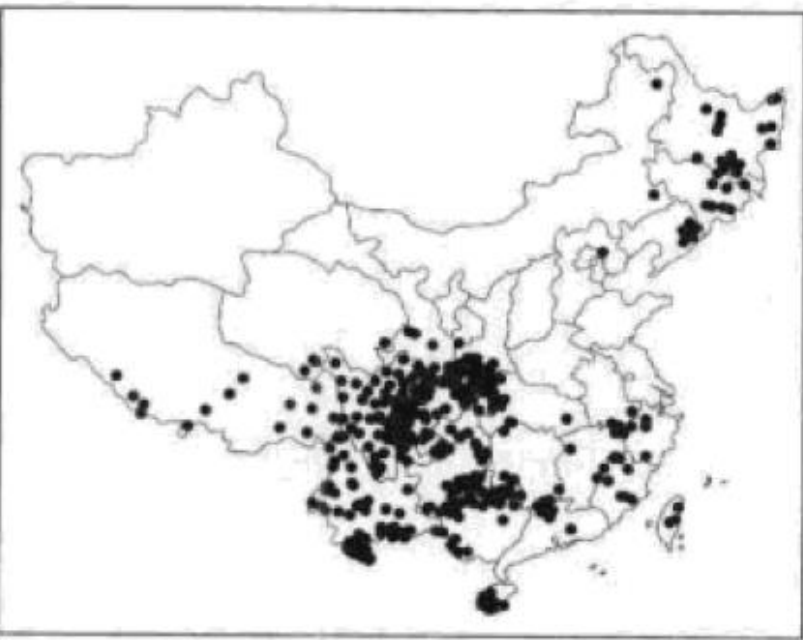
地图 477 棕熊 *Ursus arctos*



地图 475 大熊猫 *Ailuropoda melanoleuca*

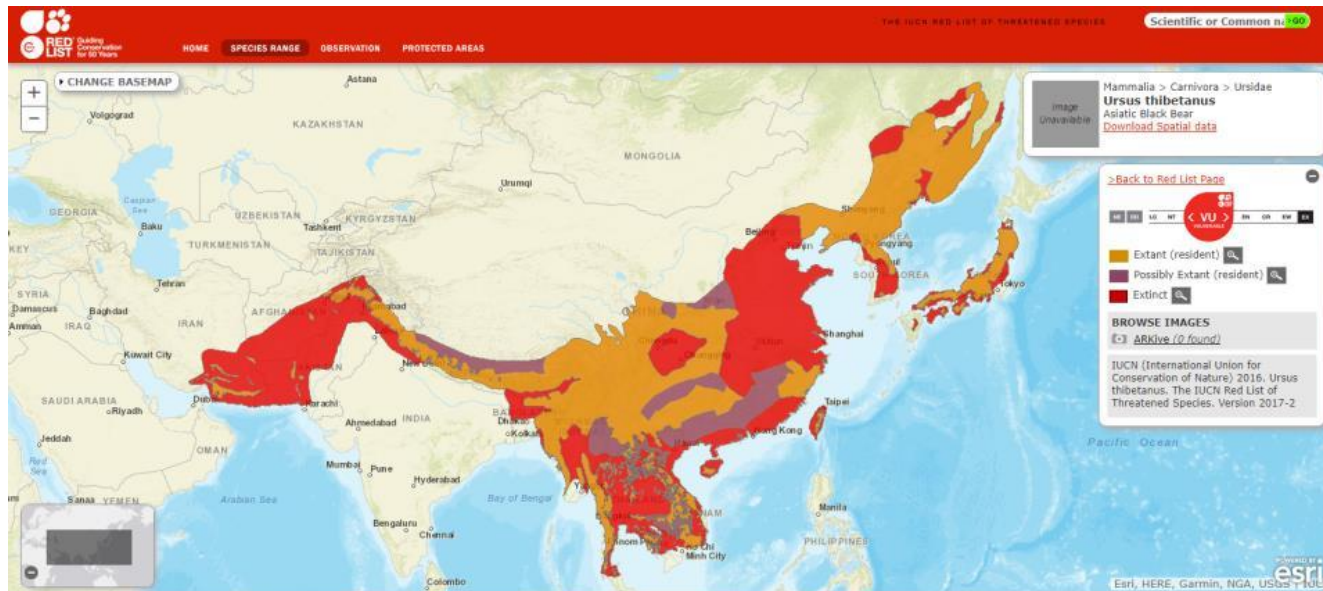


地图 476 马来熊 *Helarctos malayanus*



地图 478 黑熊 *Ursus thibetanus*

Asiatic Black Bear



Area/ 10 ⁴ km ²	Range wide	China	China %
Extant	363.86	203.71	55.99%
Possibly Extant	97.50	65.25	66.92%
Extinct	391.65	157.58	40.23%
Total	853.01	426.54	50.00%

Major Threats of Asiatic Black Bears

四川查获十余只黑熊肉块 嫌犯:有人买熊肉当年货

发稿时间: 2015-11-17 08:05:00 来源: 四川在线 中国青年网 我要评论 7



广甘高速收费站口, 犯罪嫌疑人指认赃物。



图5



广西警方从废纸车中查出173只熊掌(组图)

<http://www.sina.com.cn/> 2009年06月08日09:05 中国广播网



部分走私熊掌

Key Knowledge Gaps

- ▶ Current Status?
- ▶ Regional Population?
- ▶ Risks and Conservation priorities?

Reasons:

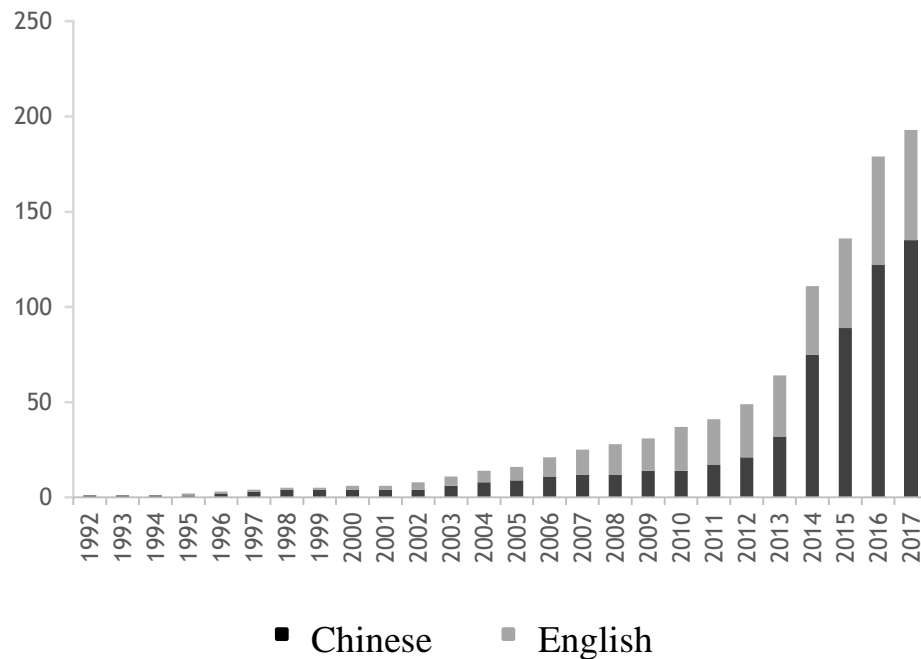
- Few field studies
- Lack of long-term monitoring
- No reliable state-wide mapping and population estimation
- Lack of robust information to support conservation planning



Research Objectives

- ▶ Mapping current distribution of ABB
- ▶ Determine the spatial pattern and identify regional populations
- ▶ Evaluate the risks and set up conservation priorities for the populations

