

Prevalence of antibodies to selected viruses and parasites in introduced and endemic carnivores in western Madagascar



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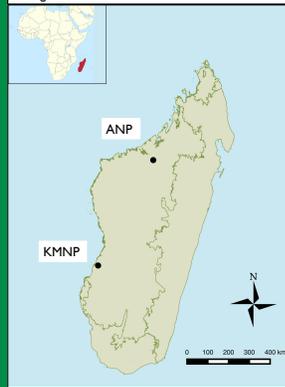
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Introduction

- The increase in domestic animal-wildlife interactions, associated with the expansion of human settlements in the vicinity of pristine natural areas, can lead to the introduction of pathogens in naïve species and new geographic areas.
- "Pathogen pollution" can pose a threat to naïve wildlife populations through disease spillovers for which domestic animals can act as reservoir species.
- The objectives of the present study were to :
 - Estimate the prevalence of antibodies to viruses and parasites in domestic carnivores living in proximity to and wild carnivores living in two protected areas in western Madagascar.
 - Identify variables associated with the exposure to pathogens in Fosa (*Cryptoprocta ferox*), the largest carnivore of Madagascar.

Figure 1: Location of the study sites Ankarafantsika National Park and Kirindy Mitea National Park in Madagascar.



Results

- We evaluated and sampled 240 animals from five species: domestic dog, domestic cat, fosa, narrow striped mongoose (*Mungotictis decemlineata*), and Indian civet.
- Antibodies to CAV, CDV, CHV, CPV and *Toxoplasma gondii* were detected in endemic and introduced carnivores (Table 1).
- Antibodies to *T. gondii* were detected in all species but the Indian civet, and the overall prevalence was 67%.
- 93% of fosa tested (n=45) had detectable antibodies to *Toxoplasma***
 - Adult fosa were more likely to have antibodies to *Toxoplasma* than younger individuals (OR: 17.5)

Methodology

- Blood samples were collected from dogs and cats living in villages near the Ankarafantsika National Park (ANP) and the Kirindy Mitea National Park (KMNP) (Fig. 1).
- Blood samples were collected from endemic and exotic wild carnivores captured in the protected areas.
- Serum samples analyzed for the presence of antibodies against
 - Canine distemper virus (Seroneutralization)
 - Canine parvovirus (Hemagglutination inhibition)
 - Canine coronavirus (Seroneutralization)
 - Feline calicivirus (Seroneutralization)
 - Feline coronavirus (Seroneutralization)
 - Feline immunodeficiency virus (ELISA)
 - Toxoplasma gondii* (ELISA)
- Prevalence of antibodies to viruses and parasites were estimated for each animal species.
- Logistic regression model to identify variables associated with the exposure to viruses and parasites in fosa (*Cryptoprocta ferox*). Variables tested include:
 - Age category (Adults/Immature)
 - Sex
 - Location (ANP/KMNP)
 - Presence of antibodies to another pathogen.

Table 1: Proportion of samples with positive antibody titers to selected pathogens in different species of domestic and endemic carnivores in Western Madagascar.

Species ¹	CAV ²		CDV ²		CHV ²		CPV ²		FCV ²		<i>Toxoplasma</i> ²	
	n	Positive (95%CI) ³	n	Positive (95%CI) ³								
<i>C. familiaris</i>	51	0.14 (0.06-0.27)	49	0.45 (0.31-0.6)	50	0.2 (0.1-0.34)	49	0.67 (0.52-0.8)			16	0.88 (0.6-0.98)
<i>Felis sp</i>									61	0.11 (0.05-0.23)	18	0.22 (0.07-0.48)
<i>Cr. ferox</i>	44	0.04 (0.01-0.15)	43	0 (0)	43	0.09 (0.03-0.23)	44	0 (0)	44	0.23 (0.13-0.38)	42	0.93 (0.79-0.98)
<i>M. decemlineata</i>							5	0.2 (0.01-0.7)	5	0.4 (0.07-0.83)	6	0.17 (0.01-0.64)

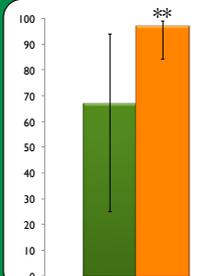


Figure 2: Prevalence of antibodies to *Toxoplasma* in different age categories of wild fosa inhabiting the Kirindy Mitea National Park and Ankarafantsika National Park, Madagascar.

Age category	n	Prevalence (95% CI)	Odds Ratio (95% CI)
Immature	6	0.67 (0.25-0.94)	reference
Adult	38	0.97 (0.84-0.99)	17.5 (1.4 - 432.6)

Discussion

- Carnivores living in or near protected areas of Madagascar show evidence of exposure to selected pathogens. These pathogens are potential threats to the conservation of endemic carnivores.
- Antibodies to *Toxoplasma* were detected in 93% of fosa. The presence of *Toxoplasma* in free-ranging fosa indicates **parasite spill-over** from an introduced cat species.
- In a captive fosa, *T. gondii* caused encephalomyelitis resulting in ataxia, muscular atrophy and eventual death (Corpa et al, 2013). High prevalence of antibodies detected in free-ranging fosa suggests that *Toxoplasma* may not be universally lethal in fosa.
- Higher prevalence of *Toxoplasma* in adult fosa suggest horizontal transmission of the parasite, possibly through ingestion of an intermediate host.
- High prevalence of antibodies to common viral and parasitic pathogens in introduced and endemic carnivores of western Madagascar.**
- A basis for monitoring the exposure of carnivores to these pathogens and for assessing the risks of spillover among carnivores.

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