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1 A resident-nepotistic-tolerant dominance style in wild white-nosed coatis (*Nasua narica*)?

2 Short title: Dominance style in white-nosed coatis

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7

8 **Summary**

9 Dominance relationships imply consistent asymmetries in social relationships. Socioecological
10 models predict that resource distribution determines the mode of competition that animals will face and,
11 ultimately, the nature of their social relationships. Here, we provide the first systematic investigation of
12 dominance style in white-nosed coatis (*Nasua narica*). Coatis live in cohesive female-resident groups, and
13 have a diet based on clumped (fruits) and dispersed (insects) food items, which are predicted to favour
14 despotic and egalitarian social styles, respectively. Our results revealed moderate linearity and steepness in
15 dominance relationships over time, with variations attributed to stages of reproductive season, rather than
16 presumed variations in food resources. Primary social bonds and coalitions were found to mediate dominance
17 rank. Overall, our results suggest some similarities between coatis and despotic-tolerant primate species, at
18 least under particular ecological circumstances, and we discuss their potential for affording a deeper
19 understanding on the sources of variation in mammal social systems.

20 **Keywords**

21 Dominance, Agonistic conflicts, Social structure, Socioecological model, Mammal societies

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23 **Introduction**

24 Dominance relationships are a key component of animal societies (Pusey & Packer, 1997; Sterck et
25 al., 1997; Smith et al., 2007; Pellegrini, 2008; Shizuka & McDonald, 2012, 2015; Lea et al., 2014; Hobson &
26 DeDeo, 2015). Dominance exists when one individual consistently prevails over another individual during
27 social conflict, resulting in a dominant-subordinate relationship which describes the direction of power
28 balance within a dyad (Hand, 1986; Drews, 1993; Preuschoft & van Schaik, 2000). Where the outcomes of
29 social conflicts are consistent within and between dyads in a social group, individuals can be ranked in an
30 order of dominance (i.e. a hierarchy of dominance). From a functional point of view, establishing dominance
31 relationships allows individuals to avoid both the cost of a continuous assessment of others' fighting abilities
32 and the risk of escalation (Clutton-Brock & Harvey, 1976; Hand, 1986). This process is expected when (i)
33 individuals meet repeatedly (Drews, 1993; Preuschoft & van Schaik, 2000), (ii) there is competition for
34 resources (Clutton-Brock, 2009; Lea et al., 2014) and (iii) rank confers some priority of access to them
35 (Kappeler, 1993; Clutton-Brock, 2009; Clutton-Brock & Huchard, 2013a; but see Hand, 1986; and Drews,
36 1993, for an alternative view). Long-term benefits for dominant individuals are likely and correlations
37 between dominance status and fitness-relevant measures are well documented (see Sapolsky, 2005; Clutton-
38 Brock & Huchard, 2013a,b; Lea et al., 2014; Habig & Archie, 2015).

39 In general, dominance hierarchies are characterized by two main properties: linearity and steepness
40 (de Vries et al., 2006). A hierarchy is perfectly linear when all dominance relationships are transitive (i.e. $A >$
41 B , $B > C$, $C < A$). The more linear the hierarchy, the more rigidly organized and predictable the dominance
42 relationships are (Isbell & Young, 2002). Steepness represents the magnitude of differences in winning
43 success among individuals (de Vries et al., 2006). When a hierarchy is shallow these differences are small,
44 whilst the steeper the hierarchy the larger the asymmetries in winning success are (i.e. the dominance
45 relationships are more despotic: Vervaecke et al., 2007). Both properties are complementary and enable
46 researchers to characterize and compare dominance structures of animal groups.

47 Whilst causes of variation in dominance structure of groups remain elusive (Clutton-Brock, 2009),
48 socioecological models (Wrangham, 1980; van Schaik, 1989; Sterck et al., 1997) predict that once group
49 living has evolved, the distribution of food resources determines the mode of competition that animals will

50 face (i.e. contest vs. scramble competition, within- vs. between-group competition), which in turn determines
51 the nature of their social relationships (reviews in Isbell & Young, 2002; Ostner & Schülke, 2012). These
52 socioecological models represent the most comprehensive attempt to explain the causes of variation in social
53 structure of groups, but are not exempt of criticism (e.g. Janson, 2000; Thierry, 2008; Koenig & Borries,
54 2009) and are seldom applied to non-primate animals, including those which are similar to primates in terms
55 of their ecology and social organization (see Clutton-Brock, 2009).

56 Coatis (*Nasua spp.*) are the most gregarious species within the family Procyonidae (Mammalia:
57 Carnivora), forming groups ('bands') that vary in size from five up to 31 individuals (see Hirsch & Gompper,
58 2017). Coati bands (*Nasua spp.*) are usually constituted by closely related adult females (i.e. the philopatric
59 sex) and their offspring, whilst males are pronouncedly less gregarious (Gompper, 1995; Gompper & Decker,
60 1998; but see Hirsch, 2011). Gompper (1996) claimed that intersexual foraging competition over clumped
61 food sources may have promoted female gregariousness, thus allowing females to drive off and even to defeat
62 the larger and stronger coati males which otherwise tend to prevail in one-to-one encounters. Although
63 various studies have addressed different aspects and consequences of coatis' social behaviour (e.g. Kaufmann,
64 1962; Smythe, 1970; Smith, 1977; Russell, 1983; Gompper & Krinsley, 1992; Gompper, 1996; Gompper et
65 al., 1997; Booth-Binczik, 2001; Haas & Valenzuela, 2002; Romero & Aureli, 2007, 2008; Hirsch &
66 Maldonado, 2011; Hirsch et al., 2012), including careful descriptions of their agonistic interactions, only one
67 study (Hirsch, 2007) has provided a systematic evaluation of their dominance relationships.

68 Coatis tend to forage primarily on invertebrates and fruits, which together account for more than
69 85% of their diet (Gompper & Decker, 1998; Valenzuela, 1998; Balaguera-Reina et al., 2009; Hirsch, 2009;
70 Booth-Binczik, 2001), although the relative importance of invertebrates versus fruits varies across species,
71 populations, and seasons (see Valenzuela, 1998; Rodríguez-Bolaños et al., 2000; Alves-Costa et al., 2004). A
72 reliance on invertebrate prey – which tends to occur unpredictably in small, rapidly consumable quantities
73 (Gompper, 1996; but see Redford, 1984) – is expected to favour scramble competition and more egalitarian
74 social relationships (Isbell, 1991; Sterck & Steenbeek, 1997; Sterck et al., 1997; Isbell & Young, 2002).
75 Accordingly, it was assumed for years (without further evidence) that coatis do not form dominance
76 hierarchies (Kaufmann, 1962; Smith, 1977; Gompper, 1995; Gompper et al., 1997). In contrast, a primarily

77 frugivorous diet – where high quality resources tend to be distributed in predictable and defensible patches –
78 should favour strong intra-group contest competition which, in turn, promotes the formation of more
79 despotic/hierarchical social structures (van Schaik, 1989; Isbell, 1991; Vogel et al., 2007; Johnson et al.,
80 2009; Wright & Robbins, 2014). Indeed, among white-nosed coatis (*N. narica*) in Barro Colorado, Panama,
81 the majority of aggressive conflicts occur over fruits (55% of observations: Gompper, 1996; but see Booth-
82 Binczik, 2001) and ring-tailed coatis (*N. nasua*) living in Iguazú National Park, Argentina, compete for Pindo
83 palm fruits (*Syagrus romanzoffianum*) which are directly responsible for as much as 33.6% of all agonistic
84 conflicts, and result in a sex/age class based dominance structure (Hirsch, 2007). In fact, in Iguazú National
85 Park juvenile coatis are dominant over most of the group members (except adult males), largely because of
86 the regular agonistic support they receive from adult females (Hirsch 2007). Regular third-party support
87 during agonistic conflicts was also reported by Kaufmann (1962) and Gompper et al. (1997) among the white-
88 nosed coatis of Barro Colorado, although no evidence for dominance relationships was found there (but
89 sociometrics were not reported). Therefore, despite coalitions representing a common event during coati
90 conflicts (see also Romero & Aureli 2008), it remains unknown whether they lead to the establishment of a
91 dominance hierarchy.

92 We investigated whether and how a band of n=23 wild white-nosed coatis living in the surroundings
93 of ‘El Tepozteco’ archaeological site (Tepoztlán, México) maintain dominance relationships, and explored
94 their basic properties in terms of linearity, steepness, and stability over eight months of observation. Given
95 observations of philopatric females directing aggressive behaviour towards subadults (Gompper et al., 1997;
96 Hirsch, 2007) and adult males (Kaufman, 1962; Gompper, 1995; but see Booth-Binczik, 2001; Hirsch et al.,
97 2012) and reports of common coalitionary support during agonistic conflicts (*N. narica*: Gompper et al.,
98 1997; *N. nasua*: Hirsch, 2007; Romero & Aureli, 2008) we expected sex, age, and social support to structure
99 dominance interactions and hierarchy, whereby females will rank above males, juveniles and adults over
100 subadults, and those animals from the largest subunits (see Methods) and participating more in coalitions will
101 outrank those with fewer potential allies or less involved in coalitions. In addition, because coati diet is
102 largely based on a combination of defensible (i.e. fruit) and indefensible (i.e. invertebrates) resources, we
103 expect coati dominance to lie midway between despotic and egalitarian social styles; i.e. we predict a linear
104 dominance hierarchy but shallow dominance gradient. However, based on the reported characteristics of coati

105 diet in tropical dry forests (see Valenzuela, 1998; Valenzuela & Macdonald, 2002), where food resources
106 show seasonal patterns in their spatio-temporal distribution and defensibility (see below), we also expected to
107 see changes in the steepness and linearity of dominance hierarchy as a consequence of the presumed variation
108 in levels of competition over food resources. We expected more despotic dominance relationships (i.e. steep
109 and linear dominance hierarchies) during the driest months of the study (February to late May), when seasonal
110 and potentially defensible food sources become available (i.e. fructifying trees: Valenzuela, 1998; Valenzuela
111 & Macdonald, 2002). In contrast, we expected more egalitarian dominance relationships during the rainy
112 season (June to September), as high quality but usually non-defensible resources become abundant (i.e.
113 invertebrates: Valenzuela, 1998; Valenzuela & Macdonald, 2002; Márquez, 2003; Toledo-Hernández et al.,
114 2015). A similar pattern was also expected regarding the general characteristics of coati conflicts, with more
115 intolerant agonistic interactions (i.e. less frequent but more intense aggression and less instances of counter-
116 aggression) during the dry season, and more tolerant ones during the rainy season.