Fast growth of camera-trapping in China during the past decade



Accumulated No. articles published on camera-trapping studies in China

Li et al. 2017

ABB as by-catch in camera-trapping



Data collection

ABB presence/absence data from camera-trapping surveys

- **Coarse-scale**: survey sites as nature reserves or timberlands (across large area but with low spatial resolution, **typically 100~900 km²**)
- **Fine-scale**: survey stations with **exact lat/lon coordinates** (high resolution but usually spatially biased: clumped points confined to small regions)

Coarse data: state-wide camera-trapping literature published from 2005-2016 (143 study sites)



Source	No.
Peer-reviewed articles	200
Reports, News (verified)	21
Unpublished datasets	5
Total	226

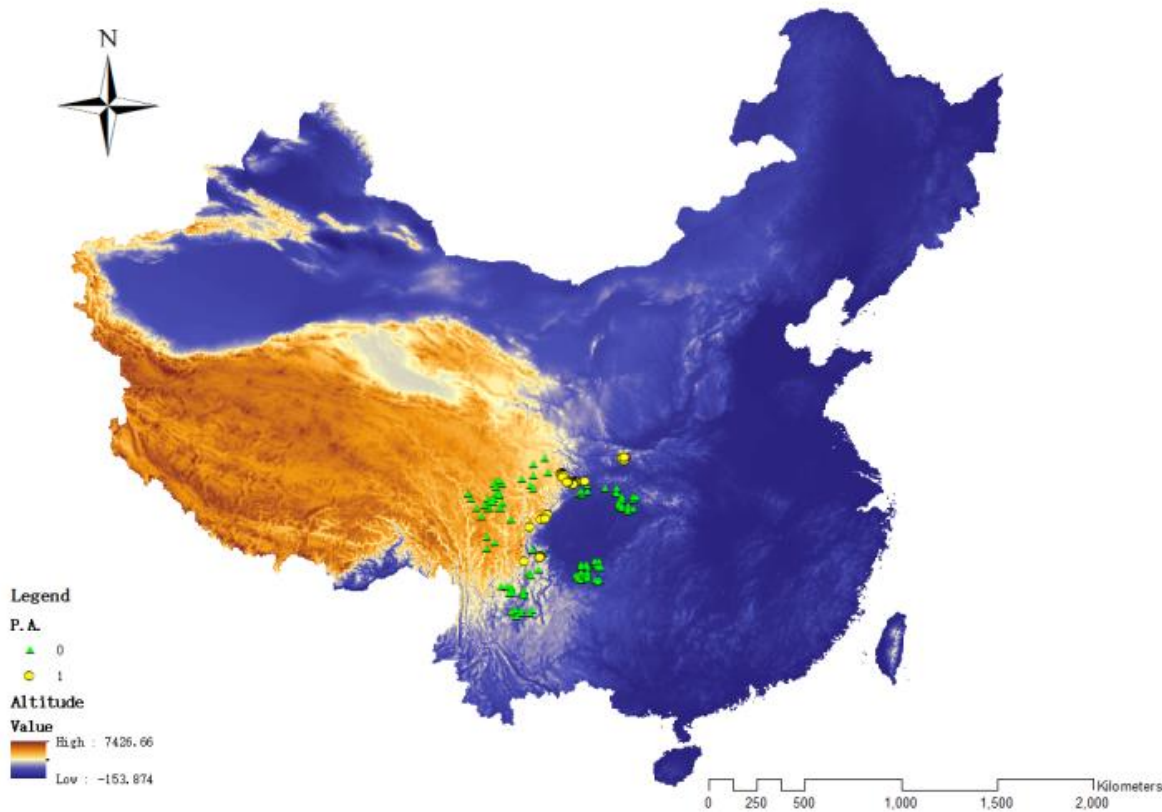
Detected
 Not detected
 >5000

Legend
 Coarse re
 P.A
 0
 1
 Altitude
 Value
 High : 7426.66
 Low : -153.874

camera-days

0 250 500 1,000 1,500 2,000 Kilometers

Fine data: detailed data generated from regional camera-trapping network

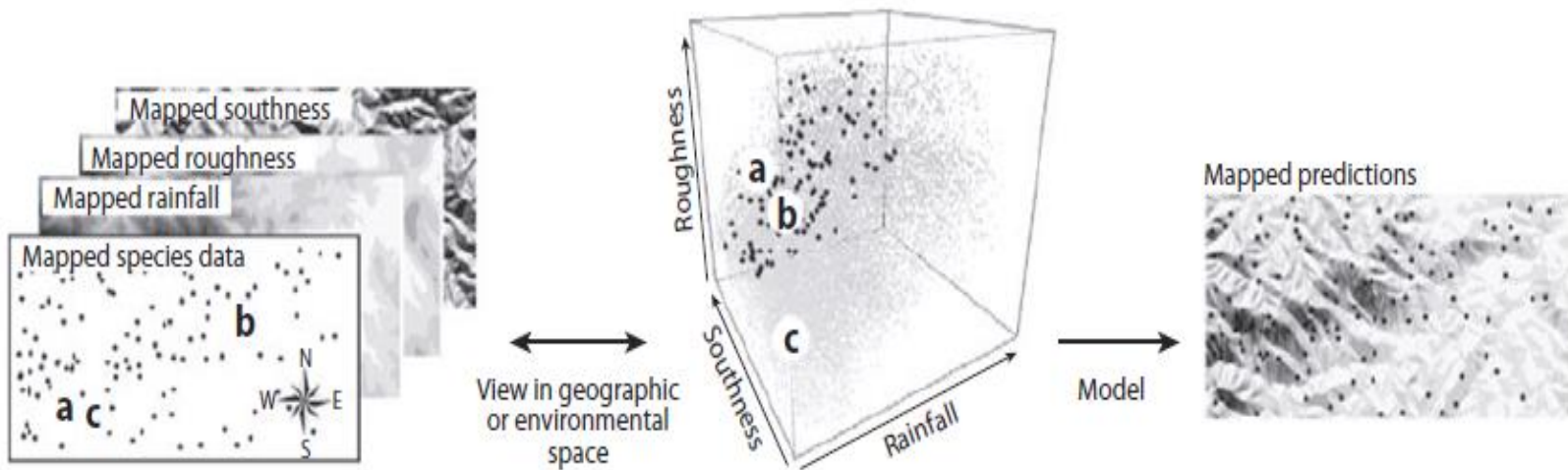


Fine-scale data from PKU network: **P**
and Liu et al. (2009) survey: **A**

Additional data sets for validation

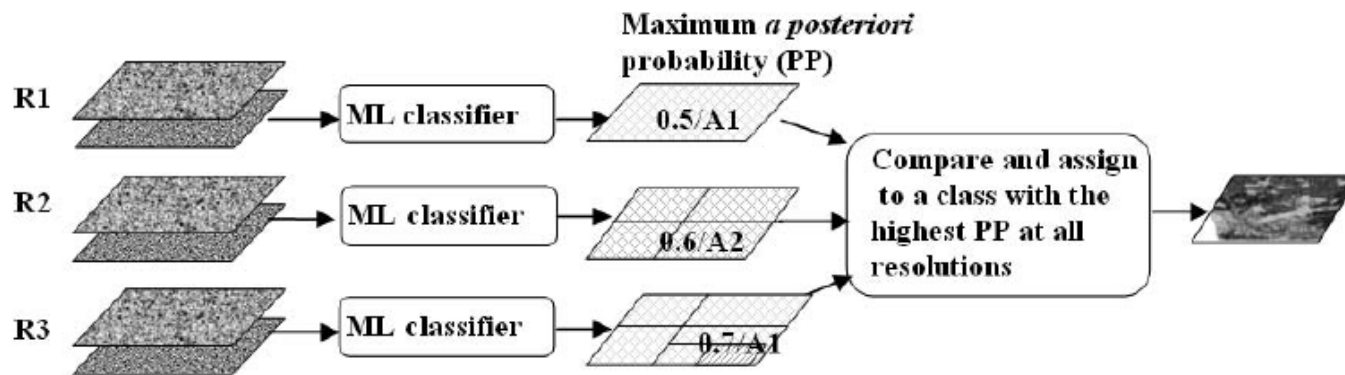
- ▶ NE China
- ▶ Western Yunnan
- ▶ Eastern China
- ▶ Liu et al. presence

