Assessing changes in distribution of the Endangered snow leopard *Panthera uncia* and its wild prey over 2 decades in the Indian Himalaya through interview-based occupancy surveys

ABHISHEK GHOSHAL, YASH VEER BHATNAGAR, BIVASH PANDAV, KOUSTUBH SHARMA
CHARUDUTT MISHRA, R. RAGHUNATH and KULBHUSHANSINGH R. SURYAWANSHI

The data from this study are available from the Dryad Digital Repository: (https://doi.org/10.5061/dryad.hp4b3). The data set has occupancy values and local extinction probability values for 88 grids/sites of 15 km X 15 km each, for snow leopard, blue sheep, Asiatic ibex and wild prey (blue sheep and ibex combined), across an area of 14,616 km^2 in the Himalaya and Trans-Himalaya mountains of Himachal Pradesh, India.

SUPPLEMENTARY MATERIAL S1 Questionnaire for key-informant survey to record detection/non-detection of snow leopard *Panthera uncia* and their wild prey in the Greater and Trans-Himalaya of Himachal Pradesh, India (Fig. 1).

Interview no: Latitude: Longitude:

RESPONDENT'S ATTRIBUTES

Name: Age: Gender:

Occupation: Village/Town: District:

Community:

Q1. Details about your area of knowledge / activities

Area (valley/range name, show on map)

Activities (e.g. patrolling, grazing, fuelwood/fodder collection)

Time of activity (e.g. season)

Duration of time spent per year (days/months)

Total duration of familiarity with the area (in years)

RESPONDENT'S KNOWLEDGE OF SNOW LEOPARDS

Q2. Have you heard of the snow leopard/barfila cheetah/safed cheetah/Shin? Yes/ No

Q3. Have you seen a snow leopard? Yes/No Have you seen evidence of a snow leopard? Yes/No (Scat/scrape/pug-mark/kill)

Q4. Which of these do you identify as a snow leopard? (Showing photos of snow leopards along with some other similar-sized felids)

Correct identification/Wrong identification

Q5. Which of these do you identify as signs of a snow leopard? (Showing photos of pug-mark, scat and scrape of snow leopard and of some other similar-sized felids)

Correct identification/Wrong identification

OCCURRENCE OF SNOW LEOPARDS

Q6. Within your areas of knowledge/activity, where have you seen snow leopards or evidence of snow leopards during 2008–2012?

Name of the area (e.g. Chomaling pasture, show on map)

Details about the area (e.g. slope towards south-west of the pasture, nearest village/town)

Year, Month/Season

Q7. Within your areas of knowledge/activity, where have you seen snow leopards or evidence of snow leopards during 1985–1992?

Q8. What evidence have you seen? Direct sighting, scat, scrape, pug-mark, kill

Q9. Where did you see it?

Name of the area (e.g. Chomaling pasture, show on map)

Details about the area (e.g. slope towards south-west of the pasture, nearest village/town)

Year, Month/Season

RESPONDENT'S KNOWLEDGE OF THE SNOW LEOPARD'S PREY BASE

Q10. Are you familiar with

(a) Bharal/nabo? Yes/No

(b) Ibex/Tungrol/Kuras/Meyi? Yes/No

(c) Hangul? Yes/No

(d) *Kastura*/Musk deer/Raush/Bhenda? Yes/No

(e) Tahr/Tehr/Tehrni/Karth/Meyi? Yes/No

(f) Goral/Parj? Yes/No

(g) Serow? Yes/No

(h) Other (Please specify) _____

Q11. How do you know about them?

_____

Q12. Identify those ungulates for which you have answered 'Yes' in the previous question (images of species shown to respondent)

Correctly identified

_____

Could not identify _____

OCCURRENCE OF PREY BASE

Q13. What snow leopard prey species have you seen in your area of knowledge/activity?

(a) _____ (b) _____ (c) _____

(d) _____ (e) _____

Q14. Within your areas of knowledge, where have you seen the above mentioned species during 2008–2012?

Name of the area (e.g. Chomaling pasture, show on map)

Details about the area (e.g. slope towards south-west of the pasture, nearest village/town)

Month/Season when seen

Q15. Were prey species of snow leopard, or evidence of these species, ever seen in the past (1985–1992)?

Yes/No

Q16. Name them:

(a) _____ (b) _____ (c) _____

(d) _____ (e) _____

Q17. What evidence was seen? Direct sighting/kill/footprint/dropping

Q18. Where did you see the species, or evidence of the species? (1985–1992)

Name of the area (e.g. Chomaling pasture, show on map)

Details about the area (e.g. slope towards south-west of the pasture, nearest village/town)

