

Notes de lecture ONB de
Barton, P. S., J. C. Pierson, M. J. Westgate, P. W.
Lane and D. B. Lindenmayer, 2015. Learning from
clinical medicine to improve the use of surrogates in
ecology. *Oikos*, **124**(4), 391-398

Frédéric GOSSELIN

Irstea

Domaine des Barres

F- 45290 Nogent sur-Vernisson

frederic.gosselin@irstea.fr

Pour mieux
affirmer
ses missions,
le Cemagref
devient Irstea



www.irstea.fr

Medecine envy?

- Les auteurs proposent d'appliquer une méthodologie issue de la médecine à l'écologie pour le développement de **variables de substitution** (« surrogate variables »), qui sont un des types d'indicateurs utilisés en écologie

Medecine envy?

- Les auteurs proposent d'appliquer une méthodologie issue de la médecine à l'écologie pour le développement de **variables de substitution** (« surrogate variables »), qui sont un des types d'indicateurs utilisés en écologie
- Les auteurs se placent systématiquement dans le cas où ce qui est visé par la démarche n'est pas l'estimation de la variable d'intérêt, qu'on a du mal à mesurer, mais **l'effet d'un « traitement »** (pour l'ONB par exemple des variables de pression ou de réponse) **sur cette variable d'intérêt**

Quantification envy?

- L'accent est mis sur le fait que la relation traitement/variable de substitution représente bien quantitativement la relation entre traitement et variable d'intérêt

Les étapes...

1- **La spécification du modèle de substitution**

- * Définition des variables, des objectifs...
- * Définition des niveaux de variation considérés comme informatifs
- * Définition d'un « modèle causal » entre traitement, variable de substitution et variable d'intérêt

Les étapes...

2- **L'estimation du modèle de substitution**

* Sur la base de données et de modèles statistiques

Les étapes...

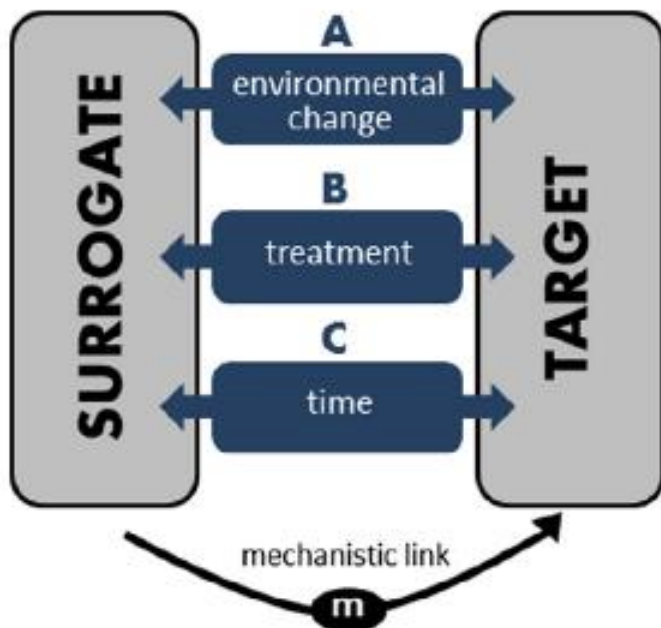
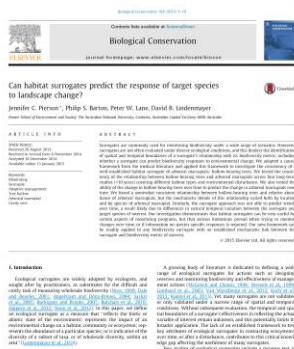
3- L'évaluation de la variable de substitution

* Consiste à organiser la mise à l'épreuve / l'estimation répétée du modèle de substitution dans différents contextes spatiaux, temporels, écologiques

* Revient à un retour répété aux étapes 1 et 2

3- L'évaluation de la variable de substitution

Ex: Relation entre arbres à cavité et marsupiaux (Pierson et al. 2015, BC)



A. Test for consistency across environmental conditions

Are hollow-bearing trees (or hollows) consistently a surrogate for possums?

