Gehyra Geckos Prioritise Warm Over Humid Environments

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Abstract

Maintaining stable hydric and thermal states are dual challenges for reptiles that inhabit terrestrial environments with variable conditions across time and space. Under some conditions, reptiles face a conundrum where both physiological parameters cannot be simultaneously maintained at optimal states by behavioural or physiological means. Prioritisation of behavioural regulation of hydric or thermal state, and at which point this prioritisation changes, was tested for nine species of congeneric tropical geckos by assessing their use of microhabitats with distinct thermal and hydric conditions in a controlled environment. *Gehyra* geckos were presented with two crevices of contrasting humidity levels, and time spent in either crevice was recorded across three ambient temperature treatments of 32 ˚C, 27 ˚C, and 22 ˚C. Temperatures in the humid crevice matched treatment temperatures, while temperatures in the dry crevice remained at 32 ˚C. In these trials, all species showed a strong preference for the dry (and warm) crevice in the 27 ˚C and 22 ˚C treatments, while preference for the humid or dry crevice was variable in the 32 ˚C treatment. Thus, *Gehyra* geckos prioritised thermoregulation and maintained thermal state through behavioural responses, and maintenance of hydric state was not optimised even when it did not compromise the animal's thermal state. Although body temperature was optimised in the short-term, this does not preclude the possibility that hydric state can be regulated on a seasonal time-scale.

1 INTRODUCTION

Reptiles are both susceptible to water loss and sensitive to external temperatures to regulate activity (Bentley & Schmidt-Nielsen, 1966). This presents challenges in maintaining stable hydric and thermal states in a variable terrestrial environment. Behavioural adaptations, including shifts in habitat use, allow reptiles to reduce hydric and thermal stress when faced with unfavourable conditions (Beltran et al., 2021; Dupoué et al., 2015; Grimm-Seyfarth, 2017; Grimm-Seyfarth et al., 2018; Nordberg & Schwarzkopf, 2019; Pirtle et al., 2019; Sannolo & Carretero, 2018). However, achieving optimal body temperatures and hydration levels can be conflicting objectives.

High temperatures enable increased activity levels and metabolic processes in reptiles, which can enhance fitness by allowing reptiles to readily escape from predators and more efficiently digest food (Christian & Tracy, 1981; Harwood, 1979; Hertz et al., 1982). Even nocturnal geckos, which are active at lower environmental temperatures, display maximum sprint performance at high temperatures, similar to diurnal reptiles (Huey et al., 1989). Body temperatures can be regulated through habitat selection, and retreat sites which promote enhanced thermoregulation are preferred (Kearney & Predavec, 2000; Shah et al., 2004). However, selection for high temperatures is detrimental to maintainence of hydric state because the rate of water loss increases at high temperatures (Chukwuka et al., 2020; Dupoué et al., 2015). Reptiles must regulate their hydric state because loss of ~25% of total body water is lethal (Bentley & Schmidt-Nielsen, 1966; Heatwole, 1977). This presents a trade-off in which maintaining either hydric or thermal state must take priority, as conditions may not be equally favourable for both traits.

The extent to which reptiles behaviourally hydroregulate, and whether hydroregulation or thermoregulation takes priority, is not well understood. Regulation of either hydric or thermal state may involve selecting conditions which optimise one parameter while compromising the other physiological parameter. For example, reptiles under hydric stress select low body temperatures which reduce further water loss, despite these temperatures being lower than those selected by hydrated conspecifics (i.e., ideal temperatures) (Crowley, 1987; Sannolo & Carretero, 2018). Pressures on hydric or thermal parameters can fluctuate with changes in environmental conditions, and reptiles may shift their priorities accordingly. Such a shift was observed in an Australian skink which selected warm but dry habitats until the high temperatures presented an intolerable risk to hydric state, at which point they preferred wet but cool habitats (Pintor et al., 2016). It is particularly important to understand this prioritisation of parameters in the context of climate change due to the predicted long-term environmental changes. Changed rainfall patterns, higher temperatures, and increased El Niño events (causing increased risks of droughts and heatwaves) are predicted for Australia (Hughes, 2003). Reptiles may be pressured to shift behaviours to compensate for this increased stress on hydric and thermal stability. Knowing how species may respond to environmental changes, and which of these changes might have the greatest impact on their fitness, is important for conservation and prediction of ecological impacts of climate change.

For some lizards, water ecology is a more constraining factor than thermal ecology (Carneiro et al., 2017; Grimm-Seyfarth, 2017; Grimm-Seyfarth et al., 2018; Kearney et al., 2018). However, it is not known if this applies to *Gehyra* gekkonids (dtellas) from tropical north Australia which regularly experience seasonal reductions in water availability. The evolutionary history and radiation of the *Gehyra* species complex have been recently described and new species identified (Hutchinson et al., 2014; Moritz et al., 2017; Oliver et al., 2019; Oliver et al., 2020), but little is known about physiological prioritisation in this group. However, it has recently been shown that tropical *Gehyra* are plastic in their evaporative water loss with the ability to reduce evaporative water loss by up to 78% in response to seasonal reductions in environmental humidity (Skelton, 2024). On the other hand, the thermal preferences of these geckos did not change seasonally (Skelton, 2024). This capacity for reversible changes in hydric, but not thermal, physiology may affect the prioritisation of these parameters in these species.

We studied the thermo- and hydro-regulatory behaviours of nine species of north Australian dtellas by observing microhabitat selection under controlled conditions. Dtellas were trialled in three experimental treatments, each of which compared microhabitat (artificial crevice) use between a warm, low humidity option and a humid microhabitat at one of three treatment temperatures. The warm, dry option had conditions similar to the geckos' preferred temperatures (32 ˚C; Skelton, 2024) and typical dry season humidity conditions in the region. While replicating an ideal thermal environment, the warm and dry conditions cause an increase in the rate of evaporative water loss, presenting challenges to maintaining hydric state (Dupoué et al., 2015; Chukwuka et al., 2020). The alternative crevice was kept at high relative humidity, to replicate typical wet season conditions, and one of three temperature treatment conditions (32 ˚C, 27 ˚C, and 22 ˚C; also experienced in the surrounding experimental environment) allowing us to detect prioritisation of thermal and hydric requirements. In one extreme, the 22 ˚C treatment tested for the selection between a warm, dry environment, or a cool, humid environment; each crevice favours the maintenance of only one physiological parameter and increases pressures on the other. On the other hand, the availability of 32 ˚C in both crevices tested whether dtellas selected the habitat with reduced pressure on maintaining hydric state even when there is no risk of suboptimal body temperature. The purpose of the 27 ˚C treatment was to test if a change in habitat selection can be detected when differences in temperature between crevices are only moderate.

We predicted that dtellas would prioritise maintaining their hydric state by spending more time in the humid crevice than the dry (and warm) crevice in the 32 ˚C and 27 ˚C treatments, but not in the 22 ˚C treatment. This prediction presumes that dtellas are more constrained by hydric limitations, as has been determined for other reptiles including another *Gehyra* sp., and therefore will select for humid environments, reducing the risk of dehydration even when there is a slight cost to their thermal state (Carneiro et al., 2017; Grimm-Seyfarth, 2017; Grimm-Seyfarth et al., 2018; Kearney et al., 2018). However, the low temperatures of the humid crevice in the 22 °C treatment presents a greater pressure on maintaining thermal state, and therefore activity levels (Huey et al., 1989). Thus, we predicted a shift toward prioritising thermoregulation when the option for hydroregulation was only possible alongside temperatures greatly below the animals' thermal optima.

2 MATERIALS AND METHODS

2.1 Sample species and sites

Nine species of *Gehyra* geckos were collected from three Northern Territory locations between 2019–2021 (Table 1). Adult, uninjured geckos were captured by hand using night-time spotlighting. The species identity of all individuals was confirmed by sequencing of mtDNA, which provides a reliable diagnostic for these taxa, some of which are difficult to distinguish based on morphology (Oliver et al. 2020). At Charles Darwin University, dtellas were housed individually in clear plastic enclosures of 40 × 25 × 13.5 cm (for moderate/large species) or 17 × 23 × 15 cm (for small species) containing a plastic hide and were supplied with a spray of clean water daily and offered live food three times per week. Enclosures were kept at 28 °C with 12 h of diurnal lighting in a temperature-controlled room. Dtellas were kept in these enclosures when not used in experiments and were released at their original location within 6 months of capture. No food or water was provided during experiments.

