CHAPTER-II

LITERATURE REVIEW

The study on the ecological aspect of *M. munzala* is limited, since its discovery in 2005 [1–5]. This has hindered the overall understanding of the fundamental ecology and functional variances with other *sinica* group of species.

2.1 Historical back ground of *Macaca munzala*

The trails of Arunachal macaque (*Macaca munzala*) was dated back from November, 1997. Choudhury [6] encounter a troop of macaque (>20 individual) at 2500 m above mean sea level during primate survey in West Kameng district of Arunachal Pradesh. The encountered species were described as a unique in appearance with prominent buffy side-whisker, shorter tail and characteristics vocalization that different from other macaque species. Choudhury [7], tentatively consider the species as a *Macaca thibetana* based on appearance of the species. Later on, species was confirmed as *M. assamenesis assamensis* as tail length proportion lie within the eastern Assamese macaque (*M. a. assamensis*) [8]. Mishra et al. [9] conducted mammalian survey in high altitude area of western Arunachal Pradesh and during the survey recorded unidentified macaque troop at altitudinal range of 2000-2700 m amsl in Tawang district. Further, Alfred et al. [10] conducted primate survey in Tawang district and described the population as Assamese macaque (*Macaca assamensis*). Alfred et al. [10] thereafter argued that due to the larger in size and darker coat colour, the species has been mistaken as new species by Mishra et al. [9]. However, the unidentified species [9] was described as a new species (*Macaca munzala*) based on tail length proportion and morphological suite [2]. *M. munzala* differed from the species described by Choudhury [6] in terms of longer tail length and lack of prominent buffy side whisker [2]. Recently, Biswas et al. [11] claimed that enigmatic macaque [6,7] and *Macaca munzala* were the similar population that fall within the range of *M. a. assamensis.*

2.2 Macaque evolution and dispersal

Macaque evolution and dispersal has been studied extensively in terms of geographical variation and ecological adaptation [12–17]. The influence of physical barrier such as mountain, river and habitat have been studied in population radiation and variation in genetic structure [18–24]. The contact zones of primates are suggested as a greater importance in terms primate hybridization study [25].

The taxonomy of macaque species has been carried out based on genital structure, morphometric measure and external morphology [14,16,26–29]. Fooden [30] conducted taxonomy of *sinica* group of genus macaca based on the pelage, external measurements, cranial characters, caudal vertebrae, glans penis and baculum, female reproductive tract, blood proteins, karyology, and hybridization. In recent time, molecular genetic study has been found widely use in macaque taxonomy with morphometric measurement [31–37]. The sub-species description in macaque species has been carried out based on the tail length, external morphology and molecular genetics study [38–40]. Weinstein [41] have been studied limb morphology of genus macaca in terms of altitudinal and climatic influence. The new species has been described in *sinica* group of genus macaca based on tail length variation and morphological characteristics. Further, species level confirmation has been carried out with molecular genetic study [2,31,33,42,43].

The study on primate colouration has been correlated with sexual competition, social signalling, defence mechanism, physical fitness and adaptive evolution [44–50]. The colour signals and dominance behaviour in Mandrills has been studied by Setchell et al. [51]. The sexual signal colouration in male-female has been studied in terms of hormonal influence, matting behaviour and social behavioural aspect [47,50,52–54]. Dubuc et al. [48] has been studied female sexual skin colouration to identify the timing of fertile phase in *Macaca mulata*. Clough et al. [45] studied influence of hormone and social behaviour in individual facial colouration. The evolution of facial colour has been studied on social and ecological aspect [55]. Primate’s morphometric colouration has been given significance importance in primate taxonomy, such as *Macaca munzala* [2] and *Macaca leucogenys* [42]. Bradley and Mundy [44] study on colour palette of primate suggested three general mechanisms for colour appearance viz., haemoglobin, structural colouration, and melanin pigmentation. The pelage colour of primate found to vary according to the latitude in *Macaca fascucularis fascucularis* [56,57]. Kamilar and Bradley [58] study on interspecific variation in primate colour was supported the Gloger’s rule of colour that darker colour animal occupies the humid and warm environment compare to the colder area. Santana et al. [49] study suggested that adaptive evolution in primate facial pigmentation related to the UV radiation and thermoregulation. However, colour variation with respect to UV radiation and altitudinal gradient has given less emphasised in studies [59–64]. Pelage characteristics has been extensively use in species level identification in primate species [2,16,28,42,57,65–70].

But, it was also argued that primate coat colour is not ideal to describe species level identification [71]. Colour description of animal is a complex framework as human perspective of colour verification is vary from individual to individual [2,11]. To overcome this, colour quantification has been done using sophisticated instrument (spectrophotometer method) [72]. However, it has difficulty in field based studies and also expensive to operate [73–75]. The recent advancement in digital image processing has given improvement in colour variation studies in primates as well as other animal [76]. Stevens et al. [77] has been described the potential use of photogrammetry method in colour assessment in animal. HSB (Hue, Saturation, Brightness), RGB (Red, Green, Blue) and CMYK (Cyan, Magenta, Yellow, and Black) digital web based colour model have been given important in biological research and quantitative assessment of colour [78–84]. Of that, RGB colour model has been found significantly used in primate colouration study [53,85]. Digital phtography has been extensively used in studies of primate sexual skin colouration [60] and adaptive evolution [45,60], hybridization [86] and nutrational status study [87]. Nevertheless, the linearization in digital image has been reported as constrain in the study of colour assessment [88]. On that regard, image processing through “white balance” have potential capacities [89–91]. Recently, Siegenthaler et al. [92] have proposed quantification of pigment cover using digital image in animal colouration study.

2.3 Population distribution and habitat

Primate diversity, distribution, structure and density have been studied in terms of habitat quality [93–101]. Lehman [102] has studied effect of habitat and diet in geographical distribution of primates of Guyana. Further, density of primates has been studied based on environmental influence in food abundance [103]. The effect of anthropogenic habitat disturbance and hunting has been studied in population structure of primates [100,104–107].

The highest diversity of primates in Indian-subcontinent has been reported in north-eastern region of India [107,108]. Among the north-eastern states, Arunachal Pradesh has the highest number of *sinica* group of species [2,109,110]. The extensive research on distribution of *sinica* group of species has been reported in various studies [14,16,26,111]. The study on distribution of *sinica* group of species has been found in Indian sub-continent, southeast Asia and China [26,28,112–117]. The population distribution of *sinica* species (genus macaca) in eastern Himalaya and northeast India has also been reported in number of studies [93,97,107,111,116,118–122,123-127]. However, researches on primate population in north-eastern part of India are lack in terms of enumeration of population demography and density estimates [119,122,123,128]. Recently, suitable habitat modelling has been carried out in India and eastern Himalaya region that has shown overlapping distribution of two sub-species of Assamese macaque (*Macaca assamensis*) [129–132].

Macaca munzala has been described from high altitude region of Tawang district of Arunachal Pradesh [2]. At present only a couple of research publications are available regarding population distribution and habitat structure of *M. munzala* in its habitat range in India [1,133]. Sinha et al. [3] studied the population distribution and conservation of the species in western Arunachal Pradesh. Kumar et al. [1] enumerate a total of 35 troops (569 individual) of *M. munzala* from western Arunachal Pradesh. The estimated mean size of troop of *M. munzala* was found to be 16.3 ±13.4 (SD). But, detail habitat characteristics of *M. munzala* have not been investigated till date. Recently, Biswas et al.[11] conducted a population survey of enigmatic macaque (considered as a similar population of *Macaca munzala*) in western Arunachal Pradesh. Chakraborty et al.[134] confirm the presence of population *M. munzala* in Upper Subansri and West Siang district the through molecular genetic study. Choudhury [127] had studied distribution of *M. munzala* in Bhutan.

2.4 Activity and feeding pattern

The effect of habitat quality and availability of food resources has been broadly studied in feeding pattern of primates [135–138]. Primate population abundance has been studied based on the feeding ecology and food abundance [139,140]. Feeding pattern of macaque species has been reported to vary based on the habitat type [136,141–143]. The influence of altitude in diet selection has been studied in macaque species [135,144]. Quality food has been given emphasis in time spent of activity studies of primates [145]. Janmaat et al. [146] has emphasized in primates' strategies to access nutritious food during scarcity of food resources. Further, the influence of food availability and vegetation characteristics has been reported in activity pattern and ranging behaviour of primates [145,147–153]. Food resource distribution and seasonal availability has been prioritised in the study of rangeland behaviour [148,150,154–158]. Campos et al. [159] has been studied the influence of fruit and temperature influence in the home range demarcation in neo-tropical primates. Maruhashi and Agetsuma [160] has correlated availability of food resources and social relationship between macaque groups. Mendes-Pontes [161] has studied habitat partition with relation to feeding variation in primates living in proximity. Zhou et al. [162] had studied niche separation in sympatric macaque species. Important of limited food plant resources has been studied in Gibbon, Colobus monkey, Baboons and macaque species [155,156,163–165] in general. In high altitude, time spent activity and ranging behaviour of primate have been emphasised based on seasonal cycle [166–171]. The home range structure has been studied in terms of group competition and finding of food resources [159,160,172,173]. Thermoregulatory cost has been significantly correlated in seasonal variation studies in activity pattern and diet selection, specifically in high altitude primate [166,167,174–176]. Furthermore, solar radiation has been given emphasised in ranging behaviour of sub-alpine forest primates [177]. The behavioural response in human-modified landscape matrix has been extensively studied in terms of time activity budget, ranging pattern and feeding adaptation of primates [164,178–185].

There are only 2 (two) scientific literature available on foraging ecology and time activity pattern of Arunachal macaque (*Macaca munzala*) [5,165]. Kumar et al. [165] reported foraging ecology of *M. munzala* in degraded broad-leaved habitat. The study was conducted during the monsoon season for the short period (July-August). Foraging was reported as major time spent activity of the species and contribution of fruit has been reported highest in diet. The diet of *M. munzala* comprises of food plant material and very low contribution of animal matter has been reported in the study. Besides that, *M. munzala* are reported to indulge in raiding in human settlement area for feeding purposes. Kumar et al. [165] study has estimated home range of *M. munzala*, which was argued as smaller (16-28 ha) than any other macaque species inhabited in similar habitat. *Erythrina* species was reported as one of the most important food plant for *M. munzala*. Mendiratta et al. [5] studied winter ecology of *M. munzala* in disturbed forest. Seasonal variation in time spent activity was reported as a very profound in *M. munzala*. Similarly, percentage of food plant material contribution in diet was subjected to seasonal availability. Notably, study reported highest percentage contribution of bark of *Erythrina* species in diet during winter season and fruit in spring season. The availability and distribution of food resource was suggested as influential factor in ranging behaviour of the species. The seasonal change in time spent activity was related with the cost of thermoregulatory in *Macaca munzala*.

