



Original Article

It's a trap: sampling bias due to animal personality is not always inevitable

Marcus Michelangeli, Bob B.M. Wong, and David G. Chapple

School of Biological Sciences, Monash University, Melbourne, Victoria 3800, Australia

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Within a population, individuals can often exhibit consistent differences in a range of behaviors across time and context (behavioral type) that are also correlated (behavioral syndrome). Recently, it has been suggested that an individual's behavioral type can influence its probability of detection and capture during sampling. As a result, certain trapping methods may be inherently biased toward targeting a non-random sample of the population with wide ranging implications—from the way we conduct ecological research to the management and conservation of species. But is sampling bias always inevitable? Currently, studies have focused almost exclusively on the efficacy of passive trapping methods (e.g., baited traps) that rely on the arrival and inspection of animals, where bold, explorative individuals are typically oversampled. Whether more active search strategies result in similar bias remains unclear. In this study, we compared 3 different trapping methods (hand capture, pitfall trapping, and mealworm fishing) in their ability to capture a range of behavioral types within a population of the delicate skink (*Lampropholis delicata*). We also tested whether a behavioral syndrome was present. Although significant behavioral variation existed within the population, we found no difference between individuals caught in the 3 trapping methods among 5 behavioral traits. However, we did find the presence of a behavioral syndrome, where skinks that were consistently more active, explored an environment faster and were more likely to bask with other skinks. We suggest that trapping bias is not ubiquitous but instead might only be associated with passive trapping methods that involve the response of animals to novelty.

Key words: boldness, exploratory behavior, invasion success, neophobia, repeatability, sociability.

INTRODUCTION

Individuals within populations can exhibit consistent differences in a range of behaviors across time and context (a behavioral type: Réale et al. 2007) that are also correlated (a behavioral syndrome: Sih et al. 2004; Réale et al. 2007; Sih et al. 2012). For example, some individuals with an aggressive behavioral type will consistently be more aggressive during mating and foraging but will also take greater risks, such as allowing predators to approach closer before fleeing (Bell and Sih 2007). An individual's behavioral type can therefore have a direct bearing on fitness and influence important fitness-related characteristics, including microhabitat use, diet preferences, activity patterns, immune condition, and intraspecific interactions (Sih et al. 2012; Wolf and Weissing 2012).

Recently, a number of studies have demonstrated that an individual's behavioral type can also influence its probability of detection and capture during sampling (Biro and Dingemanse 2009; Garamszegi et al. 2009; Carter et al. 2012; Biro 2013; Stuber et al. 2013). Although ecologists aim to collect random independent samples using strategies that minimize bias, certain trapping methods might be inherently biased towards capturing individuals with

specific behavioral types. For instance, explorative and bold colored flycatchers (*Ficedula albicollis*) were more likely to be captured in nestbox traps than shyer, less explorative individuals (Garamszegi et al. 2009). Similarly, only active North American red squirrels (*Tamiasciurus hudsonicus*) were caught regularly using baited traps (Boon et al. 2008). Indeed, “trappability” has even been used as a measure of boldness in some studies (Boyer et al. 2010; Wilson et al. 2011). Such sampling bias may affect not only the validity of behavioral studies but also any research on physiological or life history traits that are functionally associated with behavior (e.g., metabolism, stress levels, thermal preferences; Biro and Stamps 2008). As a result, it is pivotal to consider the efficacy of different trapping methods, particularly if there is more than one option available, when collecting individuals from a given population.

Although behaviorally biased trapping may have negative implications for research, identifying the ability of different trapping methods to capture behavioral types could have some beneficial applications in ecology and conservation. For example, the implementation of different catching techniques in commercial fishing may prevent the overexploitation of larger, fast growing fish, which are generally easier to angle due to their more active, exploratory, and bold behavioral type (Wilson et al. 2011). Several studies have also suggested that trapping bias can affect pest reduction regimes (Tuytens et al. 1999) and influence the composition of species introductions

Address correspondence to M. Michelangeli. E-mail: marcus.michelangeli@monash.edu.

(Chapple et al. 2011; Carrete et al. 2012; Chapple et al. 2012). With this in mind, trapping bias may be advantageous if it can be used to identify techniques that target individuals with specific behavioral types; for example, those that are more prone to become ensnared in a transport vector and accidentally introduced to new environments (Chapple et al. 2011, 2012; Carere and Gherardi 2013).

