# INFO ENTRY - QUESTION INFO

ENTRY NOTES:

* green = does not need to be editted
* yellow = info for the inputter
* ref\_id = “refs\_glossary\_2024-08-09.xls > “references” tab
  + if the reference not present, either add it (if you’re confident that you can follow the format), or add a comment in this doc with the info and I will adjust
* **images – file name in** “refs\_glossary\_2024-08-09.xls > “references” tab
* Ignore everything in the “POPULATE MARKDOWN” section
* Size of columns in tables and text format do not matter; see note on bold and italize below
* Any content with “glue}`` prefix or surrounded by “{{ “ / “ }}” indicates where text will be inserted from the keys
* You may see “<br>” throughout, you can ignore these
* additional formatting notes (optional)
  + \*\***bold**\*\*
  + \**italics*\*
* **Topic Info**
  + If the topic is NOT related to a question, you can leave “question” as NULL
  + “question” here is more for your reference
* **Assumptions, Pros, Cons**
  + Only for modelling approaches; can ignore otherwise (leave table here)
  + [WILL BE HERE, BUT INSERTED DIRECTLY FROM CSV FILE (THUS NO INPUT NEEDED)]
* **Advanced**
  + If the topic doesn’t warrant inclusion, you can leave as NULL
* **Figures**
  + Placeholders here as “filename” can leave in if not <5 images
* **Video**
  + no “<” before the URL text and a “>” after URL in this case
  + ref\_id in this example is not correct, just for illustrative purposes
* **Analytical tools & resources**
  + The ref\_id should be included in the reference column (and the full text reference in the master reference file). If you aren’t sure if the reference is in the master doc, add the full text ref as a comment.
  + Please add a “<” before the URL text and a “>” after (e.g., <http://www.somesitelink.com>)
  + Type can be something similar to: Article, App/Program, R package
* **References / Glossary** 
  + items in-text above (IGNORE FOR NOW)
* **Notes**
  + (future ref / not included in markdown conversion)

## Topic Info

|  |  |
| --- | --- |
| **info\_id** | sp\_size |
| **question** | **Question:** What is the approximate size of the Target Species?  Discuss influence of body size on design choices + Include mention of potential season effects on movement / HR + motility; movement; home range size |

## Overview

Here are a few examples of comparable species for each body size options:

- \*\***Small**\*\*: rodents and similarly sized species in the “Mustelidae” family [i.e., weasels, badgers, otters, martens, wolverine, etc.])

- \*\***Medium**\*\*: small and mid-sized species, ~< 33 lbs (or 15 kilograms), such as meso-carnivores (i.e., Red, fox, Coyote) ({{ ref\_intext\_roemer\_et\_al\_2009 }})

- \*\***Large**\*\*: bears or ungulates (i.e., large mammals with hooves, such as White-tailed deer, Elk, Moose, etc)

- \*\***Multiple**\*\*: \*select this option if your study includes multiple Target Species that vary in body size.\*

:::{figure} ../03\_images/03\_image\_files/kemp\_et\_al\_2022\_pg15\_fig1.png

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:::

\*\*Kemp et al. (2022) - Pg 15 Fig 1\*\* The graphic above shows how the height of the camera should reflect the size of the target animal to increase the chance of detection. In this case, the yellow area shows the field of view.

\*\*<font size="4"><span style="color:#2F5496">How does this relate to study design?</font></span>\*\*

Body size **affects the detection process** ({{ ref\_intext\_obrien\_et\_al\_2011 }}). Species with a larger body size are more likely to be detected; and therefore may require lower sampling effort than smaller species ({{ ref\_intext\_chatterjee\_et\_al\_2021 }}). Larger species moving through the camera’s detection zone are more likely to trigger the camera ({{ ref\_intext\_chatterjee\_et\_al\_2021 }}; {{ ref\_intext\_rowcliffe\_et\_al\_2011 }}; {{ ref\_intext\_hofmeester\_et\_al\_2017 }}); they can also be detected farther away or occur at wider angles ({{ ref\_intext\_rowcliffe\_et\_al\_2011 }}; {{{ ref\_intext\_hofmeester\_et\_al\_2017 }}). Whereas, small mammals are often undetected due to their small size (({{ ref\_intext\_obrien\_et\_al\_2011 }}; {{ ref\_intext\_anile\_devillard\_2016 }}) and because “small species which routinely move at fast speeds, such as stoats and weasels, are likely to have especially small detection zones” ({{ ref\_intext\_glen\_et\_al\_2013 }}).

