

Results



WWW.PHDCOMICS.COM

What goes in?

- **NOT** everything you did!
- Work backwards:
 - What's the main thing you want the reader to learn?
 - What's the major result that establishes this thing?
 - What other results are needed to support or qualify the major one?
- The *Results* section may be shockingly short.

Methods vs. Results

- IMRaD canon implies fairly strict separation – but not 100%
- Some methods might be mentioned in the *Results* section – but as a reminder so the reader can understand. No *new* methods in the *Results*!
- Some results might appear in the *Methods* section:
 - When they are needed to justify or explain choice of methods; *and*
 - When they don't need to be further discussed.

Results vs. Discussion

- IMRaD canon implies fairly strict separation – but not 100%
- The *Results* section should not *discuss* the data, but may *comment* on it:
 - Draw attention to important features of the data (e.g., key results, comparisons)

“Black kittens weighed 110 g (± 32 SD), while white kittens weighed 90 g (± 11 SD)”

vs

“Black kittens weighed 22% more than white kittens (110 ± 32 g vs. 90 ± 11 g, mean \pm SD)”

- Compare experiment to experiment, experiment to model, etc.
 - But save implications of these comparisons for *Discussion*
 - Also save comparisons of experiment to literature for *Discussion*

Organization

- Two common organizations:
 - (A) Simple *Results*: put main result first
 - (B) More complex *Results*: put main result last (build up to it)
 - Use paragraph or subsection structure mirroring *Methods*
- Very effective: state main result briefly first, then use organization (B)

Relating graphics to text

- Remember cost of navigation
- Good legends/titles help make figures/tables self-contained
- Text should tell the reader what to look for:

“Black kittens are bigger than white ones (Fig. 1)”

not

“Sizes of black and white kittens are shown in Figure 1”

- For more complex figures/tables, use pointers:

“Black kittens are larger than white ones (Fig.1, compare left and middle bars)”

- **Do not write this sentence:**

“Diet overlap between species increased from 2004 – 2009 in four of six comparisons: ribbon snake – green snake, mud snake – milk snake, milk snake – ribbon snake, and milk snake – green snake (Fig. 2A-F, Figs. 3 – 6, Table 3).”

Precision and significant digits

- Did black kittens weigh 110 g, 111.4 g, or 111.43238722 g?
- It depends.
 - How precise was your balance? *Significant digits*
 - How precisely does your reader need to know? *Remember your story*
- This applies to statistics too.

Never write “ $P = 0.37311002$ ”, or even “ $P = 0.3731$ ”!