Assamese macaque (*Macaca assamensis*) and Tibetan macaque (*Macaca thibetana*) are the two closely related species of *Macaca munzala* [2]. Diet and activity pattern of *M. assamensis* was reported to be influence by the availability of food resources and habitat type [186–188]. It has been also being observed that *M. munzala* and *M. assamensis* rely on particular food plant that available throughout the year [155,189]. Further, ranging behaviour of the species was reported to influence by distribution of preferred food plant species [155]. *M. assamensis* was reported as a folivore in limestone forest and frugivore in mixed broad-leaved forest [151,186]. The study on time spent activity; feeding and ranging behaviour of Tibetan macaque (*Macaca thibetana*) are found very limited to compare with *M. munzala* behaviour [190–192]. *M. thibeatana* has been reported to highly depend on particular food plant throughout the year like *M. munzala* and *M. assamensis* [192]. The reported home range of *M. thibetana* was much higher than *M. munzala* and *M. thibetana* [193]. Furthermore, literature survey and review on this topic revealed that study on activity and feeding pattern, and ranging behaviour of *M. assamensis* in north-eastern region of India are also very few [187,194,195].

2.5 Nutritional perspective of feeding pattern

In nutritional ecology of primates, it has been suggested that nutritional quality of food plays an important role in selection of diet than the habitat ecology [196]. Raubenheimer, and Boggs [197] has define nutritional ecology as a trophic branch of functional ecology and organism centred field of research. Raubenheimer et al. [198] has suggested geometric framework for animal nutritional ecology study based on organism (function, mechanism, development and history), environment (abiotic, biotic and community) and food nutrition. Further, Raubenheimer and Simpson [199] have included optimal foraging theory in geometric framework of nutritional model. Nutritional ecology is emerging as a potential tool for the study of animal phenotype (foraging behaviour, functional morphology, digestive physiology, evolution) with relation to field ecology (resource quality and distribution) [196,200,201]. Primates nutritional basis of studies are based on the chemical constituent of plant primary metabolite, secondary metabolite and minerals. Studies on food plant selection of primate have suggested greater importance of protein-fibre ratio in plant material [202–204]. Primate food adaptation outside the natural habitat has been studied on the basis of nutritional quality [184,205]. Besides that, studies reported higher content of sugar in Lemur and Gibbon food [201,206]. Davies et al. [207] reported greater importance of carbohydrate and fats in food plant selection in south-east Asian Colobine monkey. Oftedal et al. [208] has suggested less importance of protein in non-human primates in food plant selection. The secondary metabolite component of plant materials has been studied as a factor of avoidance in primates [209,210]. However, secondary metabolites are found as major constituent in primate self-medication plant [211,212]. Zhao et al. [213] suggested a geometric framework in primate nutritional model that comprises of energy maximization, nitrogen (protein) maximization, nutrient balancing, limitation of dietary fibre and avoidance of secondary metabolites. The gradual interest of optimal foraging theory, thermoregulation and energy balance in nutritional basis of diet selection was found in studies of nutritional ecology [172,196,200–202,205,206,213–223]. Guo et al. [224] has given importance in fats and carbohydrate in energy balance strategies of high altitude primate. However, important of minerals and test perception in diet selection was found less significant in food plant selection studies of primate [196,225–227].

2.6 Primate vocalization and behaviour

The lack of proper vocal tract and breath control has been explained as a reason that primate unable to reproduce human like speech [228,229]. Fitch et al. [230] study on anatomical structure of macaque and reported vocal tracts of monkey are speech ready. Moreover, Chimpanzees were reported to have certain degree of control in their respiratory and vocal tract that enables vocal learning in the species [231]. Evolutionary biology, neurobiology, psychology, linguistic anthropology and animal communication have been studied extensively on primate vocalization. Neurobiology study has been implicated in primate emotional communication based on graded facial expression and referential vocalization [232–235]. In linguistic anthropology, vocalization studies have been conducted on evolutionary perspective between human and non-human primate vocalization [229,236–240]. Primatologist have been studying vocalization in terms of signal that communicate individual to individual and with the society. The caller identity has been studied in primate vocalization for e.g., grunt vocalization of Baboons [241,242] and Lemurs [243], lost call of White-Faced Capuchin [244] and variants in vocalization of Campbell's Monkeys [245]. The relation among age/sex, body size and vocalization has been studied in different species of primates [246–249]. Vocalization and facial gesture has been combined for the study of primate vocal repertoire and evolution [238,250,251]. Primate vocalization have been given many name based on pattern and specific message associated with it, such as context-specific call, contact call, loud call, long call, food associated call, copulation call and alarm call. Contact calls have been reported as an intergroup communication calls that function as cohesiveness in the troop. Oda [252] reported that Ring-tailed lemurs are frequently use contact call during the resting and dispersion period. Similarly, contact calls have been reported in White-Faced Capuchin Monkeys [253] and Japanese macaques [254]. Schamberg et al. [255] have reported that travel calls of Bonobo's combination of high-low hoot. The male "Loud call" has been studied in terms of dominance signal that related with prevent contest between male for female mate [256]. Further, "Loud call" has been extensively used for the study of species difference [257,258]. Lost call has been studied in terms of individual species communication with group, when separated during the dispersion [244]. The copulation calls of female have been describe as a unique and utter prior to matting, during copulation and just after the copulation [259,260]. The copulation call had been studied in old world monkey and the apes [261–263]. Primates "food calls" vocalization has been associated with discovery of food and consumption [264–267]. Further, Clay and Zuberbühler [266] reported food associated call in primates are differ according to the food type. Deshpande et al. [268] reported Bonnet macaque (*Macaca radiata*) use specific call and gesture to request food from human. The most exclusively studied vocal signalling of primate was alarm call. Alarm call has been given significance importance in studies in terms of disperse information of predation risk, object information, an event likely to be occur [269]. Primate produces distinct alarm call for different predator and it has extensively studied in different species of primates [270–281]. The advancement of computer based analytical technology and relative low cost software development provides sophisticated analysis of speech and vocalization of animal, precisely [282]. The spectrogram has been used extensively in acoustic analysis of primate vocalization from the starting of this field of research [228,283]. Bioacoustics study of primate has been extensively studied based on the frequency, pitch, intensity, harmonics of sounds [228,247,284–287]. The formant has been used to explain the energy involve in sound reproduction [288]. Moreover, fundamental frequency has been widely used in studies of vocalization, which is associated with the anatomy of laryngeal vibration. Recently, new primate species description was found to use comparative assessment of fundamental frequency of vocalization with the closest one [42,289].

Overall, it is comprehended that several work were carried out in *sinica* group of genus macaca but limited work has been undertaken on *M. munzala.* A few studies, undertaken for a short period of time, on population distribution, habitat ecology and behavioural pattern of *M. munzala* are available for review. But, there is no report on colour variation, nutritional ecology and vocalization of *M. munzala*.

2.7 References

[1] Kumar, R. S., Gama, N., Raghunath, R., Sinha, A. and Mishra, C. In search of the munzala: Distribution and conservation status of the newly-discovered Arunachal macaque *Macaca munzala*. *Oryx*, 42: 360–366, 2008.

[2] Sinha, A., Datta, A., Madhusudan, M. D. and Mishra, C. *Macaca munzala*: A new species from western Arunachal Pradesh, northeastern India. *International Journal of Primatology*, 26: 977–989, 2005.

[3] Sinha, A., Kumar, R. S. and Mishra, C. Ecology and conservation of the Arunachal macaque *Macaca munzala*. NCF Technical Report No. 15, Nature conservation foundation, National institute of advanced studies and international snow Leopard trust, 2006.

[4] Kumar, R., Mishra, C. and Sinha, A. Foraging ecology and time-activity budget of the Arunachal macaque *Macaca munzala*-A preliminary study. *Current Science*, 93: 532–539, 2007.

[5] Mendiratta, U., Kumar, A., Mishra, C. and Sinha, A. Winter ecology of the Arunachal macaque *Macaca munzala* in Pangchen Valley, western Arunachal Pradesh, northeastern India. *American Journal of Primatology*, 71: 939–947, 2009.

[6] Choudhury, A. Pere David's macaque discovered in India. T*he Rhino foundation for Nature in NE India*, Newsletter, 7, 1998.

[7] Choudhury, A. Survey of primates in West Kameng district, Arunachal Pradesh, India. *American society of primatologist* 22: 12, 2002.

[8] Fooden, J. Tail length in enigmatic northeast Indian macaques and probable relatives. *The Journal of the Bombay Natural History Society*, 100: 285–292, 2003.

[9] Mishra, C., Datta, A. Madhusudan, M. D. The high altitude wildlife of Western Arunachal Pradesh: a survey report. CERC Technical Report No. 8, Nature conservation foundation, International Snow Leopard Trust, and Wildlife Conservation Society (India Program), Mysore, India, 2004.

[10] Alfred, J. R. B., Murmu, A., Mazumder, P. C. and Chaudhuri, S. A note on the primates of Tawang district, Arunachal Pradesh. *Records of the Zoological Survey of India*, 102: 1–5, 2004.

[11] Biswas, J., Borah, D. K., Das, A., Das, J., Bhattacharjee, P. C., Mohnot, S. M. and Horwich, R. H. The enigmatic Arunachal macaque: Its biogeography, biology and taxonomy in Northeastern India. *American Journal of Primatology*, 73: 458–473, 2011.

[12] Clarke, M. R. and O'Neil, J. A. S. Morphometric comparison of Chinese-origin and Indian-derived rhesus monkeys (*Macaca mulatta*). *American Journal of Primatology*, 47: 335–346, 1999.

[13] Abegg, C. and Thierry, B. Macaque evolution and dispersal in insular south-east Asia. *Biological Journal of the Linnean Society*, 75: 555–576, 2002.

[14] Fooden, J. Provisional classification and key to living species of Macaques (Primates: Macaca). *Folia Primatologica* 25: 225–236, 1976.

