



Advancing the Application of Animal Telemetry Data in Ecosystem Management

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Project Objectives

The location and movement of organisms reflects and influences the arrangement of ecological resources in space and time. Perturbations in ecosystem processes may alter the spatial and temporal arrangement of ecological resources, and consequently, the conservation and management of ecosystems are often concerned with the spatial movement of organisms.

Recent advancement and miniaturisation of remote electronic devices and GPS technology is enabling researchers to collect large volumes of highly accurate data upon animal location and movement. Collectively, these data contain a wealth of information about how individuals/species interact with each other and the landscape. The majority of telemetry studies however, are designed to address specific management questions and the data are rarely used beyond their original and narrow application.

We believe that there are great opportunities in the establishment, integration and mining of multiple animal telemetry datasets. It was the purpose of this working group to explore this concept.

Methods

The work regime of the group formed two main themes:

1. Assess the extent, magnitude, and diversity of animal telemetry research throughout Australasia, and the accessibility of raw-data and study-findings to the wider ecological community.
2. Provide recommendations for advancing the collation, sharing and re-use of animal telemetry data-sets.

To assess the total volume of Australasia-based animal telemetry research projects a database was compiled from animal ethics permit applications between 2000 and 2013. The availability of these data and findings to the wider ecological community was assessed through examination of the peer-reviewed scientific literature for the same period.

To understand the limitations involved in collating and analysing telemetry datasets from third-parties, the working group undertook a case-study.

Major Findings

- 488 studies using telemetry devices upon animals within the Australasian region were published between 2000 and 2013 (Figure 1). This necessitated the capture and tagging of 12,656 animals, amassing 81,546 tracking days.
- The majority of tracking studies were undertaken upon large vertebrates, but small vertebrate and invertebrate groups were represented (Figure. 2).
- Management of the species was the primary reason for the research (Figure. 3).
- Based upon individual author comparisons we estimated our database to be ~75% comprehensive.
- 49.2 % of animal telemetry projects undertaken between 2000 and 2013 remain unpublished and the data/findings inaccessible to the wider ecological community.
- The average period from telemetry device removal until publication was ~3 years.
- The quantity of studies utilising animal telemetry devices is increasing (Figure. 4).
- To facilitate the sharing and re-use of animal location data gathered by animal telemetry we recommend the community to develop a centralised data repository. The group provided recommendations for best practise for storing and accessing these data-sets (Appendix 1 & 2).