2.2 Experimental design

For each trial, an individual dtella was placed in a 60 × 30 × 35 cm glass tank containing two artificial crevices, each constructed from a 15 × 15 cm terracotta tile raised 1.5 cm from the base of the tank using small terracotta blocks. The tank was placed in a temperature-controlled room.

Warm (32 °C) and dry (median 35% RH) conditions were maintained in one crevice by placing a heat mat against the tile and pumping air through a container of silica gel using a low-flow air pump (Sensidyne Gilian LFS-113D). The air pump was calibrated to 0.4 L/min and serviced two setups simultaneously, resulting in each dry crevice having airflow at a rate of approximately 0.2 L/min. Dried air exited through a plastic tube positioned under the crevice. Humid (99% RH) conditions were maintained in the other crevice by soaking the tile in water for at least 24 h prior to the experiment. The edges of the tile were covered using silicone and the top of the tile was covered with an acetate sheet topped with a thin layer of rubber sheeting to reduce drying. The bottom of the tile, which formed the roof of the humid crevice, was not covered, allowing the slow release of water vapour into the crevice space. A tube with no air flow was placed under the humid crevice to mimic the structure of the dry crevice.

The experiment was repeated under three treatment conditions: 32 °C, 27 °C, and 22 °C, in a randomised order. The treatment temperature determined the temperature of the tank and the humid crevice, and treatment temperatures were controlled by changing the temperature of the room. The dry crevice remained at 32 °C under all treatment conditions by turning the heat mat off in 32°C treatments, placing it on the upper surface of the crevice tile in 27 °C treatments, or placing it on the underside of the crevice tile in 22 °C treatments. The remote sensor probe of a Sper Scientific Humidity/Temperature Monitor (model 800027, 10 - ~99 ± 1% RH, 0 - 50 ± 0.1 °C) was placed under each crevice for the entire duration of the experiment to simultaneously monitor temperature and humidity conditions both within and outside crevices. Each of the three treatment trials ran for 20 h, with a 4 h break between treatments to allow for adjustment of thermal conditions and exploration of the environment by the dtella.

Photos of the experiment were taken at 10 s intervals throughout the 20 h trials using a webcam connected to a laptop computer. Photos were captured from the front of the tank, allowing for a view of underneath both crevices and the digital displays of the temperature and humidity probes. The times at which a dtella entered and/or exited either crevice were recorded; dtellas were considered to occupy a crevice when their head and trunk were completely beneath the crevice tile. Total time spent in either crevice and number of times the dtella visited each crevice were tallied. Experiments in which the dtella did not visit both crevices in their first trial were discarded to ensure that the dtella was aware of both crevice conditions.

2.3 Data analysis

To accurately assess preference for either crevice, we first analysed total crevice use across treatments as the proportion of time spent in a crevice of either condition, compared to time spent outside crevices, throughout each 20 h trial. This metric of total crevice time was then used to scale the proportion of time spent in the humid crevice relative to the time spent in a dry crevice in a trial.

For each species, binomial generalized linear mixed models using glmmTMB in R v4.3.1 (Brooks et al., 2017; R Core Team 2023) were used to assess crevice use and crevice selection among the treatments. We analysed 'crevice use' as the proportion of total time spent in a crevice of either type, weighted by the total experiment time, and 'crevice selection' as the proportion of crevice use time spent in a humid crevice specifically, weighted by the total crevice time (h). We further tested for differences among the species in their crevice use and crevice selection within the 32 ˚C treatment. Tukey's Honest Significant Difference (HSD) test was used for post hoc testing, using $p < 0.05$ as the level for significant difference. Additionally, within the 32 ˚C treatment, a sign test was used to test for a preference for the humid crevice by comparing proportions against a value of 0.5 (representing equal division of time across both crevices).

3 RESULTS

3.1 Crevice use

Gehyra moritzi spent a mean ~90% of its time in a crevice regardless of treatment conditions. All other species spent more time in a crevice when the treatment temperature was low (22 ˚C or 27 ˚C) (Figure 1). The mean proportion of time spent in a crevice was greater in 22 ˚C temperature treatments compared to 27 ˚C treatments, and in 27 ˚C treatments compared to 32 ˚C treatments for most species ($p < 0.05$ in most cases) (Table S1). All species spent a mean of at least 90% of their time in a crevice in the 22 ˚C treatment.

In the 32 ˚C treatment, in which the two crevices only differed in their humidity, species differed significantly in time spent in a crevice ($\chi^2 = 28.4$, df = 8, $p < 0.01$) (see Figure 1, 32 ˚C treatment). The arboreal species, *G. australis*, *G. purpurascens*, and *G. gemina,* spent the shortest amount of time in crevices, each averaging < 50% of their time in crevices, whereas all other species averaged > 50%.

3.2 Crevice selection

In the 22 ˚C and 27 ˚C treatments, all species spent significantly less ($p < 0.05$) proportional time in the humid crevice versus to the dry (and warm, 32 ˚C) crevice compared to the 32 ˚C treatment (Figure 2). Species spent an average of 9 - 88% of their crevice time in the humid crevice in the 32 °C treatment, but generally used the humid crevice for 5% or less of their crevice time when it was ≤27 °C (Table S2), showing an abrupt and strong behavioural response following a moderate decrease in environment temperatures. *G. koira* was a strong exception here, spending an average of 30% of crevice time in the humid crevice in the 22 °C treatment; two atypical readings likely affected this result.

Species significantly differed in their time spent in the humid crevice in the 32 °C treatment ($\chi^2 = 31.4$, df = 8, $p < 0.01$), where the two crevices only differed in humidity levels (see Figure 2, 32 °C treatment). Post hoc testing identified *G. minuta*, the species with the lowest mean time spent in the humid crevice, as significantly different ($p < 0.05$) from the 4 species with the highest mean time spent in the humid crevice (*G. nana*, *G. australis*, *G. lapistola*, and *G. gemina*). *G. gemina* and *G. lapistola* had a significant preference for the humid crevice, and *G. minuta* and *G. purpurascens* had a significant preference for the dry crevice when temperatures were equal (sign test, $p < 0.05$). All other species showed no statistical preference for either crevice.

4 DISCUSSION

4.1 Crevice use

While crevice use has been presented here primarily for context for crevice selection analyses, some notable observations can be made which relate to the general ecology of *Gehyra*. Crevices are important refugia sites for geckos, especially those which are terrestrial and rock-dwelling, as they provide retreat sites during the day when these species are inactive. Geckos are highly selective of crevice sites, assessing structural, social, and microclimatic criteria; this complex evaluation of crevice conditions demonstrates that crevice choice is a significant factor for geckos (Schlesinger & Shine, 1994). Crevices can provide protection from predators and allow geckos to thermoregulate, supported by geckos' selection for narrow crevices which are difficult for predators to access and may allow for rapid heat conduction from the rock surface (Kearney & Predavec, 2000; Schlesinger & Shine, 1994; Shah et al., 2004). The thermoregulatory benefits of crevices also apply at night when air temperatures are reduced, as rocks can maintain warm temperatures and provide thermal refugia for geckos when they are active (Nordberg & Schwarzkopf, 2019; Kearney, 2002).

As revealed in this experiment, the use of crevice microhabitats is strongly associated with temperature for most *Gehyra* species; dtellas spent significantly greater amounts of time in crevices when environmental temperatures were 27 °C or lower. This suggests dtellas undergo a strong behavioural shift between 32 and 27 °C, selecting for the warm crevice while the external environment is cooling. *G. moritzi* is the only exception to this finding as individuals of this species spent most of their time under crevices regardless of thermal conditions, indicating a strong reliance on crevice microhabitats in this species. The arboreal species were the only dtellas tested to generally spend less than 50% of their time in crevices when temperatures were constant throughout the environment (Figure 1, 32 °C), a result which is reflective of their use of tree bark crevices in the field, which are vertical and relatively exposed.

4.2 Crevice selection

Dtellas greatly elevated their use of the warm crevice in 27 °C and 22 °C treatments despite the low humidity of the warm microhabitat, suggesting that they are sensitive to unfavourable thermal conditions, opting to maintain body temperatures at the risk of increased water loss. The strong preference for warm conditions may be due to the nocturnal lifestyle of dtellas; thermal environments are lower and less variable at night when dtellas are active, providing relatively limited opportunities to access warm environments to thermoregulate such that they depend on thermal refugia to maintain body temperature (Nordberg & Schwarzkopf, 2019). In this short time frame, there is minimal pressure on maintaining optimal hydric state. At the seasonal scale, however, it is evident that hydric balance is important, as evidenced by significantly lower rates of evaporative water loss in the dry season compared to the wet season (Skelton, 2024). During the dry season, dtellas can persist for 1 – 3 weeks without water intake before reaching vital limits of water loss, as calculated using dry season water loss rates and assuming a body water content of 73.8% and vital limit of water loss of 24.7%, as measured for another gecko species (Heatwole, 1977; Skelton, 2024). In contrast, body temperature changes at a much quicker time scale, so negative effects of suboptimal temperatures occur in the short-term (Pirtle et al., 2019). Maintenance of body temperatures within a narrow range is important in reptiles, as it can determine activity levels and performance; this includes the ability to escape predators, efficiently digest food, and enable other immediate behaviours that are necessary for survival (Christian & Tracy, 1981; Harwood, 1979; Hertz et al., 1982).