:::{figure} ../03\_images/03\_image\_files/kays\_et\_al\_2021\_fig6\_clipped.png

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:::

\*\*Kays et al. (2021) - Fig. 6\*\*: Relationship between trigger probability and body mass for four focal species (ascending order by weight: gray fox, raccoon, coyote, white-tailed deer). Error bars show standard deviation. Body mass values come from North Carolina animals in the mammal collections of the NC Museum of Natural Sciences

When thinking beyond the camera's FOV, larger species generally also have larger home ranges {{ ref\_intext\_garland\_et\_al\_1983 }} and daily movement distances, making them more likely to be detected at multiple cameras {{ ref\_intext\_chatterjee\_et\_al\_2021 }}, therefore there are also implications for which models may be appropriate (due to assumptions of “site closure” / “independent locations”).

:::{note}

This is an especially important consideration when targetting multiple species of varying sizes.

:::

## Advanced

This section will be available soon! In the meantime, check out the information in the other tabs!

```{figure} ../03\_images/03\_image\_files/00\_coming\_soon.png

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:align: center

```

## Figures

|  |  |  |  |
| --- | --- | --- | --- |
| **Image** | **file\_name** | **Caption (if applicable)** | **ref\_id** |
|  | kays\_et\_al\_2021\_fig6\_clipped.png | \*\*Kays et al. (2021) - Fig. 6\*\* Relationship between trigger probability and body mass for four focal species (ascending order by weight: gray fox, raccoon, coyote, white-tailed deer). Error bars show standard deviation. Body mass values come from North Carolina animals in the mammal collections of the NC Museum of Natural Sciences | kays\_et\_al\_2021 |
|  | anile\_devillard\_2016\_fig2.jpg | \*\*Anile & Devillard (2028) - Fig. 2\*\* Violin plot of the trap rate, expressed as the number of capture events per 1000 days of camera trapping per species (\*n\* = 30) ordered by body mass (\*n\* = 513 records).  :::{dropdown}  Some records appeared as ‘outliers’ in this figure, that is, particularly high numbers of capture events/1000 trapping hours for large felids (\*Uncia uncia, Panthera tigris\*). These data were not included in the reduced dataset used in modelling as some data were lacking (either inter-trap distance, type and number of camera used as well as if they were used in pair). Consequently, these particular records were not responsible of the observed positive relationship between RAI and body mass.  ::: | anile\_devillard\_2016 |
|  | anile\_devillard\_2016\_fig3\_clipped.jpg | \*\*Anile & Devillard (2028) - Fig. 3\*\* Predicted number of trapped individuals as a function of the log-transformed body mass and the type of study design (multispecies vs. single species).  :::{dropdown}  Fitted values are predicted for fixed effects only from the averaged model. The number of trap hours \*th\* was fixed at = 1000 days, whereas the number of camera stations \*ncamstat\*, and the inter-trap distance \*intdist\* were fixed to their median values (\*ncamstat\* = 26, \*intdist\* = 1760 m, respectively), and, the type of camera used, the use of cameras in pairs, the use of bait or lures and whether the authors took into account the nonindependence of capture events were set to \*camtyp\* = A, \*campair\* = Y, \*baitlure\* = N, and \*ind.ce\* = N, that is, the most frequent design type used, to estimate fitted values.  ::: | anile\_devillard\_2016 |
|  | bodysize\_movement.png | figure4\_caption | bodysize\_movement.png |
|  | fisher\_et\_al\_2011\_fig6\_clipped.png | figure5  \*\* Fisher et al., 2011 - Fig. 6\*\* Characteristic scale of habitat selection (determined by AIC weight, see Figs. 1 and 2), log-transformed and modeled against body mass of six mammal species for which a characteristic scale was detectable. Habitat quantified at large scales best predicts both small and large mammal occurrence, whereas habitat quantified at small scales best predicts occurrence of intermediate-sized mammals. | fisher\_et\_al\_2011 |
|  | chatterjee\_et\_al\_2021\_table2\_clipped.png | \*\*Chatterjee et al. (2021) - Table 2.\*\* Broad classifications of mammals based on occupancy and detection probabilities. | chatterjee\_et\_al\_2021 |
|  |  |  |  |
|  | kemp\_et\_al\_2022\_pg15\_fig1.png | \*\*Kemp et al. (2022) - Pg 15 Fig 1\*\* The graphic above shows how the height of the camera should reflect the size of the target animal to increase the chance of detection. In this case, the yellow area shows the field of view. | kemp\_et\_al\_2022 |
|  | figure8\_filename.png | figure8\_caption | figure8\_ref\_id |
|  | figure9\_filename.png | figure9\_caption | figure9\_ref\_id |
|  | figure10\_filename.png | figure10\_caption | figure10\_ref\_id |
|  | figure11\_filename.png | figure11\_caption | figure11\_ref\_id |
|  | figure12\_filename.png | figure12\_caption | figure12\_ref\_id |
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## Video

