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Cover: Indian Grey Wolf *Canis lupus pallipes* and Smooth-coated Otter *Lutrogale perspicillata* sharing the territory in Chambal basin. Digital art on Procreate by Aakanksha Komanduri.



First record of interspecific allopreening among *Gyps* vultures in the Aravalli Range, India

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Abstract: We report an observation of interspecific allopreening behaviour among the Indian Vulture *Gyps indicus*, Himalayan Griffon *Gyps himalayensis*, and Eurasian Griffon *Gyps fulvus* in the village of Kailashpuri in the Udaipur District of Rajasthan. A total of 623 seconds of interspecific allopreening behaviour was recorded. In the first instance, a *G. indicus* preened the neck of a *G. himalayensis* for 296 seconds; in another instance, a *G. fulvus* preened the neck of a *G. indicus* for 162 seconds; and further, a *G. fulvus* preened the neck and shoulder of a *G. himalayensis* for 165 seconds. All three species also engaged in self-preening activity during the observation period; *G. indicus* spent the maximum time (376 seconds), followed by *G. fulvus* (300 seconds), and *G. himalayensis* spent the minimum time in self-preening (257 seconds). This is the first documented record of interspecific allopreening behaviour among these vulture species in India. This observation contributes to interspecific interactions that are important for understanding the complex social structures between *G. indicus* and *G. himalayensis* and *G. fulvus* in their natural habitat. Interspecific allopreening is a complex ecological behaviour that contributes to individual health by managing parasites and fostering social tolerance, thereby reducing competition and aggression within the community. Although the functional significance of the behaviour could not be determined from this single observation, interspecific allopreening may have hygienic and social functions similar to those across species boundaries in wild birds.

Keywords: Aggression, behaviour, competition, *Gyps fulvus*, *Gyps himalayensis*, *Gyps indicus*, interaction, natural habitat, self-preening, social structure.

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Author contribution: NLC—observation and data collection, manuscript editing. HG and AKS—manuscript writting and proof reading.

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INTRODUCTION

Preening and scratching are collectively known as grooming behaviours (Carter & Leffer 2015). Grooming and preening behaviours have been recorded in several social animals, including birds and mammals (Baker & Aureli 2000; Lewis et al. 2007; Gill 2012; Carter & Leffer 2015). Among birds, allopreening is defined as the act of one individual preening the neck, shoulders, and feathers of another individual of the same species, in which one individual preens the feathers of another individual, potentially providing hygienic benefits through the removal of ectoparasites and debris, as well as social benefits (Cullen 1963; Brooke 1985; Villa et al. 2016). Additionally, it helps maintain pair bonds between mating partners, mitigates aggression between conspecifics, and facilitates cooperation during parental care (Radford & Du Plessis 2006; Lewis et al. 2007; Takahashi et al. 2017; Gillies et al. 2021). Intraspecific allopreening behaviour has been observed in several animal species, including numerous birds under natural conditions (Barbour & DeGange 1982; Radford & Du Plessis 2006; Choudhary & Chishty 2020, 2021), while interspecific allopreening (allopreening between two different species) is rarely observed in animals, including birds (Mo 2016; Cortes 2017; Zhou & Zhang 2022). These studies document interspecific allopreening behaviour in non-captive environments such as that of the Black Vulture *Coragyps atratus* and Crested Caracara *Caracara plancus* (Ng & Jaspersen 1984; Palmeira 2008; Souto et al. 2009; Sanabria 2015), Razorbill *Alca torda* and Common Murre *Uria aalge* (Walsh et al. 2001), Royal Spoonbill *Platalea regia* and Australian White Ibis *Threskiornis molucca* (Mo 2016), Mitred Psittacara *mitratus* and Monk Parakeet *Myiopsitta monachus* (Cortes 2017), and Spot-necked Babbler *Stachyris striolata* and Nonggang Babbler *Stachyris nonggangensis* (Zhou & Zhang 2022).