To date, studies investigating the effects of capture bias have all focused primarily on passive trapping methods (baited traps: Tuytens et al. 1999; Boon et al. 2008; Boyer et al. 2010; Carter et al. 2012, nestbox traps: Garamszegi et al. 2009; Stuber et al. 2013, and nets: Biro 2013) that rely heavily on the arrival and inspection of animals (i.e., requiring those individuals to be relatively explorative and bold). Here, we set out to compare more active methods that potentially could capture a broader range of individuals. Active trapping methods are used regularly by ecologists when sampling from wild populations, but surprisingly the suitability of such capture methods has been largely overlooked.

Accordingly, in this study, we compared 3 different trapping methods (both active and passive; see methods below) in their ability to capture a range of behavioral types within a population of the delicate skink (*Lampropholis delicata*). The delicate skink is a small diurnal lizard (adult snout–vent length [SVL] 34–51 mm) that is native and abundant throughout eastern Australia. It is an ideal study species with which to investigate the efficacy of different trapping methods in catching different behavioral types. First, lizards can be caught using a range of trapping techniques that potentially can have varying levels of bias in trapping certain behavioral types over others (discussed by Carter et al. 2012). Second, interindividual behavioral variation has been shown in the delicate skink (Chapple et al. 2011; Cromie and Chapple 2012; Bezzina et al. 2014) and a behavioral syndrome between activity and exploration has been reported (Moule et al. forthcoming). Finally, the delicate skink is the only Australian lizard species to have successfully invaded overseas and is commonly intercepted within freight being transported overseas (Chapple, Miller, et al. 2013; Chapple, Whitaker, et al. 2013), thus offering us an insight into the behavior and “trappability” of a frequent stowaway that has successfully invaded into new areas.

METHODOLOGY

Animal collection and husbandry

Delicate skinks were collected from Lane Cove National Park, Sydney, Australia (33°47′17.754″S, 151°08′43.968″E) between October and November 2013 in accordance with the appropriate collection and research permits (New South Wales SL101203, Victoria: 10006866). We used 3 different trapping methods—hand capture, pitfall traps, and mealworm fishing. Hand capture involved active search methods, such as checking under logs and rocks for sheltering individuals or attempting to collect any individuals observed basking or scurrying in open areas. This capture method was mostly carried out in the morning when conditions were generally cooler and lizards were not yet at optimal body temperature for activity. Pitfall trapping involved the use of 4-L plastic buckets, which were dug into the ground so that the lip was flush with the ground level. Leaf litter covered the surrounding areas. Eight 2-mm (diameter) holes were drilled into the base of the bucket to enable water drainage. A layer of soil and a wire mesh bundle (made of chicken wire) was placed at the bottom to provide shelter and protection from the elements. These traps were designed to capture any active skinks that may fall into the buckets. Pitfall traps were only opened during the day (08:00–15:00) and checked

5 times daily. Mealworm fishing involved the use of a wooden pole with some fishing line attached. A sinker and a piece of cotton thread were attached to the fishing line, and a mealworm (*Tenebrio molitor*) was tied onto one end. The mealworm was then positioned within the sight of a skink. Skinks would generally bite/grab onto the mealworm, allowing the skink then to be lifted off the ground and into a bucket. Using this method, we could target skinks basking in sun spots within dense vegetation or those hiding within their shelter which would otherwise be impossible to hand capture. The number of individuals captured using each trapping method were as follows: hand capture: $n = 22$, pitfall trap: $n = 19$, and mealworm fishing: $n = 22$.

On capture, skinks were measured for tail length (TL, length from vent to tip of tail), SVL (length from tip of snout to vent), and their sex determined (via eversion of hemipenes in males). Tail loss (Downes and Shine 2001; Cromie and Chapple 2012) and gravidity (Shine 2003) can influence behavior in *Lampropholis* skinks, therefore only adult males (SVL > 34 mm) with long tails (TL > SVL) were retained. Skinks from different trapping methods did not differ in size (mean SVL \pm standard error [SE]: hand capture = 35.9 mm \pm 0.4, pitfall trapping = 35.7 mm \pm 0.3, mealworm fishing = 36.5 \pm 0.3; Anova: $F_{2,62} = 1.56$, $P = 0.22$).

