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Taking the bait: The inßuence of attractants and microhabitat on detections of fauna by remote-sensing cameras

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Summary Autonomously triggered cameras are a common wildlife survey technique. The use of attractants and surrounding microhabitats is likely to influence detection probabilities and survey outcomes; however, few studies consider these factors. We compared three attractants (peanut butter-based, tuna-based and a control) in a Latin square design through a coastal shrubland with high microhabitat variability at Cape Otway, Victoria, Australia (38°50′S, 143°30′E). Deployments involved 36 cameras for four days in each of five years. The percentage cover of each vegetation structural type (low [no or sparse cover], moderate [grass] or high [shrubs]) within 20 m of each camera was calculated and reduced to a single variable using PCA. Dynamic occupancy modelling, with lure type and vegetation structure as covariates of detection probability, found that peanut butter attracted the greatest diversity of species (24 of 35 species, 69%) and yielded the greatest number of detections (50% of 319) when compared with tuna oil (66% and 24%, respectively) and the control (43% and 26%, respectively). Peanut butter attracted more Macropodidae (wallabies) and Muridae (rats and mice); however, vegetation structural variables were the greatest influence on Corvidae/Artamidae (raven/currawong) detections with higher detectability in more open areas. Vegetation structure also influenced Muridae detections. This study reinforces the critical choice of appropriate attractants and camera placement when investigating vertebrate groups and highlights the role of microhabitat in the detection of small mammals and birds. We suggest future large-scale camera surveys consider different bait types and microhabitats in their designs, to control for any biases and enable future advice on 'optimal' methods.

Key words: *detection probability, dynamic occupancy model, lure.*

Implications to Managers

- Choice of lure type and placement are critical for camera trapping studies of wildlife, and likely inßuence survey results.
- We show a peanut butter-based lure represents a useful general lure for detections of mammals and birds in an Australian coastal shrubland and that microhabitat inßuences detections.
- To be effective, large-scale camera surveys should consider different lures and microhabitats, to control for these effects, and to enable further evidence to support future survey decision tools.

Introduction

Many animals are attracted to odours in their environment that communicate the presence and quality of potential food, competitors, partners or function to demarcate territories. Odours associated with food have been used to lure animals to particular locations and often increase the probability of detecting otherwise elusive species (McCoy *et al*. 2011; du Preeze *et al*. 2014; Mills *et al.* 2019). Surveys of terrestrial fauna have long relied on attractants, which encourage animals into ÔtrapsÕ in which they are detected by direct capture, being photographed, leaving tracks or scats, or samples such as hair (Hamel *et al*. 2013; Fleming *et al*. 2014; du Preeze *et al*. 2014).

Attraction to lures may differ between species and contexts, resulting in biased estimates of community compositions (da Rocha *et al*. 2016). Different lures provide different levels of attraction for a variety of taxa including birds (McLean *et al*. 2017) and mammals (Ferreras *et al*. 2018; Ferreira-Rodriguez & Pombal 2019). Although lures may attract some species, they repel others, including prey species that avoid encounters with predators (da Rocha *et al*. 2016). Lures may artiÞcially inßate detection probabilities for some species over others or may encourage animals to move outside their normal habitats or home ranges (Gerber *et al.* 2012).

The presence of an attractant can alter detection proÞles when compared to passive detection (no olfactory lure) (McCoy *et al*. 2011; du Preeze *et al*. 2014), yet understanding the inßuence of these on detectability of animals is complex. Detectability is inßuenced at the individual level, with individuals with poorer body condition or bolder characteristics more likely to be detected (Carter *et al*.

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2012; Stokes 2013). Across species, differential sensory capacities may inßuence bait detectability; some species forage visually, others use alternate and often multiple senses (Ekanayake *et al.* 2015). At the community level, landscapes of fear can inßuence whether some species are detected based on the presence of a competitively dominant or predatory species (Lazenby & Dickman 2013). Attraction to different olfactory lures therefore varies between species and faunal communities, which themselves vary between habitat types.

Habitat is fundamental in speciesÕ persistence within landscapes. Species can show differential responses to the age-structure of vegetation (Fox 1982), and the prevailing climate and its subsequent impact on microclimates (Hale *et al.* 2016). The microhabitat in which ÕtrapsÕ are deployed, therefore, may inßuence speciesÕ detectability in addition to attractants used during surveys. Conversely, attractants may work to draw individuals from their preferred habitat. Most studies of lure attractiveness understandably use relatively uniform habitats, where each sampling point holds a relatively constant probability of representing habitat for any given species. Many areas, however, are habitat mosaics—in these instances, attractants and microhabitat placement warrant simultaneous consideration (Stokeld *et al.* 2016).