B. Test treatment effects

Do hollow-bearing trees and possums respond similarly to a disturbance?

C. Test if change in surrogate can predict change in target

Do hollow-bearing trees and arboreal marsupials respond similarly over time?

A. Test for consistency across environmental conditions

Are hollow-bearing trees (or hollows) consistently a surrogate for possums?

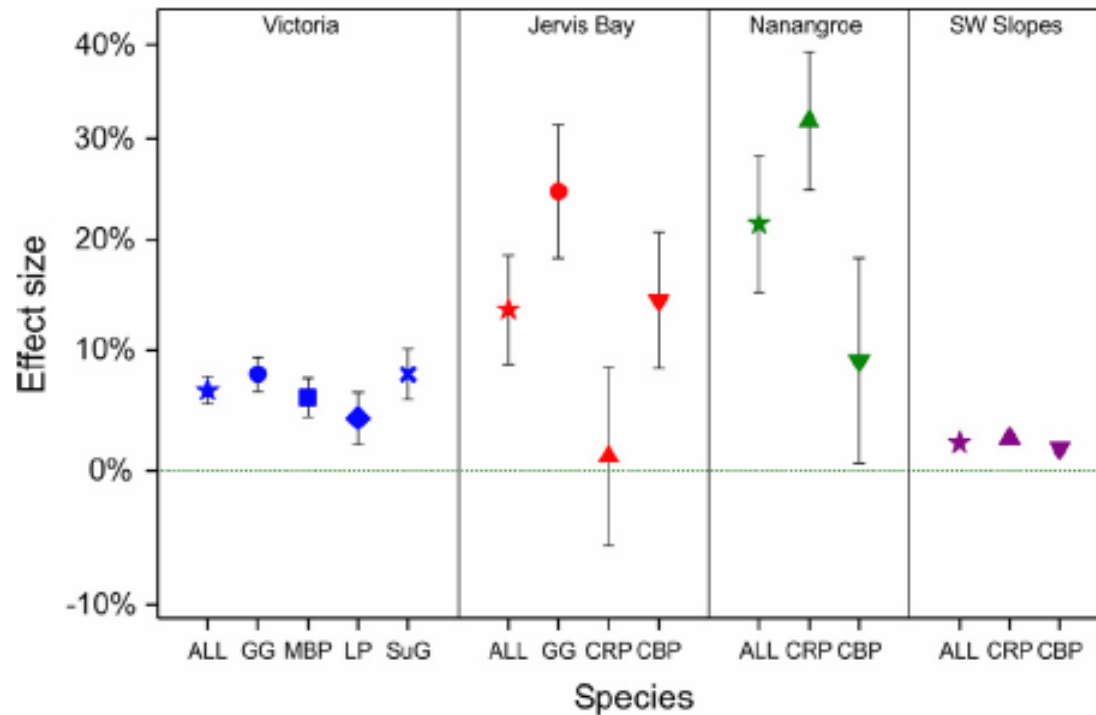


Fig. 2. Responses of the relative abundance of arboreal marsupials to the abundance of hollow-bearing trees (or hollows in Nanangroe) across the four study locations. All responses, except the common ringtail possum in Jervis Bay and the



B. Test treatment effects

Do hollow-bearing trees and possums respond similarly to a disturbance?

