

[EXTERNAL] FW: for our discussion tomorrow

Jerod Merkle <jmerkle@uwyo.edu>

Fri 6/9/2023 9:55 AM

To: Geremia, Chris J <Chris\_Geremia@nps.gov>

 3 attachments (1 MB)

Results of bison social analyses 4 April 2019.docx; bison\_network\_diads.pdf; Individual\_network\_metrics.pdf;

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**From:** Jerod Merkle

**Sent:** Thursday, April 4, 2019 5:42 PM

**To:** Geremia, Chris <chris\_geremia@nps.gov>

**Subject:** for our discussion tomorrow

Ger,

We still on to chat at 2pm tomorrow? If so, I've made some more progress on the analyses. See attached for some discussion points. Looking forward to it!

Jerod

## Results of bison social analyses. 4 April 2019

Seasons:

Breeding season: 1 July to 31 Aug

Removal season: 30 Nov to 31 March

Figure 1. Proportion of time diads are together during each season. This shows how diads spend more time together during the breeding season.

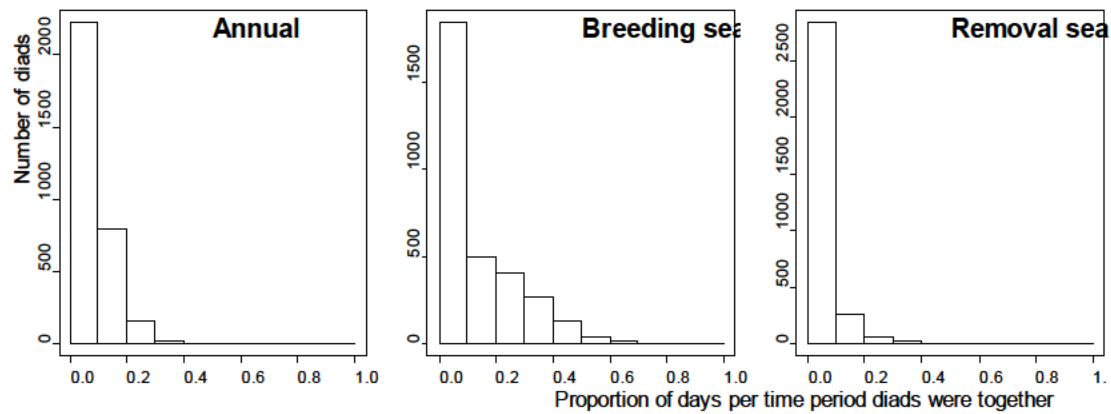


Figure 2. Histogram of time spent on northern range across all id-yrs.

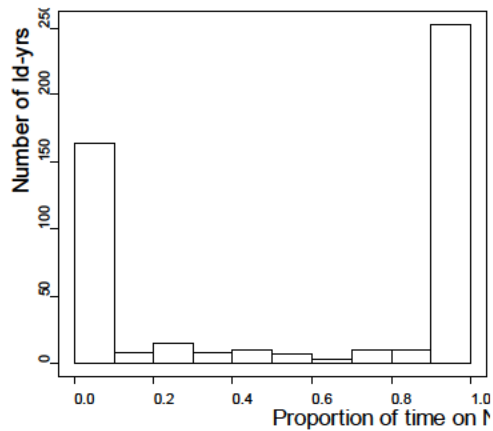


Figure 3. Some basic metrics of each Annual network developed for each year. This includes a) the number of collared animals in each year; b) the number of clusters identified; c) the mean number of connections among individuals compared to all the connections possible; and d) mean centrality of the graphs. In general, vertices with high eigenvector centralities are those which are connected to many other vertices which are, in turn, connected to many others (and so on).

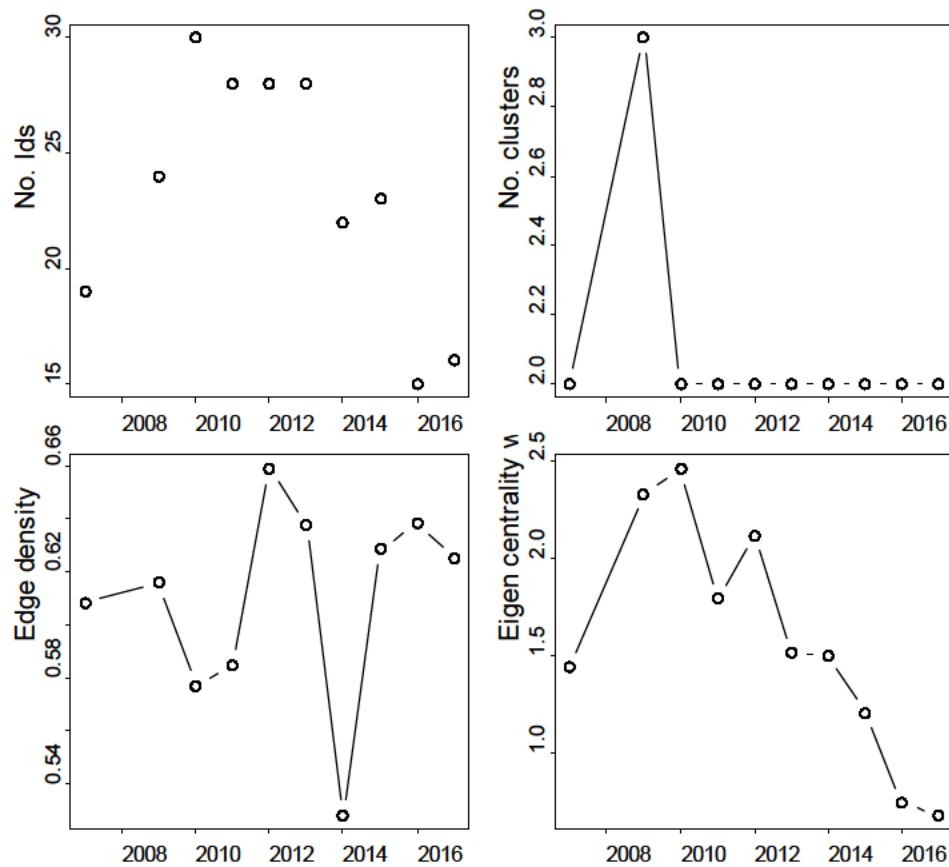
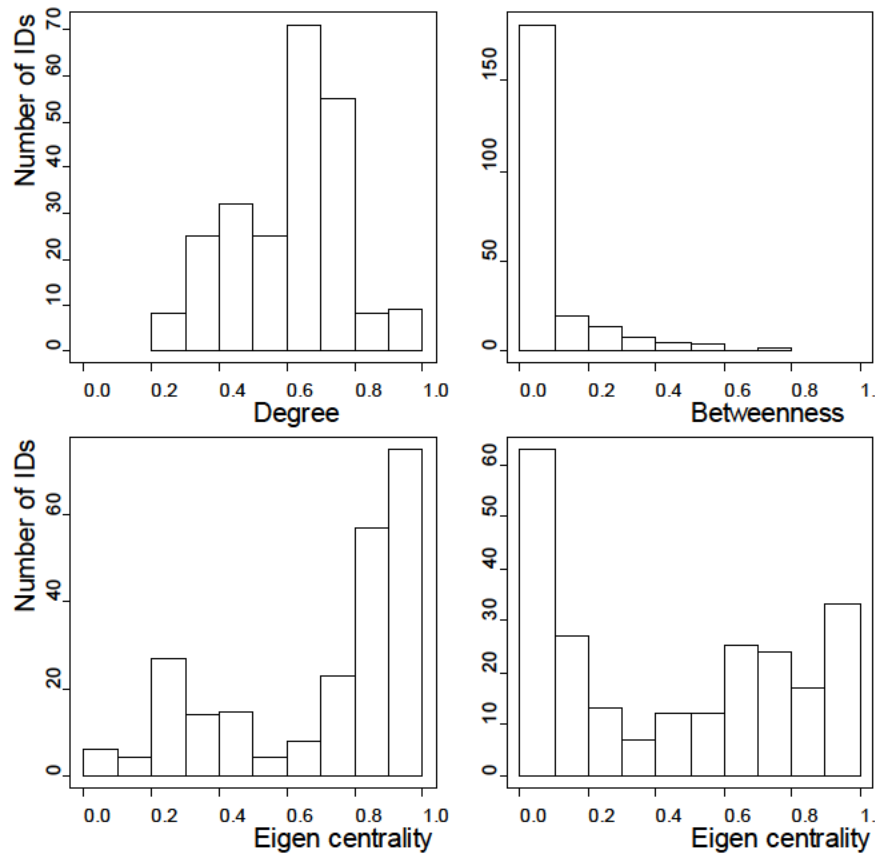
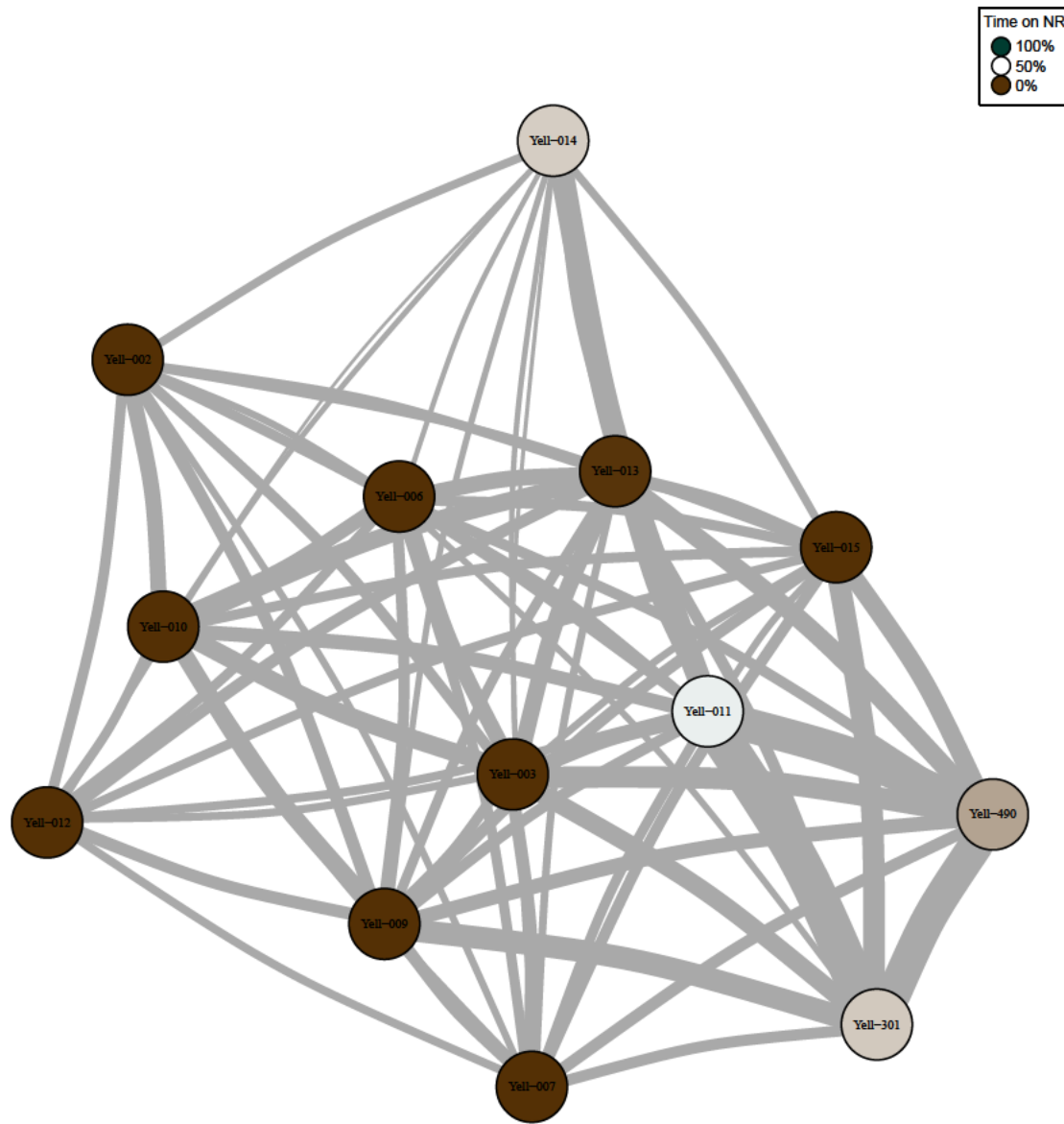


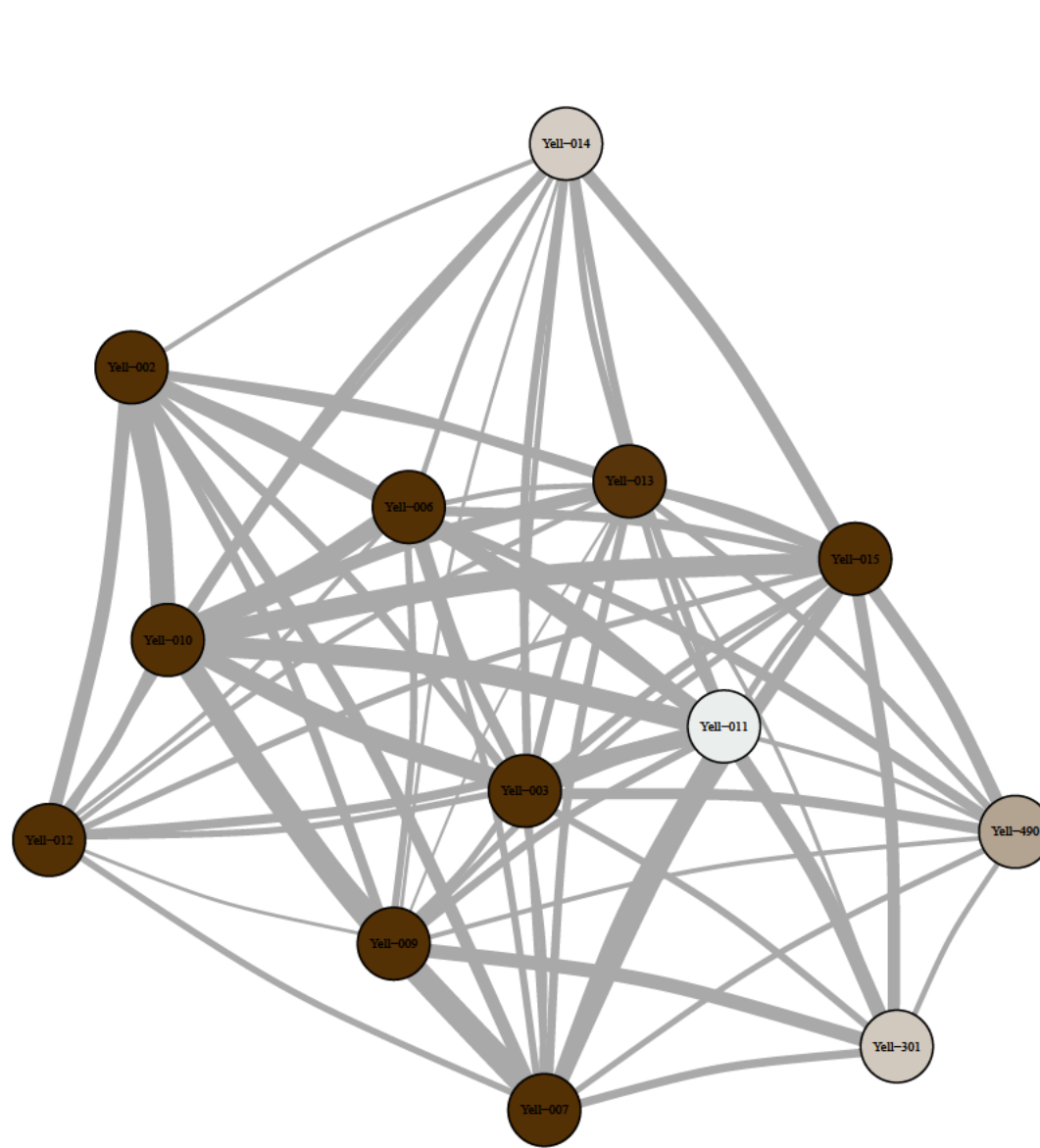
Figure 4. Distribution of network metrics for individual animals across the years. The degree of a vertex is the number of its adjacent edges. The vertex betweenness is defined by the number of shortest paths going through a vertex. In general, vertices with high eigenvector centralities are those which are connected to many other vertices which are, in turn, connected to many others (and so on). (The perceptive may realize that this implies that the largest values will be obtained by individuals in large cliques (or high-density substructures)).