Camera trapping is now a dominant survey technique for wildlife, mostly applied for mammal surveys, but increasingly for bird surveys (Dinata *et al.* 2008). Some birds possess an olfactory capacity (Zelenitsky *et al.* 2011), and odour might attract invertebrates which in turn attract insectivorous birds.

There have been two rigorous multi-species studies of attractant effectiveness undertaken in Australia (Paull *et al.* 2011; Diete *et al.* 2016). Both found that species detected through remote camera monitoring of bait stations differed depending on the attractant used. A standard peanut butter and oats mix attracted many animals and was an excellent, general-purpose attractant in both studies. Other lures, notably meat-based attractants (i.e. tuna oil; Austin *et al.* 2017), offered the possibility of selectively attracting target species. Control (non-scented) attractants detected fewer animals. Currently, such studies are extremely limited for terrestrial faunal communities and rarely consider the role of microhabitat on detectability. Coastal shrublands represent stark microhabitat mosaics, many harbouring bare sand dune blowouts interspersed with thick shrubland, yet faunal communities are poorly known (Rendall *et al.* 2019). This makes them ideal ecosystems to test the role of habitat and attractant type on the detectability of fauna.

We investigate the attractiveness of a classic peanut butter mix, tuna oil and a control, and consider how faunal detection proÞles are mediated by habitat structural complexity. We predict that detections will differ with attractant type and microhabitat; with these differences being related to the foraging modality of the species, i.e. predators will be attracted to tuna oil (sensu Austin *et al.* 2017), herbivores to peanut butter (sensu Paull *et al.* 2011; Diete *et al.* 2016) and generalists to both.

Methods

Study area

We deployed camera traps in the Great Otway National Park, southwestern Victoria, Australia (38°50′S, 143°30′E; 103,000 ha). The study location was selected from within a large tract of undulating coastal shrub environment dominated by Coastal Beard Heath (*Leucopogon parviflorus*), Coastal Wattle (*Acacia longifolia sophorae*) and Coastal Tea Tree (*Leptospermum laevigatum*) interspersed with Coastal Daisybush (*Olearia axillaris*), White Correa (*Correa alba*) and Common Tussock Grass (*Poa labillardieri*). The area has been extensively grazed since the 1840s, with leases ceasing (2009) after the creation of the park (2004) (Parks Victoria 2009). No active revegetation works have been undertaken, and the area is a mosaic of vegetation from open sand dunes to dense patches of shrubland.

Design

Thirty-six camera trap sites (12 of each attractant) were established simultaneously on a systematic 500 × 500 m (25 ha) grid. Cameras were at 100 m intervals in a 6 × 6 camera grid deployed in late October or early November of each year, deployed at the same sites with the same attractants from 2010 to 2014, inclusive. A Latin square design sampled vegetation variation across the area and each site was assigned the same treatment across years. Sites were established for Þve days per year. Detections at each camera trap were compiled into each of four 24-hour periods commencing from the time of deployment each year. Cameras were deployed in the afternoon, and because most detections occurred by night, we refer to detections in the 24-hour period as ÔnightlyÕ detections. Infrared remote cameras were deployed (Scout Guard DTV-530V), beside and facing towards each bait station (~2–3 m away; 0.5 m from the ground). The immediate vicinity around the camera was cleared to minimise false triggers. Cameras were set on the same sensitivity at any given time to ensure comparability (usually high sensitivity, but this was sometimes reduced if wind caused large numbers of false triggers) and recorded three images per trigger (across a seven second period) with minimum delay (1 second) between images.

Attractants were selected on the basis that they are broadly used and represent both a non-meat and Ômeat-basedÕ lure (Paull *et al.* 2011; Diete *et al.* 2016). Peanut butter (peanut butter, honey, linseed oil and vanilla essence; De Bondi *et al.* 2010; Rendall *et al.* 2014) represented a non-meat attractant. Tuna oil was used as a predator attractant. HolloÞl synthetic Þbre was soaked in either of the mixtures and placed inside a highly perforated 10-cm-long polyvinyl chloride (PVC) tube. The tube was sealed at each end with PVC end caps and pegged securely to the substrate. Tube contents could not be consumed or removed, thus assumed effective for the duration of their deployment (Hamel *et al.* 2013). We used unsoaked HolloÞl within a clean and

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weathered PVC tube as an unscented control; this treatment was included to determine whether the lure itself was attracting species to sites. All bait tubes were thoroughly washed between years, were packed separately in plastic sealed bags, and stored and carried only with tubes of the same treatment, to prevent cross-contamination. Attractant type was treated as a categorical covariate with three levels representing the three lure types.

