Short Note

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New data on the distribution and natural history of the lesser grison (*Galictis cuja*), hog-nosed skunk (*Conepatus chinga*), and culpeo (*Lycalopex culpaeus*) in northwestern Argentina

Abstract: We present a total of 190 new distribution records of three little-known mammalian carnivores (*Conepatus chinga*, *Galictis cuja*, and *Lycalopex culpaeus*) obtained using camera trap techniques and direct observation in the highlands of Jujuy province, northwestern Argentina. These new records extend the present known distributions of these three species to the west of the province and to higher altitudes, and provide additional information on habitat association and activity patterns.

Keywords: Andes; *Conepatus chinga*; distribution; *Galictis cuja*; *Lycalopex culpaeus*.

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Although many members of the mammalian carnivore order are among the most iconic and studied animals, some species have received little study, and basic information such as geographic distributions are still uncertain (Collen et al. 2004), especially in developing countries (Boitani and Powell 2012). The Molina's hog-nosed skunk *Conepatus chinga* (Molina, 1782; hog-nosed skunk, henceforward) is a small (1–3 kg) mephitid, with a black and white coat pattern typical of many members of this carnivore family and morphologically adapted to find and dig for invertebrate prey. The lesser grison, *Galictis cuja* (Molina, 1782), is a small (1–2.5 kg) mustelid, with gray-yellowish upperparts, and black face and underparts. Both *C. chinga* and *G. cuja* occur in southern Peru, Bolivia, Paraguay, southern Brazil, Uruguay, Chile, and Argentina (Redford and Eisenberg 1992). With a maximum body mass of 13.8 kg, the culpeo *Lycalopex culpaeus* (Molina, 1782) is the largest South American fox. It is distributed along the Andes from southern Colombia to southernmost South America (Redford and Eisenberg 1992). Although these three species have been listed as Least Concern by the International Union for Conservation of Nature (2012), there is a lack of detailed information on their distributions and habitat associations that makes a proper categorization of their conservation status difficult.

We report here new records for these three carnivores and provide ancillary data on habitat associations and activity patterns for the highlands of northwestern Argentina.

The study area was the Greater Vilama in the western part of the Argentinean province of Jujuy (approximately 22°30″ S, 66°30″ W), near the borders with Chile and Bolivia. The area has an average altitude of 4200 m above sea level and forms part of the arid biogeographic regions of Puna and High Andes (Cabrera 1976). The topography is broken, with many canyons and steep cliffs. The vegetation is very sparse and formed by a mixture of grasslands (mostly *Stipa* and *Festuca*) and scrublands dominated by *Prastrephia* spp. and *Fabiana* spp. The annual rainfall varies between 100 and 200 mm and is concentrated in summer (January and February) (Cajal 1998). Owing to the elevation, daily thermal excursions are extreme and the temperature can range from 35°C during the day to -15°C at night.

During six survey periods, between 2005 and 2012 (total sampling effort of 16,143 trap days), we took 7 photographs of lesser grisons, 20 of hog-nosed skunks, and 146 of culpeos. Because of malfunctions, some cameras

did not record the picture date and time. In these cases, we assigned the photo times to one of four categories (day, sunset, night, and sunrise) based on ambient light and shadows to study activity patterns. During fieldwork, we also sighted two lesser grisons, one hog-nosed skunk, and nine culpeos. Additionally, one hog-nosed skunk and four culpeo carcasses were recorded (see Appendix I for the geographical coordinates of records).

Considering all the sources of data, the ranges of altitudes were 3874–4161 m above sea level for the lesser grison, 3874–4329 m for the hog-nosed skunk, and 3570–4645 m for the culpeo.

The lesser grison was mostly recorded in scrubland habitats (71.4% of photographs; Table 1). For hog-nosed skunks, no clear habitat association was recorded; however, this was the only species documented in grassland habitats (Table 1). Culpeos appeared to prefer rocky areas (67.8% of photos) but they also used scrublands, as reported by Redford and Eisenberg (1992) (Table 1). All the photographs of hog-nosed skunks were taken at night, which agrees with the nocturnal habits described for this species (Donadio et al. 2001, Lucherini et al. 2009). Conversely, all the photographs and observations of lesser grisons were during daylight hours despite being described as cathemeral (Nowak 2005). Two lesser grison individuals were seen together, which is in agreement with other sightings reported by Jayat et al. (1999) and the suggestion that these mustelids may form monogamous pairs (Nowak 2005). Because culpeos showed more variability in their activity patterns and because our sample size was greater than for the other species, we analyzed it in more detail (Figure 1). Culpeo activity was largely nocturnal, and this was the only period of the day when the proportion of records exceeded that expected on the basis of availability (Figure 1). This pattern resembles that reported for the High Andes by Lucherini et al. (2009).