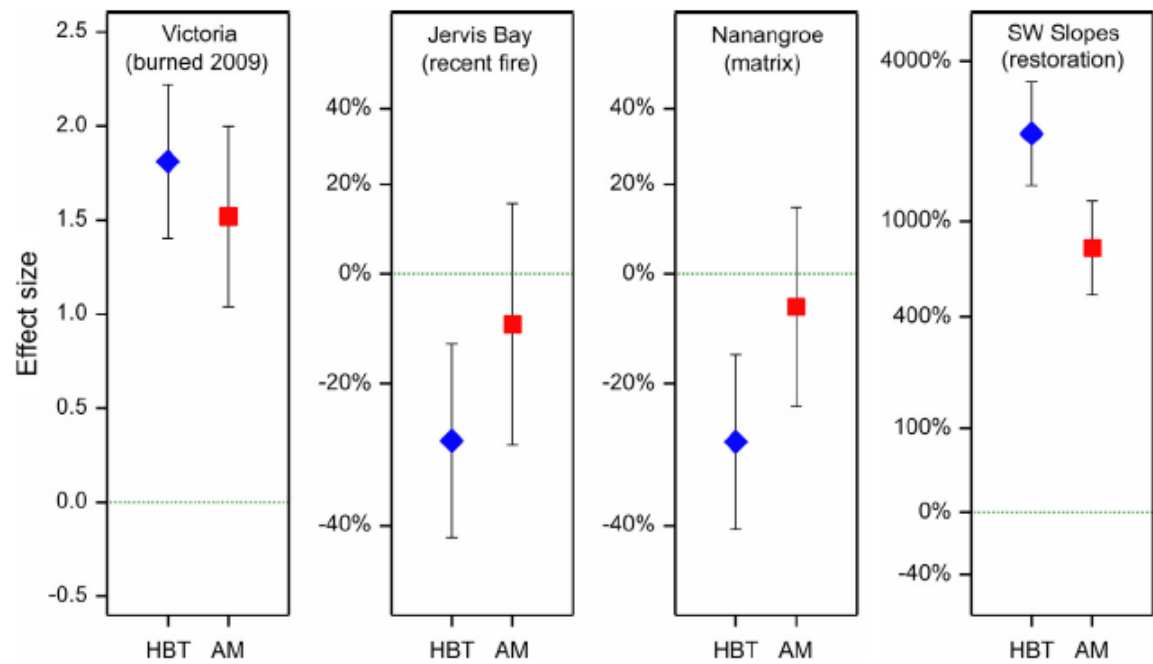


Can habitat surrogates predict the response of target species to landscape change?

Jennifer C. Pearson¹, Philip S. Barton, Peter W. Lane, David B. Lindenmayer

ABSTRACT
 Habitat surrogates are used to predict biodiversity within a wide range of habitats. However, the accuracy of these surrogates depends on the specific response of target and nontarget biodiversity to landscape disturbance. We therefore tested whether habitat surrogates could predict biodiversity responses to landscape change in a natural landscape. We used a landscape-level experiment to test the ability of habitat surrogates to predict the response of target and nontarget species to landscape change. We used a landscape-level experiment to test the ability of habitat surrogates to predict the response of target and nontarget species to landscape change. We used a landscape-level experiment to test the ability of habitat surrogates to predict the response of target and nontarget species to landscape change.

1. Introduction
 A growing body of literature is focused on defining a wide range of habitat surrogates to address such an important issue and increasing biodiversity and the resilience of landscapes. However, the accuracy of these surrogates depends on the specific response of target and nontarget biodiversity to landscape disturbance. We therefore tested whether habitat surrogates could predict biodiversity responses to landscape change in a natural landscape. We used a landscape-level experiment to test the ability of habitat surrogates to predict the response of target and nontarget species to landscape change. We used a landscape-level experiment to test the ability of habitat surrogates to predict the response of target and nontarget species to landscape change.



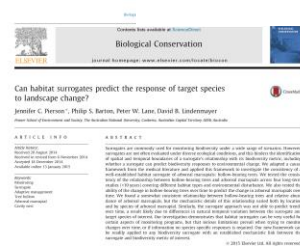
C. Test if change in surrogate can predict change in target

Do hollow-bearing trees and arboreal marsupials respond similarly over time?

Table 4

Results from GLM with the change in the number of arboreal marsupials between time-points as the response variable and the change in the number of hollows or hollow-bearing trees as the explanatory variable. A Gaussian distribution with an identity link was used in all models.