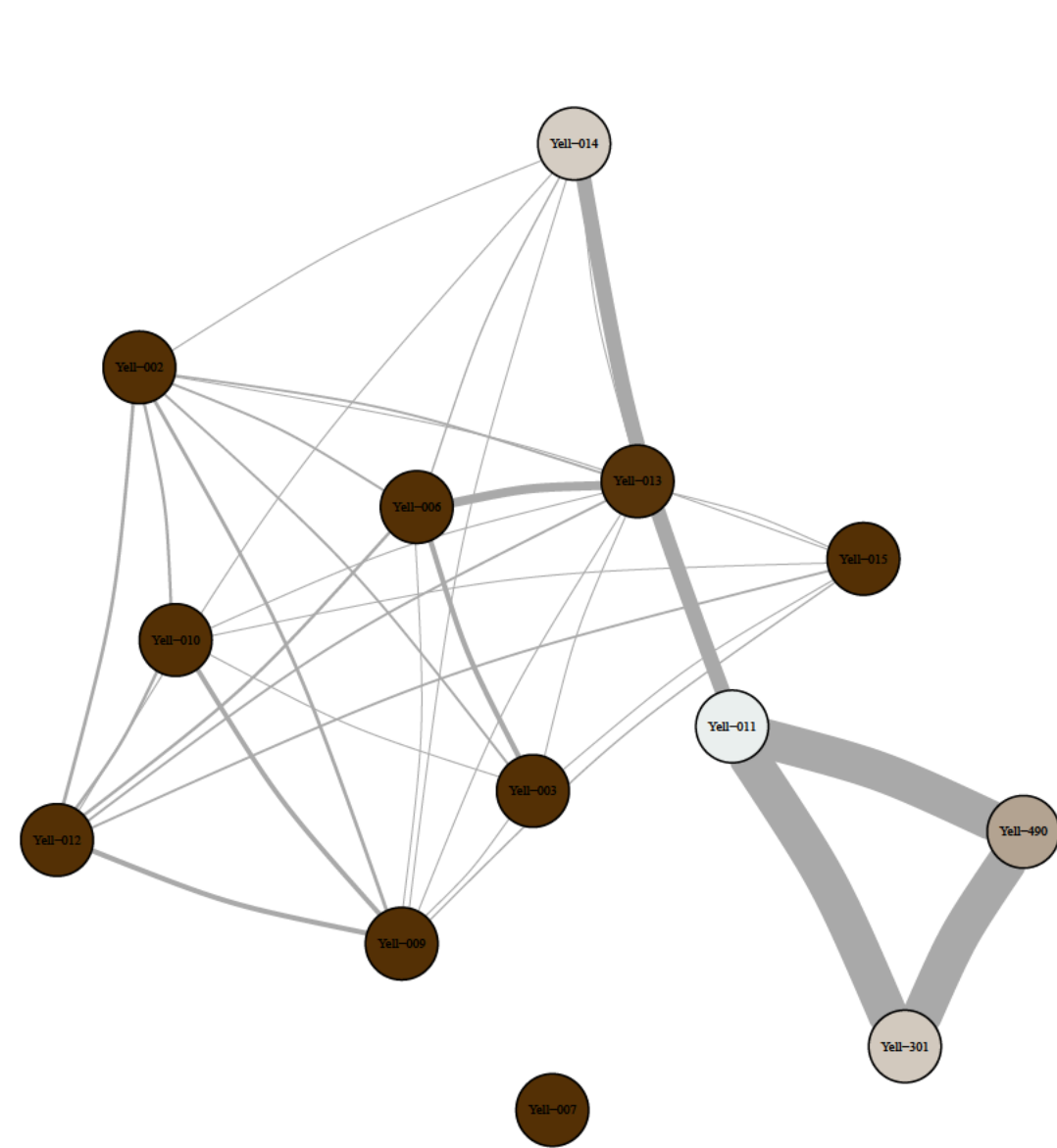
Annual: 2004



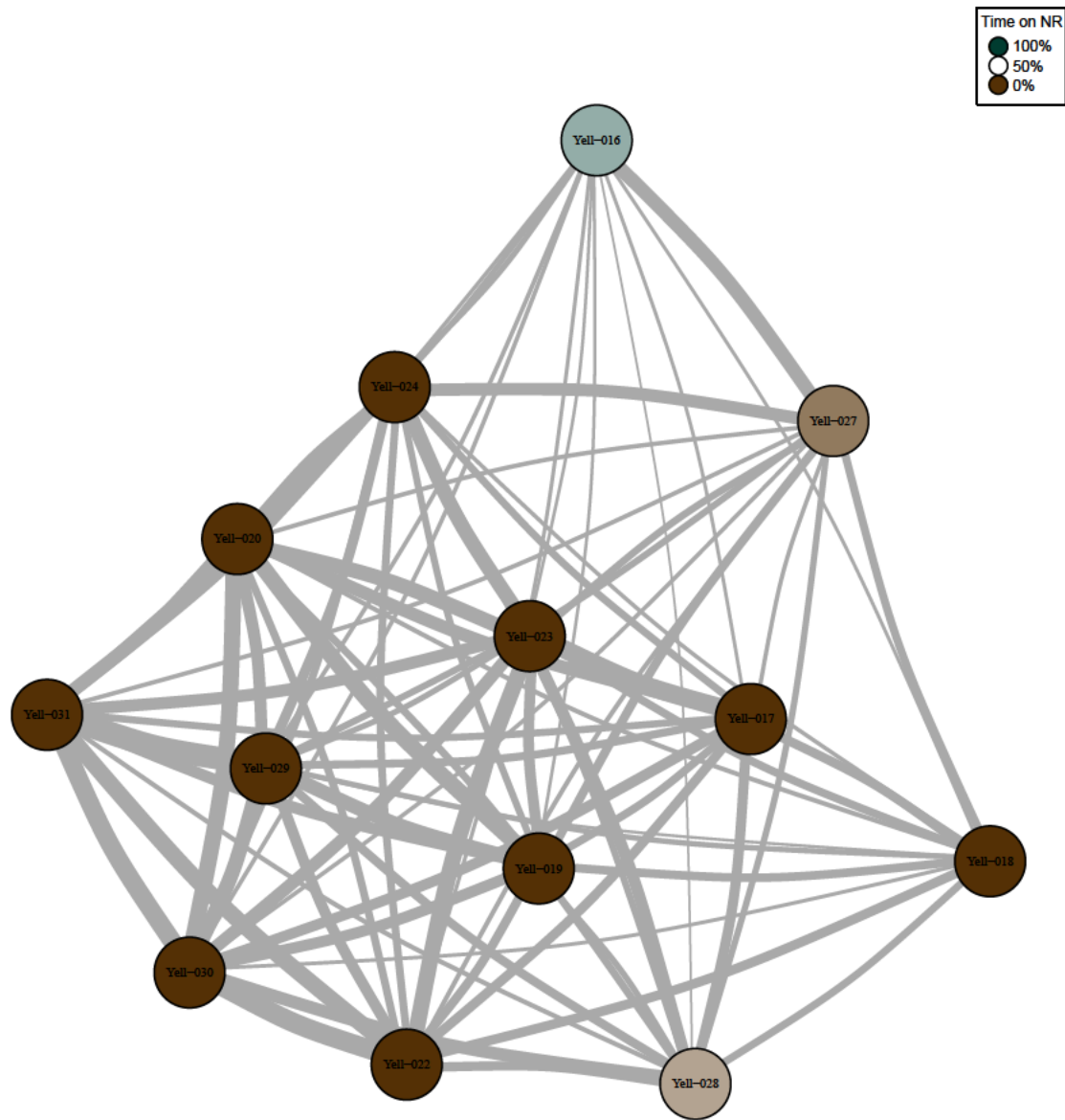
Breeding season: 2004



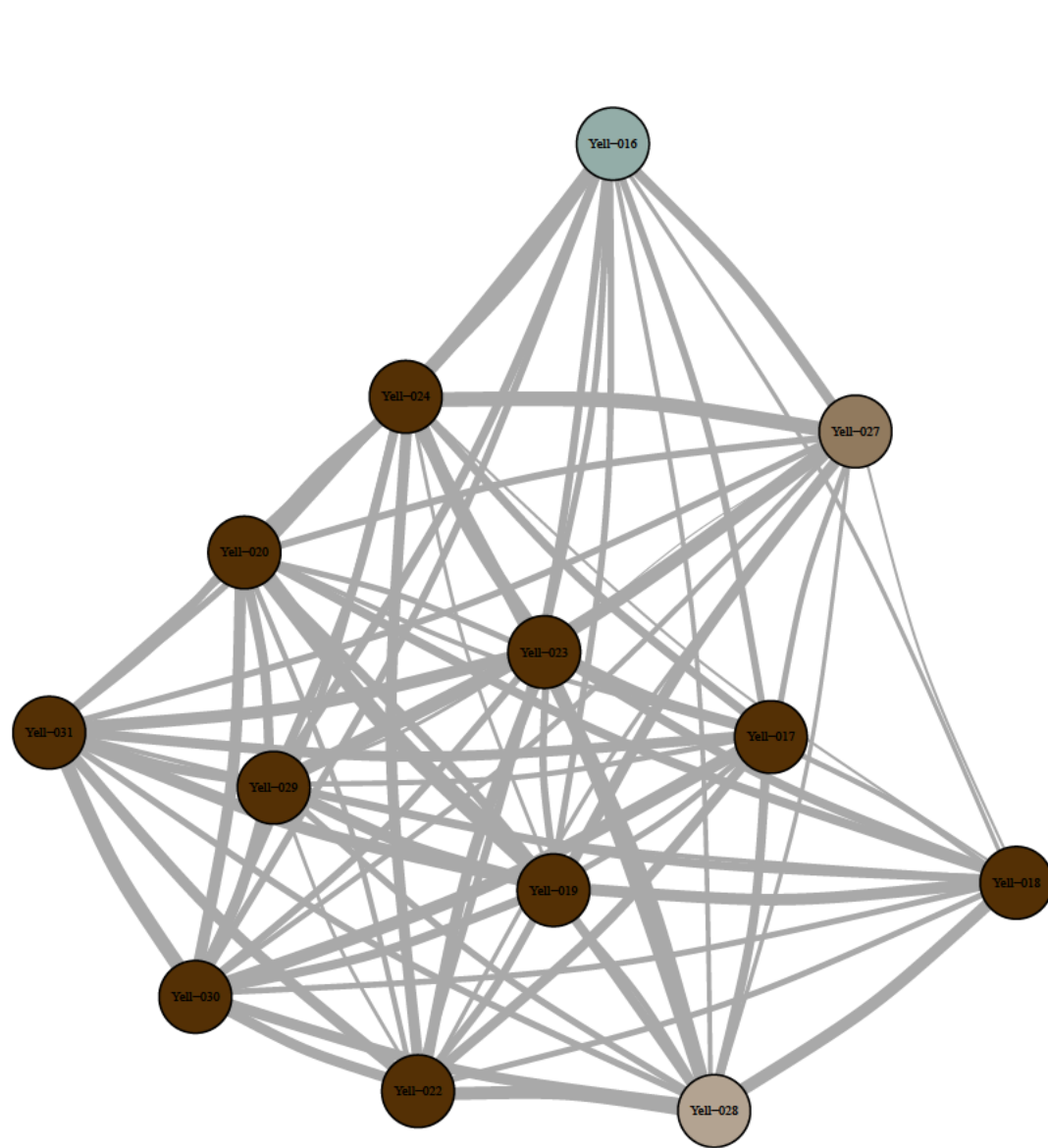
Removal season: 2004



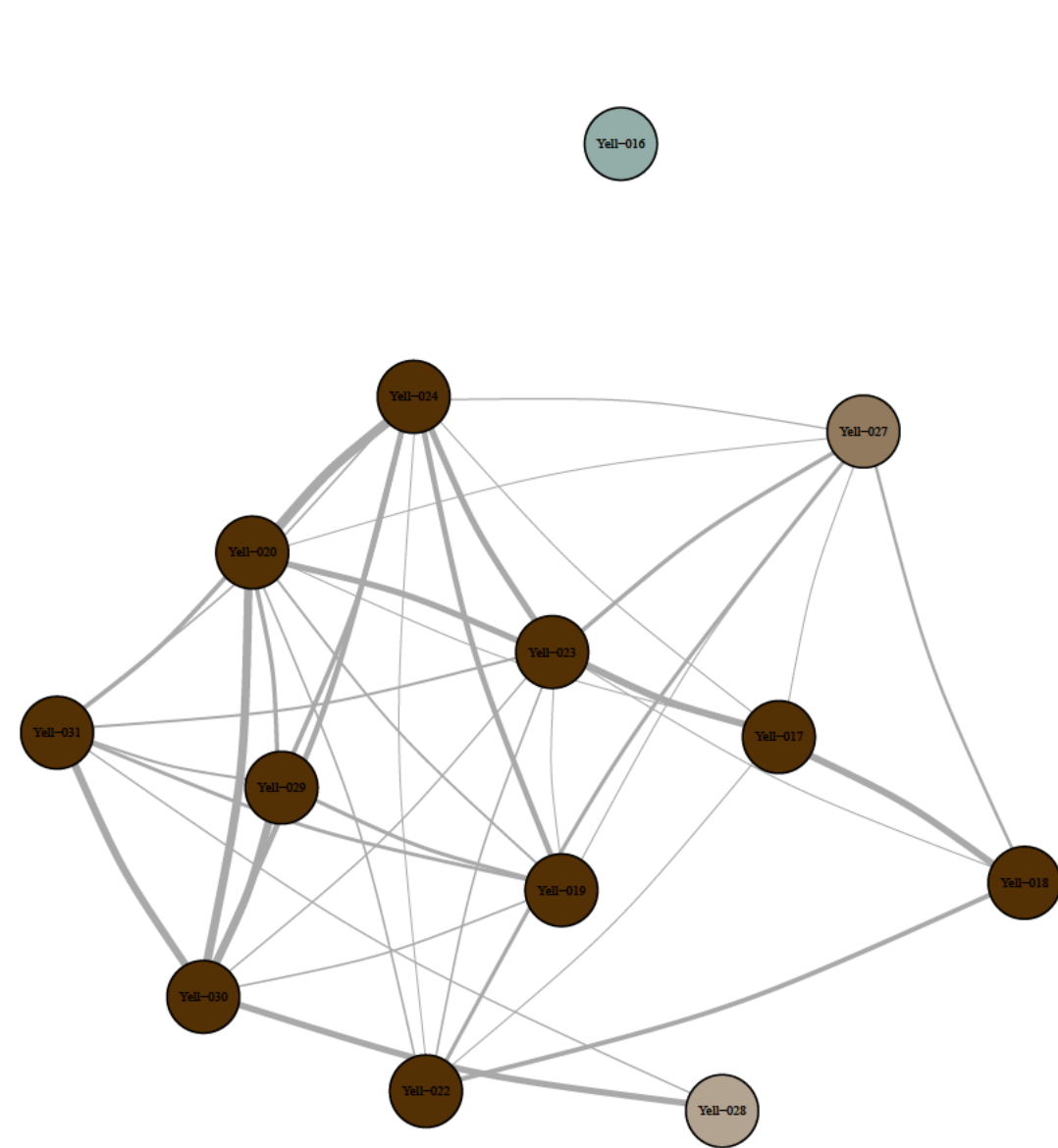
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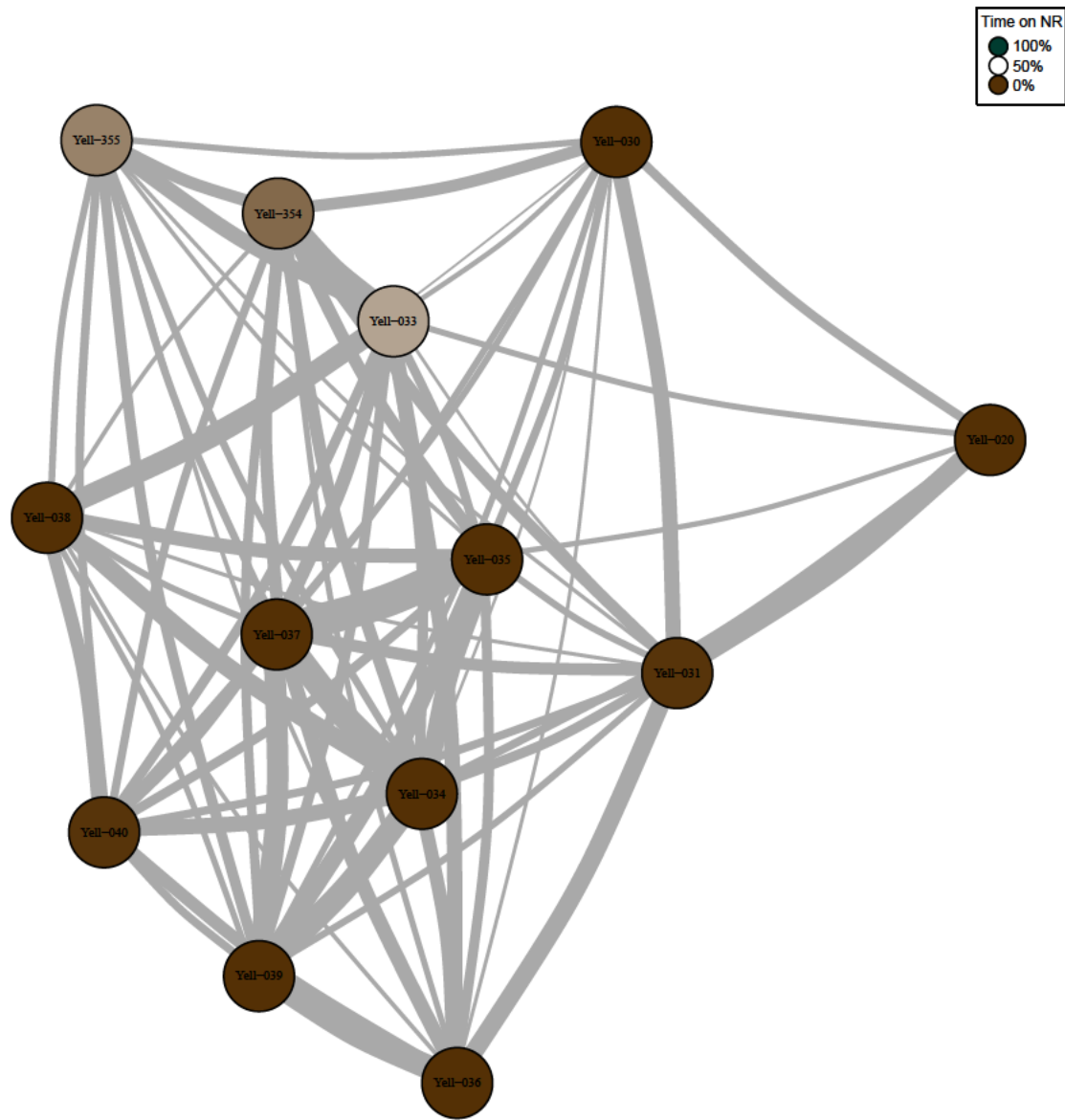
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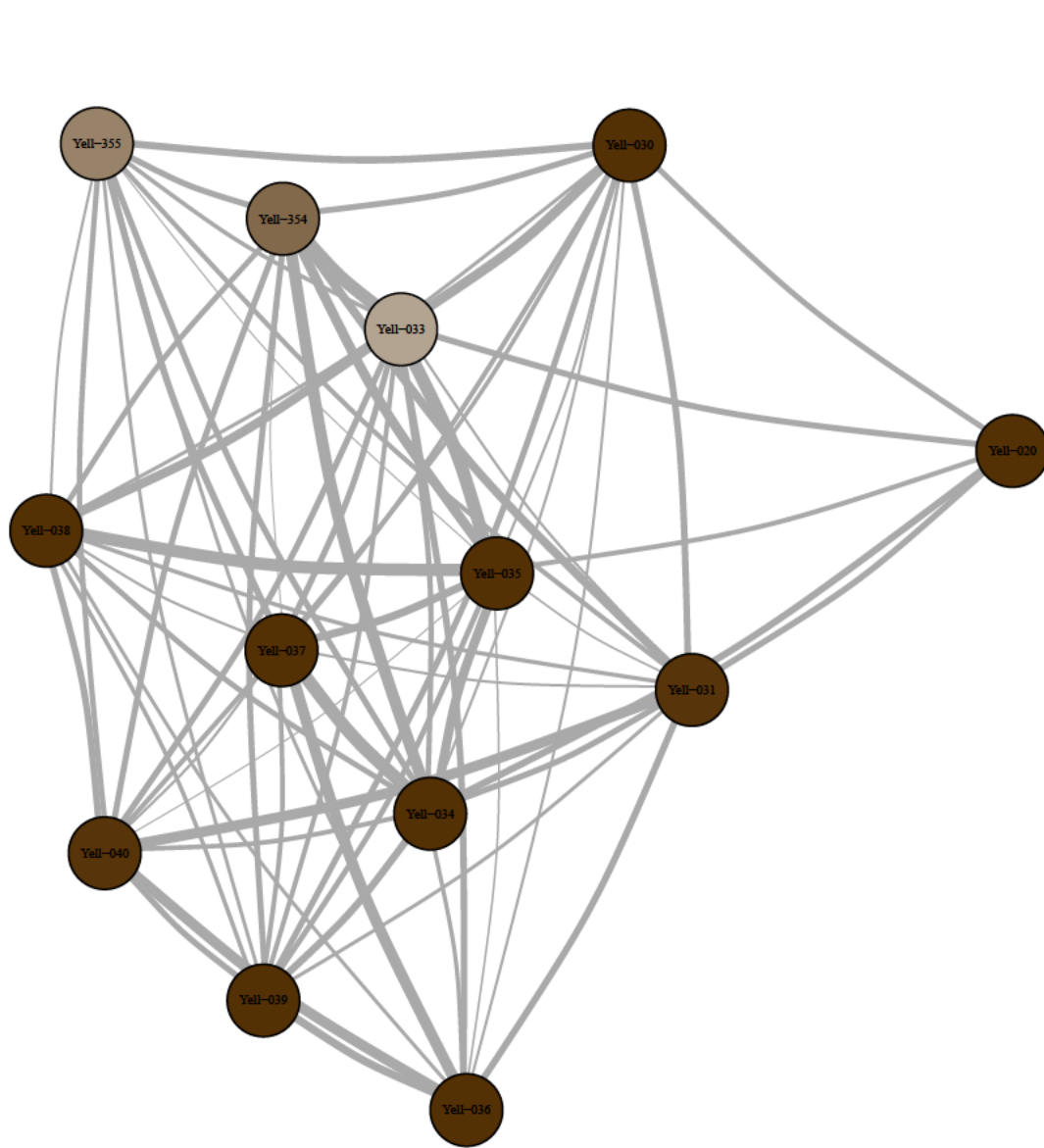