The new locations that we report in this study for different ecosystems extend both altitudinally (*Galictis cuja*: 420 m, *Conepatus chinga:* 829 m; *Lycalopex culpaeus*: 727 m) and to the west (*G. cuja*: 100 km; *C. chinga*: 60 km, and *L. culpaeus*: 80 km), the known distribution of these carnivores in the province of Jujuy.

Table 1 Percentages of photos of each species in each habitat type (sample sizes in parentheses).

	Rocky areas	Scrubland	Grassland
Galictis cuja (n=7)	28.6	71.4	0
Conepatus chinga (n=20)	50	45	5
Lycalopex culpaeus (n=146)	67.8	32.2	0

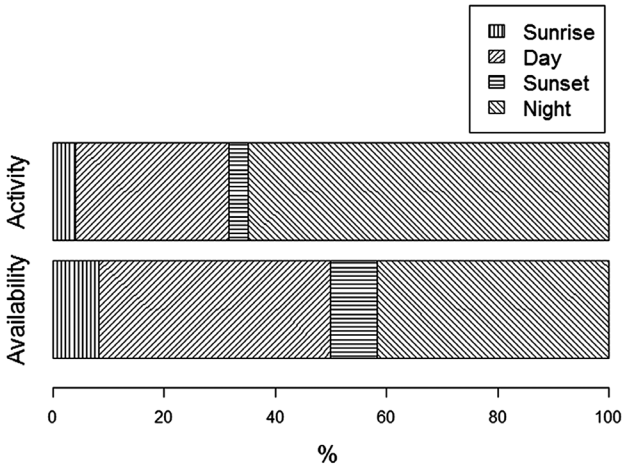

Figure 1 Daily activity patterns of culpeos as proportions of pictures recorded in four time categories (Activity) compared to the duration of each category (Availability).

Although it is clear that more studies are needed to understand the ecology of these three species (particularly *Conepatus chinga* and *Galictis cuja*) in this region, and that our conclusions should be interpreted with caution given the low sample number, the information reported here suggests the presence of niche segregation among them.

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Appendix I Coordinates, altitude (meters above sea level), type of evidence, and time and date of collection for the new locations of three carnivore species in the highlands of northwestern Argentina. Because of camera malfunctioning, some of the records lacked time or date. In those cases, date is reported as a period (e.g., 1-Aug/15-Aug-01 means that the photograph was taken between August 1 and August 15, 2001) and time was assigned to one of four categories (day, night, sunrise, and sunset) based on ambient light and shadows.