Lizards were transported back to Monash University for laboratory behavioral experiments. Focal skinks were housed individually in plastic containers (25 cm \times 20 cm \times 18 cm). This was done to prevent possible competition between individuals and to control for state-dependence effects (e.g., all individuals were ensured to have equal access to food and shelter) which could alter an individual's behavior. On one end of each housing container, a basking area was created using heat tape and a flat basking platform (a terracotta tile). This created a thermal gradient in the housing container (22–35 °C) allowing thermoregulation from 08:00 to 18:00. Small plastic pots were provided for shelter. Ultraviolet lighting was placed above the containers and was activated from 08:00 to 18:00. All housing containers were in a temperature-controlled room with an ambient temperature of approximately 22 °C and room lighting from 07:00 to 21:00 daily. Skinks were fed a diet of crickets (*Acheta domesticus*), dusted in a vitamin supplement (Reptivite™), 3 times a week and water was made available ad libitum.

Behavioral experiments

We conducted a series of behavioral assays to examine variation and correlation among 5 common behavioral traits: activity, exploration, sociability, foraging activity, and boldness. Assays were carried out in a fixed order (in the order presented below), where trials that could have the greatest influence on behavior were carried out last to reduce potential carry-over effects (Bell 2012). To test repeatability, individuals were placed through each behavioral assay twice at least 3 days apart (Bell et al. 2009).

All behavioral assays were conducted in opaque-walled experimental arenas (550 mm \times 320 mm \times 240 mm). The setup of the arena was modified to accommodate the trial being conducted. Skinks were allowed to acclimatize under transparent containers for 10 min prior to the start of each trial. All trials were recorded using JVC Everio GZ-E100 video cameras. After each trial, the footage was downloaded to a computer for later playback (using JWatcher™; Blumstein et al. 2006) and data analysis. All equipment was thoroughly washed between trials with hot water and scentless dishwashing detergent to prevent scent contamination amongst trials. Because *Lampropholis* skinks are known to modify their behaviors following large meals (Shine 2003), we ensured that lizards were not fed in the 24 h prior to each behavioral trial.

Activity

To measure activity levels, skinks were allowed to roam freely in a test arena marked with 20 equal grid squares. We recorded the number of transitions between grid squares the skink made over 45 min. The greater number of transitions the skink made the higher the activity level (sensu Chapple et al. 2011; Cromie and Chapple 2012; Moule et al. forthcoming).

Exploratory behavior

To measure an individual's ability to explore a novel environment, skinks were presented with a barrier that divided a test arena into 2 compartments. The barrier was trapezium shaped, so that skinks could squeeze themselves through either end of the barrier to reach the other compartment. Whether skinks reached the far compartment and the time taken for skinks to reach the far compartment was recorded (sensu Chapple et al. 2011; Moule et al. forthcoming).

Sociability

We conducted a dichotomous choice experiment to measure the social behavior of skinks. Individual lizards were offered a choice between basking with a group of conspecifics and basking alone following Chapple et al. (2011). Briefly, this was achieved by splitting the test arena into 3 zones: social zone, asocial zone, and a "no choice" zone. A black marker pen was used to draw five 11-cm segments along the length of the test arena to create the 3 zones. A basking site, positioned under a 40-W heating lamp, was placed at each end of the arena, on the inner edge of the exterior segments. Each basking site was divided in half by a clear PerspexTM partition (10 cm high), which ran the width of the arena. Three stimulus lizards were placed within one of the peripheral sections, enabling focal lizards to see, but not physically interact with them. This left three inner segments, with the 2 adjoining the basking sites designated as either the "social zone" (containing the stimulus lizards) or the "asocial zone" (containing no lizards), and the central one considered to be a "no choice" or neutral zone. Stimulus lizards ($n = 15$) were caught during the collecting trip in October and were not used for any other behavioral assay. No focal lizards were used as stimuli.

The temperature underneath the heat lamps (~ 35 °C) was substantially higher than the ambient temperature (~ 20 °C), prompting the lizards to use the basking sites. Each trial ran for 45 min and we recorded the amount of time focal skinks spent within each zone (sensu Chapple et al. 2011).