117 **Material and methods**

118 *Study subjects and site*

119 The study was conducted from January to October 2014 on a community (sensu Wells et al., 1987)
120 of free-ranging white-nosed coatis of both sexes and all age classes, inhabiting the surroundings of the
121 archaeological site El Tepozteco (19° 0' 2''N, 99° 6' 4''W) in Tepoztlán, México (Central Mexico). We
122 selected a band of n=23 animals (2 adult males, 7 adult females, 4 subadult females, 2 juvenile males, and 8
123 juvenile females) for behavioural sampling and statistical analyses, on the basis of their regular presence at
124 the archaeological site and our ability to identify individuals accurately (see Table S1 in Supporting
125 Information). Age classes were defined after Gompper (1996) and Hirsch (2007) as follows: juveniles (< 1
126 year old.), subadults (between 1 and 2 years old), and adults (> 3 years old). All juveniles were at least six
127 months old at the start of the study. Behavioural data from four additional individuals were also collected, but
128 we did not include them in our present analyses because those individuals (plus two unidentified ones)
129 appeared to belong to another band.

130 The archaeological site is located on the top of the Tepozteco mountain (2310 m.a.s.l.), within the
131 protected El Tepozteco National Park - Chichinautzin Biological Corridor (Trans-Mexican Volcanic Belt).

132 The surroundings of the site present an irregular surface with steep slopes, raised cliffs, and deep ravines.
133 Temperate sub humid climate (i.e. rainy and hot summer, dry winter) and an ecotone of tropical dry forest
134 characterize the study area (CONANP, 2008). June to September period accounted for 75% of the 2014
135 annual precipitation (1393 mm) (<http://clima.inifap.gob.mx/redinifap/est.aspx?est=35883>).

136 The tropical dry forest habitat provides fleshy fruits and litter arthropods consumed by coatis
137 (Valenzuela, 1998; Valenzuela & Macdonald, 2002), and several species of fig trees (*Ficus sp.*) can be found
138 at the study site (pers. obs.), which fruit once or twice between September-February (Piedra-Malagón et al.,
139 2006) and serve as food sources for the coatis. Other potential sources of fruit include wild grapes (*Vitis*
140 *tiliifolia*), red mombin (*Spondias purpurea*), red nanche (*Malpighia mexicana*) (pers. obs.), as well as species
141 from Ericaceae, Garryaceae, Verbenaceae, Onagraceae, Fabaceae, and Myrtaceae families (remains of fruits
142 of those families have been found in the faeces of coatis at the study site; F. Gómez-Sánchez, pers. comm.).
143 Litter arthropods have been reported by Valenzuela (1998) as part of the coatis' diet in a tropical dry forest
144 and include scorpions (Arachnida: Scorpiones), grasshoppers and crickets (Insecta: Orthoptera), and white-
145 grubs/beetles (*Phyllophaga spp.*). Orthopterans and beetles become abundant during the rainy season (pers.
146 obs.) and, along with myriapods (Arthropoda: Myriapoda), represent the most common invertebrates in coati
147 faeces at the study site (F. Gómez-Sánchez, pers. comm.). Since El Tepozteco is a highly visited tourist
148 attraction, coatis also have access to anthropogenic food sources. Although visitors are prohibited from both
149 feeding animals and entering the archaeological site carrying food, the coatis do consume human-derived food
150 items. In fact, remains of this food appeared in 20% of all examined coati faeces (F. Gómez-Sánchez, pers.
151 comm.), and one of each six agonistic conflicts (17.41%) occurred over anthropogenic food sources (Table 1).

152 *Behavioural observations*

153 Coatis at the site are habituated to humans and we were able to follow them closely (~ 2 m), without
154 any apparent disturbance, and all individuals were individually identifiable by ear tags and/or physical
155 features. Ear tags (Nasco Rototags, Fort Atkinson, Wisconsin, USA) were fitted during routine captures
156 (License of Scientific Collection FAUT-0251 granted by SEMARNAT to DV-G) conducted according to the
157 ASAB's "Guidelines for the treatment of animals in behavioural research and teaching", and the Mexican law
158 NOM-126-SEMARNAT-2000.

159 Behavioural data were collected from February to the first week of October 2014 from Monday to
160 Friday (tourist numbers were higher during weekends and interfered with observations). We conducted
161 observations of the coatis over four broad periods that corresponded to the following events: mating
162 season/early dry season (February-March), gestation period/late dry season (April-May), birth and nesting
163 period/early rainy season (June-July), and young's early socialization/late rainy season (August-early
164 October). Behaviours were identified on basis of the ethograms of Kaufmann (1962) and Smith (1977) and
165 observations began as soon as animals arrived at the archaeological site from ravines/mountainsides and
166 continued until the archaeological site's closing (1730 h). Hourly instantaneous scan samples (Altmann, 1974)
167 were conducted by walking through the site and scoring each animal's behaviour when first detected. Animals
168 that were not observed during 20 minutes were considered absent for that scan. We carried out 15-min
169 continuous focal observations (Altmann, 1974), once per day/individual at randomly allocated time slots,
170 resulting in a mean \pm SD of 43.87 \pm 7.88 focal observations per animal (Table S1). Complementarily, we
171 opportunistically recorded every agonistic and grooming interaction (*ad libitum sampling*: Altman, 1974).

172 After mating season, pregnant females reduced the time they spent with the band, but were only
173 completely isolated from the band for ~ one week after giving birth. We were therefore able to collect
174 behavioural data on females during pregnancy and post conception. The two adult males in this study were
175 associated with the band throughout the study period, which is not typical (Kaufmann, 1962; Gompper, 1995),
176 and we were able to conduct a similar number of focal samples on each sex (Table S1).

177 *Agonistic interactions (conflicts)*

178 During agonistic interactions, animals which showed submissive behaviour towards their opponent
179 were classified as the 'loser' and the opponent became the 'winner'. Submissive behaviour was recognized
180 when an animal retreated or fled in response to the approach or aggression from another individual (see Table
181 S2 for detailed behavioural definitions). Displacements, where an individual retreated from an approaching
182 individual were also recorded as submissive behaviours, with the former was considered the loser (and the
183 approaching individual considered the winner). Otherwise, the outcome of the agonistic interaction was
184 classified as undecided. Interactions were defined as unidirectional (i.e. just one animal attacked) or involving
185 counter-aggression (i.e. the victim reacted by attacking its former aggressor). After Butovskaya (1993), we

186 discriminated aggressive behaviour in two categories depending on whether physical contact took place; i.e.
187 contact vs. non-contact aggression. Where interactions involved two or more animals acting together against a
188 third-party (i.e. ‘coalitions’, see Table S2), we recorded the identities of each animal involved, and recorded
189 detailed winner-loser interactions at a dyadic scale. An interaction was considered to have finished when
190 opponents stopped and did not restart performing aggressive behaviours during the next 30 seconds.

191 We computed the rate of conflicts per hour, the trigger of the conflicts when evident, the percentage
192 of these which involved counter-aggression, coalitions, or remained undecided, as well as the percentage of
193 contact aggressions. Rates per hour were computed exclusively from focal sampling data. We assessed these
194 parameters in order to better characterize the dominance style of coati society. For example, in the well-
195 studied genus *Macaca* (Primates: Cercopithecidae), occasional but severe aggression and scarce counter-
196 aggression during conflicts are expected in the more intolerant species (e.g. *M. mulatta*, *M. fuscata*; see
197 Thierry, 2000; Balasubramaniam et al., 2012), whilst the opposite is expected for the more tolerant ones (e.g.
198 *M. tonkeana*, *M. sylvanus*; see Thierry, 2000; Duboscq et al., 2013).

199 *Grooming interactions and adult-young units*

200 A grooming bout was defined as individuals grooming without interruptions of more than 10
201 seconds. Otherwise, it was scored as a new grooming bout (see Table S2). After a few days observing coatis'
202 interactions, it became evident that young individuals tended to segregate into subunits by associating with a
203 given adult female. We used rates of grooming to determine the composition of such associations. Only data
204 on unidirectional (i.e. non-mutual) grooming bouts (n= 723), collected during focal and ad libitum samples,
205 were used. For all individuals, we computed the cumulative binomial probability for at least (i.e. the same or
206 more) the amount of grooming received from each band member, relative to the overall individual grooming
207 received

$$P(X \geq x)$$

208 where X denotes the event we are interested in (i.e. the grooming received from a given individual),
209 and x denotes the observed frequency of grooming received from that individual. Then, we considered as
210 carer-young dyads those composed by an adult female and a juvenile/subadult, whose cumulative probability

211 was ≤ 0.001 . Those juveniles/subadults sharing a grooming bond with the same adult female were considered
212 members of the same subunit, as they largely represent adult females' local grooming network. Together, the
213 adult female and the non-adult individuals attached to her constituted what we called an 'adult-young unit'.
214 We preferred this more cautious term rather than 'matrifocal unit' (sensu Fedigan, 1992), because coati
215 species have been reported to perform allonursing (McToldridge, 1969; Russell, 1983), thus raising the
216 possibility that young end up attached to an adult female different to their mother. Therefore, we cannot
217 assure that all the dyads within adult-young units represent mother-offspring or sibling relationships.

218 *Dominance hierarchy*

219 In order to test whether expected changes in food availability altered patterns of dominance and
220 aggression, and to control for any effects of mating seasons, we assessed the coati dominance hierarchy over
221 the foregoing observational periods (see above). Then, we constructed four squared sociometric matrices
222 (Tables S3, S4, S5 and S6) for the corresponding periods from all decided agonistic conflicts (i.e. those where
223 a winner and loser could be identified, see Hausfater, 1975), including polyadic ones. From each matrix we
224 computed the number of undecided relationships (i.e. tied and unknown), the Normalized David's Scores
225 (NDS) (de Vries et al., 2006), the improved Landau's linearity index (de Vries, 1995), and the steepness (i.e.
226 the slope of the regression line when plotting the ordinal dominance rank vs. its corresponding NDS) of the
227 resulting dominance hierarchy (de Vries et al., 2006). We also assessed these parameters for the whole dry
228 and rainy seasons. These analyses were conducted using the compiled version of SOCPROG 2.6 (Whitehead,
229 2009), and the Steepness 0.2-2 (Leiva & de Vries, 2014) and Compete 0.1 (Curley, 2016) packages for R
230 environment (R Development Core Team, 2013). By convention, animals hold an ordinal rank inverse to their
231 NDS; i.e. the first ordinal number belongs to the animal with the highest NDS and the last ordinal number
232 represents the animal with the lowest NDS.

