Supplementary Materials and Methods

Study site

This study was conducted in the Silaluo region (N27°48′, E98°20′) of the Drung River Valley, Gongshan County, Yunnan, China. This valley runs adjacent to Chayu in Tibet to the north, and Kachin State in Myanmar to the south and west. The Gaoligongshan and Dandanglika mountains are located to the east and west of the river, respectively. These mountains descend from north to south and are characterized by steep elevational drops (4 000 m maximum) (Li et al., 2015).

Due to the influence of the southwest monsoon and specific topographic features of the region, the climate of the Drung River Basin is mild, with an average temperature of 14.5 °C during 2010–2012. The highest average temperature was recorded in August (21.6 °C) and the lowest average temperature was recorded in January (6.6 °C) (Li et al., 2015). Relative monthly humidity ranged from 82% to 88%, with a mean of 85.2%. Annual mean precipitation was 2 745.1 mm and 94.1% of rainfall occurred between February and October, with a peak in March–April and June–September, respectively (Li et al., 2015). According to He & Li (1996), the Drung River Valley features dense forests and remarkable vertical zonation of vegetation: from low to high elevation, the vegetation includes monsoon evergreen broadleaf forest (1 500 m–2 400 m), mixed broadleaf-conifer forest (2 400 m–2 800 m), cold temperate coniferous forest (2 800 m–3 000 m), frigid-temperate coniferous forest (3 000 m–3 700 m), and alpine scrub and meadows (>3 700 m).

Study subjects

In total, ~19 groups of *T. shortridgei* comprising 250–370 individuals reside in the Drung River Valley, Yunnan, China (Cui et al., 2016). We conducted observations in the Silaluo area in the middle part of the Drung River Valley, which has a relatively high population density of langurs (around 16.0–16.8 individuals per km^2) and better observation conditions than other areas. After one month of preliminary observation in July 2012, behavioral data collection occurred from August 2012 (except December) to September 2013 (without July due to heavy rains and fog). The study subjects included a total of five one male-multi female groups that ranged from 1 700 m to 2 300 m a.s.l. These groups contained one adult male, 2–3 adult females, and 3–5 offspring, ranging in size from 7 to 9 individuals for a study total of 39–41 individuals (Li et al., 2015).

Data collection

All groups were restricted to the forests east of the Drung River. There is a road (about 1 500 m a.s.l.) west of the river and a steel cable for crossing, but no bridge. Due to the deep gully landscape and dense forests, we were only able to conduct observations along the road, rather than directly following the groups. The groups did not react to observers, local people, or vehicles present on the road. We tracked the langurs every day from 0700–1930 h and observed their feeding behavior at a distance of 60–800 m with a monocular telescope (Leica Televid 77, 8×42, Germany). We observed one group of langurs until they moved across the ridge and disappeared from sight, and then looked for another focal group. We did not witness any human disturbances influencing the langurs' range use, or other large animals competing with the langurs for food, shelter, or other resources. Dietary data were collected for different age-sex classes – i.e., adult males and females, juveniles, and infants older than six months (identified by their silver coats) – using scan sampling at 10 min intervals (Altmann, 1974). The age-sex classes were categorized according to body size and color, and other morphological features such as chopped tail, whiskers, and nipples (see Li et al., 2015). When the langurs were feeding, we recorded the plant species and parts ingested. The dietary categories included buds, young leaves, mature leaves, petioles, flowers, fruits (including seeds), mosses, herbs and ferns, and bamboo shoots. Voucher specimens were collected for later identification at the Kunming Institute of Botany, Chinese Academy of Sciences, if a species could not be identified on the spot.

Food availability

To estimate food availability, we established seven vegetation plots (10×20 m^2) within the home range of the Shortridge's langurs. The plots were established at intervals of 500–800 m along a line transect (1 420 m–1 500 m a.s.l.). From the 1st to the 10th of each month, all shrubs and trees with diameters at breast height of more than 10 cm (Ma et al., 2017) were chosen to estimate the abundance of food parts (including mature leaves, young leaves, flowers, fruits, and buds). We recorded one of the following five categories of tree crown coverage: 0=<1%, 1=1%–25%, 2=26%–50%, 3= 51%–75%, and 4=76%–100% (Poulsen et al., 2001; Ma et al., 2017). A relative food availability index (Wi) was used to describe food availability:

$Wi=Oi/P$

where Oi is the total scores of food availability of a given food type (e.g., young leaves, fruits) in month i, and P is the total score of the highest annual score of food availability for all tagged tree/shrub species providing food types (Krebs, 1989; Xiang et al., 2012).