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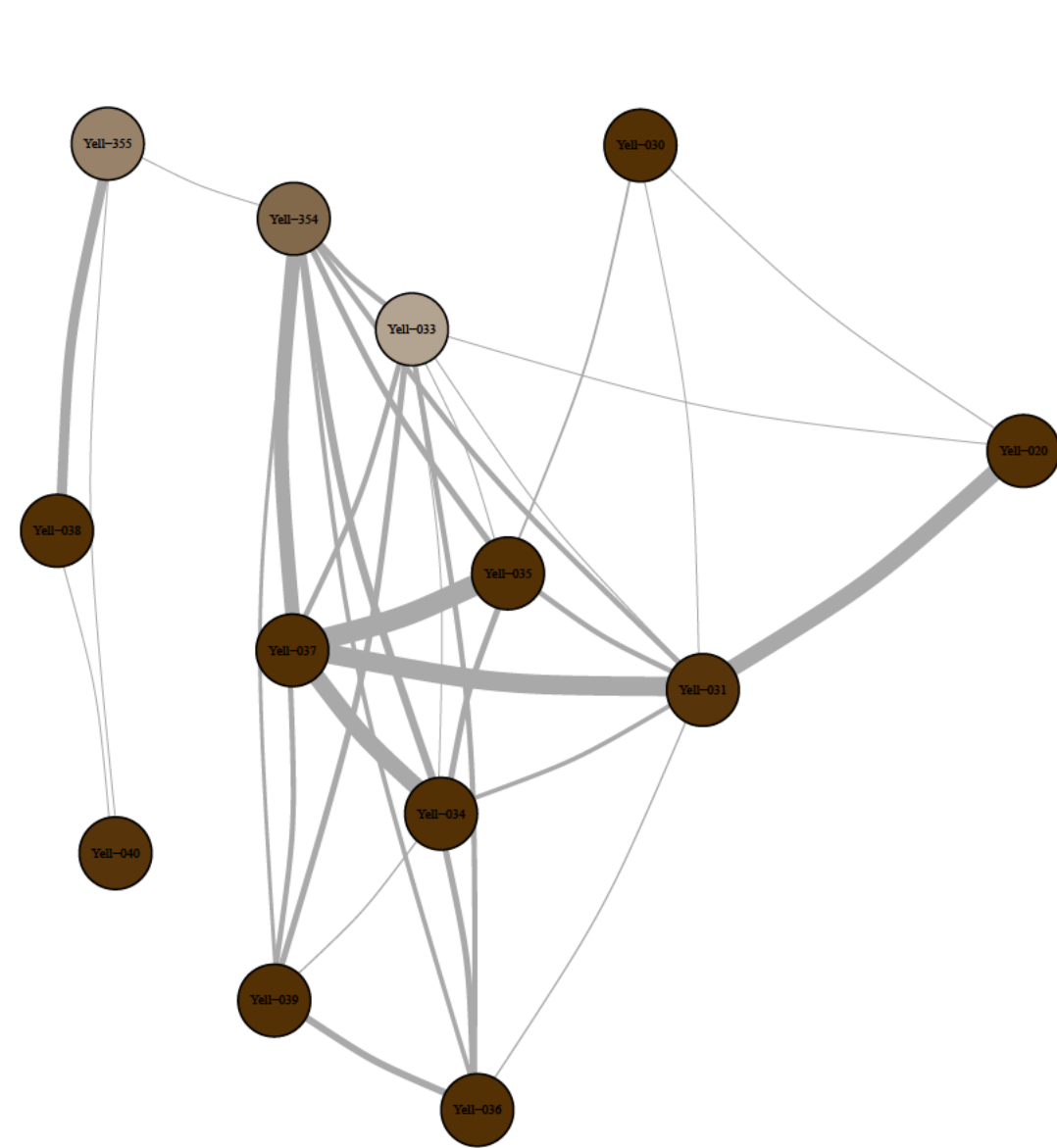
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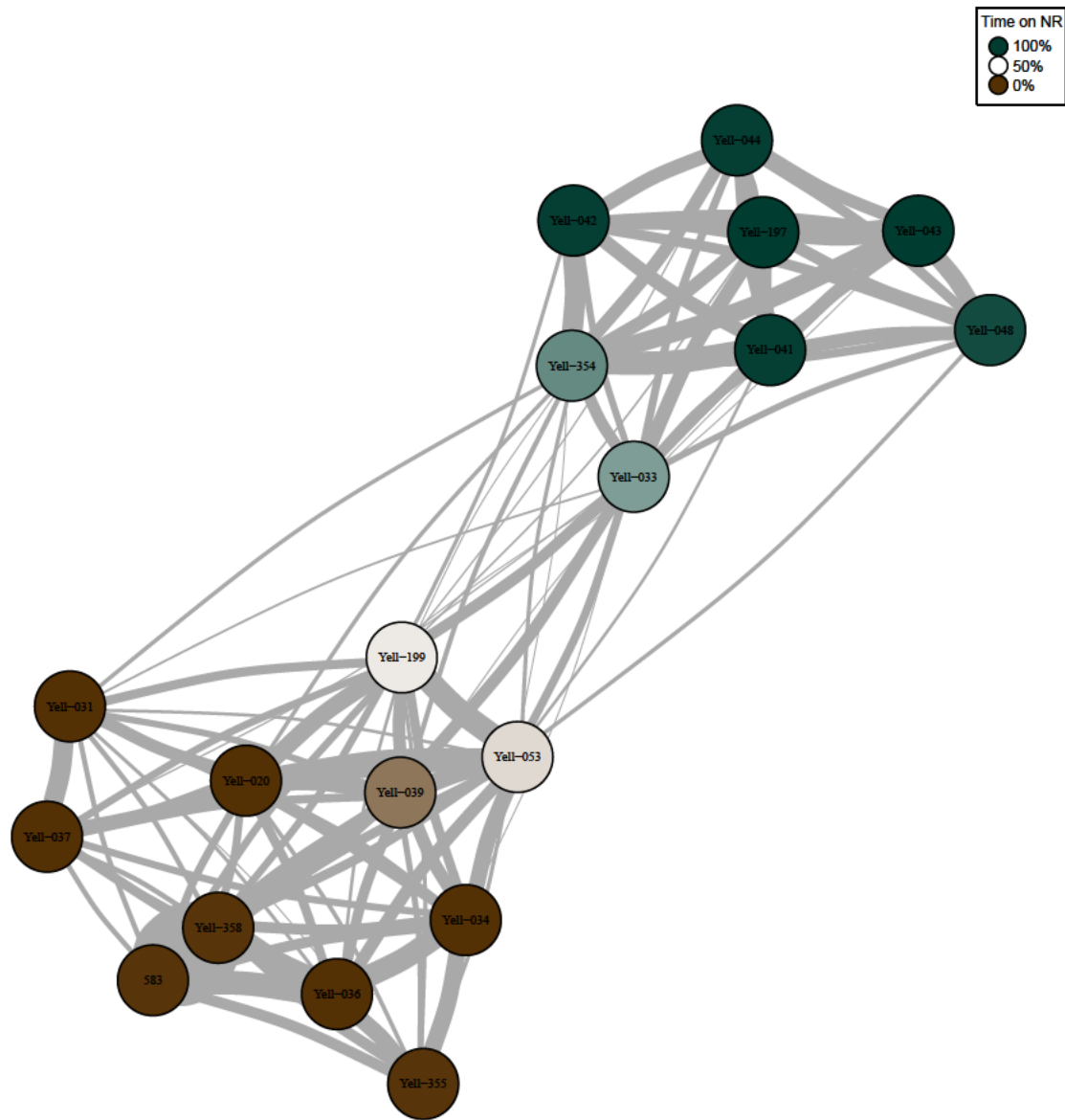
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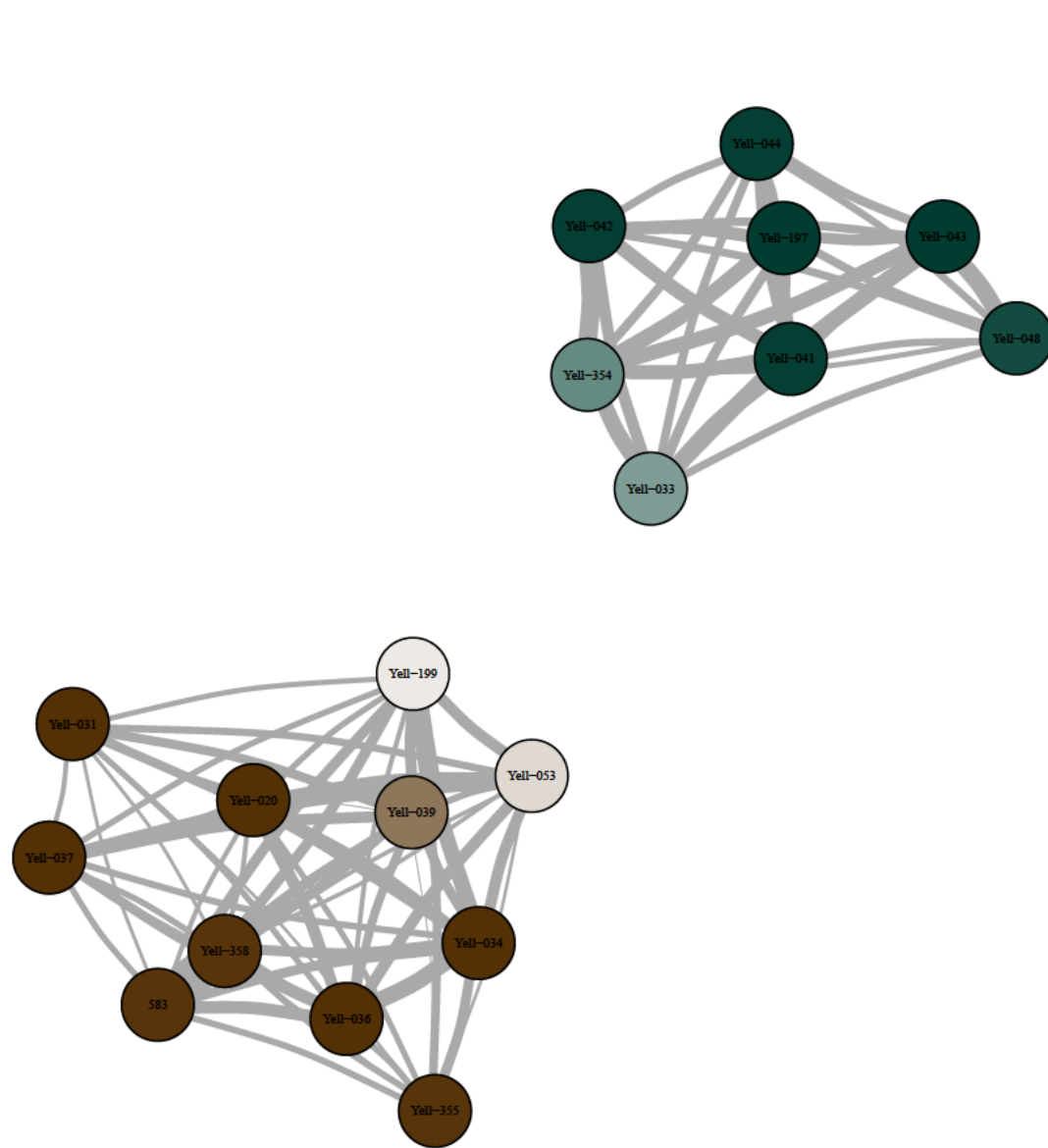
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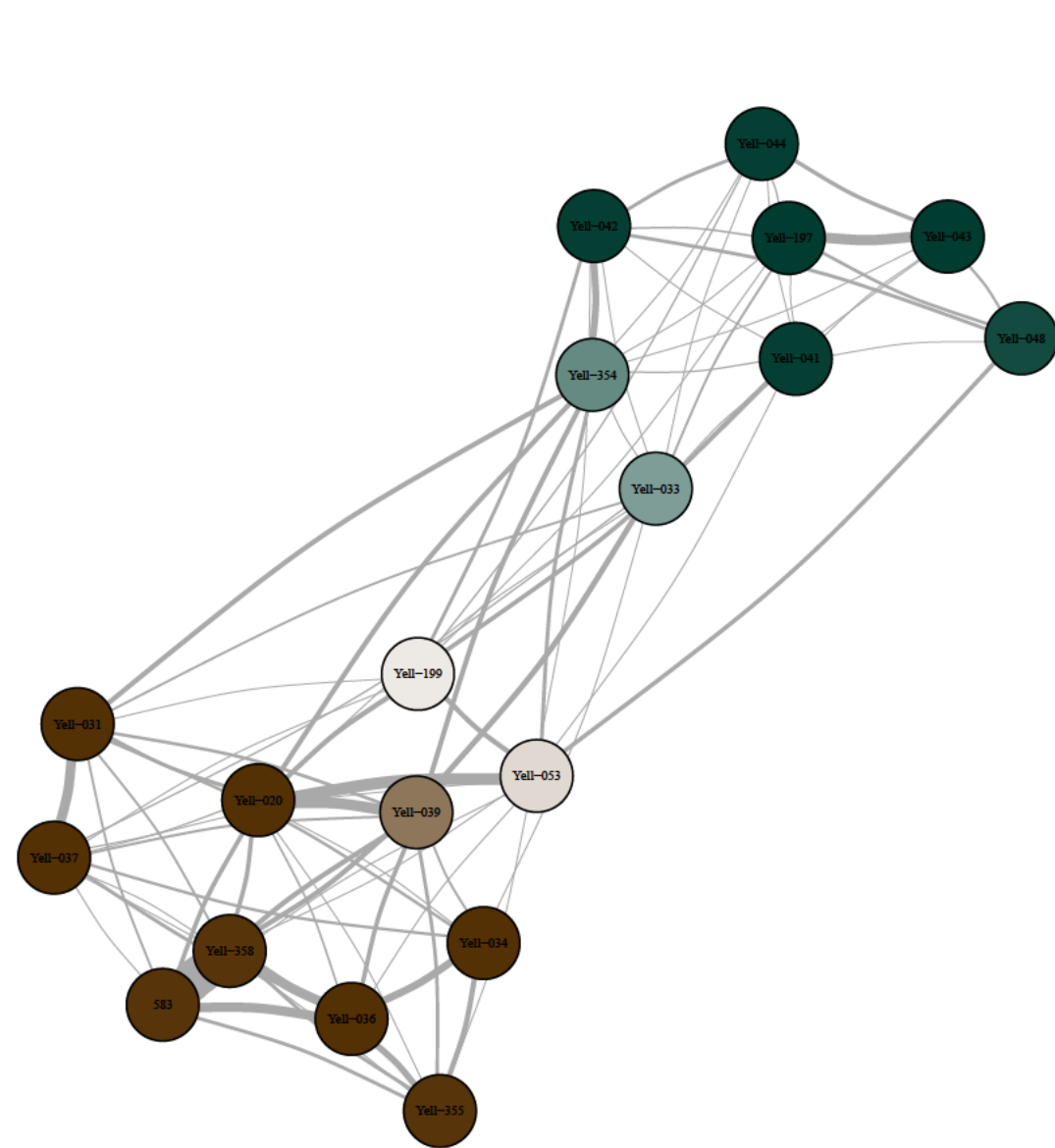
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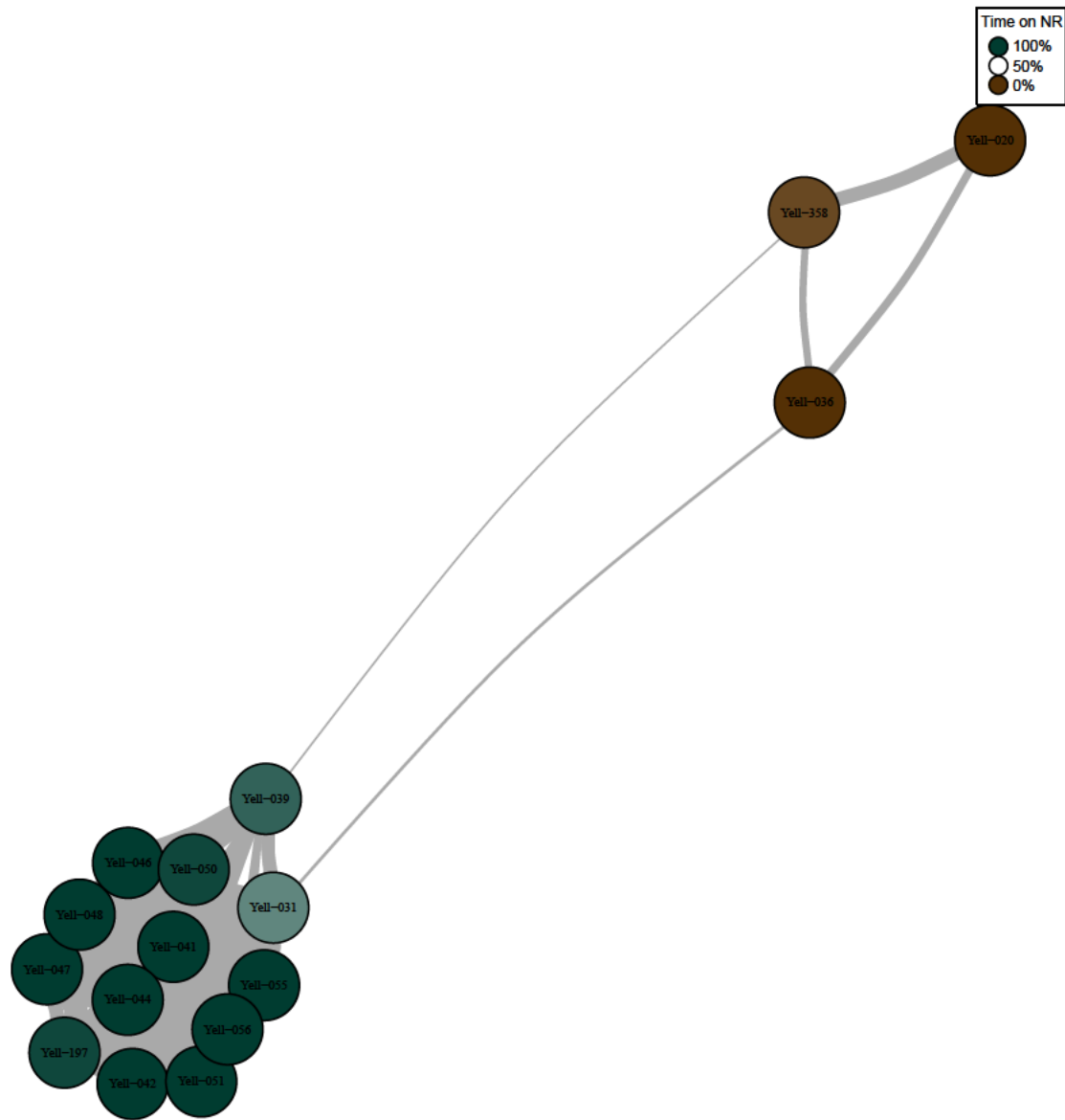