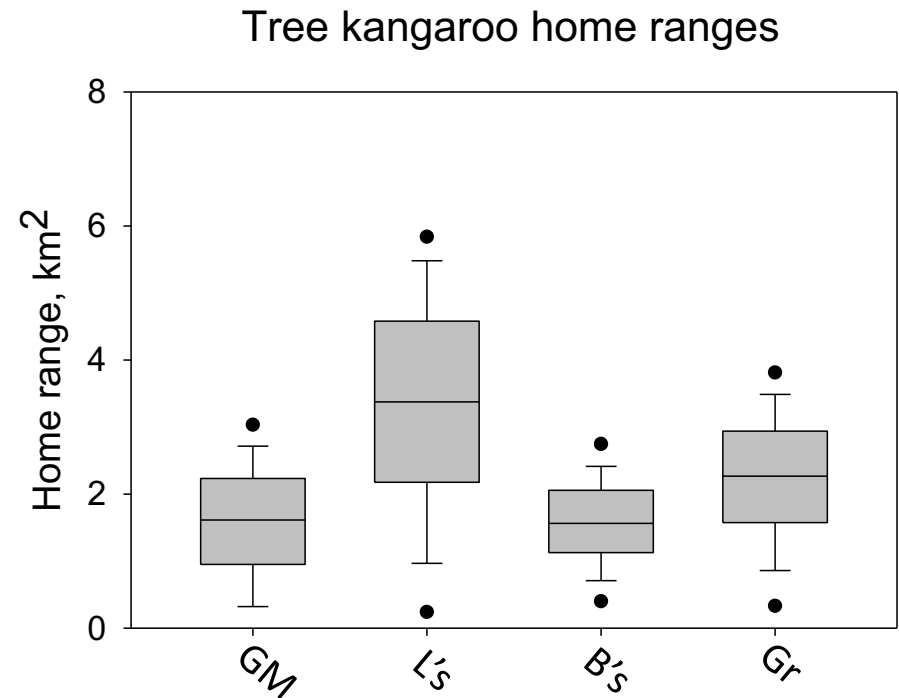
New figures vs. borrowed

- Most of the time, you'll be making new figures from scratch
- **When you are not:** borrowed figures **must** be credited.
 - Failure to credit is **plagiarism** and may also be **copyright infringement**
 - What might you borrow?
 - A figure, or part of it, from your previous paper
 - A figure, or part of it, from someone else's paper
 - A photograph to illustrate species, site, apparatus, etc.

Where do numbers go?

“Golden-mantled tree-kangaroo home ranges were on average 1.7 km² (\pm 0.9 SD), while Lumholtz’s tree-kangaroos had home ranges of 3.3 km² (\pm 1.8), Bennett’s tree-kangaroos 1.6 km² (\pm 0.7), and grizzled tree-kangaroos 2.2 km² (\pm 1.1)”.

Species	Home range size (mean)	SD
Golden-mantled	1.7	0.9
Lumholtz’s	3.3	1.8
Bennett’s	1.6	0.7
Grizzled	2.2	1.1



Numbers in text

“Golden-mantled tree-kangaroo home ranges were on average $1.7 \text{ km}^2 (\pm 0.9 \text{ SD})$, while Lumholtz’s tree-kangaroos had home ranges of $3.3 \text{ km}^2 (\pm 1.8)$, Bennett’s tree-kangaroos $1.6 \text{ km}^2 (\pm 0.7)$, and grizzled tree-kangaroos $2.2 \text{ km}^2 (\pm 1.1)$ ”.

- Low costs of navigation
- High costs of comprehension (for more than a couple of numbers)
- **Report only reasonable levels of precision**
 - How many digits are significant?
 - How many digits matter to your reader?

Numbers in tables

Species	Home range size (mean)	SD
Golden-mantled	1.7	0.9
Lumholtz's	3.3	1.8
Bennett's	1.6	0.7
Grizzled	2.2	1.1

- Readers must navigate to, from, and within the table
- Easy to extract precise numerical values
- Difficult to show trends, relationships among variables, etc.

