The speciation survey app: an interactive dashboard for exploring the results of the online survey

Sean Stankowski*[1,2], Ahmad Nadeem[3], and Mark Ravient[4]

[1]Department of Animal and Plant Sciences, University of Sheffield, Sheffield, UK
[2]Current Address: IST Austria, AM1 Campus, Klosterneuburg, Austria
[3]Department of Computer Science SBASSE, Lahore University of Management Sciences, Lahore, Pakistan.
[4]School of Life Sciences, University of Nottingham, Nottingham, UK
*seanstankowski@ist.ac.at; seanstankowski@gmail.com

1. Purpose and details of the speciation survey

This document gives basic instructions for how to install and use an interactive dashboard to explore and analyze the results of an online survey of speciation researchers. The purpose of the survey was to gauge thoughts about concepts and ideas that are central to speciation research along with respondent information about their research interests, level of experience and educational training.

The survey, which was written by Sean Stankowski and Mark Ravinet, received ethical approval through the University of Sheffield Ethics Review Procedure (Application 029768). The online survey was distributed using email lists for several speciation-focused conferences and workshops (Gordon Conference of Speciation 2019, Ventura, California; SMBE Speciation Genomics 2019, Tjärnö, Sweden; Speciation Genomics Conference, 2018 Cambridge, UK), and by targeted email and on Twitter and Evoldir. Responses were accepted from the 26/7/2019 until the 10/9/2019.

The online dashboard, produced by Ahmad Nadeem with directions from Sean Stankowski. It is designed to allow students and researchers to visualize and explore the results of the survey. Although we have tested the application extensively, we provide it 'as is'. Please report any bugs or errors so that they can be corrected.

Thus far, results of the survey have been used in the following peer-reviewed publications:

Stankowski S & Ravinet M (2021). Quantifying the species problem. *Current Biology*. In press.

Stankowski S & Rvianet M (2021). Defining the speciation continuum. ***Evolution***. In press.

2. Accessing the shiny app

There are two ways to access the shiny app: online via the URL provided below, or by deploying the app in your own shiny account. The later option is recommended because the URL provided can only receive limited traffic.

Option 1: Via the following URL

This is the easiest way to access the survey. A limited number of users can access the dashboard at once via this link, so it is possible that it may not work at the time that you want to use it.

https://speciation-survey.shinyapps.io/final_speciation_survey/

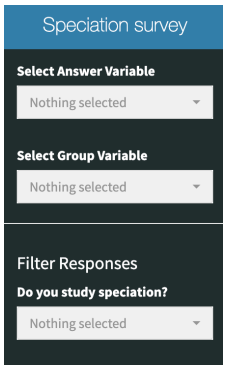
Option 2: By deploying the app from your own shiny account

A second option is to deploy the app from your own computer. This requires a local instillation of R https://www.r-project.org/.

1) Download the app file, *app.R*, and datafile *20_dec_survey_cleaner_without_taxa.xlsx* https://github.com/seanstankowski/Speciation_survey
2) Move these files to a directory on your computer and note the full path to the directory containing the files (i.e., the 'working directory'). You will need this when deploying the app.
3) Sign up for a shiny account: https://www.shinyapps.io/admin/#/signup
4) In your R console, follow the instructions on the shiny website. There are 3 steps: INSTALL RSCONNECT, AUTHORIZE ACCOUNT, and DEPLOY. Note that last step requires that additional R packages are installed on your machine. If they are not installed, you will be notified by warning messages. Simply install the listed packages and their dependencies and re-deploy.

3. Using the shiny app

If you have successfully deployed the app, you should see a window following window with several dropdown menus in the left margins:



Use the **Select Answer Variable** dropdown to indicate the answer to be plotted as a stacked bar graph. Percentages and sample sizes are always reported for this variable.