Response variable	Coeff	SE	P
<i>Jervis Bay</i>			
All arboreal marsupials	-0.0214	0.0602	0.723
Greater glider	0.0032	0.0353	0.929
Common ringtail possum	-0.0329	0.0331	0.323
Common brushtail possum	-0.0705	0.0438	0.110
<i>Victorian Central Highlands</i>			
All arboreal marsupials	0.1740	0.1010	0.087
Greater glider	0.0645	0.0425	0.132
Mountain brushtail possum	0.0130	0.0437	0.766
Leadbeaters possum	0.0408	0.0603	0.500
<i>Nanangroe</i>			
All arboreal marsupials	-0.0755	0.0865	0.385
Common ringtail possum	-0.0232	0.0443	0.602
Common brushtail possum	-0.0477	0.0651	0.466
<i>Southwest Slopes</i>			
All arboreal marsupials	0.0150	0.0096	0.118
Common ringtail possum	0.0045	0.0058	0.438
Common brushtail possum	0.0112	0.0062	0.074



1. Introduction
 A growing body of literature is focused on defining a suite of surrogate variables to assess the impact of landscape change on biodiversity. Surrogate variables are used to predict the response of target species to landscape change. The use of surrogate variables is based on the assumption that the response of target species to landscape change is similar to the response of surrogate variables. This assumption is based on the idea that surrogate variables are correlated with the response of target species. The use of surrogate variables is based on the idea that surrogate variables are correlated with the response of target species. The use of surrogate variables is based on the idea that surrogate variables are correlated with the response of target species.



3- L'évaluation de la variable de substitution

Ex: Relation entre arbres à cavité et marsupiaux (Pierson et al. 2015, BC)

* bonne covariation spatiale des deux (en termes de significativité), mais variation spatiale forte de la magnitude

* mauvaises covariations temporelles ou en réponse à un traitement



Can habitat surrogates predict the response of target species to landscape change?
 Jennifer C. Pierson¹, Philip S. Baran, Peter W. Lane, David B. Lindemeyer
¹Forest Interactions and Safety, The Institute for Natural Resources, University of Idaho, 83842, USA

ABSTRACT
 Surrogates are commonly used for conserving biodiversity within a wide range of habitats. However, surrogates are not necessarily good proxies for biodiversity, and their use can be problematic if they are not carefully evaluated. We evaluated the ability of landscape surrogates to predict the response of target species to landscape change. We used a large dataset of landscape change and species response data to evaluate the ability of landscape surrogates to predict the response of target species to landscape change. We found that landscape surrogates were not good predictors of species response to landscape change, and that the ability of landscape surrogates to predict the response of target species to landscape change varied among species and habitats. Our results suggest that landscape surrogates should be used with caution, and that the ability of landscape surrogates to predict the response of target species to landscape change should be carefully evaluated for each species and habitat.

1. Introduction
 Biological surrogates are widely adopted by managers, and their use is increasing as demand for the efficient and effective management of natural resources grows (Forman, 2005; Forman & Leuter, 2005; Forman & Leuter, 2005; Forman & Leuter, 2005). Biological surrogates are used to represent the biodiversity of a landscape, and their use is increasing as demand for the efficient and effective management of natural resources grows (Forman, 2005; Forman & Leuter, 2005; Forman & Leuter, 2005; Forman & Leuter, 2005). Biological surrogates are used to represent the biodiversity of a landscape, and their use is increasing as demand for the efficient and effective management of natural resources grows (Forman, 2005; Forman & Leuter, 2005; Forman & Leuter, 2005; Forman & Leuter, 2005).



3- L'évaluation de la variable de substitution

Bien distinguer pour quoi la variable de substitution souhaite être utilisée

- (1) pour rendre compte des variations spatiales de la variable d'intérêt à large échelle ;
- (2) même chose mais à plus petite échelle ;
- (3) pour rendre compte de la réponse de la variable d'intérêt à un traitement ;
- (4) pour rendre compte des variations temporelles de la variable d'intérêt ?

En corollaire, ce n'est pas parce qu'une variable de substitution « substitue » bien à un niveau ou pour un objectif donné qu'elle est bonne à d'autres niveaux ou pour d'autres objectifs



Disc: Causal, vous avez dit causal?

