A Global Analysis of the Impacts of Free-ranging Dogs on Native Wildlife

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Humans knowingly and unknowingly disperse species around the world, resulting in some becoming invasive and impacting native ecosystems(1). Invasive species can cause decreases in native biodiversity as well as threaten the economic, social, and political values of local people(2). Among the most notorious of these invasive species is the domestic cat (Felis catus). These small carnivorous mammals have been the cause or a notable factor in the extinction of many species worldwide, resulting in an increasing amount of management attention, particularly in Australia. The most devastating impacts recorded are the predation of threatened and endangered vertebrates, but they also threaten biodiversity through resource competition and disease transmission (3).

Because of the problems with cats, there have been numerous articles published on the urgency of cat management in order to prevent further biodiversity loss, but among these we have found a gap in the literature. Specifically, another introduced carnivore might be producing similar ecological effects, but has not been researched, published, or managed nearly as much: feral dogs (*Canis lupus familiaris, Canis dingo*). Among the comparatively fewer publications on their impacts (Fig. 1), we have discovered considerable evidence that dogs might pose a similar ecological threat to biodiversity that cats do. The relationship between humans and dogs is extensive and complex, with dogs holding a role in society as our companions, pets, and workers. Humans have brought dogs with them as they have expanded around the world, allowing dogs to thrive under the care and protection of humans. With this advantage and their opportunistic eating habits, dogs have been reported to eat many of the same species as cats, which suggests that they could be having similar ecological effects (3,4) .

To address the gap in our knowledge about dogs, we propose to quantify the ecological effects of free ranging dogs by evaluating the prey species they consume. There have been hundreds of articles published documenting the species that free-ranging dogs kill and eat, but there has not been a thorough compilation and analysis of these data, meaning that we could be overlooking a major environmental crisis. As such, we hypothesize that free-ranging dogs are a major contributor to native species predation and are environmentally as damaging as free-ranging cats. The diets of free-ranging cats have been documented more frequently, and the result of a synthesis of that data, performed in the Fantle-Lepczyk/-Lepczyk lab, showed reason for concern. Dogs are eating hundreds (perhaps thousands) of species and may be threatening the conservation status of many. With this research, we are seeking to quantify these impacts to increase public awareness and provide needed information to practitioners and policymakers.
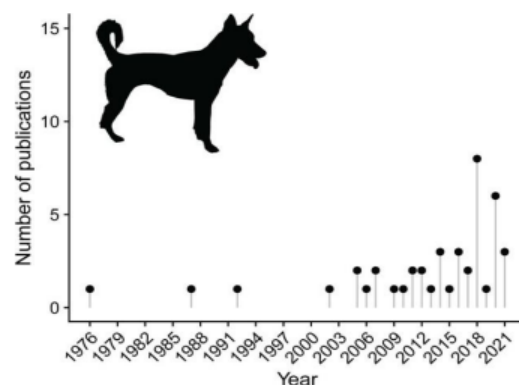

Fig. 1. Timeline of research studies published directly pertaining to a dog predation event. The first event

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on record is in 1976, the most recent in 2021, and the highest volume in 2018.

This research project is a work in progress, meaning that we have already completed some aspects of the methods. Beginning in January of 2022 we worked with our college's science librarian to collect all available articles from the primary literature regarding free-ranging dog diet using structured literature reviews via Web of Science, Google Scholar, BIOSIS, BioOne, JSTOR, and library records. Using the search terms (dog* OR "canis familiaris" OR dingo* OR "canis lupus dingo" OR "canis dingo" OR "canis lupus familiaris" OR "canis familiaris dingo" OR "community dog*") AND (feral OR wild OR stray OR "free-ranging" OR "free ranging" OR unowned), we gathered 2,000+ articles from this search, which were then uploaded to Zotero where each paper was scanned to remove duplicates and any papers that did not pertain to our research. This process left us with approximately 250 articles, which we are currently collecting data from. This search provided us with global studies dating back to 1927. We considered a study for inclusion if the dog, either feral or a free- ranging pet, killed any animal, whether on purpose or accidentally. We are including accidental depredation because we have data suggesting that many animals are put at risk due to dogs stepping or running over them/their nests. We define free-ranging dogs as being either unowned, off-leash, or truly feral. We are also including dingoes in the study as they are invasive dogs that have invaded Australia, which is where a significant amount of the feral dog and cat studies originate.