Species Distribution Modeling (SDMs)—Niche Models



Elith, J., & Leathwick, J. R. (2009). Species Distribution Models: Ecological Explanation and Prediction Across Space and Time. *Annual Review of Ecology, Evolution, and Systematics*, 40(1), 677-697. doi:10.1146/annurev.ecolsys.110308.120159

Heterogeneous modeling with data collected at varied spatial scales



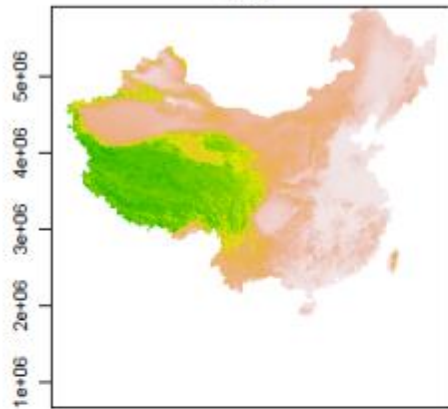
A Machine Learning Method: Random Forest (RF)

+

A Bayes approach

Environmental variables

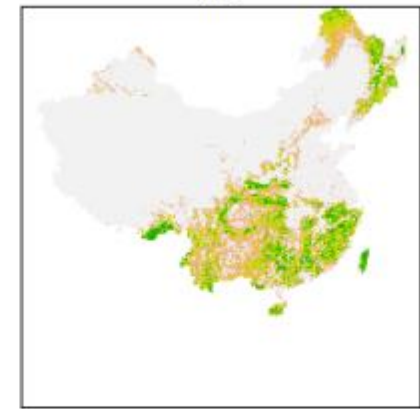
Six selected from 20+ candidate variables



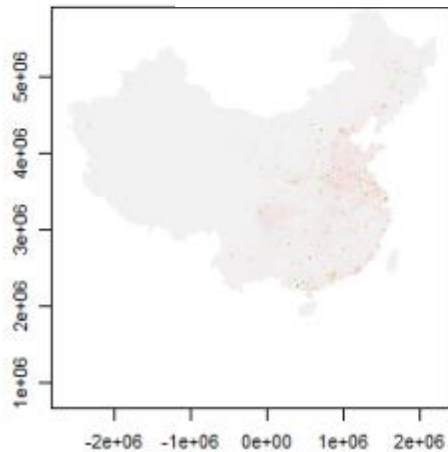
Elevation



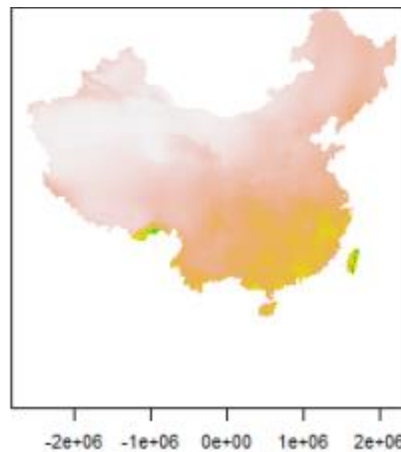
Topo Ruggedness



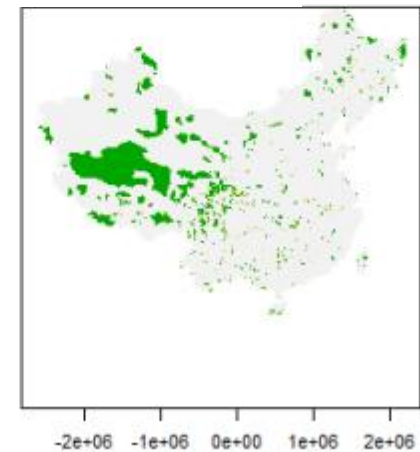
Forest Coverage



Human Population



Precipitation

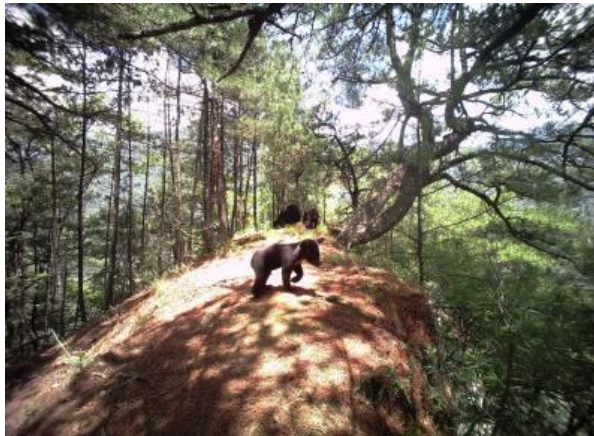


Protected Area

No. points used for model construction and validation

(Training: after spatial thinning and class balancing)

No. Points	Presence	Absence
Coarse scale		
Training	41	54
Validation	1	10
Fine scale		
Training	96	103
Validation	236	10