Removal season: 2007

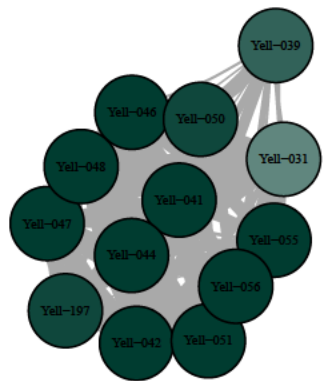




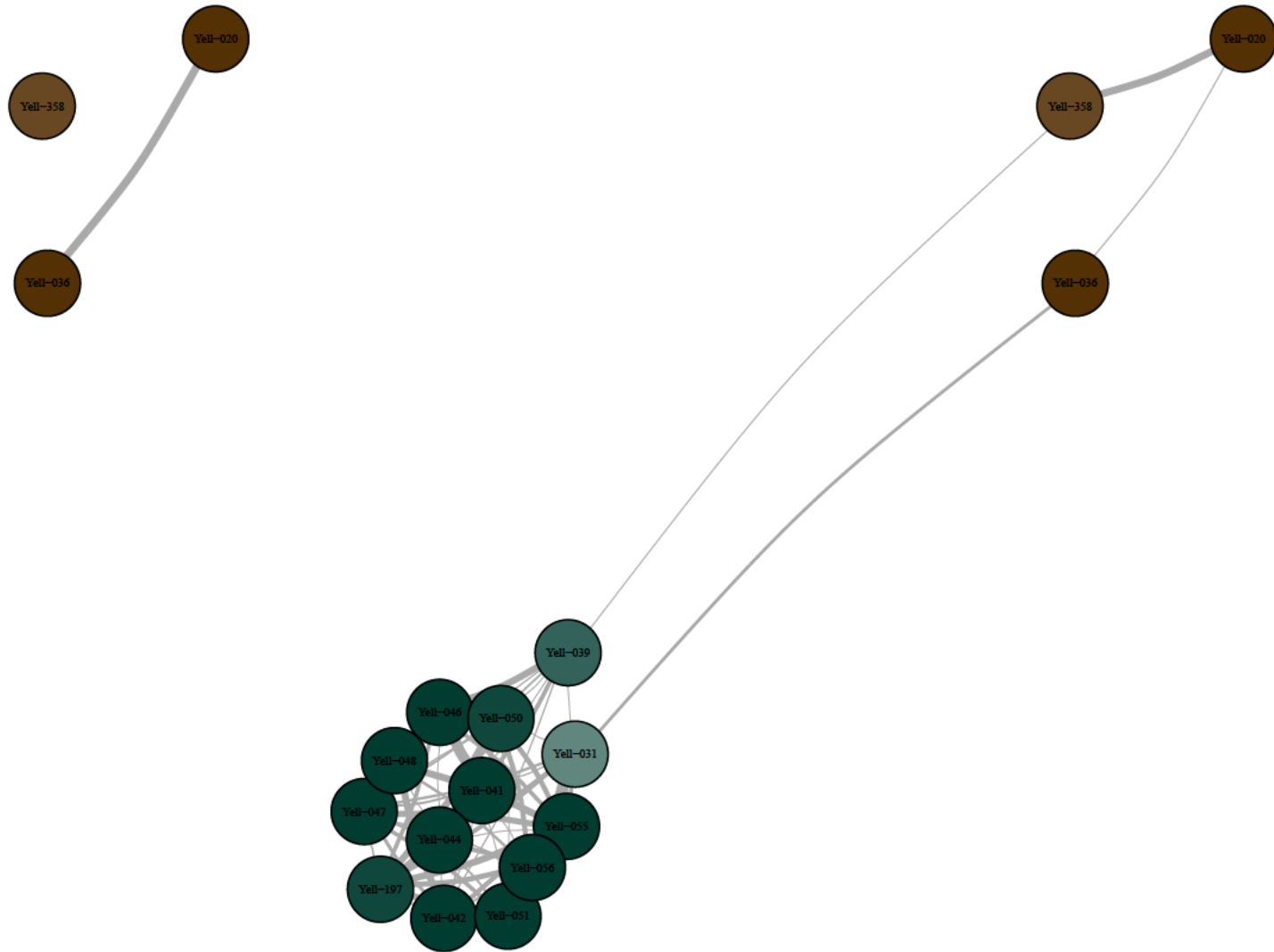
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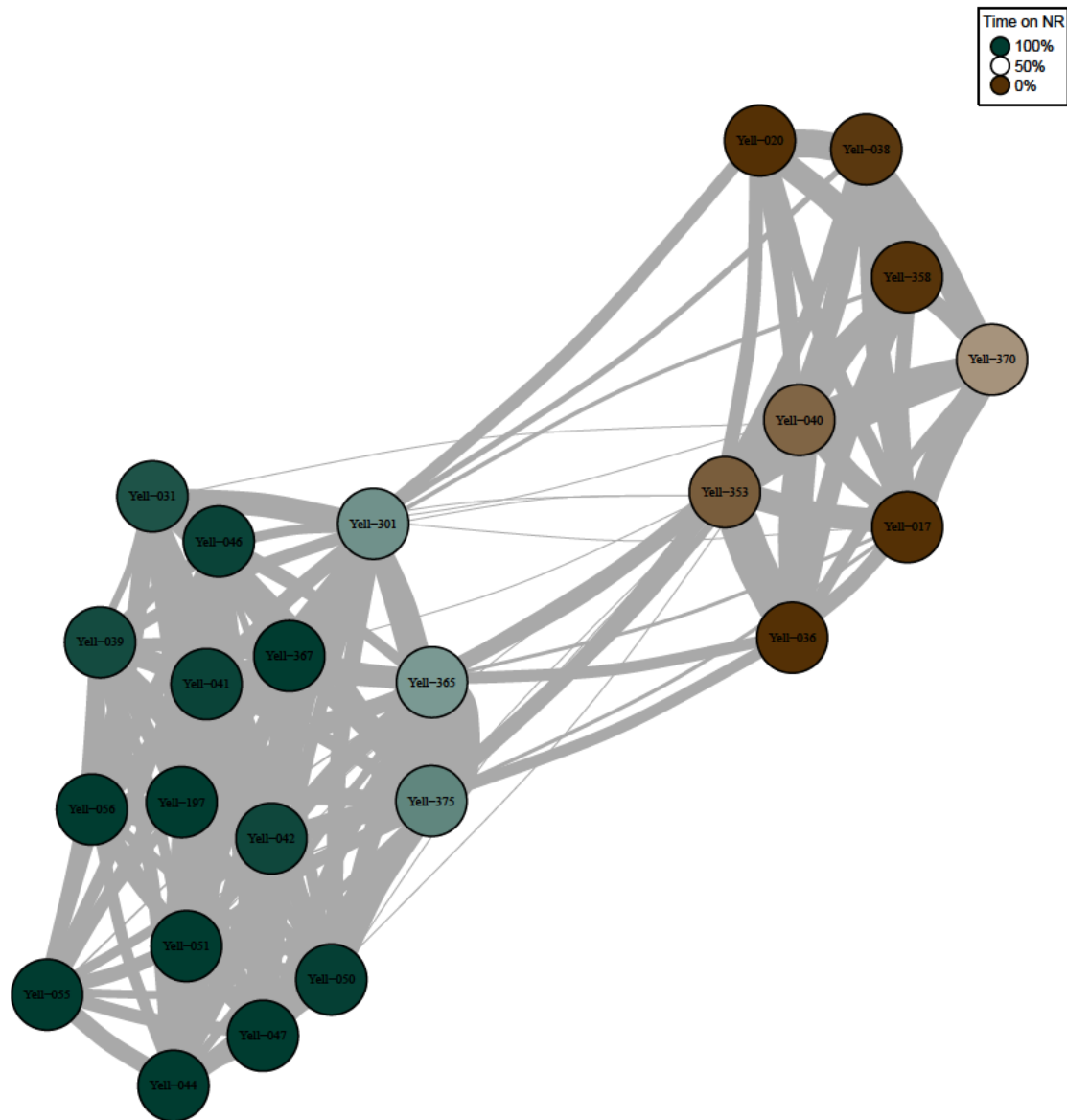
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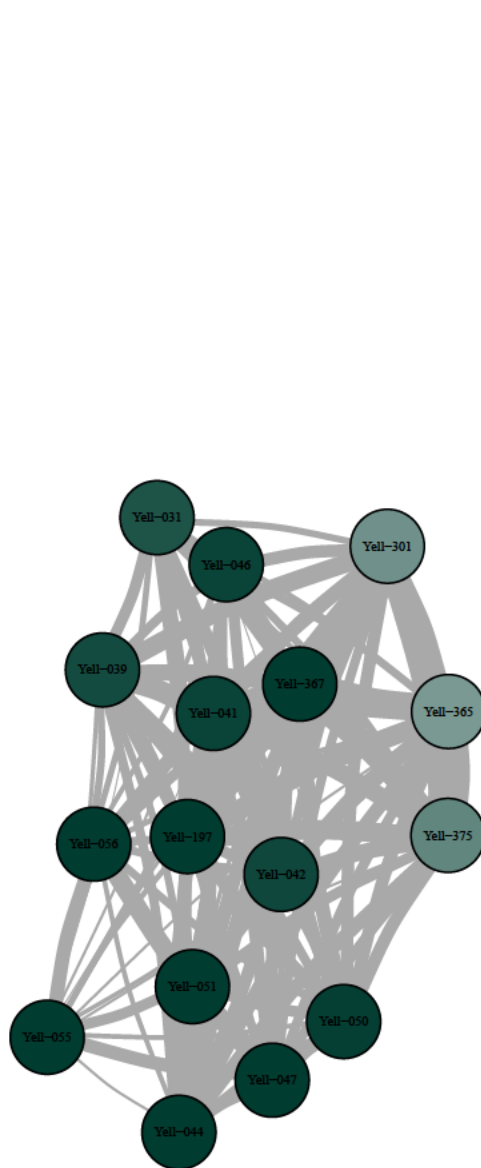
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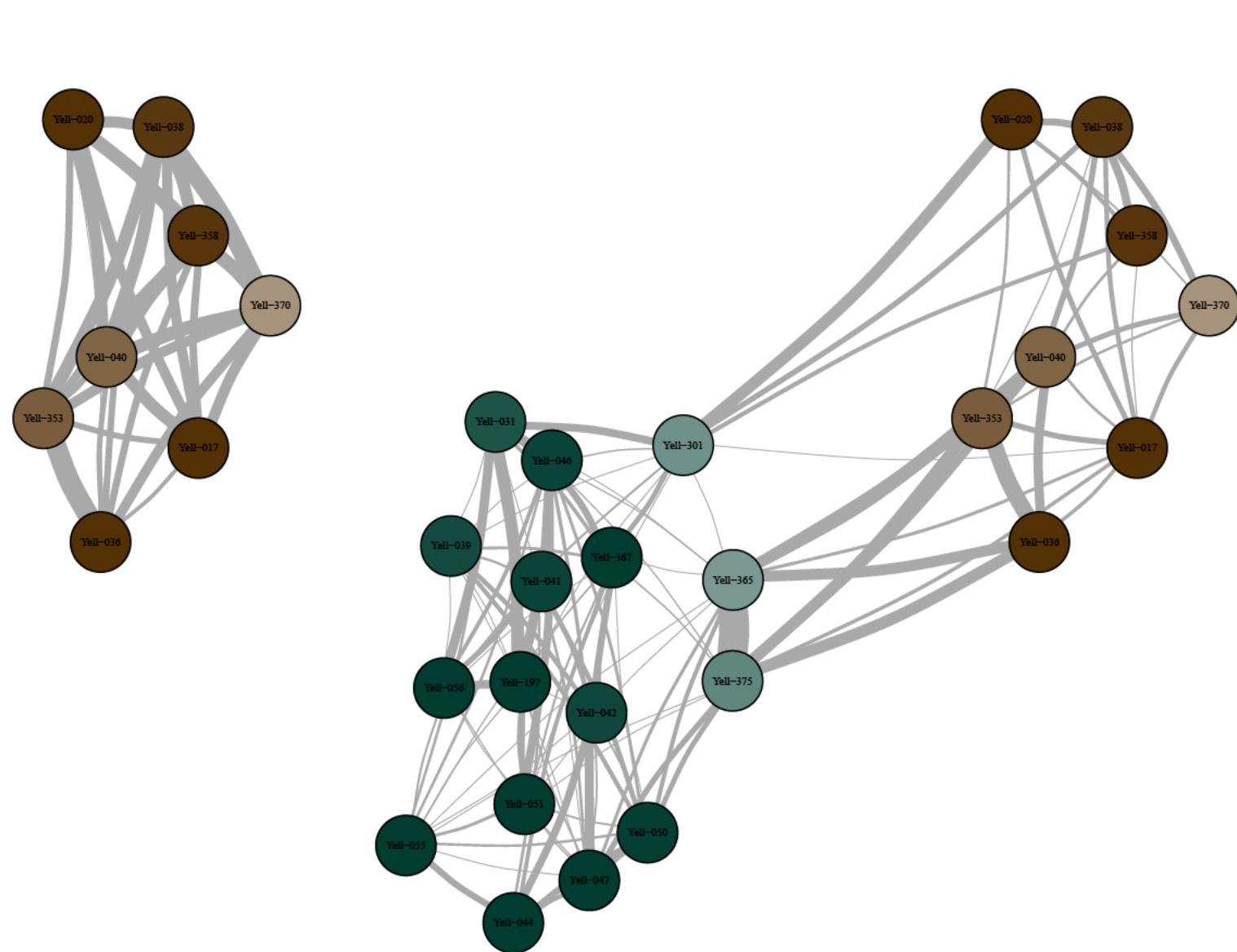
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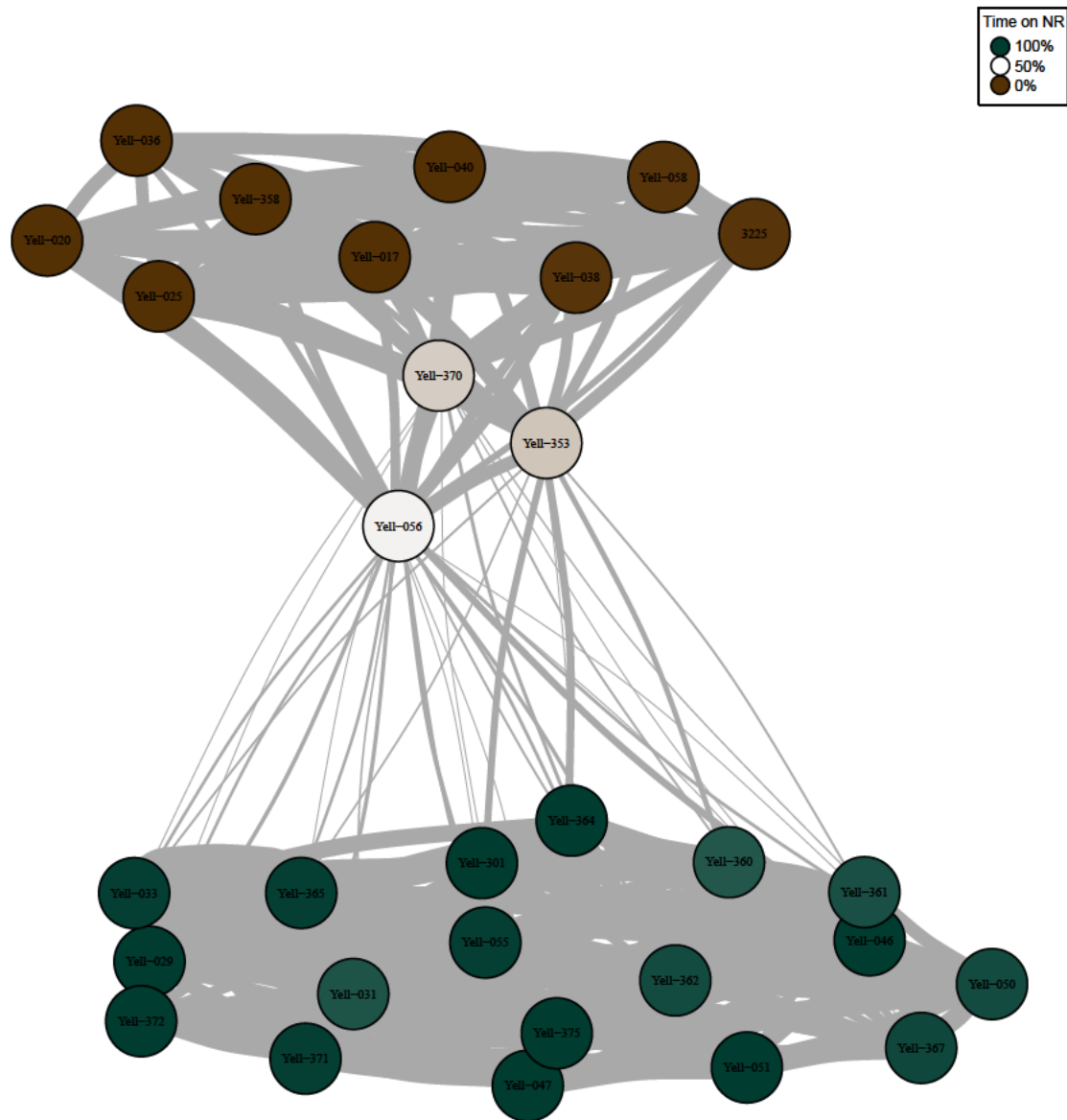