[15] Albrecht, G. H. Latitudinal, taxonomic, sexual, and insular determinants of size variation in pigtail macaques, *Macaca nemestrina*. *International Journal of Primatology*, 1: 141–152, 1980.

[16] Fa, J. E. The genus Macaca : A review of taxonomy and evolution. *Mammal Review* ·, 19: 45–81, 1989.

[17] Roos, C. and Zinner, D. Diversity and evolutionary history of macaques with special focus on *Macaca mulatta* and *Macaca fascicularis.* In Bluemel, J; Korte, S., Schenck, E; Weinbauer, G.F., editors, *The Nonhuman Primate in Nonclinical Drug Development and Safety Assessment*, pages 3–16. Elsevier, 2015.

[18] Eriksson, J., Hohmann, G., Boesch, C. and Vigilant, L. Rivers influence the population genetic structure of Bonobos (*Pan paniscus*). *Molecular Ecology*, 13: 3425–3435, 2004.

[19] Baumgarten, A. and Williamson, G. B. The distributions of Howling monkeys (*Alouatta pigra* and *A. palliata*) in southeastern Mexico and Central America. *Primates*, 48: 310–315, 2007.

[20] Ram, M. S., Kittur, S. M., Biswas, J., Nag, S., Shil, J. and Umapathy, G. Genetic diversity and structure among isolated populations of the endangered gees golden Langur in Assam, India. *PLoS ONE*, 11: 1–15, 2016.

[21] Blair, M. E., Sterling, E. J., Dusch, M., Raxworthy, C. J. and Pearson, R. G. Ecological divergence and speciation between lemur (Eulemur) sister species in Madagascar. *Journal of Evolutionary Biology*, 26: 1790–1801, 2013.

[22] Liedigk, R., Yang, M., Jablonski, N. G., Momberg, F., Geissmann, T., Lwin, N., Hla, T. H., Liu, Z., Wong, B., Ming, L., Yongcheng, L., Zhang, Y. P., Nadler, T., Zinner, D. and Roos, C. Evolutionary history of the odd-nosed monkeys and the phylogenetic position of the newly described myanmar snub-nosed monkey rhinopithecus strykeri. *PLoS ONE*, 7: 2012.

[23] Vences, M., Wollenberg, K. C., Vieites, D. R. and Lees, D. C. Madagascar as a model region of species diversification. *Trends in Ecology and Evolution*, 24: 456–465, 2009.

[24] Groves, Colin P; Tattersall, I. Geographical variation in the Fork-Marked Lemur, *Phaner furcifer* (Primates, Cheiogaleidae). *Folia Primatologica*, 56: 39–49, 1991.

[25] Watanabe, Kunio; Matsumura, S. The borderlands and possible hybrids between three Species of Macaques , *M . nigra* , *M . nigrescens* , and *M. hecki* in the Northern Peninsula of Sulawesi. *Primates*, 32: 365–370, 1991.

[26] Brandon-Jones, D., Eudey, A. A., Geissmann, T., Groves, C. P., Melnick, D. J., Morales, J. C., Shekelle, M. and Stewart, C. B. Asian primate classification. *International Journal of Primatology*, 25: 97–164, 2004.

[27] Fooden, J. and Aimi, M. Systematic review of Japanese macaques, *Macaca fuscata* (Gray, 1870). Fieldiana, Zoology, New Series, no.104. *Primates*, 47: 184–185, 2006.

[28] Jiang, X. and Wang, Y. Taxonomy and distribution of Tibetan macaques. *Zoological Research*, 17: 361–369, 1996.

[29] Pan, R., Jablonski, N. G., Oxnard, C. and Freedman, L. Morphometric analysis of *Macaca arctoides* and *M. thibetana* in relation to other macaque species. *Primates*, 39: 519–537, 1998.

[30] Fooden, J. Taxonomy and evolution of the sinica group of macaques: 2. Species andsubspecies accounts of the Indian Bonnet Macaque, *Macaca radiata*. *Field Museum of Natural History* 9: 1981.

[31] Fan, P., Liu, Y., Zhang, Z., Zhao, C., Li, C., Liu, W., Liu, Z. and Li, M. Phylogenetic position of the white-cheeked macaque (*Macaca leucogenys*), a newly described primate from southeastern Tibet. *Molecular Phylogenetics and Evolution*, 107: 80–89, 2017.

[32] Morales, J. C. and Melnick, D. J. Phylogenetic relationships of the macaques (Cercopithecidae: Macaca), as revealed by high resolution restriction site mapping of mitochondrial ribosomal genes. *Journal of Human Evolution*, 34: 1–23, 1998.

[33] Chakraborty, D., Ramakrishnan, U., Panor, J., Mishra, C. and Sinha, A. Phylogenetic relationships and morphometric affinities of the Arunachal macaque *Macaca munzala*, a newly described primate from Arunachal Pradesh, northeastern India. *Molecular Phylogenetics and Evolution*, 44: 838–849, 2007.

[34] Yao, Y. F., Dai, Q. X., Li, J., Ni, Q. Y., Zhang, M. W. and Xu, H. L. Genetic diversity and differentiation of the rhesus macaque (*Macaca mulatta*) population in western Sichuan, China, based on the second exon of the major histocompatibility complex class II DQB (MhcMamu-DQB1) alleles. *BMC Evolutionary Biology*, 14: 1–13, 2014.

[35] Zhang, L. Z. M. Genetic diversity of two Tibetan macaque (*Macaca thibetana*) populations from Guizhou and Yunnan in China based on mitochondrial DNA D-loop sequences. *Genes Genom*, 35: 205–214, 2013.

[36] Yao, Y., Zhong, L., Liu, B., Li, J., Ni, Q. and Xu, H. Genetic variation between two Tibetan macaque (*Macaca thibetana*) populations in the eastern China based on mitochondrial DNA control region sequences. *Mitochondrial DNA*, 24: 267–275, 2013.

[37] Chu, J. H., Lin, Y. S. and Wu, H. Y. Evolution and dispersal of three closely related macaque species, *Macaca mulatta*, *M. cyclopis*, and *M. fuscata*, in the eastern Asia. *Molecular Phylogenetics and Evolution*, 43: 418–429, 2007.

[38] Fooden, J. Taxonomy and evolution of the sinica group of macaques: 3. Species and subspecies accounts of *Macaca assamensis*. *Fieldiana Zoology*, 10: 1–52, 1982.

[39] Fan, Z., Zhao, G., Li, P., Osada, N., Xing, J., Yi, Y., Du, L., Silva, P., Wang, H., Sakate, R., Zhang, X., Xu, H., Yue, B. and Li, J. Whole-genome sequencing of Tibetan Macaque (*Macaca thibetana*) provides new insight into the Macaque evolutionary history. *Molecular Biology and Evolution*, 31: 1475–1489, 2014.

[40] Evans, B. J., Supriatna, J. and Melnick, D. J. Hybridization and population genetics of two macaque species in Sulawesi, Indonesia. *Evolution*, 55: 1686–1702, 2001.

[41] Weinstein, K. J. Climatic and altitudinal influences on variation in *Macaca* limb morphology. *Anatomy Research International*, 2011: 1–18, 2011.

[42] Li, C., Zhao, C. and Fan, P. F. White-cheeked macaque (*Macaca leucogenys*): A new macaque species from Medog, southeastern Tibet. *American Journal of Primatology*, 77: 753–766, 2015.

[43] Hou, W., Liu, S., Jiang, J., Fan, Z., Fan, P. and Li, J. The complete mitochondrial genome of White-cheeked macaque (*Macaca leucogenys*). *Mitochondrial DNA Part B: Resources*, 1: 374–375, 2016.

[44] Bradley, B. J. and Mundy, N. I. The primate palette: The evolution of primate coloration. *Evolutionary Anthropology*, 17: 97–111, 2008.

[45] Clough, D., Heistermann, M. and Kappeler, P. M. Individual facial coloration in male *Eulemur fulvus rufus*: A condition-dependent ornament? *International Journal of Primatology*, 30: 859–875, 2009.

[46] Stoner, C. J., Bininda-emonds, O. R. P. and Caro, T. I. M. The adaptive significance of coloration in lagomorphs. *Biological Journal of the Linnean Society*, 79: 309–328, 2003.

[47] Dubuc, C., Winters, S., Allen, W. L., Brent, L. J. N., Cascio, J., Maestripieri, D., Ruiz-Lambides, A. V., Widdig, A. and Higham, J. P. Sexually selected skin colour is heritable and related to fecundity in a non-human primate. *Proceedings of the Royal Society B: Biological Sciences*, 281: 2014.

[48] Dubuc, C., Brent, L. J. N., Accamando, A. K., Gerald, M. S., MacLarnon, A., Semple, S., Heistermann, M. and Engelhardt, A. Sexual skin color contains information about the timing of the fertile phase in free-ranging macaca mulatta. *International Journal of Primatology*, 30: 777–789, 2009.

[49] Santana, S. E., Lynch Alfaro, J. and Alfaro, M. E. Adaptive evolution of facial colour patterns in Neotropical primates. *Proceedings of the Royal Society B: Biological Sciences*, 279: 2204–2211, 2012.

[50] Rigaill, L., Higham, J. P., Lee, P. C., Blin, A. and Garcia, C. Multimodal sexual signaling and mating behavior in olive baboons (*Papio anubis*). *American Journal of Primatology*, 75: 774–787, 2013.

[51] Setchell, J. M. C. Is Brightest Best ? Testing the Hamilton-Zuk Hypothesis in Mandrills. *International Journal of Primatology*, 30: 825–844, 2009.

[52] Grueter, C. C., Zhu, P., Allen, W. L., Higham, J. P., Ren, B. and Li, M. Sexually selected lip colour indicates male group-holding status in the mating season in a multi-level primate society. *Royal Society Open Science*, 2: 2015.

[53] Dubuc, C., Allen, W. L., Maestripieri, D. and Higham, J. P. Is male rhesus macaque red color ornamentation attractive to females? *Behavioral Ecology and Sociobiology*, 68: 1215–1224, 2014.

[54] Higham, J. P. Signaling in multiple modalities in male rhesus macaques: sex skin coloration and barks in relation to androgen levels, social status, and mating behavior James. *Behavioral Ecology and Sociobiology*, 67: 1–24, 2013.

[55] Rakotonirina, H., Kappeler, P. M. and Fichtel, C. Evolution of facial color pattern complexity in lemurs. *Scientific Reports*, 7: 1–11, 2017.