233 To further evaluate the power asymmetries, we computed three group-level measures on the
234 equality/unbalance in aggression direction. First, an average reciprocity index for aggression was computed
235 for each of the four periods (Silk et al., 1999). The index ranges from zero to one, where values near to zero
236 indicate that aggression was mostly unidirectional across the dyads (i.e. not reciprocated) and values close to

237 one indicate that aggression was evenly performed (or that no aggression occurred at all). The index is
238 computed as follows:

$$RI = \frac{\sum_i^n \frac{P_{ab}(X \leq x)}{P_{ba}(X \leq x)}}{k}$$

239 where n represents all instances of aggressive behaviour observed for the ij dyad, $P_{ab}(X \leq x)$
240 represented the cumulative binomial probability of aggression in the least frequent direction observed within a
241 dyad, $P_{ba}(X \leq x)$ represented the cumulative binomial probability of aggression in the most frequent
242 direction observed within a dyad, and k represented the total number of dyads observed. Second, we
243 computed the average directional consistency index for aggression (DCI) across the four periods (van Hoof &
244 Wensing, 1987). The DCI represents a measure of the skew in the direction of a behaviour across dyads. The
245 DCI ranges from zero to one, where values near to zero indicate that the behaviour is evenly performed
246 between the actors (or not performed at all) and values close to one indicate a strong unidirectionality for a
247 given behaviour. Third, we performed matrix correlation tests for both the absolute (R-test: Dietz, 1983) and
248 relative (Rr-test: Hemelrijk, 1990) reciprocity of aggression; i.e. animals return exactly the amount of
249 aggression they receive from each opponent (absolute reciprocity) vs. animals roughly return aggression, but
250 following a hierarchical order based on who attacks them more (relative reciprocity). A positive correlation
251 implies reciprocity in aggression and a negative correlation indicates overall asymmetries in aggression.
252 Matrix correlation tests were conducted in the SOCPROG 2.6 software package (Whitehead, 2009).

253 *Statistical analyses*

254 In order to determine the stability of dominance scores over the study period, we computed the intra-
255 class correlation coefficient (ICC(1,1)). This statistic quantifies how consistent the measures from an
256 individual-typical case were at different opportunities (MacLennan, 1993), meaning in our case how
257 consistent the NDS were from a given coati over the four periods. Values range between 0 and 1 with values
258 close to 1 indicating highly consistent measures.

259 We used a linear mixed model (LMM) in order to assess the influence of individual dominance status
260 (i.e. categorised as top-, middle- or low-ranked scores) on the short-term stability of ordinal rank (i.e. the

261 number of positions a given animal moved upwards or downwards the dominance hierarchy between
262 consecutive periods). Status was assigned on the basis of an individual's ordinal rank during the first of the
263 periods compared. Unbalanced status categories were defined based on a visual exploration of the data, later
264 confirmed by our analyses, as it suggested that two small subsets of animals lay consistently at the top- and
265 low-four positions of the hierarchy. Animals' identities and the number of opportunities each individual had
266 for a rank change (i.e. repeated observations) were included as random effects, and an heterogeneous AR(1)
267 covariance structure was set (Littell et al., 2000). To conduct pair-wise comparisons among the three levels of
268 the categorical fixed effect and minimize the likelihood of type I error (Cohen et al., 2003), the LSD method
269 (Carmer & Swanson, 1973) was employed. To further investigate the results of this model, we built a post-
270 hoc LLM including the same random effects and covariance structure as above, but with the three consecutive
271 periods when rank change was possible (i.e. early to late dry season, dry to rainy season, early to late rainy
272 season) as the only categorical fixed-effect.

273 We built four generalized estimating equations models (GEE) – an extension of the generalized
274 linear model (Liang & Zeger, 1986) – to evaluate the influence of reported seasonal variation in food
275 resources on the general characteristics of coati conflicts. In each GEE model, the individual identities and
276 behavioural sampling period (i.e. repeated measures) were introduced as subject and within-subject variables,
277 respectively. For all these models, an autoregressive working correlation structure was selected along with a
278 robust model-based estimator (Hardin & Hilbe, 2013). We defined the 1) rate of conflicts per hour, and the
279 percentage of conflicts involving 2) contact aggression, 3) counter aggression, and 4) coalitionary support as
280 the response variable in the corresponding GEE model. Because these response variables were continuous,
281 and presented non-negative values with a point mass at zero (see Dunn & Smyth, 2005), we employed a
282 tweedy probability distribution with a log-link function. Since our sampling period extended over the two
283 climatic seasons occurring at the study site, we defined climatic season (dry season: February to May vs. rainy
284 season: June to early October) as the only fixed effect in all these models.

285 Because anthropogenic food sources may have affected the patterns of coati agonistic behaviour, we
286 built two post-hoc GEE models with the same subject and within-subject variables, and autoregressive
287 working correlation, described previously. For these two models, the average number of tourists (if any)

288 observed within a radius of ~ 20 m of the focal animal at the start and end of the behavioural sampling (a
289 proxy for the availability of human-derived food items) was defined as the only fixed effect, and a negative
290 binomial probability distribution with a log-link function was employed. The number of conflicts of any type
291 occurring during each focal sampling, as well as the number of conflicts over anthropogenic food, were
292 defined as response variables in the corresponding model.

293 Another GEE model was built in order to assess the influence of sex, age class, adult-young units
294 (i.e. primary social bonds), and involvement in coalitions on individuals' dominance ranks. Subject and
295 within-subject variables were the same than in the GEE models mentioned above, as well as the working
296 correlation structure and robust model-based estimator. NDSs were included as the response variable and an
297 identity link function was set. Then, a main effects model was built with sex (i.e. male or female), age class
298 (i.e. juvenile, subadult, and adult), size of the adult-young unit, and participation in coalitions as fixed effects.
299 We followed a frequentist rather than a model selection approach (sensu Mundry, 2011) since we were
300 focused on testing the prediction that age, sex, subunit size, and coalitions structure coatis' dominance
301 relationships. To avoid bias in parameter estimates and before running the model, we looked for the existence
302 of multicollinearity in the predictors by computing the tolerance and variance inflation factor (Freckleton,
303 2011).

304 In order to test the effect of belonging to a particular adult-young unit on the individual NDS (in
305 contrast with only the size of the adult-young unit affecting NDSs), we built a post-hoc GEE model with the
306 same characteristics described previously, but having the identity of the adult-young unit (named after the
307 corresponding adult female) as the only categorical fixed effect. Here we employed a Bonferroni adjustment
308 method for taking into account the multiple contrasts performed among the five levels of the fixed effect
309 (Cohen et al., 2003).

310 Because our prediction assumed that belonging to a larger adult-young unit represented more
311 opportunities to form coalitions and acquire/maintain dominance rank, we built a GEE model (same subject
312 and within-subject variables) with individuals' involvement in coalitions as the response variable, and the size
313 of the adult-young units to which those individuals belonged as the only fixed effect. A negative binomial
314 probability distribution with a log-link function was defined for this model.

315 Unless stated otherwise, the statistical analyses were carried out in SPSS 22 (IBM Corp, Armonk,
316 NY, USA), tests were two-tailed, and significance was set at $p \leq 0.05$.

317 **Results**

318 *Coati conflicts and dominance hierarchy*

319 An average of 3.35 conflicts per hour were observed during the whole study period with just 10% of
320 these aggressive exchanges involving contact, and counter-aggression occurred in only in 5% of observations.
321 One in ten conflicts involved coalitionary support (see Table 1 for a breakdown of the characteristics of these
322 conflicts). We did not find effects of seasonality either on the rate of conflicts per hour (GEE: $n = 89$, Wald
323 chi-square= 1.374, $df = 1$, $p = 0.241$), or in the percentage of conflicts involving counter aggression (GEE: $n =$
324 89, Wald chi-square= 0.005, $df = 1$, $p = 0.942$) or coalitionary support (GEE: $n = 89$, Wald chi-square= 0.330,
325 $df = 1$, $p = 0.566$). However, contact aggression was more common during dry season (February to May)
326 relative to rainy season (June to early October) (GEE: $n = 89$, Wald chi-square= 8.536, $df = 1$, $p = 0.003$, $B \pm$
327 S.E.= 0.526 ± 0.180 , 95% C.I.= 0.174–0.879). Tourist presence in the surrounding area where animals
328 performed their activities was positively related to the frequency of agonistic conflicts in general (GEE: $n =$
329 925, Wald chi-square= 16.936, $df = 1$, $p < 0.001$, $B \pm$ S.E.= 0.017 ± 0.004 , 95% C.I.= 0.009–0.025), but not to
330 conflicts over human-derived food items (GEE: $n = 925$, Wald chi-square= 0.001, $df = 1$, $p = 0.971$).

331 (Table 1 here)

332 We found a linear dominance hierarchy across each of our four observation periods (Table 2), with
333 linearity and steepness values being lowest during the early dry season (Figure 1a; Table 2) and late rainy
334 season (Figure 1d; Table 2), and highest during the late dry season (Figure 1b; Table 2) and early rainy season
335 (Figure 1c; Table 2). The lower linearity and steepness values occurred during the two periods with the
336 highest number of undecided relationships (up to 53% of all relationships, see Table 2). Because undecided
337 relationships may affect negatively both linearity and steepness of hierarchy (Klass & Cords, 2011), we also
338 computed these parameters for the whole dry and rainy seasons to increase the number of agonistic conflicts
339 analysed per period (thus breaking ties for some dyads and avoiding zeros for other ones). Then, we found

340 that the number of undecided relationships decreased to a maximum of 15.81 %, and linearity and steepness
341 values improved in both periods (Table 2).

342 To highlight the importance of coalitions in defining dominance relationships, but mainly because it
343 represents the standard approach followed by most of the studies on this phenomenon, we also computed
344 dominance parameters based exclusively on dyadic conflicts (i.e. excluding coalitions). This procedure
345 changed the rank order, increased the number of undecided relationships, and decreased the linearity and
346 steepness of the dominance hierarchy (Table S7). However, the main results were consistent with our
347 previous analyses: linearity and steepness of the hierarchies were moderate but statistically significant during
348 late dry season and early rainy season, and both parameters increased their values during the complete dry and
349 rainy seasons, as the number of undecided relationships decreased. Furthermore, RO and AP stood as the
350 most dominant individuals through the study period, and the two adult males were consistently ranked among
351 the lowest five individuals.

352 (Table 2 and Fig. 1 here)

353 The asymmetries in the direction of aggression closely followed the variation observed for
354 dominance hierarchy's parameters: aggression was more equitably exchanged when the linearity and
355 steepness of dominance hierarchy were lower (i.e. early dry and late rainy seasons), and more unidirectional
356 when these parameters reached their highest (i.e. late dry and early rainy seasons, see Table 3).