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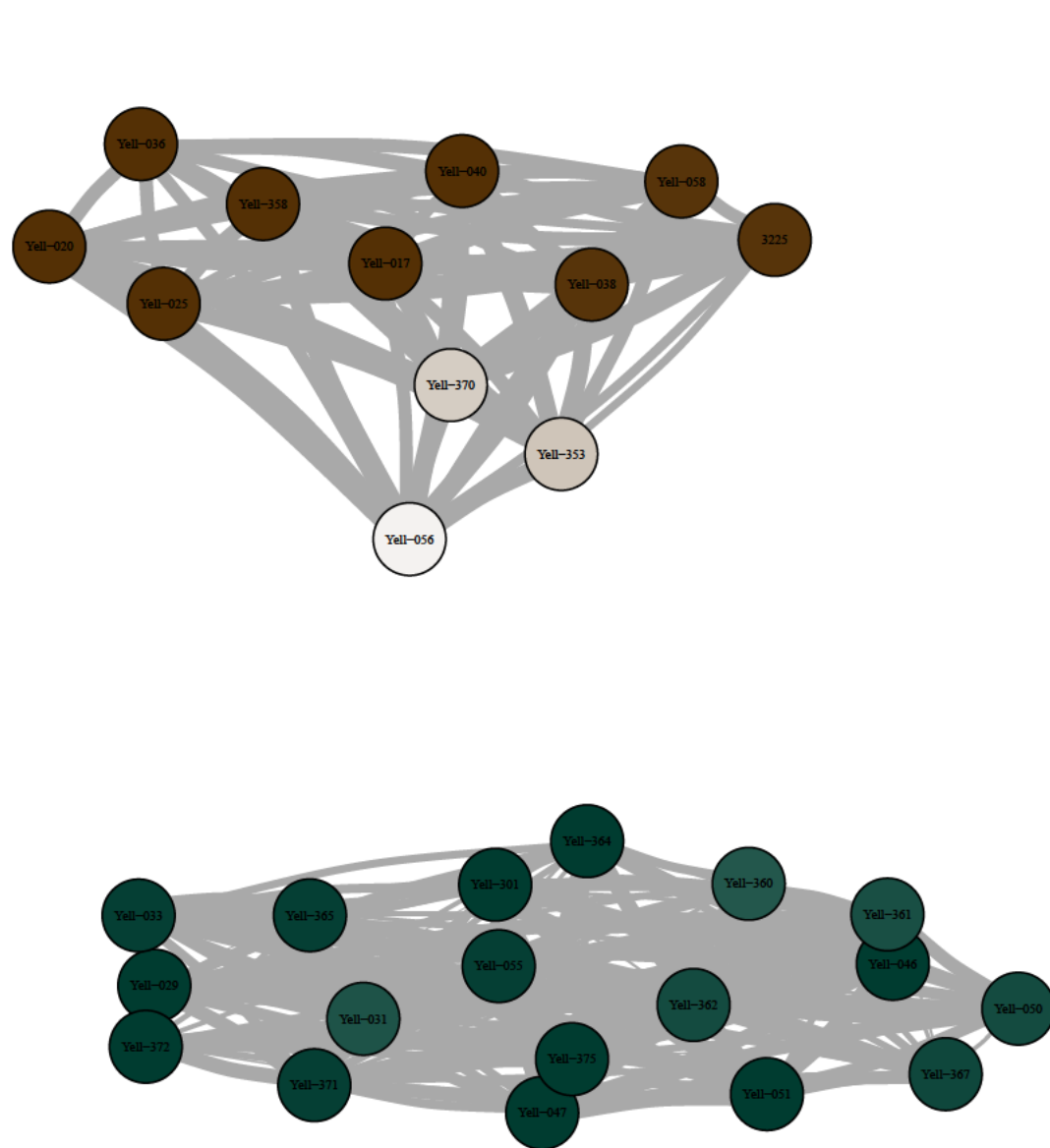
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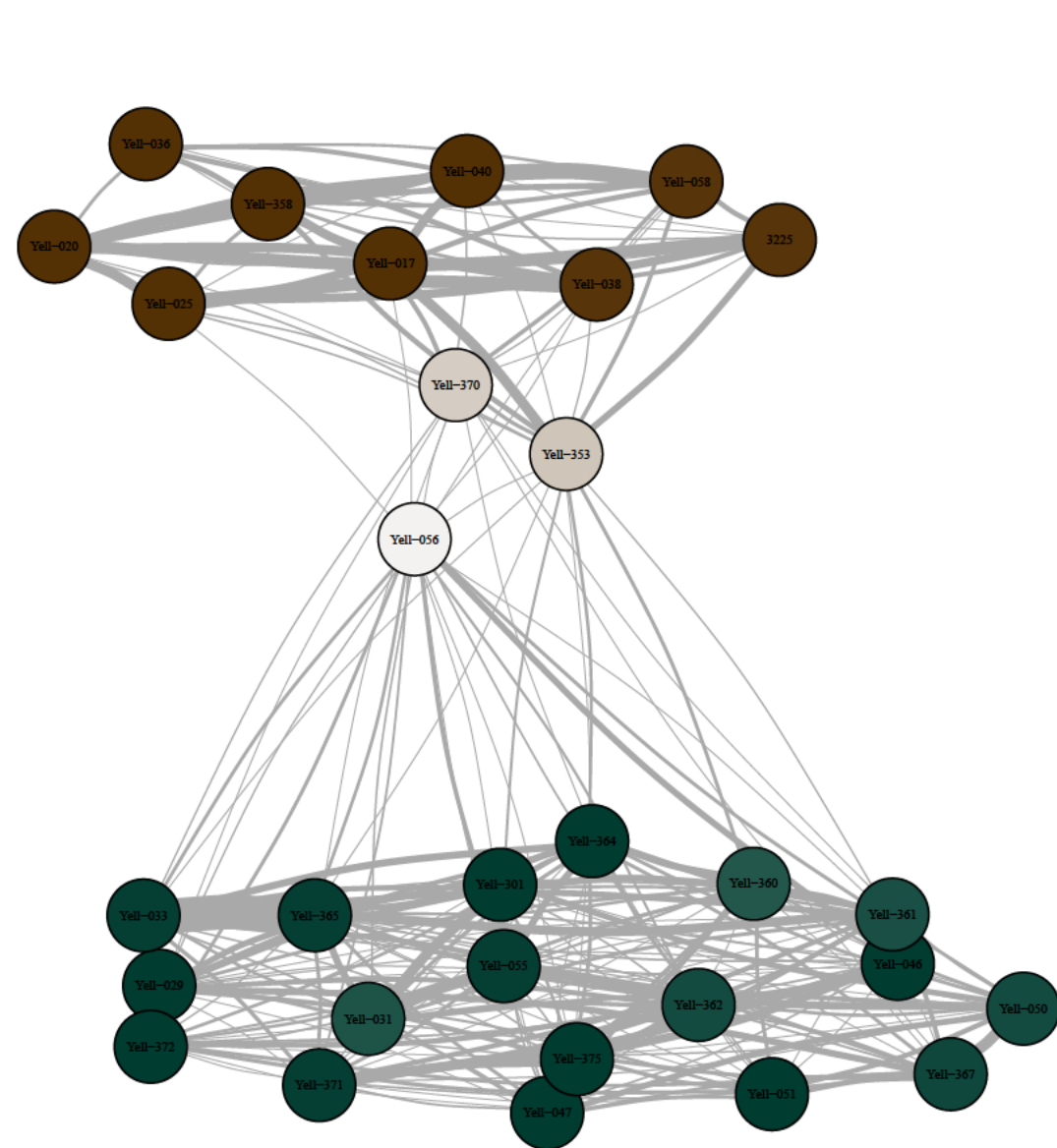
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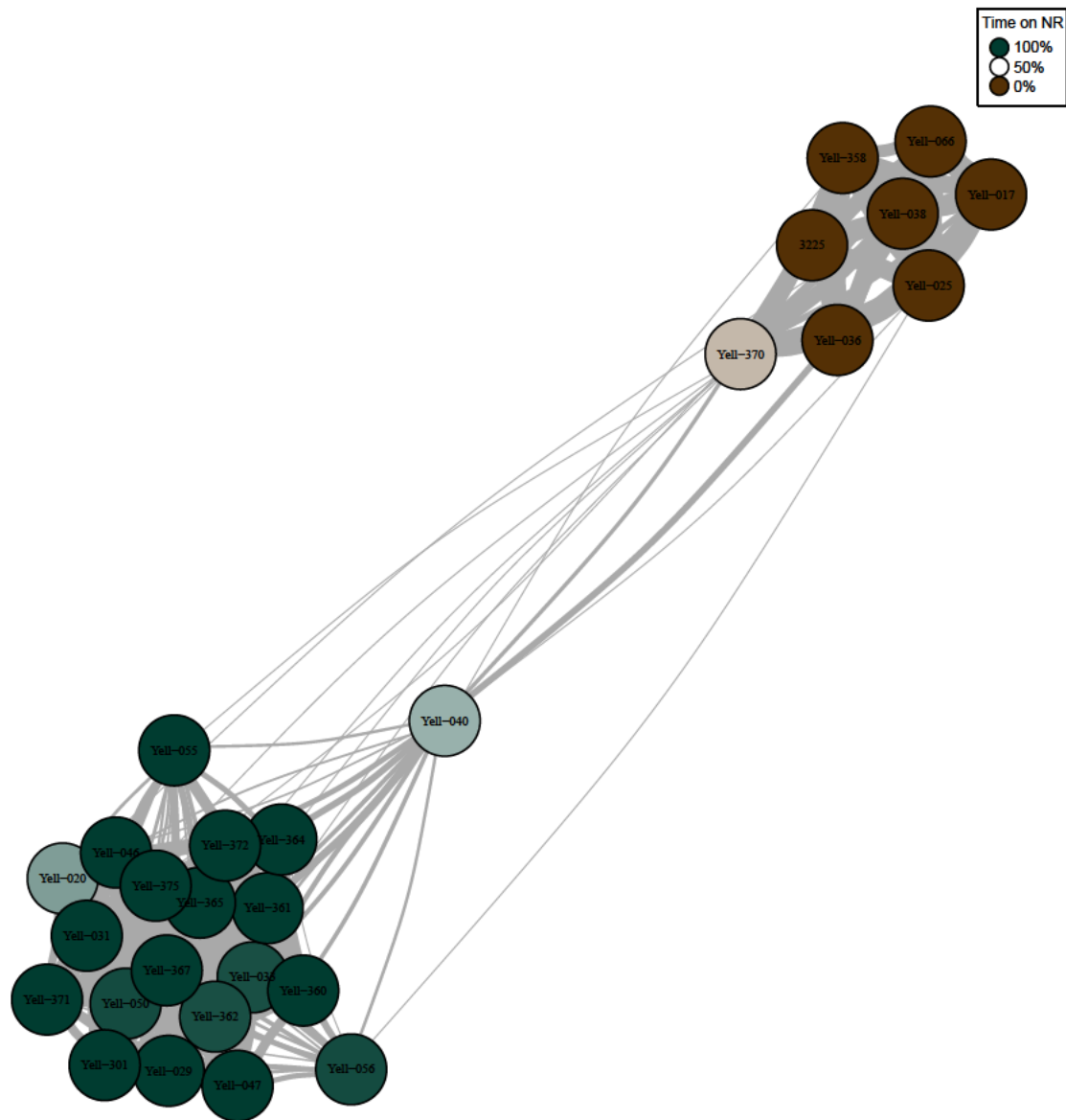
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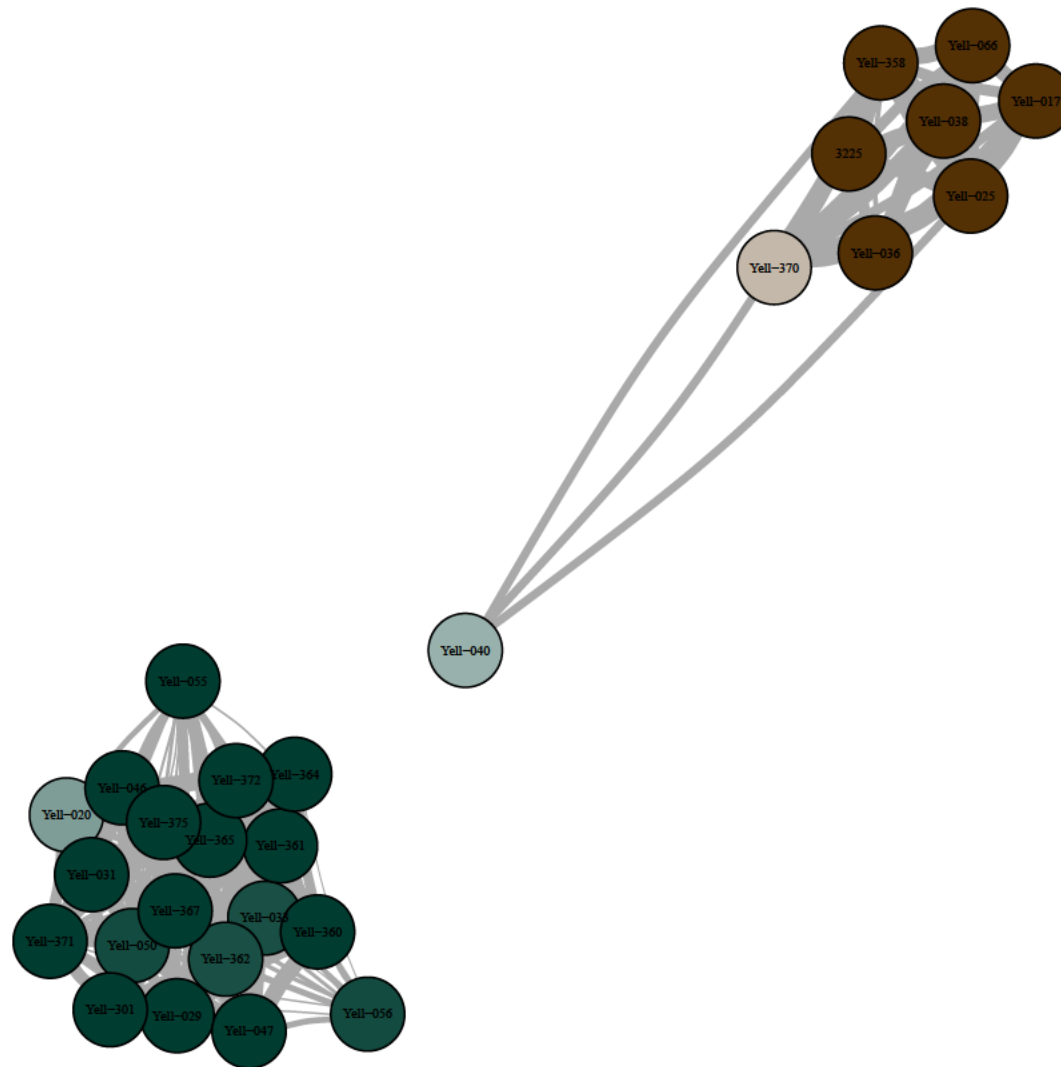
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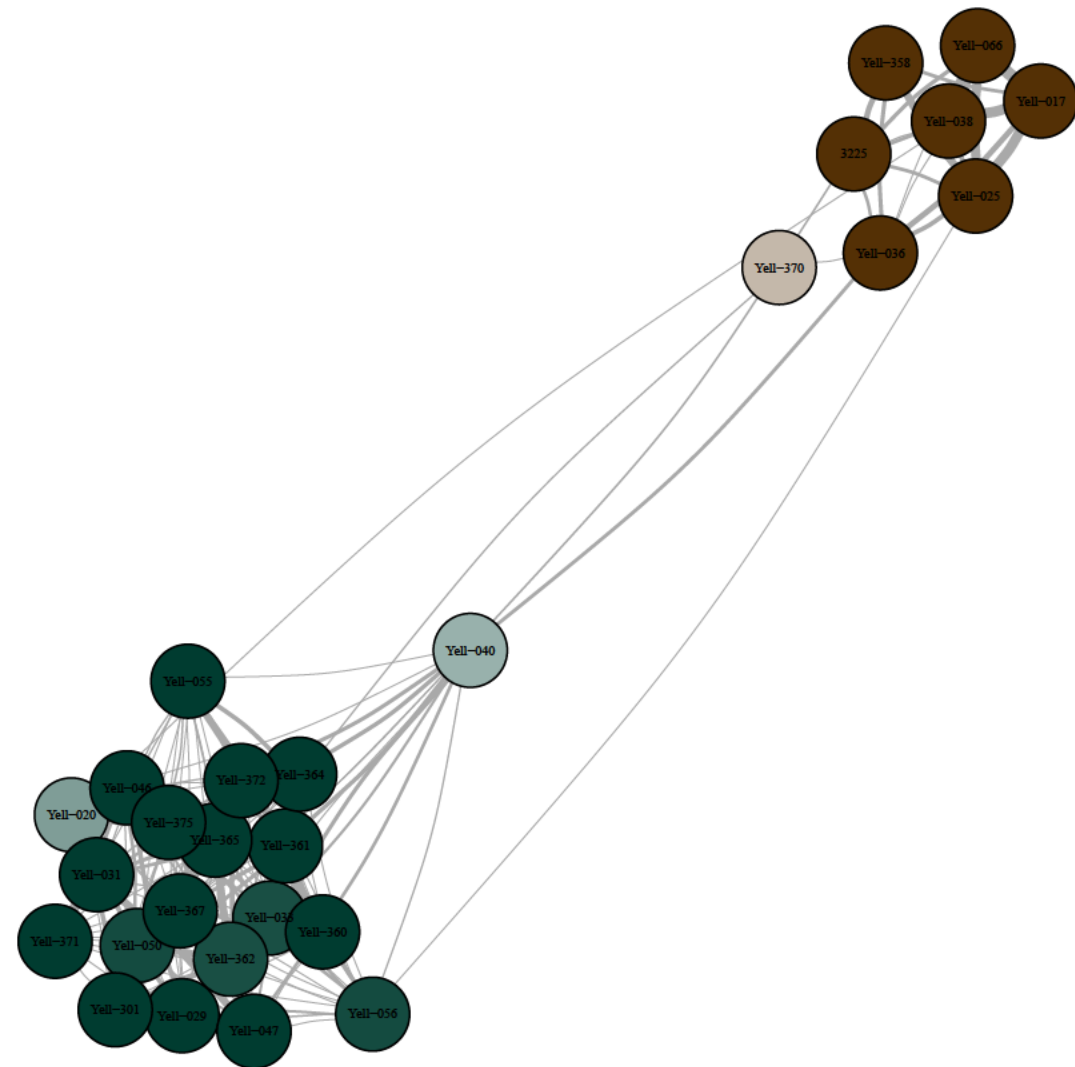
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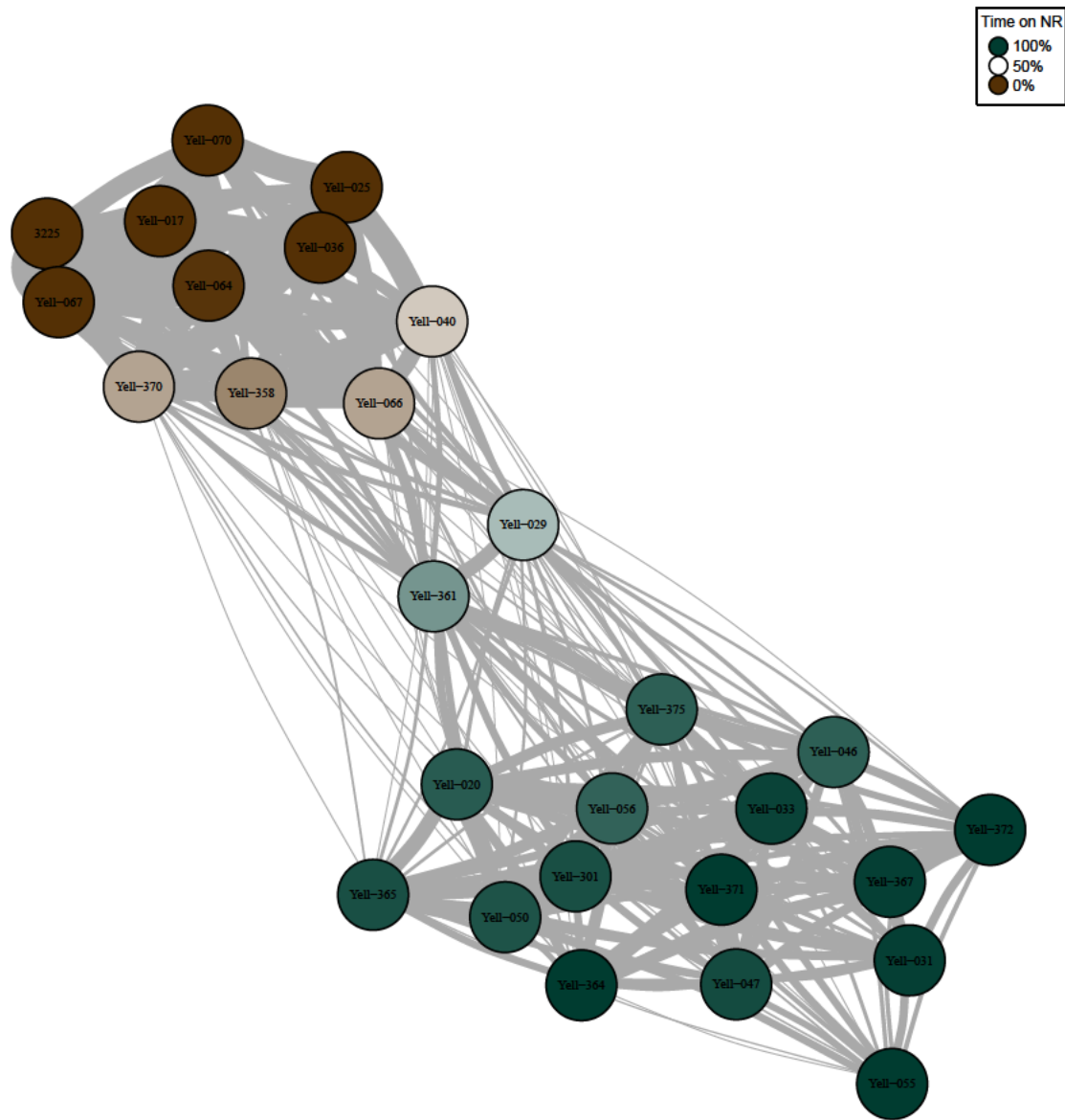