- Article pas très clair sur la notion de causalité utilisée
- Néanmoins l'étape 3 permet de relier des approches corrélatives à une vision élargie de la notion de causalité (Gosselin 2012, JEcol)



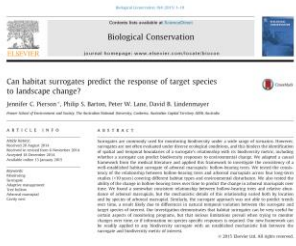
Disc.: Autres axes d'évaluation

- **Comparaison** de plusieurs variables de substitution (Barbier et al. 2009 *FEM*, Zilliox & Gosselin 2014 *FEM*)
- Prise en compte de la **magnitude** de la relation (Barbier et al. 2009 *FEM*, Zilliox & Gosselin 2014 *FEM*)
- Envisager des **formes de relations non-linéaires** (GNB 2014)
- Envisager des relations qui varient en fonction des **conditions écologiques** (Zilliox & Gosselin 2014 *FEM*)

Disc.: Revoir la méthode d'évaluation

- **Gros problème de variables explicatives (x) sur différentes échelles**

↳ **les différences de magnitude sont beaucoup plus faibles qu'annoncées (et en sens contraire) !**



1. Introduction

Ecological surrogates are widely adopted by managers and planners to assess the potential for the effects of land use changes on biodiversity. However, the relationship between surrogates and biodiversity is often weak and the use of surrogates can be problematic. This paper reviews the use of habitat surrogates to predict species responses to landscape change and discusses the implications for managers and planners. It also discusses the use of habitat surrogates to predict species responses to landscape change and discusses the implications for managers and planners.

Disc.: Revoir la méthode d'évaluation

- Gros problème de variables explicatives (x) sur différentes échelles

↳ les différences de magnitude sont beaucoup plus faibles qu'annoncées (et en sens contraire) !

- Pas assez de réflexion sur la forme de la relation

↳ des « variations » de la magnitude entre zones pourraient simplement provenir d'un modèle constant mais non-linéaire





***Disc.:* Impacts en terme de suivi**

- Peut-être utile de mesurer la variable de substitution et la variable cible dans les cadre des suivis (Vos et al. 2000 *Envir. Mon. Assess.*)



Implications possibles pour l'ONB

(O1) Distinguer **parmi les indicateurs ONB ceux qui relèvent de variables de substitution** d'autres formes d'indicateurs

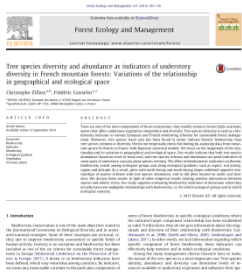
(O2) Voir dans les **champs ONB** et aussi dans les **champs IBD2** si la méthode proposée ici est bien prise en compte. A priori la partie (i) ci-dessus doit déjà être présente dans les fiches d'évaluation. La partie (iii) pourrait probablement être clarifiée et étoffée (à vérifier)

(O3) **Voir s'il est du ressort de l'ONB de structurer un travail autour des points précédents** (mais peut-être pas)

Diapos Annexes

Disc.: Autres axes d'évaluation

Ex: relation entre variables dendrométriques (*ici: couvert sapin*) et richesse spécifique floristique (*ici: groupes héliophilie*), en fonction des conditions écologiques (*ici: pente et orientation*)



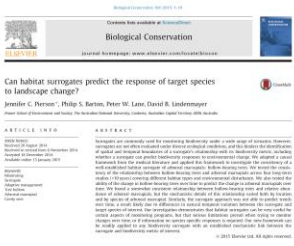
log multiplier of SR for +15% cover **fir**

	Herbaceous			Woody	
	HL	IL	LL	HL	IL
Flat terrains	-0.142 [-0.206; -0.0806] 0**	0.0275 [-0.0165; 0.0719] 00	0.0933 [0.0381; 0.145] 0**	-0.0282 [-0.0581; 0.000448] 00	-0.0556 [-0.116; 0.00857] 0
E/W aspect	-0.249 [-0.395; -0.103] -**	-0.0117 [-0.113; 0.079] 00	0.158 [0.0489; 0.268] **	0.047 [-0.0138; 0.117] 0	-0.0458 [-0.193; 0.109] 0
S aspect	0.04 [-0.24; 0.321]	0.206 [0.0124; 0.386] *	0.42 [0.197; 0.658] ++**	0.163 [0.0281; 0.296] *	0.2 [-0.105; 0.526]
N aspect	-0.538 [-0.707; -0.368] --**	-0.229 [-0.353; -0.11] -**	-0.104 [-0.253; 0.0317]	-0.0687 [-0.155; 0.0165] 0	-0.291 [-0.482; -0.101] -



