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Article

# Moving to stay in place: behavioral mechanisms for coexistence of African large carnivores

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## Abstract

Most ecosystems have multiple predator species that not only compete for shared prey, but also pose direct threats to each other. These intraguild interactions are key drivers of carnivore community structure, with ecosystem-wide cascading effects. Yet, behavioral mechanisms for coexistence of multiple carnivore species remain poorly understood. The challenges of studying large, free-ranging carnivores have resulted in mainly coarse-scale examination of behavioral strategies without information about all interacting competitors. We overcame some of these challenges by examining the concurrent fine-scale movement decisions of almost all individuals of four large mammalian carnivore species in a closed terrestrial system. We found that the intensity of intraguild interactions did not follow a simple hierarchical allometric pattern, because spatial and behavioral tactics of subordinate species changed with threat and resource levels across seasons. Lions (*Panthera leo*) were generally unrestricted and anchored themselves in areas rich in not only their principal prey, but also, during periods of resource limitation (dry season), rich in the main prey for other carnivores. Because of this, the greatest cost (potential intraguild predation) for subordinate carnivores was spatially coupled with the highest potential benefit of resource acquisition (prey-rich areas), especially in the dry season. Leopard (*P. pardus*) and cheetah (*Acinonyx jubatus*) overlapped with the home range of lions but minimized their risk using fine-scaled with the activity areas of lions. Contrary to expectation, the smallest species (African wild dog, *Lycaon pictus*) did not avoid only lions, but also used multiple tactics to minimize encountering all other competitors. Intraguild competition thus forced wild dogs into areas with the lowest resource availability year round. Coexistence of multiple carnivore species has typically been explained by dietary niche separation, but our multi-scaled movement results suggest that differences in resource acquisition may instead be a consequence of avoiding intraguild competition. We generate a more realistic representation of hierarchical behavioral interactions that may ultimately drive spatially explicit trophic structures of multi-predator communities.

## Citing Literature

## Supporting Information

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