Science for Saving Species

Research findings factsheet

Project 1.1.2

Threatened Species Recovery Hub

National Environmental Science Programme

The impact of feral cats on Australian invertebrates

In brief

Insects and other invertebrates play many important roles in ecosystems, such as pollination and decomposition, and are a very important food source for many native wildlife species.

We assessed the consumption of invertebrates by feral cats in Australia.

Based on 87 dietary studies across Australia, we found that:

- Feral cats collectively consume 1.1 billion invertebrates per year across Australia
- The number of insects killed per feral cat per year varies from 371 in natural environments to 453 in modified environments.
- On average, invertebrates comprise 39% by frequency of feral cat diets, though the proportion per cat is highly variable.
- Insects form a greater proportion of feral cat diets in low rainfall areas and in densely vegetated areas.
- The relative frequency of invertebrate prey types varies with habitat and climatic changes.
- Crickets and grasshoppers comprise almost a third of all invertebrates consumed.

This study was unable to compare the impact of feral cats to other threats to invertebrates such as habitat loss or altered fire regimes due to a lack of available evidence. However, this study suggests that cats may pose a threat to some large-bodied invertebrates, particularly those with restricted distributions.

Giant crested grasshopper - Macrolopholia *sp.*
Image: Tissa Ratnayeke

Background

The invertebrate fauna of Australia is poorly understood, with the majority of species yet to be formally described. Very little is known about their population trends, relative impacts from key threats or spatial distribution.

Currently, there are insufficient data to assess trends in populations of native insects or other invertebrates in Australia, both at the individual species level, and collectively as a taxonomic group.

Invertebrates in Australia (and worldwide) provide critical ecosystem services (such as pollination and decomposition) and are an important food source for many animals. They can also pose problems for agriculture and human health, such as crop damage and as vectors of disease.

Recent research has found that there have been substantial declines in insect populations in some parts of the world, and there are associated concerns for the impact of such declines on ecosystem services.

There have been ten known invertebrate extinctions since 1788 in Australia, and there are anecdotal indications of declines for other insect species. The major threats to insect populations in Australia include habitat loss, fragmentation

Stomach contents of a feral cat, Witchelina Reserve SA, comprising a bearded dragon, 10 skinks, 3 geckoes, a blind snake, 25 centipedes, 13 crickets and 1 moth. Image: Sally South

Background (continued)

and degradation, weed invasion, inappropriate fire regimes, pesticide regimes, trampling and grazing by stock and feral animals, and introduced predators.

This study assesses one of the identified threats to insects in Australia - the impact of feral cats on native insects and the conservation implications of this impact.

Relevant prior research

The impact of introduced predators (cats and foxes) on native wildlife in Australia has been well studied. Recent comprehensive reviews of cat dietary studies examined the overall take of reptiles, frogs, birds and mammals by feral and pet cats in Australia. These reviews also included estimates of the average number of animals killed per cat per year, and the average number of animals taken per square kilometre. A separate review of feral cat diet across Australia found that feral cats consumed invertebrates most frequently of all the prey groups (birds, mammals, reptiles, frogs).

Main aim of the research

The main aims of this research were to:

1. assess the frequency of occurrence of invertebrates in feral cat diets across Australia and the environmental and geographic factors associated with this variation,
2. estimate the number of invertebrates consumed by feral cats annually and the spatial variation of this consumption, and
3. interpret the conservation implications of these results.

What we did

We undertook a review of 87 cat diet studies in Australia (Figure 1). These studies included quantitative information on the frequency of occurrence (FOO) of invertebrates in scat or stomach samples from feral cats. We used the same analysis for invertebrates as has been used for other taxonomic groups (birds, mammals, reptiles and subsequently frogs), as part of efforts to estimate the annual toll of feral cats on native wildlife in Australia.

The occurrence records from these 87 dietary studies were grouped into broad invertebrate categories: ants, termites, beetles, butterflies and moths (including caterpillars), centipedes, cicadas and other true bugs, cockroaches, crickets and grasshoppers, crustaceans, dragonflies, flies (excluding maggots), mantids, scorpions, spiders, and wasps.

We assessed whether environmental variables (mean annual temperature, mean annual rainfall, mean tree cover, topographic ruggedness and, where applicable, island size) were associated with variation in the frequency of occurrence of invertebrates in feral cat diet samples.

We used these modelled relationships to predict the number of invertebrates consumed by feral cats in largely natural and highly modified environments across Australia.