[56] Hamada, Y., Suryobroto, B., Goto, S. and Malaivijitnond, S. Morphological and body color variation in Thai *Macaca fascicularis fascicularis* north and south of the Isthmus of Kra. *International Journal of Primatology*, 29: 1271–1294, 2008.

[57] Villano, J. S., Ogden, B. E., Yong, P. P., Lood, N. M. and Sharp, P. E. Morphometrics and pelage characterization of longtailed macaques (*Macaca fascicularis*) from Pulau Bintan, Indonesia; Singapore; and Southern Vietnam. *Journal of the American Association for Laboratory Animal Science*, 48: 727–33,

2009.

[58] Kamilar, J. M. and Bradley, B. J. Interspecific variation in primate coat colour supports Gloger's rule. *Journal of Biogeography*, 38: 2270–2277, 2011.

[59] Chen, Y. C., Norsang, G., Pingcuo, N., Dahlback, A., Frette, O., Kjeldstad, B., Hamre, B., Stamnes, K. and Stamnes, J. J. Solar UV radiation measurements across the Tibetan Plateau. in *AIP Conference Proceedings* 1531: 848–851, 2013.

[60] Bergman, T. J. and Beehner, J. C. A simple method for measuring colour in wild animals: validation and use on chest patch colour in geladas (*Theropithecus gelada*). *Biological Journal of the Linnean Society*, 94: 231–240, 2008.

[61] D'Orazio, J., Jarrett, S., Amaro-Ortiz, A. and Scott, T. UV radiation and the skin. *International Journal of Molecular Sciences*, 14: 12222–12248, 2013.

[62] Parra, E. J. Human pigmentation variation: Evolution, genetic basis, and implications for public health. *American Journal of Physical Anthropology*, 50: 85–105, 2007.

[63] Brenner, M. and Hearing, V. J. The Protective role of melanin against UV damage in human Skin. *Cancer*, 84: 539–549, 2009.

[64] Blumthaler, M., Ambach, W. and Ellinger, R. Increase in solar UV radiation with altitude. *Journal of Photochemistry and Photobiology B: Biology*, 39: 130–134, 1997.

[65] Wangchuk, T., Inouye, D. W. and Hare, M. P. A new subspecies of golden langur (*Trachypithecus geei*) from Bhutan. *Folia Primatologica*, 74: 104–108, 2003.

[66] Koyabu, D. B., Malaivijitnond, S. and Hamada, Y. Pelage color variation of *Macaca arctoides* and its evolutionary implications. *International Journal of Primatology*, 29: 531–541, 2008.

[67] Gippoliti, S. Notes on the taxonomy of *Macaca nemestrina leonina* Blyth, 1863 (Primates: Cercopithecidae). *Hystrix*, 12: 51–54, 2001.

[68] Butynski, T. M. and Jong, Y. A. de. Distribution of the Potto *Perodicticus potto* (Primates: Lorisidae) in Eastern Africa, with a Description of a New Subspecies from Mount Kenya. *Journal of East African Natural History*, 96: 113–147, 2007.

[69] Garbino, G. S. T., Rezende, G. C. and Valladares-Padua, C. Pelage variation and distribution of the Black Lion Tamarin, *Leontopithecus chrysopygus*. *Folia Primatologica*, 87: 244–261, 2016.

[70] Kobayashi, S., Langguth, A. A new species of titi monkey, *Callicebus* Thomas, from north-eastern Brazil (Primates, Cebidae). *Revista Brasileira de Zoologia*, 16: 531–551, 1999.

[71] Defler, T. R. and Stevenson, P. R. The woolly monkey: Behavior, ecology, systematics, and captive research. Sringer, 17–26, 2014.

[72] Sumner, P. and Mollon, J. D. Colors of primate pelage and skin: Objective assessment of conspicuousness. *American Journal of Primatology*, 59: 67–91, 2003.

[73] Stevens, M., Stoddard, M. C. and Higham, J. P. Studying primate color: Towards visual system-dependent methods. *International Journal of Primatology*, 30: 893–917, 2009.

[74] Higham, J. P. Primate coloration: An introduction to the special issue. *International Journal of Primatology*, 30: 749–751, 2009.

[75] Pike, T. W. Using digital cameras to investigate animal colouration: Estimating sensor sensitivity functions. *Behavioral Ecology and Sociobiology*, 65: 849–858, 2011.

[76] Allen, W. L., Cuthill, I. C., Scott-Samuel, N. E. and Baddeley, R. Why the leopard got its spots: relating pattern development to ecology in felids. *Radioengineering*, 20: 766–774, 2011

[77] Stevens, M., Parraga, C. a, Cuthill, I. C., Partridge, J. C. and Troscianko, T. S. Using digital photography to study animal coloration. *Biological Journal of the Linnean Society*, 90: 211–237, 2007.

[78] Shimoji, H., Tokuda, G., Tanaka, Y., Moshiri, B. and Yamasaki, H. A simple method for two-dimensional color analyses of plant leaves 1. *Russian Journal of Plant Physiology*, 53: 126–133, 2006.

[79] Kendal, D., Hauser, C. E., Garrard, G. E., Jellinek, S., Giljohann, K. M. and

Joslin, L. Quantifying plant colour and colour difference as perceived by humans using digital images. *PLoS ONE*, 8: 1–11, 2013.

[80] Edorea, C. T. and Ohnsenb, J. Using RGB displays to portray color realistic imagery to animal eyes. *Current Zoology*, 63: 27–34, 2017.

[81] Villafuerte, R. and Negro, J. J. Digital imaging for colour measurement in ecological research. *Ecology Letters*, 1: 151–154, 1998.

[82] Berggren, Å. and Merilä, J. WWW design code - A new tool for colour estimation in animal studies. *Frontiers in Zoology*, 1: 1–4, 2004.

[83] Lin, C. and Su, C. Colour image segmentation using the relative values of RGB. *Proceedings of the 9th WSEAS International Conference on applications of computer Engineering*, 46–51, 2010.

[84] Tollenaar, L. S. A., Zhao, D. P., Middeldorp, J. M., Slaghekke, F., Oepkes, D. and Lopriore, E. Color difference in placentas with twin anemia-polycythemia sequence: An additional Diagnostic Criterion? *Fetal Diagnosis and Therapy*, 40: 123–127, 2016.

[85] Gerald, M. S., Bernstein, J., Hinkson, R. and Fosbury, R. A. E. Formal method for objective assessment of primate color. *American Journal of Primatology*, 53: 79–85, 2001.

[86] Jadejaroen, J., Hamada, Y., Kawamoto, Y. and Malaivijitnond, S. Use of photogrammetry as a means to assess hybrids of rhesus (*Macaca mulatta*) and long-tailed (*M. fascicularis*) macaques. *Primates*, 56: 77–88, 2014.

[87] Kurita, H., Suzumura, T., Kanchi, F. and Hamada, Y. A photogrammetric method to evaluate nutritional status without capture in habituated free-ranging Japanese macaques (*Macaca fuscata*): A pilot study. *Primates*, 53: 7–11, 2012.

[88] Allen, W. L. and Higham, J. P. Analyzing visual signals as visual scenes. *American Journal of Primatology*, 75: 664–682, 2013.

[89] Maik, V., Cho, D., Har, D. and Paik, J. Colour analysis on portable sphere for custom white balance with multiple illuminations. *Electronics Letters*, 46: 129, 2010.

[90] Penczek, J., Boynton, P. A. and Splett, J. D. Color error in the digital camera image capture process. *Journal of Digital Imaging*, 27: 182–191, 2014.

[91] Lam, E. Y. and Fung, G. S. K. *Automatic White Balancing in Digital Photography*. In Lukac, R., Single-Sensor Imaging: Methods and Applications for Digital. CRC Press, Taylor & Francis Group, London, pages, 267-294, 2008.

[92] Siegenthaler, A., Mondal, D. and Benvenuto, C. Quantifying pigment cover to assess variation in animal colouration. *Biology Methods and Protocols*, 2:1–8, 2017.

[93] Mazumder, M. K. Diversity, habitat preferences, and conservation of the primates of Southern Assam, India: The story of a primate paradise. *Journal of Asia-Pacific Biodiversity* 7: 347–354, 2014.

[94] Fa, J. E. Habitat Distribution and Habitat Preference in Barbary Macaques (*Macaca-Sylvanus*). *International Journal of Primatology*, 5: 273–286, 1984.

[95] Pyritz, L. W., Büntge, A. B. S., Herzog, S. K. and Kessler, M. Effects of habitat structure and fragmentation on diversity and abundance of Primates in tropical deciduous forests in Bolivia. *International Journal of Primatology*, 31: 796–812, 2010.

[96] Boubli, J. P., Couto-Santos, F. R. and Mourthé, Í. M. C. Quantitative assessment of habitat differences between Northern and Southern Muriquis (Primates, Atelidae) in the Brazilian Atlantic forest. *Ecotropica*, 16: 63–69, 2010.

[97] Timmins, A. R. J., Duckworth, J. W., Timmins, R. J. and Duckworth, J. W. Distribution and Habitat of Assamese Macaque *Macaca assamensis* in Lao PDR, including its use of low-altitude Karsts. *Primate Conservation*, 103–114, 2013.

[98] Ray, P. C., Kumar, A., Devi, A., Krishna, M. C., Khan, M. L. and Brockelman, W. Y. Habitat Characteristics and Their Effects on the Density of Groups of Western Hoolock Gibbon (*Hoolock hoolock)* in Namdapha National Park, Arunachal Pradesh, India. *International Journal of Primatology*, 36: 445–459, 2015.

[99] Sarma, K., Krishna, M. and Kumar, A. Fragmented populations of the Vulnerable eastern hoolock gibbon *Hoolock leuconedys* in the Lower Dibang Valley

district, Arunachal Pradesh, India. *Oryx*, 49: 133–139, 2015.

[100] Peres, C. A. Effects of habitat quality and hunting pressure on arboreal folivore densities in neotropical forests: A case study of howler monkeys (*Alouatta* spp.). *Folia Primatologica*, 68: 199–222, 1997.

[101] Andrew J. Marshall. Effect of habitat quality on primate populations in Kalimantan: Gibbons and Leaf Monkeys as case studies. In S. Gursky-Doyen and J. Supriatna., editors, *Indonesian Primates, Developments in Primatology: Progress and Prospects*, pages, 120–124, 2010.