Prevailing hypotheses regarding the function of allopreening behaviour emphasise its role in parasite removal (Freeland 1976) and its significance in facilitating intra-social interactions (Call et al. 2002; Radford & Du Plessis 2006). According to Souto et al. (2009), the interspecific allopreening observed between Black Vulture and Crested Caracara likely reflects a multifaceted social and ecological interaction. The increased vigilance afforded by mixed-species flocks, the complementary vocal abilities of caracaras that compensate for vultures' morphological limitations, and the opportunistic benefits caracaras gain in locating food all contribute to reinforcing their association.

The underlying mechanism of interspecific

allopreening in these species is probably distinct, as they actively pursue preening from other species by engaging in chasing, followed by displays inviting allopreening (Selander & La Rue Jr 1961). In this study, we observed the first interspecific allopreening behaviour among three species of vultures in non-captive environments: Indian Vulture *Gyps indicus*, Himalayan Griffon *Gyps himalayensis*, and Eurasian Griffon *Gyps fulvus*.

Study area

Kailashpuri Village is located at 24.45° N, 73.43° E in the southern Aravalli ranges in Udaipur District of Rajasthan. The site supports several resident and migratory vulture species and serves as an important roosting area. The rock cliff area of the study site is a permanent nesting colony for vultures (Image 3). There are approximately 10 *G. indicus* nests and two Egyptian Vulture *Neophron percnopterus* nests in this region. The vulture nesting colony was approximately 350 m wide. The average elevation of *G. indicus* nests ranged 670–680 m. A cow shelter located near the vulture study site occasionally provides a potential food resource in the form of livestock carcasses. Additionally, the presence of two large water bodies, Indra Sarovar Talab and Bagela Lake, fulfils the demand for water throughout the year. The presence of green patches, rocky cliffs, agricultural landscapes, and these water bodies supports a variety of birds and mammals. Tropical dry deciduous forest occurs in the study area with dominant plant species such as Palash *Butea monosperma*, Euphorbia spp., Peepal *Ficus religiosa*, Neem *Azadirachta indica*, Gonda *Cordia dichotoma*, Jamun *Syzygium cumini*, Desi Babool *Vachellia nilotica*, Banyan *Ficus benghalensis*, Mahua *Madhuca indica*, Emli *Tamarindus indica*, and Danda-thor *Euphorbia caducifolius*. Apart from this, mammalian species including Leopard *Panthera pardus*, Jungle Cat *Felis chaus*, Indian Jackal *Canis aureus*, Striped Hyena *Hyaena hyaena*, Hanuman Langur *Semnopithecus entellus*, and Rhesus Macaque *Macaca mulatta* occur.

MATERIAL AND METHODS

Study site selection was based on earlier experience and secondary data gathered from the Forest Department of Rajasthan regarding the presence of vultures in the region. Vultures were observed using Nikon 8 × 42 binoculars. Photographs and video clips of vulture behaviour were recorded using a long-distance zoom camera (Nikon P1000 with 125x zoom). Observations were conducted on a single day (28 January

2025) at 0800–1200 h and 1600–1800 h, and a total of six hours of observation were conducted. Behavioural observations were conducted using the focal sampling method, with particular attention to individuals involved in interspecific allopreening. Interspecific allopreening was defined as the directed manipulation of the feathers of one individual by another individual belonging to a different species. Vulture species were identified using a field manual and identification guide, as prescribed by Ali & Ripley (1987), Kazmierczak (2006), Grimmett et al. (2011), and Vyas (2013).

RESULTS

During the six-hour observation period on a single day, intraspecific and interspecific allopreening behaviour was recorded. *G. indicus* is a resident breeding species of the Aravalli ranges, whereas *G. himalayensis* and *G. fulvus* are winter migrants in this region. During the field survey on 28 January 2025, we found 21 vultures in the village of Kailashpuri. Of these, 12 individuals were *G. indicus*, five were *G. himalayensis*, and the remaining four were *G. fulvus*. The recorded interspecific allopreening behaviour was exhibited by one individual of each of the three species in the study. They were sitting very close to each other and displaying self-preening and interspecific allopreening behaviour. Multiple episodes of self-preening and interspecific allopreening were noted between three vulture species during a six-hour observation period (Tables 1 & 2).