357 (Table 3 here)

358 *Stability of dominance ranks*

359 Individual dominance scores showed moderate repeatability over our four observation periods
360 ($ICC(1,1) = 0.702$, 95% C.I. = 0.523–0.847, $F(20,63) = 10.414$, $p < 0.001$; Figure 2), and variation in ranks was
361 influenced by individuals' dominance status (LMM: $n = 66$, $F(2,20.65) = 6.167$, $p = 0.008$), with middle ranked
362 animals experiencing larger rank changes than top-ranked animals (Mean difference in ranks = 3.727, $df =$
363 20.69, $p = 0.004$, 95% C.I. = 1.323–6.131; Figure 2). Middle ranked animals also experienced larger but non-
364 significant rank changes than low ranked animals (Mean difference in ranks = 2.371, $df = 20.69$, $p = 0.053$,

365 95% C.I.= -0.033–4.776). The period of observation did not affect the degree of rank variation observed
366 (LMM: $n= 66$, $F(2,30.54)= 0.943$, $p= 0.401$).

367 (Fig. 2 here)

368 *Age-sex classes, adult-young units and involvement in coalitions*

369 Based on grooming patterns, 92.86% of all the juveniles and subadults ($n=14$) were associated to an
370 adult female (see Table S1), resulting in five adult-young units of different sizes (see Figure 3). Whilst we did
371 not find any significant effect of sex (GEE: $n= 89$, Wald chi-square= 0.267, $df= 1$, $p= 0.606$) or age class
372 (Wald chi-square= 2.327, $df= 2$, $p= 0.312$) on dominance rank, the size of the adult-young unit to which
373 animals belonged did positively and significantly predict their dominance scores; i.e. the largest the adult-
374 young unit an individual belonged the more dominant it was (Wald chi-square= 6.522, $df= 1$, $p= 0.011$, $B \pm$
375 $S.E.= 0.203 \pm 0.079$, 95% C.I.= 0.047–0.359). Certain adult-young units were dominant over others (GEE: $n=$
376 69 , Wald chi-square= 49.662, $df= 4$, $p \leq 0.001$; Figure 3). The size of the adult-young units was positively
377 and significantly associated with individuals' involvement in coalitions: the largest the adult-young unit an
378 individual belonged the more it participated in coalitions (GEE: $n= 69$, Wald chi-square= 9.811, $df= 1$,
379 $p=0.002$, $B \pm S.E.= 0.185 \pm 0.059$, 95% C.I.= 0.069–0.300). In turn, animals' involvement in coalitions also
380 was positively and significantly related to their dominance scores: the more an individual participated in
381 coalitions the more dominant it was (GEE: $n= 89$, Wald chi-square= 13.722, $df= 1$, $p \leq 0.001$, $B \pm S.E.=$
382 0.071 ± 0.019 , 95% C.I.= 0.034–0.109).

383 (Fig. 3 here)

384 **Discussion**

385 Dominance has been widely studied in very different taxa (e.g. Insecta, Mammalia) and using
386 theoretical models. It represents a fundamental social phenomenon whose biological importance goes beyond
387 its role in shaping social systems, also affecting developmental processes, life histories, and decision-making
388 (Wilson, 1980; Pereira & Kappeler, 1993; Broom et al., 2009; King et al., 2008; Smith et al., 2010).
389 Therefore, a careful evaluation of dominance is essential in order to assess the structure of animal societies

390 (*sensu* Hinde, 1976), but also for pinning down the constraints it imposes on individuals' opportunities and
391 strategies to reach biological goals.

392 Coati species (*Nasua spp.* and *Nasuella spp.*) offer valuable models for understanding the factors
393 shaping female social relationships. Although coatis have been the target of continuous interest among animal
394 behaviourists for more than 50 years (e.g. Ingles, 1957; Kaufman, 1962), only one study (Hirsch, 2007) has
395 properly addressed dominance (i.e. presenting metrics) in one species (*N. nasua*) of this clade. Here, we have
396 quantified the characteristics of agonistic conflicts and the resulting structure of dominance/subordination
397 networks among one band of free-ranging white-nosed coatis (*N. narica*), and discuss each of our major
398 findings in turn.

399 Agonistic conflicts in this band were characterized by low percentages of contact aggression and
400 scarce counter-aggression. This was unexpected, since patterns of mild aggression and moderate power
401 asymmetries (see below) should minimize the potential costs from conflict escalation for subordinates and
402 relax constraints for counterattacking (Matsumura, 1999). However, negative consequences from escalation
403 not only arise from opponents' power asymmetries (e.g. risk of injuries) as aggression can impose non-
404 obvious physiological and social costs on individuals involved (see Aureli et al., 2002). Frequent counter-
405 aggression would imply that opponents assume and impose further costs from conflict escalation, which
406 actually is the opposite of what we found in this band. Even those conflicts involving coalitions or contact
407 aggression usually lasted just a few seconds, and never resulted in opponents suffering visible
408 wounds/injuries. A similar pattern of short and mild agonistic interactions has been reported among wild
409 (Kaufman, 1964) and captive (Smith, 1977) white-nosed coatis (for ring-tailed coatis see Hirsch, 2007).

410 The general characteristics of coati conflicts may represent a conflict management mechanism based
411 on low-cost behaviours (i.e. non-contact aggression) and escalation avoidance (i.e. rare counter-aggression),
412 aimed to quickly settle the conflicts, minimize the costs from aggression, and preserve the benefits from
413 sociability. This is a plausible explanation since coati species are strongly characterized by their prosocial
414 behaviour. Behavioural mechanisms for preventing or buffering the social costs from aggression are expected
415 when animals gain benefits from their sociopositive relationships (Kummer, 1979; Aureli & de Waal, 2000;
416 Aureli & Schaffner, 2007) and do not experience a strong reproductive skew (see Kutsukake & Clutton-

417 Brock, 2008). In fact, coati bands are reported to contain multiple breeders (Gompper, 1995) and exhibit some
418 degree of cooperative nursing (McToldridge, 1969; Russell, 1983), coalitionary support (Gompper et al.,
419 1997; Romero & Aureli, 2008, Hirsch, 2007), and strong mother-offspring bonds (Kaufmann, 1962; Gompper
420 et al., 1997; Romero & Aureli, 2007, 2008; Hirsch et al., 2012). In addition, high within-band relatedness
421 characteristic of coati bands (Gompper et al., 1997; Hirsch et al. 2012) should limit the intensity of
422 aggression, as severe aggression/escalation in this context may impose costs on inclusive fitness (de la O &
423 Mondragón-Ceballos, 2014), especially considering coatids' powerful claws and sharp teeth.

424 Dominance parameters reflect the general characteristics of coati conflicts. This band formed a
425 network of dominance relationships (*sensu* Preuschoft & van Schaik, 2000), mainly characterized by their
426 moderate linearity and steepness. Both parameters were relatively stable over time and remained at mid-levels
427 even when they were expressed at their strongest. Despite the large number of undecided relationships during
428 the first and last observational periods, which are predicted to negatively affect linearity and steepness (Klass
429 & Cords, 2011), these parameters remain statistically significant at every period. Computing dominance
430 parameters for the whole dry and rainy seasons – to include more conflicts evaluated per dyad – resulted in a
431 drastic decrease of undecided relationships and the improvement of linearity and steepness, although both
432 remained at moderate levels. When coalitions were excluded, the large increase in undecided relationships
433 negatively affected dominance parameters, but we still found moderate linearity and steepness in the
434 dominance hierarchy when < 40% of all relationships were undecided (see Table S7). Furthermore,
435 alternative measures of power asymmetry at the group level reflected linearity and steepness outcomes,
436 revealing both moderate imbalances and limited reciprocity in aggressive exchanges, regardless of the
437 observation period. Therefore, our results are likely to describe accurately the dominance structure of this
438 band (see Wittemyer & Getz, 2007; Klass & Cords, 2011).

439 The shallow dominance gradients observed here imply that most of the coatids were unable to exert a
440 strong negative influence (e.g. coercion) on others (see Henzi & Barrett, 1999), making a strict orderliness of
441 the hierarchy unlikely over long periods. Our results are in line with this prediction: most of the instability in
442 the dominance hierarchy arose from the intermediate positions, where power asymmetries among animals
443 were subtle. In contrast, more stability was found when looking at the opposite extremes of the hierarchy:

444 high-ranked animals were mostly the same anytime and low-ranked individuals had only a small scope for
445 improving their status, with low-ranked coatis hardly ever rising to intermediate and never to top positions for
446 more than one period. Together, these results revealed a moderate despotism in coati dominance.

447 Unidirectional signals indicating the dominance/subordination status between individuals (i.e. formal
448 dominance, de Waal, 1986) are not predicted when power asymmetries among individuals are low (as we
449 found), and the likely outcome of agonistic encounters is relatively uncertain (Preuschoft & van Schaik,
450 2000). Moreover, coati prosocial behaviours mentioned above should confer subordinates some influence on
451 dominants (i.e. leverage: Hand, 1986), making unnecessary explicit signals of subordination to gain tolerance
452 (Preuschoft & van Schaik, 2000). As expected, we did not observe interactions suggesting formalised
453 dominance relationships in this band, neither have such signals been reported in previous studies of coati
454 behaviour (e.g. Kaufmann, 1962; Smith, 1977; Gompper et al., 1997; Hirsch, 2007; Romero & Aureli, 2008).
455 In addition, computing dominance hierarchies based on the direction of grooming interactions did not reveal
456 any transitivity (i.e. linearity) in these exchanges, with a large number of dyadic relationships remaining
457 undecided (Table S8).

458 In contrast to ring-tailed coatis (*N. nasua*) in Iguazú, Argentina (Hirsch, 2007), dominance in this
459 band of white-nosed coatis (*N. narica*) was not structured by the sex or age class of animals. However, it is
460 worth noticing that the two adult males associated with the band ranked consistently at the bottom of the
461 hierarchy. Smith (1977) described a similar situation among captive white-nosed coatis: after one male and
462 various females were housed together, the male behaved increasingly submissive towards females and finally
463 avoided their hostile proximity. It is possible that our small sample size (four males and only two of them
464 adults), hampered our ability to find a significant effect of sex on rank. Further studies are necessary to
465 determine how common and enduring is the association of males to white-nosed coati bands, and the
466 cost/benefits from that.

467 Rather than sex or age classes, adult-young units and coalitions structured dominance relationships in
468 this band. The size of the adult-young unit an individual belonged to was positively associated with its
469 dominance scores; i.e. the more close-associates an animal had the more dominant it was. Such subunits may
470 or may not represent close-kin bonds (e.g. mother-offspring, elder sister-young), but they can be viewed as

471 functionally similar in terms of providing the main source of social support during development, and even
472 later in lifetime. For example, the top-four individuals in the dominance hierarchy belonged to the largest
473 adult-young unit ($n=7$), with the adult female holding the alpha position. This suggests that the availability
474 of potential allies in the band may directly affect the opportunities to improve social rank, maybe via kin
475 support. Among the white-nosed coatis of Barro Colorado, Panama, those individuals with close relatives in
476 the band received more coalitionary support than those without (Gompper et al., 1997). Similarly, in our
477 studied band those animals from larger adult-young units also participated more in coalitions. Furthermore,
478 we found that those individuals more involved in coalitions also attained higher dominance scores.