[102] Lehman, S. M. Biogeography of the primates of Guyana: Effects of habitat use and diet on geographic distribution. *International Journal of Primatology*, 25: 1225–1242, 2004.

[103] Hanya, G., Yoshihiro, S., Zamma, K. and Matsubara, H. Environmental determinants of the altitudinal variations in relative group densities of Japanese macaques on Yakushima. *Ecological Research*, 19: 485–493, 2004.

[104] Rovero, F., Mtui, A. S., Kitegile, A. S. and Nielsen, M. R. Hunting or habitat degradation? Decline of primate populations in Udzungwa Mountains, Tanzania: An analysis of threats. *Biological Conservation*, 146: 89–96, 2012.

[105] Kümpel, N. F., Milner-Gulland, E. J., Rowcliffe, J. M. and Cowlishaw, G. Impact of gun-hunting on diurnal primates in continental equatorial Guinea. *International Journal of Primatology*, 29: 1065–1082, 2008.

[106] Linder, J. M. and Oates, J. F. Differential impact of bushmeat hunting on monkey species and implications for primate conservation in Korup National Park, Cameroon. *Biological Conservation*, 144: 738–745, 2011.

[107] Srivastava, A. Conservation of threatened primates of Northeast India. *Primate Conservation*, 20: 107–113, 2006.

[108] Solanki, G. S. Primates: Distribution, status and threats. *Journal of Bioresource*, 2: 1–2, 2015.

[109] Chetry, D., Borthakur, U. and Das, R. K. A short note on a first distribution record of White-cheeked macaque *Macaca leucogenys* from India. *Asian*

Primates Journal, 5: 45–47, 2015.

[110] Kumar, R. S., Mishra, C. and Sinha, A. Discovery of the Tibetan macaque *Macaca thibetana* in Arunachal Pradesh, India. *Current Science*, 88: 1387–1388, 2005.

[111] Kawamoto, Y., Aimi, M., Wangchuk, T. and Sherub. Distribution of Assamese macaques (*Macaca assamensis*) in the inner himalayan region of bhutan and their mtDNA diversity. *Primates*, 47: 388–392, 2006.

[112] Dittus, W. P. J. The Social Regulation of population density and age-sex distribution in the Toque Monkey. *Behaviour*, 63: 281–322, 1977.

[113] Abegg, C. and Thierry, B. Macaque evcolution and dispersal in insular south-east Asia. *Biological Journal of the Linnean Society*, 75: 555–576, 2002.

[114] Sinha, A. The Monkey in the Town's Commons: A Natural history of the Indian Bonnet Macaque. *NIAS Report R2 - 2001*, 40, 2001.

[115] Sengupta, A. and Radhakrishna, S. Of concern yet ? Distribution and conservation status of the Bonnet Macaque (*Macaca radiata*) in Goa , India. *Primate Conservation*, 109–114, 2013.

[116] Sinha, A. The Bonnet Macaque Revisited : Ecology , Demography and behaviour. *Envis Bulletin: Wildlife and Protected Areas*, 1: 30–39, 2001.

[117] Blair, M. E., Sterling, E. J. and Hurley, M. M. Taxonomy and conservation of Vietnam's primates: A review. *American Journal of Primatology*, 73: 1093–1106, 2011.

[118] Murmu, A., Chaudhuri, S., Mazumder, P. C. and Talukder, B. Status of Assamese macaque, *Macaca assamensis* in Darjeeling district, West Bengal, India. *Records of the Zoological Survey of India*, 103: 33–41, 2004.

[119] Chetry, D., Medhi, R., Biswas, J., Das, D. and Bhattacharjee, P. C. Nonhuman primates in the Namdapha National Park, Arunachal Pradesh, India. *International Journal of Primatology*, 24: 383–388, 2003.

[120] Choudhury, A. Photographic Record Of The Assamese Macaque *Macaca assamensis* in Tripura, Northeastern India. *Asian Primates Journal*, 7: 2–5,

2018.

[121] Sukmak, M., Malaivijitnond, S., Schülke, O., Ostner, J., Hamada, Y. and Wajjwalku, W. Preliminary study of the genetic diversity of eastern Assamese macaques (*Macaca assamensis assamensis*) in Thailand based on mitochondrial DNA and microsatellite markers. *Primates*, 55: 189–197, 2014.

[122] Medhi, R., Chetry, D., Basavdatta, C. and Bhattacharjee, P. C. Status and Diversity of temple Primates in Northeast India. *Primate Conservation*, 22: 135–138, 2007.

[123] Choudhury, A. Primates in northeast India: an overview of their distribution and conservation status. *Technical Report* 1: 92–101, 2001.

[124] Wada, K. The distribution pattern of rhesus and Assamese monkeys in Nepal. *Primates*, 46: 115–119, 2005.

[125] Chalise, M. K., Ph, D. and Ghimire, M. Non-human Primate census in different parts of Nepal. *Perspectives on Higher Education*, 2 & 3: 35–41, 2005.

[126] S. Chakraborty; A. K. Sen. Mammals of the Mehao wildlife sanctuary (Dibang Valley District, Arunachal Pradesh) with remarks on their Status. *Records of the Zoological Survey of India*, 88: 263–285, 1991.

[127] Choudhury, A. Primates of Bhutan and observations of hybrid Langurs. *Primate Conservation*, 23: 65–73, 2008.

[128] Choudhury, A. The status of endangered species in northeast India. *Journal-Bombay Natural History Society*, 103: 157, 2006.

[129] Karanth, K. K., Nichols, J. D. and Hines, J. E. Occurrence and distribution of Indian primates. *Biological Conservation*, 143: 2891–2899, 2010.

[130] Khanal, L., Chalise, M. K., He, K., Acharya, B. K., Kawamoto, Y. and Jiang, X. Mitochondrial DNA analyses and ecological niche modeling reveal post-LGM expansion of the Assam macaque (*Macaca assamensis*) in the foothills of Nepal Himalaya. *American Journal of Primatology*, 80: 1–13, 2018.

[131] Regmi, G. R., Huettmann, F., Suwal, M. K., Nijman, V., Nekaris, K. A. I., Kandel, K., Sharma, N. and Coudrat, C. First open access ensemble climate

envelope predictions of Assamese macaque *Macaca assamensis* in Asia: a new role model and assessment of endangered species. 36: 149–160, 2018.

[132] Sarma, K., Kumar, A., Krishna, M., Medhi, M. and Tripathi, O. P. Predicting suitable habitats for the vulnerable Eastern Hoolock Gibbon, *Hoolock leuconedys*, in India using the MaxEnt Model. *Folia Primatologica*, 86: 387–397, 2015.

[133] Sinha, A., Kumar, R. S., Gama, N., Madhusudan, M. D. and Mishra, C. Distribution and conservation status of the Arunachal Macaque, *Macaca munzala*, in Western Arunachal Pradesh, Northeastern India. *Primate Conservation*, 145–148, 2006.

[134] Chakraborty, D., Sinha, A. and Ramakrishnan, U. Mixed fortunes: Ancient expansion and recent decline in population size of a subtropical montane primate, the Arunachal macaque Macaca munzala. *PLoS ONE*, 9: 2014.

[135] Tsuji, Y., Hanya, G. and Grueter, C. C. Feeding strategies of primates in temperate and alpine forests: Comparison of Asian macaques and colobines. *Primates*, 54: 201–215, 2013.

[136] Zhou, Q., Wei, H., Huang, Z. and Huang, C. Diet of the Assamese macaque *Macaca assamensis* in limestone habitats of Nonggang, China. *Current Zoology*, 57: 18–25, 2011.

[137] Mourthé, I. Response of frugivorous primates to changes in fruit supply in a northern Amazonian forest. *Brazilian Journal of Biology*, 74: 720–727, 2014.

[138] Ménard, N., Motsch, P., Delahaye, A., Saintvanne, A., Le Flohic, G., Dupé, S., Vallet, D., Qarro, M., Tattou, M. I. and Pierre, J. S. Effect of habitat quality on diet flexibility in Barbary macaques. *American Journal of Primatology*, 76: 679–693, 2014.

[139] Branch, L. C. Seasonal and habitat differences in the abundance of primates in the Amazon (Tapajos) National Park, Brazil. *Primates* 24: 424–431, 1983.

[140] Hanya, G. and Chapman, C. A. Linking feeding ecology and population abundance: A review of food resource limitation on primates. *Ecological Research*, 28: 183–190, 2013.

[141] Koirala, S. and Chalise, M. K. Feeding Ecology of Assamese Macaque (*Macaca assamensis*) in Nagarjun Forest of Shivapuri Nagarjun National Park, Nepal. *Nepalese Journal of Zoology*, 2: 31–38, 2014.

[142] Zhou, Q., Wei, H., Huang, Z., Krzton, A. and Huang, C. Diet of the Assamese macaque *Macaca assamensis* in lime- stone habitats of Nonggang, China. *Mammalia*, 78: 171–176, 2014.

[143] Agetsuma, N. Effects of habitat differences on feeding behaviors of Japanese Monkeys: Comparisonb Yakushima and Kinkazan. *Primates*, 39: 275–289, 1998.

[144] Hanya, G., Noma, N. and Agetsuma, N. Altitudinal and seasonal variations in the diet of Japanese macaques in Yakushima. *Primates*, 44: 51–59, 2003.

[145] Guo, S., Li, B. and Watanabe, K. Diet and activity budget of *Rhinopithecus roxellana* in the Qinling Mountains, China. *Primates*, 48: 268–276, 2007.

[146] Janmaat, K. R. L., Polansky, L., Ban, S. D. and Boesch, C. Wild chimpanzees plan their breakfast time, type, and location. *Proceedings of the National Academy of Sciences*, 111: 16343–16348, 2014.

[147] O'Brien, T. G. and Kinnaird, M. F. Behavior, diet, and movements of the Sulawesi crested black macaque (*Macaca nigra*). *International Journal of Primatology*, 18: 321–351, 1997.

[148] Albert, A., Huynen, M. C., Savini, T. and Hambuckers, A. Influence of food resources on the ranging pattern of Northern Pig-tailed Macaques (*Macaca leonina*). *International Journal of Primatology*, 34: 696–713, 2013.

[149] Hanya, G., Stevenson, P., van Noordwijk, M., Te Wong, S., Kanamori, T., Kuze, N., Aiba, S. I., Chapman, C. A. and van Schaik, C. Seasonality in fruit availability affects frugivorous primate biomass and species richness. *Ecography*, 34: 1009–1017, 2011.