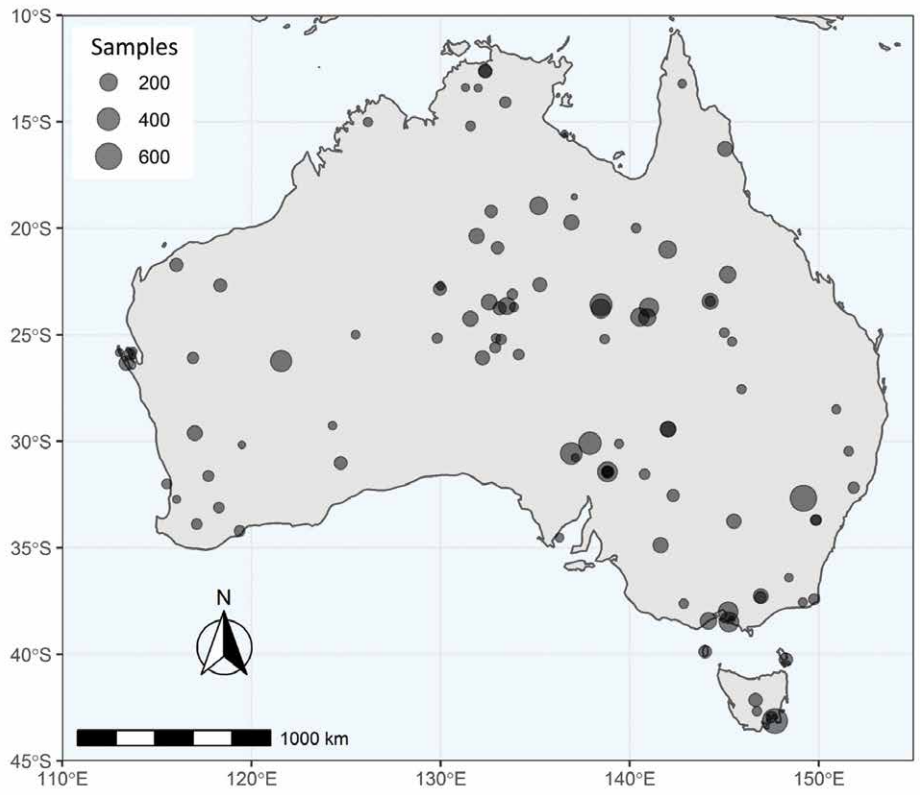

Figure 1: Location of 87 feral cat dietary studies used in this assessment. Circle size corresponds to sample size at each study site. Christmas Island (n = 187) and Macquarie Island (n = 756) are not shown.

Stomach contents of a feral cat, Witchelina Reserve SA, comprising 31 skinks, 2 geckoes, 6 centipedes, 2 crickets and a grasshopper. Image: Sally South

Key findings

Based on 87 dietary studies, we found that invertebrates, on average, comprise 39% of a feral cat's diet by frequency in relatively natural environments, but this figure could vary from 0% to 100%. Insects form a greater proportion of feral cat diets in low rainfall areas and in densely vegetated areas.

Key findings:

- Feral cats collectively consume 1.1 billion invertebrates per year across Australia.
- Collectively, feral cats in natural environments consume more invertebrates than feral cats in modified environments, with the most consumption being in arid and semi-arid areas.
- The key variables predicting frequency of occurrence of invertebrates in feral cat diets across Australia were mean annual rainfall, mean annual temperature and tree cover. A higher frequency of consumption of invertebrates occurred in feral cat diet in areas of lower rainfall and lower mean temperature. We modelled the relationships between these variables to project the frequency of invertebrates in feral cat diets across Australia (Figure 2a).
- The average number of invertebrates consumed per feral cat per year ranged from:
  - 371 in natural environment
  - 453 in modified environments (Figure 2b).
- Roaming pet cats also prey on invertebrates across Australia; however, there are currently no estimates for the number of invertebrates consumed.
- There was substantial spatial variation in the frequency of occurrence of invertebrate prey items in feral cat diets.
- Across all cat dietary studies, crickets and grasshoppers were the most frequently observed prey items and comprised almost a third of all invertebrates consumed (Figure 3).
- The consumption of grasshoppers, crickets and centipedes is greatest in open areas with sparse tree cover.
- The frequency of consumption of beetles increased in areas of low rainfall and with intermediate to high tree cover.