When temperatures were equal, preference for the humid habitat varied across species, further suggesting the short-term maintenance of optimal hydric state is not universally important across *Gehyra*. Two species preferred humid crevices, two preferred the dry crevice, and all other species showed no preference for either crevice. There was no apparent association between crevice preference and sampling location, body size, or habitat use (i.e., terrestrial or arboreal). The absence of a short-term preference for humid crevices contradicted our initial predictions that dtellas would select humid crevices in both 32 °C and 27 °C treatments; these expectations were based on the presumption that hydric conditions are more limiting for these species as they are in other reptiles, including another species of *Gehyra* (Carneiro et al., 2017; Grimm-Seyfarth, 2017; Grimm-Seyfarth et al., 2018; Kearney et al., 2018). Dtellas instead tolerated suboptimal conditions with respect to water loss across all thermal treatments in this short-term study, prioritising the maintenance of body temperature. This result aligns with observations of another Australian gecko species, *Oedura lesueurii*, which strongly preferred dry rather than wet crevices, even though temperatures were equal (Schlesinger & Shine, 1994). There may be other factors which have not been considered here that cause geckos to avoid crevices with high moisture content, and restricting these considerations to the context of hydric physiology may be overlooking other important criteria for crevice selection.

4.3 General conclusion

Thermoregulation through selection of high temperatures is prioritised in dtellas, despite the susceptibility of reptiles to increased rates of evaporative water loss, and therefore increased risk of dehydration, associated with high temperatures (Bentley & Schmidt-Nielsen, 1966; Chukwuka et al., 2020; Dupoué et al., 2015; Heatwole, 1977). This finding conflicted with expectations for this study and is inconsistent with some ecophysiological studies that concluded that water ecology may be more limiting than thermal ecology for some reptiles, including another member of the *Gehyra* genus (Carneiro et al., 2017; Grimm-Seyfarth, 2017; Grimm-Seyfarth et al., 2018; Kearney et al., 2018). However, maintaining hydric state is important over the long-term because hydric state can impact thermoregulatory ability and is important for survival if water loss exceeds water gain over an extended period (Crowley, 1987; Heatwole, 1977; Sannolo & Carretero, 2018). Although behaviourally selecting humid microhabitats is not a priority for *Gehyra* in the short-term, long-term exposure to dehydrating conditions results in physiological adjustments of evaporative water loss in these species at a seasonal time-scale (Skelton, 2024). Thus, physiological plasticity allows *Gehyra* species to cope with seasonal environmental pressures on hydric state while they behaviourally maintain thermal states in the short-term. This is especially important to consider in the context of climate change, where changed rainfall patterns, higher temperatures, and increased El Niño events are predicted for Australia (Hughes, 2003).

AUTHOR CONTRIBUTIONS

Kade Skelton, Kimberley Day, Keith Christian, and Craig Moritz: contributed to experimental design and logistics. Kade Skelton, Kimberley Day, and Keith Christian: conducted experiments. Kade Skelton and Chava Weitzman: conducted statistical analyses. Kade Skelton, Keith Christian, Craig Moritz, Christine Schlesinger, and Chava Weitzman: drafted the manuscript. All authors contributed critically to the drafts and gave final approval for publication.

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DATA AVAILABILITY STATEMENT

Data are available in Table S3 in the Supporting Information.

ETHICS STATEMENT

All experimental protocols (including animal collection, housing, experimentation and release) were approved by the Charles Darwin University's Animal Ethics Committee (project approval code A19005).

CONFLICT OF INTEREST STATEMENT

The authors declare no conflicts of interest.

REFERENCES

Beltrán, I., Perry, C., Degottex, F. and Whiting, M.J., 2021. Behavioral thermoregulation by mothers protects offspring from global warming but at a cost. *Physiological and Biochemical Zoology*, *94*, pp.302-318.

Bentley, P.J. and Schmidt-Nielsen, K., 1966. Cutaneous water loss in reptiles. *Science*, *151*, pp.1547-1549.

Brooks, M., Bolker, B., Kristensen, K., Maechler, M., Magnusson, A., McGillycuddy, M., Skaug, H., Nielsen, A., Berg, C., van Bentham, K., Sadat, N., Lüdecke, D., Lenth, R., O'Brien, J., Geyer, C. J., Jagan, M., Wiernik, B., Stouffer, D. B., 2017. glmmTMB: Generalized Linear Mixed Models using Template Model Builder (v1.1.7). *R Foundation for Statistical Computing*, Vienna, Austria. URL: https://CRAN.R-project.org/package=glmmTMB

Carneiro, D., García-Muñoz, E., Žagar, A., Pafilis, P. and Carretero, M.A., 2017. Is ecophysiology congruent with the present-day relictual distribution of a lizard group? Evidence from preferred temperatures and water loss rates. *Herpetological Journal*, *27*.

Christian, K.A. and C.R. Tracy 1981. The effect of the thermal environment on the ability of hatchling Galapagos Land Iguanas to avoid predation during dispersal. Oecologia 49:218-223. doi.org/10.1007/BF00349191

Chukwuka, C.O., Monks, J.M. and Cree, A., 2020. Heat and water loss versus shelter: a dilemma in thermoregulatory decision making for a retreat-dwelling nocturnal gecko. *Journal of Experimental Biology*, *223*, p.jeb231241.

Crowley, S.R., 1987. The effect of desiccation upon the preferred body temperature and activity level of the lizard *Sceloporus undulatus*. *Copeia*, pp.25-32.

Dupoué, A., Stahlschmidt, Z.R., Michaud, B. and Lourdais, O., 2015. Physiological state influences evaporative water loss and microclimate preference in the snake *Vipera aspis*. *Physiology & Behavior*, *144*, pp.82-89.

Grimm-Seyfarth, A., 2017. *Effects of climate change on a reptile community in arid Australia: exploring mechanisms and processes in a hot, dry, and mysterious ecosystem* (Doctoral Dissertation, Universität Potsdam, 2018).

Grimm-Seyfarth, A., Mihoub, J.B., Gruber, B. and Henle, K., 2018. Some like it hot: from individual to population responses of an arboreal arid-zone gecko to local and distant climate. *Ecological Monographs*, *88*, pp.336-352.

Harwood, R.H., 1979. The effect of temperature on the digestive efficiency of three species of lizards, *Cnemidophorus tigris, rrhonotus multicarinatus* and *Sceloporus occidentalis*. *Comparative Biochemistry and Physiology Part A: Physiology*, 63, pp.417-433.

Heatwole, H. and Veron, J.E.N., 1977. Vital limit and evaporative water loss in lizards (Reptilia, Lacertilia): a critique and new data. *Journal of Herpetology*, pp.341-348.

Hertz, P.E., Huey, R.B. and Nevo, E., 1982. Fight versus flight: body temperature influences defensive responses of lizards. *Animal Behaviour*, *30*, pp.676-679.

Huey, R.B., Niewiarowski, P.H., Kaufmann, J. and Herron, J.C., 1989. Thermal biology of nocturnal ectotherms: is sprint performance of geckos maximal at low body temperatures?. *Physiological Zoology*, 62, pp.488-504.

Hughes, L., 2003. Climate change and Australia: trends, projections and impacts. *Austral Ecology*, 28, pp.423-443.

Hutchinson, M.N., Sistrom, M.J., Donnellan, S.C. and Hutchinson, R.G., 2014. Taxonomic revision of the Australian arid zone lizards *Gehyra variegata* and *G. montium* (Squamata, Gekkonidae) with description of three new species. *Zootaxa*, 3814, pp.221-241.

Kearney, M.R., Munns, S.L., Moore, D., Malishev, M. and Bull, C.M., 2018. Field tests of a general ectotherm niche model show how water can limit lizard activity and distribution. *Ecological Monographs*, *88*, pp.672-693.