Species	UTM zone	xUTM	yUTM	Altitude (m)	Type of evidence	Time	Date
Galictis cuja	19K	757088	7518364	3874	Photo	18:01	5-Oct-09
	19K	763434	7510930	3944	Photo	17:04	3-Nov-09
	19K	757072	7510621	4161	Photo	15:12	30-Nov-09
	19K	759795	7511249	4125	Photo	16:01	26-Nov/18-Dec-09
	19K	754963	7516835	3947	Photo	11:19	5-Sep-11
	19K	758193	7515696	3907	Photo	16:55	7-Jul-11
	19K	770200	7520611	3954	Photo	09:46	10-Jun-11
	19K	768290	7517054	3947	Sighting	Day	3-Jul-05
	19K	775327	7506426	4060	Sighting	Day	20-Nov-06
Conepatus chinga	19K	768084	7510688	4173	Photo	03:25	25-Sep-09
	19K	756047	7508457	4318	Photo	01:08	2-Oct-09
	19K	756047	7508457	4318	Photo	05:45	1-Oct-09
	19K	768868	7511271	4144	Photo	23:19	15-Sep-12
	19K	768868	7511271	4144	Photo	04:04	10-Jun-12
	19K	768868	7511271	4144	Photo	00:26	15-Sep-12
	19K	758193	7515696	3907	Photo	23:35	13-Jul-12
	19K	758193	7515696	3907	Photo	05:09	14-Jul-12
	19K	758193	7515696	3907	Photo	02:44	17-Jul-12
	19K	758193	7515696	3907	Photo	21:56	14-Aug-12
	19K	758193	7515696	3907	Photo	21:58	28-Sep-12
	19K	755641	7510338	4326	Photo	04:04	10-Jun-12
	19K	757088	7518364	3874	Photo	22:57	21-May-11
	19K	757088	7518364	3874	Photo	05:07	13-Oct-12
	19K	757088	7518364	3874	Photo	23:34	22-Oct-12
	19K	757088	7518364	3874	Photo	22:49	15-Jun-12
	19K	757088	7518364	3874	Photo	00:31	14-Jul-12
	19K	757088	7518364	3874	Photo	22:35	2-Sep-11
	19K	740778	7527825	4329	Photo	21:24	3-Jun-07
	19K	775202	7445085	3997	Photo	20:52	23-Nov-08
	19K	779459	7507374	4317	Sighting	Day	4-Jun-07
	19K	760291	7506608	4089	Carcass	...	14-Jun-07
Lycalopex culpaeus	19K	741836	7515115	4450	Carcass	...	1-Oct-07
	19K	756013	7509260	7179	Carcass	...	17-May-07
	19K	755106	7507244	4375	Carcass	...	22-May-07
	19K	757610	7507927	4234	Carcass	...	15-Jun-07
	19K	738711	7537889	4622	Photo	Night	18-Oct/31-Oct-05
	19K	738711	7537889	4622	Photo	Night	18-Oct/31-Oct-05
	19K	738711	7537889	4622	Photo	Night	18-Oct/31-Oct-05
	19K	739891	7537147	4630	Photo	Night	18-Oct/31-Oct-05
	19K	755368	7508283	4228	Photo	Night	8-Oct/17-Oct-05
	19K	761376	7508394	4065	Photo	20:25	30-Oct-12
	19K	761376	7508394	4065	Photo	21:48	25-Jun-12
	19K	761376	7508394	4065	Photo	13:57	30-Jun-12
	19K	761376	7508394	4065	Photo	09:16	2-Jul-12
	19K	761376	7508394	4065	Photo	21:29	20-Jul-12
	19K	758964	7510542	4184	Photo	Night	14-Nov/30-Nov-05
	19K	758481	7510329	4146	Photo	Night	14-Nov/30-Nov-05
	19K	741567	7518300	4444	Photo	03:38	11-Dec-07
	19K	737714	7514579	4645	Photo	22:57	20-Nov-07
	19K	737862	7517104	4521	Photo	20:31	5-Nov-07
	19K	742156	7517420	4415	Photo	20:03	6-Nov-07
	19K	739931	7517116	4447	Photo	03:10	19-Oct-07

(**Appendix I** Continued)