Every image taken by the cameras was inspected by multiple personnel to ensure no detection was missed. Species identiÞcation was aided by our detailed experience of species in the general area, including trapping and handling local variants of small mammals away from the cameras.

Spatial covariates

To quantify vegetative cover of each camera trap site, we used a supervised classiÞcation approach to classify the visible red band of a 2012 aerial photo (Department of Environment, Land, Water, and Planning, 50 cm resolution) into three classes: low (no or sparse), moderate (grasses) and high (shrubs) cover. Vegetation cover was comparable over time, with sites remaining in the same vegetation category throughout the study period (pers. obs. from annual site visits). The proportional area of each cover type within a 20 m radius of each point was then calculated from aerial images (across camera locations: low cover, 7–42%; moderate, 7–86%; high, 0–86%). A principal component analysis (PCA) with Varimax rotation was used to reduce proportions of vegetation in the three categories to fewer variables. Two components were produced (Table 1). The Þrst component (hereafter Ôvegetation structural complexityÕ) described a gradient where higher component values represented areas with high shrub cover, while low values represented areas of bare ground (Table 1). There was limited explanatory power or utility associated with the second component which was not used in subsequent analysis.

Statistical analysis

Dynamic occupancy models were used with site occupancy, colonisation probability and extinction probability held constant (MacKenzie *et al.* 2003). The inßuence of attractant type, vegetation structural complexity and their interaction was assessed against the detectability of each taxonomic group (functional groups of similar taxa regularly detected on cameras). Detection probabilities for each taxonomic group did not differ between years for Muridae or Corvidae/Artamidae species but differed for Macropodidae species (Table S1), and the effect of year was therefore only considered for Macropods.

The most parsimonious model was determined using Akaike information criteria, corrected for small sample size (AICc). Models with a delta AIC (Δ AIC) > 2 were considered to have less support. NagelkerkeÕs (1991) R^2 index was used to quantify the proportion of variation explained by each model. Chi-squared goodness-of-Þt tests were run, with 1000 boot-strapped samples, to assess model Þt to the data. If model Þt was not adequate, then a quasi-likelihood overdispersion parameter was estimated and used to modify AIC values (QAIC) in the model selection process (MacKenzie *et al.* 2006). Given the probability of detecting an individual within its respective taxonomic group, we calculated the number of nights that would be required to be 80-95% conÞdent the species was not present at a site using the formula:

$$P_{i,n} = 1-(1-p_1)*(1-p_2)*(1-p_3)\ldots(1-p_n).$$

where P is the cumulative nightly detection probability at a given site, p_1 is the detection probability for night one, and n is the total number of survey-nights required for the corresponding level of conÞdence (P).

Occupancy models were run in R (2017) using the ÔunmarkedÕ package (Fiske & Chandler 2011) with model selection and chi-square goodness-of-Þt tests run in ÔAICcmodavgÕ (Mazerolle 2016). ClassiÞcation of the aerial photograph and estimation of the proportion of vegetation cover types were undertaken in ArcGIS 10.1 (ESRI 2012).

Table 1. Factor loadings for principal components derived from proportion of 'shrub cover', 'grass cover' and 'bare ground' at camera sites

Proportional vegetation metrics	Component 1: 'habitat structural complexity'	Component 2: 'grass cover'
High (shrub cover)	0.957	–0.290
Medium (grass cover)	0.117	0.993
Low (bare ground)	–0.987	–0.163
Variance explained (%)	63.43	36.56

Results

There were 720 camera trap nights which yielded 319 detections of 35 species (15 mammals, 19 birds and one reptile; Table S2). Peanut butter attracted the highest diversity of species (24 of 35 species, 69%) and had the greatest number of detections (50%) compared with tuna oil (66% and 24%, respectively) and the control (43% and 26%, respectively). Given the low detectability of many species, we categorised the species into three taxonomic groups (Macropodidae, Muridae and Corvidae/Artamidae). These groups reßect commonly detected species: Macropodidae (Swamp Wallaby *Wallabia bicolor*), Muridae (Black Rat *Rattus rattus*, Bush Rat *Rattus fuscipes,* Swamp Rat *R. lutreolus* and House Mouse *Mus musculus*) and Corvidae/Artamidae (Australian Raven *Corvus coronoides*, Forest Raven *C. tasmaniscus* and Pied Currawong *Strepera graculina*). These groups represented the majority (66%) of detections throughout the study (35%, 18% and 13%, respectively).