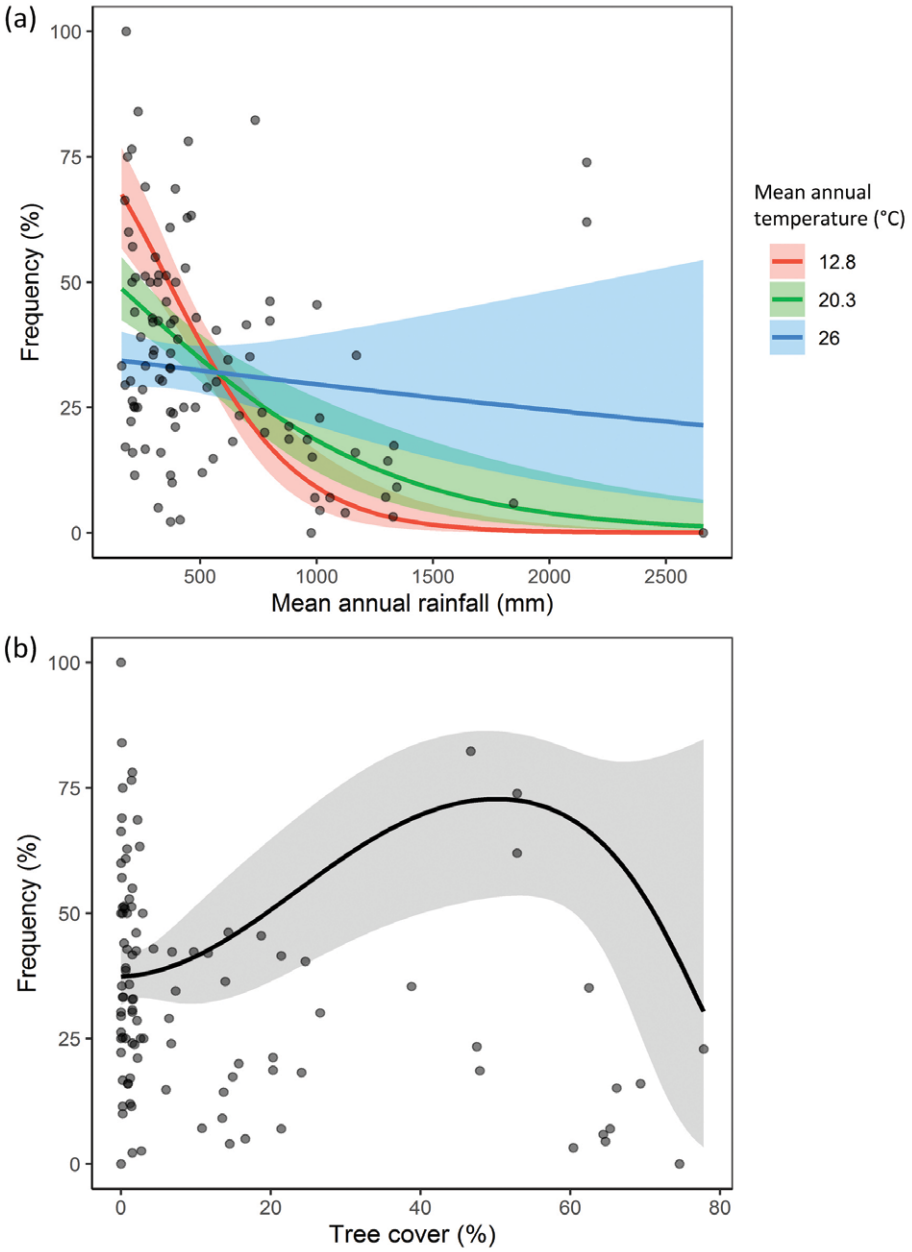

Figure 2: Model projections of (a) the frequency of occurrence (%) of invertebrates in feral cat diets, and (b) the rate of consumption of invertebrates by feral cats (per square kilometre per year) in largely natural environments throughout Australia.

Feral cat.
Image: Hugh McGregor

Key findings (continued)

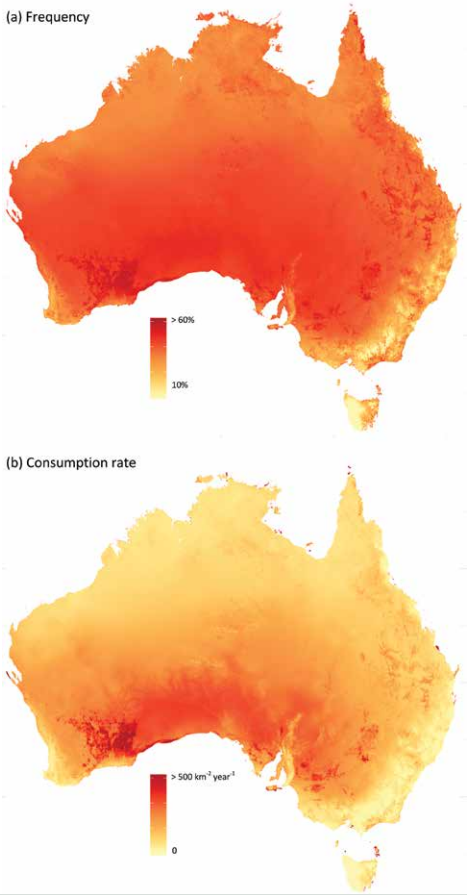

Figure 3: The total number of individual invertebrates consumed per year by feral cats in Australia (based on a review of 87 dietary studies).

Implications

There are still many knowledge gaps about invertebrates in Australia, including the relative contribution of threatening processes that may affect them. Currently, we are unable to assess the relative impact of predation by cats on invertebrates, and whether there are any conservation implications, in Australia.

This study suggests that cats may pose a threat to some large-bodied invertebrates, particularly those with restricted distributions.

Global studies have found that large-bodied insects (grasshoppers, crickets, beetles and butterflies) are favoured prey items for feral cats; in Australia, the favoured prey items were predominantly grasshoppers and crickets, followed by centipedes and beetles. It should be noted that there is likely under-reporting of soft-bodied invertebrates due to faster or complete digestion.

The impact of cat predation on invertebrates warrants further investigation. Further empirical studies will allow us to better understand whether feral cats pose a substantial conservation threat to invertebrates in Australia, particularly for large-bodied insects with a restricted range.

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Further Information

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