## Ethograms

Table S1: Location sampled every 2 minutes during within-enclosure observations.

|  |  |
| --- | --- |
| **Behaviour** | **Definition** |
| Location | The location of the head. Head location could be: Water bowl, ‘rock’ hide, damp hide, hanging hide, branch, on aspen, under aspen, heat lamp, thermometer, glass, wall, none (not near any object). Location is specified as touching the object or within one head’s length, unless otherwise specified (i.e. under substrate). The Location is coded as ‘not visible’ if it is not possible to ascertain the snake’s location. |

Table S2: Behaviours recorded continuously for 1 minute every 5 minutes during within-enclosure observations.

|  |  |
| --- | --- |
| **Behaviour** | **Definition** |
| Resting | Snake not moving around the enclosure for prolonged periods, only brief movements (e.g. adjusting position without moving from its current location) can be considered as still within resting, does not appear to be attentive to its surroundings. Locomotory behaviours (Stationary, Partial movement and Locomotion) were only coded when the snake was not ‘resting’. |
| Partial movement | Part of body was stationary but movement was still occurring (e.g. tail-end stationary, but head-end moving). Includes brief pauses between head movements. |
| Locomotion | Actively moving around the enclosure, entire body (from head to tail) in motion. |
| Stationary | Neither head nor body moving but snake not resting (i.e. appeared to be attentive to surroundings and/or pauses whilst otherwise active). Needed to be more than 1 second long, brief pauses between head movements were not included. |
| Stretch | How ‘coiled’ the snake was when resting outside of hide.  Tightly coiled: No gaps between coils (this was assumed if the snake was in a hide). Full contact with self.  Partially (tightly) coiled: Few gaps, but some gaps between coils. Mostly in contact with self.  Loosely coiled: Little contact with self, but with very elongated coils and/or lateral bending with some continuous straight portions. Includes no contact with self if snake was bent round multiple corners.  Stretched out: Snake is in a straight or near straight line posture, with a mostly continuous portion of the snake being straight, (i.e. no lateral bending) with no self-contact. Cannot be going round corners to be defined as stretched. |
| Drinking | Snake was consuming water. |
| Submerged | Snake had head or body under water. |
| Gaping | Mouth opened to a wide angle. |
| Nose rubbing | A type of interaction with transparent boundary. Nose was pushed against the glass and rubbed. |
| Excreting | Snake was passing excrement. |
| Not visible | Snake was not visible to the coder, thus it was not possible to ascertain the above information. |

Table S3: Behaviours analysed in novel environment and novel object tests.

|  |  |  |
| --- | --- | --- |
| **Type** | **Behaviour** | **Definition** |
| Activity | Partial movement | Part of body was stationary but movement still occurred (e.g. tail-end stationary, but head-end moving). Includes brief pauses between head movements. |
| Activity | Locomotion | Actively moving around the arena, entire body (from head to tail) in motion. |
| Activity | Stationary | Neither head nor body moving for at least 1 second. Does not include brief pauses between head movements. |
| Contact | Wall contact | Snake was in contact with the wall with any part of its body, not inclusive of the head. |
| Contact | Self contact | Snake in contact with itself, this was any time any part of the snake was in contact with any other part of itself, including overlap/crossing over. |
| Contact | Climbing | Began when the body (not the head) was in contact with the wall at the base of the wall and the snake’s head was approximately one third up the wall. Ended when the head reached the ground. |
| Object | Location | (Novel object only) Which quadrant the snake was in to determine location relative to object. Defined by location of head, as soon as the snake’s head begins to cross the line they are in the next quadrant. |
| Object | Object investigation | (Novel object only) Head in contact or close proximity of object – within one head length. |
| Object | Body object | (Novel object only) In contact with object not inclusive of head contact. |

Table S4: Behaviours analysed in emergence test.

|  |  |  |  |
| --- | --- | --- | --- |
| **Type** | **Observation required** | **Behaviour** | **Description** |
| Latency | Continuous | Latency Emergence | Length of time till the snake fully emerges from the hide. Recorded as 600 for did not emerge. |
| Distance/  Proportion | Continuous | Greatest Emergence | The greatest distance that the snake emerges as a proportion of its overall length (coded as the point at which the snake switches from emerging to retreating (or at end of test, whichever comes first), if this occurs several times during the test only the longest measurement of these points was used). |
| Time | Continuous | Time Emerged | Time that the snake is emerged from the hide (considered emerged once the entirety of the head is outside of the hide, ends when head returns to hide). |

Table S5: Behaviours analysed in reverse emergence test.

|  |  |  |  |
| --- | --- | --- | --- |
| **Type** | **Observation required** | **Behaviour** | **Description** |
| Latency | Continuous | Latency Head | Length of time till the head enters the hide. Coded as 600 seconds for did not enter. |
| Time | Continuous | Fully Emerged | Time that the snake is entirely (head and body) outside of the hide. |
| Count/  Proportion | Sampling | Greatest Elongation | The total number of squares the snake was in and the number of squares along the length and width of the arena was counted from the screenshots taken every 30 seconds. Coded as NA if in hide or climbing. This was then converted to a single value of elongation using the following formula:  Where is number of squares along arena length that are occupied by the snake, is number of squares along arena width that are occupied by the snake, is arena width, is the snakes length in cm and is total number of squares occupied by the snake. The greatest elongation was taken to be the largest number obtained. |

## Results

Table S6: Results of Linear Mixed Models for in vivarium behaviours.