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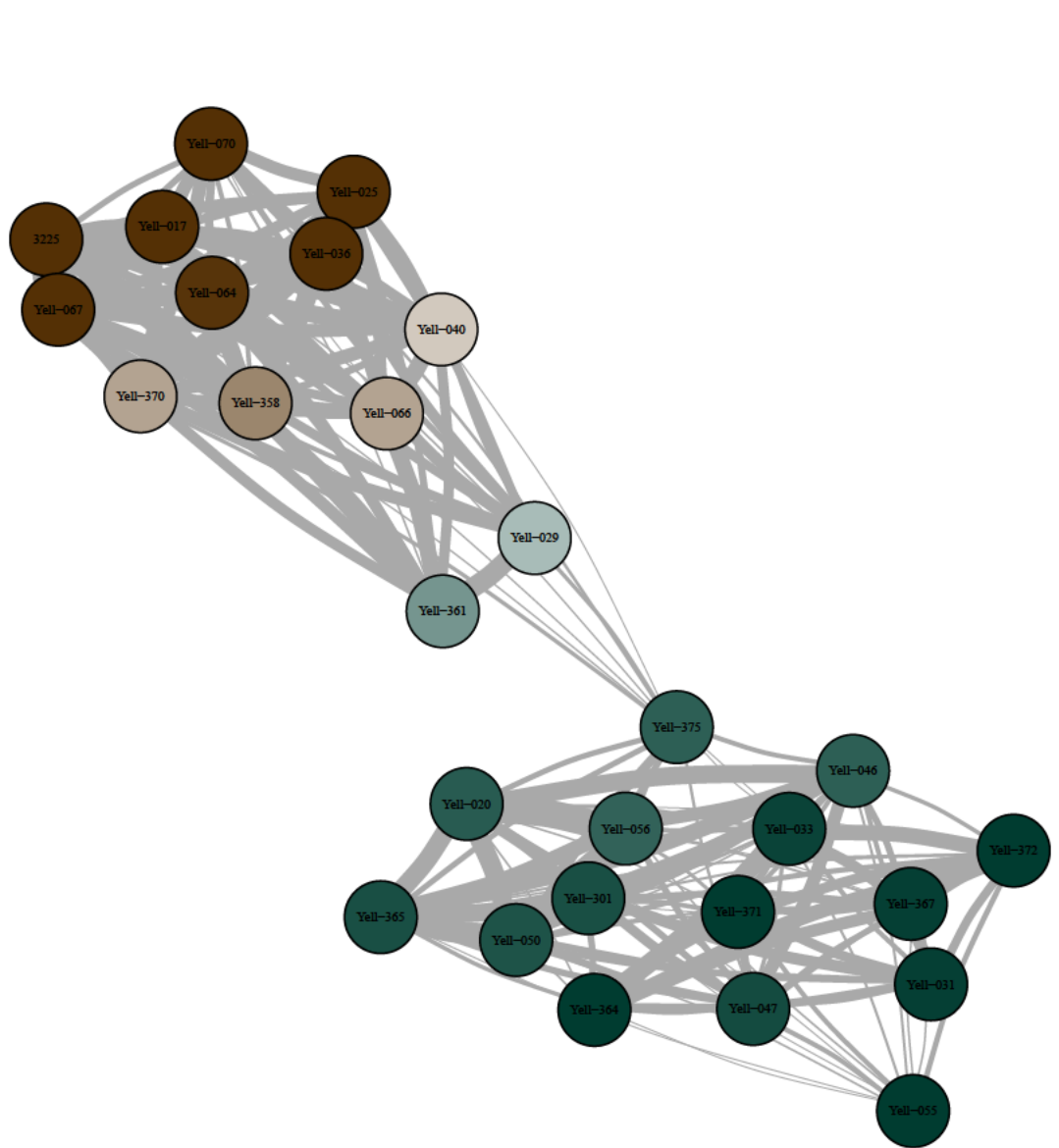
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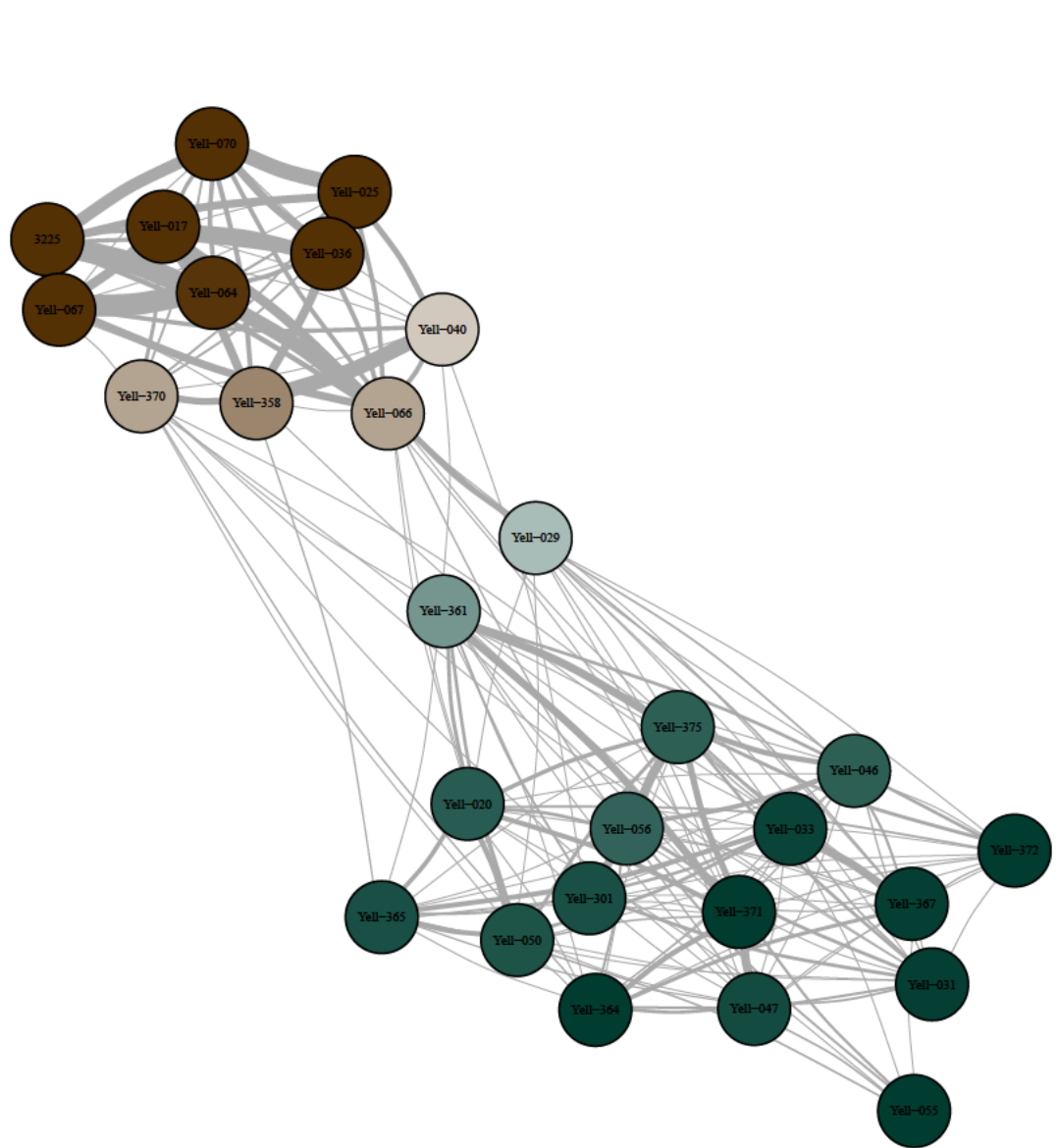
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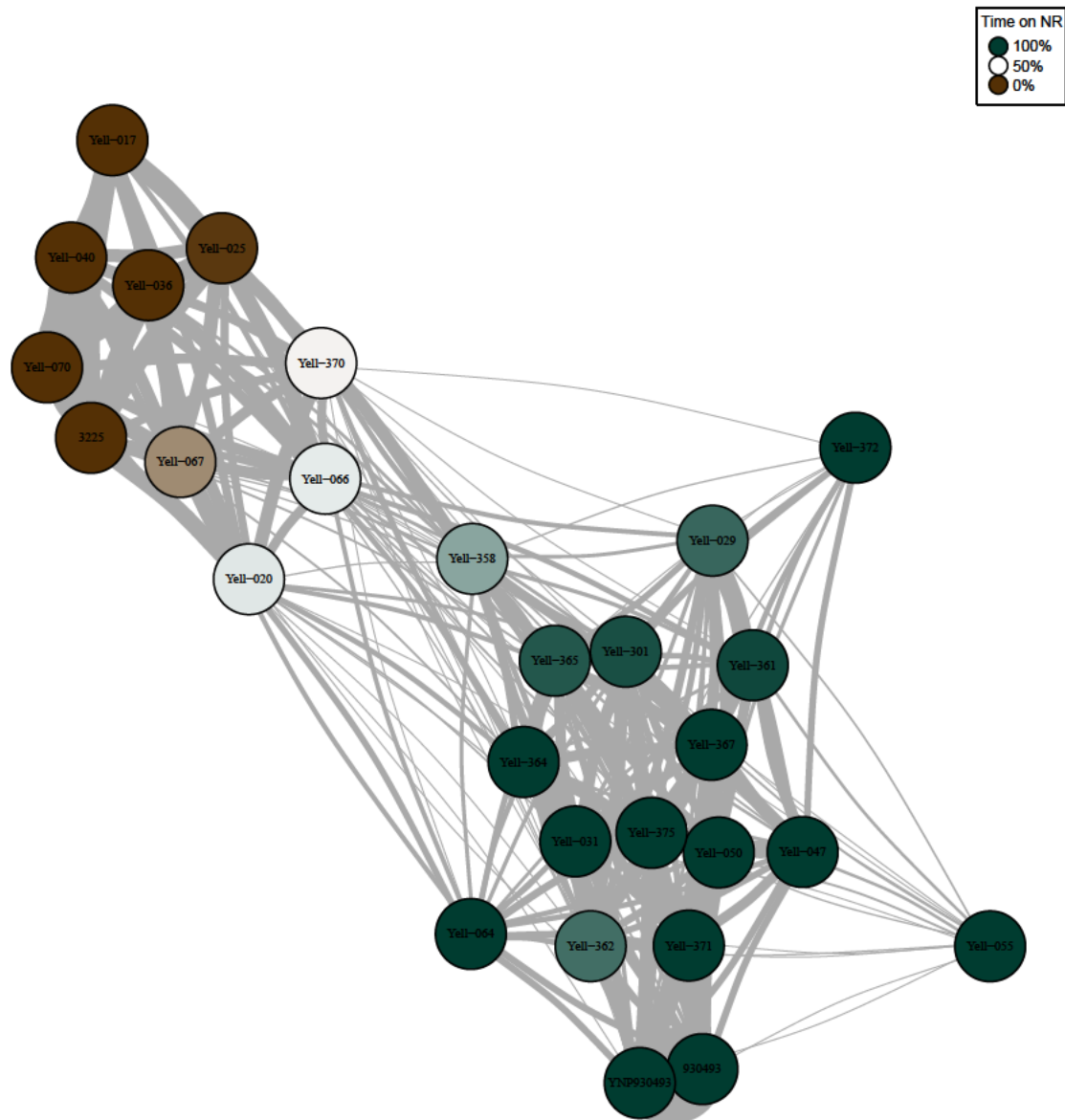
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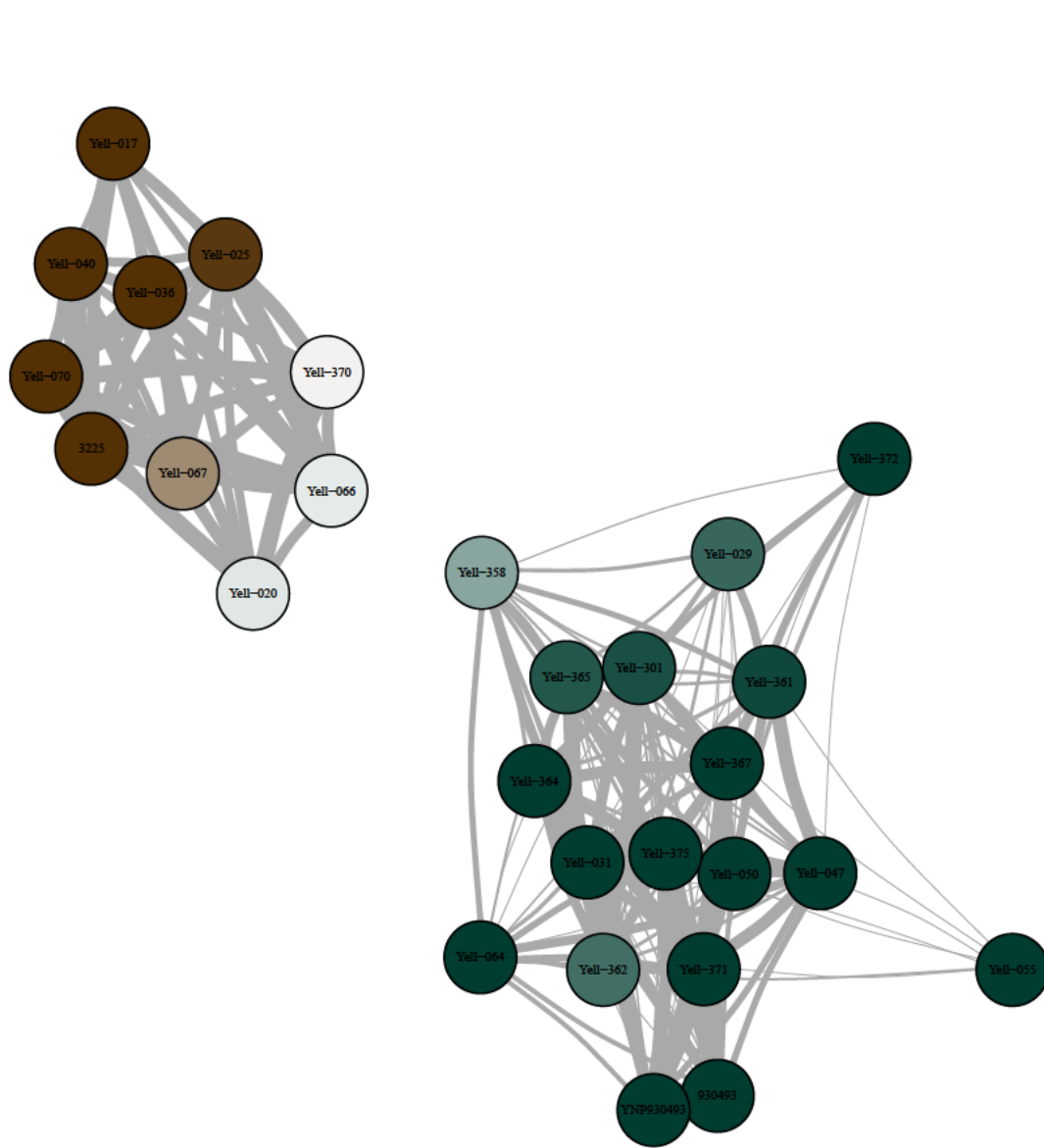
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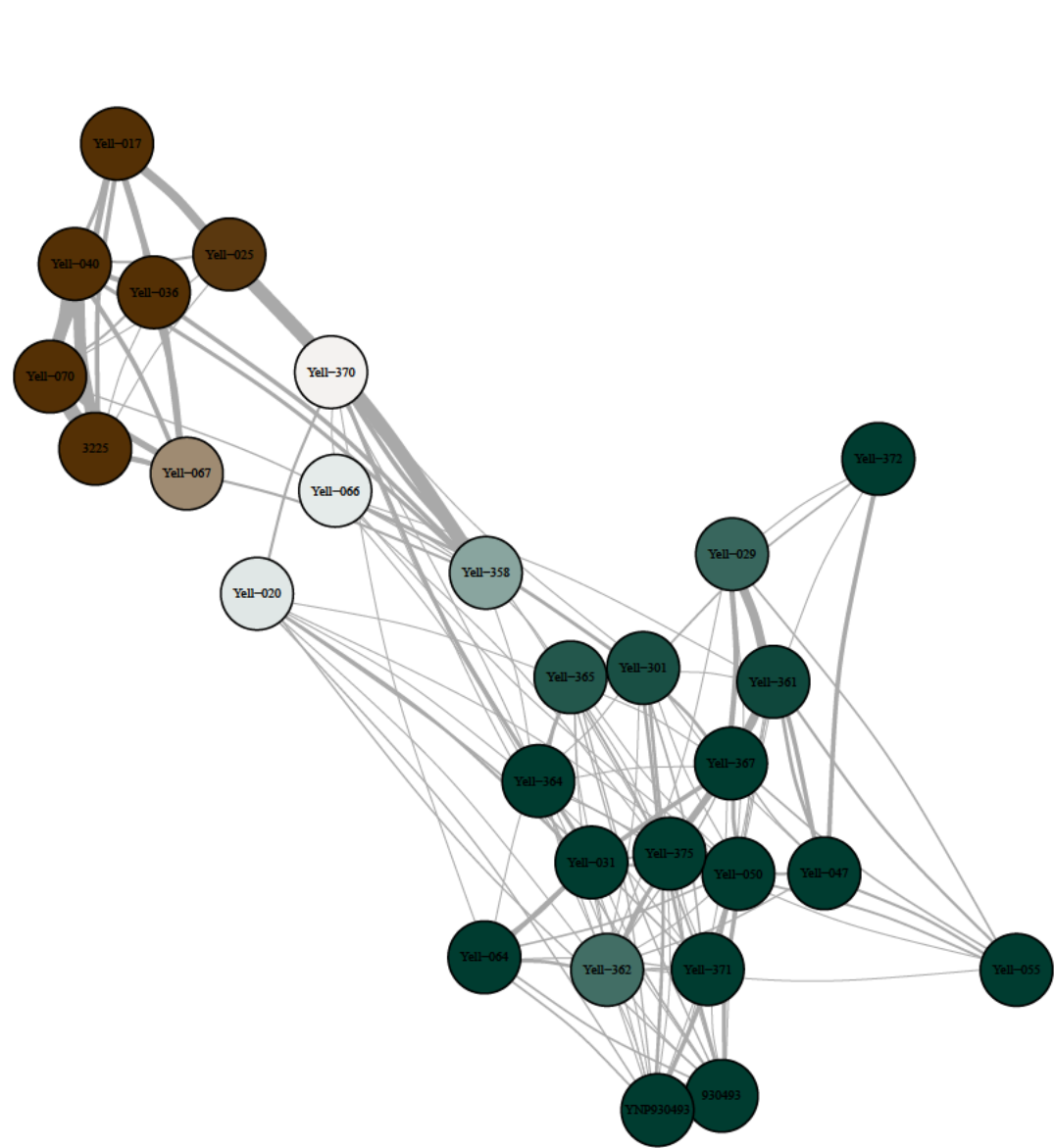
Annual: 2013