Disc.: Revoir la méthode d'évaluation

- Gros problème de variables explicatives (x) sur différentes échelles



1. Introduction

A growing body of literature is devoted to defining a wide range of wildlife surrogates for diverse taxa or ecological metrics and assessing their ability and effectiveness of predicting species response to landscape change. While many surrogates are used to assess landscape change, few have been evaluated in the context of a specific taxon or ecological metric. This is particularly true for the use of landscape metrics to predict the response of target species to landscape change. The use of landscape metrics to predict the response of target species to landscape change is a common practice in conservation planning, but the accuracy of such surrogates is often questioned. We evaluated the ability of landscape metrics to predict the response of 10 target species to landscape change in a semi-arid woodland. We used a combination of field and remote sensing data to assess the response of target species to landscape change. We found that landscape metrics were generally poor predictors of species response, with the exception of one metric, which was a good predictor of response for one species.



Disc.: Revoir la méthode d'évaluation

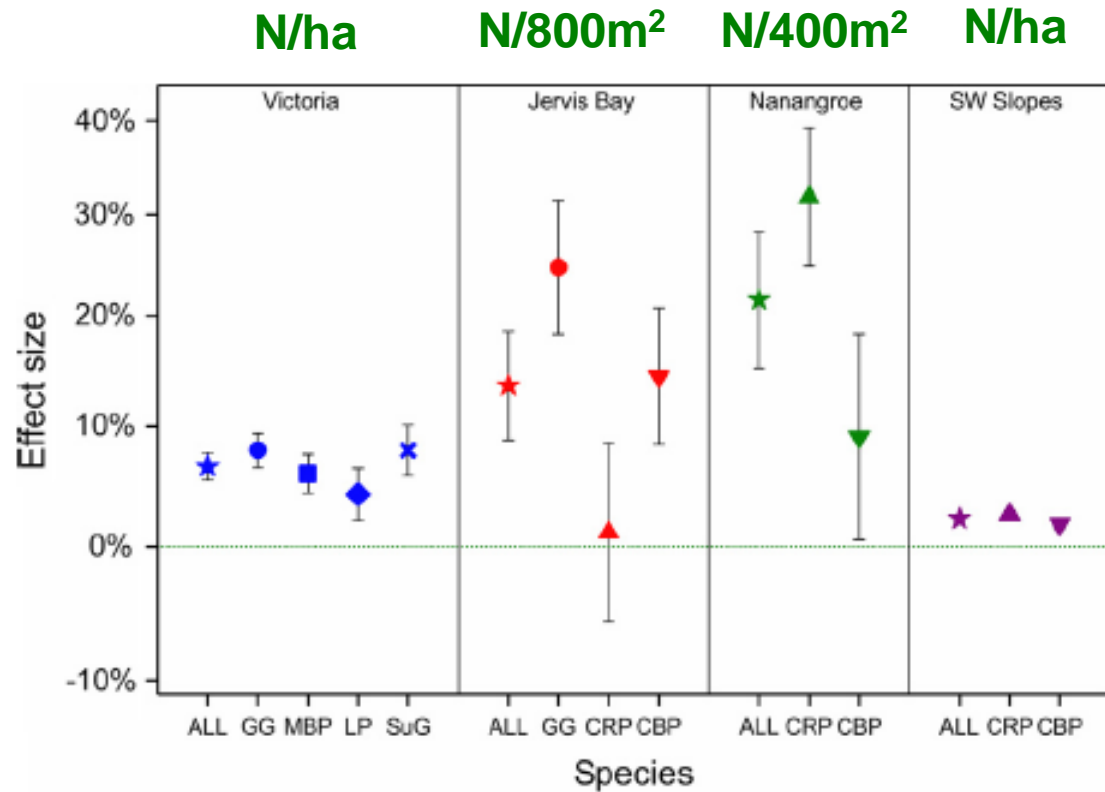
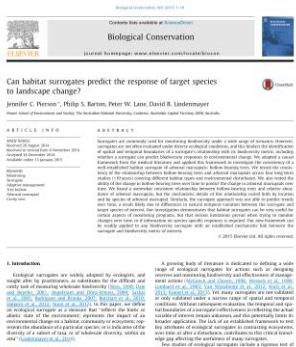