Year, Month/Season

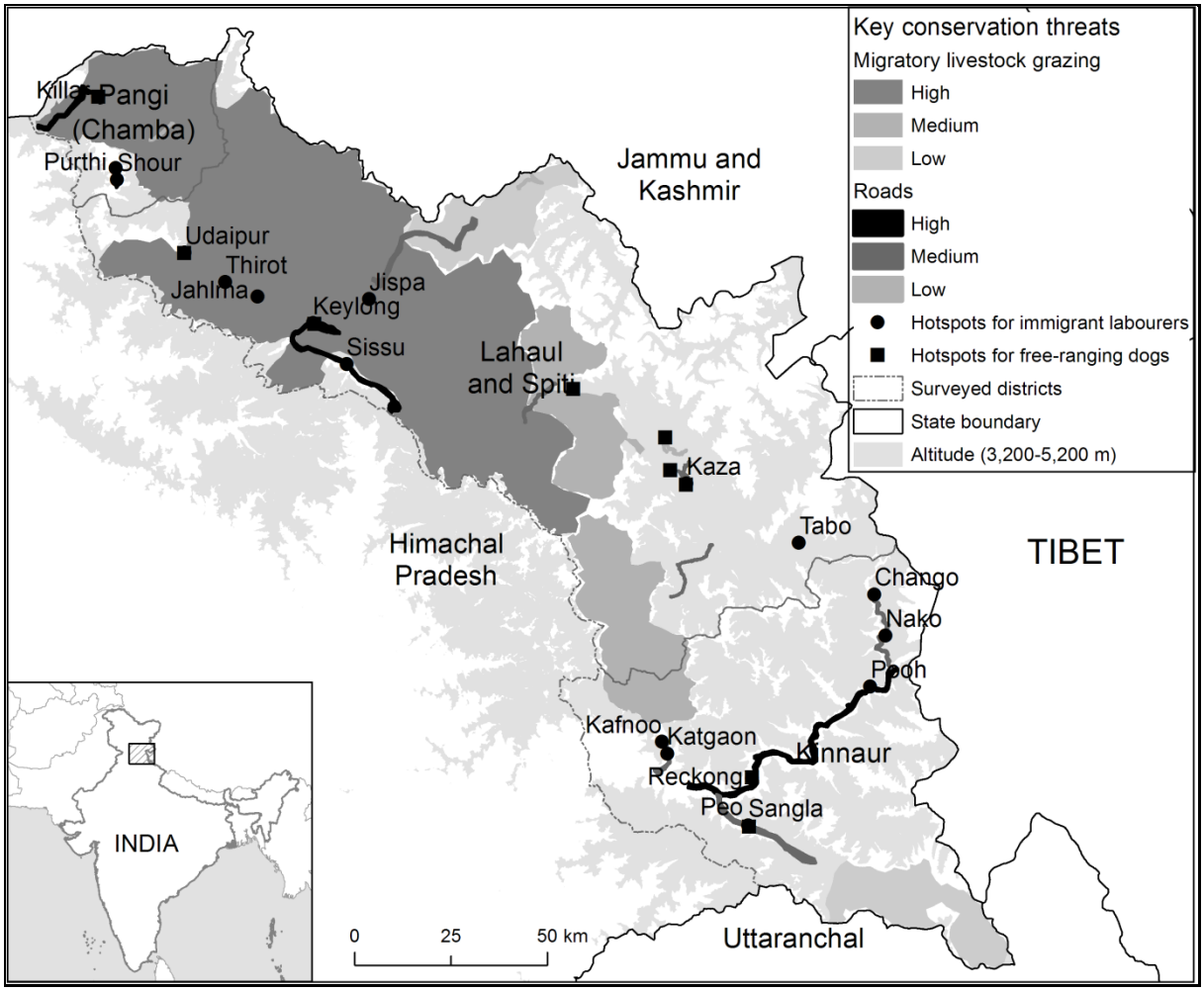


FIG. S1 Key conservation threats across Kinnaur, Lahaul & Spiti, and Pangi in Himachal Pradesh, India.

TABLE S1 Candidate model sets for snow leopards *Panthera uncia*, wild prey, blue sheep *Pseudois nayaur* and Asiatic ibex *Capra sibirica*, in Himachal Pradesh, India (Fig. 1), using single-species multi-season occupancy modelling. The models have been arranged in ascending order of Akaike Information Criteria (AIC).

Models*	AIC	ΔAIC	AIC weight
Snow leopard			
psi1(alt+tri)=psi2(alt+tri),gamma(),p(s+a+f+ts+prof)	819.73	0	0.45
psi1(alt+tri)=psi2(alt+tri),gamma(),p(s+prof)	821.53	1.80	0.18
psi1(alt+tri), psi2(alt+tri),gamma(),p(s+a+f+ts+prof)	821.57	1.84	0.18
psi1(tri), psi2(tri),gamma(),p(s+a+f+ts+prof)	822.76	3.03	0.10
psi1(.), psi2(.), gamma(),p(s+a+f+ts+prof)	823.06	3.33	0.09
psi1(alt+tri), psi2(alt+tri),gamma(),p(s+a+prof)	823.21	3.48	0.00
psi(),gamma(),p(s+a+f+prof)	823.29	3.56	0.00
psi1(alt), psi2(alt+migrh),gamma(),p(s+a+f+ts+prof)	823.31	3.58	0.00
psi1(alt+tri), psi2(alt+tri+migrh),gamma(),p(s+a+f+ts+prof)	823.42	3.69	0.00
psi1(tri), psi2(tri+migrh),gamma(),p(s+a+f+ts+prof)	823.81	4.08	0.00
psi(),gamma(),p(s+a+ts+prof)	824.23	4.50	0.00
psi1(alt), psi2(alt),gamma(),p(s+a+f+ts+prof)	824.60	4.87	0.00
psi(),gamma(),p(s+a+prof)	824.69	4.96	0.00
psi1(tri), psi2(tri+migrh+lspop),gamma(),p(s+a+f+ts+prof)	825.58	5.85	0.00
psi(),gamma(),p(s+prof)	825.83	6.10	0.00
psi(),gamma(),p(s+ts+prof)	826.22	6.49	0.00
psi1(alt+tri), psi2(alt+tri),gamma(),p(s+f+prof)	826.36	6.63	0.00
psi(),gamma(),p(s+f+prof)	827.69	7.96	0.00
psi(),gamma(),p(s+f+ts+prof)	827.87	8.14	0.00
psi(),gamma(),p(prof)	830.37	10.64	0.00
psi1(alt+tri)=psi2(alt+tri),gamma(),p(s+a+f)	850.85	31.12	0.00
psi(),gamma(),p(s+a+f)	855.33	35.60	0.00
psi(),gamma(),p(s+a)	855.89	36.16	0.00
psi(),gamma(),p(s)	856.01	36.28	0.00
psi(),gamma(),p(s+a+f+ts)	857.18	37.45	0.00
psi(),gamma(),p(s+a+ts)	857.63	37.90	0.00
psi(),gamma(),p(s+f)	857.96	38.23	0.00
psi(),gamma(),p(s+ts)	857.97	38.24	0.00
psi(),gamma(),p()	858.98	39.25	0.00
psi1=psi2,gamma(),p()	859.28	39.55	0.00
psi(),gamma(),p(s+f+ts)	859.89	40.16	0.00
Models that did not converge			
psi1(alt+tri)=psi2(alt+tri),gamma(),p(s+a+prof)			
psi1(.), psi2(migrh+lspop),gamma(),p(s+a+f+ts+prof)			