Result

ABB distribution: Coarse-scale map

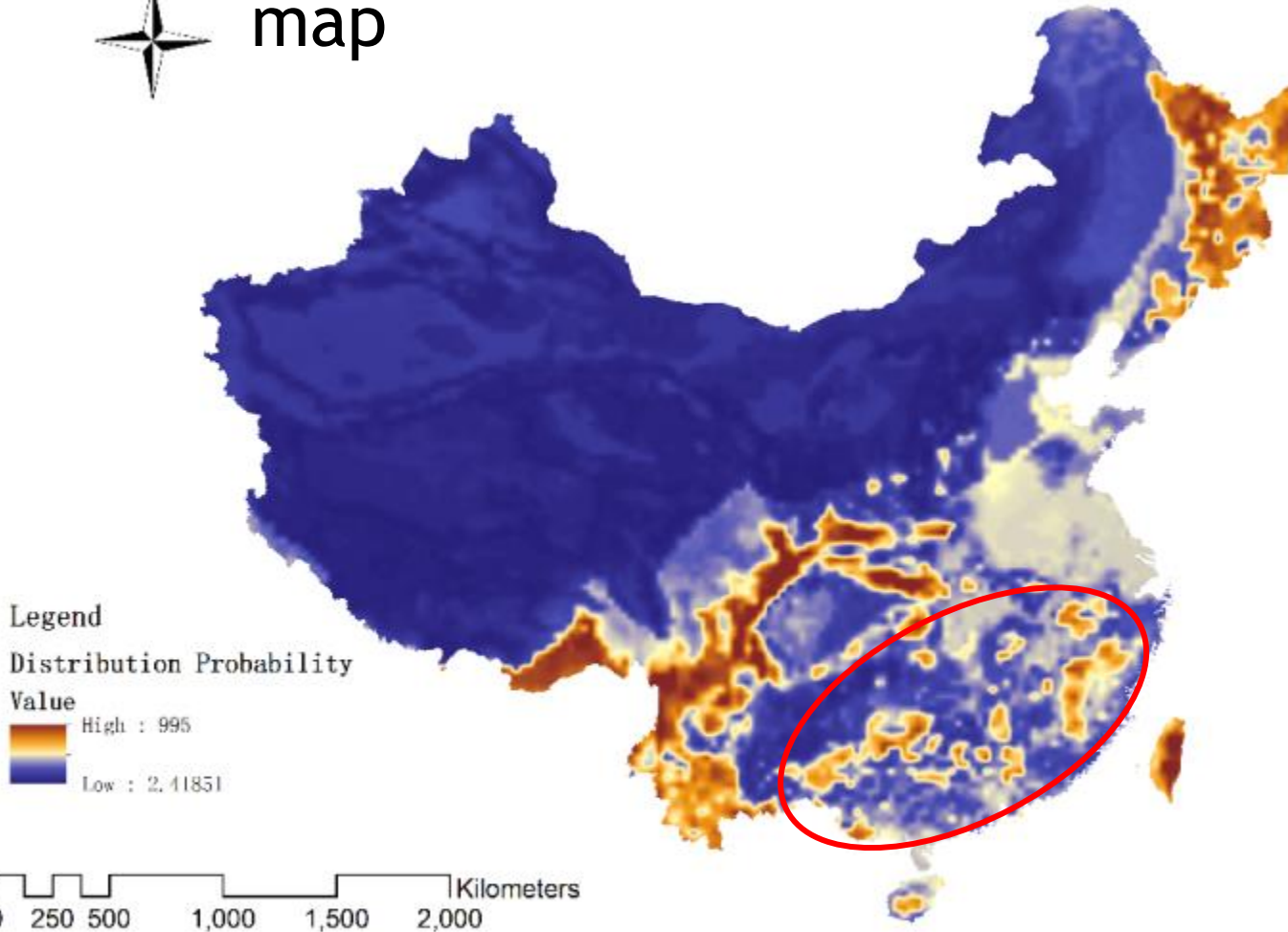
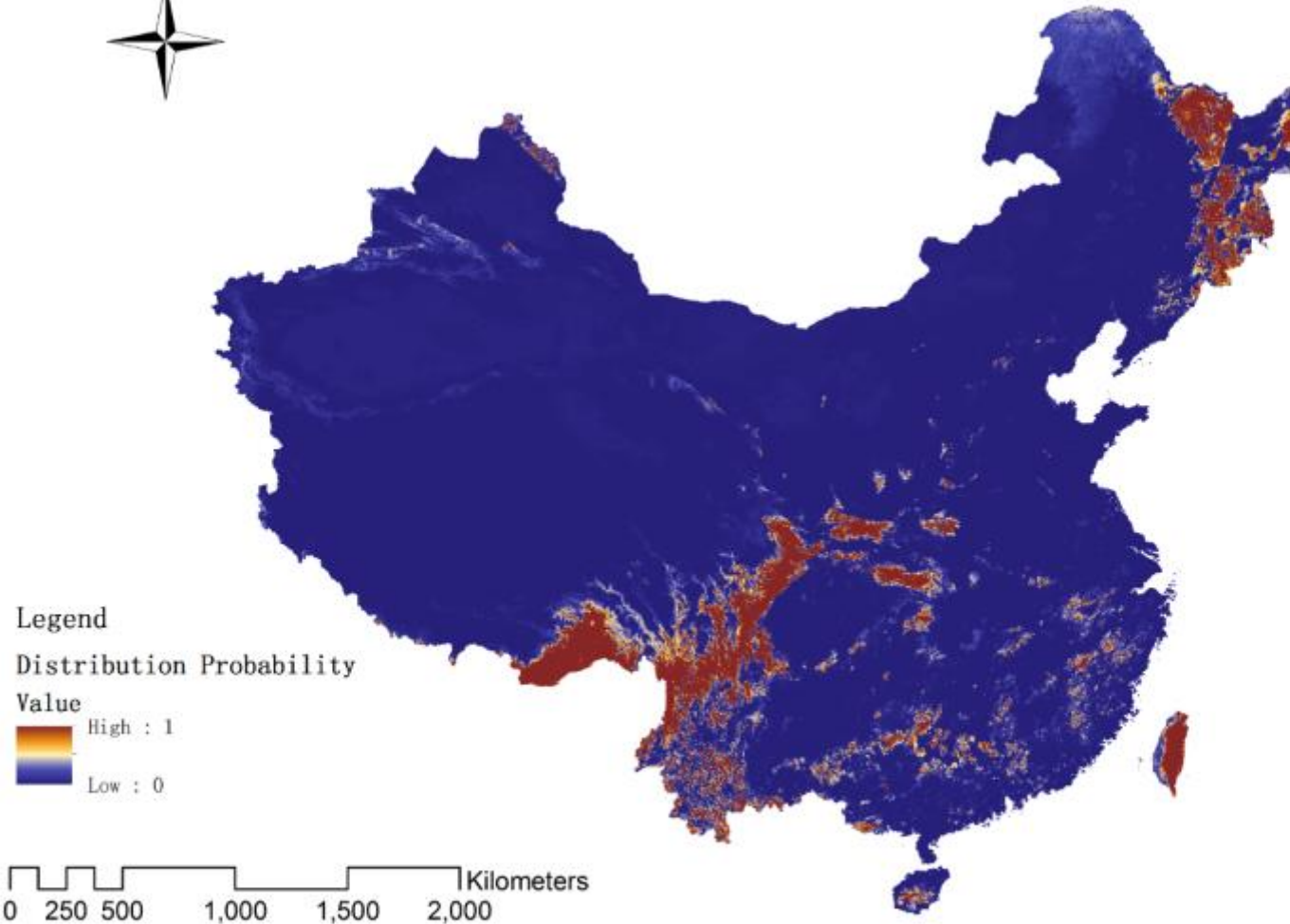
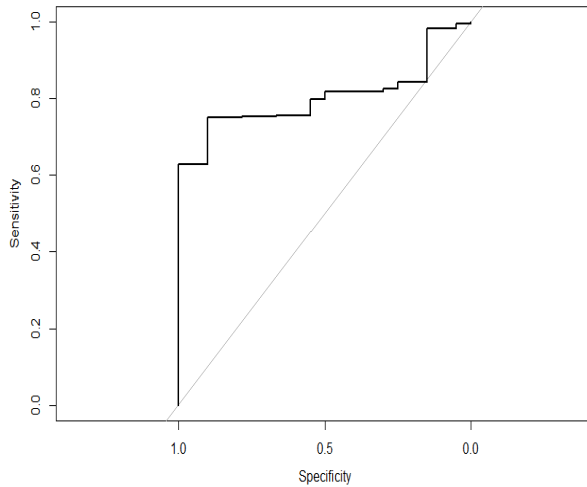