Macropodidae

The top model for Macropodidae included the inßuence of attractants and survey year on detection probability. There was model selection uncertainty with vegetation structural complexity also being

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supported (AIC = 1.59; Table 2). Peanut butter was associated with the highest detection probability for macropods and was different to the control (= 0.726, 95% CI: 0.05–1.41, Table 3). Tuna oil had poor detection probabilities, lower than the control although these were not different (= Š0.459, Š1.31–0.39). Annual detection probabilities varied between 0.077 (95% CI: 0.034–0.166) in 2011 and 0.288 (0.186–0.416) in 2014. Comparisons using 2010 as the reference category showed only 2014 differed, with higher detection probabilities in 2014 compared to 2010 (0.288, 95% CI: 0.186–0.416; 0.122, 0.058–0.240, respectively). Vegetation structural complexity negatively inßuenced detection probabilities with decreasing detections as structural complexity increased across all attractant types (= Š0.113, 95% CI: Š0.47–0.25), although estimates overlapped zero. The best supported model explained 41.5% of the variation in the data. Predictions of nightly detection probabilities estimated that 12 survey-nights would be required to be 95% conÞdent of a site-speciÞc absence if using peanut butter, considerably less than tuna oil (31 nights) and the control (21 nights) (Fig. 1, Figure S1). A chi-square goodness-of-Þt test suggests these models Þt the data well (^{2} = 68.339, P = 0.237).

Table 2. Candidate model selection for three most detected taxonomic groups

Taxonomic Group	Model	K	AICc	AIC	AIC	R^2
Macropodidae	psi(.), col(.), ext(.), p(AT + Y)	10	472.44	0.00	0.541	0.415
	psi(.), col(.), ext(.), p(AT + HS + Y)	11	474.03	1.59	0.246	0.422
	psi(.), col(.), ext(.), p(AT)	6	476.33	3.89	0.077	0.186
	psi(.), col(.), ext(.), p(AT + HS)	7	477.97	5.53	0.034	0.195
	psi(.), col(.), ext(.), p(HS + Y)	9	478.03	5.59	0.033	0.278
	psi(.), col(.), ext(.), p(AT + HS + Y + AT*Y)	19	478.14	5.69	0.031	0.585
	psi(.), col(.), ext(.), p(.)	4	479.76	7.32	0.014	0.000
	psi(.), col(.), ext(.), p(AT + HS + AT*HS)	9	480.43	7.99	0.010	0.228
	psi(.), col(.), ext(.), p(AT + HS + Y + HS*Y)	15	480.56	8.11	0.009	0.445
	psi(.), col(.), ext(.), p(HS)	5	481.64	9.20	0.005	0.003
Muridae	psi(.), col(.), ext(.), p(AT)	7	133.58*	0.00*	0.37*	0.319
	psi(.), col(.), ext(.), p(AT + HS)	5	134.11*	0.53*	0.29*	0.415
	psi(.), col(.), ext(.), p(.)	7	134.69*	1.11*	0.21*	0.000
	psi(), col(.), ext(.), p(HS)	8	135.97*	2.40*	0.11*	0.083
	psi(), col(.), ext(.), p(AT + HS + AT*HS)	8	139.58*	6.00*	0.02*	0.474
Corvidae/ Artamidae	psi(.), col(.), ext(.), p(HS)	5	181.48	0.00	0.579	0.160
	psi(.), col(.), ext(.), p(AT + HS)	7	183.33	1.85	0.229	0.210
	psi(.), col(.), ext(.), p(.)	4	185.79	4.31	0.067	0.000
	psi(.), col(.), ext(.), p(AT)	6	185.90	4.41	0.064	0.100
	psi(.), col(.), ext(.), p(AT + HS + AT*HS)	9	185.98	4.50	0.061	0.240

Results represent the number of parameters (K), Akaike Information Criterion, corrected (AICc), AIC difference (AIC), Akaike weights (AIC) and Nagelkerke's *R*-squared (R^2). Model parameters include site occupancy (psi), probability of colonisation (col), probability of extinction (ext) and detection probability (p). Variables include attractant type (AT), habitat structural complexity (HS), year (Y) and constant (.). Quasi Akaike information criterion corrected values (QAICc), QAIC and QAIC weights were used where overdispersion was present (*).