Breeding season: 2013

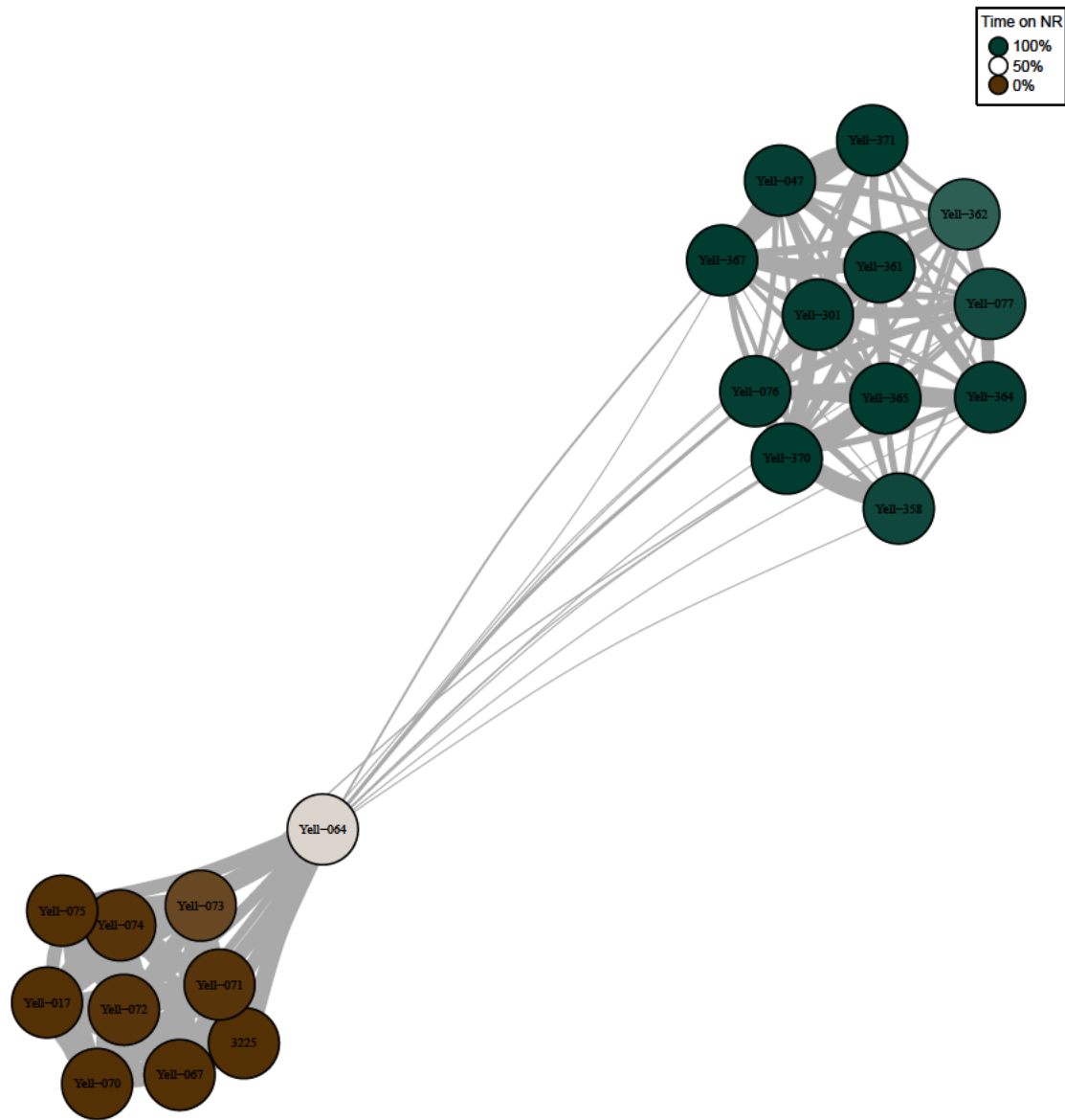


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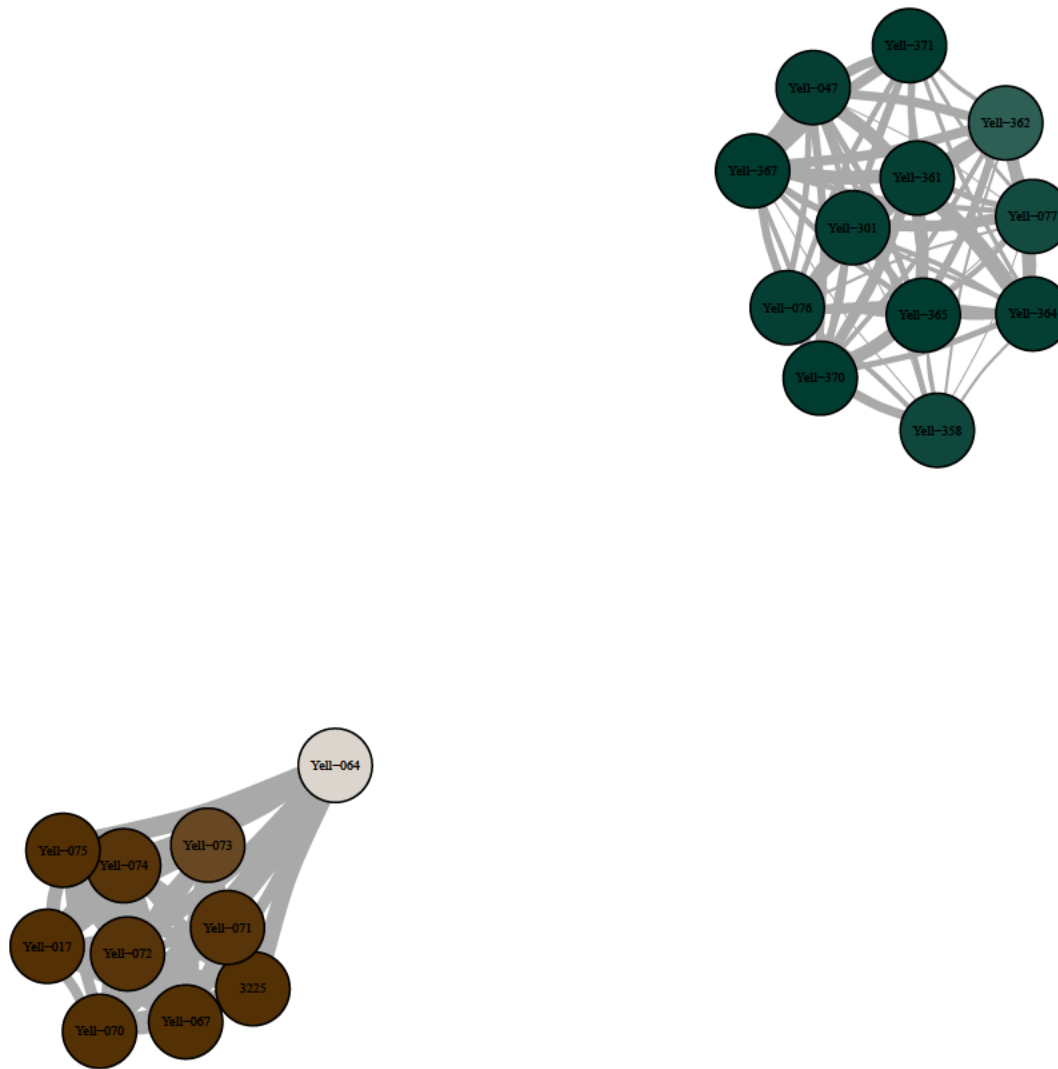