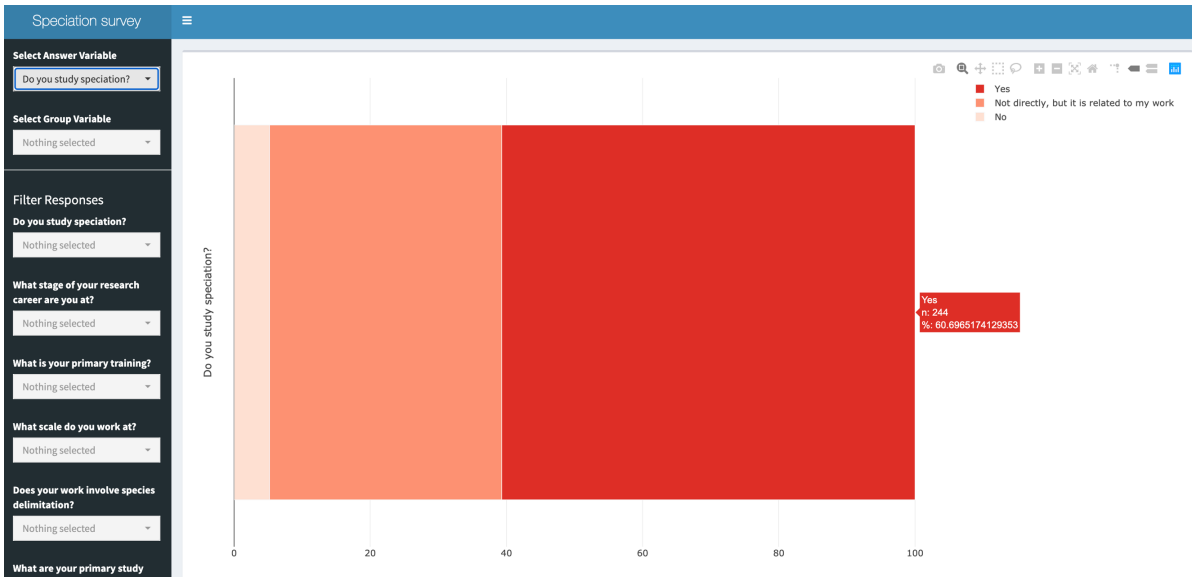
The **Select Group Variable** dropdown controls which question the answer variable is plotted by.

The **Filter Reponses** dropdowns allow some or all answers for each question to be excluded

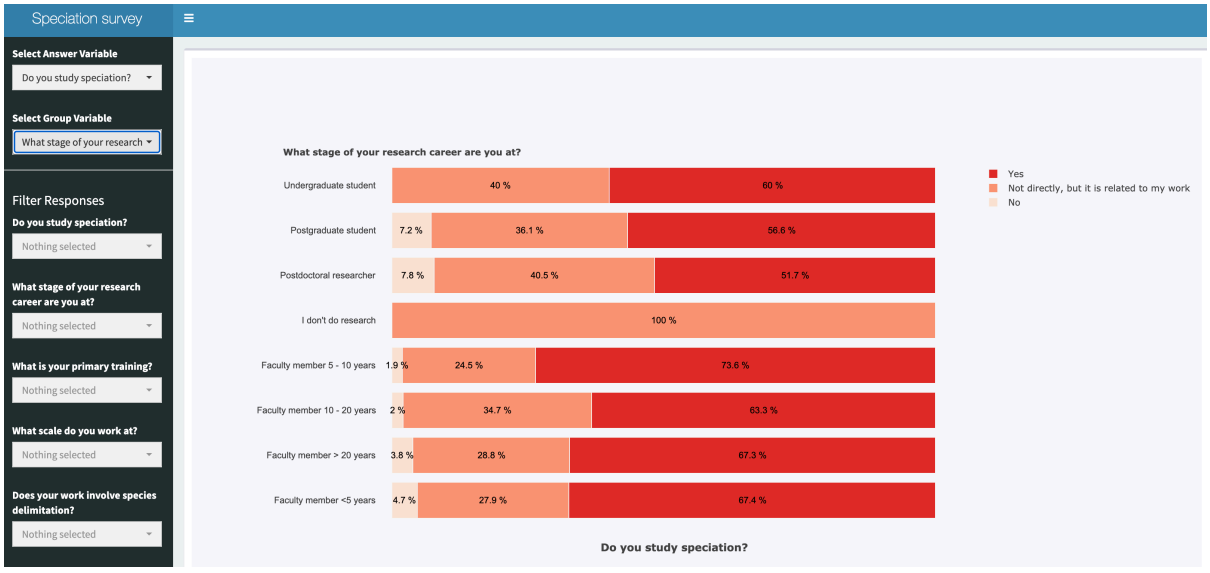
Examples

Here is a simple plot with only an answer variable selected (*Do you study speciation?)*. The percentage (%) and number of responses (*n*) for each answer can