Muridae

Attractants were the primary inßuence on the detection probability of Muridae species (Table 2). There was also support for an inßuence of vegetation structural complexity (QAIC = 0.53) and a constant model (QAIC = 1.11). Peanut butter led to the highest detection probabilities and was different (= 2.18, 0.91–3.44) when compared to tuna oil and the control which were similar (= 0.632, Š0.68–1.94; Table 3; Fig. 1, Figure S1). Vegetation structural complexity had a positive inßuence on Muridae detection probabilities across all attractant types (= 0.693, 0.12–1.27; Fig. 2). The best supported model explained 31.9% of the variation in detection probability. Predictions suggested that Þve survey-nights are required to be 95% conÞdent of a site-speciÞc absence when using peanut butter compared to 18 and 32 nights

Table 3. Detection probability of three taxonomic groups in relation to attractant type (for groups in which attractant type inßuenced detection probability)

Taxonomic Group	Attractant Type	*P*	SE (*P*)	80%	90%	95%
Macropodidae	PB	0.226	0.034	7 (5–9)	9 (7–13)	12 (9–17)
	Tuna	0.093	0.032	17 (9–34)	24 (12–49)	31 (16–64)
	Control	0.134	0.032	12 (7–19)	17 (10–27)	21 (13–36)
Muridae	PB	0.476	0.094	3 (2–5)	4 (3–7)	5 (3–9)
	Tuna	0.162	0.062	10 (5–22)	14 (6–31)	18 (8–40)
	Control	0.093	0.047	18 (7–48)	25 (9–68)	32 (12–88)
Corvidae/Artamidae	PB	0.076	0.047	21 (7–75)	30 (9–106)	39 (12–138)
	Tuna	0.036	0.022	44 (14–150)	63 (19–215)	82 (25–279)
	Control	0.036	0.025	45 (12–180)	64 (17–257)	83 (22–334)

Table includes nightly detection probability (*P*) and standard errors (SE (*P*)) as well as the number of nights required to be 80, 90 and 95 per cent con dent in a site-speci c absence (mean 95% CI). Attractant types include peanut butter (PB), tuna oil (Tuna) and a control.

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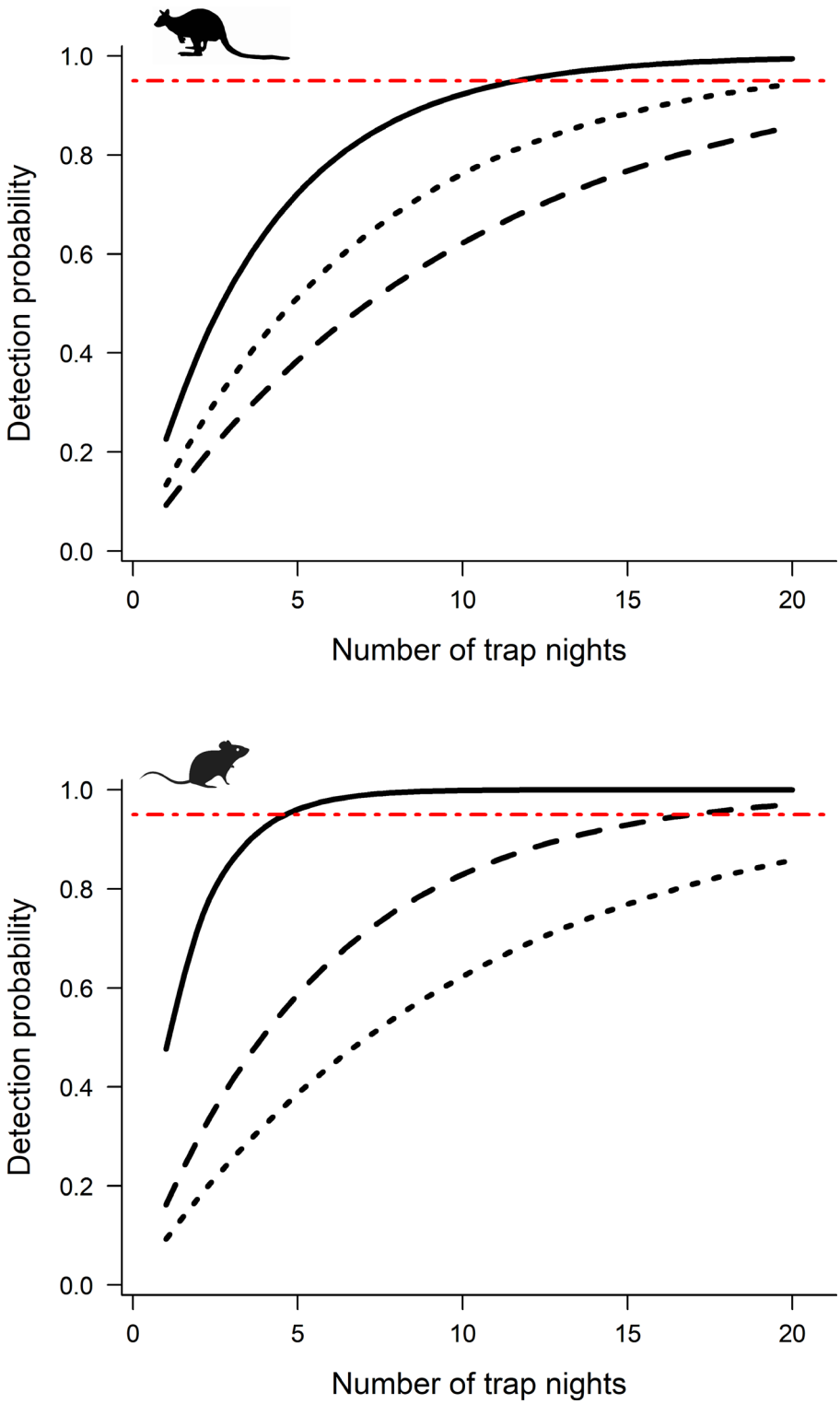