Models*	AIC	ΔAIC	AIC weight
psi1(.), psi2(lspop),gamma(),p(s+a+f+ts+prof)			
psi1(alt+tri), psi2(alt+tri+migrh+lspop),gamma(),p(s+a+f+ts+prof)			
psi1(alt+tri), psi2(alt+tri),gamma(),p(prof)			
psi1(alt+tri), psi2(alt+tri),gamma(),p(s+ts+prof)			
psi1(alt+alt_sq), psi2(alt+alt_sq),gamma(),p(s+a+f+ts+prof)			
psi1(alt+alt_sq+tri), psi2(alt+alt_sq+tri+migrh),gamma(),p(s+a+f+ts+prof)			
psi1(alt+alt_sq), psi2(alt+alt_sq+migrh),gamma(),p(s+a+f+ts+prof)			
psi1(alt+alt_sq+tri), psi2(alt+alt_sq+tri),gamma(),p(s+a+f+ts+prof)			
psi1(alt+alt_sq), psi2(alt+alt_sq+migrh+lspop),gamma(),p(s+a+f+ts+prof)			
psi1(alt+tri)=psi2(alt+tri),gamma(),p(s+a)			
psi1(alt+tri), psi2(alt+tri),gamma(),p(s+a+f+ts)			
psi1(alt+alt_sq+tri), psi2(alt+alt_sq+tri+migrh+lspop),gamma(),p(s+a+f+ts+prof)			
psi1(alt+tri+migrh)=psi2(alt+tri+migrh)gamma(.)p(s+a+f+ts+prof)			
psi1(tri+migrh)=psi2(tri+migrh)gamma(.)p(s+a+f+ts+prof)			
psi1(alt+migrh)=psi2(alt+migrh)gamma(.)p(s+a+f+ts+prof)			
psi1(alt+alt_sq+migrh) = psi2(alt+alt_sq+migrh)gamma(.)p(s+a+f+ts+prof)			
Wild prey			
psi1(alt+alt_sq),psi2(alt+alt_sq),gamma(),p(s+a+f+prof)	1,511.53	0	0.23
psi1(tri),psi2(tri),gamma(),p(s+a+f+prof)	1,512.14	0.61	0.17
psi1(alt+tri),psi2(alt+tri),gamma(),p(s+a+f+prof)	1,512.60	1.07	0.14
psi1(.),psi2(.),gamma(),p(s+a+f+prof)	1,514.10	2.57	0.06
psi1(tri),psi2(tri+migrh),gamma(),p(s+a+f+prof)	1,514.13	2.60	0.06
psi1(alt+tri+ndvi),psi2(alt+tri+ndvi),gamma(),p(s+a+f+prof)	1,514.24	2.71	0.06
psi1(alt+alt_sq+tri),psi2(alt+alt_sq+tri+migrh),gamma(),p(s+a+f+prof)	1,514.44	2.91	0.05
psi1(alt+alt_sq),psi2(alt+alt_sq+migrh),gamma(),p(s+a+prof)	1,514.91	3.38	0.04
psi1(.),psi2(.),gamma(),p(s+a+f+ts+prof)	1,515.33	3.80	0.03
psi1(.),psi2(.),gamma(),p(s+a+prof)	1,515.48	3.95	0.03
psi1(tri)=psi2(tri),gamma(),p(s+a+f+prof)	1,515.55	4.02	0.03
psi1(alt),psi2(alt),gamma(),p(s+a+f+prof)	1,515.56	4.03	0.03
psi1(ndvi),psi2(ndvi),gamma(),p(s+a+f+prof)	1,515.74	4.21	0.03
psi1(.),psi2(.),gamma(),p(s+a+ts+prof)	1,516.47	4.94	0.02
psi1(tri)=psi2(tri),gamma(),p(s+a+prof)	1,516.91	5.38	0.02
psi1(alt),psi2(alt+migrh),gamma(),p(s+a+f+prof)	1,517.41	5.88	0.02
psi1(.),psi2(.),gamma(),p(s+a+f)	1,517.49	5.96	0.01
psi1(.),psi2(.),gamma(),p(s+a+f+ts)	1,519.30	7.77	0.01
psi1(alt+migrh) = psi2(alt+migrh),gamma(),p(s+a+f+prof)	1,519.56	8.03	0.00
psi1(.),psi2(.),gamma(),p(s+a)	1,519.64	8.11	0.00
psi1(tri)=psi2(tri),gamma(),p(s+a)	1,521.09	9.56	0.00
psi1(.),psi2(.),gamma(),p(s+a+ts)	1,521.35	9.82	0.00