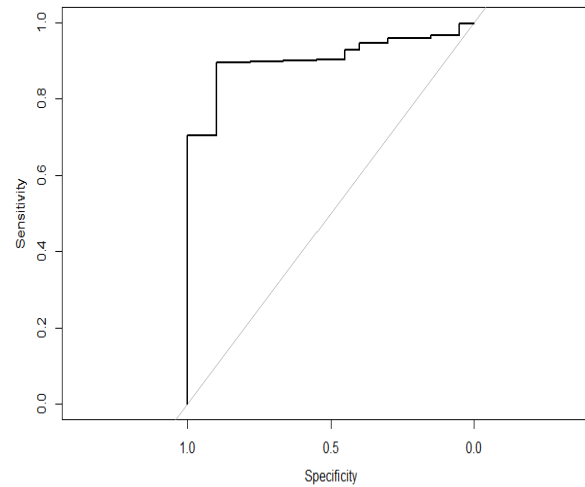
ABB distribution: Final map



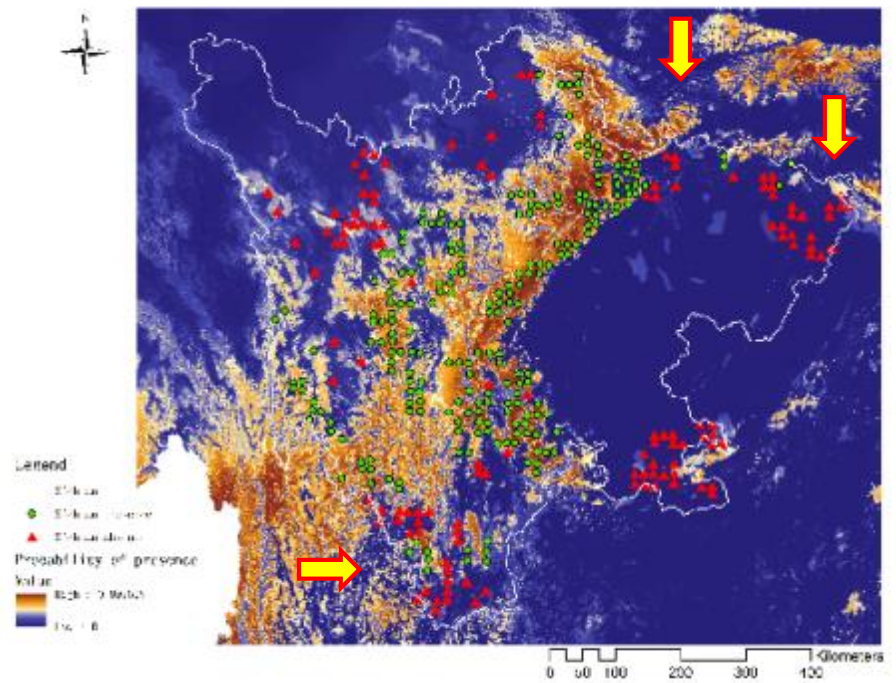
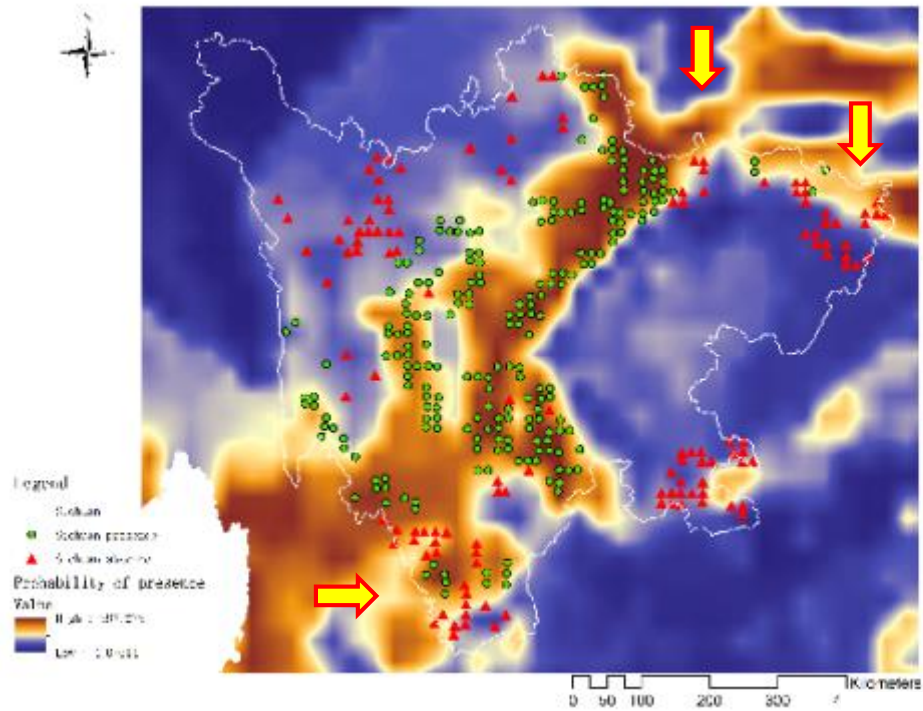
Model validation

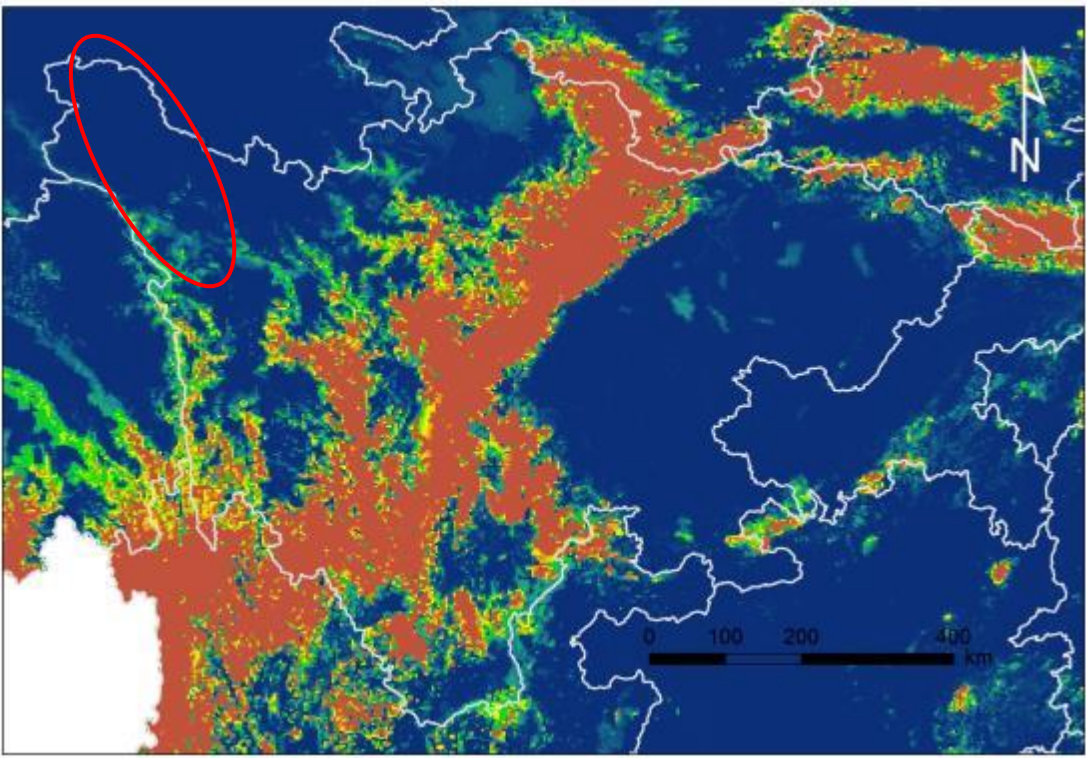
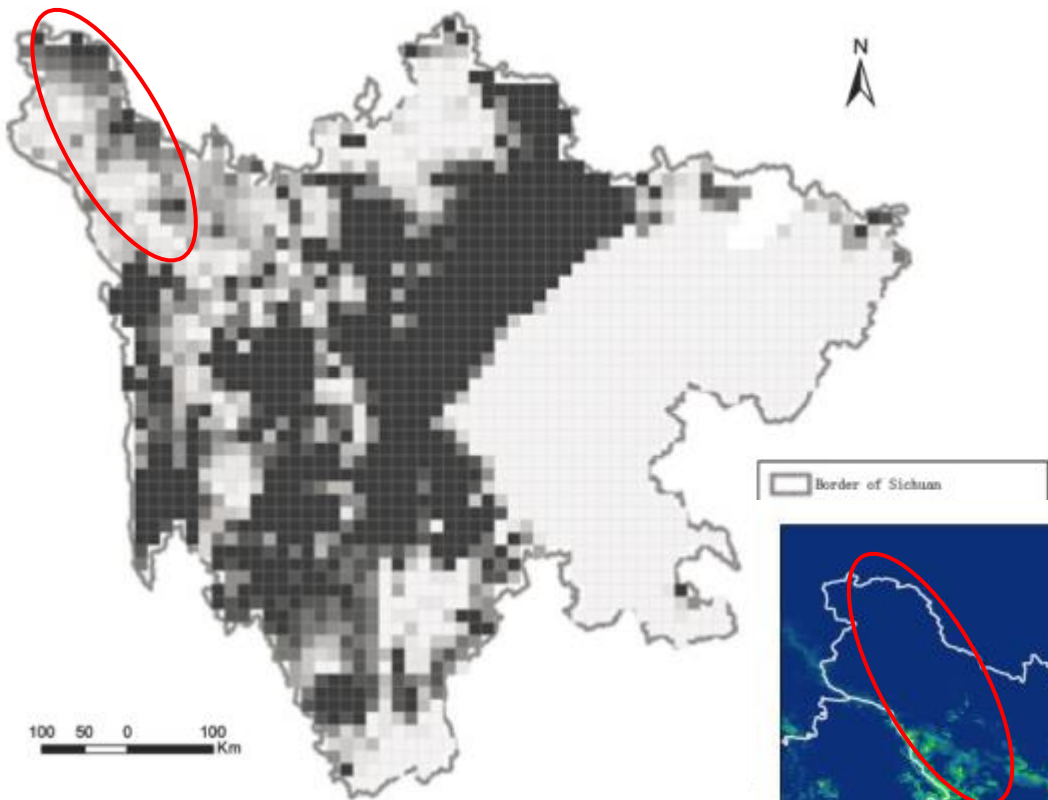