Foraging activity

To measure an individual's foraging behavior, skinks were placed in a test arena with a shelter site at one end. Skinks had not been fed for 3 days prior to experimentation. After an acclimation period, 5 crickets, of equal size, were dropped into the arena by the observer (M.M.). This was done from behind a curtain to avoid any disturbance. We then recorded how many crickets were eaten by the skink and the number of failed capture attempts the skink made—failed capture attempts included prey drops (when a cricket was caught but then dropped), and any lunge attacks that failed to capture a cricket—over 15 min. Using these variables, we calculated a foraging score for each skink as follows:

$$\text{Foraging score} = \frac{(\text{number of crickets eaten} / \text{total number of crickets offered})}{(\text{total number of capture attempts} / \text{number of successful attempts})}$$

Boldness

To measure how bold an individual was, we exposed skinks to a simulated predator attack and then measured their basking behavior after the attack. In reptiles, basking is considered to be a risky behavior as it exposes individuals to potential predators (Downes and Hoefer 2004). Thus, bolder skinks are expected to bask more than shy skinks after a predatory attack (Downes 2001). Skinks were placed at the centre of a test arena with a basking site on one end and a shelter site on the other. The basking site was positioned under a 40-W heating lamp so that the temperature of the basking site (~ 35 °C) was substantially higher than the ambient temperature (~ 20 °C). After the acclimation period, a model of a bird's head was released, striking at a central point 5 cm above the bottom of the arena, before being immediately retracted. Trials ran for 25 min, and we recorded the amount of time skinks spent in the open basking site (i.e., underneath the basking lamp) after the attack as our measure of boldness. As not all skinks fled to the shelter site immediately after the "bird attack" we did not record an individual's re-emergence from shelter time.

This research was conducted with approval from the Animal Ethics Committee at Monash University (BSCI/2013/19).

Statistical analysis

All data were analyzed using the statistical program R (R Development Core Team 2012). Statistical significance was assigned at $\alpha = 0.05$. Assumptions were checked using diagnostic plots, and square-root transformations were applied to all non-normal data.

Behavioral repeatability (or test–retest reliability) across time was assessed using nonparametric Spearman rank correlation (r_s) between Trial 1 and Trial 2. We also included the intraclass correlation coefficient (ICC: "ICC" package: Wolak et al. 2012). Anova on standardized behavioral values was carried out in order to obtain variance components. If behaviors are repeatable, this indicates that behaviors show relatively low within-individual variance compared with high between-individual variance (Bell et al. 2009).

We used linear mixed effects models ("lme4" package: Bates et al. 2014) solved by restricted maximum likelihood to determine if there were any behavioral differences between skinks caught in each of the trapping methods. Trapping method and trial number were assigned as fixed factors with skink ID as the random factor to take into account repeated measures (Bolker et al. 2009). *P* values were obtained by likelihood ratio tests of the full model with the effects (i.e., fixed effects: trapping method, trial number, and their interaction) against the model without the effects.

As we found significant behavioral variation and repeatability among behavioral traits, we performed Principal component analysis (PCA) with varimax rotation (Quinn and Keough 2002) to determine if a behavioral syndrome was present. All individuals that did not complete the full set of behavioral assays were excluded from the analysis. We retained 3 PCA components based on the Kaiser–Guttman criterion (eigenvalues > 1 ; Jackson 1993). Following PCA analyses, correlation between the 5 behavioral traits (activity, exploratory behavior, sociability, foraging activity, and boldness) was calculated using Spearman rank correlation to determine behavioral syndrome structure.

RESULTS

Skinks showed repeatable behavior across Trials 1 and 2 for all 5 behaviors assayed (see Table 1). Individuals also varied significantly

among all 5 behaviors (i.e., significant between-individual variation; see Table 1). However, skinks from different trapping methods did not differ in the number of transitions they made (i.e., activity; $\chi^2_3 = 4.35, P = 0.23$; Figure 1a), the time it took them to pass the obstacle (i.e., exploratory behavior; $\chi^2_3 = 1.72, P = 0.63$;

Table 1
Behavioral repeatability (Spearman rank correlation and ICC) and between-individual variation components of the 5 behaviors assayed (over 2 trials)