Models*	AIC	ΔAIC	AIC weight
psi1(alt+alt_sq),psi2(alt+alt_sq+migrh),gamma(),p(s+prof)	1,523.43	11.90	0.00
psi1(.),psi2(.),gamma(),p(s+f+prof)	1,523.99	12.46	0.00
psi1(.),psi2(.),gamma(),p(s+prof)	1,524.03	12.50	0.00
psi1(.),psi2(.),gamma(),p(s+f+ts+prof)	1,525.60	14.07	0.00
psi1(tri)=psi2(tri),gamma(),p(s+prof)	1,525.68	14.15	0.00
psi1(.),psi2(.),gamma(),p(s+ts+prof)	1,525.95	14.42	0.00
psi1(.),psi2(.),gamma(),p(s)	1,527.08	15.55	0.00
psi1(.),psi2(.),gamma(),p(s+f)	1,527.62	16.09	0.00
psi1(.),psi2(.),gamma(),p(s+ts)	1,529.07	17.54	0.00
psi1(.),psi2(.),gamma(),p(s+f+ts)	1,529.59	18.06	0.00
psi1(.),psi2(.),gamma(),p(prof)	1,536.85	25.32	0.00
psi1(.),psi2(.),gamma(),p()	1,541.94	30.41	0.00
psi1=psi2,gamma(),p()	1,545.55	34.02	0.00

Models that did not converge

psi1(alt+alt_sq),psi2(alt+alt_sq+migrh+lspop),gamma(),p(s+a+f+prof)

psi1(alt+alt_sq+tri+ndvi),psi2(alt+alt_sq+tri+ndvi),gamma(),p(s+a+f+prof)

psi1(alt+alt_sq+tri),psi2(alt+alt_sq+tri+migrh+lspop),gamma(),p(s+a+f+prof)

psi1(alt+tri),psi2(alt+tri+migrh+lspop),gamma(),p(s+a+f+prof)

psi1(alt+tri),psi2(alt+tri+migrh),gamma(),p(s+a+f+prof)

psi1(alt+alt_sq)=psi2(alt+alt_sq),gamma(),p(s+a+f+prof)

psi1(tri),psi2(tri+migrh+lspop),gamma(),p(s+a+f+prof)

psi1(.),psi2(migrh+lspop),gamma(),p(s+a+f+prof)

psi1(alt+alt_sq+tri)=psi2(alt+alt_sq+tri),gamma(),p(s+a+f+prof)

psi1(alt+alt_sq+tri)=psi2(alt+alt_sq+tri),gamma(),p(s+a+prof)

psi1(alt),psi2(alt+migrh+lspop),gamma(),p(s+a+f+prof)

psi1(alt+tri+ndvi),psi2(alt+tri+ndvi+migrh+lspop),gamma(),p(s+a+f+prof)

psi1(alt+alt_sq+tri+ndvi),psi2(alt+alt_sq+tri+ndvi+migrh+lspop),gamma(),p(s+a+f+prof)

psi1(alt+alt_sq+tri)=psi2(alt+alt_sq+tri),gamma(),p(s+a)

psi1(ndvi),psi2(ndvi+migrh+lspop),gamma(),p(s+a+f+prof)

psi1(tri)=psi2(tri),gamma(),p(s)

psi1(alt+alt_sq+migrh) = psi2(alt+alt_sq+migrh),gamma(),p(s+a+f+prof)

psi1(migrh) = psi2(migrh),gamma(),p(s+a+f+prof)

psi1(alt+tri+migrh) = psi2(alt+tri+migrh),gamma(),p(s+a+f+prof)

Blue sheep

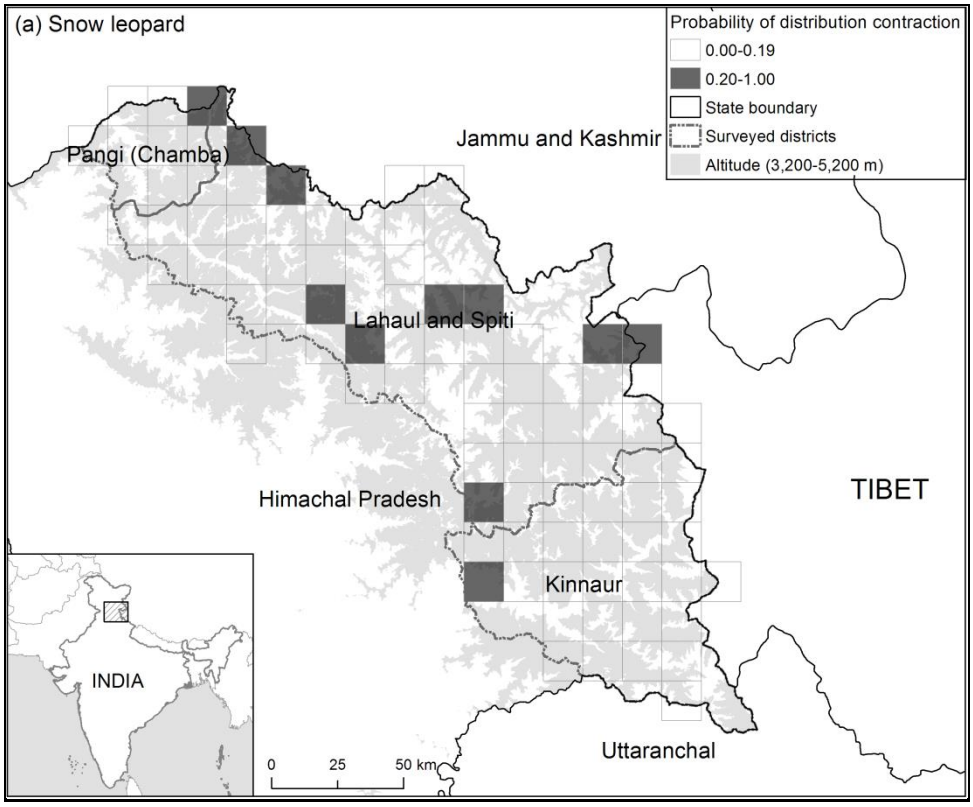
psi1(alt+migrh) = psi2(alt+migrh),gamma(),p(s+a+prof)	726.23	0	0.50
psi1(alt+migrh), psi2(alt+migrh),gamma(),p(s+a+prof)	727.92	1.69	0.22
psi1(alt+tri+migrh) = psi2(alt+tri+migrh),gamma(),p(s+a+prof)	728.22	1.99	0.19
psi1(alt+tri+migrh), psi2(alt+tri+migrh),gamma(),p(s+a+prof)	729.63	3.4	0.09