479 Dominance relationships appeared to be more loosely defined when data on coalitionary support
480 were not taken into account (cf. Table 2 vs Table S7). In fact, coalitions play a fundamental role in defining
481 dominance relationships (e.g. Primates: Watts, 2010; Carnivora: Smith et al., 2010), by introducing a source
482 of power asymmetry beyond individual attributes (“intrinsic” vs “derived dominance”; see review in Watts,
483 2010). Coalitions are also a central element of coati agonistic conflicts (Gompper et al., 1997; Romero &
484 Aureli, 2008, Hirsch, 2007), and in this band they made up 10% of all observed conflicts. Such percentage is
485 noticeably lower than the previously reported 68% for free-ranging *N. narica* (Gompper et al., 1997) and 38%
486 for captive *N. nasua* (Romero & Aureli, 2008), but more similar to that reported by Hirsch (2007) at 7% for
487 free-ranging *N. nasua* and within the average values reported by Smith et al. (2010) for 16 non-primate
488 species ($\bar{x} \pm \text{S.D.} = 17 \pm 8\%$). Moreover, > 60% of the observed coalitions in this band involved individuals
489 from the same adult-young unit, which may be close-relatives: e.g. mother and offspring, siblings (see Hirsch
490 & Maldonado, 2011, who accurately determined mother-offspring relationships based on grooming bouts;
491 also see Romero & Aureli, 2008). Such sources of coalitionary support (i.e. kin) would be even more
492 important if a proportion of the remaining ~ 40% of coalitions teaming up individuals from different adult-
493 young units might involve more distant relatives (e.g. grandmothers, aunts, elder siblings), which would be
494 expected if support provides inclusive fitness benefits (Hamilton, 1963). Jointly, the regular occurrence of
495 coalitions among (but not exclusively) members of the same adult-young unit, and the positive influence of
496 subunit size and coalitions on dominance scores, raises the possibility of a ‘loose’ nepotism characterizing
497 coati dominance style. We employ the term ‘loose nepotism’ because: a) kinship among those subunits was
498 uncertain, and b) the resulting hierarchy was not strictly organized in a sequence of adult-young units whose

499 members ranked consecutively, nor did individuals within adult-young units follow the Kawamura's (1958)
500 'youngest ascendancy rule' (i.e. 'strong nepotism'). Once again, it is possible that the moderate and dynamic
501 differences in winning success, particularly among mid-ranked individuals, preclude the development of a
502 'strongly nepotistic' dominance style, including larger bias in coalition formation.

503 Our results broadly fit our prediction on the dominance characteristics (i.e. moderate despotism, mild
504 agonist conflicts) expected on the basis of coati diet (i.e. fruits and invertebrates) and the associated modes of
505 foraging competition (i.e. contest and scrambling, respectively). However, our results did not provide support
506 for the prediction that dominance parameters vary in response to regular climate oscillations (i.e. dry and
507 rainy season), a proxy for the main type of competition the animals were likely to face in response to expected
508 food distribution. Linearity and steepness were both weakly and moderately expressed within the same
509 season, and the alternative measures of power asymmetry did not suggest any influence of weather on the
510 pattern of agonistic interactions. Neither the rate of conflicts per hour, nor the percentage of conflicts
511 involving counter-aggression or coalitions varied significantly through time, and only the percentage of
512 contact aggression followed our predicted relationship (see below). However, note that the presumed spatio-
513 temporal patterns of food distribution were largely uncertain, since we did not estimate systematically the
514 abundance or the consumption of food by coatis throughout the year.

515 Instead, our results suggest that variation in coati dominance was more likely influenced by the
516 stages of reproductive season: mating, gestation, and nesting. Indeed, contact aggression was more common
517 during the dry season, but this was particularly noticeable at the time of mating season (see Table 1) when the
518 dominance hierarchy was also more poorly defined (see Table 2). In primates increased severity of aggressive
519 patterns has been reported when animals face more uncertainty in dominance relationships (e.g. de Waal,
520 1982; Gust & Gordon, 1991; McCowan et al., 2008). Moreover, the most linear and asymmetric dominance
521 relationships occurred during gestation and nesting periods. Here, it is possible that the energetic demands of
522 pregnancy and nursing (Speakman, 2008) have intensified contest competition among females, as suggested
523 by the slight increment in the frequency (although not in the severity) of agonistic conflicts at that time (see
524 Table 1). Alternatively, the increase of linearity and steepness may have resulted from the socio-cognitive
525 development of juveniles (i.e. the gradual acquisition of knowledge of the social rules governing group life).

526 In this case, more well-differentiated and stable dominance relationships can be expected as young animals
527 became older. In fact, there was a trend towards more asymmetric and transitive dominance relationships
528 whilst juveniles approached 1 year of age, and this trend disappeared when the new cubs (socially
529 inexperienced but strongly supported by adults; see Gompper et al., 1997; Hirsch, 2007) joined the band.
530 However, the number of positions that animals moved in the dominance hierarchy between consecutive
531 periods (i.e. our proxy for rank stability) did not significantly change over time.

532 Even though different in terms of the variables structuring dominance (age class and sex vs. social
533 support), our results are similar to those reported by Hirsch (2007) for ring-tailed coatis regarding linearity of
534 the dominance hierarchy, regular occurrence of coalitions, and rare use of contact aggression during agonistic
535 conflicts. We extended the description of coati dominance style by providing data on despotism (i.e.
536 steepness, aggression direction) and potential nepotism (i.e. interrelationship among adult-young units,
537 coalition involvement, and dominance scores), and also on the general features of agonistic conflicts. None of
538 the evaluated aspects of coati dominance were expressed strongly anytime, and dominance relationships were
539 noticeably less despotic and stable than they are in other animal societies largely structured by female kinship
540 (e.g. cercopithecines: Di Fiore & Rendall, 1994; spotted hyaenas, *Crocuta crocuta*: Frank, 1986; Holekamp &
541 Smale, 1991). The observed patterns of power asymmetries between individuals – in spite of their large
542 differences in resource holding potential (e.g. experience, size, weight) – and mild aggression during agonistic
543 conflicts resembled the characteristics of an egalitarian dominance style (Hand, 1986; Isbell & Young, 2002).
544 On the other hand, the hierarchical organization of dominance relationships (and their very existence), the
545 moderate bias in aggression direction, the regular occurrence of coalitions, and the positive effects of primary
546 social bonds and coalitions on dominance scores denote some degree of despotism-nepotism in dominance
547 structure. Actually, coatis showed most of the characteristics (i.e. female philopatry, mild aggressive patterns,
548 coalition formation, potential kin effects on individual rank, moderate linearity and steepness of dominance
549 hierarchy) which define the resident-nepotistic-tolerant dominance style (Sterck et al., 1997) and their
550 equivalent behavioural syndromes (see Isbell & Young, 2002; Clutton-Brock & Janson, 2012); such low
551 amounts of counter-aggression during agonistic conflicts were contrary to that predicted for a tolerant style
552 (Thierry, 2000; Balasubramaniam et al., 2012). Further data on post-conflict affiliations would be beneficial
553 in order to situate coati species in the tolerance-intolerance continuum.

554 It is worth noticing that between group contest competition (BGC) has been proposed as the main
555 selective pressure in the evolution of resident-nepotistic-tolerant societies (see Isbell & Young, 2002; Clutton-
556 Brock & Janson, 2012). In this regard, Kaufmann (1962) described infrequent and mild conflicts among
557 bands of wild white-nosed coatis in Barro Colorado, Panamá. Similarly, Hirsch (pers. comm.) observed low
558 amounts of BGC among ring-tailed coatis in Iguazú National Park, Argentina. In the present study BGC
559 accounted for 9% of all agonistic conflicts observed during dry season, but was barely observed during the
560 rest of the time. Almost all the instances of BGC took place between the two bands described in Methods
561 section (i.e. our studied band and the second one). We cannot make further conclusions from such a limited
562 sample, but the role of BGC in shaping coati social relationships seems limited. Nonetheless, BGC may be
563 more evident at higher population density and its effects on sociability more suitable of being studied.

564 Human activities at the study were likely to affect the agonistic interactions of this band. In fact,
565 coati dominance relationships showed more despotism (but still at moderate levels) when conflicts over
566 anthropogenic food sources were more frequent (Tables 2 and 3). Although our analyses revealed that the
567 frequency of coati conflicts increased as the number of visitors in the surroundings was higher (our proxy for
568 the availability of anthropogenic food), there is not a direct relationship between the number of visitors and
569 the frequency of conflicts occurring over human derived food items. Feeding animals is forbidden at the site
570 and most visitors followed authorities' guidelines, but not all of them. Which visitors would feed the animals
571 was random, and therefore largely unpredictable for coatis. Thus, it is possible that coati expectancies on
572 anthropogenic food availability in response to touristic influx decreased social tolerance in general, but not
573 enough to promote strong despotism in dominance relationships.

574 We acknowledge that studying a single coati band imposes limitations on our discussion. Also
575 contextual (e.g. perturbed habitat) and methodological (e.g. indirect estimates on food abundance and
576 consumption, correlational results) issues should be considered to avoid risky generalizations at the species
577 level or about the general factors determining dominance relationships. However, we consider that our study
578 offers a plausible evaluation of coati dominance structure, but also possess a heuristic value. Our results
579 suggest that under certain ecological circumstances, the traditional view of white-nosed coatis living in an
580 egalitarian society (see Kaufmann 1962, Smith 1977, Gompper 1995, Gompper et al. 1997) might not be the

581 case. Because anthropogenic disturbance is a growing situation around the world, and coatis have been
582 reported to regularly display activities around urbanised areas/touristic sites (e.g. Hirsch, 2009; Sazima, 2010;
583 Ferreira, 2013; de la Rosa-Arana et al. 2016), our results may reflect a common situation faced for other coati
584 populations.