During the six-hour observation period, interspecific allopreening was recorded for a total of 623 s. *G. indicus* preened the neck of *G. himalayensis* for 296 s, *G. fulvus* preened the neck of *G. indicus* for 162 s, and *G. fulvus* preened the neck and shoulder of *G. himalayensis* for 165 s (Table 1; Image 1).

In addition to self-preening and interspecific allopreening behaviour, the three vulture species, namely Indian, Himalayan and Eurasian Griffon, showed various behavioural activities. These activities encompassed walking, resting, wing and neck stretching, flying, soaring, and interspecific territorial fights (Table 2; Images 2 & 6). Tables 1 & 2 provide a comprehensive account of these behavioural episodes, illustrating the complexity and diversity of vulture activity patterns. A review of the literature revealed no previous record of interspecific allopreening behaviour by *G. indicus*, *G. himalayensis*, and *G. fulvus* in this region. To the best of our knowledge, this represents the first documented observation of interspecific allopreening among three

vulture species in the Aravalli region of Rajasthan, India, as we found no previously published record.

DISCUSSION

Allopreening is associated with a “preening invitation” or “head-down” display (David & Jasperson 1984). Interspecific allopreening behaviour is more complex when it occurs between different animal species and is rarely observed in wild or non-captive environments. Interspecific allopreening has been documented in Black Vultures and Crested Caracaras (David & Jasperson 1984). Black Vultures showed allopreening behaviour, in which one vulture nibbled the feathers of the lower neck of the other individual, and the latter that individual responded by nibbling the neck feathers of the first (Haverschmidt 1977). Intraspecific allopreening has also been reported for vultures in wild environments (Haverschmidt 1977), similar to the “head-down” display described by Selander & La Rue (1961). During this one-day observation, it was observed that *G. indicus* preened the neck of the *G. himalayensis*, whereas *G. fulvus* preened the shoulder of the *G. himalayensis*, and *G. fulvus* preened the neck of the *G. indicus*. Vultures may spend considerable time sunbathing or wing-spreading in extended postures, as a thermoregulatory behaviour (Manigandan et al. 2021). Self-preening is an important component of plumage maintenance and may contribute to the removal of ectoparasites, debris, and other materials from their feathers. Thermoregulatory or sunbathing time varies according to the climatic conditions or seasons in a particular area. For instance, *G. indicus* spends more time on thermoregulation during the winter months than during the summer months (Chishty & Choudhary 2020). In this manner, intra- and interspecific allopreening behaviour is a complex social interaction that goes beyond mere grooming and may contribute to social tolerance and maintenance of affiliative interactions among individuals. Through allopreening, individuals not only enhance hygiene by removing ectoparasites and debris but also strengthen social bonds that are essential for group stability. This observation was based on a single day of field observation and therefore does not allow inference about the frequency, seasonality, or generality of interspecific allopreening among these species. Repeated observations across seasons and sites would be necessary to determine whether the behaviour represents a regular component of interspecific social interactions or an occasional association.

Table 1. Duration of interspecific allopreening behaviour among three species of vulture: Indian Vulture (IV), Eurasian Griffon (EG), and Himalayan Griffon (HG), during six hours.

Study hours (in h)	Time duration (in h)	Species interaction	Direction/ interaction	Time duration of interspecific allopreening (in s)
0800–0900	0811–0820	EG-HG	EG→HG	40
0901–1000	0900–0910	IV-HG	IV→HG	38
	0921–0930	IV-HG	IV→HG	42
	0931–0940	IV-HG	IV→HG	10
	0941–0950	IV-HG	IV→HG	27
		EG-HG	EG→HG	44
1000–1100	1000–1010	EG-HG	EG→HG	40
	1031–1040	IV-HG	IV→HG	40
	1041–1050	IV-HG	IV→HG	68
		EG-IV	EG→IV	58
	1051–1100	EG-IV	EG→IV	40
1100–1200	1100–1110	EG-HG	EG→HG	25
	1111–1120	IV-HG	IV→HG	40
	1121–1130	EG-HG	EG→HG	16
	1131–1140	IV-HG	IV→HG	31
	1141–1150	EG-IV	EG→IV	29
	1151–1200	EG-IV	EG→IV	35
1600–1700	1600–1700	Interspecific allopreening behaviour was not performed during this duration.		
1700–1800	1700–1800	Interspecific allopreening behaviour was not performed during this duration.		
Total observation time	06 h	Three types of interspecific interaction were observed: EG-HG; IV-HG; EG-IV.	Direction of interspecific allopreening: EG→HG; IV→HG; EG→IV.	Total time duration of interspecific allopreening: 623 s (EG→HG = 165 s; IV→HG = 296 s; EG→IV = 162 s).