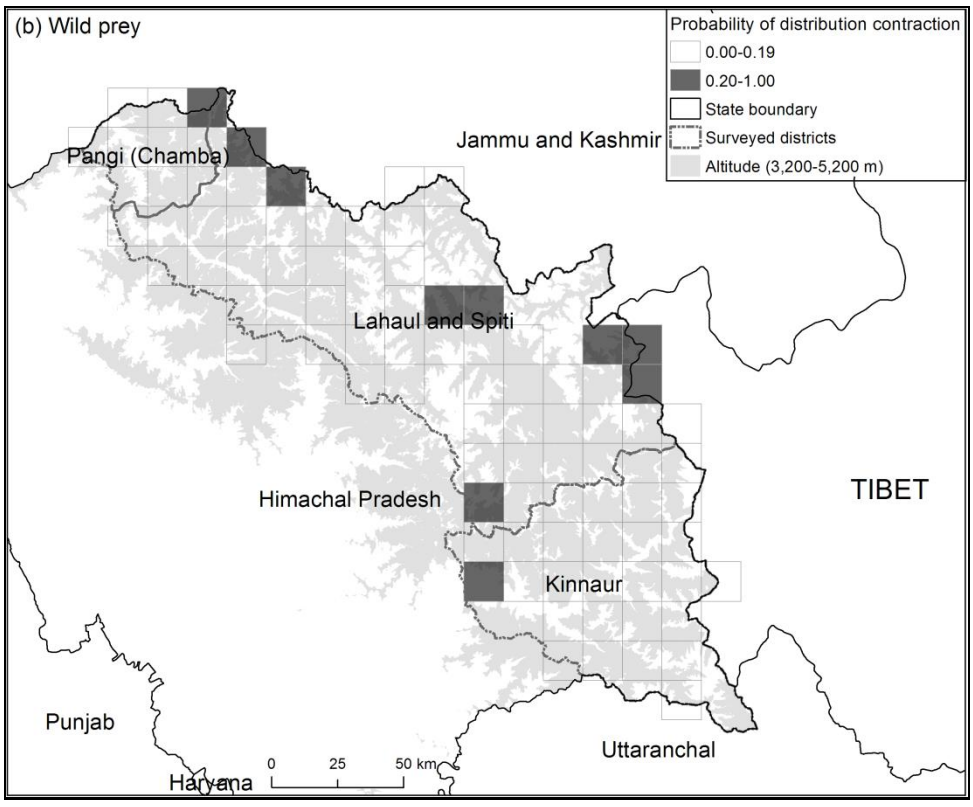
Models*	AIC	ΔAIC	AIC weight
psi1(alt+tri)=psi2(alt+tri),gamma(),p(s+a+prof)	743.45	17.22	0.00
psi1(alt+alt_sq+tri)=psi2(alt+alt_sq+tri),gamma(),p(s+a+prof)	744.74	18.51	0.00
psi1(alt+tri),psi2(alt+tri),gamma(),p(s+a+prof)	745.36	19.13	0.00
psi1(alt+alt_sq+tri),psi2(alt+alt_sq+tri),gamma(),p(s+a+prof)	746.26	20.03	0.00
psi1(tri),psi2(tri),gamma(),p(s+a+prof)	747.09	20.86	0.00
psi1(alt+tri+ndvi),psi2(alt+tri+ndvi),gamma(),p(s+a+prof)	747.23	21	0.00
psi1(alt+alt_sq+tri+ndvi),psi2(alt+alt_sq+tri+ndvi),gamma(),p(s+a+prof)	747.93	21.7	0.00
psi1(.),psi2(.),gamma(),p(s+a+prof)	749.69	23.46	0.00
psi1(.),psi2(.),gamma(),p(s+a+ts+prof)	750.94	24.71	0.00
psi1(alt),psi2(alt),gamma(),p(s+a+prof)	751.56	25.33	0.00
psi1(ndvi),psi2(ndvi),gamma(),p(s+a+prof)	751.68	25.45	0.00
psi1(.),psi2(.),gamma(),p(s+a+f+prof)	751.69	25.46	0.00
psi1(.),psi2(.),gamma(),p(s+a+f+ts+prof)	752.94	26.71	0.00
psi1(alt+alt_sq),psi2(alt+alt_sq),gamma(),p(s+a+prof)	753.29	27.06	0.00
psi1(.),psi2(.),gamma(),p(s+f+prof)	756.21	29.98	0.00
psi1(.),psi2(.),gamma(),p(s+ts+f+prof)	758.14	31.91	0.00
psi1(alt+tri)=psi2(alt+tri),gamma(),p(s+prof)	759.2	32.97	0.00
psi1(alt+alt_sq+tri)=psi2(alt+alt_sq+tri),gamma(),p(s+prof)	760.71	34.48	0.00
psi1(.),psi2(.),gamma(),p(s+prof)	765.52	39.29	0.00
psi1(.),psi2(.),gamma(),p(s+ts+prof)	767.51	41.28	0.00
psi1(alt+tri)=psi2(alt+tri),gamma(),p(s+a)	768.5	42.27	0.00
psi1(alt+alt_sq+tri)=psi2(alt+alt_sq+tri),gamma(),p(s+a)	770.09	43.86	0.00
psi1(.),psi2(.),gamma(),p(s+a)	774.8	48.57	0.00
psi1(.),psi2(.),gamma(),p(s+a+ts)	776.07	49.84	0.00
psi1(.),psi2(.),gamma(),p(s+a+f)	776.75	50.52	0.00
psi1(.),psi2(.),gamma(),p(s+a+f+ts)	778.05	51.82	0.00
psi1(.),psi2(.),gamma(),p(s+f)	778.51	52.28	0.00
psi1(.),psi2(.),gamma(),p(s+f+ts)	780.35	54.12	0.00
psi1(.),psi2(.),gamma(),p(s)	785.14	58.91	0.00
psi1(.),psi2(.),gamma(),p(s+ts)	787.14	60.91	0.00
psi1(.),psi2(.),gamma(),p(prof)	796.22	69.99	0.00
psi1=psi2,gamma(),p()	813.73	87.5	0.00
psi1(.),psi2(.),gamma(),p()	814.43	88.2	0.00
Models that did not converge			
psi1(.)=psi2(migrh),gamma(),p(s+a+prof)			
psi1(.),psi2(migrh),gamma(),p(s+a+prof)			
psi1(alt),psi2(alt+migrh),gamma(),p(s+a+prof)			
psi1(tri),psi2(tri+migrh+lspop),gamma(),p(s+a+prof)			
psi1(alt+alt_sq+tri),psi2(alt+alt_sq+tri+migrh+lspop),gamma(),p(s+a+prof)			
psi1(alt+alt_sq),psi2(alt+alt_sq+migrh+lspop),gamma(),p(s+a+prof)			
psi1(.)=psi2(migrh),gamma(),p(s+prof)			