AUC=0.8038
Coarse



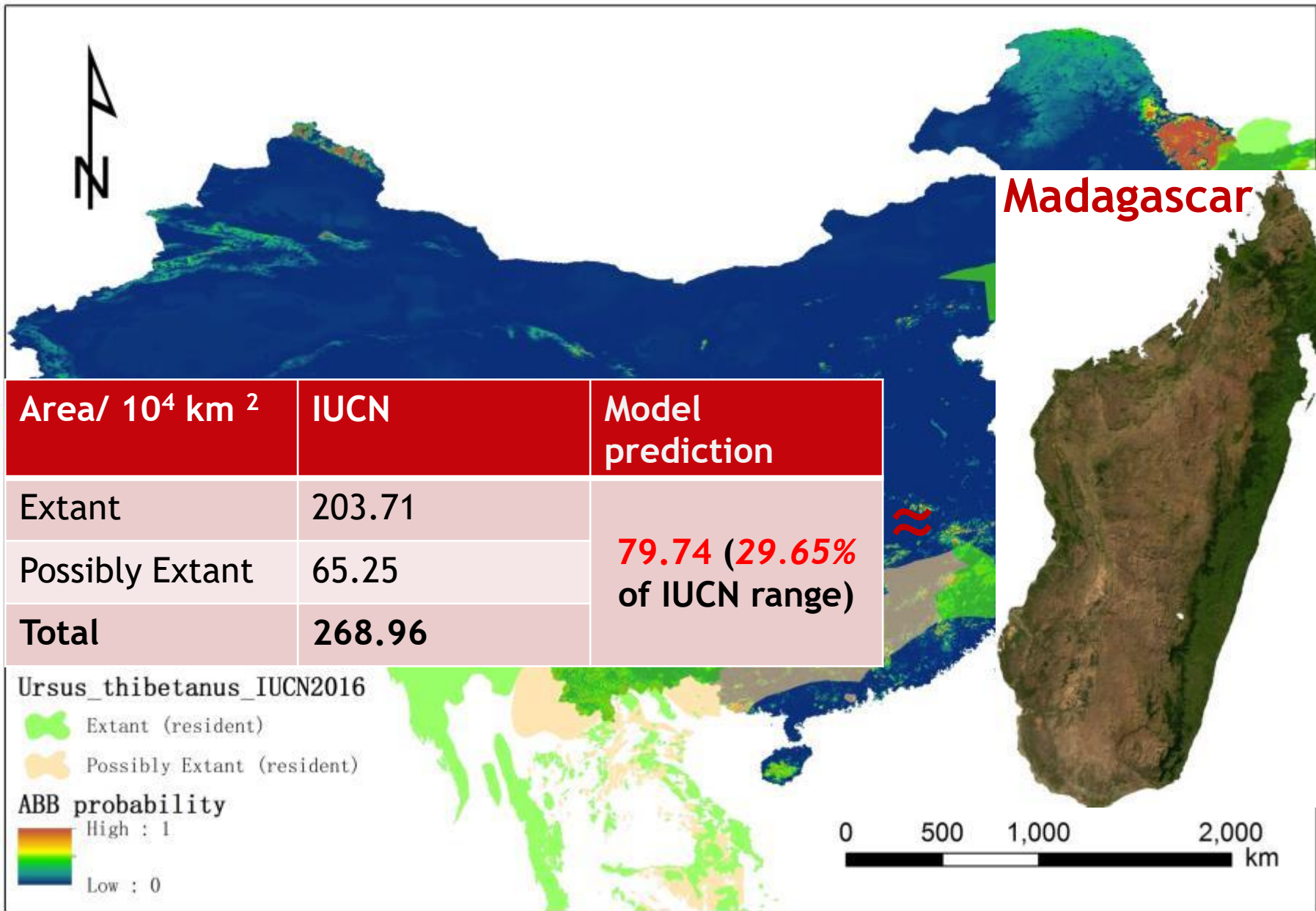
AUC=0.9028
After Bayes





Spatial distribution as a measure of conservation needs: an example with Asiatic black bears in south-western China

Fang Liu^{1*}, William McShea², David Garshelis³, Xiaojian Zhu¹, Dajun Wang¹, Ji'en Gong⁴ and Youping Chen⁵



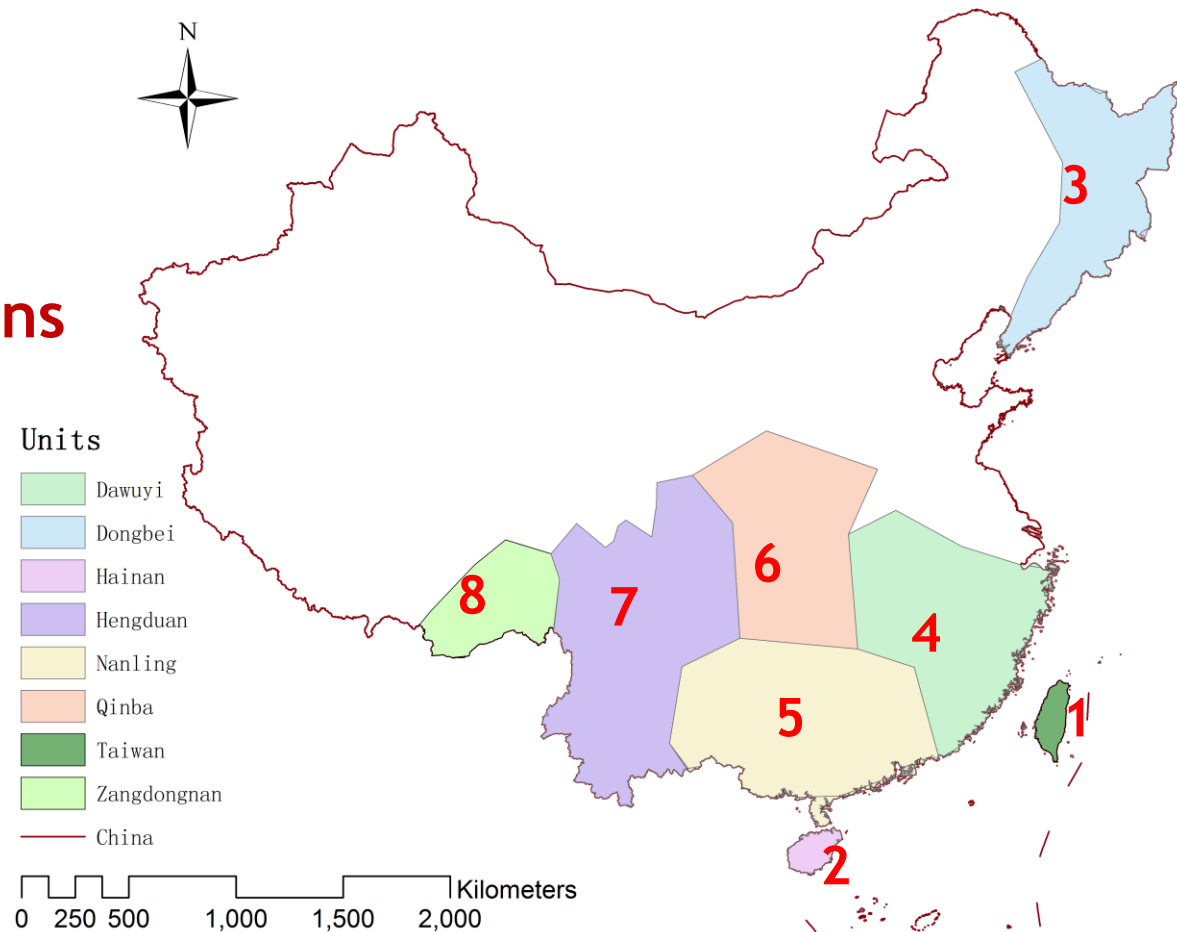
Reginal Populations / Complex of Management units