[150] Di Bitetti, M. S. Home-range use by the tufted capuchin monkey (*Cebus apella nigritus*) in a subtropical rainforest of Argentina. *Journal of Zoology*, 253: 33–45, 2001.

[151] Huang, Z., Huang, C., Tang, C., Huang, L., Tang, H., Ma, G. and Zhou, Q. Dietary adaptations of Assamese macaques (*Macaca assamensis*) in limestone forests in Southwest China. *American Journal of Primatology*, 77: 171–185, 2015.

[152] Nila, S., Suryobroto, B. and Widayati, K. A. Dietary variation of Long tailed macaques (*Macaca fascicularis*) in Telaga Warna, Bogor, West Java. *HAYATI Journal of Biosciences*, 21: 8–14, 2014.

[153] Sarma, K. and Kumar, A. The day range and home range of the Eastern Hoolock Gibbon *Hoolock leuconedys* (Mammalia : Primates : Hylobatidae) in Lower Dibang Valley District in. 8: 8641–8651, 2016.

[154] Erinjery, J. J., Kavana, T. S. and Singh, M. Food resources, distribution and seasonal variations in ranging in lion-tailed macaques, *Macaca silenus* in the Western Ghats, India. *Primates*, 56: 45–54, 2015.

[155] Zhou, Q., Wei, H., Huang, Z., Krzton, A. and Huang, C. Ranging behavior and habitat use of the Assamese macaque (*Macaca assamensis*) in limestone habitats of Nonggang, China. *Mammalia*, 78: 171–176, 2014.

[156] Zhang, D., Fei, H. L., Yuan, S. D., Sun, W. M., Ni, Q. Y., Cui, L. W. and Fan, P. F. Ranging behavior of Eastern Hoolock Gibbon (*Hoolock leuconedys*) in a northern montane forest in Gaoligongshan, Yunnan, China. *Primates*, 55: 239–247, 2014.

[157] Harris, T. R., Chapman, C. A. and Monfort, S. L. Small folivorous primate groups exhibit behavioral and physiological effects of food scarcity. *Behavioral Ecology*, 21: 46–56, 2010.

[158] Diego, S., Jolla, L. and Sio, S. Habitat use and resource availability in baboons w. *Animal Behaviour*, 43: 831–844, 1992.

[159] Campos, F. A., Bergstrom, M. L., Childers, A., Hogan, J. D., Jack, K. M., Melin, A. D., Mosdossy, K. N., Myers, M. S., Parr, N. A., Sargeant, E., Schoof, V. A. M. and Fedigan, L. M. Drivers of home range characteristics across spatiotemporal scales in a Neotropical primate, Cebus capucinus. *Animal Behaviour*, 91: 93–109, 2014.

[160] Maruhashi, T. and Agetsuma, N. Home range structure and inter-group competition for land of Japanese Macaques in evergreen and deciduous forests. *Primates*, 39: 291–301, 1998.

[161] Mendes-Pontes, a. R. Habitat partitioning among primates in Maracá island, Roraima, Northern Brazilian Amazonia. *International Journal of Primatology*, 18: 131–157, 1997.

[162] Zhou, Q., Wei, H., Tang, H., Huang, Z., Krzton, A. and Huang, C. Niche separation of sympatric macaques, *Macaca assamensis* and *M. mulatta*, in limestone habitats of Nonggang, China. *Primates*, 55: 125–137, 2014.

[163] Fashing, P. J. Feeding ecology of guerezas in the Kakamega Forest, Kenya: The importance of Moraceae fruit in their diet. *International Journal of Primatology*, 22: 579–609, 2001.

[164] Pebsworth, P. A., MacIntosh, A. J. J., Morgan, H. R. and Huffman, M. A. Factors influencing the ranging behavior of Chacma Baboons (*Papio hamadryas ursinus*) living in a Human-modified habitat. *International Journal of Primatology*, 33: 872–887, 2012.

[165] Kumar, R. S., Mishra, C. and Sinha, A. Foraging ecology and time-activity budget of the Arunachal macaque *Macaca munzala* – A preliminary study. *Current Science*, 93: 532–539, 2007.

[166] Hanya, G. Seasonal variations in the activity budget of Japanese macaques in the coniferous forest of Yakushima: Effects of food and temperature. *American Journal of Primatology*, 63: 165–177, 2004.

[167] Majolo, B., McFarland, R., Young, C. and Qarro, M. The effect of climatic factors on the activity budgets of Barbary Macaques (*Macaca sylvanus*). *International Journal of Primatology*, 34: 500–514, 2013.

[168] Ménard, N. and Vallet, D. Behavioral responses of Barbary macaques (*Macaca sylvanus*) to variations in environmental conditions in Algeria. *American Journal of Primatology*, 43: 285–304, 1997.

[169] David A. Hill. Seasonal Variation in the Feeding Behavior and Diet of Japanese Macaques (*Macaca fuscata yakui*) in lowland forest of Yakushima. *American*

Journal of Primatology, 322: 43:304-322, 1997.

[170] Hanya, G. Diet of a Japanese monkey troop in the coniferous forest of Yakushima. *International Journal of Primatology*, 25: 55–69, 2004.

[171] Tsuji, Y., Hanya, G. and Grueter, C. C. Feeding strategies of primates in temperate and alpine forests: Comparison of Asian macaques and colobines. *Primates*, 54: 201–215, 2013.

[172] Mertl-Millhollen, A. S., Moret, E. S., Felantsoa, D., Rasamimanana, H., Blumenfeld-Jones, K. C. and Jolly, A. Ring-Tailed Lemur home ranges correlate with food abundance and nutritional content at a tme of environmental stress. *International Journal of Primatology*, 24: 969–985, 2003.

[173] Li, B., Chen, C., Ji, W. and Ren, B. Seasonal home range changes of the Sichuan snub-nosed monkey (*Rhinopithecus roxellana*) in the Qinling Mountains of China. *Folia Primatologica*, 71: 375–386, 2000.

[174] Campos, F. A. and Fedigan, L. M. Behavioral adaptations to heat stress and water scarcity in white-faced capuchins (*Cebus capucinus*) in Santa Rosa National park, costa rica. *American Journal of Physical Anthropology*, 138: 101–111, 2009.

[175] Chih, J., Sha, M., Kurihara, Y., Tsuji, Y., Take, M., He, T., Kaneko, A., Suda-hashimoto, N., Morimoto, M. and Natsume, T. Seasonal variation of energy expenditure in Japanese macaques (*Macaca fuscata*). *Journal of Thermal Biology*, 76: 139–146, 2018.

[176] Hanya, G., Otani, Y., Hongo, S., Honda, T., Okamura, H. and Higo, Y. Activity of wild Japanese macaques in Yakushima revealed by camera trapping: Patterns with respect to season, daily period and rainfall. *PLoS ONE*, 13: 1–18, 2018.

[177] Quan, R., Ren, G., Behm, J. E., Wang, L., Huang, Y., Long, Y. and Zhu, J. Why Does *Rhinopithecus bieti* prefer the highest elevation range in winter ? A test of the sunshine hypothesis. *Plos*, 6: 1–9, 2011.

[178] Ménard, N., Motsch, P., Delahaye, A., Saintvanne, A., Le Flohic, G., Dupé, S., Vallet, D., Qarro, M. and Pierre, J. S. Effect of habitat quality on the ecological behaviour of a temperate-living primate: Time-budget adjustments. *Primates*,

54: 217–228, 2013.

[179] Schwitzer, C., Glatt, L., Nekaris, K. A. I. and Ganzhorn, J. U. Responses of animals to habitat alteration: An overview focussing on primates. *Endangered Species Research*, 14: 31–38, 2011.

[180] Singh, M. Behavioural responses of lion-tailed macaques (*Macaca silenus*) to a changing habitat in a tropical rain forest fragment in the western behavioural responses of Lion-Tailed macaques (*Macaca silenus*) to a changing habitat in a Tropical Rain Forest Fragm. *Folia Primatologica*, 006: 278–291, 2001.

[181] Riley, E. P. Flexibility in diet and activity patterns of *Macaca tonkeana* in response to anthropogenic habitat alteration. *International Journal of Primatology*, 28: 107–133, 2007.

[182] Estrada, A., Raboy, B. E. and Oliveira, L. C. Agroecosystems and primate conservation in The tropics: a review. *American Journal of Primatology*, 74: 696–711, 2012.

[183] Jaman, M. F. and Huffman, M. A. The effect of urban and rural habitats and resource type on activity budgets of commensal rhesus macaques (*Macaca mulatta*) in Bangladesh. *Primates*, 54: 49–59, 2013.

[184] Lafleur, M. and Gould, L. Feeding outside the forest: The importance of crop raiding and an invasive weed in the diet of gallery forest ring-tailed Lemurs (*Lemur catta*) following a cyclone at the beza mahafaly special reserve, madagascar. *Folia Primatologica*, 80: 233–246, 2009.

[185] Sarma, K., Kumar, A., Murali Krishna, C., Tripathi, O. P. and Gajurel, P. R. Ground feeding observations on corn (*Zea mays*) by eastern hoolock gibbon (*Hoolock leuconedys*). *Current Science*, 104: 587–589, 2013.

[186] Koirala, S., Chalise, M. K., Katuwal, H. B., Gaire, R., Pandey, B. and Ogawa, H. Diet and activity of *Macaca assamensis* in Wild and Semi-Provisioned groups in Shivapuri Nagarjun National Park, Nepal. *Folia Primatologica*, 88: 57–74, 2017.

[187] Prabal, Bhattacharya, A. and Mohnot, S. M. Time budgeting and activity profile of free ranging forest group of Assamese macaque. *Journal of Biodiversity and*

Environmental Sciences (JBES), 3: 104–111, 2013.

[188] Chalise, M. K., Ogawa, H. and Pandey, B. Assamese Monkeys In Nagarjun Forest Of Shivapuri Nagarjun National Park. *Tribhuvan University Journal*, XXVIII: 181–190, 2013.

[189] Zhou, Q., Huang, Z., Wei, H. and Huang, C. Variations in diet composition of sympatric *Trachypithecus francoisi* and *Macaca assamensis* in the limestone habitats of Nonggang , China. *Zoological Research*, 38: 1–7, 2018.

[190] Zhao, Q. K. Responses to seasonal changes in nutrient quality and patchiness of food in a multigroup community of Tibetan macaques at Mt. Emei. *International Journal of Primatology*, 20: 511–524, 1999.