Kearney, M. and Predavec, M., 2000. Do nocturnal ectotherms thermoregulate? A study of the temperate gecko *Christinus marmoratus*. *Ecology*, *81*, pp.2984-2996.

Kearney, M., 2002. Hot rocks and much-too-hot rocks: seasonal patterns of retreat-site selection by a nocturnal ectotherm. *Journal of Thermal Biology*, *27*, pp.205-218.

Moritz, C.C., Pratt, R.C., Bank, S., Bourke, G., Bragg, J.G., Doughty, P., Keogh, J.S., Laver, R.J., Potter, S., Teasdale, L.C. and Tedeschi, L.G., 2018. Cryptic lineage diversity, body size divergence, and sympatry in a species complex of Australian lizards (*Gehyra*). *Evolution*, *72*, pp.54-66.

Nordberg, E.J. and Schwarzkopf, L., 2019. Heat seekers: a tropical nocturnal lizard uses behavioral thermoregulation to exploit rare microclimates at night. *Journal of Thermal Biology*, *82*, pp.107-114.

Oliver, P.M., Ashman, L.G., Bank, S., Laver, R.J., Pratt, R.C., Tedeschi, L.G. and Moritz, C.C., 2019. On and off the rocks: persistence and ecological diversification in a tropical Australian lizard radiation. *BMC Evolutionary Biology*, *19*, pp.1-15.

Oliver, P.M., Prasetya, A.M., Tedeschi, L.G., Fenker, J., Ellis, R.J., Doughty, P. and Moritz, C., 2020. Crypsis and convergence: integrative taxonomic revision of the *Gehyra australis* group (Squamata: Gekkonidae) from northern Australia. *PeerJ*, *8*, p.e7971.

Pintor, A.F., Schwarzkopf, L. and Krockenberger, A.K., 2016. Hydroregulation in a tropical dry-skinned ectotherm. *Oecologia*, *182*, pp.925-931.

Pirtle, E.I., Tracy, C.R. and Kearney, M.R., 2019. Hydroregulation: A neglected behavioral response of lizards to climate change?. In *Behavior of lizards* (pp. 343-374). CRC Press.

R Core Team (2023) R: A Language and Environment for Statistical Computing. R Foundation for Statistical Computing. https://www.R-project.org/

Sannolo, M. and Carretero, M.A., 2019. Dehydration constrains thermoregulation and space use in lizards. *PLoS One*, *14*, p.e0220384.

Schlesinger, C.A. and Shine, R., 1994. Selection of diurnal retreat sites by the nocturnal gekkonid lizard *Oedura lesueurii. Herpetologica*, pp.156-163.

Shah, B., Shine, R., Hudson, S. and Kearney, M., 2004. Experimental analysis of retreat-site selection by thick-tailed geckos *Nephrurus milii*. *Austral Ecology*, *29*, pp.547-552.

Skelton, K. 2024. *How Hydric and Thermal Physiological Traits of North Australian Dtellas Compare Across Species and Environments*. PhD Thesis, Charles Darwin University.

Table 1. Species and locations for Northern Territory *Gehyra* geckos sampled between 2019–2021 for microhabitat selection experiments.

Species	Habitat Use	Sampling Location/s	*N*
G. australis	Arboreal	Litchfield	12
G. lapistola	Terrestrial	Litchfield	10
G. nana	Terrestrial	Kidman Springs, Litchfield	12
G. paranana	Terrestrial	Litchfield	10
G. gemina	Arboreal	Kidman Springs	9
G. koira	Terrestrial	Kidman Springs	10
G. minuta	Terrestrial	Kurundi Station	11
G. moritzi	Terrestrial	Kurundi Station	11
G. purpurascens	Arboreal	Kurundi Station	10

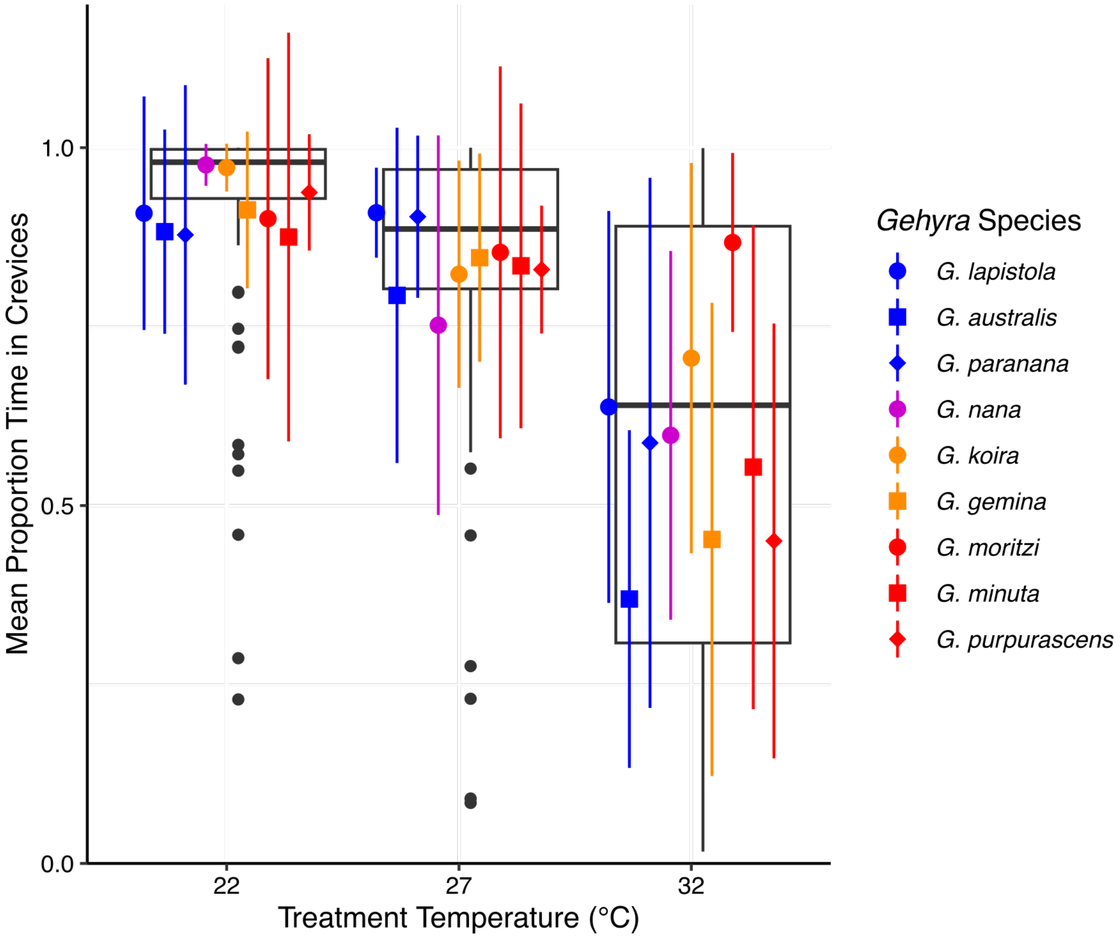

Figure 1. Mean proportion of experiment time *Gehyra* species spent in crevices across temperature treatments. There was a significant treatment effect on crevice use for all species except *G. moritzi,* which spent a mean ~90% of its time in a crevice regardless of treatment. Boxplots represent data from all species combined, depicting median values, upper and lower quartile ranges, and outliers (black circles). Coloured data points are mean values for each species ± 1 standard deviation. Colours represent sampling location: blue = Litchfield, purple = Litchfield & Kidman Springs, orange = Kidman Springs, red = Kurundi Station.