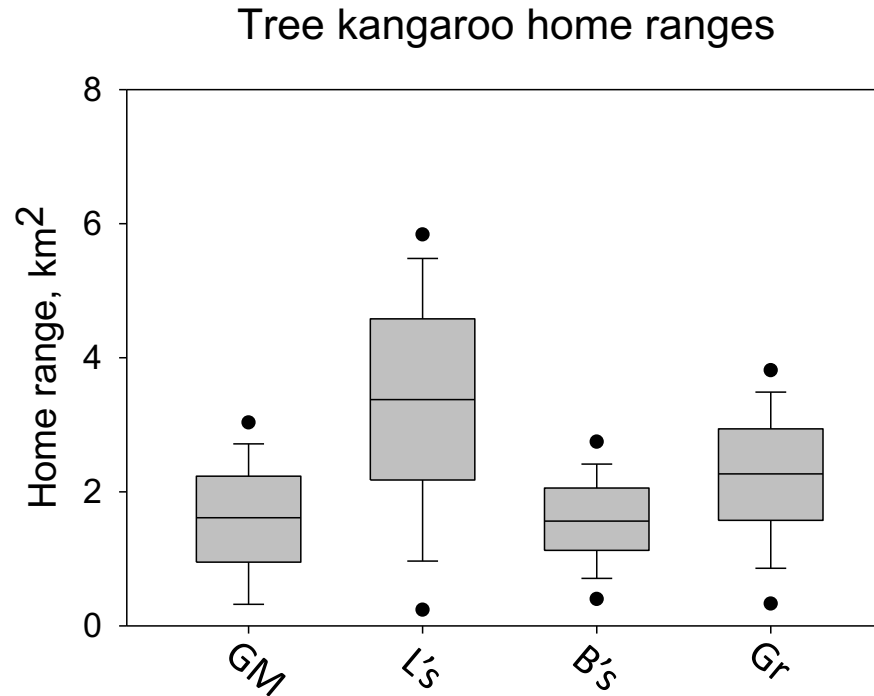
Table design

Species	Home range size (mean)	SD
Golden-mantled	1.7	0.9
Lumholtz's	3.3	1.8
Bennett's	1.6	0.7
Grizzled	2.2	1.1

Species	Golden- mantled	Lumholtz's	Bennett's	Grizzled
Home range size (mean)	1.7	3.3	1.6	2.2
SD	0.9	1.8	0.7	1.1

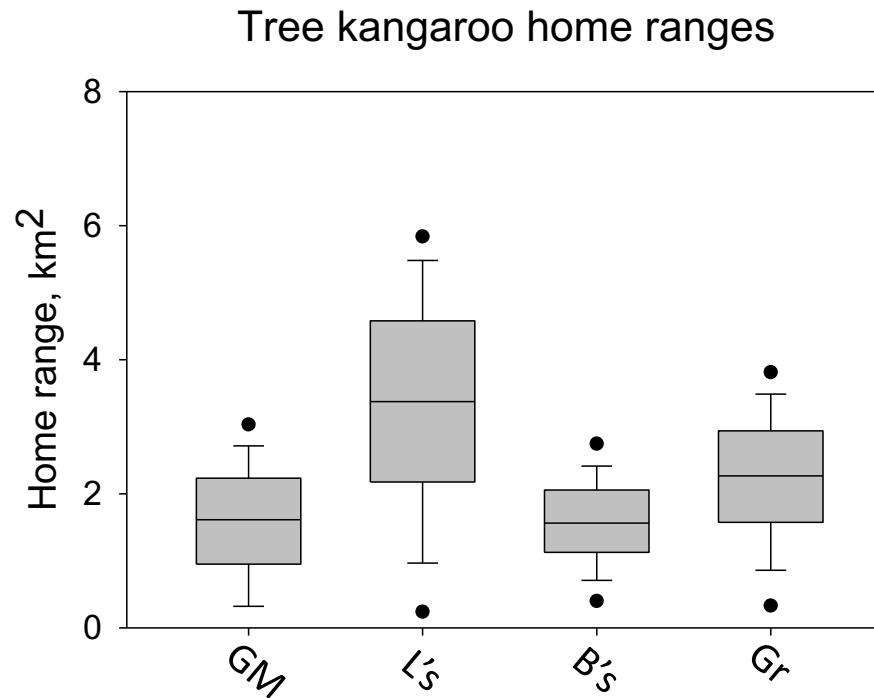
- Patterns are easiest to see vertically
- Left-to-right convention (independent/dependent variables, etc.)
- Use rules and whitespace