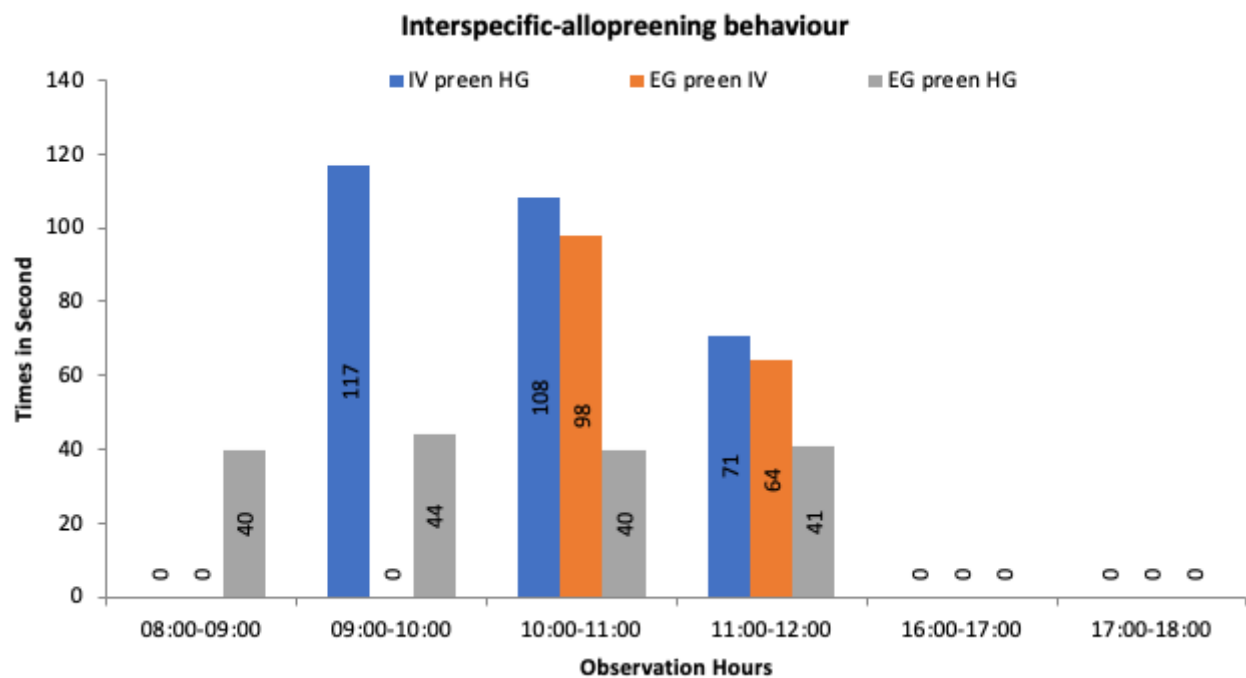
**Image 1.** Time duration of interspecific allopreening behaviour performed by three species of vultures (in seconds): HG—Himalayan Griffon | IV—Indian Vulture | EG—Eurasian Griffon.

Table 2. Ethogram of three species of vultures: IV—Indian Vulture | EG—Eurasian Griffon | HG—Himalayan Griffon during the observation period. Activity: +—activity was performed | —activity was not performed.