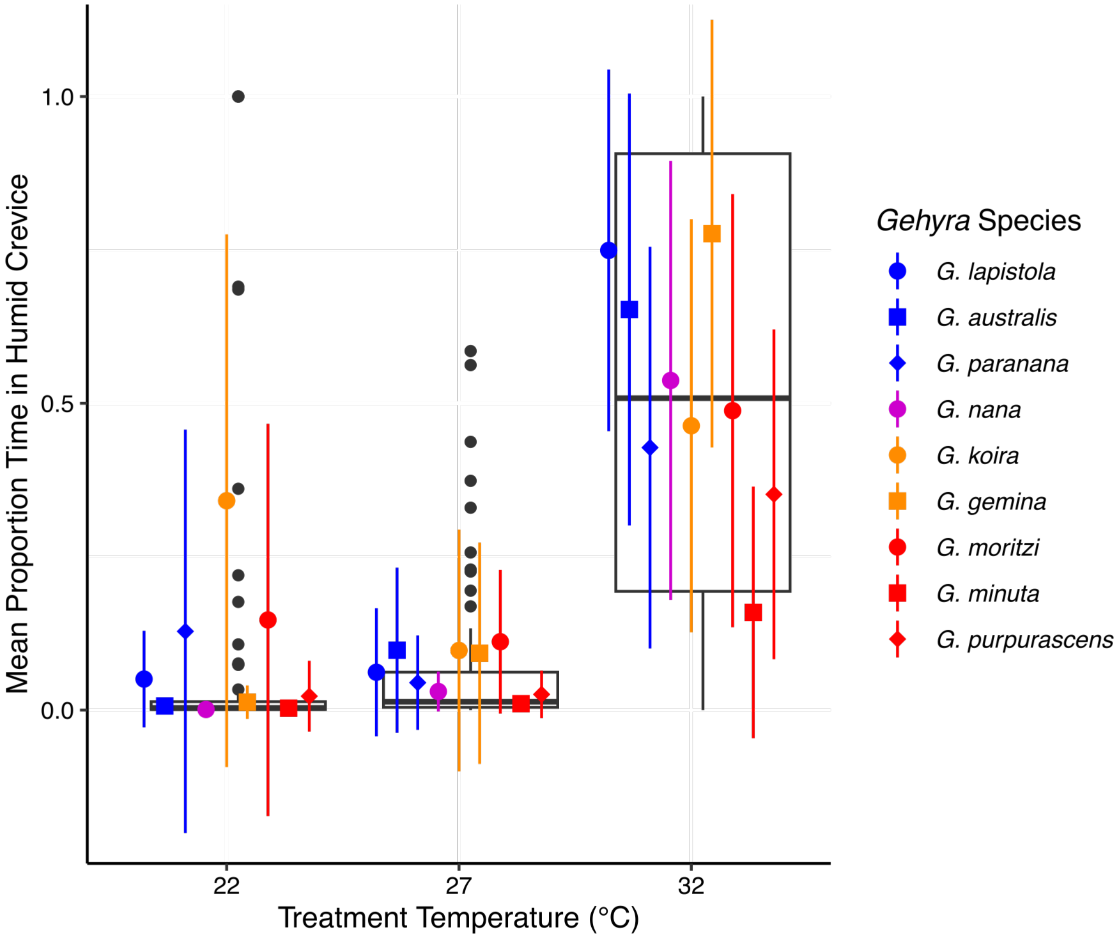

Figure 2. Mean proportion of crevice time *Gehyra* species spent in the humid crevice (versus the dry crevice) across temperature treatments. Treatment had a significant effect on crevice selection for all species. Boxplots represent data from all species combined, depicting median values, upper and lower quartile ranges, and outliers (black circles). Coloured data points are mean values for each species ± 1 standard deviation. Colours represent sampling location: blue = Litchfield, purple = Litchfield & Kidman Springs, orange = Kidman Springs, red = Kurundi Station.

Table S1. Mean proportion of time *Gehyra* species spent in crevices across temperature treatments. Statistically significant p-values are marked with ‘*’.

Species	Mean Proportion Time in Crevice			Treatment *p*-Value	Treatment Comparisons (*p*-Values)		
	32 °C	27 °C	22 °C		32-27 °C	27-22 °C	32-22 °C
G. australis	0.34	0.82	0.9	<0.01*	<0.01*	0.05*	<0.01*
G. gemina	0.47	0.87	0.94	<0.01*	<0.01*	0.06	<0.01*
G. koira	0.77	0.9	0.98	<0.01*	<0.01*	<0.01*	<0.01*
G. lapistola	0.62	0.91	0.95	<0.01*	<0.01*	0.5	<0.01*
G. nana	0.61	0.77	0.98	<0.01*	<0.01*	<0.01*	<0.01*
G. paranana	0.62	0.93	0.91	<0.01*	<0.01*	0.8	<0.01*
G. moritzi	0.91	0.89	0.93	0.3	-	-	-
G. minuta	0.6	0.88	0.93	<0.01*	<0.01*	0.3	<0.01*
G. purpurascens	0.44	0.83	0.94	<0.01*	<0.01*	<0.01*	<0.01*

Table S2. Mean proportion of time *Gehyra* gecko species spent in humid crevices (at treatment temperature) relative to dry crevices (at 32 °C) across temperature treatments. Statistically significant p-values are marked with ‘*’. The lack of significant difference between 32 ˚C and 22 ˚C treatments for *G. minuta* is due to removal of some 22 ˚C samples where the dtella did not investigate both crevices, causing statistical imbalances.

Species	Mean Proportion Time in Humid Crevice			Treatment *p*-Value	Treatment Comparisons (*p*-Values)		
	32 °C	27 °C	22 °C		32-27 °C	27-22 °C	32-22 °C
G. australis	0.73	0.04	<0.01	<0.01*	<0.01*	<0.01*	<0.01*
G. gemina	0.88	0.03	<0.01	<0.01*	<0.01*	0.01*	<0.01*
G. koira	0.41	0.05	0.3	<0.01*	<0.01*	0.3	<0.01*
G. lapistola	0.84	0.04	0.02	<0.01*	<0.01*	0.3	<0.01*
G. nana	0.54	<0.01	<0.01	<0.01*	<0.01*	0.4	<0.01*
G. paranana	0.31	0.02	0.06	<0.01*	<0.01*	0.02*	<0.01*
G. moritzi	0.47	0.05	0.1	<0.01*	<0.01*	0.2	<0.01*
G. minuta	0.09	<0.01	<0.01	<0.01*	<0.01*	0.9	0.06
G. purpurascens	0.24	0.01	<0.01	<0.01*	<0.01*	1	<0.01*

ID	Species	HabitatType	Treatment	Time in Humid C	Time in Dry Crev
288	G. australis	arboreal	32	21.33333333	107.3
288	G. australis	arboreal	27	11	1169.7
288	G. australis	arboreal	22	6.333333333	1154.816667
293	G. australis	arboreal	32	408.9666667	26.33333333
293	G. australis	arboreal	27	130.6666667	850.3
293	G. australis	arboreal	22	1.333333333	1034.966667
294	G. australis	arboreal	32	762.6666667	59.66666667
294	G. australis	arboreal	27	119	996.95
294	G. australis	arboreal	22	10	691.7833333
295	G. australis	arboreal	32	162.1166667	479.4
297	G. australis	arboreal	32	45.81666667	218.4166667
297	G. australis	arboreal	27	66.3	633.05
297	G. australis	arboreal	22	9.833333333	1169.733333
299	G. australis	arboreal	32	107.3	0
299	G. australis	arboreal	27	0	276.0833333
299	G. australis	arboreal	22	3.5	862.9333333
300	G. australis	arboreal	27	18.5	881.0666667
302	G. australis	arboreal	32	744.3166667	3.833333333
302	G. australis	arboreal	27	459.7166667	591.8833333
302	G. australis	arboreal	22	1	1198.566667
303	G. australis	arboreal	32	608.8166667	209.1666667
303	G. australis	arboreal	27	2.833333333	1193.783333
303	G. australis	arboreal	22	4.166666667	1128.966667
304	G. australis	arboreal	32	97.98333333	185.1166667
304	G. australis	arboreal	27	2.666666667	975.2
304	G. australis	arboreal	22	1.5	1055.85
316	G. australis	arboreal	32	511.0333333	4.666666667
316	G. australis	arboreal	27	193.5	951.3666667
316	G. australis	arboreal	22	25.16666667	1171.95
326	G. australis	arboreal	32	72.16666667	39.5
192	G. gemina	arboreal	32	0	216.9333333
192	G. gemina	arboreal	27	1	1128.016667
192	G. gemina	arboreal	22	1.5	1164.7
204	G. gemina	arboreal	32	225.3333333	3.5
204	G. gemina	arboreal	27	62.83333333	1044.75
204	G. gemina	arboreal	22	1.666666667	1197.916667
205	G. gemina	arboreal	32	467.1	0
205	G. gemina	arboreal	27	118.75	902.3
205	G. gemina	arboreal	22	15.33333333	1107.683333
209	G. gemina	arboreal	32	763.45	48.66666667
209	G. gemina	arboreal	27	38.85	623.15
209	G. gemina	arboreal	22	0	1185
210	G. gemina	arboreal	27	1.166666667	1129.016667
211	G. gemina	arboreal	32	194.65	176.8166667
211	G. gemina	arboreal	27	30.35	942.3
211	G. gemina	arboreal	22	0	956.7333333
212	G. gemina	arboreal	32	81.33333333	5.483333333
212	G. gemina	arboreal	27	454.9833333	354.1666667
212	G. gemina	arboreal	22	0	1174.816667
217	G. gemina	arboreal	32	985.3	112.5
217	G. gemina	arboreal	27	6	1170.25