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| **caption** | **URL (no < / > before/after URL** | **ref\_id** |
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| vid2\_caption | vid2\_url | vid2\_ref\_id |
| vid3\_caption | vid3\_url | vid3\_ref\_id |
| vid4\_caption | vid4\_url | vid4\_ref\_id |
| vid5\_caption | vid5\_url | vid5\_ref\_id |
| vid6\_caption | vid6\_url | vid6\_ref\_id |

## Shiny

Shiny name = Species home range / body size lookup

Shiny caption = A R Shiny app created for the RC Decision Support Tool to lookup information on species home range size / body size; information pulled directly from the following sources:

- Burton et al. (2015) supplementary material “S2. Average body mass and home range size for a sample of species and studies among the reviewed set of camera trap publications”

- PanTHERIA database ({{ ref\_intext\_jones\_et\_al\_2009 }}) “a species-level database of life history, ecology,and geography of extant and recently extinct mammals

- HomeRange: A global database of mammalian home ranges ({{ ref\_intext\_broekman\_et\_al\_2022 }})

Shiny URL = https://7e2l38-cassondra-stevenson.shinyapps.io/lu\_species\_homerange/

Shiny name = shiny\_name2

Shiny caption =shiny\_caption2

Shiny URL = shiny\_url2

## Analytical tools & resources

|  |  |  |  |  |
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| resource5\_type | resource5\_name | resource5\_note | resource5\_url | resource5\_ref\_id |
| resource6\_type | resource6\_name | resource6\_note | resource6\_url | resource6\_ref\_id |
| resource7\_type | resource7\_name | resource7\_note | resource7\_url | resource7\_ref\_id |
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| resource13\_type | resource13\_name | resource13\_note | resource13\_url | resource13\_ref\_id |
| resource14\_type | resource14\_name | resource14\_note | resource14\_url | resource14\_ref\_id |
| resource15\_type | resource15\_name | resource15\_note | resource15\_url | resource15\_ref\_id |

## References / Glossary

|  |  |
| --- | --- |
| **ref\_id** |  |
| {{ ref\_bib\_anile\_devillard\_2016 }}  {{ ref\_bib\_blackburn\_gaston\_1999 }}  {{ ref\_bib\_broekman\_et\_al\_2022 }}  {{ ref\_bib\_burton\_et\_al\_2015 }}  {{ ref\_bib\_chatterjee\_et\_al\_2021 }}  {{ ref\_bib\_fisher\_et\_al\_2011 }}  {{ ref\_bib\_garland\_1983 }}  {{ ref\_bib\_glen\_et\_al\_2013 }}  {{ ref\_bib\_hofmeester\_et\_al\_2017 }}  {{ ref\_bib\_jones\_et\_al\_2009 }}  ({{ ref\_bib\_kays\_et\_al\_2021 }}  {{ ref\_bib\_labarbera\_1989 }}  {{ ref\_bib\_obrien\_et\_al\_2011 }}  {{ ref\_bib\_roemer\_et\_al\_2009 }}  {{ ref\_bib\_rowcliffe\_et\_al\_2011 }} |  |