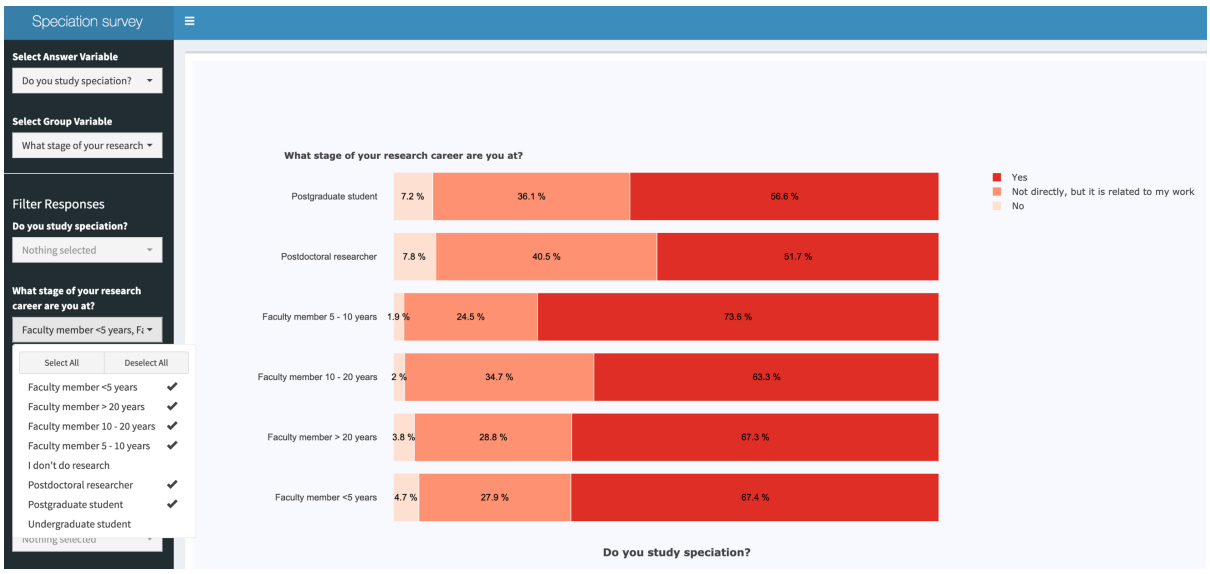
be seen by hovering over each section of the bar. The toolbar at the top right has some other tools for data exploration.



Here is the same answer variable (*Do you study speciation?)* plotted by a group variable (*What stage of your career are you at?*).



We can remove 'undergraduate students' and 'people who don't do research' (both have small sample sizes) using the Filter Reponses dropdown for relevant group variable (*What stage of your career are you at?*) and selecting only the groups to keep.



The Filter Reponses dropdowns can be used for any number of questions simultaneously. This means that it is possible to view the answers in any way that the user desires.

4. Suggestions for formal analysis

The dashboard is exploratory tool so is not intended to produce publication quality graphs or to perform statistical analysis. The percentages and sample sizes can be recorded manually by the user using the hover tools ('show closest data on hover' and 'compare data on hover') and analyzed and illustrated using other packages.

5. Survey questions included in the dashboard

The following images show the survey form that was filled in by respondents. Some answers were not included in the dashboard because they required that the users provided written answers. These answers were complex and unique so could not be summarized in the same way as questions with fixed option. The answers to these questions can be downloaded in the

Speciation: The Survey!

This survey is designed to gauge thoughts on concepts that are central to speciation research. The survey is anonymous. The summarized results may be circulated and published and answers will ultimately be available to anyone that wants to use them. The country of origin will only be used to measure the spread of the survey. Please circulate the link to anyone that you think may be interested in taking part.

The survey was written by Dr. Sean Stankowski, a research scientist from the department of Animal and Plant Sciences at the University of Sheffield (https://www.sheffield.ac.uk/aps), and Dr. Mark Ravinet, a research scientist from the Centre for Ecological and Evolutionary Synthesis (https://www.mn.uio.no/cees/). If you have any general questions about the survey, please email: s.stankowski@sheffield.ac.uk

The survey has received ethical approval from the Department of Animal and Plant Sciences, University of Sheffield. In the event of any concern or complaint about this survey, please contact the Head of Department, of Animal and Plant Sciences, University of Sheffield.