217	G. gemina	arboreal	22	63.83333333	800.8833333
507	G. gemina	arboreal	32	988.95	75.98333333
507	G. gemina	arboreal	27	1.666666667	1130.066667
178	G. koira	terrestrial	32	1133.533333	43.18333333
178	G. koira	terrestrial	27	0	1199.933333
178	G. koira	terrestrial	22	1199.883333	0
180	G. koira	terrestrial	32	175.8833333	192.0166667
180	G. koira	terrestrial	27	9	751
181	G. koira	terrestrial	32	279.7166667	891.3833333
181	G. koira	terrestrial	27	20.33333333	1157.8
181	G. koira	terrestrial	22	4	1132.55
182	G. koira	terrestrial	32	156	395
182	G. koira	terrestrial	27	3.333333333	852.1833333
182	G. koira	terrestrial	22	7.5	1083.466667
183	G. koira	terrestrial	32	212.7166667	740.9833333
183	G. koira	terrestrial	27	701.9	497.6166667
183	G. koira	terrestrial	22	821.7333333	377.1833333
206	G. koira	terrestrial	32	57.16666667	958.7833333
206	G. koira	terrestrial	27	3.833333333	1120.816667
206	G. koira	terrestrial	22	819.3333333	367.9333333
207	G. koira	terrestrial	32	823.2	193.6833333
207	G. koira	terrestrial	27	9.666666667	833.6
208	G. koira	terrestrial	32	115.7666667	226.4666667
208	G. koira	terrestrial	27	11.66666667	964.9666667
208	G. koira	terrestrial	22	0	1187.783333
213	G. koira	terrestrial	32	286.8833333	866.2666667
214	G. koira	terrestrial	32	718.65	4
214	G. koira	terrestrial	27	172.5	580.4
214	G. koira	terrestrial	22	3.166666667	1160.983333
283	G. lapistola	terrestrial	32	80	547.7333333
283	G. lapistola	terrestrial	27	3.666666667	1046.066667
283	G. lapistola	terrestrial	22	20.16666667	1042.4
284	G. lapistola	terrestrial	32	900.0833333	40.85
284	G. lapistola	terrestrial	27	11.35	1024.616667
285	G. lapistola	terrestrial	32	987.7333333	184.45
285	G. lapistola	terrestrial	27	83.96666667	1098.7
285	G. lapistola	terrestrial	22	87.31666667	1091.533333
286	G. lapistola	terrestrial	32	287.45	3.333333333
286	G. lapistola	terrestrial	27	5.5	1021.616667
287	G. lapistola	terrestrial	32	835.2	347.0833333
287	G. lapistola	terrestrial	27	75.15	941.6333333
287	G. lapistola	terrestrial	22	6.5	1169.116667
289	G. lapistola	terrestrial	27	375.6666667	763.3166667
289	G. lapistola	terrestrial	22	35.16666667	1156.983333
291	G. lapistola	terrestrial	32	484.9333333	54.66666667
291	G. lapistola	terrestrial	27	23.66666667	1157.266667
291	G. lapistola	terrestrial	22	3	1160.266667
324	G. lapistola	terrestrial	22	144.6666667	513.8333333
331	G. lapistola	terrestrial	32	464.1666667	416.8333333
331	G. lapistola	terrestrial	27	1.166666667	1013.333333
555	G. lapistola	terrestrial	32	461.9166667	26
555	G. lapistola	terrestrial	27	45.5	1126.266667

555	G. lapistola	terrestrial	22	3.833333333	1195.783333
770	G. minuta	terrestrial	32	4.666666667	1085.533333
770	G. minuta	terrestrial	27	7.5	987.0666667
770	G. minuta	terrestrial	22	1.333333333	273.6
773	G. minuta	terrestrial	32	344.7666667	543.9833333
773	G. minuta	terrestrial	27	3.166666667	889.4333333
776	G. minuta	terrestrial	32	19.33333333	1082.933333
776	G. minuta	terrestrial	27	13.83333333	1073.1
776	G. minuta	terrestrial	22	1	1196.55
782	G. minuta	terrestrial	32	30.48333333	147.7833333
782	G. minuta	terrestrial	27	9.833333333	321.0333333
782	G. minuta	terrestrial	22	0	1156.4
786	G. minuta	terrestrial	27	5.666666667	1175.316667
789	G. minuta	terrestrial	32	32.05	22.55
789	G. minuta	terrestrial	27	24.35	1107.833333
789	G. minuta	terrestrial	22	11	1174.516667
791	G. minuta	terrestrial	32	8.516666667	226.8833333
791	G. minuta	terrestrial	27	13.5	996.4666667
791	G. minuta	terrestrial	22	5.666666667	1137.616667
794	G. minuta	terrestrial	32	66.8	1028.566667
797	G. minuta	terrestrial	32	245.55	522.65
797	G. minuta	terrestrial	27	0	1191.333333
797	G. minuta	terrestrial	22	0	1196.5
801	G. minuta	terrestrial	32	2.683333333	794.1166667
801	G. minuta	terrestrial	27	0	1197.733333
801	G. minuta	terrestrial	22	2.333333333	1194.9
803	G. minuta	terrestrial	32	1.666666667	433.6166667
771	G. moritzi	terrestrial	32	184.6666667	890.3833333
771	G. moritzi	terrestrial	27	260.1666667	892.1333333
771	G. moritzi	terrestrial	22	5	339.1333333
774	G. moritzi	terrestrial	32	558.6333333	519.1666667
774	G. moritzi	terrestrial	27	149.1666667	978.8
774	G. moritzi	terrestrial	22	5.166666667	1183.633333
777	G. moritzi	terrestrial	32	696.3333333	127.8333333
777	G. moritzi	terrestrial	27	40.66666667	68.16666667
777	G. moritzi	terrestrial	22	0	1198.583333
783	G. moritzi	terrestrial	32	680.65	410.9
783	G. moritzi	terrestrial	27	11.66666667	978.8166667
785	G. moritzi	terrestrial	32	640.7166667	434.5166667
785	G. moritzi	terrestrial	27	8	1109.2
785	G. moritzi	terrestrial	22	9.333333333	949
788	G. moritzi	terrestrial	32	18	1129.033333
788	G. moritzi	terrestrial	27	15.16666667	1095.5
788	G. moritzi	terrestrial	22	4.5	1163.466667
790	G. moritzi	terrestrial	32	706.1	389.65
790	G. moritzi	terrestrial	27	217.7	900.8
790	G. moritzi	terrestrial	22	0	1198.733333
793	G. moritzi	terrestrial	32	909.3833333	90
793	G. moritzi	terrestrial	27	105.6666667	1063.866667
793	G. moritzi	terrestrial	22	0	1197.033333
795	G. moritzi	terrestrial	32	549.8666667	45.86666667
795	G. moritzi	terrestrial	27	128.5	857.7166667

