Notes and records

Gastrointestinal parasites of free-ranging colobus monkeys (*Colobus angolensis palliatus*) in Kwale District, Kenya coast

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Introduction

Approximately 2000 black and white Angolan colobus monkeys (*Colobus angolensis palliatus*) remain in Kwale District, Southern Kenya. They are threatened by deforestation due to private development countrywide.

Primates can act as indicators of the degree of change in a habitat, as habitat changes potentially affect how they deal with parasitic infection (Mittermeier & Cheney, 1987). An increasing human population in Diani, Kwale District, encroaches on the forest habitat of the Angolan colobus and brings the primate species into closer proximity with rubbish and waste from the local human population. This study established the type and distribution of gastrointestinal parasites in Angolan colobus in Diani Forest, Kwale according to age and sex and the effect of varying habitat integrity on parasite prevalence.

Materials and methods

Angolan colobus were sampled from Diani Forest in the Kenyan South Coast, Kwale District (4°15′30″, 4°35′30″S and 39°35′00″, 39°34′30″E). Temperatures reach up to 35°C during the dry seasons and remain around 28°C in the rainy seasons. Humidity ranges between 80 and 100%. Diani has an ancient indigenous coral rag forest spanning 0.5–1 km in width and stretching for 12 km along the coast. It is currently degraded into patches by tourism and agricultural activities.

Faecal samples were collected from 74 colobus during troop follows. Samples were labelled according to age, sex and the troop ID of the individual. Samples were processed using the modified formol-ether technique (Munene *et al.*, 1998) and the McMaster's technique (Aiello, 1998). The Harada–Mori larval culture (Karere & Munene, 2002) was an additional technique used mainly to identify the hatched larvae. Parasites were identified using standard criteria (Ash & Orihel, 1991).

Vegetation transects were conducted through known colobus troop territories to assess forest integrity and vegetation cover. Vegetation features, such as canopy height, canopy cover, indigenous species and tree spacing (distance from the transect line) were recorded. Tree damage was noted when it occurred and classified as human associated damage or natural damage.

Statistical means for each parameter were computed per habitat and ranked between I and III according to mean percentage, metres or incidents of damage observed.

Modal mean scores were used to rank the habitat as follows:

Rank I – habitat with mostly intact forest (>75% canopy cover and indigenous species; >5 m canopy height; <2 m tree distance).

Rank II – habitat showing signs of degradation (40–75% canopy cover and indigenous species; 2–4 m canopy height; 2–4 m tree distance).

Rank III – degraded habitat (<40% canopy cover and indigenous species; <2 m canopy height; >5 m tree distance).

Results

The protozoans *Entamoeba coli* (95 cysts) and *Entamoeba histolytica* (86 cysts) and nematodes from *Strongyloides* (fourteen eggs), *Trichuris* (eighteen eggs) and *Enterobius vermicularis* (one egg) species, occurred in *C. angolensis* faecal samples (Table 1).

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Table 1 Prevalence of infection for protozoan and nematode parasite species in Angolan colobus faecal samples according to age and sex (% values are given in parentheses)

	Sex		Age		
Parasites	Males	Females	Adults	Sub-adults	Juveniles
Protozoa					
Entamoeba coli	31 (97)	41 (98)	49 (100)	13 (87)	10 (100)
Entamoeba histolytica	29 (91)	37 (88)	45 (92)	13 (87)	8 (80)
Nematodes					
Trichuris sp.	3 (9)	4 (10)	5 (10)	1 (7)	1 (10)
Strongyloides sp.	3 (9)	4 (10)	4 (8)	0	3 (30)
Enterobius vermicularis	0	1 (2)	0	0	1 (10)
Total no. of samples	32	42	49	15	10

Table 2 Prevalence of parasite species in Angolan colobus in each habitat type (% values are given in parentheses)

	Rank I habitats	Rank II habitats	Rank III habitats
Entamoeba coli	28 (93)	21 (100)	21 (100)
Entamoeba histolytica	26 (87)	19 (90)	19 (90)
Strongyloides sp.	3 (10)	2 (10)	2 (10)
Trichuris sp.	2 (7)	1 (5)	3 (14)
Enterobius vermicularis	0	1 (5)	0
Total no. of samples per habitat	30	21	21

Protozoans were more prevalent than nematodes, ranging between 87 and 100% prevalence compared to 0–30% nematode prevalence. Little difference occurred in parasite prevalence between sexes and age groups (Table 2).

Fifty incidents of vegetation damage were recorded. Fifty-six per cent of observed damage was associated with human, with a proportion of 54% inflicted recently. Parasite prevalence between habitats varied between 0 and 7%.

Discussion

Observed ground contact in the Angolan colobus was presumed to be the main mode of infection. Other potentially contributing factors include area geography, which may influence the distribution of *Strongyloides* species (Marcial-Rojas, 1971).

Entamoeba coli does not have much significance regarding its zoonotic potential. However, *E. histolytica* is potentially pathogenic in colobines and has proven zoonotic potential (Soulsby, 1982; Loomis *et al.*, 1983). The findings of this study suggest that there is not a large-enough margin of variation between Diani habitat types to significantly affect parasite infection prevalence. Additionally, available data from this and other studies (Mahaney & Krishnamani, 2000) suggest that there are alternative reasons behind why the colobus come to the ground, which are not necessarily related to habitat quality. Further investigation into the ability of Angolan colobus to adapt to various levels of forestation can be used as a tool in aiding the long-term conservation of the species.

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