Systems Modelling for Investigating Sustainable Dog Population Management

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Background

There are approximately 700 million dogs globally and ~75% are free-roaming (owned, stray & feral)[1]. Overpopulation of dogs has significant implications for:

1. **Public health**
2. **Animal welfare**
3. **The environment**

Dog population management (DPM) methods involve **i) culling**, **ii) reproductive control (e.g. catch-neuter-release (CNR))** and/or **iii) long-term sheltering**. There is a need to assess the impact of these methods.

Aims

Use a **systems modelling** approach to determine how different DPM methods impact:

1. Free-roaming dog population size over time.
2. Public health risk.
3. Free-roaming dog welfare.

Use the systems model to evaluate **efficiency** and **effectiveness** of each DPM method. This will allow us to assess the **long-term sustainability** of these methods.

What is a systems model?

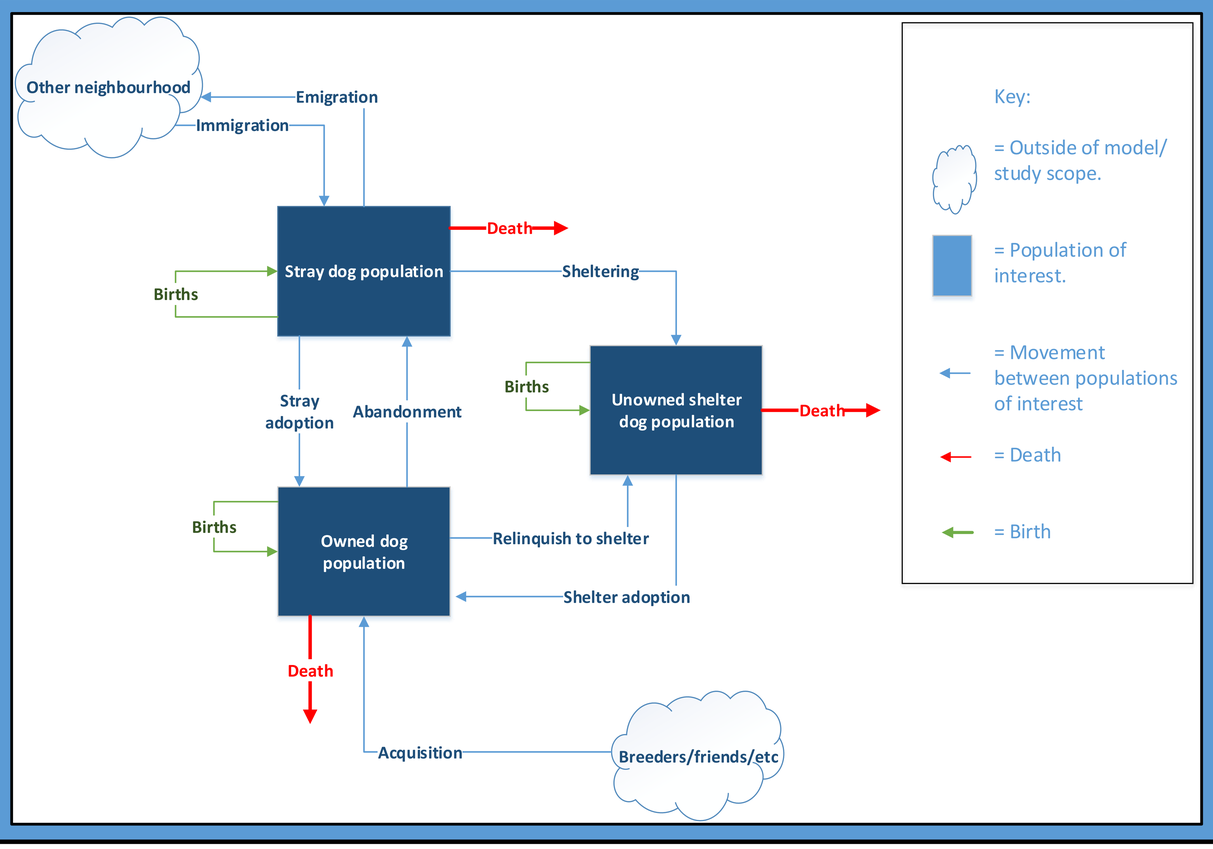
- The dog population can be thought of as a system, comprising components (e.g. the stray and owned dog population) and processes (e.g. the movement of individuals through birth, death and migration).
- Modelling allows us to look at patterns within the system, to assess the **sustainability**, **effectiveness** and **efficiency** of different DPM methods.
- We need to understand the **main drivers** of dog population dynamics by developing a **conceptual map** (fig. 1), which is **a simplified starting point** for the systems model.

Conceptual Map

- A visualisation of **part of** the system, made up of stocks and flows.
  - **Stocks**: different dog populations (blue boxes).
  - **Flows**: movement between stocks (arrows).
- DPM methods will impact the stocks and flows in differing ways. E.g. culling increases death rate or CNR decreases birth rate.

Future work

1) Build upon conceptual map. 2) Collect data in the field in Bulgaria, Italy and Ukraine to feed into the model. 3) Build the model using collected data. 4) Run the model under different scenarios (e.g. intensity of CNR, such as % of population neutered or time-frame).



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References

1. Hughes, J. & Macdonald, D. W. A review of the interactions between free-roaming domestic dogs and wildlife. *Biol. Conserv.* **157,** 341–351 (2013).