[191] Wang, X., Sun, L., Li, J., Xia, D., Sun, B. and Zhang, D. Collective movement in the Tibetan macaques (*Macaca thibetana*): Early joiners write the rule of the game. *PLoS ONE*, 10: 1–14, 2015.

[192] Zhao, Q. K., Deng, Z. Y. and Xu, J. M. Natural foods and their ecological implications for *Macaca thibetana* at Mount Emei, China. *Folia Primatologica*, 57: 1–15, 1991.

[193] Zhao, Q. K. Intergroup interactions in Tibetan macaques at Mt. Emei, China. *American Journal of Physical Anthropology*, 104: 459–470, 1997.

[194] Cooper, M. A. and Bernstein, I. S. Social grooming in assamese macaques (*Macaca assamensis*). *American Journal of Primatology*, 50: 77–85, 2000.

[195] Bernstein, I. S. and Cooper, M. A. Dominance in assamese macaques (*Macaca assamensis*). *American Journal of Primatology*, 48: 283–289, 1999.

[196] Hohmann, G., Potts, K., N'Guessan, A., Fowler, A., Mundry, R., Ganzhorn, J. U. and Ortmann, S. Plant foods consumed by Pan: Exploring the variation of nutritional ecology across Africa. *American Journal of Physical Anthropology*, 141: 476–485, 2010.

[197] Raubenheimer, D. and Boggs, C. Nutritional ecology, functional ecology and functional ecology. *Functional Ecology* 23: 1–3, 2009.

[198] Raubenheimer, D., Simpson, S. J. and Mayntz, D. Nutrition, ecology and

nutritional ecology: toward an intergrated framework. *Functional Ecology*, 23: 4–16, 2009.

[199] Raubenheimer, D. and Simpson, S. J. ScienceDirect Nutritional ecology and foraging theory. *Current Opinion in Insect Science*, 27: 38–45, 2018.

[200] Akinyemi, A. and Kayode, I. Nutritional composition of plant materials consumed by Baboon (*Papio Anubis*) and Tantalus Monkeys (*Chlorocebus Tantalus*) in Yankari Game Reserve, Nigeria. *Journal of Primatology*, 1: 1–5, 2012.

[201] Ma, C., Liao, J. and Fan, P. Food selection in relation to nutritional chemistry of Cao Vit gibbons in Jingxi, China. *Primates*, 58: 63–74, 2017.

[202] Felton, A. M., Felton, A., Raubenheimer, D., Simpson, S. J., Foley, W. J., Wood, J. T., Wallis, I. R. and Lindenmayer, D. B. Protein content of diets dictates the daily energy intake of a free-ranging primate. *Behavioral Ecology*, 20: 685–690, 2009.

[203] Matsuda, I., Tuuga, A., Bernard, H., Sugau, J. and Hanya, G. Leaf selection by two Bornean colobine monkeys in relation to plant chemistry and abundance. *Scientific Reports*, 3: 1–6, 2013.

[204] Matsuda, I., Clauss, M., Tuuga, A., Sugau, J., Hanya, G., Yumoto, T., Bernard, H. and Hummel, J. Factors affecting leaf selection by foregut-fermenting Proboscis monkeys: New insight from in vitro digestibility and toughness of leaves. *Nature* , 7, 2017.

[205] Riley, E. P., Tolbert, B. and Farida, W. R. Nutritional content explains the attractiveness of cacao to crop raiding Tonkean macaques. *Current Zoology*, 59: 160–169, 2013.

[206] Yamashita, N. Chemical properties of the diets of two Lemur species in Southwestern Madagascar. *International Journal of Primatology*, 29: 339–364, 2008.

[207] Davies, Ag., Bennett, E. L. and Waterman, P. G. Food selection by two South-east Asian colobine monkeys (*Presbytis rubicunda* and *Presbytis melalophos*) in relation to plant chemistry. *Biological Journal of the Linnean*

Society, 34: 33–56, 1988.

[208] Oftedal, O. T., Whiten, A., Southgate, D. A. T. and Soest, P. V. The nutritional consequences of foraging in primates: the relationship of nutrient intakes to nutrient requirements. *Philosophical Transactions of the Royal Society B: Biological Sciences*, 334: 161–170, 1991.

[209] Forbey, J. S., Harvey, A. L., Huffman, M. A., Provenza, F. D., Sullivan, R. and Tasdemir, D. Exploitation of secondary metabolites by animals: A response to homeostatic challenges. *Integrative and Comparative Biology*, 49: 314–328, 2009.

[210] Glander, K. E. The impact of plant secondary compounds on primate feeding behavior. *American Journal of Physical Anthropology*, 25: 1–18, 1982.

[211] Huffman, M. Self-medicative behavior in the African great apes: An evolutionary perspective into the origins of human traditional medicine. *BioScience*, 51: 651–661, 2001.

[212] Huffman, M. A. and Vitazkova, S. K. *Primates, plants, and parasites: the evolution of animal self-medication and ethnomedicine*. Ethnopharmacology, e-book http://www. eolss. net, Eolss Publishers, Oxford, 2007.

[213] Zhao, H., Wang, X., Kreigenhofer, B., Qi, X., Guo, S., Wang, C., Zhang, J., Zhao, J. and Li, B. Study on the nutritional ecology of wild primates. *Acta Ecologica Sinica*, 33: 185–191, 2013.

[214] Milton, K. Food choice and digestive strategies of two sympatric primate species. *The American Naturalist*, 117: 496–505, 1981.

[215] Calvert, J. J. Food selection by Western gorillas (*G . g . gorilla*) in relation to food Chemistry. *Oecologia*, 65: 236–246, 1985.

[216] Milton, K. Nutritional characteristics of wild primate foods: Do the diets of our closest living relatives have lessons for us? *Nutrition*, 15: 488–498, 1999.

[217] Chapman, C. A. and Chapman, L. J. Foraging challenges of red colobus monkeys: Influence of nutrients and secondary compounds. *Comparative Biochemistry and Physiology - A Molecular and Integrative Physiology*, 133:

861–875, 2002.

[218] Chapman, C. A., Chapman, L. J., Naughton-Treves, L., Lawes, M. J. and Mcdowell, L. R. Predicting folivorous primate abundance: Validation of a nutritional model. *American Journal of Primatology*, 62: 55–69, 2004.

[219] Rothman, J. M., Chapman, C. A. and van Soest, P. J. Methods in primate nutritional ecology: A user's guide. *International Journal of Primatology*, 33: 542–566, 2012.

[220] Rothman, J. M., Raubenheimer, D., Bryer, M. A. H., Takahashi, M. and Gilbert, C. C. Nutritional contributions of insects to primate diets: Implications for primate evolution. *Journal of Human Evolution*, 71: 59–69, 2014.

[221] Righini, N. Recent advances in primate nutritional ecology. *American Journal of Primatology*, 79: 1–5, 2017.

[222] Milton, K. Factors influencing leaf choice by Howler Monkeys: A Test of Some Hypotheses of food selection by generalist Herbivores. *The American Naturalist*, 114: 362–378, 1979.

[223] Oates, J. F., Waterman, P. G., Choo, G. M. and Url, S. Food selection by the South Indian leaf-monkey, *Presbytis johnii*, in relation to leaf chemistry. *Oecologia*, 45: 45–56, 1980.

[224] Guo, S., Li, F., Hou, R., Li, B., Garber, P. A., Raubenheimer, D., He, S., Wu, F., Righini, N. and Jay, W. J. O. Nutrient- specific compensation for seasonal cold stress in a free- ranging temperate colobine monkey. *Functional Ecology*, 32: 2170–2180, 2018.

[225] Milton, K. Micronutrient intakes of wild primates: are humans different? *Comprative Biochemistry and Physiology*, 136: 47–59, 2003.

[226] Hladik, C. M. and Simmen, B. Taste perception and feeding behavior in non-human primates and human populations. *Evolutionary Anthropology*, 5: 58–71, 1996.

[227] Chapman, C. A., Chapman, L. J., Rode, K. D., Hauck, E. M. and McDowell, L. R. Variation in the nutritional value of primate foods: Among trees, time

periods, and areas. *International Journal of Primatology*, 24: 317–333, 2003.

[228] Lieberman, P. On the acoustic analysis of primate vocalizations. *Behavior Research Methods and Instrumentation*, 1: 169–174, 1968.

[229] MacLarnon, A. M. and Hewitt, G. P. The evolution of human speech: The role of enhanced breathing control. *American Journal of Physical Anthropology*, 109: 341–363, 1999.

[230] Fitch, W. T., De Boer, B., Mathur, N. and Ghazanfar, A. A. Monkey vocal tracts are speech-ready. *Science Advances*, 2: 2016.

[231] Crockford, C., Herbinger, I., Vigilant, L. and Boesch, C. Wild Chimpanzees produce group-specific calls: a case for vocal learning? *Ethology*, 243: 221–243, 2004.

[232] Parr, L. A., Waller, B. M. and Fugate, J. Emotional communication in primates: Implications for neurobiology. *Current Opinion in Neurobiology*, 15: 716–720, 2005.

[233] Scharff, C., Friederici, A. D. and Petrides, M. Neurobiology of human language and its evolution: Primate and non-primate perspectives. *Frontiers in Evolutionary Neuroscience*, 5: 2012–2013, 2013.

[234] Rilling, J. K. Comparative primate neurobiology and the evolution of brain language systems. *Current Opinion in Neurobiology*, 28: 10–14, 2014.

[235] Ghazanfar, A. A. and Eliades, S. J. The neurobiology of primate vocal communication. *Current Opinion in Neurobiology*, 28: 128–135, 2014.

[236] Hockett;, C. F. C. D. The origin of speech. *Scientific American*, 203: 88–97, 1960.

[237] Fedurek, P. and Slocombe, K. E. Primate vocal communication: A useful tool for understanding human speech and language evolution? *Human Biology*, 83: 153–173, 2011.

[238] Arbib, M. A., Liebal, K. and Pika, S. Primate vocalization, gesture, and the evolution of human language. *Current Anthropology*, 49: 1053–1076, 2008.

[239] Zuberbühler, K. The phylogenetic roots of language: Evidence from primate

communication and cognition. *Current Directions in Psychological Science*, 14: 126–130, 2005.

[240] Liebal, K. and Oña, L. Different approaches to meaning in primate gestural and vocal communication. *Frontiers in Psychology*, 9: 1–7, 2018.