Time duration (in h)	Behaviour	Species of vulture			Time spent in Interspecific allopreening behaviour in a particular hours.
		IV	EG	HG	
0800–0900	Self-preening	+ (153 s)	+ (79 s)	+ (105 s)	EG preens neck of HG (40 s)
	Body movement	+	+	+	
0900–1000	Self-preening	+ (60 s)	+ (104 s)	+ (46 s)	IV preens neck and body of HG (117 s); EG preens neck of HG (44 s)
	Thermoregulation	-	+	+	
1000–1100	Self-preening	+ (97 s)	+ (43 s)	+ (38 s)	IV preens neck of HG (108 s); EG preens neck of IV (98 s); EG preens neck of HG (40 s)
	Walking on rock	-	+	+	
1100–1200	Self-preening	+ (49 s)	+ (36 s)	+ (49 s)	IV preens neck of HG (71 s); EG preens neck of IV (64 s); EG preens neck of HG (41 s)
	Wing stretching and thermoregulation	+	-	+	
	Walking on rock	-	+	-	
1600–1700	Self-preening		+ (38 s)	+ (19 s)	
	Resting	+	+	+	
	Wing stretching and thermoregulation	+	+	+	
	Flying / soaring	+	-	+	
1700–1800	Self-preening	+ (17 s)	-	-	-
	Walking on rock	+	-	-	
	Flying / soaring	-	+	+	
	Resting	+	+	+	

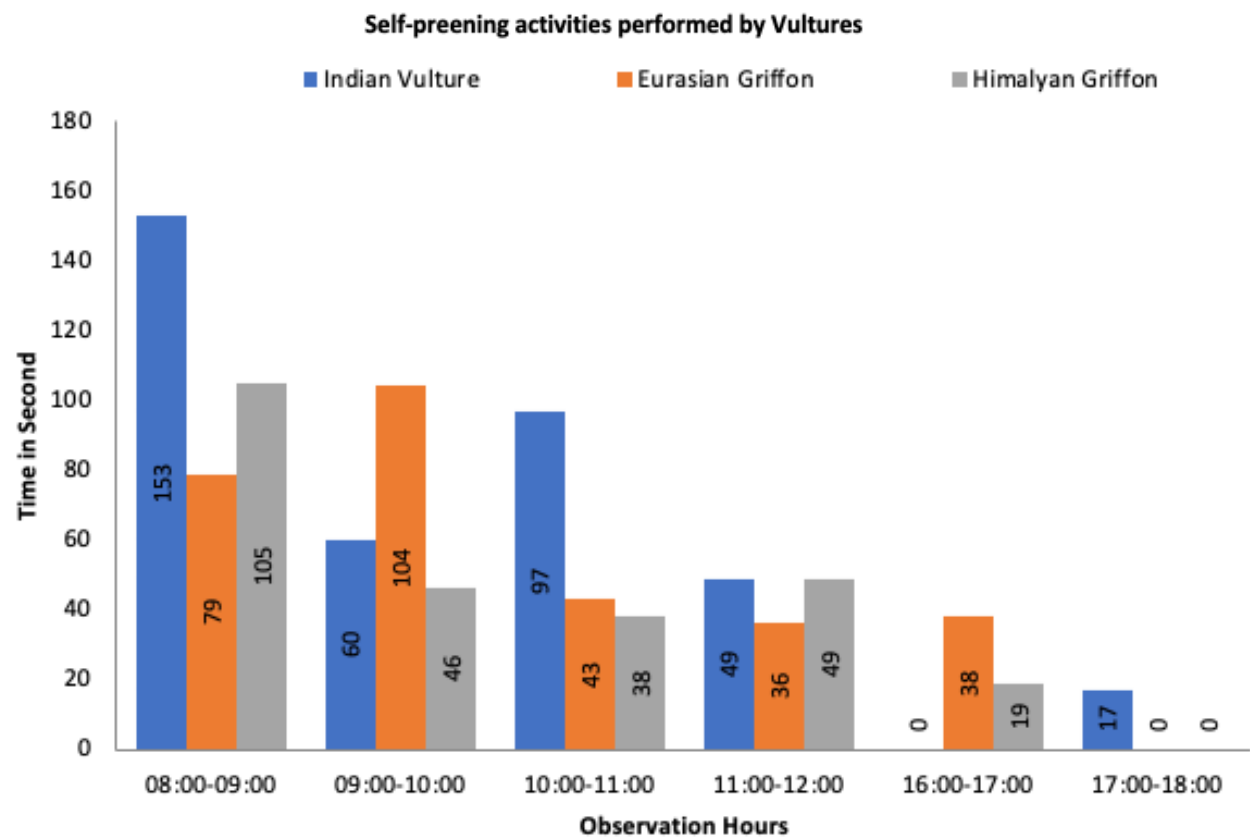


Image 2. Duration of self-preening behaviour performed by three species of vultures (in seconds), based on six hours of observation on 28.i.2025.