585 Overall, whilst our results did not match exactly any of the dominance styles predicted by
586 socioecological models (see Isbell & Young, 2002; Clutton-Brock & Janson, 2012), we consider the
587 singularities of coati dominance may arise from two key aspects of coati life history largely different from
588 primates: a) the number of offspring produced per reproductive event, and b) the life span. Indeed, whilst
589 most of the primates are characterized by producing only one young per reproductive event and being
590 relatively long-lived (Harvey et al., 1987; Ross, 1998; Jones, 2011), coati females can produce up to six cubs
591 per reproductive event and have a shorter life span (Gompper, 1995). As a result of this, reproductive adult
592 females raise multiple cubs simultaneously, facing the challenge of making them becoming fully independent
593 before the next reproductive season (i.e. < 1 year). On the other hand and similar to primates, coati species
594 (*Nasua spp.*) are plural breeders (Gompper, 1995; Gompper & Decker, 1998), which produces a social
595 situation where multiple juveniles from different mothers are born into the band simultaneously. At least two
596 consequences on the ontogeny of coati dominance relationships are expected from the aforementioned: first,
597 coati mothers face a scenario where they have to divide their attention and agonistic support among various
598 equally related individuals (and differentiate them from the other same-age ones), making a strict adherence
599 to the ‘youngest ascendance’ order (Kawamura, 1958) observed among despotic-nepotistic species impossible
600 (e.g. *Macaca spp.*, see Chapais, 2004). In addition, coati life expectancy and accelerated growing rate are
601 likely to impose strong constraints on the time and opportunities for socio-cognitive development and
602 expression of complex social behaviour.

603 Our results support the claim that dominance represents a continuum of power imbalances within
604 relationships (Hand, 1986) which accounts for its basic properties: egalitarianism-despotism, tolerance-
605 intolerance, individualism-nepotism (Klass & Cords, 2015). Although it has been proposed these dimensions
606 tend to covariate in a specific way (the systematic variation hypothesis: Castles et al., 1996) and constitute
607 dominance styles (see Balasubramaniam et al., 2012), we consider it better not to assume a priori the

608 existence of a close association between the components of dominance phenomenon. It is now important for
609 more comparative studies on dominance and other aspects of sociability (i.e. bonding, cooperativeness)
610 among carnivores and other mammals to provide valuable elements to assess how ecological, life history and
611 phylogenetic factors participate in the variation of different aspects of sociality between and within species
612 and populations.

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933 **Table 1.** Characteristics of coati agonistic conflicts across the study period for n=23 white-nosed coatis.

934 Average values computed from the whole dataset.

Period	Conflicts/Hr ^a	% Contact aggression ^{b,c}	% Counter- aggression ^{b,d}	% Coalitions ^{b,d}	% Undecided conflicts ^{b,d}	% Conflicts over ASF ^{b,d}	T@SS
Feb-Mar	2.60	17.28	1.69	9.80	39.19	3.67	25.67
Apr-May	3.16	11.84	2.70	8.28	31.25	12.84	34.58
Jun-Jul	4.16	8.45	6.48	11.20	40.94	28.04	45.53
Aug-Oct	2.72	7.44	6.96	10.44	40.51	8.25	48.40
Average	3.35	10.43	4.82	10.07	37.92	17.41	41.86

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936 ASF= Anthropogenic sources of food (e.g. peanuts, chips, food waste)

937 T@SS= Number of tourist at the start of scan samplings

938 ^a Computed from focal samplings only

939 ^b Computed from focal and ad libitum samplings

940 ^c Relative to all instances of aggression

941 ^d Relative to all conflicts

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943 **Table 2.** Dominance parameters (Corrected Landau h' , Steepness) across the study period for n=23 white-
 944 nosed coatis.

Period/Season	Corrected Landau h'	p -value	Steepness	Right p -value	% undecided relationships
Feb-Mar	0.251	0.007	0.109	< 0.001	52.81
Apr-May	0.387	< 0.001	0.262	< 0.001	23.32
<i>Dry season^a</i>	<i>0.431</i>	<i>< 0.001</i>	<i>0.319</i>	<i>< 0.001</i>	<i>15.81</i>
Jun-Jul	0.439	< 0.001	0.326	< 0.001	15.15
Aug-Oct	0.299	< 0.001	0.162	< 0.001	45.89
<i>Rainy season^b</i>	<i>0.540</i>	<i>< 0.001</i>	<i>0.405</i>	<i>< 0.001</i>	<i>9.09</i>

945 ^a February to May

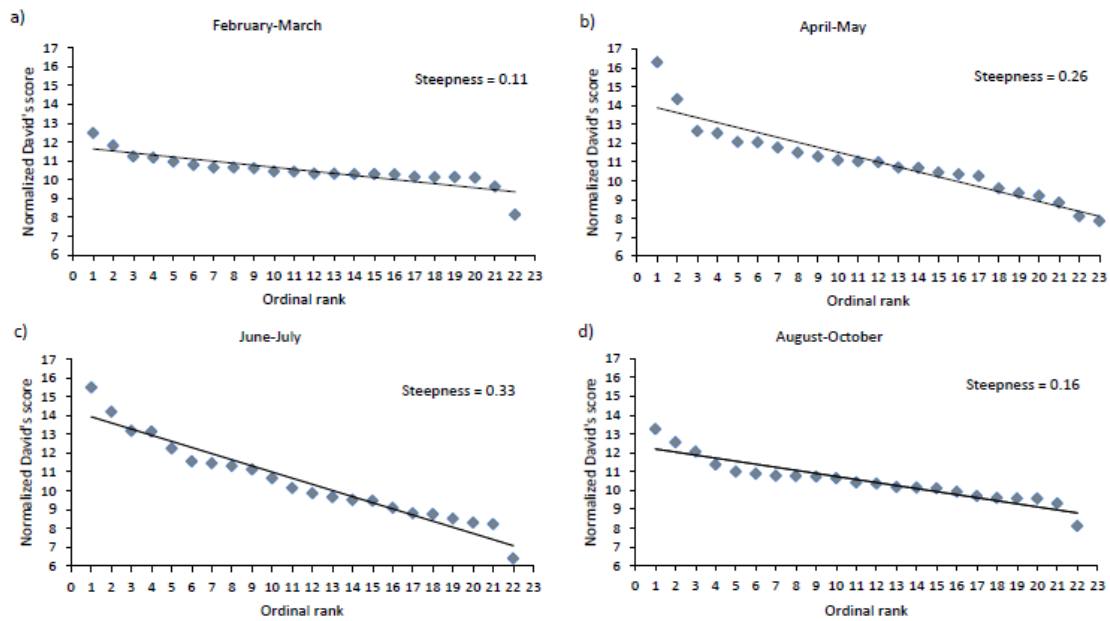
946 ^b June to early October

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948 **Table 3.** Silk's Reciprocity Index (RI), directional consistency index for aggression (DCI), Dietz R-test, and
 949 Hemelrijk Rr-test (with respective *P* values for the latter two) across the study period for n=23 white-nosed
 950 coatis.

Period	RI ($\bar{x} \pm \text{S.D.}$)	DCI ($\bar{x} \pm \text{S.D.}$)	Dietz R-test (absolute reciprocity)	<i>p</i> -value (R-test)	Hemelrijk Rr-test (relative reciprocity)	<i>p</i> -value (Rr-test)
Feb-Mar	0.672 ± 0.339	0.377 ± 0.472	0.227	< 0.001	0.268	< 0.001
Apr-May	0.569 ± 0.328	0.580 ± 0.459	0.363	< 0.001	0.284	< 0.001
Jun-Jul	0.438 ± 0.333	0.638 ± 0.421	0.267	< 0.001	0.161	< 0.001
Aug-Oct	0.597 ± 0.369	0.459 ± 0.490	0.461	< 0.001	0.153	< 0.001

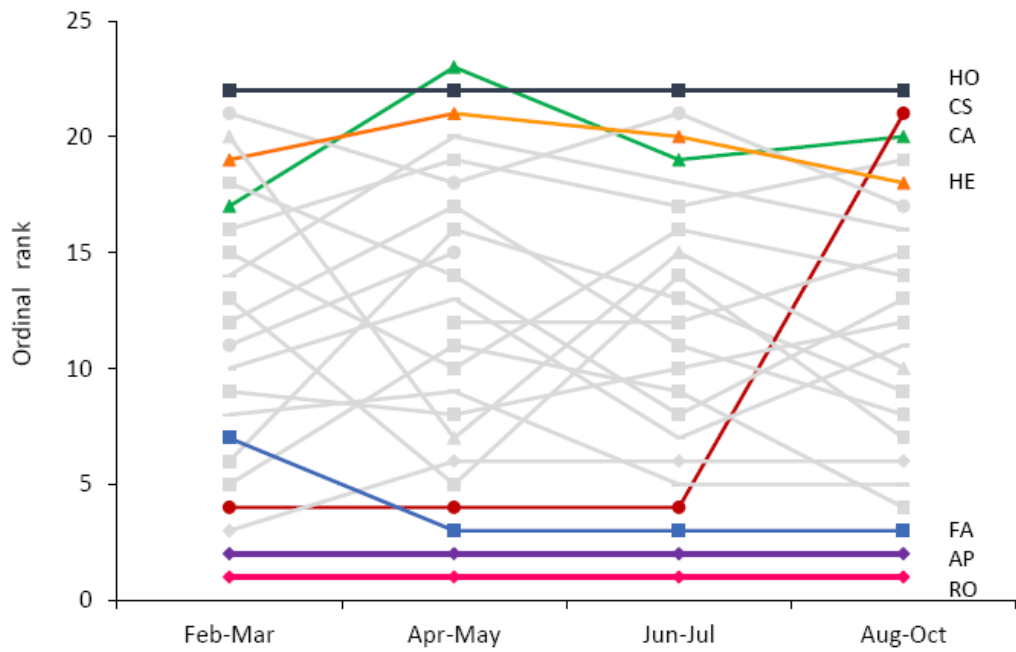
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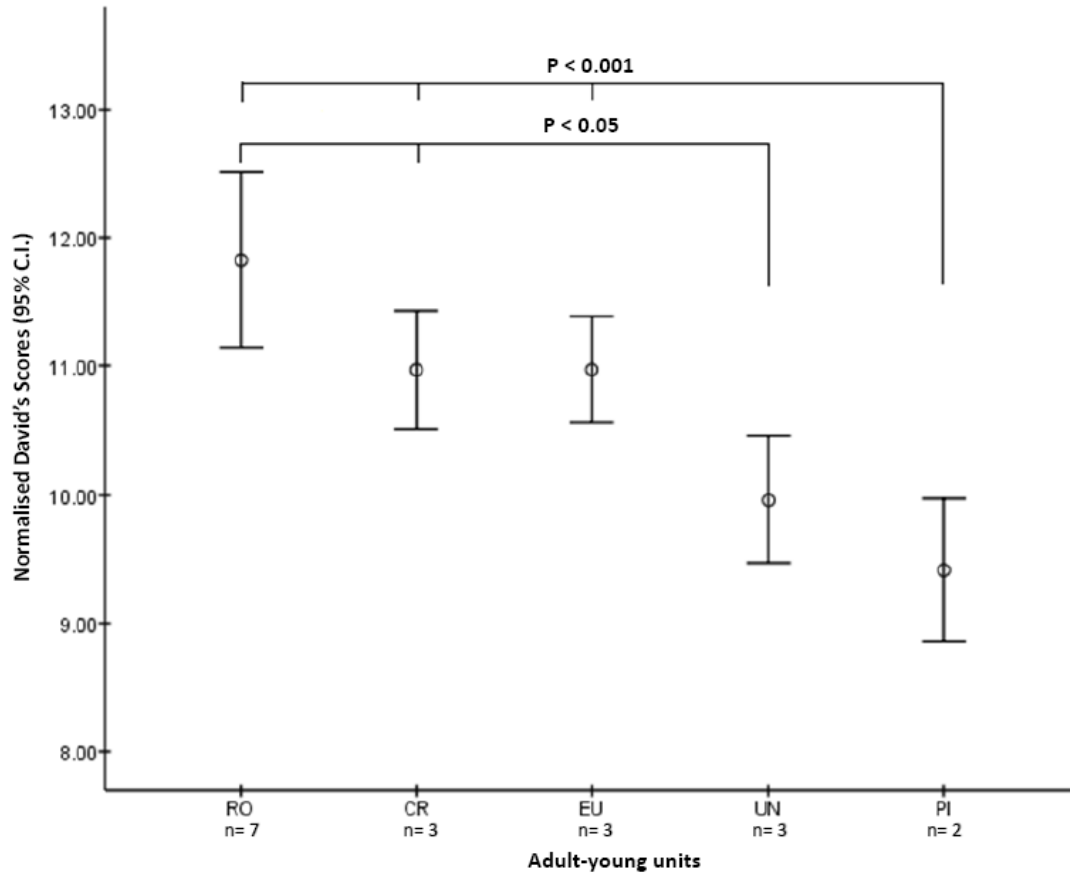
953 **Figure 1.** Dominance ranks (normalised David's scores) as a function of ordinal rank for n=23 white-nosed
 954 coatis across four observation periods: a) middle dry season/mating season, b) late dry season/gestation
 955 period, c) early rain season/birthing and nesting period, d) late rainy season/new litters become part of the
 956 group. Steepness of the hierarchy is represented by the slope of the regression line.