Figure 1. Number of nights required to be 95% confident (cumulative detection probability) of detecting Macropodidae species (top) and Muridae species (bottom) across three attractants: peanut butter (solid line), tuna oil (dashed line), and control (dot line). Red dash-dot line represents target 95% confidence in site-specific absences.

for tuna oil and control, respectively (Fig. 1). Overdispersion was present within the Muridae models (χ^2 = 112.25, P = 0.002, c-hat= 1.94); therefore, an overdispersion parameter was included in the model selection process and quasi Akaike information criterion corrected (QAICc) was used.

Corvidae/Artamidae

A model containing vegetation structural complexity was the best supported model for Corvidae/Artamidae species (Table 2). There was model selection uncertainty with attractants receiving some support (Δ AIC = 1.85); however, when attractant type was considered alone it had limited support (Δ AIC = 4.41; Table 2). Vegetation structural complexity had a negative inßuence on detections with higher detection probabilities in more open areas (β = –0.741, –1.17–-0.31; Fig. 3). All attractant type comparisons overlapped zero. The best supported model explained 16% of the variation in the data. Model predictions suggest 39 survey-nights would be required to be 95% conÞdent of site-speciÞc absence at peanut butter baits; however, there was high variability around these estimates emphasising the weak relationship (Table 3). Chi-squared goodness-of-Þt tests suggested this model Þtted the data well (χ^2 = 63.32, P = 0.380).

Discussion

We highlight the role of attractants and microhabitats on realised animal detections. Peanut butter attractants yielded the highest rate of species detection across most taxonomic groups. Vegetation complexity positively inßuenced Muridae detections and negatively inßuenced Corvidae/Artamidae highlighting the importance of stratifying camera trap placement across microhabitat mosaics, or for targeted surveys, selecting the appropriate structural elements.

Peanut butter provides a versatile lure for camera traps (Paull *et al.* 2011; Diete *et al.* 2016; this study). Our Þnding that lure type inßuenced mammalian but not