Data analysis

To reduce bias resulting from unequal sample sizes (hours per day and days per month) due to difficult observation conditions, we measured the monthly percentage of different food species and plant parts consumed by averaging the feeding events recorded per month. We then obtained seasonal dietary compositions by calculating the average time spent feeding on plant parts taken monthly (Gupta & Kumar, 1994; Le et al., 2019; Stanford, 1991; Xiang et al., 2012; Zhou et al., 2007, 2018). We only calculated dietary composition in spring and autumn rather than summer and winter due to their low feeding records (<150).

Seasons were divided into spring (February–April), summer (May–August), autumn (September–November), and winter (December–January) according to the phenological changes in the deciduous broadleaf trees in the seven vegetation plots and 14 cross-shaped quadrants at 100 m intervals. This phenological definition of seasons has been used previously (Xiang et al., 2010) as animals may vary food plants based on phenology and spatiotemporal distribution in temperate forests. The beginning of spring was considered to be the date when the cumulative frequency of buds ready to sprout was more than 10%. The beginning of summer was estimated to be the date when the cumulative frequency of leaves unfolding was more than 90%. Autumn started when the cumulative frequency of discolored trees was more than 5%. Winter began when 50% of trees had shed their leaves (Yang, 1983).

We searched for *Trachypithecus* species-related dietary papers published in Chinese in the China Academic Journal Network Publishing Database (CAJD) and the China National Knowledge Infrastructure (CNKI, http://www.cnki.net/), and for papers in English through the Web of Science database (http://apps.webofknowledge.com), using "diet or food” and “langurs or *Trachypithecus*" as search terms. We included reports after filtering papers as per Tsuji et al. (2013). Primate taxonomy followed that of Roos et al. (2014). We used Spearman rank correlation to explore the relationship between the percentages of food parts in the diet and their availabilities in the plots.

Supplementary Tables

Supplementary Table S1. Dietary composition of *Trachypithecus* species.

Species	Latitude (N)	Longitude (E)	Elevation (a.s.l.)	Precipitation (mm)	Species	Leaf[1]	Fruit & Seed	Mature leaf	Young leaf	Fruit	References
T. auratus	–7.7	108.7	N/A	N/A	85	70.7	23.9	0.75	69.9	21.2	Tsuji et al., 2019
T. obscurus	5.5	100.2	N/A	N/A	56	60.3	19.9	N/A	N/A	19.9	Leen et al., 2019
T. germaini	10.1	104.6	100	2156.6	58	72	22.7	9.5	58	22.7	Le et al., 2019
T. obscurus obscuru[2]	11.8	N/A	54	1281	N/A	N/A	N/A	N/A	38	N/A	Aggimarangsee, 2006
T. phayrei	16.5	101.6	700	N/A	N/A	46.2	39.5	12.4	31.3	39.5	Suarez, 2013
T. francoisi	22.3	107.3	300	1240	97	76.6	17.1	15.5	61.1	17.1	Li et al., 2016
T. francoisi	22.4	106.9	300	N/A	90	56.9	31.4	13.9	38.9	17.2	Zhou et al., 2006
T. francoisi	22.4	106.9	300	1373	92	71	17.4	N/A	N/A	17.4	Zhou et al., 2018
T. leucocephalus	22.4	107.7	500	N/A	N/A	85.7	6.6	15.6	69.8	6.6	Zhang et al., 2019
T. leucocephalus	22.5	107.9	234.5	N/A	50	87.9	7.7	8.4	74.9	6.8	Li et al., 2003
T. geei[2]	23.7	N/A	3000	2000	53	43.8	46.9	2.4	41.1	21.2	Gupta & Chivers, 2000
T. crepusculus	24.4	100.7	2100	1836	148	54.2	32.1	24.7	N/A	N/A	Fan et al., 2015
T. pileatus	24.7	90.1	25	N/A	51	48	32	N/A	N/A	28	Monirujjaman & Khan, 2017

T. phayrei	24.8	98.8	2000	717.8	50	52.6	40.9	4.1	N/A	22.2	Ma et al., 2017
T. pileatus	27.0	92.3	1000	2545	52	68	16	6	57	N/A	Solanki et al., 2008
T. shortridgei	27.8	98.3	1900	2745.1	52	47.7	28.7	25.2	15.2	28.7	Our study
T. francoisi	28.6	108.3	744	952	164	63.9	32.2	N/A	N/A	25.7	Hu, 2011

[1]Leaf: including buds, petioles, young leaves, and mature leaves.

[2]Data on latitude, longitude, elevation, and precipitation were from Tsuji et al. (2013).