795	G. moritzi	terrestrial	22	1200	0
798	G. moritzi	terrestrial	32	0	1188
798	G. moritzi	terrestrial	27	0	1189.833333
798	G. moritzi	terrestrial	22	419.1666667	743
800	G. moritzi	terrestrial	32	141.7666667	1035.066667
800	G. moritzi	terrestrial	27	54.85	1143.216667
800	G. moritzi	terrestrial	22	90.66666667	1103.016667
185	G. nana	terrestrial	32	130.1166667	3.666666667
185	G. nana	terrestrial	27	42.16666667	974.8166667
187	G. nana	terrestrial	32	501.6833333	39.66666667
187	G. nana	terrestrial	27	3.333333333	1175.066667
187	G. nana	terrestrial	22	3.666666667	1158.716667
189	G. nana	terrestrial	32	60.98333333	871.95
189	G. nana	terrestrial	27	13.81666667	675.5333333
194	G. nana	terrestrial	32	297.4	457.2166667
194	G. nana	terrestrial	27	12.16666667	89.31666667
194	G. nana	terrestrial	22	2	1196.733333
195	G. nana	terrestrial	32	550.9666667	88.1
195	G. nana	terrestrial	27	11.98333333	873.6333333
195	G. nana	terrestrial	22	0	1177.216667
197	G. nana	terrestrial	32	66.33333333	196.3
197	G. nana	terrestrial	27	7.333333333	1024.516667
197	G. nana	terrestrial	22	0	1199.966667
199	G. nana	terrestrial	32	279.2666667	613.3666667
199	G. nana	terrestrial	27	0	988.4
199	G. nana	terrestrial	22	1	1098.066667
201	G. nana	terrestrial	32	865.4333333	89.13333333
201	G. nana	terrestrial	27	52.16666667	1121.35
201	G. nana	terrestrial	22	3.166666667	1194.516667
202	G. nana	terrestrial	32	927.2	15.66666667
202	G. nana	terrestrial	27	47.66666667	1127.533333
202	G. nana	terrestrial	22	0	1188.916667
216	G. nana	terrestrial	32	159.55	306.7333333
216	G. nana	terrestrial	27	5.5	932.7666667
216	G. nana	terrestrial	22	0	1145.216667
312	G. nana	terrestrial	32	269.0333333	751.8666667
312	G. nana	terrestrial	27	40.66666667	1059.116667
313	G. nana	terrestrial	32	176.3333333	895.2833333
313	G. nana	terrestrial	27	16.66666667	533.2833333
305	G. paranana	terrestrial	27	3.5	1172.35
306	G. paranana	terrestrial	32	329	428.05
306	G. paranana	terrestrial	27	1.166666667	1160.3
306	G. paranana	terrestrial	22	1	1192.95
308	G. paranana	terrestrial	32	368.8333333	818.7666667
308	G. paranana	terrestrial	27	41.95	1096.883333
308	G. paranana	terrestrial	22	7.333333333	1185.85
325	G. paranana	terrestrial	32	769.2	78.78333333
325	G. paranana	terrestrial	27	12.18333333	947.8166667
325	G. paranana	terrestrial	22	1.5	684.5166667
327	G. paranana	terrestrial	32	47.9	3.166666667
327	G. paranana	terrestrial	27	52.73333333	1145
327	G. paranana	terrestrial	22	4.5	1194.4

329	G. paranana	terrestrial	32	483	589
329	G. paranana	terrestrial	27	46.5	1066.333333
329	G. paranana	terrestrial	22	1.333333333	1100.833333
330	G. paranana	terrestrial	32	0	1163.933333
330	G. paranana	terrestrial	27	0	1199.933333
330	G. paranana	terrestrial	22	59	492.1
332	G. paranana	terrestrial	32	10.16666667	9.833333333
332	G. paranana	terrestrial	27	5	1064.666667
332	G. paranana	terrestrial	22	0	1199.933333
333	G. paranana	terrestrial	32	96.5	341.6666667
333	G. paranana	terrestrial	27	194.8333333	563.7166667
333	G. paranana	terrestrial	22	1200	0
334	G. paranana	terrestrial	32	65.16666667	742.6666667
334	G. paranana	terrestrial	27	49	1018.583333
334	G. paranana	terrestrial	22	38.83333333	1119.75
769	G. purpurascens	arboreal	32	115.1666667	108.3333333
769	G. purpurascens	arboreal	27	74.5	913.6666667
769	G. purpurascens	arboreal	22	187.1666667	874.5
772	G. purpurascens	arboreal	22	2.5	1180.55
781	G. purpurascens	arboreal	27	7.166666667	1181.15
784	G. purpurascens	arboreal	32	10.83333333	659.6666667
784	G. purpurascens	arboreal	27	0	910.1666667
784	G. purpurascens	arboreal	22	6.333333333	1191.666667
787	G. purpurascens	arboreal	32	38	126.5
787	G. purpurascens	arboreal	27	16.83333333	1047.2
787	G. purpurascens	arboreal	22	7.833333333	1124.733333
792	G. purpurascens	arboreal	32	180.7833333	111.5
792	G. purpurascens	arboreal	27	8.5	955.95
792	G. purpurascens	arboreal	22	3.166666667	1111.616667
796	G. purpurascens	arboreal	32	0	855.1666667
796	G. purpurascens	arboreal	27	0	1028.2
796	G. purpurascens	arboreal	22	1	895.4166667
799	G. purpurascens	arboreal	32	136.3333333	501.8833333
799	G. purpurascens	arboreal	27	101.6666667	838.7333333
799	G. purpurascens	arboreal	22	1.833333333	1194.05
799	G. purpurascens	arboreal	32	672.7333333	345.6666667
799	G. purpurascens	arboreal	27	7.25	806.85
799	G. purpurascens	arboreal	22	0	1199.85
802	G. purpurascens	arboreal	32	157.3333333	124.6833333
802	G. purpurascens	arboreal	27	7.5	1055.683333
802	G. purpurascens	arboreal	22	8.333333333	1134.083333

Length of Ex	Proportion Crevi	Proportion of Ex	Total Time in Any Crevice (hours)
20	0.165846074	0.107194444	2.143888889
20	0.009316507	0.983916667	19.67833333
20	0.005454363	0.967625	19.3525
20	0.939505322	0.36275	7.255
20	0.133201944	0.817472222	16.34944444
20	0.001286629	0.863583333	17.27166667
20	0.927442238	0.685277778	13.70555556
20	0.106635602	0.929958333	18.59916667
20	0.014249412	0.584819444	11.69638889
20	0.252708425	0.534597222	10.69194444
20	0.173394727	0.220194444	4.403888889
20	0.094802316	0.582791667	11.65583333
20	0.008336395	0.982972222	19.65944444
20	1	0.089416667	1.788333333
20	0	0.230069444	4.601388889
20	0.004039549	0.722027778	14.44055556
20	0.020565457	0.749638889	14.99277778
20	0.99487625	0.623458333	12.46916667
20	0.437159249	0.876333333	17.52666667
20	0.000833634	0.999638889	19.99277778
20	0.744289818	0.681652778	13.63305556
20	0.002367787	0.997180556	19.94361111
20	0.003677119	0.944277778	18.88555556
20	0.34610856	0.235916667	4.718333333
20	0.002727025	0.814888889	16.29777778
20	0.001418641	0.881125	17.6225
20	0.990950811	0.42975	8.595
20	0.169015315	0.954055556	19.08111111
20	0.021022735	0.997597222	19.95194444
20	0.646268657	0.093055556	1.861111111
20	0	0.180777778	3.615555556
20	0.000885727	0.940847222	18.81694444
20	0.001286229	0.971833333	19.43666667
20	0.984705025	0.190694444	3.813888889
20	0.056730118	0.922986111	18.45972222
20	0.001389371	0.999652778	19.99305556
20	1	0.38925	7.785
20	0.116301846	0.850875	17.0175
20	0.013653701	0.935847222	18.71694444
20	0.940074291	0.676763889	13.53527778
20	0.058685801	0.551666667	11.03333333
20	0	0.9875	19.75
20	0.001032281	0.941819444	18.83638889
20	0.524003948	0.309555556	6.191111111
20	0.031203413	0.810541667	16.21083333
20	0	0.797277778	15.94555556
20	0.936840084	0.072347222	1.446944444
20	0.562297885	0.674291667	13.48583333
20	0	0.979013889	19.58027778
20	0.897522317	0.914833333	18.29666667
20	0.005100956	0.980208333	19.60416667

20	0.073819941	0.720597222	14.41194444
20	0.928649681	0.887444444	17.74888889
20	0.001472667	0.943111111	18.86222222
20	0.963301843	0.980597222	19.61194444
20	0	0.999944444	19.99888889
20	1	0.999902778	19.99805556
20	0.478073752	0.306583333	6.131666667
20	0.011842105	0.633333333	12.66666667
20	0.238849515	0.975916667	19.51833333
20	0.017258941	0.981777778	19.63555556
20	0.003519423	0.947125	18.9425
20	0.283121597	0.459166667	9.183333333
20	0.003896281	0.712930556	14.25861111
20	0.006874637	0.909138889	18.18277778
20	0.223043585	0.79475	15.895
20	0.585152353	0.999597222	19.99194444
20	0.685396539	0.999097222	19.98194444
20	0.056269173	0.846625	16.9325
20	0.003408468	0.937208333	18.74416667
20	0.690100511	0.989388889	19.78777778
20	0.809532395	0.847402778	16.94805556
20	0.011463357	0.702722222	14.05444444
20	0.338268238	0.285194444	5.703888889
20	0.0119458	0.813861111	16.27722222
20	0	0.989819444	19.79638889
20	0.248782321	0.960958333	19.21916667
20	0.994464817	0.602208333	12.04416667
20	0.229114092	0.627416667	12.54833333
20	0.002720153	0.970125	19.4025
20	0.127442651	0.523111111	10.46222222
20	0.003492951	0.874777778	17.49555556
20	0.018979201	0.885472222	17.70944444
20	0.95658566	0.784111111	15.68222222
20	0.010955951	0.863305556	17.26611111
20	0.842644069	0.976819444	19.53638889
20	0.070997745	0.985555556	19.71111111
20	0.074069361	0.982375	19.6475
20	0.988536711	0.242319444	4.846388889
20	0.005354796	0.855930556	17.11861111
20	0.706429649	0.985236111	19.70472222
20	0.073909551	0.847319444	16.94638889
20	0.005529013	0.979680556	19.59361111
20	0.329826307	0.949152778	18.98305556
20	0.029498525	0.993458333	19.86916667
20	0.898690388	0.449666667	8.993333333
20	0.020040646	0.984111111	19.68222222
20	0.002578944	0.969388889	19.38777778
20	0.219691217	0.54875	10.975
20	0.526863413	0.734166667	14.68333333
20	0.001149992	0.845416667	16.90833333
20	0.946712212	0.406597222	8.131944444
20	0.038830256	0.976472222	19.52944444