[241] Rendall, D. Acoustic correlates of caller identity and affect intensity in the vowel-like grunt vocalizations of baboons. *The Journal of the Acoustical Society of America*, 113: 3390, 2003.

[242] Owren, M. J., Seyfarth, R. M. and Cheney, D. L. The acoustic features of vowel-like *grunt* calls in chacma baboons (*Papio cyncephalus ursinus*): Implications for production processes and functions. *The Journal of the Acoustical Society of America*, 101: 2951–2963, 1997.

[243] Gamba, M., Colombo, C. and Giacoma, C. Acoustic cues to caller identity in lemurs: A case study. *Journal of Ethology*, 30: 191–196, 2012.

[244] Diweed, M, Shannon; Fedigan, N. Linda; Rendall, D. Who cares who calls? Selective responses to the lost calls of socially dominant group members in the White-Faced Capuchin (*Cebus Capucinus*). *Asian Academy of Management Journal*, 69: 829–835, 2007.

[245] Lemasson, A., Hausberger, M. and Zuberbühler, K. Socially meaningful vocal plasticity in adult Campbell's monkeys (*Cercopithecus campbelli*). *Journal of Comparative Psychology*, 119: 220–229, 2005.

[246] Lillehei, R. A. and Snowdon, C. T. Individual and situational differences in the vocalizations of young Stumptail macaques (*Macaca arctoides*). *Behaviour*, LXV: 270–281, 1977.

[247] Pfefferle, D. and Fischer, J. Sounds and size: identification of acoustic variables that reflect body size in hamadryas baboons, *Papio hamadryas*. *Animal Behaviour*, 72: 43–51, 2006.

[248] Fitch, W. T. Vocal tract length and formant frequency dispersion correlate with body size in Rhesus macaques. *The Journal of the Acoustical Society of America*, 102: 1213–1222, 1997.

[249] Bowling, D. L., Garcia, M., Dunn, J. C., Ruprecht, R., Stewart, A., Frommolt, K. H. and Fitch, W. T. Body size and vocalization in primates and carnivores. *Scientific Reports*, 7: 1–11, 2017.

[250] Fischer, J. and Hammerschmidt, K. An overview of the Barbary macaque, *Macaca sylvanus*, vocal repertoire. *Folia Primatologica*, 73: 32–45, 2002.

[251] Andrew, R. J. The origin and evolution of the calls and facial expressions of the primates. *Behaviour*, 20: 1–109, 1963.

[252] Oda, R. Effects of contextual and social variables on contact call production in free-ranging ringtailed lemurs (*Lemur catta*). *International Journal of Primatology*, 17: 191–205, 1996.

[253] Boinski, S. Vocal coordination of troop movement among white-faced capuchin monkeys, *Cebus capucinus*. *American Journal of Primatology*, 30: 85–100, 1993.

[254] Koda, H., Shimooka, Y. and Sugiura, H. Effects of caller activity and habitat visibility on contact call rate of wild Japanese macaques (*Macaca fuscata*). *American Journal of Primatology*, 70: 1055–1063, 2008.

[255] Schamberg, I., Cheney, D. L., Clay, Z., Hohmann, G. and Seyfarth, R. M. Bonobos use call combinations to facilitate inter-party travel recruitment. *Behavioral Ecology and Sociobiology*, 71: 2017.

[256] Neumann, C., Assahad, G., Hammerschmidt, K., Perwitasari-Farajallah, D. and Engelhardt, A. Loud calls in male crested macaques, *Macaca nigra*: a signal of dominance in a tolerant species. *Animal Behaviour*, 79: 187–193, 2010.

[257] Muroyama, Y. and Thierry, B. Species differences of male loud calls and their perception in Sulawesi macaques. *Primates*, 39: 115–126, 1998.

[258] Wich, S. A., Schel, A. M. and De Vries, H. Geographic variation in Thomas langur (*Presbytis thomasi*) loud calls. *American Journal of Primatology*, 70: 566–574, 2008.

[259] Semple, S. Individuality and male discrimination of female copulation calls in the yellow baboon. *Animal Behaviour*, 61: 1023–1028, 2001.

[260] Pradhan, G. R., Engelhardt, A., Van Schaik, C. P. and Maestripieri, D. The evolution of female copulation calls in primates: A review and a new model. *Behavioral Ecology and Sociobiology*, 59: 333–343, 2006.

[261] Bernstein, S. K., Sheeran, L. K., Wagner, R. S., Li, J. H. and Koda, H. The vocal repertoire of Tibetan macaques (*Macaca thibetana*): A quantitative classification. *American journal of primatology*, 78: 937–949, 2016.

[262] Deputte, B. L. Copulatory vocalizations of female macaques (*Macaca fascicularis*): variability factors analysis. *Primates*, 21: 83–99, 1980.

[263] Townsend, S. W., Deschner, T. and Zuberbühler, K. Female chimpanzees use copulation calls flexibly to prevent social competition. *PLoS ONE*, 3: 1–7, 2008.

[264] Di Bitetti, M. S. Food-associated calls and audience effects in tufted capuchin monkeys, *Cebus apella nigritus*. *Animal Behaviour*, 69: 911–919, 2005.

[265] Hauser, M. D. and Marler, P. Food-associated calls in rhesus macaques (*Macaca mulatta*): I. Socioecological factors. *Behavioral Ecology*, 4: 194–205, 1993.

[266] Clay, Z. and Zuberbühler, K. Food-associated calling sequences in bonobos. *Animal Behaviour*, 77: 1387–1396, 2009.

[267] Cheney, D. L., Owren, M. J., Dieter, J. A. and Seyfarth, R. M. ’Food’calls produced by adult female Rhesus (*Macaca Mulatta*) and Japanese (*M. Fuscata*) macaques, their normally-raised offspring, and offspring cross-fostered between species. *Behaviour*, 120: 218–231, 1992.

[268] Deshpande, A., Gupta, S. and Sinha, A. Intentional communication between wild bonnet macaques and humans. *Scientific Reports*, 8: 1–12, 2018.

[269] Owren, M. J. and Rendall, D. Sound on the rebound: Bringing form and function back to the forefront in understanding nonhuman primate vocal signaling. *Evolution anthropology*, 10: 58–71, 2001.

[270] Ramakrishnan, U. and Coss, R. G. Recognition of heterospecific alarm vocalizations by bonnet macaques (*Macaca radiata*). *Journal of Comparative Psychology*, 114: 3–12, 2000.

[271] Arnold, K., Pohlner, Y. and Zuberbühler, K. A forest monkey's alarm call series to predator models. *Behavioral Ecology and Sociobiology*, 62: 549–559, 2008.

[272] Seyfarth, R. M., Cheney, D. L. and Marler, P. Vervet monkey alarm calls: Semantic communication in a free-ranging primate. *Animal Behaviour*, 28: 1070–1094, 1980.

[273] Masataka, N. Psycholinguistic analyses of alarm calls of Japanese monkeys (*Macaca fuscata fuscata*). *American Journal of Primatology*, 5: 111–125, 1983.

[274] Ramakrishnan, U. and Coss, R. G. Age differences in the responses to adult and juvenile alarm calls by bonnet macaques (*Macaca radiata*). *Ethology*, 106: 131–144, 2000.

[275] Cäsar, C. and Zuberbühler, K. Referential alarm calling behaviour in new world primates. *Current Zoology*, 58: 680–697, 2012.

[276] Petracca, M. M. and Caine, N. G. Alarm calls of Marmosets (*Callithrix geoffroyi*) to Snakes and Perched Raptors. *International Journal of Primatology*, 34: 337–348, 2013.

[277] Coss, R. G., McCowan, B. and Ramakrishnan, U. Threat-related acoustical differences in alarm calls by wild bonnet macaques (*Macaca radiata*) elicited by python and leopard models. *Ethology*, 113: 352–367, 2007.

[278] Cäsar, C., Byrne, R. W., Hoppitt, W., Young, R. J. and Zuberbühler, K. Evidence for semantic communication in titi monkey alarm calls. *Animal Behaviour*, 84: 405–411, 2012.

[279] Arnold, K. and Zuberbühler, K. The alarm-calling system of adult male putty-nosed monkeys, *Cercopithecus nictitans martini*. *Animal Behaviour*, 72: 643–653, 2006.

[280] Fichtel, C., Perry, S. and Gros-Louis, J. Alarm calls of white-faced capuchin monkeys: An acoustic analysis. *Animal Behaviour*, 70: 165–176, 2005.

[281] Fichtel, C., Kappeler, P. M., Ecology, S. B. and Feb, N. Anti-Predator Behavior of Group-Living Malagasy Primates: Mixed evidence for a referential alarm call system. *Behavioral Ecology and Sociobiology*, 51: 262–275, 2002.

[282] Gamba, M. and Giacoma, C. Key issues in the study of primate acoustic signals, an update. *Journal of Anthropological Sciences*, 88: 215–220, 2005.

[283] Robinson, J. G. An analysis of the organization of vocal communication in the Titi Monkey *Callicebus moloch*. *Zeitschrift für Tierpsychologie*, 49: 381–405, 1979.

[284] Fischer, J., Hammerschmidt, K. and Todt, D. Factors affecting acoustic variation in Barbary-macaque (*Macaca sylvanus*) disturbance calls. *Ethology*, 101: 51–66, 1995.

[285] Lameira, A. R., Hardus, M. E. and Wich, S. A. Orangutan (Pongo spp.) whistling and implications for the emergence ofan open-ended call repertoire: A replication and extension. *Journal of the Acoustical Society of America*, 2013.

[286] Srivathsan, A. and Meier, R. Proboscis monkey (*Nasalis larvatus*) (Wurmb. 1787)) have unusually high-pitched vacalizations. *Raffles Bulletin of Zoology*, 59: 319–323, 2011.

[287] Weiss, D. J. and Hauser, M. D. Perception of harmonics in the combination long call of cottontop tamarins, *Saguinus oedipus*. *Animal Behaviour*, 64: 415–426, 2002.

[288] Schrader, L. and Hammerschmidt, K. Computer-aided analysis of acoustic parameters in animal vocalisations: a multi- parametric approach. *Bioacoustics*, 247–265, 2012.

[289] Merker, S. and Groves, C. P. Tarsius lariang: A New primate species from western Central Sulawesi. *International Journal of Primatology*, 27: 465–485, 2006.