	Repeatability	Between-individual variation
Activity	$r_s = 0.31, P = 0.009,$ ICC = 0.45	$F_{68,69} = 2.61, P < 0.001$
Exploratory behavior	$r_s = 0.33, P = 0.005,$ ICC = 0.32	$F_{71,72} = 1.96, P = 0.002$
Sociability	$r_s = 0.32, P = 0.006,$ ICC = 0.33	$F_{71,72} = 1.97, P = 0.003$
Foraging activity	$r_s = 0.64, P < 0.001,$ ICC = 0.49	$F_{71,72} = 4.97, P < 0.001$
Boldness	$r_s = 0.32, P = 0.008,$ ICC = 0.37	$F_{68,69} = 1.87, P = 0.005$

Figure 1b), the time they spent in the social zone (i.e., sociability; $\chi^2_3 = 3.56, P = 0.31$; Figure 1c), their foraging scores ($\chi^2_3 = 6.49, P = 0.09$; Figure 1d), or the time they spent basking after a predatory attack (i.e., boldness; $\chi^2_3 = 1.45, P = 0.69$; Figure 1e).

Kaiser–Guttman analysis of the PCA revealed 3 factors that explained 72.1% of the variance (Table 2). Behaviors with a loading of at least 0.4 were considered to contribute to a component. PC1 contained strong loadings toward activity, exploratory behavior, and sociability. Indeed, pairwise correlations revealed significant positive associations between activity and exploratory behavior ($r_s = 0.19, P = 0.03$), activity and sociability ($r_s = 0.18, P = 0.04$), and exploratory behavior and sociability ($r_s = 0.27, P = 0.002$). Thus, PC1 suggests that more active skinks were also quicker to pass the obstacle and spent more time basking with other skinks. On the other hand, PC2 was strongly loaded toward foraging activity and PC3 toward boldness, suggesting that these behaviors were not part of any behavioral syndrome. Lastly, we found no differences in factor loading scores between trapping methods (Anova; PC1: $F_{2,129} = 0.26, P = 0.77$; PC2: $F_{2,129} = 1.03, P = 0.36$; PC3: $F_{2,129} = 0.23, P = 0.79$) and thus trapping method had no influence on the behavioral syndrome.