Numbers in figures



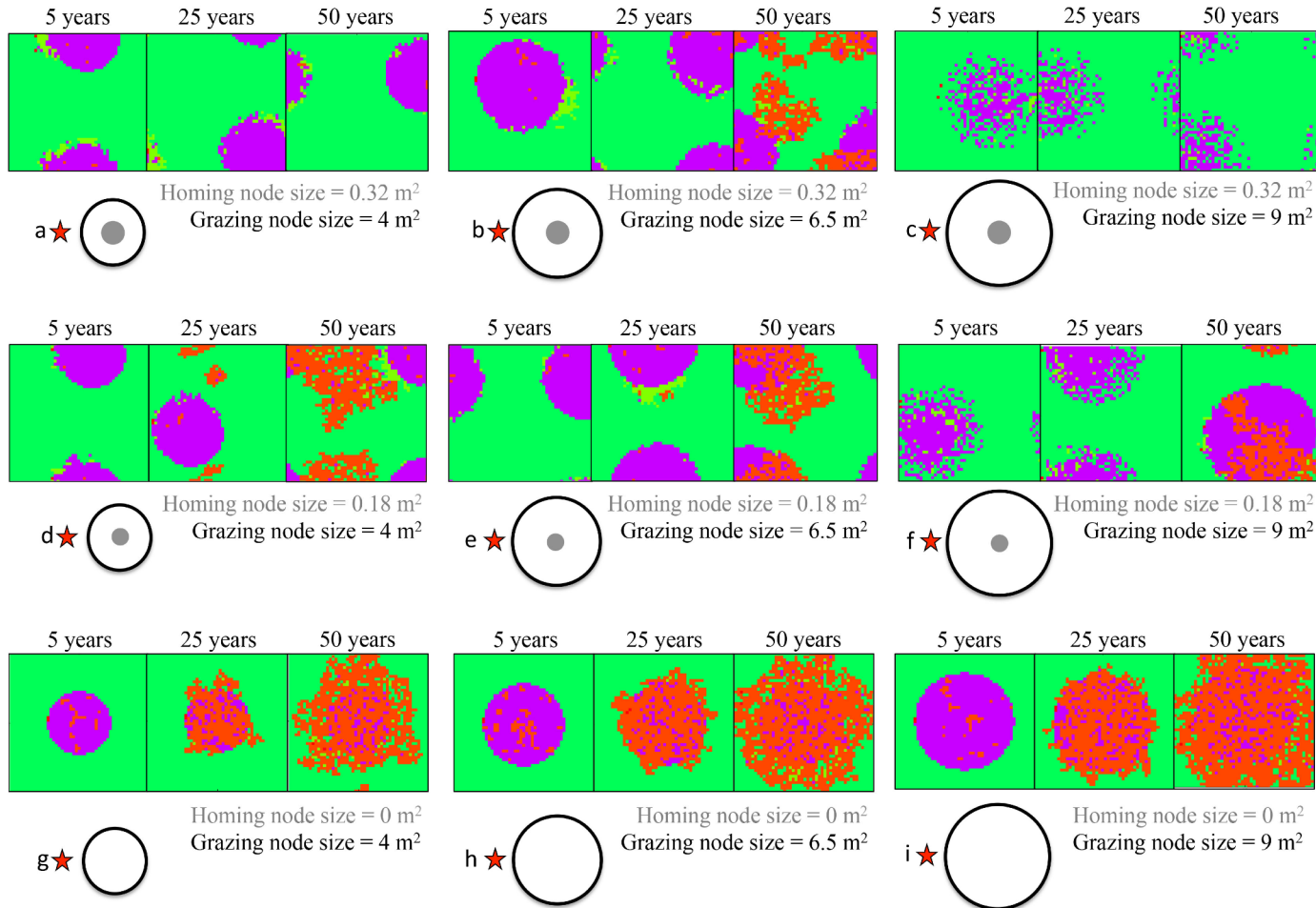
- Readers must navigate to, from, and within the figure
- Difficult to read if there are many boxes/axes/plots/variables/panels
- Difficult to extract precise numerical values
- Easy to show trends, relationships among variables, etc.