We are completing the data extraction and entry this semester, Spring of 2023. The work will be continued in Fall of 2024, and we will then analyze the complete dataset. The data analysis will evaluate what species are being depredated and where, the time and location of the predation event was recorded, as well as the dog type (free-ranging pet, feral, or dingo) and the sampling method (scat analysis, gut content analysis, observed predation, or inferred predation). We will also evaluate the prey species' taxonomic classification as well as its listing on the International Union for Conservation (IUCN) Red List. The IUCN quantifies the risk of this species of endangerment or extinction and assigns a status: least concern, near threatened, vulnerable, endangered, and critically endangered. While

there are several species that had not yet been assessed by the IUCN or were domestic and thus not applicable, many of the species are included in this assessment. At the time of this analysis the partial database contains 638 incidents of depredation, and at this rate we expect a total of approximately 1,500 when the work is completed. The analysis of the studies shows a concerning number of depredated species having a status of Near Threatened, Vulnerable, Endangered, or Critically Endangered (Fig. 2). The results of this study thus far support the hypothesis that dogs are a much larger threat than they are represented as - they exist globally and in abundance, form bonds with humans that protect and feed them, and are pack animals, which offers them more protection and allows them to kill larger prey. If management for these carnivores is not implemented soon, we can only expect to see this downward trend continue. Social awareness of their impact needs to be made more public so that locals understand their threat and do not act in ways to aid free-ranging dogs, as well as keeping their own dogs leashed or enclosed.
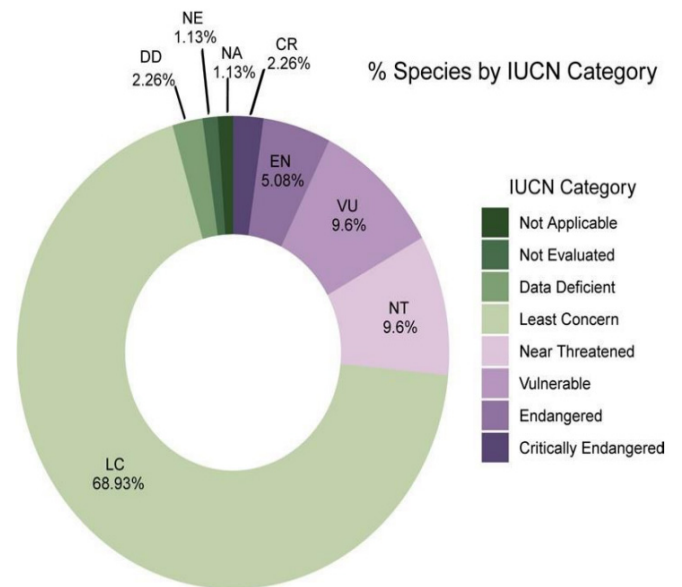

Fig. 2. Distribution of species depredated by dogs classified by IUCN Red List Category: Not Applicable (NA), Not Evaluated (NE), Data Deficient (DD), Least Concern (LC), Near Threatened (NT), Vulnerable (VU), Endangered (EN), and Critically Endangered (CR).

As aforementioned this research is ongoing, meaning that we do not have all the information needed to construct a complete PRISMA Flow Diagram, but a partial chart is included to document progress (Fig.3).
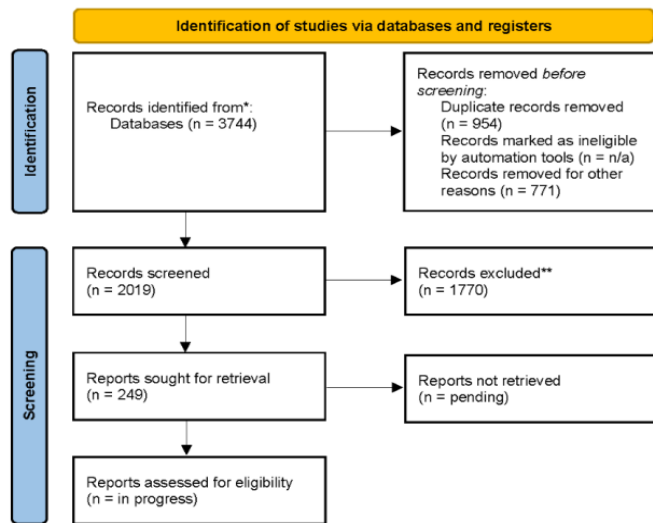
Fig. 3. PRISMA Flow Diagram detailing the number of articles at different stages through the study.

Statement of Research Advisor

Invasive species are a global problem causing both ecological and economical harm. Ally's resesarch exploring one invaseive species, free-ranging dogs, comes at a time when we are starting to fully understand the negative impacts that pets have on the environment.

- Dr. Chrisopher Lepczyk, Professor, College of Forestry, Wildlife and Environment

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Authors Biography

Ally Cobern is a junior pursuing a B.S. degree in Wildlife Ecology and Management at Auburn University. As an under graduate research fellow, she has played key research roles in invasive species data refinement, collection, and analysis.

Garrett Ake is a recent Auburn graduate with a B.S. degree in Wildlife Ecology and Management. He played a role in data refinement.

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Kylee Dunham is an Applied Quantitative Eco logist at the Cornell Lab of Ornithology. She played a key role in data analysis and graphics.

Dr. Jean Fantle-Lepczyk is an Assistant Research Professor in the College of Forestry, Wildlife and Environment at Auburn University. Her research involves the conservation of wildlife, especially species that are under- studied and of conservation concern, using a variety of non-invasive tools.

Dr. Christopher Lepczyk is an Alumni Professor in the College of Forestry, Wildlife and Environment at Auburn University. He is ecologist and conservation biologist who focuses on wildlife, landscapes, citizen science, bio-diversity, urban ecosystems, and both endangered and invasive species.