**Title:** A review of dynamic occupancy models (DOMs) in applied studies

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**Target journal:** [Ecography](http://www.ecography.org/authors/author-guidelines)

**Abstract:**

**Introduction:**

**Materials and Methods:**

*Paper solicitation:* This review is focused on research which models occupancy across multiple sites and seasons using real data. To qualify for inclusion in the review, papers were required to fulfil all the following criteria:

* Multiple sites capable of exhibiting multiple occupancy states, which must include an unoccupied and occupied state.
* Multiple time-steps between which occupancy state can change, with transitions between states modelled as a Markovian process dependent on prior timestep.
* Data used must be from a real system, not simulated or theoretical. Data need not have been explicitly collected for the given survey.

Key terms were identified to capture papers applying these models. Following conversations with co-authors and other experts, four terms were selected for this class of models:

* Dynamic occupancy model
* Occupancy dynamics model
* Multi-season occupancy model
* Stochastic patch occupancy model

Queries for each term were made on Google Scholar (Appendix I). The first 100 results for each term were considered for inclusion. Papers which were clearly outside the field of ecology & evolution, not in English, or not accessible via Google Scholar of the University of Melbourne Library were immediately discarded. 287 papers remained for consideration.

*Preliminary review:* The pool of eligible papers was stratified by search query and publication period (defined as 2000-2005, 2005-2010, 2010-2015, and 2015-2021). Papers were assigned ranks with a random number generator. Papers ranked in the lowest 5 papers or 25% of papers (whichever was larger) within their strata were included in the preliminary review. The authors developed a structured spreadsheet with categories for study data, objectives, taxa, location, data collection, detection, covariates, modelling, and outputs. If after reading it a paper did not qualify for inclusion, it was excluded and replaced by the next lowest paper in its strata if any additional papers were available. As JMK read each paper its findings were noted in the spreadsheet. 75 papers ultimately qualified for inclusion in the preliminary review

*Formal Review:* After considering the spreadsheet findings of the preliminary review research questions were further refined – a new spreadsheet with better articulated parameters was created (details in Appendix II). Additionally, the authors determined that ‘Stochastic patch occupancy models’ represented a separate model form from the other three search queries with a unique history and distinct qualities. Most importantly, SPOMs, DOMs, and ODMs are generally derived from the model outlined in *Mackenzie et al. 2003,* whereas SPOMs were defined in *Hanski 20XX.* While there are many similarities, it is apparent that these models are distinct, and we have excluded these papers (n = X) from the formal review. All remaining papers were read by JMK. and results logged in the spreadsheet. In cases where there was uncertainty in how to document a field in any given paper, the issue was flagged and discussed with a second author on a later occasion.

*Analysis*

**Results:**

**Discussion:**

**Conclusion:**