## Notes

Not used

* Very small species (< 100 g) are sometimes detected by higherend camera traps on the market today (e.g. Fig 4-3), but detections will only be reliable at distances less than 2 m from the camera ({{Rowcliffe et al. 2011}})
* There is also some evidence that detection angles are smaller for species which move at faster speeds ({{Rowcliffe et al. 2011}}.
* Small species which routinely move at fast speeds, such as stoats and weasels, are likely to have especially small detection zones ({{Glen et al., 2013}}).
* "Most species with larger body sizes had moderate or high detection probabilities and thus required lower sampling efforts than smaller mammals. This makes sense, as larger-bodied animals are more likely to trigger the camera trap and have larger home ranges (Garland 1983) and daily movement distances, making them more likely to be detected at multiple cameras." (Chatterjee et al., 2021)
* “While occupancy was positively correlated with body size, detection probability was not significantly correlated with body size (r = 0.17, P = 0.49).” (Chatterjee et al., 2021)
* Species with higher dispersal ability (i.e., able to travel further distances) are also more likely to be absent during the survey (may generally occur at a camera location, but weren’t detected when you were sampling)
* Body size affects how easy it is to detect an individual moving through the camera’s detection zone ([detectability]()); larger species can be detected farther away or occur at wider angles ({{Rowcliffe et al. 2011}}; {{Hofmeester et al. 2017}}). ;;;;; However, body size has been found to have the most important effect on detection zones, with larger species being detected at larger distances and wider angles ({{Rowcliffe et al. 2011}}; {{Hofmeester et al. 2017}}).

Other

“All other things being equal, larger species might be more easily trapped as they move more slowly than smaller species, or because their population density is higher (see Bengsen et al., 2011 and Rowcliffe & Carbone, 2008; Rowcliffe et al., 2008 on the importance of population density on trapping rates).”

SEE

* Ofstad, E. G., Herfindal, I., Solberg, E. J., & Saether, B. E. (2016). Home ranges, habitat and body mass: Simple correlates of home range size in ungulates. \**Proceedings of the Royal Society B: Biological Sciences*, *283*\* (1845), 20161234. <<https://doi.org/10.1098/rspb.2016.1234>>
* LaBarbera, M. (2003). Analyzing Body Size as a Factor in Ecology and Evolution. \*Annual Review of Ecology and Systematics, 20\*(1), 97-117. <https://doi.org/10.1146/annurev.es.20.110189.000525>
* Yu, H., Lin, Z., & F. Xiao. (2024). Role of Body Size and Shape in Animal Camouflage. \**Ecology and Evolution,* 14\*(5), e11434. <https://doi.org/10.1002/ece3.11434>

# POPULATE MARKDOWN \_2024-09-20 - INFO

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display\_name: Python 3

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name: python3

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(i\_)=

# {{ title\_i\_sp\_size }}

:::{note}

Unsure about the size of your Target Species? Check out the “Shiny Apps/Widgets” tab to see if information for your Target Species is available for in our “Species home range / body size lookup.”

:::

### :::::::{tab-set}

#### ::::::{tab-item} Overview

Here are a few examples of comparable species for each body size options:

- \*\***Small**\*\*: rodents and similarly sized species in the “Mustelidae” family [i.e., weasels, badgers, otters, martens, wolverine, etc.])

- \*\***Medium**\*\*: small and mid-sized species, ~< 33 lbs (or 15 kilograms), such as meso-carnivores (i.e., Red, fox, Coyote) ({{ ref\_intext\_roemer\_et\_al\_2009 }})

- \*\***Large**\*\*: bears or ungulates (i.e., large mammals with hooves, such as White-tailed deer, Elk, Moose, etc)

- \*\***Multiple**\*\*: \*select this option if your study includes multiple Target Species that vary in body size.\*

:::{figure} ../03\_images/03\_image\_files/kemp\_et\_al\_2022\_pg15\_fig1.png

:align: center

:::

\*\*Kemp et al. (2022) - Pg 15 Fig 1\*\* The graphic above shows how the height of the camera should reflect the size of the target animal to increase the chance of detection. In this case, the yellow area shows the field of view.