Two island populations

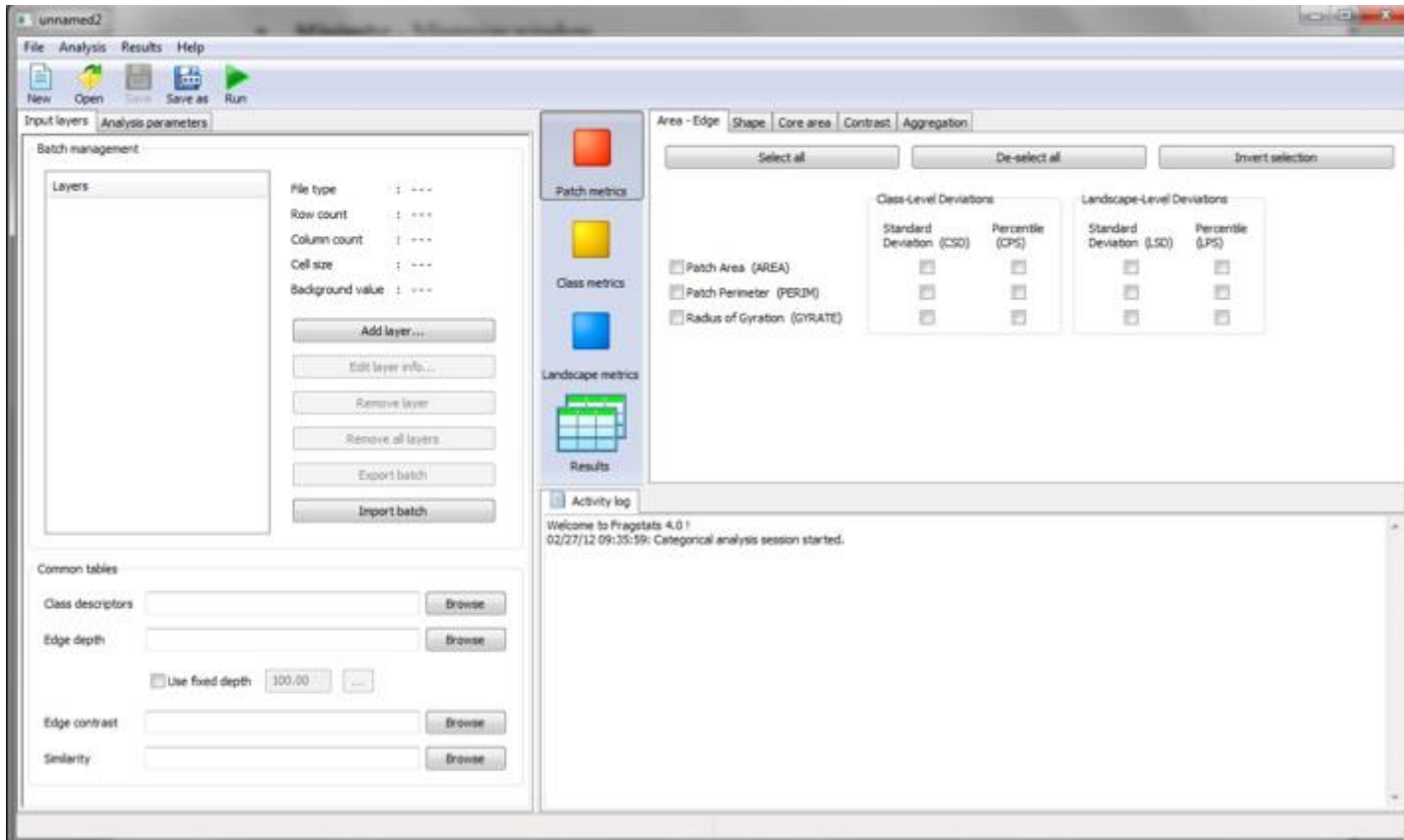
1. Taiwan
2. Hainan

Six mainland populations

3. NE China
4. Wuyi Mts
5. Nanling Mts
6. Qinba Mts
7. Hengduan Mts(SW China)
8. E Himalayas



Fragment analysis using FRAGSTATS



Fragmentation status and conservation priorities

Unit	Mean patch CORE Area 100/km ² (patch #)	CORE Area /100km ²	CAI (%)	CONNECT
<i>Island</i>				
1.Taiwan	25.48(1)	25.48	93.64	0.00
2.Hainan	0.536(8)	4.28	49.59	17.86
<i>Mainland</i>				
3.NE China	1.671(82)	137.01	21.66	1.14
4.Wuyi Mts	0.130(86)	11.19	16.68	0.68
5.Nanling Mts	0.196(135)	26.44	19.60	0.54
6.Qinba Mts	1.278(42)	53.69	24.02	1.16
7.Hengduan Mts (SW China)	1.483(163)	241.71	13.55	0.65
8. E Himalayas	8.236(12)	98.84	25.53	3.03