Consent: please confirm that you understand that your anonymous answers may be summarized, circulated and published.

- [ ] I confim consent

Only confirmed answers included in dashboard

What country are you in? This will only be used determine the reach of the survey; leave blank if you would rather not say.

Short answer text

Not included; list of countries can be downloaded

Do you study speciation?

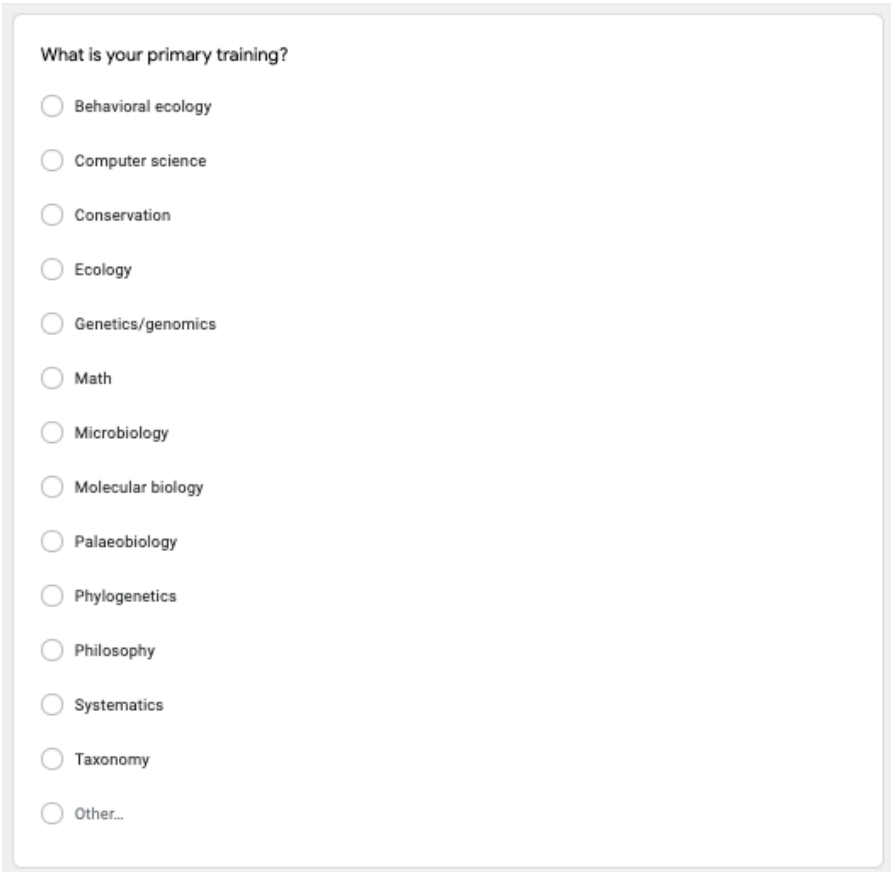
- ( ) Yes
- ( ) No
- ( ) Not directly, but it is related to my work

Included

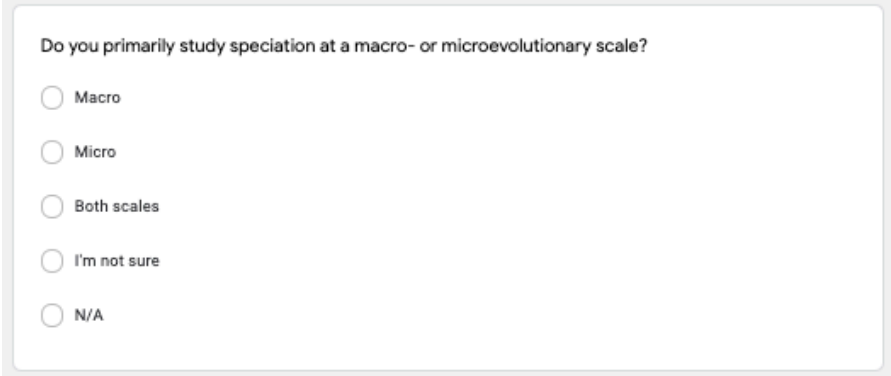
What stage of your research career are you at?