Species	UTM zone	xUTM	yUTM	Altitude (m)	Type of evidence	Time	Date
	19K	739931	7517116	4447	Photo	02:35	19-Oct-07
	19K	739931	7517116	4447	Photo	22:16	18-Oct-07
	19K	739931	7517116	4447	Photo	22:20	19-Oct-07
	19K	771312	7514133	4234	Photo	00:09	6-May-11
	19K	778199	7446534	3894	Photo	09:58	8-Nov-08
	19K	754770	7506526	4610	Photo	20:25	30-Oct-12
	19K	754770	7506526	4610	Photo	21:48	25-Jun-12
	19K	754770	7506526	4610	Photo	13:57	30-Jun-12
	19K	754770	7506526	4610	Photo	09:16	2-Jul-12
	19K	754770	7506526	4610	Photo	21:29	20-Jul-12
	19K	754770	7506526	4610	Photo	05:00	11-Nov-12
	19K	754770	7506526	4610	Photo	03:58	20-Jul-12
	19K	778299	7445521	3877	Photo	16:56	6-Nov-08
	19K	777451	7444621	4001	Photo	20:51	4-Nov-08
	19K	780464	7445985	3852	Photo	Day	5-Nov/16-Nov-08
	19K	768131	7516369	3986	Photo	13:27	12-Dec-08
	19K	773514	7446287	4048	Photo	21:37	10-Dec-08
	19K	773514	7446287	4048	Photo	20:28	9-Dec-08
	19K	773514	7446287	4048	Photo	04:11	16-Dec-08
	19K	773514	7446287	4048	Photo	22:56	12-Dec-08
	19K	773514	7446287	4048	Photo	11:31	14-Nov-08
	19K	772770	7445847	4061	Photo	Night	17-Nov-08
	19K	778775	7444050	3831	Photo	21:26	6-Dec-08
	19K	778775	7444050	3831	Photo	23:48	21-Nov-08
	19K	778775	7444050	3831	Photo	11:42	10-Dec/17-Dec-08
	19K	777166	7446001	3893	Photo	13:27	12-Dec-08
	19K	759475	7514951	2876	Photo	21:50	20-Nov-09
	19K	756047	7508457	4318	Photo	17:03	19-Nov-09
	19K	763029	7515247	3869	Photo	Night	21-Sep/21-Oct-09
	19K	757088	7518364	3874	Photo	22:36	25-Sep-09
	19K	757088	7518364	3874	Photo	01:59	28-Sep-09
	19K	762045	7510741	4144	Photo	Night	27-Sep/18-Oct-09
	19K	768121	7516185	4007	Photo	23:20	18-Oct-09
	19K	765248	7519722	3828	Photo	06:18	25-Oct-09
	19K	772343	7513188	3967	Photo	20:57	19-Oct-09
	19K	764463	7516041	3843	Photo	02:35	14-Oct-09
	19K	758986	7508641	4129	Photo	18:09	16-Nov-09
	19K	757072	7510621	4161	Photo	06:51	20-Nov-09
	19K	757606	7511560	4121	Photo	22:51	15-Nov-09
	19K	757606	7511560	4121	Photo	18:04	19-Nov-09
	19K	757606	7511560	4121	Photo	20:20	30-Nov-09
	19K	757606	7511560	4121	Photo	21:18	5-Dec-09
	19K	757038	7518249	3883	Photo	03:04	22-Jun-11
	19K	755988	7508335	4318	Photo	23:49	26-May-11
	19K	755988	7508335	4318	Photo	11:04	11-Jun-11
	19K	755988	7508335	4318	Photo	21:46	11-Jun-11
	19K	755988	7508335	4318	Photo	16:00	13-Jun-11
	19K	757988	7509670	4234	Photo	05:11	13-Jun-11
	19K	771481	7510330	4139	Photo	05:07	29-Jun-11
	19K	771481	7510330	4139	Photo	23:52	15-Jul-12
	19K	771481	7510330	4139	Photo	19:21	21-Aug-12
	19K	771481	7510330	4139	Photo	00:26	18-Jun-11
	19K	771481	7510330	4139	Photo	23:01	15-Jul-11
	19K	771481	7510330	4139	Photo	06:05	8-Aug-11
	19K	771481	7510330	4139	Photo	11:07	22-Aug-11
	19K	765653	7510998	3942	Photo	06:40	6-Nov-11

(**Appendix I** Continued)