Fragmentation status and conservation priorities

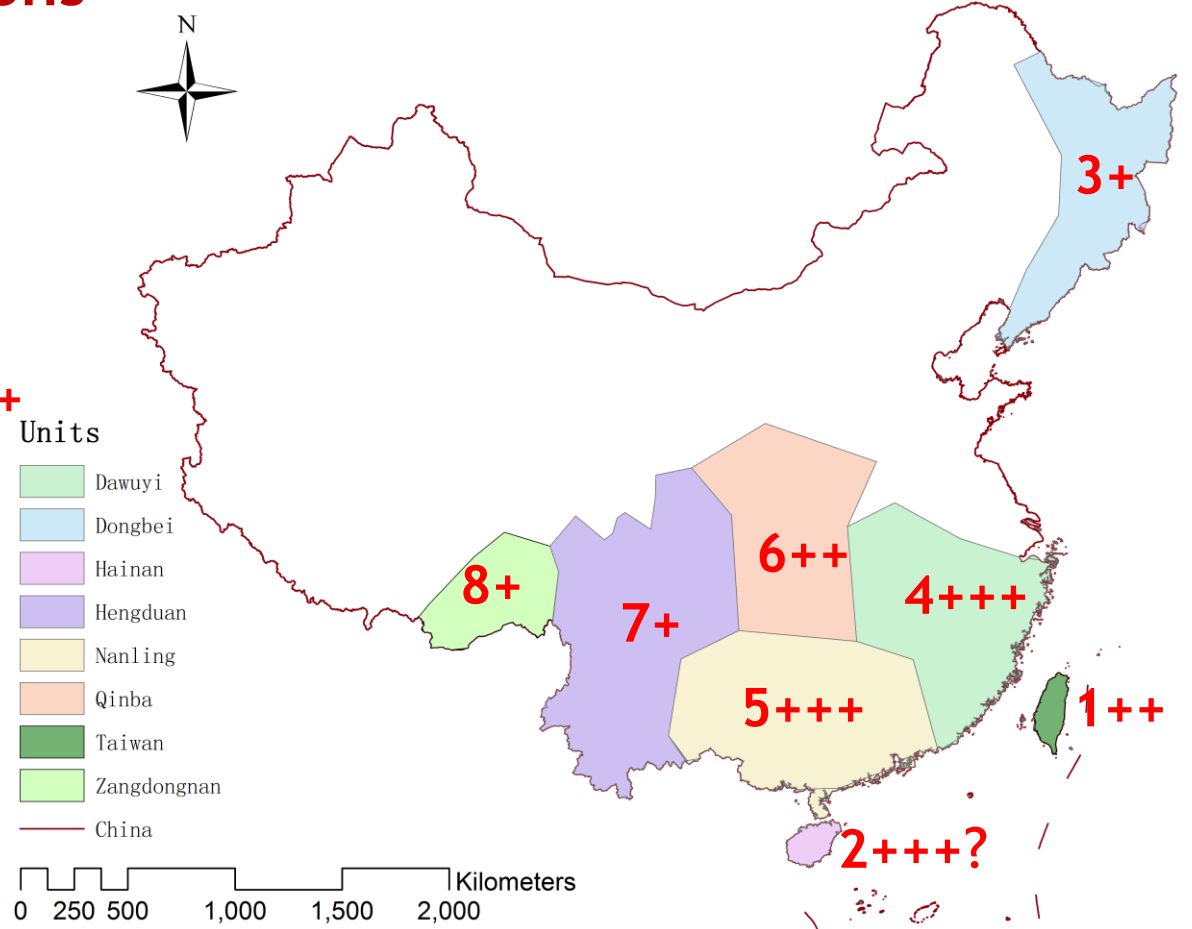
Unit	Mean patch CORE Area 100/km ² (patch #)	CORE Area /100km ²	CAI (%)	CONNECT	Priority
<i>Island</i>					
1.Taiwan	25.48(1)	25.48	93.64	0.00	++
2.Hainan	0.536(8)	4.28	49.59	17.86	+++ ?
<i>Mainland</i>					
3.NE China	1.671(82)	137.01	21.66	1.14	+
4.Wuyi Mts	0.130(86)	11.19	16.68	0.68	+++
5.Nanling Mts	0.196(135)	26.44	19.60	0.54	+++
6.Qinba Mts	1.278(42)	53.69	24.02	1.16	++
7.Hengduan Mts (SW China)	1.483(163)	241.71	13.55	0.65	+
8. E Himalayas	8.236(12)	98.84	25.53	3.03	+

Two island populations

- 1. Taiwan ++
- 2. Hainan +++ ? Probably extinct

Six mainland populations

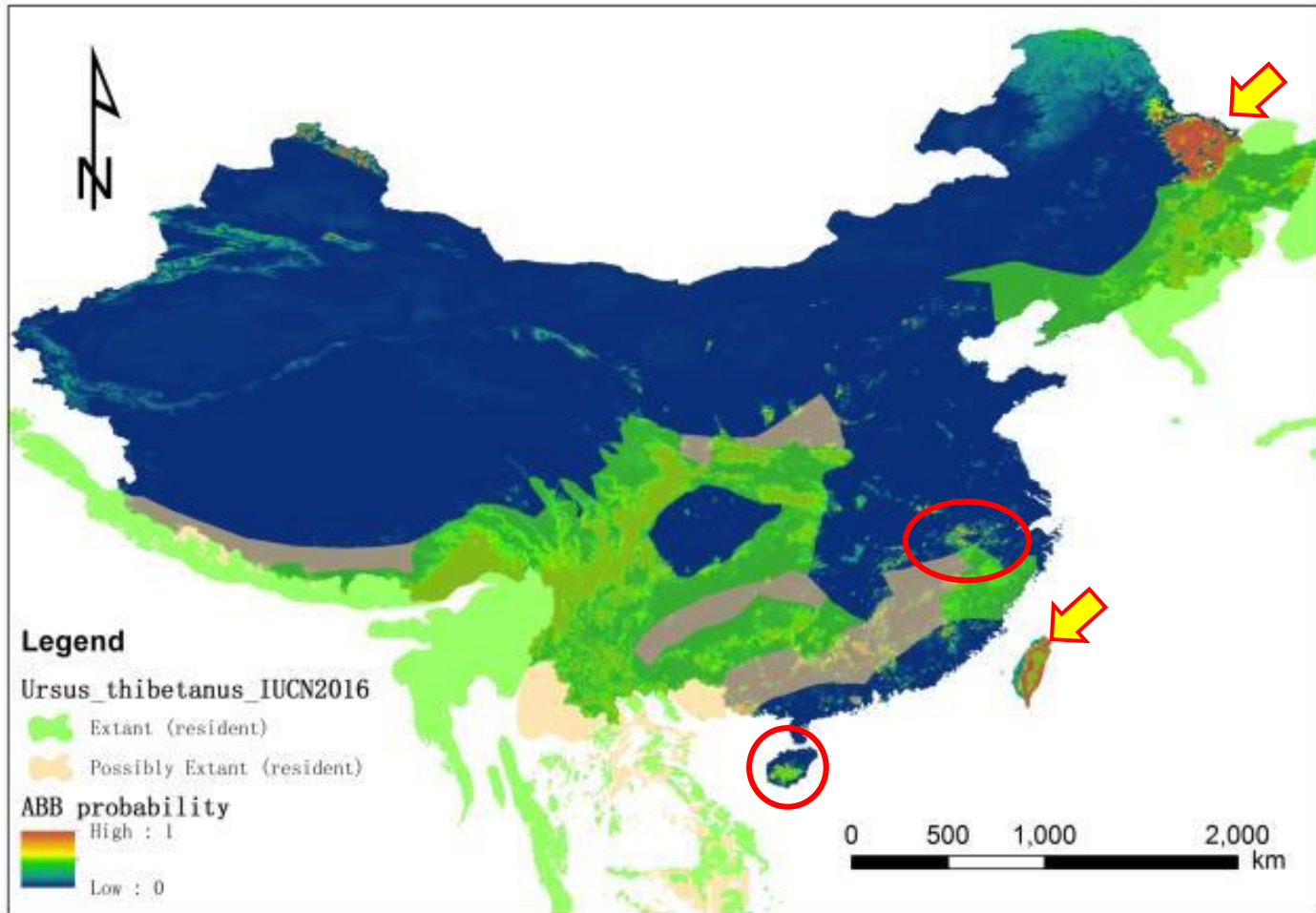
- 3. NE China +
- 4. Wuyi Mts ++++
- 5. Nanling Mts ++++
- 6. Qinba Mts ++
- 7. Hengduan Mts(SW China) +
- 8. E Himalayas +



Summary

- ❑ First state-wide mapping of ABB in China
- ❑ Current range **much less and more fragmented** than we thought (area 70% lower than IUCN estimate)
- ❑ **2 island** and **6 mainland** populations
- ❑ Populations of Eastern and Southern China at highest risks-- high priorities
- ❑ The Hainan Island population?

Next steps



Thanks!



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