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958 **Figure 2.** N=23 coatis' ordinal rank across four observation periods. Animals ranked at the top (n=4) and
 959 bottom (n=3) positions of the dominance hierarchy are most stable and are represented by coloured lines.
 960 Capital letters at the right of the graph represent these animals' ID codes. First and last ordinal numbers
 961 correspond to the alpha and omega animals, respectively.
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965 **Figure 3.** Differences in dominance (Normalised David's Scores) among five adult-young units, assumed
 966 from observed affiliative grooming patterns.

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SUPPORTING INFORMATION

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Resident-nepotistic-tolerant dominance style in wild white-nosed coatis (*Nasua narica*)

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987 **Table S1:** White-nosed coati band age-sex class composition, adult-young units defined from grooming data
 988 (and named after the adult female), and focal samples conducted.

ID Code	Sex	Age class	Adult-young unit	No. focal samples
AP	♂	Juvenile ^a	RO	46
BR	♀	Juvenile ^a	RO	47
CA	♂	Adult ^c		44
CL	♀	Juvenile ^a	UN	45
CR	♀	Adult ^c	Head of unit	50
CS	♀	Subadult ^b	RO	50
DE	♀	Adult ^c		42
DI	♀	Subadult ^b	PI	51
ES	♀	Juvenile ^a	CR	47
EU	♀	Adult ^c	Head of unit	42
FA	♀	Juvenile ^a	RO	46
HE	♀	Adult ^c		43
HO	♂	Adult ^c		38
MA	♀	Subadult ^b	RO	47
NA	♀	Juvenile ^a	EU	11
PAN	♂	Juvenile ^a	EU	44
PE	♀	Subadult ^b	RO	48
PI	♀	Adult ^c	Head of unit	49
RO	♀	Adult ^c	Head of unit	47
SE	♀	Juvenile ^a		42
TA	♀	Juvenile ^a	CR	47
UN	♀	Adult ^c	Head of unit	42
UNC	♀	Juvenile ^a	UN	41

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990 ♀ = female

991 ♂ = male

992 ^a Juvenile < 1y.o.

993 ^b Subadult < 2y.o.

994 ^c Adult > 2y.o.

995 **Table S2:** Behavioural definitions.

Category	Behaviour	Definition
Affiliation	Grooming	The giver gently “handles” the fur of the target, mainly by using its muzzle and rarely its paws. It could be unidirectional or mutual.
Submissive	Retreating	Moving back or walking away from a former aggressor.
	Fleeing	The animal runs away from a former aggressor which is chasing after it.
	Displacement	Spontaneously avoiding an approaching individual (i.e. a non-former aggressor) by stepping aside or walking away.
Non-contact aggression	Nose-up display	A conspicuous threat at the opponent by exposing the incisors and canines.
	Feinting	A quick head movement at a close target, the muzzle slightly open and exposing subtly the incisors and canines.
	Lunging	Running towards the opponent who could either move or stay.
Contact aggression	Chasing	Running after a fleeing opponent for more than 3 m.
	Rough contact	Approaching and making a brusque contact at the opponent’s body.
	Pushing	Using the head or forepaws to drive off a group mate in close proximity.
	Biting	Exerting pressure on some part of the opponent body by employing the aggressor tooth, mainly the maxillary canines.
	Fighting	A brief but conspicuous encounter where the opponents grabbed each other employing their claws, rolled together on the ground, and exchanged bites.
Agonistic support	Coalition	Two or more animals joining forces to attack/ defend another individual. Individuals forming a coalition could either initiate the attack/defence simultaneously, or the supporter(s) could “join in” after a few seconds.

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1004 **Table S3:** Win-loss sociomatrix for n= 22 white-nosed coatis during February-March period. Individuals in
 1005 ID column are ordered according to their ordinal rank in this period (from top to the bottom). Conflicts won
 1006 against each opponent are presented in rows.

AYU	Age/Sex	ID	RO	AP	EU	CS	CR	BR	FA	ES	PAN	PE	NA	MA	DE	PI	UN	CL	CA	SE	HE	TA	DI	HO	
RO	AF	RO	x	2	0	2	1	0	2	5	1	1	0	2	1	0	3	1	1	3	2	0	5	2	
RO	JM	AP	0	x	0	1	0	3	4	5	0	2	0	1	1	0	0	1	1	0	3	1	1	4	
EU	AF	EU	0	0	x	1	0	0	0	1	1	1	0	1	0	2	1	0	0	0	0	0	2	2	
RO	SAF	CS	0	1	0	x	0	0	0	0	1	2	0	2	0	0	0	0	3	1	1	1	2	1	
CR	AF	CR	0	0	1	0	x	0	0	0	0	1	0	0	2	2	1	0	0	0	0	0	0	0	
RO	JF	BR	0	1	0	1	0	x	1	0	0	1	0	0	1	0	0	0	0	0	0	0	1	0	1
RO	JF	FA	1	0	0	0	0	0	x	4	0	1	0	1	0	0	0	0	0	0	4	0	1	0	2
CR	JF	ES	0	0	1	1	0	0	2	x	0	0	0	1	0	0	0	0	0	2	0	1	2	6	
EU	JM	PAN	0	0	1	0	0	0	0	0	x	0	3	0	0	0	1	3	2	0	0	0	0	3	
RO	SAF	PE	0	1	0	0	0	0	1	0	0	x	0	1	0	0	0	1	1	0	0	1	0	0	
EU	JF	NA	0	0	0	0	1	0	0	0	1	0	x	0	0	1	1	1	0	0	0	0	1	2	
RO	SAF	MA	0	0	0	0	0	0	0	1	1	0	0	x	0	1	0	0	1	0	0	0	1	2	
-	AF	DE	1	0	0	0	0	0	0	0	0	0	0	0	x	0	0	0	2	1	0	1	0	0	
PI	AF	PI	0	0	0	0	0	0	0	0	0	0	1	0	1	x	0	0	1	0	0	0	0	4	
UN	AF	UN	0	0	1	0	1	0	0	0	0	0	0	0	0	0	x	0	0	0	0	0	0	0	
UN	JF	CL	0	0	0	0	0	1	0	0	1	0	0	0	0	1	0	x	0	0	0	0	1	0	
-	AM	CA	3	0	0	0	0	0	0	1	0	0	1	0	1	0	0	0	x	1	0	0	4	10	
-	JF	SE	0	2	0	0	0	1	1	0	0	0	0	0	0	0	0	0	2	x	1	0	0	2	
-	AF	HE	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	x	0	0	0	
CR	JF	TA	0	0	0	1	0	0	1	0	0	1	0	0	0	0	0	0	0	0	0	x	0	0	
PI	SAF	DI	0	0	0	0	0	0	0	0	0	0	1	0	1	0	0	1	2	0	0	0	x	2	
-	AM	HO	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	1	0	0	0	0	x	

1007 AYU= Adult-young unit (named after the adult female)

1008 AF= Adult female

1009 AM= Adult male

1010 SAF= Subadult female

1011 JF=Juvenile female

1012 JM= Juvenile male

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1017 **Table S4:** Win-loss sociomatrix for n= 23 white-nosed coatis during April-May period. Individuals in ID
 1018 column are ordered according to their ordinal rank in this period (from top to the bottom). Conflicts won
 1019 against each opponent are presented in rows.