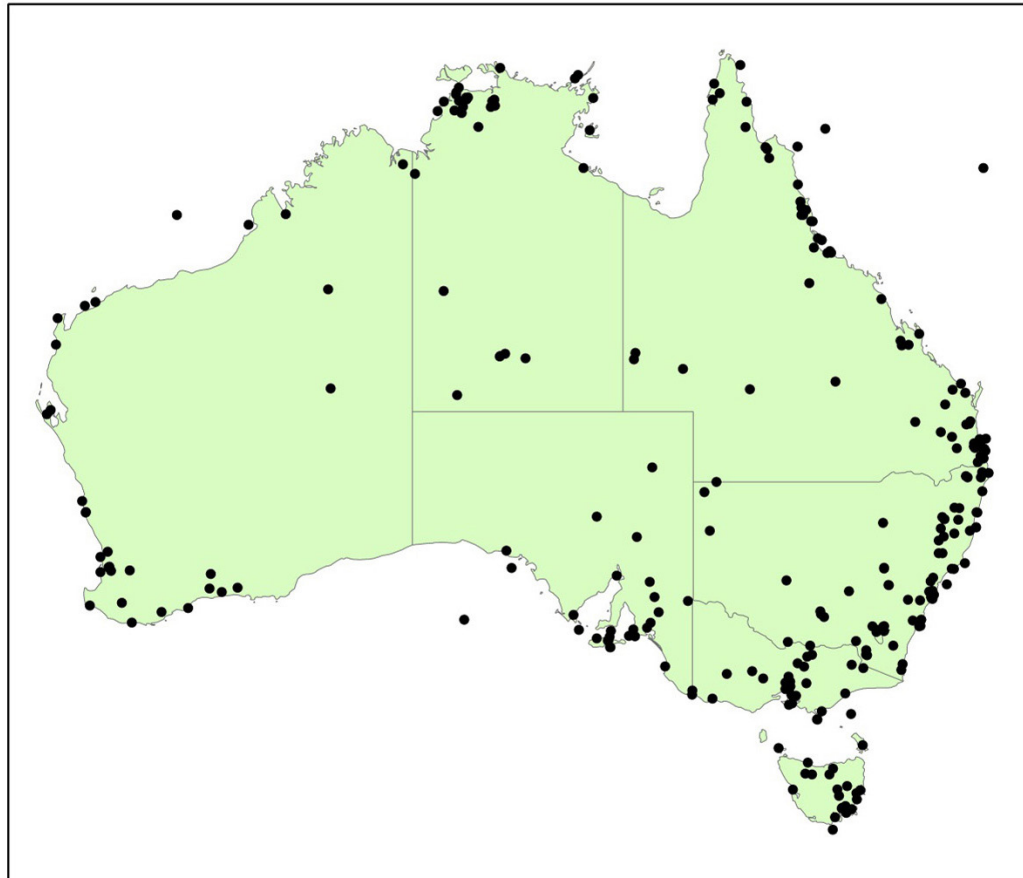


Figure 1. The location of the 488 animal telemetry research projects published within peer-reviewed literature between 2000 and 2013. The spatially referenced database containing project details and content can be viewed and queried at <http://aceas-data.science.uq.edu.au/portal/>

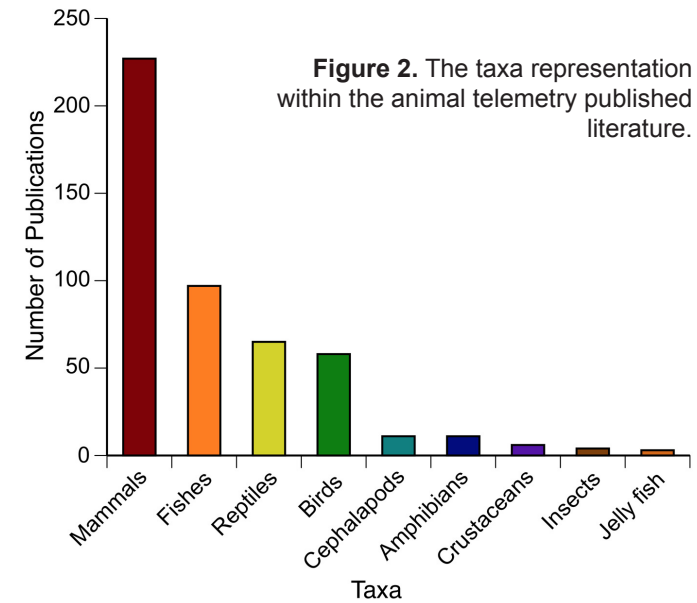


Figure 2. The taxa representation within the animal telemetry published literature.

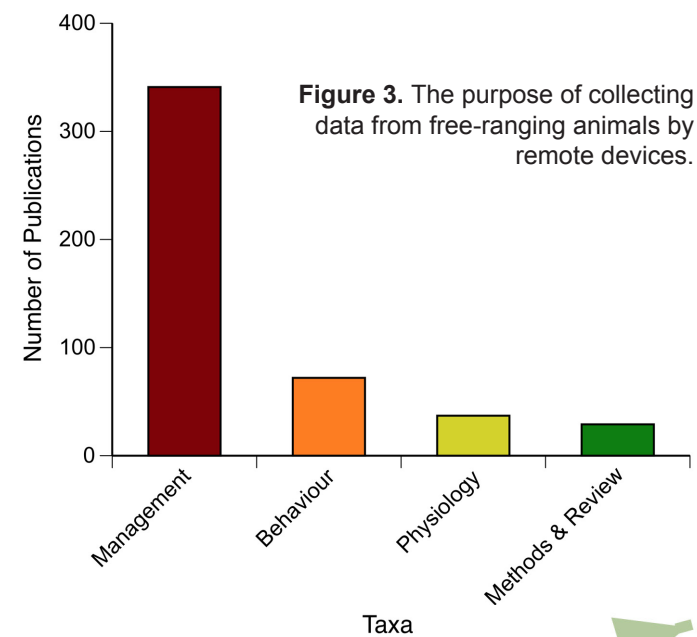


Figure 3. The purpose of collecting data from free-ranging animals by remote devices.