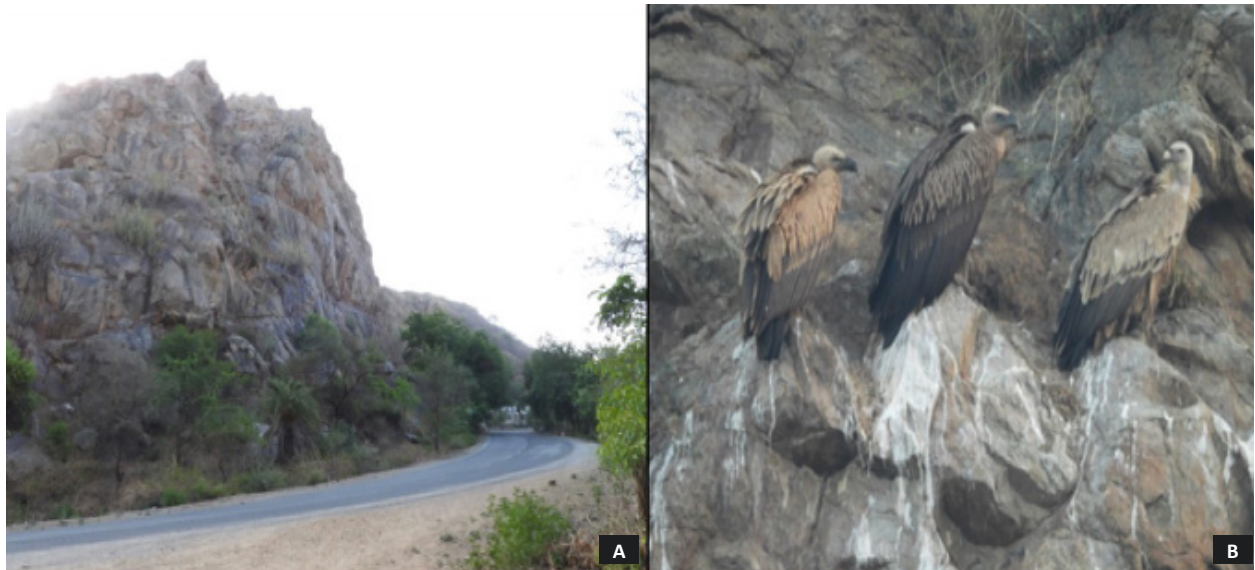


Image 3. A—Study site | B—Eurasian Griffon, Himalayan Griffon, and Indian Vulture at the roosting site. © Narayan Lal Choudhary.



Image 4. A—Interspecific allopreening: Indian Vulture preens the neck of the Himalayan Griffon | B & C—Interspecific allopreening: Eurasian Griffon preens the shoulder of the Himalayan Griffon | D—Interspecific allopreening: Eurasian Griffon preens the neck of the Indian Vulture. © Narayan Lal Choudhary.



Image 5. Self-preening behaviour: A—Self-preening behaviour performed by Eurasian Griffon and Indian Vulture | B—Self-preening behaviour performed by Eurasian Griffon | C—Self-preening behaviour performed by all three species of vultures | D—Eurasian Griffon and Himalayan Griffon in resting position. © Narayan Lal Choudhary.



Image 6. Different behavioural activities performed by three vulture species at the study site during the study period: A—Thermoregulation by Indian Vulture | B—Resting behaviour performed by Eurasian Griffon and Indian Vulture | C—Roosting behaviour performed by Eurasian Griffon | D—Resting behaviour performed by Eurasian Griffon and Himalayan Griffon after the interspecific allopreening | E—Wing stretching and self-preening behaviour performed by Indian Vulture | F—Sitting behaviour performed by Indian Vulture. © Narayan Lal Choudhary.

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