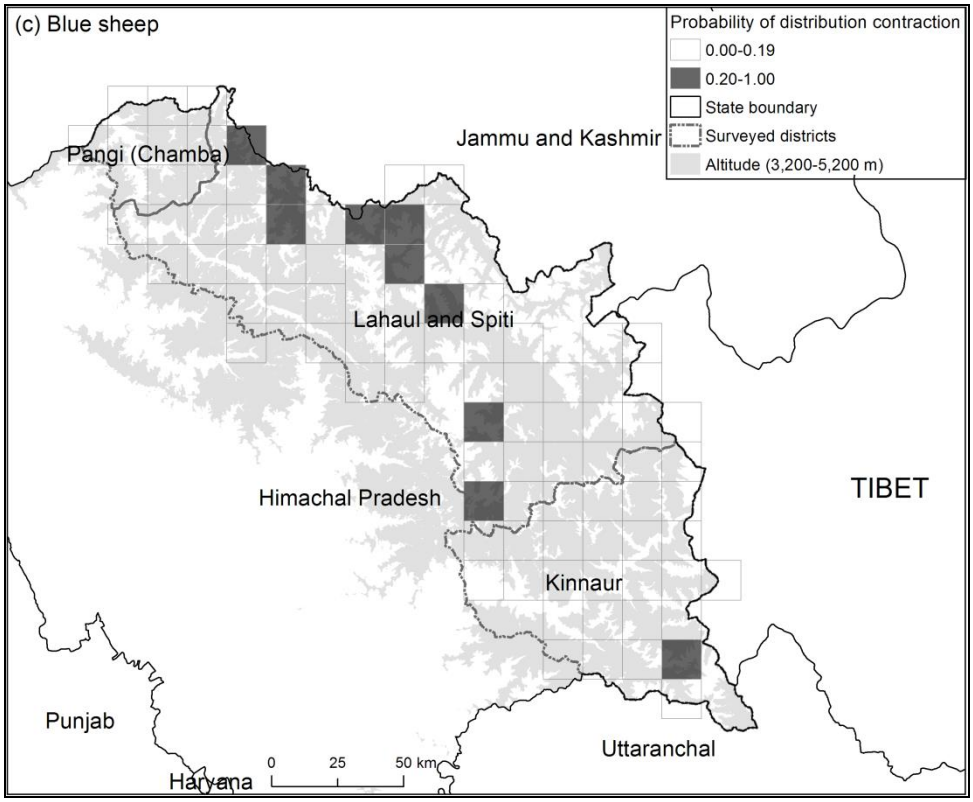
Models*	AIC	ΔAIC	AIC weight
psi1(.)=psi2(migrh),gamma(),p(s+a)			
psi1(tri),psi2(tri+migrh),gamma(),p(s+a+prof)			
psi1(alt+tri),psi2(alt+tri+migrh),gamma(),p(s+a+prof)			
psi1(ndvi),psi2(ndvi+migrh+lspop),gamma(),p(s+a+prof)			
psi1(.),psi2(lspop),gamma(),p(s+a+prof)			
psi1(alt),psi2(alt+migrh+lspop),gamma(),p(s+a+prof)			
psi1(.),psi2(migrh+lspop),gamma(),p(s+a+prof)			
psi1(alt+alt_sq+tri),psi2(alt+alt_sq+tri+migrh),gamma(),p(s+a+prof)			
psi1(alt+tri),psi2(alt+tri+migrh+lspop),gamma(),p(s+a+prof)			
psi1(alt+tri+ndvi),psi2(alt+tri+ndvi+migrh+lspop),gamma(),p(s+a+prof)			
psi1(alt+alt_sq+tri+ndvi),psi2(alt+alt_sq+tri+ndvi+migrh+lspop),gamma(),p(s+a+prof)			
psi1(alt+alt_sq),psi2(alt+alt_sq+migrh),gamma(),p(s+a+prof)			
Asiatic ibex			
psi1(migrh) = psi2(migrh),gamma(),p(s+f)	983.42	0	0.68
psi1(alt+migrh) = psi2(alt+migrh),gamma(),p(s+f)	984.97	1.55	0.32
psi1(.)=psi2(.),gamma(),p(s+f)	1,012.17	28.75	0
psi1(ndvi)=psi2(ndvi),gamma(),p(s+f)	1,013.60	30.18	0
psi1(.), psi2(.),gamma(),p(s+f)	1,014.17	30.75	0
psi1(ndvi), psi2(ndvi),gamma(),p(s+f)	1,015.58	32.16	0
psi1(.), psi2(.),gamma(),p(s+a+f)	1,015.73	32.31	0
psi1(tri), psi2(tri),gamma(),p(s+f)	1,015.79	32.37	0
psi1(.), psi2(.),gamma(),p(s+f+ts)	1,016.07	32.65	0
psi1(alt), psi2(alt),gamma(),p(s+f)	1,016.13	32.71	0
psi1(.), psi2(.),gamma(),p(s+a+f+ts)	1,017.63	34.21	0
psi1(alt+tri), psi2(alt+tri),gamma(),p(s+f)	1,017.66	34.24	0
psi1(.), psi2(.),gamma(),p(s+f+prof)	1,018.05	34.63	0
psi1(.), psi2(.),gamma(),p(s+a)	1,018.40	34.98	0
psi1(alt+tri+ndvi), psi2(alt+tri+ndvi),gamma(),p(s+f)	1,018.58	35.16	0
psi1(.), psi2(.),gamma(),p(s+a+f+prof)	1,019.60	36.18	0
psi1(.), psi2(.),gamma(),p(s+f+ts+prof)	1,019.89	36.47	0
psi1(.), psi2(.),gamma(),p(s+a+ts)	1,019.99	36.57	0
psi1(.), psi2(.),gamma(),p(s+a+f+ts+prof)	1,021.42	38	0
psi1(.), psi2(.),gamma(),p(s+a+prof)	1,022.05	38.63	0
psi1(alt+alt_sq+tri+ndvi), psi2(alt+alt_sq+tri+ndvi+migrh+lspop),gamma(),p(s+f)	1,022.58	39.16	0
psi1(.), psi2(.),gamma(),p(s+a+ts+prof)	1,023.38	39.96	0
psi1(alt+tri), psi2(alt+tri+migrh+lspop),gamma(),p(s+f)	1,023.96	40.54	0
psi1(.)=psi2(.),gamma(),p(s)	1,027.70	44.28	0
psi1(ndvi)=psi2(ndvi),gamma(),p(s)	1,029.02	45.6	0
psi1(.), psi2(.),gamma(),p(s)	1,029.69	46.27	0
psi1(.), psi2(.),gamma(),p(s+ts)	1,029.89	46.47	0