How will this affect Australian ecosystem science & management?

The use of telemetry devices to monitor animal location and movement is an important and increasing component of ecosystem science and management throughout Australasia. It is trusted that the products derived from the group will facilitate a new era of co-operation, data-sharing and data re-use by the community.

Appendix 1.

Associated meta-data standards for the storage of animal telemetry data-sets

- The Datum and geographical coordinates
- Diagnostics data for location
- What error screening filters have been applied to the data, and any other modification/manipulations of the data
- Date and time of tagged animal release and recapture
- What technology was used,
- Attachment technique, weight of tag
- Environmental context (Landscape type, vegetation type and structure)
- Social context – individual conditions, reproductive state, population, sex , age, weight
- Experimental context- translocated, manipulation, reintroduction
- Temporal context (weather, seasons)
- Environmental stochasticity (was there irregular unusual factors involved)
- Licensing and ethics permits
- Contact details
- Publications associated with the research

Appendix 2.

Steps involved in re-using animal telemetry data from a third party:

- define your question and be explicit
- is your question specific to a particular context – season, habitat, social context, intra and inter-specific interactions
- are you interested in sampling movement or descriptions of movement, i.e. are your questions about movement pathways or about use of space.
- what is the appropriate sampling interval – are you interested in behaviours that occur rapidly relative to the rate of the individual's movement or are you interested behaviours that occur slowly relative to the individual's movement
- Is there sufficient data to address the question?

Participants Institutions

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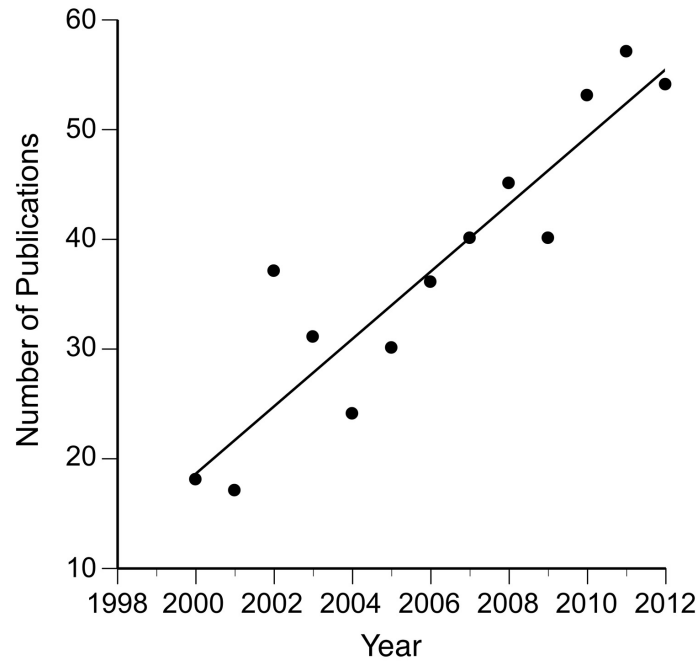


Figure 4. The yearly increase in peer-reviewed publications that have utilised telemetry devices to monitor free-ranging animals ($y = 3.07x + 18.6$; $r^2 = 0.84$)

Key papers or products

- A spatially explicit database that provides the meta-data, references, and contacts for research projects that have utilised animal telemetry equipment.
- An online storage repository for animal telemetry data for the Australasian community.
- A peer-reviewed manuscript (in prep) – Who is following whom? : Research trends in animal telemetry across Australasia.