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| **Behaviour** | | **Significant?** | **t** | **df** | **p** |
| **Resting** | | **Significant – Snakes in smaller vivaria spent more time resting.** | **3.308** | **203.00** | **0.0011** |
| Activity (while not resting) | Locomotion | Not significant | -0.260 | 45.89 | 0.796 |
| Partial Movement | Not significant | 0.219 | 43.92 | 0.828 |
| Stationary | Not significant | 0.082 | 45.28 | 0.935 |
| Stretch (while not in hide) | **Loosely Coiled** | **Significant - Snakes in larger vivaria spent more time loosely coiled while resting.** | **-5.260** | **98.81** | **<0.001** |
| **Partially Coiled** | **Significant - Snakes in smaller vivaria spent more time partially coiled while resting.** | **3.771** | **97.25** | **<0.001** |
| **Tightly Coiled** | **Significant - Snakes in smaller vivaria spent more time tightly coiled while resting.** | **3.326** | **94.96** | **0.0013** |
| **Visibility** | | **Significant – Snakes in larger vivaria spent more time not visible.** | **-2.697** | **203.00** | **0.0080** |
| Location | **Hides Combined** | **Significant – Snakes in larger vivaria spent more time resting in the hides.** | **-3.191** | **203.00** | **0.0016** |
| **Hanging Hide** | **Significant – Snakes in larger vivaria spent more time resting in the hanging hide. No other hides showed significant difference when analysed individually.** | **-2.961** | **203.00** | **0.0034** |
| **On Substrate** | **Significant – Snakes in smaller vivaria spent more time resting on the substrate.** | **2.022** | **203.00** | **0.0445** |
| Under Substrate | Not significant | -1.108 | 203.00 | 0.2690 |
| Bowl | Not significant | 0.587 | 203.00 | 0.5578 |
| **Branch** | **Significant – Snakes in smaller vivaria spent more on the branch.** | **3.319** | **203.00** | **0.0011** |
| Heat lamp | Not significant – too few observations | 1.42 | 214.00 | 0.157 |
| Glass | Not significant | 1.328 | 203.00 | 0.1858 |
| Wall | Not significant – too few observations | 0.345 | 214.00 | 0.730 |
| None | Not significant | 0.218 | 203.00 | 0.828 |

Table S7: Results of mixed effects models for the novel environment test.

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| Measure | | | Significant? | t | df | p |
| Proportion of Total Time | Activity Type | Locomotion | Not Significant | -0.057 | 11 | 0.955 |
| Partial Movement | Not Significant | -0.215 | 22 | 0.832 |
| Inactive | Not Significant | 0.474 | 11 | 0.645 |
| Self-Contact | | Not Significant | 0.231 | 11 | 0.822 |
| Wall-Contact | | Not Significant | 2.057 | 11 | 0.0642 |
| Climbing | | Not Significant | -0.118 | 22 | 0.907 |
| Latencies | Movement | | Not Significant | 1.038 | 22 | 0.311 |

Table S8: Results of mixed effects models for the novel object test.

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| Measure | | | Significant? | t | df | p |
| Proportion of Total Time | Activity Type | Locomotion | Not Significant | 0.054 | 11 | 0.958 |
| Partial Movement | Not Significant | -0.568 | 22 | 0.576 |
| Inactive | Not Significant | 1.244 | 11 | 0.2395 |
| Self-Contact | | Not Significant | -1.549 | 22 | 0.136 |
| Wall-Contact | | Not Significant | -0.015 | 11 | 0.988 |
| Climbing | | Not Significant | 0.140 | 11 | 0.891 |
| Object | Investigation | Not Significant | 0.733 | 11 | 0.479 |
| **Body Contact** | **Significant – Snakes in smaller vivaria spend more time in body contact with the object.** | **3.086** | **11** | **0.010** |
| Quadrant | Not Significant | 0.299 | 22 | 0.768 |
| Frequencies | Object | Investigation | Not Significant | 1.181 | 11 | 0.2623 |
| Body Contact | Not Significant | -0.445 | 22 | 0.661 |
| Quadrant | Not Significant | -0.62 | 11 | 0.548 |
| Latencies | Movement | | Not Significant | 0.593 | 22 | 0.559 |
| Object | Investigate | Not Significant | 0.795 | 11 | 0.444 |

Table S9: Results of mixed effects models for the emergence test.

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| Measure | Significant? | t | df | p |
| Greatest distance emerged | Not Significant | -0.965 | 11 | 0.355 |
| Time emerged (head only) | Not Significant | -0.938 | 11 | 0.368 |
| Latency to emerge from the hide fully | Not Significant | 1.358 | 11 | 0.202 |

Table S10: Results of mixed effects models for the reverse emergence test.

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| Measure | Significant? | t | df | p |
| **Time spent completely outside of the hide** | **Significant – Snakes in large vivaria spent more time outside of the hide** | **-3.198** | **11** | **0.008** |
| **Latency for the head to enter the hide** | **Significant – Snakes in large vivaria were quicker to reach of the hide** | **-2.923** | **11** | **0.014** |
| Maximum elongation | Not Significant | -1.171 | 11 | 0.266 |