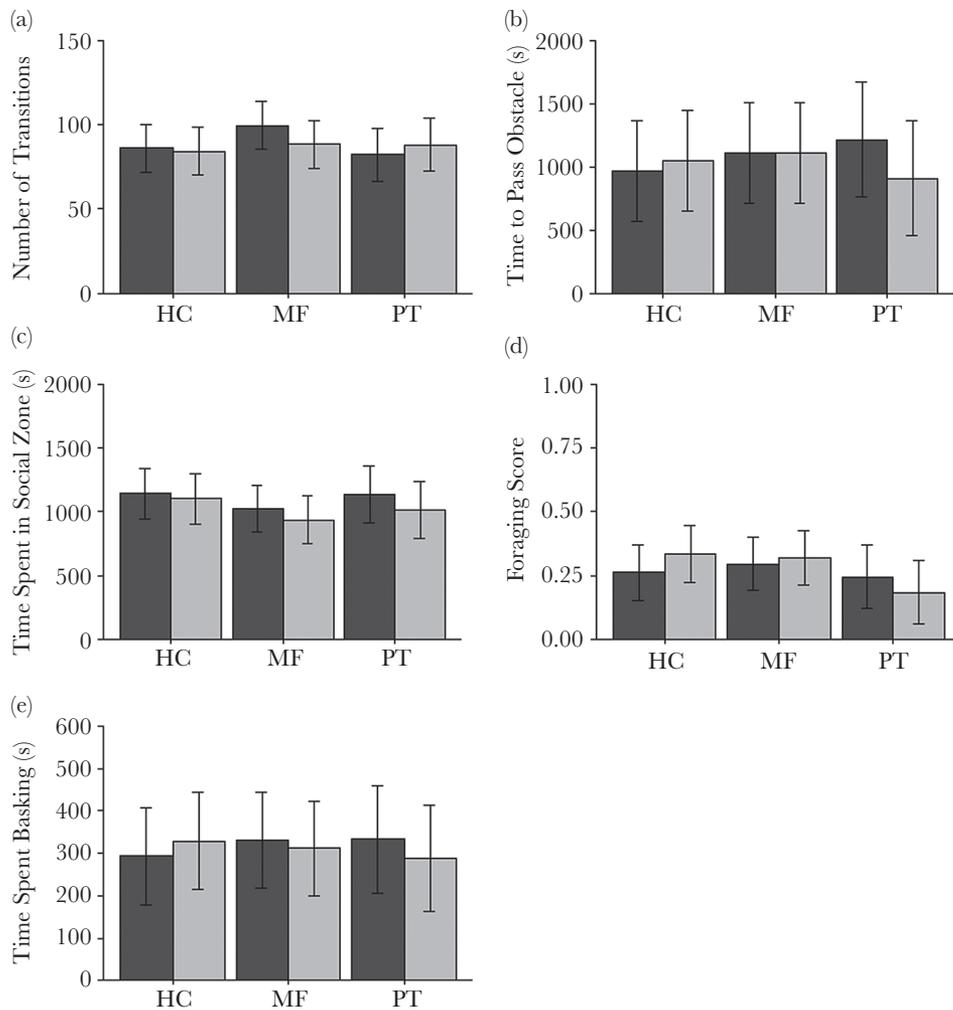


Figure 1
Behavioral measurements of delicate skinks (*Lampropholis delicata*) caught in 3 different trapping methods (HC, MF, and PT) over 2 repeated trials (Trial 1 and Trial 2). (a) Activity (number of transitions \pm SE), (b) exploratory behavior (time taken to pass obstacle \pm SE), (c) sociability (time spent in the social zone \pm SE), (d) foraging behavior (foraging score \pm SE), and (e) boldness (time spent basking after a predatory attack \pm SE). HC, hand capture; MF, pitfall traps; PT, mealworm fishing.

Table 2
Component loadings of behaviors observed on 3 orthogonally rotated principal components. Only behaviors with a loading of at least 0.4 were considered to contribute to a component

	PC1	PC2	PC3
	Activity–exploration– sociability	Foraging activity	Boldness
Activity	0.50		
Exploratory behavior	0.56		
Sociability	0.50		
Foraging activity		0.89	
Boldness			−0.95
Variance explained (%)	33.5	20.8	17.7
Total explained (%)	72.1		

DISCUSSION

Despite the presence of significant and consistent between-individual behavioral variation within the population, we detected no differences in the behavioral type of delicate skinks caught in the 3 trapping methods tested in our study. Although we cannot rule out the possibility that all 3 trapping methods may have retained the same capture bias (*sensu* Biro 2013), the substantial behavioral variation found within the population suggests that this is unlikely and that we had, in fact, sampled a diverse range of individuals across all 3 methods. Furthermore, we found a behavioral syndrome between activity, exploratory behavior, and sociability, but trapping method had no effect on this syndrome. These results indicate that hand capture, pitfall trapping, and mealworm fishing are suitable capture techniques for the delicate skink, and potentially other small reptiles (particularly lizards), as their vulnerability to capture bias based on behavioral types appears to be limited. More broadly, our results have important implications for animal personality research in general, as this is the first study, as far as we are aware, to demonstrate that trapping bias is not ubiquitous (Biro and Dingemans 2009), but instead might only be associated with passive trapping methods that involve the response of animals to novelty (e.g., baited traps: Carter et al. 2012, artificial nestboxes: Stuber et al. 2013, fishing nets: Biro 2013).

Many passive trapping methods rely on the arrival and inspection of animals and consequently these techniques are more vulnerable to rejection by neophobic/shy individuals. The shy–bold continuum is one of the most widely documented personality axes (Wilson et al. 1993; Réale et al. 2007), whereby shy individuals take less risk, are slower explorers and are often more averse to novel objects compared with bold individuals (Carter et al. 2012; Biro 2013; Stuber et al. 2013). These behavioral proclivities could, in turn, result in biased capture of bolder individuals if shy lizards are less likely to be enticed by the novelty of the actual trapping apparatus. However, in our study, none of the 3 trapping methods relies on individuals having to inspect the trap itself. For example, our pitfall traps were unbaited and did not use drift nets. Likewise, traps that can target individuals that stay within close vicinity of their shelter will have a greater probability of capturing shy individuals. Mealworm fishing is one such method, as natural bait can be lowered into a shelter site with minimal disturbance luring any individual into a false sense of security. With a similar result, Wilson et al. (2011) found that shy bluegill sunfish (*Lepomis macrochirus*) were more likely caught via angling in more sheltered, densely vegetated areas compared with bolder fish which were more likely caught in open areas. Thus, a thorough understanding of an animal's ecology, including their

range of microhabitat preferences (Mehrabian et al. 2014), can inform targeted trapping strategies, ensuring limited bias during sampling.