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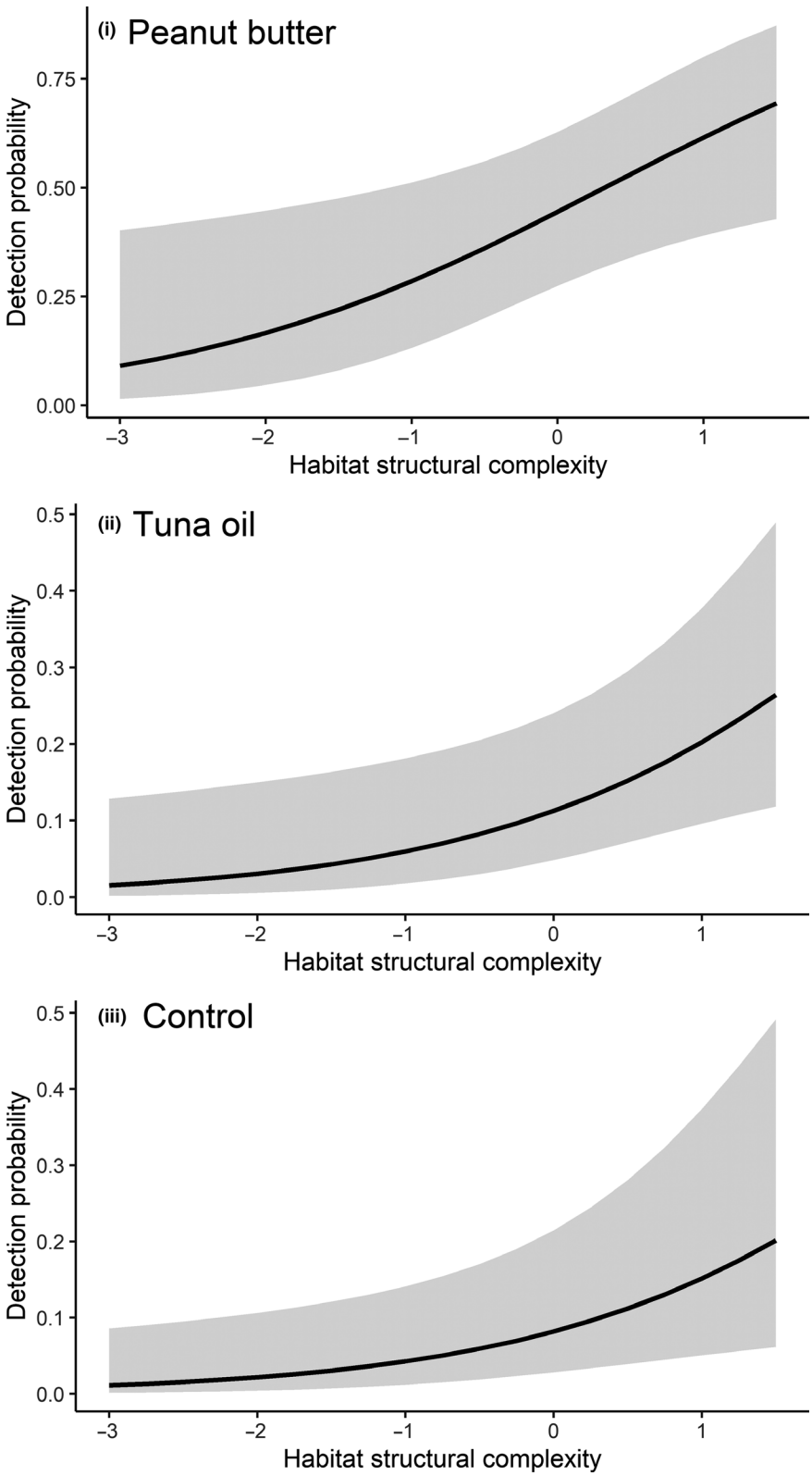

Figure 2. The influence of habitat structural complexity on the detection probability of Muridae species across three attractant types (line of best fit ± 95% CI). Low values represent open areas with minimal to no vegetation, and high values represent high proportions of shrubs around the camera location.

bird detection (for the species studied here) presumably reßects the olfactory nature of prey detection and communication in mammals, and the absence or rarity of this sensory modality in the birds we studied (see Ekanayake *et al*. 2015). While birds may have been incidentally recorded by cameras (passing by rather than being attracted), many birds did take interest in the lure and camera, perhaps due to the neophilic nature of the species we analysed (Higgins *et al*. 2006). Lures may have provided visual attractants (McLean *et al*. 2017) or may have attracted invertebrates, a possible food source, which consequently attracted birds.

In our study area, placement of cameras inßuenced detectability in ways consistent with habitat preferences. Increased small mammal detections occurred at sites of high structural complexity, and more ground-foraging birds occurred at open sites (Higgins *et al*. 2006; Rendall *et al*. 2014; Villaseñor *et al*. 2015). We found a limited relationship of vegetation structural complexity with Macropod detection. While Swamp Wallaby prefer more structurally complex habitats (Di Stefano *et al*. 2009), the species is highly mobile and unlikely to be restricted to these habitats, moving readily throughout our study site. For larger, more mobile species, microhabitat placement may therefore be less inßuential.

Detections at control sites occurred in this study, and three potential explanations exist. Firstly, these detections may have involved animals incidentally passing the site. We could not reliably index attraction (investigation of the lure) because of delays between images; however, some images revealed animals investigating control lures. Secondly, residual odours may have existed, perhaps from human scent associated with installation (Duncan *et al*. 2002), from the thoroughly cleaned and weathered tubes, or from other animals which had visited them (Gurnell & Little 1992; Paull *et al*. 2011). Thirdly, neophilia associated with visual cues may have encouraged some animals to approach (GrifÞn *et al*. 2017). This could be due to either the presence of a novel stimulus or through following human tracks (Jones & Urban 2018).