Species	UTM zone	xUTM	yUTM	Altitude (m)	Type of evidence	Time	Date
	19K	765653	7510998	3942	Photo	14:55	19-Nov-11
	19K	765653	7510998	3942	Photo	18:13	26-Nov-11
	19K	765653	7510998	3942	Photo	19:50	2-Dec-11
	19K	765653	7510998	3942	Photo	23:06	9-Dec-11
	19K	759420	7514821	2876	Photo	Day	7-Aug/19-Oct-11
	19K	759420	7514821	2876	Photo	Night	26-Jun-11
	19K	759420	7514821	2876	Photo	Day	3-Dec-11
	19K	755641	7510338	4326	Photo	22:34	3-Aug-11
	19K	755641	7510338	4326	Photo	23:20	23-Sep-11
	19K	760398	7506731	4098	Photo	22:06	14-Oct-11
	19K	761992	7510563	4149	Photo	Night	11-Jul/13-Aug -11
	19K	757890	7514252	4030	Photo	Night	10-Oct-11
	19K	757890	7514252	4030	Photo	Night	12-Oct-11
	19K	757890	7514252	4030	Photo	Night	6-Nov-11
	19K	757890	7514252	4030	Photo	Night	19-Nov-11
	19K	768068	7516057	4149	Photo	16:43	7-Oct-11
	19K	768068	7516057	4149	Photo	17:55	6-Oct-11
	19K	764047	7513023	3969	Photo	Night	25-Oct/11-Dec-11
	19K	757945	7509589	4232	Photo	10:43	15-Jun-12
	19K	757945	7509589	4232	Photo	19:18	24-Jun-12
	19K	757945	7509589	4232	Photo	01:11	1-Jul-12
	19K	757945	7509589	4232	Photo	23:00	10-Jul-12
	19K	757945	7509589	4232	Photo	19:56	22-Jul-12
	19K	757945	7509589	4232	Photo	04:07	3-Aug-12
	19K	758193	7515696	3907	Photo	15:13	26-Aug-12
	19K	758193	7515696	3907	Photo	12:02	2-Sep-12
	19K	758193	7515696	3907	Photo	14:28	28-Nov-11
	19K	754963	7516835	3947	Photo	23:19	5-Sep-12
	19K	754963	7516835	3947	Photo	21:14	1-Jun-11
	19K	770446	7511645	4215	Photo	06:12	31-Jun/21-Jul-11
	19K	770446	7511645	4215	Photo	Day	26-Aug-11
	19K	760732	7513794	3920	Photo	Day	7-Jun/26-Jun-11
	19K	756158	7520565	3928	Photo	09:36	7-Jun/26-Jun-11
	19K	760732	7513794	3920	Photo	Night	26-Jun/27-Jul-11
	19K	770200	7520611	3954	Photo	20:34	11-Jun-11
	19K	770200	7520611	3954	Photo	16:38	2-Jul-11
	19K	770200	7520611	3954	Photo	16:29	12-Jul-11
	19K	760161	7509227	4134	Photo	11:06	12-Jul-11
	19K	760161	7509227	4134	Photo	10:07	23-Jul-11
	19K	753211	7510355	4102	Photo	20:41	30-Sep-11
	19K	753211	7510355	4102	Photo	10:13	11-Oct-11
	19K	753211	7510355	4102	Photo	23:40	14-Oct-11
	19K	753211	7510355	4102	Photo	10:01	6-Nov-11
	19K	753211	7510355	4102	Photo	06:08	22-Nov-11
	19K	753211	7510355	4102	Photo	09:31	23-Nov-11
	19K	758880	7508151	4185	Photo	16:47	24-Oct-12
	19K	758880	7508151	4185	Photo	20:14	2-Nov-12
	19K	754131	7507552	4381	Photo	00:54	9-Nov-06
	19K	754131	7507552	4381	Photo	06:53	15-Nov-06
	19K	754131	7507552	4381	Photo	00:14	9-Dec-06
	19K	754131	7507552	4381	Photo	Night	20-Oct-09
	19K	754131	7507552	4381	Photo	Night	10-Oct-09
	19K	754131	7507552	4381	Photo	Night	27-Oct/21-Nov-06
	19K	756206	7509421	4142	Photo	Night	11-Nov-06
	19K	798732	7579841	4236	Photo	Night	28-Feb-05
	19K	759015	7509980	4210	Photo	02:23	27-Apr-07

(**Appendix I** Continued)

Species	UTM zone	xUTM	yUTM	Altitude (m)	Type of evidence	Time	Date
	19K	759902	7511465	4113	Photo	Night	15-Jun/21-Jun-05
	19K	759902	7511465	4113	Photo	Day	27-Jun/01-Jun-05
	19K	759902	7511465	4113	Photo	Night	21-Jun/27-Jun-05
	19K	759902	7511465	4113	Photo	19:23	22-May-07
	19K	757160	7508470	4205	Photo	21:03	27-May-07
	19K	759010	7507820	4172	Photo	05:08	2-May-07
	19K	754215	7507481	4382	Photo	18:42	29-May-07
	19K	754689	7509142	4228	Photo	Night	24-Apr-07
	19K	760120	7506722	4110	Photo	21:18	27-Apr-07
	19K	757305	7507212	4430	Photo	19:47	20-May/6-Jun-07
	19K	757305	7507212	4430	Photo	19:55	20-May/6-Jun-07
	19K	770743	7516616	4254	Photo	05:27	23-Jul-12
	19K	770743	7516616	4254	Photo	23:52	15-Jul-12
	19K	770743	7516616	4254	Photo	02:13	3-Jul-12
	19K	770743	7516616	4254	Photo	09:26	22-Aug-12
	19K	758555	7511132	4053	Photo	07:05	26-Apr-07
	19K	758555	7511132	4053	Photo	00:38	5-May-07
	19K	737893	7517479	4495	Sighting	Day	1-May-09
	19K	757566	7508554	4165	Sighting	Day	29-Apr-07
	19K	757900	7508543	4150	Sighting	Day	2-May-07
	19K	759905	7509187	4122	Sighting	Day	6-Jun-07
	19K	723639	7511190	4737	Sighting	Day	9-May-06
	19K	757669	7507805	4003	Sighting	Day	1-Sep-12
	19K	770743	7516616	4236	Sighting	Day	7-Jun-12
	19K	781267	7510273	4256	Sighting	Day	24-Jun-12
	20k	191783	7511630	3570	Sighting	Day	1-May-12

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