AYU	Age/Sex	ID	RO	AP	FA	CS	DE	EU	TA	PAN	ES	UN	CR	UNC	PE	SE	NA	BR	MA	DI	CL	PI	HE	HO	CA
RO	AF	RO	x	7	1	6	4	3	2	5	2	3	8	1	3	3	2	6	1	4	3	4	10	1	3
RO	JM	AP	2	x	4	3	2	0	6	2	5	0	3	0	2	3	1	7	3	2	1	4	0	1	1
RO	JF	FA	0	2	x	3	0	0	1	0	1	2	2	0	0	1	0	2	2	1	0	1	1	2	1
RO	SAF	CS	2	0	0	x	0	1	0	1	3	3	3	1	3	2	1	1	2	5	0	3	1	2	4
-	AF	DE	1	0	0	2	x	0	2	2	1	1	0	3	0	0	0	0	0	1	2	2	1	0	4
EU	AF	EU	0	0	0	0	0	x	2	1	1	3	1	1	0	0	1	0	0	1	1	2	4	1	4
CR	JF	TA	0	3	3	0	0	0	x	3	0	1	0	0	3	2	0	1	1	0	1	2	1	0	1
EU	JM	PAN	0	0	2	0	0	1	1	x	1	1	2	5	0	0	3	0	1	1	2	1	1	2	4
CR	JF	ES	0	0	1	3	3	2	0	0	x	0	1	0	0	2	0	1	0	1	0	1	2	3	3
UN	AF	UN	1	0	0	2	1	0	0	0	2	x	0	2	2	1	1	1	0	2	2	3	0	3	1
CR	AF	CR	0	0	0	0	4	1	2	3	1	1	x	1	0	1	1	0	2	0	2	0	5	4	0
UN	JF	UNC	0	1	0	1	0	0	2	1	0	0	1	x	1	1	0	0	0	1	1	1	2	0	2
RO	SAF	PE	0	0	0	0	2	0	1	0	0	0	0	1	x	0	0	0	1	2	0	0	3	0	1
-	JF	SE	2	0	0	1	0	0	0	0	1	0	3	0	0	x	0	2	2	2	0	0	1	1	4
EU	JF	NA	0	0	1	0	1	0	0	1	0	0	0	0	0	0	x	0	0	1	1	0	0	0	0
RO	JF	BR	2	1	0	2	0	1	0	0	1	0	1	0	0	2	0	x	1	0	0	1	0	0	0
RO	SAF	MA	0	1	0	0	0	0	0	1	0	0	0	0	1	2	0	1	x	3	1	0	0	0	0
PI	SAF	DI	0	0	0	0	0	0	0	0	0	2	0	1	0	0	1	1	2	x	3	1	1	1	5
UN	JF	CL	0	0	0	0	0	0	0	3	1	1	3	1	0	0	1	1	0	1	x	0	0	3	0
PI	AF	PI	0	1	0	0	1	1	0	1	0	1	0	1	0	0	0	1	0	0	1	x	2	1	0
-	AF	HE	0	0	0	1	0	0	0	0	0	1	0	1	1	0	0	0	0	0	1	0	x	2	1
-	AM	HO	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	x
-	AM	CA	0	0	0	0	0	0	0	1	0	0	1	0	0	1	0	0	0	1	1	1	0	1	x

1020 AYU= Adult-young unit (named after the adult female)

1021 AF= Adult female

1022 AM= Adult male

1023 SAF= Subadult female

1024 JF=Juvenile female

1025 JM= Juvenile male

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1030 **Table S5:** Win-loss sociomatrix for n= 22 white-nosed coatis during June-July period. Individuals in ID
 1031 column are ordered according to their ordinal rank in this period (from top to the bottom). Conflicts won
 1032 against each opponent are presented in rows.

AYU	Age/Sex	ID	RO	AP	FA	CS	ES	EU	PE	SE	CR	PAN	MA	UNC	BR	DE	TA	UN	CL	PI	CA	HE	DI	HO
RO	AF	RO	x	5	8	7	4	8	3	8	5	3	1	2	2	5	9	7	4	4	3	12	10	2
RO	JM	AP	3	x	5	2	8	2	3	14	3	5	3	0	7	0	5	1	2	1	2	0	6	0
RO	JF	FA	2	1	x	2	2	0	1	4	5	0	4	1	1	1	2	3	2	0	5	4	3	7
RO	SAF	CS	2	1	3	x	2	2	1	2	5	3	2	3	0	3	1	2	5	1	1	4	4	3
CR	JF	ES	2	1	1	2	x	3	0	4	0	1	3	0	4	6	0	4	1	2	5	4	9	6
EU	AF	EU	0	0	0	4	0	x	0	0	3	6	2	0	1	0	0	0	3	2	3	7	1	2
RO	SAF	PE	0	1	0	0	0	1	x	0	0	2	0	0	1	2	1	1	0	1	2	5	2	2
-	JF	SE	3	2	2	6	1	0	2	x	1	1	3	0	2	1	0	1	0	2	5	6	4	3
CR	AF	CR	2	0	0	3	4	1	1	0	x	1	1	3	1	5	1	4	1	0	4	5	8	1
EU	AM	PAN	0	1	0	2	2	2	0	2	4	x	3	3	3	0	0	0	1	0	4	2	2	3
RO	SAF	MA	0	1	0	0	2	0	0	3	0	0	x	2	0	2	0	2	2	3	0	1	3	0
UN	JF	UNC	1	1	1	0	0	1	0	1	0	0	0	x	0	2	1	0	0	0	0	1	1	7
RO	JF	BR	1	0	0	0	1	0	0	3	3	0	1	0	x	1	3	0	1	1	2	1	3	2
-	AF	DE	1	1	1	0	0	0	1	1	1	1	0	0	1	x	0	1	0	0	1	1	0	0
CR	JF	TA	0	0	2	0	0	0	0	2	1	0	0	0	0	1	x	0	0	1	0	1	0	3
UN	AF	UN	0	0	0	0	0	0	0	0	1	0	0	2	2	1	0	x	1	0	1	2	0	2
UN	JF	CL	2	0	0	0	0	0	0	0	1	0	0	0	1	1	0	1	x	0	0	0	1	6
PI	AF	PI	0	0	0	0	0	0	0	0	1	1	0	0	0	0	0	0	1	x	2	1	0	0
-	AM	CA	1	0	1	0	2	2	0	2	0	4	1	1	2	0	0	0	0	1	x	1	1	1
-	AF	HE	1	1	0	0	2	0	1	0	1	3	0	3	2	0	1	0	0	0	3	x	0	1
PI	SAF	DI	0	0	0	2	2	0	0	0	1	3	0	1	0	0	3	1	2	4	0	0	x	0
-	AM	HO	0	0	0	0	0	0	0	1	0	0	0	0	1	0	0	0	0	0	1	0	0	x

1033 AYU= Adult-young unit (named after the adult female)

1034 AF= Adult female

1035 AM= Adult male

1036 SAF= Subadult female

1037 JF=Juvenile female

1038 JM= Juvenile male

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1043 **Table S6:** Win-loss sociomatrix for n= 22 white-nosed coatis during August-October period. Individuals in
 1044 ID column are ordered according to their ordinal rank in this period (from top to the bottom). Conflicts won
 1045 against each opponent are presented in rows.

AYU	Age/Sex	ID	RO	AP	FA	CR	ES	EU	DE	MA	BR	TA	PE	PAN	SE	UN	UNC	PI	DI	HE	CL	CA	CS	HO
RO	AF	RO	x	4	3	1	2	1	1	1	1	0	3	0	2	2	0	6	1	2	3	1	4	0
RO	SAM	AP	0	x	1	2	2	0	0	0	2	1	4	0	1	1	0	2	2	0	1	1	2	5
RO	SAF	FA	1	0	x	1	1	1	0	2	3	0	4	0	0	0	0	1	0	2	0	0	3	2
CR	AF	CR	0	0	0	x	1	0	0	0	0	0	1	1	0	0	0	0	2	0	2	0	2	1
CR	SAF	ES	2	0	0	0	x	0	0	0	2	0	1	0	0	2	0	1	3	1	0	0	5	3
EU	AF	EU	0	0	0	0	0	x	0	1	0	0	0	1	0	2	0	1	0	0	0	4	0	0
-	AF	DE	0	0	0	0	0	0	x	0	1	0	0	0	0	0	2	0	0	0	2	1	0	0
RO	AF	MA	0	0	0	0	0	0	0	x	0	0	0	1	0	0	1	0	2	2	0	3	0	2
RO	SAF	BR	1	0	0	0	1	0	0	0	x	1	0	0	0	1	0	0	0	0	0	0	0	4
CR	SAF	TA	0	1	0	0	0	0	0	0	0	x	0	0	0	1	0	0	1	0	0	1	2	1
RO	AF	PE	0	0	0	0	0	1	0	0	0	0	x	0	0	0	0	1	1	2	1	0	0	2
EU	SAM	PAN	0	0	0	0	1	0	1	1	0	0	0	x	0	0	1	0	7	1	1	5	2	1
-	SAF	SE	0	0	0	0	0	0	0	0	0	0	0	0	x	0	0	0	0	0	0	1	1	1
UN	AF	UN	0	0	0	0	0	0	0	0	0	0	0	1	0	x	0	1	0	0	1	2	0	0
UN	SAF	UNC	0	0	0	0	0	0	0	0	0	0	0	1	0	0	x	2	0	0	0	1	0	2
PI	AF	PI	0	0	0	0	0	0	0	1	0	0	0	5	0	0	1	x	0	0	2	1	1	5
PI	AF	DI	0	0	0	0	1	0	0	0	0	1	0	2	1	0	1	0	x	0	1	1	1	2
-	AF	HE	0	0	1	0	0	0	0	0	0	1	1	0	0	0	1	0	0	x	0	0	1	0
UN	SAF	CL	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	1	0	x	0	1	0
-	AM	CA	0	0	0	0	1	0	0	0	0	0	0	4	0	2	0	3	1	1	0	x	0	0
RO	AF	CS	0	0	0	0	0	1	0	0	0	0	0	0	1	0	0	1	1	4	0	0	x	1
-	AM	HO	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	2	0	x

1046 AYU= Adult-young unit (named after the adult female)

1047 AF= Adult female

1048 AM= Adult male

1049 SAF= Subadult female

1050 SAM= Subadult male

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1056 **Table S7:** Dominance parameters (Corrected Landau h' , Steepness) across the study period for n=23 white-
 1057 nosed coatis. Conflicts involving coalitionary support were excluded from these analyses.

Period/Season	Corrected Landau h'	p -value	Steepness	Right p -value	% undecided relationships
Feb-Mar	0.162	0.284	0.058	0.047	64.93
Apr-May	0.359	<0.001	0.200	<0.001	37.15
Dry season^a	0.357	<0.001	0.245	<0.001	28.06
Jun-Jul	0.295	0.003	0.223	<0.001	27.70
Aug-Oct	0.209	0.094	0.088	<0.001	59.74
Rainy season^b	0.380	<0.001	0.293	<0.001	18.18

1058 ^a February to May
 1059 ^b June to early October

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1074 **Table S8:** Dominance parameters (Corrected Landau h' , Steepness) across the study period, based on
 1075 grooming interactions among $n=23$ white-nosed coatis.

Period/Season	Corrected Landau h'	p -value	Steepness	Right p -value	% undecided relationships
Feb-Mar	0.141	0.384	0.028	0.931	80.24
Apr-May	0.138	0.388	0.051	0.967	68.77
Dry season^a	0.143	0.310	0.062	0.0691	62.05
Jun-Jul	0.160	0.247	0.051	0.849	69.70
Aug-Oct	0.136	0.431	0.026	0.560	80.09
Rainy season^b	0.183	0.147	0.074	0.054	61.47

1076 ^a February to May
 1077 ^b June to early October