Models*	AIC	ΔAIC	AIC weight
psi1(.), psi2(.),gamma(),p(s+ts+prof)	1,032.52	49.1	0
psi1(.), psi2(.),gamma(),p(s+prof)	1,033.02	49.6	0
psi1(.), psi2(.),gamma(),p()	1,077.96	94.54	0
psi1(.), psi2(.),gamma(),p(prof)	1,081.22	97.8	0
psi1=psi2,gamma(),p()	1,083.12	99.7	0
Models that did not converge			
psi1(alt), psi2(alt+migrh+lspop),gamma(),p(s+f)			
psi1(alt+tri+ndvi)psi2(alt+tri+ndvi+migrh+Lspop)gamma(.)p(s+f)			
psi1(alt+alt_sq+tri+ndvi)psi2(alt+alt_sq+tri+ndvi)gamma(.)p(s+f)			
psi1(alt+alt_sq+tri)psi2(alt+alt_sq+tri)gamma(.)p(s+f)			
psi1(alt+alt_sq)psi2(alt+alt_sq)gamma(.)p(s+f)			
psi1(.)psi2(migrh+lspop)gamma(.)p(s+f)			
psi1(.)psi2(migrh)gamma(.)p(s+f)			
psi1(.)psi2(lspop)gamma(.)p(s+f)			
psi1(alt+alt_sq+tri)psi2(alt+alt_sq+tri+migrh+Lspop)gamma(.)p(s+f)			
psi1(alt+alt_sq)psi2(alt+alt_sq+migrh+Lspop)gamma(.)p(s+f)			
psi1(alt)psi2(alt+migrh+lspop)gamma(.)p(s+f)			
psi1(tri)psi2(tri+migrh+lspop)gamma(.)p(s+f)			
psi1(ndvi)psi2(ndvi+migrh+lspop)gamma(.)p(s+f)			
psi1(alt+alt_sq+tri)psi2(alt+alt_sq+tri+migrh)gamma(.)p(s+f)			
psi1(alt+tri)psi2(alt+tri+migrh)gamma(.)p(s+f)			
psi1(alt+alt_sq)psi2(alt+alt_sq+migrh)gamma(.)p(s+f)			
psi1(alt)psi2(alt+migrh)gamma(.)p(s+f)			
psi1(tri)psi2(tri+migrh)gamma(.)p(s+f)			
psi1(tri+migrh)=psi2(tri+migrh)gamma(.)p(s+f)			
psi1(alt+alt_sq+migrh)=psi2(alt+alt_sq+migrh)gamma(.)p(s+f)			
psi1(alt+tri+migrh)=psi2(alt+tri+migrh)gamma(.)p(s+f)			
psi1(alt+migrh), psi2(alt+migrh),gamma(),p(s+f)			