Fig. 2. Responses of the relative abundance of arboreal marsupials to the abundance of hollow-bearing trees (or hollows in Nanangroe) across the four study locations. All responses, except the common ringtail possum in Jervis Bay and the



Disc.: Revoir la méthode d'évaluation

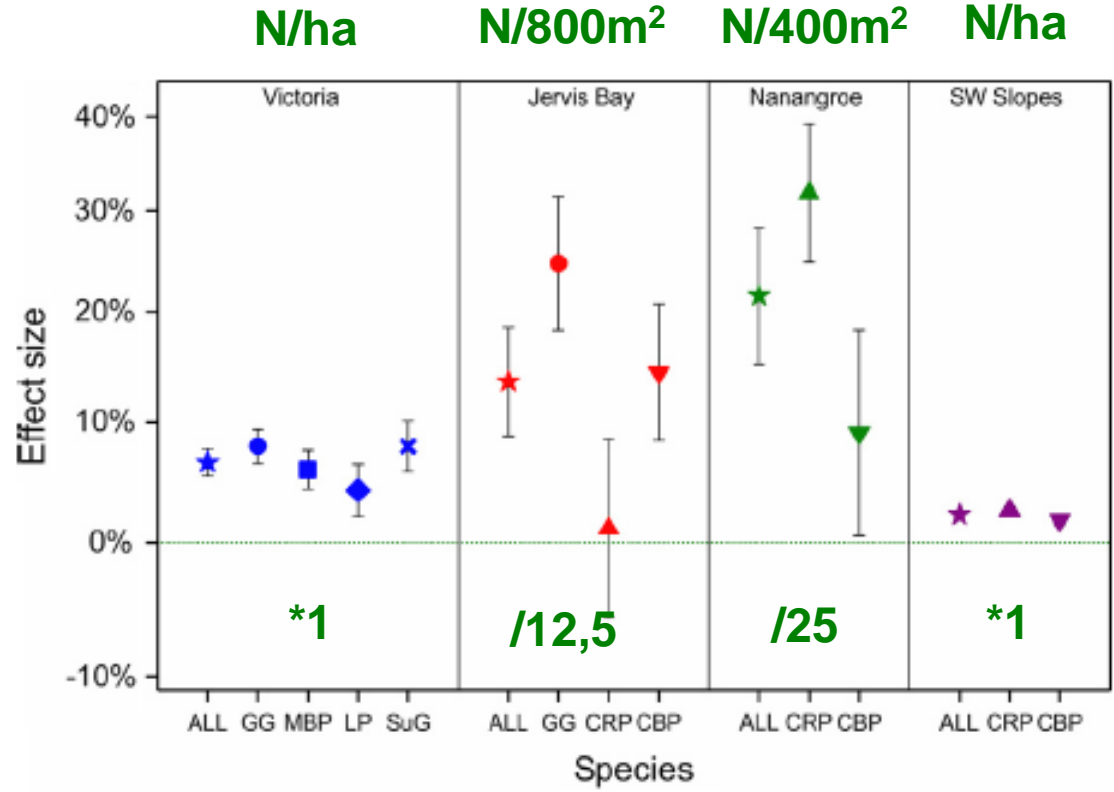
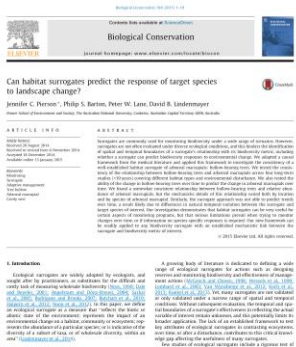


Fig. 2. Responses of the relative abundance of arboreal marsupials to the abundance of hollow-bearing trees (or hollows in Nanangroe) across the four study locations. All responses, except the common ringtail possum in Jervis Bay and the