- ( ) I don't do research
- ( ) Undergraduate student
- ( ) Postgraduate student
- ( ) Postdoctoral researcher
- ( ) Faculty member <5 years
- ( ) Faculty member 5 - 10 years
- ( ) Faculty member 10 - 20 years
- ( ) Faculty member > 20 years

Included



Included; by choosing 'other', respondents could provide a written answer. These were included in the app if they were used more than once. Singletons were included as 'other'



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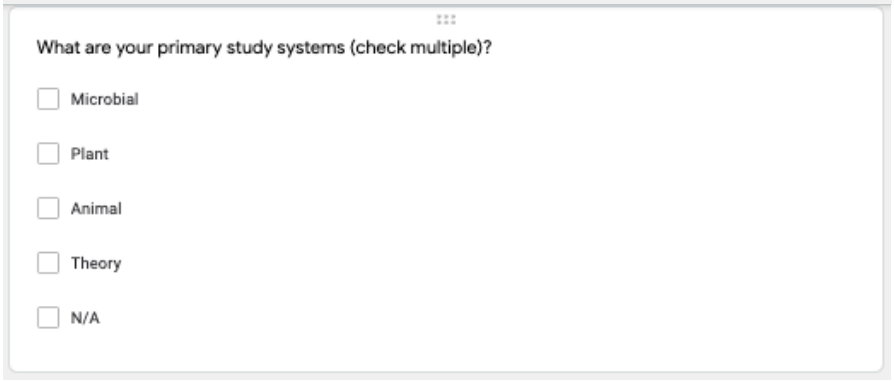

Included

What are the main taxa (e.g., genera, groups) have you worked on (if applicable)? If multiple, please list these chronologically separated by commas.

Short answer text

Not included; several respondents indicated the answers enabled them to be identified. List of taxa can be downloaded.

Do you use experimental evolution in your research?

- No
- Yes
- N/A

Included

What is the primary species concept that you work with?

- Genotypic Cluster Species Concept (Mallet 1995): A distinguishable group of individuals that has few or n...
- Recognition Species Concept (Paterson 1985): The most inclusive population of individual biparental orga...
- Cohesion Species Concept (Templeton 1989): The most inclusive population of individuals having the pote...
- Ecological Species Concept (Van Valen 1976): A species is a lineage (or closely related set of lineages), w...
- Evolutionary Species Concept (Wiley 1978; Simpson 1961): A single lineage of ancestral descendant popul...
- Evolutionary Species Concept II (Barraclough 2019): An independently evolving group of organisms that is ...
- Biological Species Concept (Mayr 1995): Species are groups of interbreeding natural populations that are r...
- Relaxed Biological Species Concept (Coyne & Orr 2004): Species are groups of interbreeding natural popul...
- Phylogenetic Species Concept. e.g., (de Queiroz & Donoghue 1998): A species is the smallest (exclusive) ...
- Genealogical Species Concept (Baum and Donoghue 1995): A species is a basal, exclusive group of organi...
- I tend to follow the existing taxonomy for the group I work on rather than a specific concept.
- My favourite species concept isn't here!
- N/A

Included

If the species concept that you work with was not listed above, what is it (provide a reference if possible)?

Long answer text

Answers were included with the above question if a reference was provided

Has the species concept that you work with changed over time?

- Yes
- No
- N/A

Included

In a sentence or two, what is reproductive isolation?

Long answer text

Included

Briefly, When does speciation begin?

Long answer text

Not included; short answer format. Short answers can be downloaded.

When does speciation end?

Long answer text

Not included; short answer format. Short answers can be downloaded

Have you referred to the 'speciation continuum' in your work?

- ○ Yes
- ○ No
- ○ I've never heard of the speciation continuum
- ○ N/A

Included

Position on the speciation continuum informs us directly about (You can check multiple boxes)

- ☐ Time
- ☐ Progress of speciation
- ☐ Level of phenotypic divergence
- ☐ Level of genetic divergence
- ☐ Strength of reproductive isolation
- ☐ Level of ecological divergence
- ☐ I'm not sure

Included

Do you think that the speciation continuum is a useful concept for helping us understand speciation?

- ○ Yes
- ○ No
- ○ I'm not sure

Included

Please explain why you think the speciation continuum is/is not useful (or why you are not sure).

Long answer text

Not included; short answer format. Short answers can be downloaded