*psi1, past occupancy; psi2, recent occupancy; gamma, probability of distribution expansion; p, detection probability; Site covariates: alt, mean altitude in a grid; alt_sq, altitude squared (quadratic function); tri, proportion of rugged area in a grid, derived from terrain ruggedness index; ndvi, proportion of vegetated area in a grid, derived from normalized difference vegetation index; migrh, presence/absence of migratory livestock grazing in a grid; lspop, relative abundance of livestock in a grid; survey covariates: s, time lapse/seasonality; a, age of a respondent; f, respondents' familiarity of area of knowledge; ts, time spent by a respondent in area of knowledge per year; prof1, sedentary profession (e.g. office worker); prof2, sedentary and partially outdoor profession (e.g. forest guard); prof3, completely outdoor profession (e.g. herder, hunter)


(a) Snow leopard
Probability of distribution contraction
0.00-0.19
0.20-1.00
State boundary
Surveyed districts
Altitude (3,200-5,200 m)
Jammu and Kashmir
Pangi (Chamba)
Lahaul and Spiti
Himachal Pradesh
TIBET
Kinnaur
INDIA
Uttaranchal
0
25
50 km


(b) Wild prey
Probability of distribution contraction
0.00-0.19
0.20-1.00
State boundary
Surveyed districts
Altitude (3,200-5,200 m)
Jammu and Kashmir
Pangi (Chamba)
Lahaul and Spiti
Himachal Pradesh
TIBET
Kinnaur
Punjab
Haryana
Uttaranchal
0
25
50 km



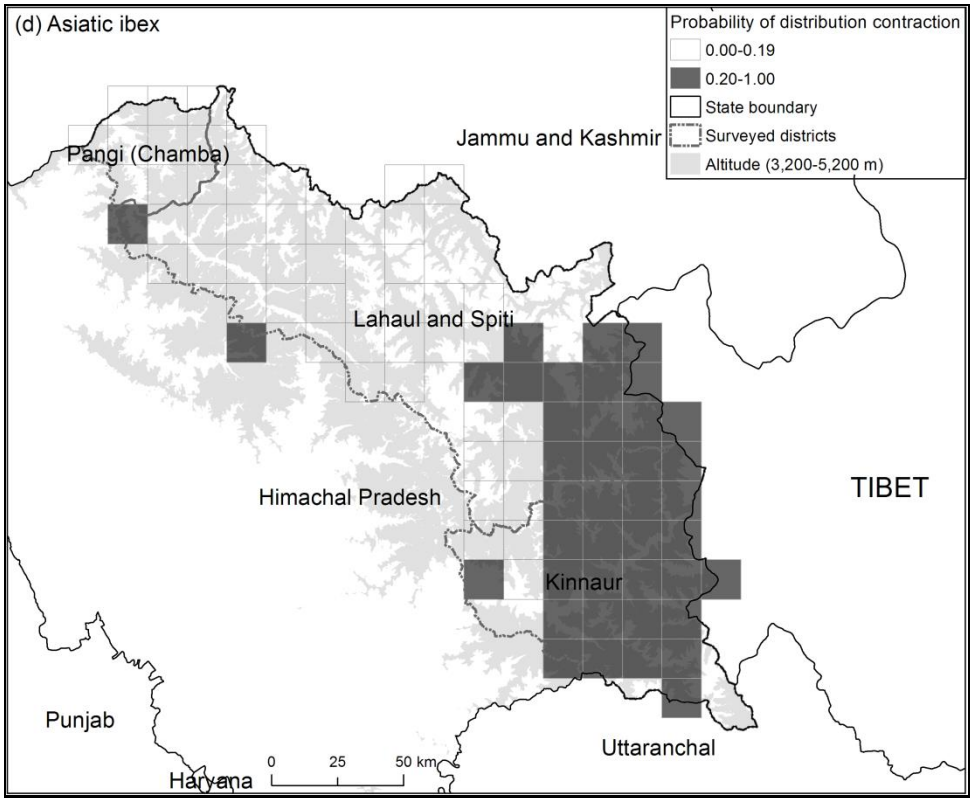


FIG. S2 Probability of distribution contraction for (a) snow leopards, (b) wild prey, (c) blue sheep and (d) Asiatic ibex in the Greater and Trans-Himalayan mountains of Himachal Pradesh, India.