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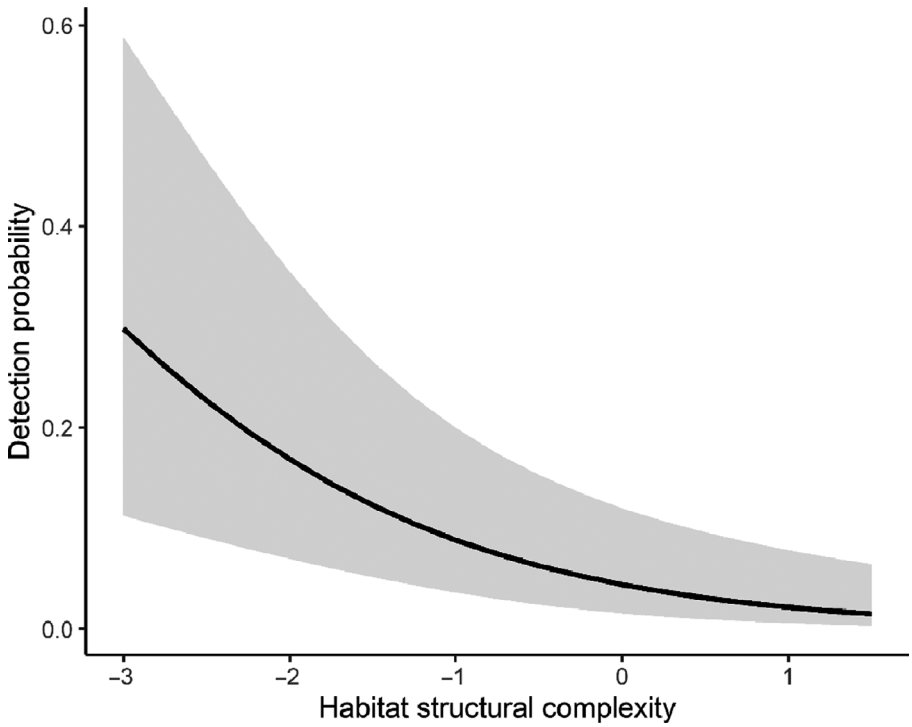

Figure 3. Detection probability of Corvidae/Artamidae species given differing levels of habitat structural complexity (line of best fit ± 95% CI). Low values represent open areas with minimal to no vegetation, and high values represent high proportions of shrubs around the camera location.

Regardless of the cause, some degree of attraction appears independent of possible food odours and suggests lures may work in ways other than emitting olfactory cues.

Inter-annual variability in detection probabilities was only observed for macropods. Our sampling sites and lure types remained constant across the study period suggesting that this increase in detection probability may be associated with a local population-level increase of Swamp Wallaby. Our coastal mosaic is a regenerating shrubland, with habitat complexity increasing across the region during the study (authors, pers. obs.). The increase in preferred habitat (Di Stefano *et al*. 2009) has likely facilitated such a population increase.

Choosing the optimum bait and placement

Recent guidance on where, when and how long to deploy camera traps for mammal surveys has become available (Kays *et al.* 2020). However, currently there are no decision support tools available to inform ÔoptimalÕ baits for multispecies camera surveys, indeed a single bait (using a single survey technique such as camera trapping) may not reliably capture the full range of species within an area. The same lack of guidance applies to camera placements in habitat mosaics (though such factors are important to consider; Kays *et al.* 2020). One broad approach could be to use different bait types/placements in Latin Square or randomised designs, to enable any effect of bait type or microhabitat on detections to be statistically controlled (see Kays *et al.* 2020). This should also allow further investigation of the attractiveness of different baits and inßuence of microhabitat on detections of all species in the community (including rare species). Such investigations may permit the generation and testing of transportable, generally applicable advice based on bait–habitat–species interactions and patterns in relation to species traits, phylogeny or habitat variation. It is surprising that methodical investigations of attractants are not more common, and a fundamental component of broad-scale camera trapping studies (see Hofmeester *et al*. 2019).

In an Australian context, peanut butter lures may represent an ideal standard attractant (Paull *et al*. 2011; Diete *et al*. 2016). We emphasise that the microhabitat in which cameras are placed is critical, with taxon-speciÞc detection probabilities varying with microhabitat. The choice of bait and camera location is therefore critical to the efÞcacy and interpretation of camera trapping studies.

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Supporting Information

Additional supporting information may be found online in the Supporting Information section at the end of the article.

Appendix S1. Inßuence of year on detection probability of each taxonomic group.

Appendix S2. All species identiÞed across Þve years of investigating bait-type inßuences on detectability.

Appendix S3. The cumulative nightly detection probability for Macropodidae (top row) and Muridae (bottom row) species across each of three bait types (cumulative detection probability ± 95% conÞdence intervals).

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