\*\*<font size="4"><span style="color:#2F5496">How does this relate to study design?</font></span>\*\*

Body size **affects the detection process** ({{ ref\_intext\_obrien\_et\_al\_2011 }}). Species with a larger body size are more likely to be detected; and therefore may require lower sampling effort than smaller species ({{ ref\_intext\_chatterjee\_et\_al\_2021 }}). Larger species moving through the camera’s detection zone are more likely to trigger the camera ({{ ref\_intext\_chatterjee\_et\_al\_2021 }}; {{ ref\_intext\_rowcliffe\_et\_al\_2011 }}; {{ ref\_intext\_hofmeester\_et\_al\_2017 }}); they can also be detected farther away or occur at wider angles ({{ ref\_intext\_rowcliffe\_et\_al\_2011 }}; {{{ ref\_intext\_hofmeester\_et\_al\_2017 }}). Whereas, small mammals are often undetected due to their small size (({{ ref\_intext\_obrien\_et\_al\_2011 }}; {{ ref\_intext\_anile\_devillard\_2016 }}) and because “small species which routinely move at fast speeds, such as stoats and weasels, are likely to have especially small detection zones” ({{ ref\_intext\_glen\_et\_al\_2013 }}).

:::{figure} ../03\_images/03\_image\_files/kays\_et\_al\_2021\_fig6\_clipped.png

:align: center

:::

\*\*Kays et al. (2021) - Fig. 6\*\*: Relationship between trigger probability and body mass for four focal species (ascending order by weight: gray fox, raccoon, coyote, white-tailed deer). Error bars show standard deviation. Body mass values come from North Carolina animals in the mammal collections of the NC Museum of Natural Sciences

When thinking beyond the camera's FOV, larger species generally also have larger home ranges {{ ref\_intext\_garland\_et\_al\_1983 }} and daily movement distances, making them more likely to be detected at multiple cameras {{ ref\_intext\_chatterjee\_et\_al\_2021 }}, therefore there are also implications for which models may be appropriate (due to assumptions of “site closure” / “independent locations”).

:::{note}

This is an especially important consideration when targetting multiple species of varying sizes.

:::

#### ::::::

#### ::::::{tab-item} Advanced

This section will be available soon! In the meantime, check out the information in the other tabs!

```{figure} ../03\_images/03\_image\_files/00\_coming\_soon.png

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#### ```

::::::

#### ::::::{tab-item} Visual resources

##### :::::{grid} 3

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###### ::::{grid-item-card} {{ ref\_intext\_kays\_et\_al\_2021 }}