When sampling, it is important to consider the environmental context in which sampling is occurring and the ecology of the animal being trapped. Currently, only one other study has focused on the trapping efficacy of reptiles (Carter et al. 2012), with the majority focusing on fish (Wilson 1998; Wilson et al. 2011; Biro 2013) and birds (Garamszegi et al. 2009; Stuber et al. 2013). Carter et al. (2012) found, when attempting to catch rock agamas (*Agama planiceps*) with baited traps, that trapping success was influenced by boldness, where the shyest individuals (those with the highest flight initiation distance [FID]) were rarely caught. The authors suggested that any trapping method requiring animals to have a relatively short FID, such as hand capture, are more vulnerable to bias, as they are likely to over-sample bold individuals. However, we did not find this relationship, possibly due to the delicate skinks ecology and the way we hand caught individuals. Firstly, as ectotherms, reptiles are easier to hand capture in the morning when temperatures are colder as they are not at optimal temperature for activity. Thus, you can take advantage of shorter and slower FIDs, increasing your likelihood of capturing individuals basking closer to their shelter sites. Secondly, the delicate skink has a relatively short home-range size (<20 m; Jardine A, unpublished data) and prefers to inhabit more open areas within leaf litter (Howard et al. 2003) allowing easier access to captors. Conversely, animals that prefer to shelter within inaccessible areas are much harder to hand capture, and thus those that are hand caught may come from the bolder subset of the population that frequent more open areas.

We also found positive correlations between activity, exploratory behavior, and sociability in the delicate skink, indicating the presence of a behavioral syndrome. These results are consistent with previous work that reported a relationship between activity and exploratory behavior (Moule et al. forthcoming). This is the first study, however, to find the syndrome linked with sociability and one of only a handful of studies to find a behavioral syndrome in an invasive species (but see references in Chapple et al. 2012). Specifically, active skinks were faster explorers and spent more time basking with conspecifics, whereas less active skinks were slower explorers and preferred to bask on their own. This syndrome has been found in other animals, including the invasive mosquitofish (*Gambusia affinis*) (Cote et al. 2010), where the syndrome has also been associated with dispersal tendency (Fogarty et al. 2011; Rodríguez-Prieto et al. 2011). In common lizards (*Lacerta vivipara*), social individuals disperse when population densities are low, presumably to find other individuals, whereas asocial individuals tend to disperse when population densities are high (Cote and Clobert 2007). In the context of an accidental introduction event, such a dispersal-related syndrome may be pivotal to success, as active, explorative, and social individuals may have greater opportunity of finding mates in low population densities, avoiding potential Allee effects (Cote et al. 2011; Sih et al. 2012). This could help explain the delicate skinks success as an invasive species and warrants greater attention in future research for what it may reveal about the dynamics of accidental invasions.

CONCLUSION

All 3 trapping techniques used in this study—encompassing both passive and active methods—appear to be appropriate for sampling populations of the delicate skink. We found no differences between skinks caught via mealworm fishing, hand capture, and pitfall trapping among 5 repeatable behavioral traits. We provide the first

evidence that trapping bias caused by interindividual behavioral differences is not always inevitable but, instead, may only be associated with more passive trapping methods involving the response of animals to novelty. By extension, our results are important—not only for behavioral research but also for any study looking at traits associated with behavior (e.g., cognition, thermal preferences; [Biro and Stamps 2008](#)). In addition, we provide the first evidence of a behavioral syndrome involving activity, exploratory behavior, and sociability in the delicate skink, and one of the few in an invasive species. The occurrence of this syndrome provides exciting opportunities for future research and may help explain the delicate skink's successful invasion history via accidental introductions.

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