[3]N/A: Not available.

Supplementary Table S2. Monthly food species and percentage of feeding records for different plant parts consumed by *Trachypithecus shortridgei.*

Month	Scans	Feeding record	Bud	Young leaf	Mature leaf	Petiole	Flower	Ripe fruit	Unripe fruit	Moss	Herb and Fern	Bamboo shoot	No. of parts eaten	No. of species eaten	Unidentified food parts
12-Aug	97	31	0	0	0	0	41.4	0	58.6	0	0	0	2	2	2
12-Sep	252	108	0	0	17.6	8.8	4.4	49.5	6.6	7.7	3.3	2.2	8	12	17
12-Oct	193	100	0	0	35.1	1.1	18.1	19.1	14.9	11.7	0	0	6	12	6
12-Nov	234	176	0	0	21.5	0	4.7	49.7	2.7	20.8	0.7	0	6	10	27
13-Jan	198	102	0	4.4	58.9	22.2	0	3.3	5.6	3.3	0	2.2	7	9	12
13-Feb	163	151	5.9	1.5	30.1	12.5	1.5	0.7	0	41.9	5.9	0	8	14	15
13-Mar	258	228	2.9	42.6	26.3	3.3	2.9	0	2.9	13.9	5.3	0	8	21	19
13-Apr	19	18	7.7	38.5	46.2	7.7	0	0	0	0	46.7	0	5	4	5
13-May	72	38	0	33.3	16.7	0	0	0	0	3.3	0	0	3	5	8
13-Jun	10	13	0	25.0	8.3	8.3	0	0	58.3	0	0	0	4	2	1
13-Aug	103	58	0	22.2	16.7	0	7.4	0	44.4	9.3	0	0	4	6	4
13-Sep	19	3	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	3
Mean±*SD*		85.5 ± 71.6	1.5±2.8	15.2±17.3	25.2±16.8	5.8±7.0	7.4±12.5	11.1±19.8	17.6±23.9	10.2±12.4	5.6±13.8	0.4±0.9	5.5±2.1	8.8±5.8	9.9±8.1

[1]N/A: Not available.

Supplementary Table S3. Observed food components of *Trachypithecus shortridgei* diet.

No.	Species	Family	Plant type[1]	Part eaten[2]	Month	% of total feeding records Spring	Summer	Autumn	Winter	All year
1	*Macrothamnium macrocarpum*[3]	Hylocomiaceae	M	M	1–3, 5, 8–11	31.3	6.6	19.1	5.3	21.2
2	*Scapania verrucosa*[3]	Scapaniaceae	M	M						
3	*Saurauia napaulensis*	Actinidiaceae	T	Pe	1–4, 8	5.5	1.1		24.6	4.4
				Ripe Fr	9, 10			18.8		7.1
4	*Dendropanax burmanicus*	Araliaceae	S	Ripe Fr	11			18.8		7.1
5	*Schefflera octophylla*	Araliaceae	T	Yl	3	0.7				0.3
				Pe	1–3, 9	0.7		2.3	10.5	2.1
				Fl	9, 11			4.7		1.8
				Unripe Fr	1				3.5	0.3
				?	3	0.4				0.1
6	*Lindsaea odorata*	Lindsaeaceae	F	HF	2, 3, 5, 11	6.9	12.1	0.4		4.6
7	*Wendlandia speciosa*	Rubiaceae	T	Unripe Fr	10, 11			7.0		2.7
				Yl	3	3.6				1.5
8	*Turpinia dulongensis*	Staphyleaceae	T	Unripe Fr	8, 9		28.6	2.3		3.8
				Ripe Fr	10			0.8		0.3
9	*Meliosma oldhamii*	Sabiaceae	T	Yl	3	5.5				2.2
				Ml	3	2.5				1.0
				B	3	0.4				0.1
10	*Ilex godajam*	Aquifoliaceae	T	Ripe Fr	11			8.6		3.2
11	*Dipentodon sinicus*	Celastraceae	S	Ripe Fr	9			1.2		0.4
				Unripe Fr			19.8			2.7