```{figure} ../03\_images/03\_image\_files/kays\_et\_al\_2021\_fig6\_clipped.png

:class: img\_grid

```

\*\*Kays et al. (2021) - Fig. 6\*\* Relationship between trigger probability and body mass for four focal species (ascending order by weight: gray fox, raccoon, coyote, white-tailed deer). Error bars show standard deviation. Body mass values come from North Carolina animals in the mammal collections of the NC Museum of Natural Sciences

###### ::::

###### ::::{grid-item-card} {{ ref\_intext\_anile\_devillard\_2016 }}

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\*\*Anile & Devillard (2028) - Fig. 2\*\* Violin plot of the trap rate, expressed as the number of capture events per 1000 days of camera trapping per species (\*n\* = 30) ordered by body mass (\*n\* = 513 records).

:::{dropdown}

Some records appeared as ‘outliers’ in this figure, that is, particularly high numbers of capture events/1000 trapping hours for large felids (\*Uncia uncia, Panthera tigris\*). These data were not included in the reduced dataset used in modelling as some data were lacking (either inter-trap distance, type and number of camera used as well as if they were used in pair). Consequently, these particular records were not responsible of the observed positive relationship between RAI and body mass.

:::

###### ::::

###### ::::{grid-item-card} {{ ref\_intext\_anile\_devillard\_2016 }}

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\*\*Anile & Devillard (2028) - Fig. 3\*\* Predicted number of trapped individuals as a function of the log-transformed body mass and the type of study design (multispecies vs. single species).

:::{dropdown}

Fitted values are predicted for fixed effects only from the averaged model. The number of trap hours \*th\* was fixed at = 1000 days, whereas the number of camera stations \*ncamstat\*, and the inter-trap distance \*intdist\* were fixed to their median values (\*ncamstat\* = 26, \*intdist\* = 1760 m, respectively), and, the type of camera used, the use of cameras in pairs, the use of bait or lures and whether the authors took into account the nonindependence of capture events were set to \*camtyp\* = A, \*campair\* = Y, \*baitlure\* = N, and \*ind.ce\* = N, that is, the most frequent design type used, to estimate fitted values.

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figure4\_caption

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```

figure5

\*\* Fisher et al., 2011 - Fig. 6\*\* Characteristic scale of habitat selection (determined by AIC weight, see Figs. 1 and 2), log-transformed and modeled against body mass of six mammal species for which a characteristic scale was detectable. Habitat quantified at large scales best predicts both small and large mammal occurrence, whereas habitat quantified at small scales best predicts occurrence of intermediate-sized mammals.

###### ::::

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```

\*\*Chatterjee et al. (2021) - Table 2.\*\* Broad classifications of mammals based on occupancy and detection probabilities.

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###### ::::{grid-item-card} {{ ref\_intext\_kemp\_et\_al\_2022 }}

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```

\*\*Kemp et al. (2022) - Pg 15 Fig 1\*\* The graphic above shows how the height of the camera should reflect the size of the target animal to increase the chance of detection. In this case, the yellow area shows the field of view.

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figure8\_caption

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figure9\_caption

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figure10\_caption

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figure11\_caption

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vid6\_caption

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#### ::::::{tab-item} Shiny apps/Widgets

Check back in the future!

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##### :::::{card}

\*\*Species home range / body size lookup \*\*

A R Shiny app created for the RC Decision Support Tool to lookup information on species home range size / body size; information pulled directly from the following sources:

- Burton et al. (2015) supplementary material “S2. Average body mass and home range size for a sample of species and studies among the reviewed set of camera trap publications”

- PanTHERIA database ({{ ref\_intext\_jones\_et\_al\_2009 }}) “a species-level database of life history, ecology,and geography of extant and recently extinct mammals

- HomeRange: A global database of mammalian home ranges ({{ ref\_intext\_broekman\_et\_al\_2022 }})

<iframe

width="100%"

height="900"

src="https://7e2l38-cassondra-stevenson.shinyapps.io/lu\_species\_homerange/"

frameborder="0"

allow="accelerometer; autoplay; clipboard-write; encrypted-media; gyroscope; picture-in-picture"

allowfullscreen>

</iframe>

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##### :::::{card}

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::::{dropdown} shiny\_name2

shiny\_caption2

<iframe shiny\_url2

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#### ::::::{tab-item} Analytical tools & resources

| Type | Name | Note | URL |Reference |

|:----------------|:---------------------------------------|:----------------------------------------------------------------|:----------------------------------------------------------------|:----------------------------------------------------------------|

| resource1\_type | resource1\_name | resource1\_note | resource1\_url | {{ ref\_bib\_resource1\_ref\_id }} |

| resource2\_type | resource2\_name | resource2\_note | resource2\_url | {{ ref\_bib\_resource2\_ref\_id }} |

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| resource4\_type | resource4\_name | resource4\_note | resource4\_url | {{ ref\_bib\_resource4\_ref\_id }} |

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#### ::::::{tab-item} References

{{ ref\_bib\_anile\_devillard\_2016 }}

{{ ref\_bib\_blackburn\_gaston\_1999 }}

{{ ref\_bib\_broekman\_et\_al\_2022 }}

* {{ ref\_bib\_burton\_et\_al\_2015 }}

{{ ref\_bib\_chatterjee\_et\_al\_2021 }}

{{ ref\_bib\_fisher\_et\_al\_2011 }}

{{ ref\_bib\_garland\_1983 }}

* {{ ref\_bib\_glen\_et\_al\_2013 }}
* {{ ref\_bib\_hofmeester\_et\_al\_2017 }}

{{ ref\_bib\_jones\_et\_al\_2009 }}

* ({{ ref\_bib\_kays\_et\_al\_2021 }}
* {{ ref\_bib\_labarbera\_1989 }}
* {{ ref\_bib\_obrien\_et\_al\_2011 }}

{{ ref\_bib\_roemer\_et\_al\_2009 }}

{{ ref\_bib\_rowcliffe\_et\_al\_2011 }}

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