Figure design



- Use straightforward, familiar figure designs
- Keep them simple
- Readability: font sizes, color/shading/symbol distinctions, etc.
- Do you really need color?
- Do not mislead!
- Good captions

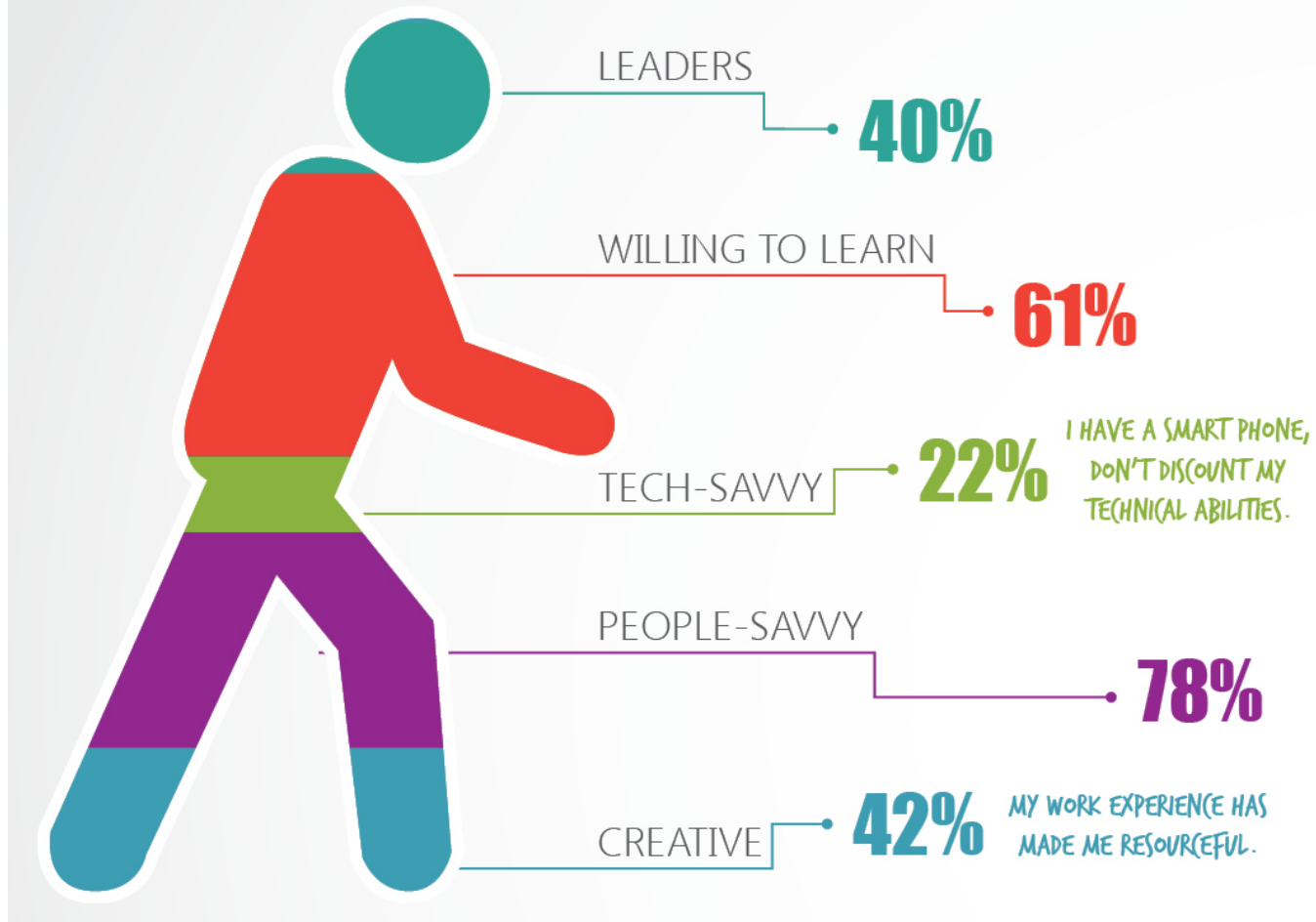
coral (*red*); macroalgae (*green*); turf algae (*blue*); CCA (*purple*)



Too much?

HOW BABY BOOMERS DESCRIBE THEMSELVES

via visual.ly/blog/learning-from-mistakes-in-visualization/



How many ways is this figure a disaster?