20	0.003195465	0.999680556	19.99361111
20	0.00428056	0.9085	18.17
20	0.007540973	0.828805556	16.57611111
20	0.004849661	0.229111111	4.582222222
20	0.387923113	0.740625	14.8125
20	0.003547688	0.743833333	14.87666667
20	0.017539615	0.918555556	18.37111111
20	0.012726938	0.905777778	18.11555556
20	0.000835038	0.997958333	19.95916667
20	0.170998504	0.148555556	2.971111111
20	0.029719927	0.275722222	5.514444444
20	0	0.963666667	19.27333333
20	0.004798261	0.984152778	19.68305556
20	0.586996337	0.0455	0.91
20	0.021507118	0.943486111	18.86972222
20	0.009278655	0.987930556	19.75861111
20	0.036179553	0.196166667	3.923333333
20	0.013366778	0.841638889	16.83277778
20	0.004956485	0.952736111	19.05472222
20	0.060984145	0.912805556	18.25611111
20	0.319643322	0.640166667	12.80333333
20	0	0.992777778	19.85555556
20	0	0.997083333	19.94166667
20	0.003367637	0.664	13.28
20	0	0.998111111	19.96222222
20	0.001948938	0.997694444	19.95388889
20	0.003828924	0.362736111	7.254722222
20	0.171774956	0.895875	17.9175
20	0.225780323	0.96025	19.205
20	0.014529252	0.286777778	5.735555556
20	0.518308901	0.898166667	17.96333333
20	0.132243861	0.939972222	18.79944444
20	0.004346119	0.990666667	19.81333333
20	0.844893832	0.686805556	13.73611111
20	0.373660031	0.090694444	1.813888889
20	0	0.998819444	19.97638889
20	0.623562824	0.909625	18.1925
20	0.011778761	0.825402778	16.50805556
20	0.595886164	0.896027778	17.92055556
20	0.007160759	0.931	18.62
20	0.00973913	0.798611111	15.97222222
20	0.015692656	0.955861111	19.11722222
20	0.013655462	0.925555556	18.51111111
20	0.00385285	0.973305556	19.46611111
20	0.644398814	0.913125	18.2625
20	0.194635673	0.932083333	18.64166667
20	0	0.998944444	19.97888889
20	0.909944466	0.832819444	16.65638889
20	0.090349427	0.974611111	19.49222222
20	0	0.997527778	19.95055556
17	0.923008057	0.584052288	9.928888889
20	0.130295912	0.821847222	16.43694444

20	1	1	20
20	0	0.99	19.8
20	0	0.991527778	19.83055556
20	0.360676897	0.968472222	19.36944444
20	0.120464523	0.980694444	19.61388889
20	0.045782093	0.998388889	19.96777778
20	0.075955376	0.994736111	19.89472222
20	0.9725925	0.111486111	2.229722222
20	0.041462495	0.847486111	16.94972222
20	0.926726394	0.451125	9.0225
20	0.002828694	0.982	19.64
20	0.003154438	0.968652778	19.37305556
20	0.0653673	0.777444444	15.54888889
20	0.020043036	0.574458333	11.48916667
20	0.394107383	0.628847222	12.57694444
20	0.119888323	0.084569444	1.691388889
20	0.001668428	0.998944444	19.97888889
20	0.862142708	0.532555556	10.65111111
20	0.013531061	0.738013889	14.76027778
20	0	0.981013889	19.62027778
20	0.252570123	0.218861111	4.377222222
20	0.007106976	0.859875	17.1975
20	0	0.999972222	19.99944444
20	0.31285709	0.743861111	14.87722222
20	0	0.823666667	16.47333333
20	0.000909863	0.915888889	18.31777778
20	0.906624297	0.795472222	15.90944444
20	0.044453281	0.977930556	19.55861111
20	0.002643993	0.998069444	19.96138889
20	0.983384006	0.785722222	15.71444444
20	0.040560472	0.979333333	19.58666667
20	0	0.990763889	19.81527778
20	0.342173929	0.388569444	7.771388889
20	0.005861873	0.781888889	15.63777778
20	0	0.954347222	19.08694444
20	0.263525647	0.85075	17.015
20	0.03697698	0.916486111	18.32972222
20	0.16454889	0.893013889	17.86027778
20	0.030305785	0.458291667	9.165833333
20	0.00297657	0.979875	19.5975
20	0.4345816	0.630875	12.6175
20	0.001004477	0.967888889	19.35777778
20	0.000837556	0.994958333	19.89916667
20	0.310570338	0.989666667	19.79333333
20	0.036835943	0.949027778	18.98055556
20	0.006146024	0.994319444	19.88638889
20	0.9070933	0.706652778	14.13305556
20	0.012690972	0.8	16
20	0.002186536	0.571680556	11.43361111
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20	0.044027608	0.998111111	19.96222222
20	0.003753441	0.999083333	19.98166667

20	0.450559701	0.893333333	17.86666667
20	0.041785233	0.927361111	18.54722222
20	0.001209738	0.918472222	18.36944444
20	0	0.969944444	19.39888889
20	0	0.999944444	19.99888889
20	0.10705861	0.45925	9.185
20	0.508333333	0.016666667	0.333333333
20	0.004674353	0.891388889	17.82777778
20	0	0.999944444	19.99888889
20	0.220235831	0.365138889	7.302777778
20	0.256849691	0.632125	12.6425
20	1	1	20
20	0.080668455	0.673194444	13.46388889
20	0.045898056	0.889652778	17.79305556
20	0.033517946	0.965486111	19.30972222
20	0.515287099	0.18625	3.725
20	0.07539214	0.823472222	16.46944444
20	0.176295133	0.884722222	17.69444444
20	0.002113182	0.985875	19.7175
20	0.00603094	0.990263889	19.80527778
20	0.016157097	0.55875	11.175
20	0	0.758472222	15.16944444
20	0.005286589	0.998333333	19.96666667
20	0.23100304	0.137083333	2.741666667
20	0.015820306	0.886694444	17.73388889
20	0.006916443	0.943805556	18.87611111
20	0.618520842	0.243569444	4.871388889
20	0.008813313	0.803708333	16.07416667
20	0.002840612	0.928986111	18.57972222
20	0	0.712638889	14.25277778
20	0	0.856833333	17.13666667
20	0.001115553	0.747013889	14.94027778
20	0.213616066	0.531847222	10.63694444
20	0.108110024	0.783666667	15.67333333
20	0.001533037	0.996569444	19.93138889
16.98333	0.660578686	0.999411187	16.97333333
20	0.00890554	0.678416667	13.56833333
20	0	0.999875	19.9975
20	0.55788665	0.235013889	4.700277778
20	0.007054287	0.885986111	17.71972222
20	0.007294478	0.952013889	19.04027778

Column Name
ID
Species
HabitatType
Treatment
Time in Humid Crevice (min)
Time in Dry Crevice (min)
Length of Experiment (hours)
Proportion Crevice time in Humid
Proportion of Experiment in Crevice
Total Time in Any Crevice (hours)

Column Description	Units
unique identifier for each gecko	
gecko species in genus Gehyra	
species' habitat type in the wild (arboreal or terrestrial)	
experimental treatment (22, 27, or 32 C) -- temperature that humid crevice was set to	˚C
total time gecko spent in the humid crevice	minutes
total time gecko spent in the dry crevice	minutes
total experimental time	hours
of the time the gecko spent in a crevice, the proportion in the humid crevice	proportion
of the total experimental time, the proportion spent in any crevice	proportion
total time during the experiment the gecko spent in any crevice	hours