12	*Jasminum subhumile*	Oleaceae	V	Ml	1, 3, 4	3.6			15.8	2.8
				Yl	1				1.8	0.2
13	*Neomicrocalamus prainii*	Gramineae	H	Ml	1–3, 11	1.1		0.8	21.1	2.7
				Yl	3	0.4				0.1
14	*Celastrus orbiculatus*	Celastraceae	V	Yl	3	5.5				2.2
				Ml	3	0.4				0.2
15	*Ficus neriifolia*	Moraceae	T	Yl	3	5.5				2.2
16	*Cyclobalanopsis glauca*	Fagaceae	T	Fl	8		13.2			1.8
				Ripe Fr	10			0.8		0.3
17	*Dipteris conjugata*	Dipteridaceae	F	Ml	2, 3	4.4		0.4		1.8
18	*Millettia sapindiifolia*	Leguminosae	V	Ml	3, 5, 10	2.2	2.2			1.0
				Yl	3, 6	0.4				0.4
19	*Elaeocarpus borealiyunnanensis*	Elaeocarpaceae	T	Unripe Fr	1, 3	2.2			5.3	1.3
20	*Meliosma thomsonii*	Sabiaceae	T	Ml	2, 3	3.3				1.3
21	*Toddalia asiatica*	Rutaceae	V	Ripe Fr	11			1.2		0.4
				Ml	1				5.3	0.4
				Yl	1				1.8	0.2
22	*Sauruia erythrocarpa*	Actinidiaceae	T	Pe	2, 3	2.5				1.0
23	*Daphniphyllum himalense*	Daphniphyllaceae	T	Unripe Fr	6		7.7			1.0
24	*Luculia yunnanensis*	Rubiaceae	S	Fl	10			2.3		0.9
25	*Impatiens margaritifera*	Balsaminaceae	H	HF	5, 9		3.3	1.2		0.9
26	*Ficus oligodon*	Moraceae	T	Yl	3	1.8				0.7
27	*Laurocerasus zippeliana*	Rosaceae	S	Fl	10			1.2		0.4
28	*Betula utilis*	Betulaceae	T	Yl	4, 5	0.7	2.2			0.6
29	*Lyonia ovalifolia*	Ericaceae	S	Fl	8	0	4.4			0.6

30	*Evodia rutaecarpa*	Rutaceae	S	B	2	0.7				0.3
				Ml	2	0.4				0.1
31	*Smilax lanceifolia*	Liliaceae	V	Ml	3, 9	0.4		0.4		0.3
				Yl	3	0.4				0.2
32	*Laurocerasus undulata*	Rosaceae	S	Fl	10			1.2		0.4
33	*Juglans cathayensis*	Juglandaceae	T	B	2, 3	1.5				0.6
34	*Reevesia pubescens*	Sterculiaceae	T	Yl	6		2.2			0.3
				Ml	6		1.1			0.1
35	*Corylopsis trabeculosa*	Hamamelidaceae	S	Yl	3	1.1				0.4
36	*Trachelospermum axillare*	Apocynaceae	S	Fl	3	1.1				0.4
37	*Astilbe rivularis*	Saxifragaceae	H	Ml	10, 11			2.3		0.9
38	*Chimonobambusa armata*	Gramineae	H	Bs	9			0.8		0.3
39	*Cephalostachyum virulentum*	Gramineae	H	Bs	1				3.5	0.3
40	*Zanthoxylum scandens*	Rutaceae	V	Ml	2	0.7				0.3
41	*Turpinia macrosperma*	Staphyleaceae	T	Unripe Fr	8		2.2			0.3
42	*Michelia doltsopa*	Magnoliaceae	T	Fl	2	0.7				0.3
43	*Scurrula parasitica*	Loranthaceae	S	Ml	3	0.7				0.3
44	*Embelia parviflora*	Myrsinaceae	V	Ml	10			0.8		0.3
45	*Hicriopteris gigantea*	Gleicheniaceae	F	Ml	2	0.7				0.3
46	*Musa rubra*	Musaceae	H	Yl	2	0.4				0.1
47	*Holboellia fargesii*	Lardizabalaceae	V	Ml	9			0.4		0.2
48	*Pilea cadierei*	Urticaceae	H	Ml	9			0.4		0.1
49	*Decaisnea insignis*	Lardizabalaceae	S	Ml	9			0.4		0.1
50	*Solena amplexicauli*	Cucurbitaceae	V	Ml	9			0.4		0.2
51	*Prenanthes yakoensis*	Compositae	V	Ml	1				1.8	0.2

52	*Stachyurus himalaicus*	Stachyuraceae	S	Ml	10, 11	1.2	0.4

[1]Plant type: T: Tree; V: Vine; S: Shrub; H: Herb; F: Fern; M: Moss.

[2]Part eaten: Fr: Fruits, Yl: Young leaves; Ml: Mature leaves; Pe: Petioles; Fl: Flowers; Bs: Bamboo shoots; B: Buds; M: Mosses; HF: Herbs and ferns.

[3]Combined during data collection.

"?": Unknown plant type.

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