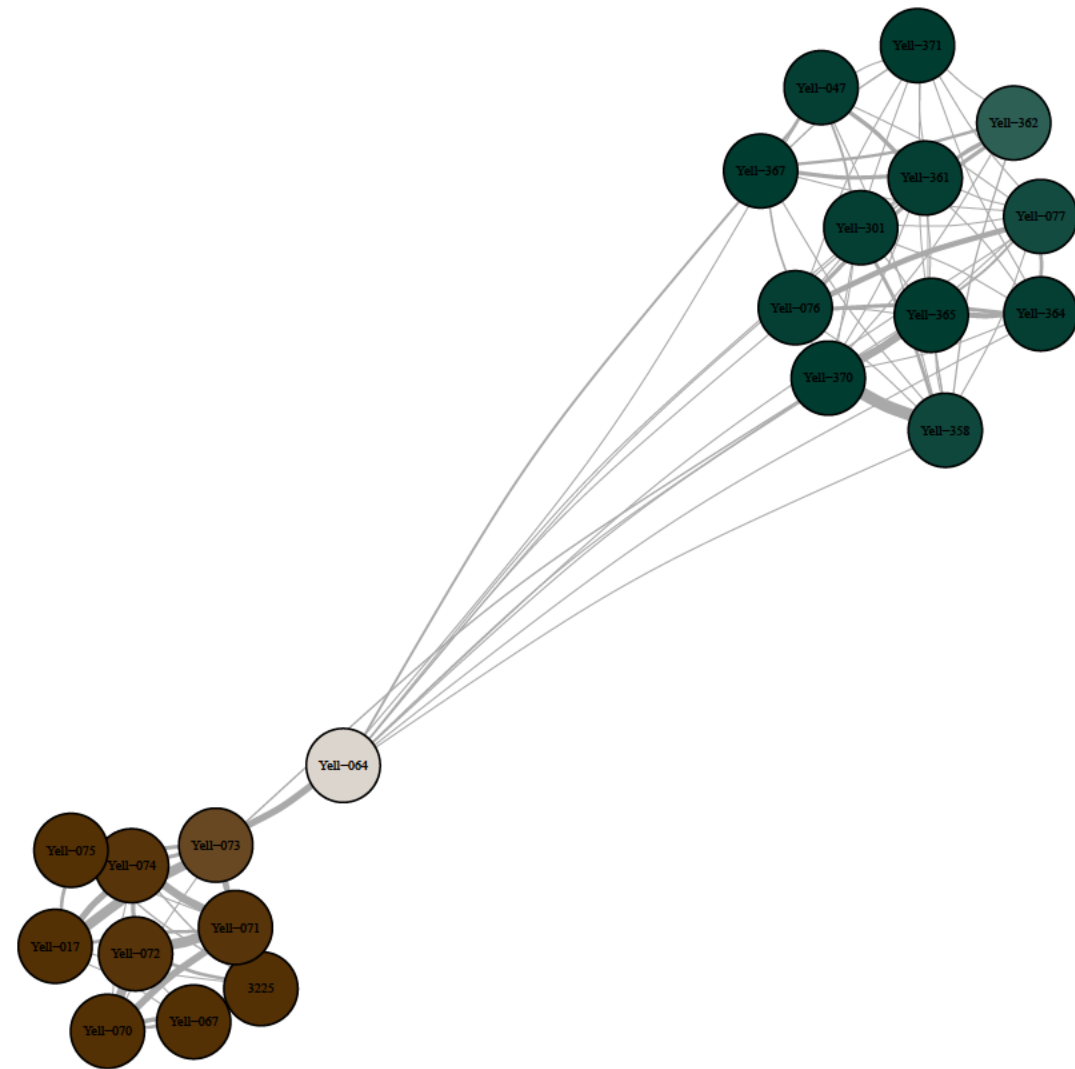
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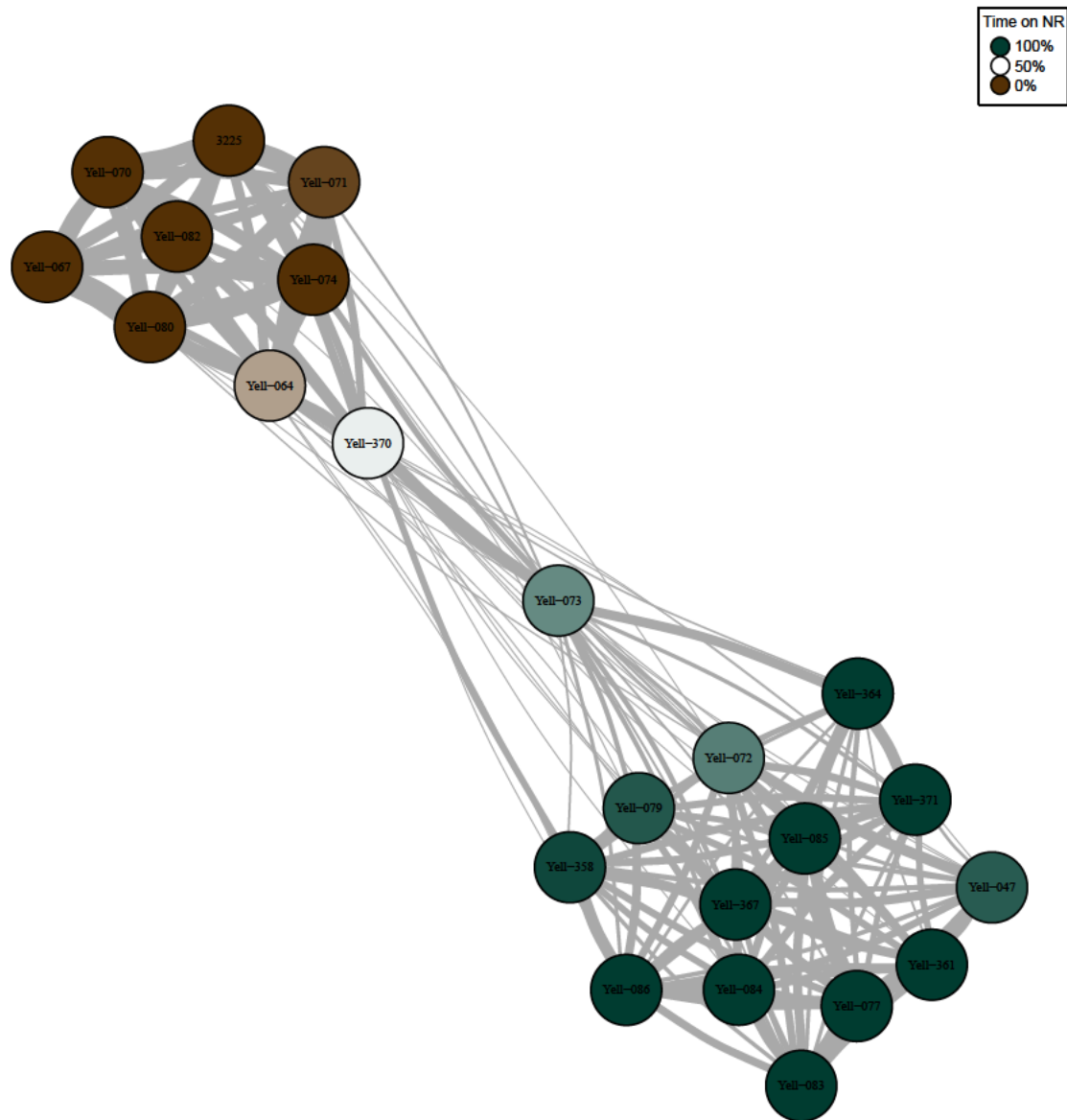
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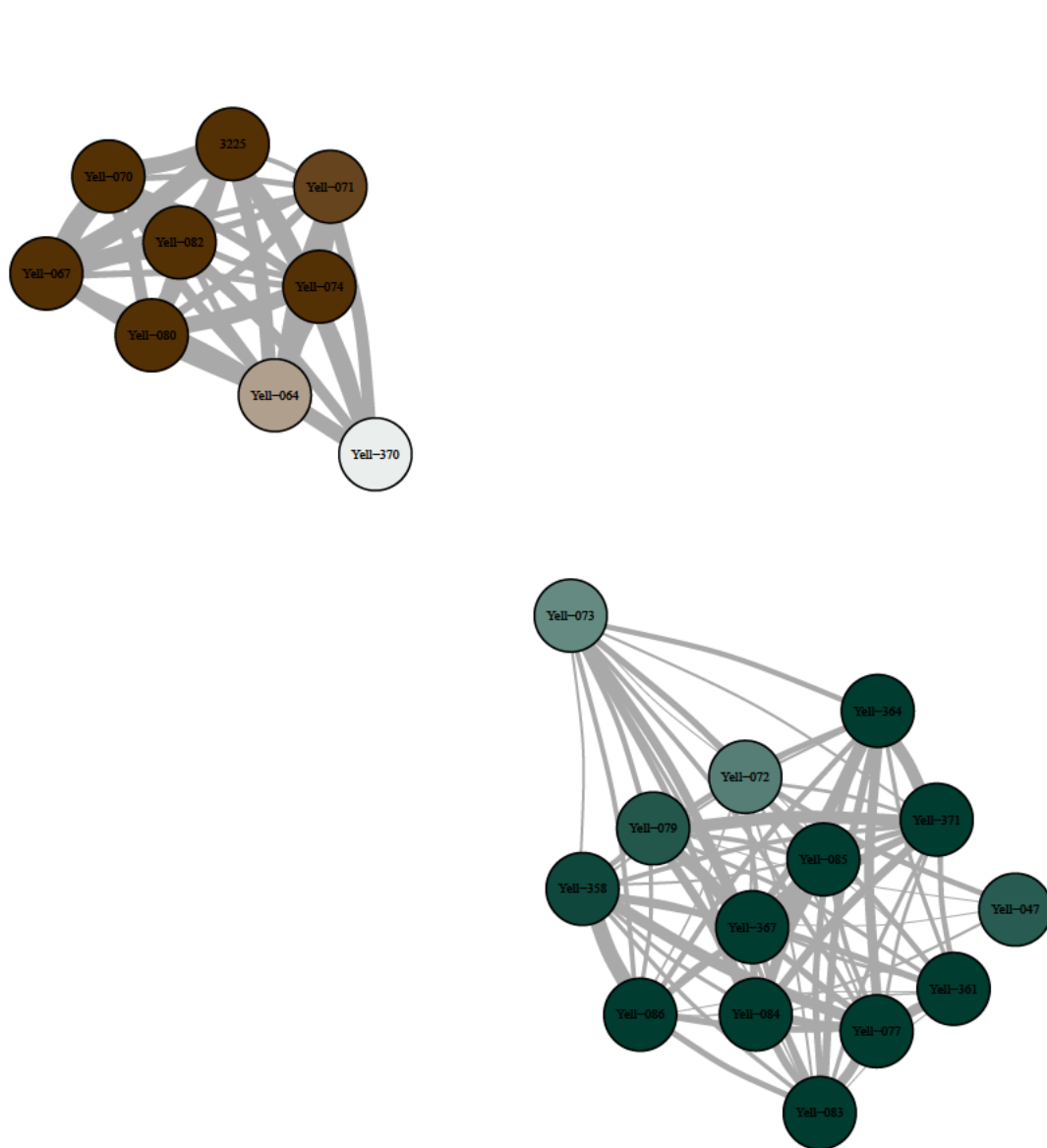
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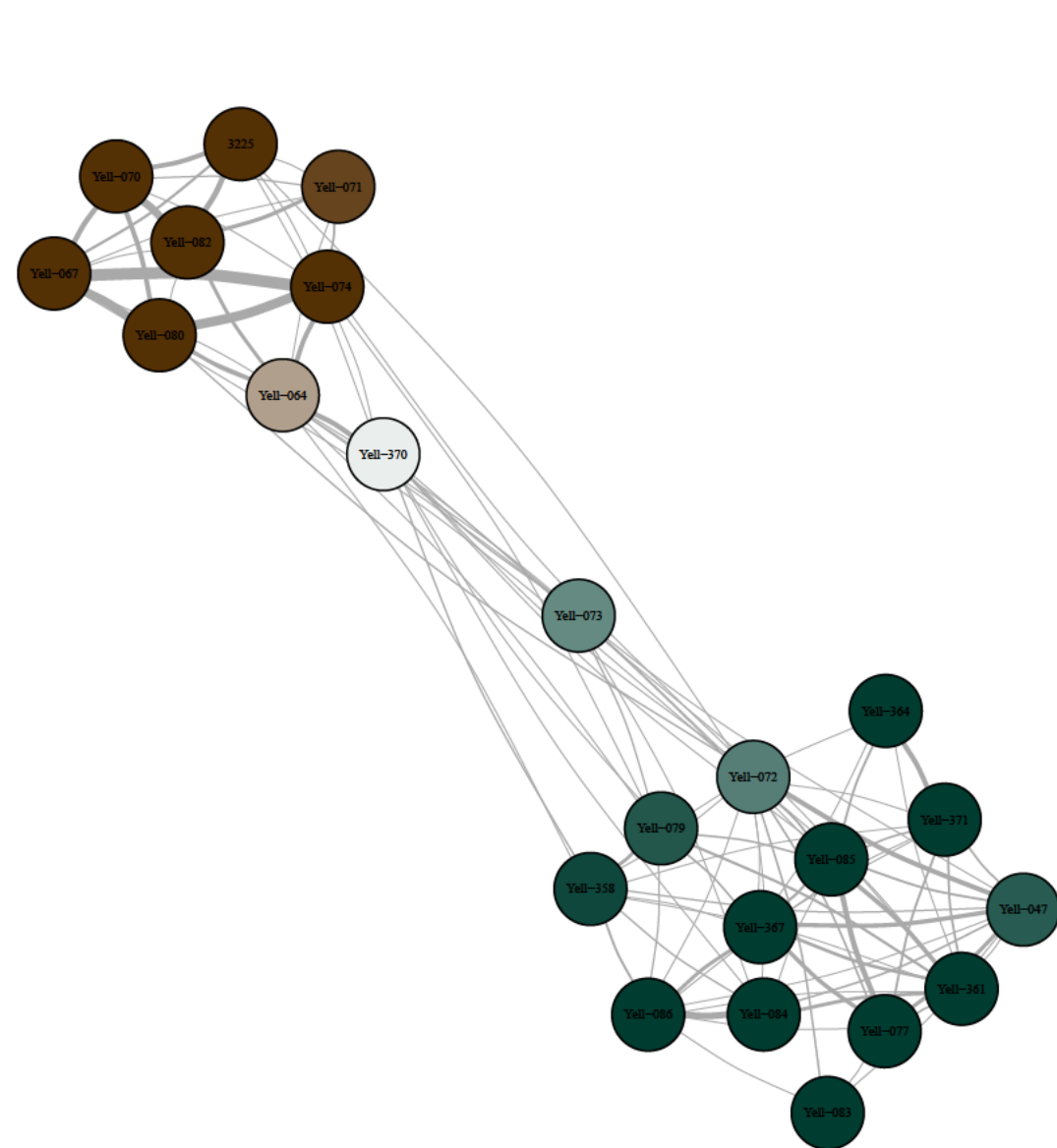
Annual: 2015



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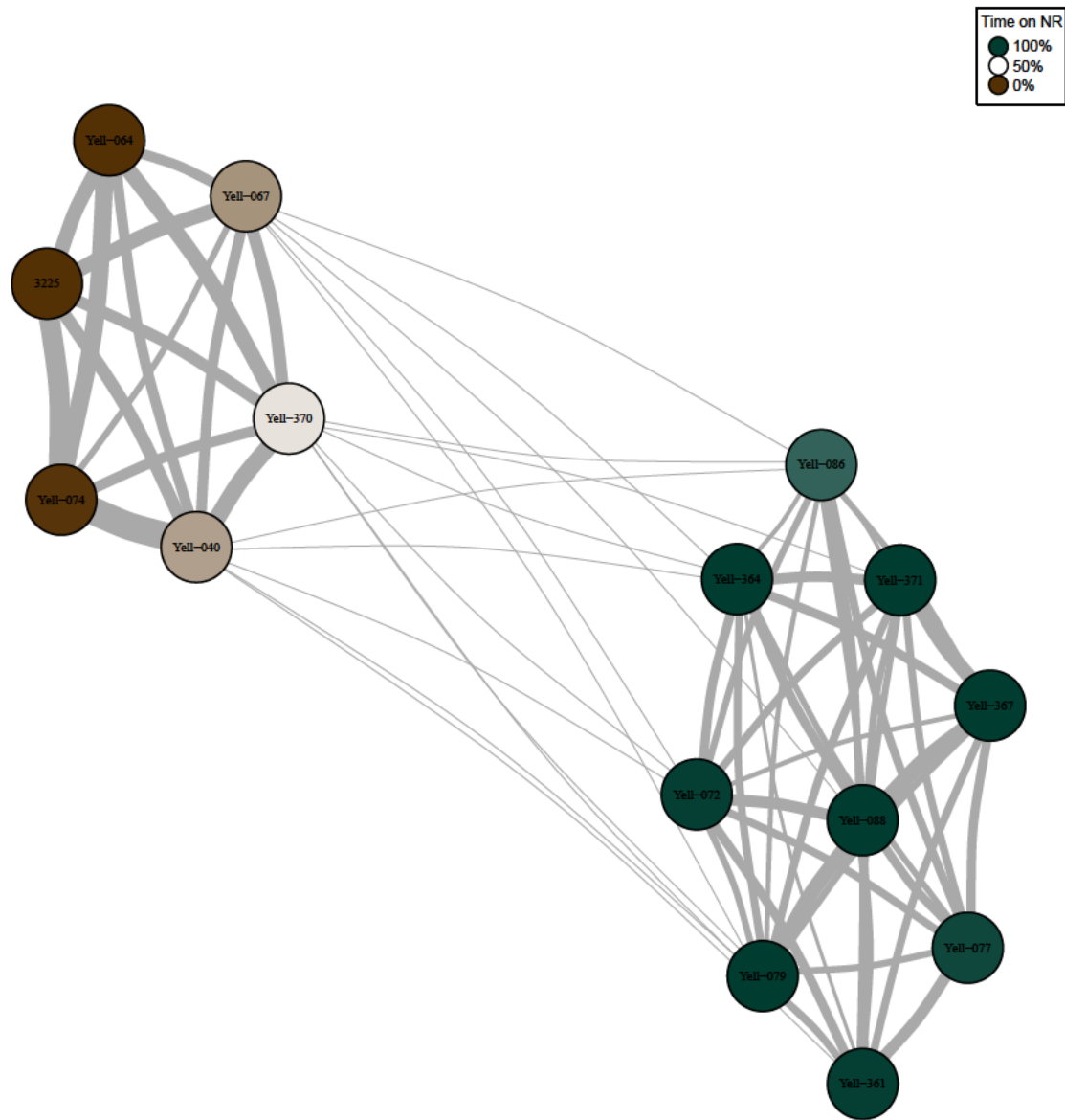


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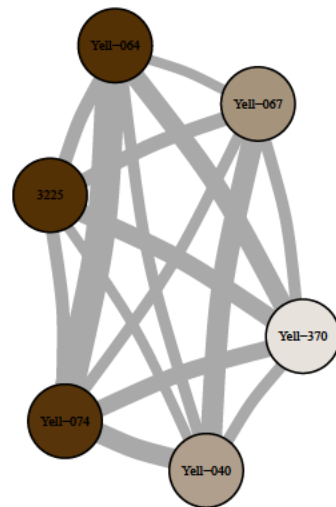




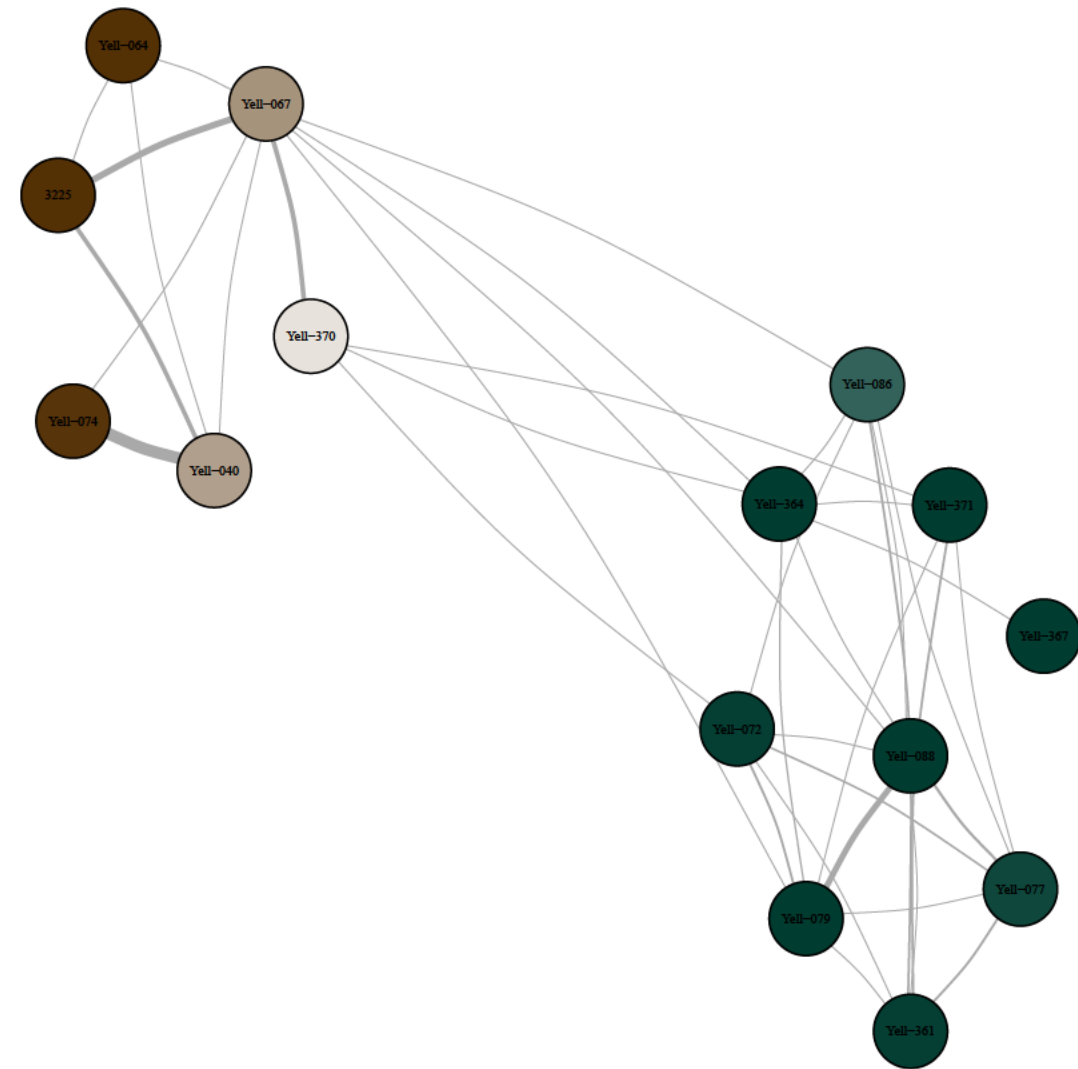
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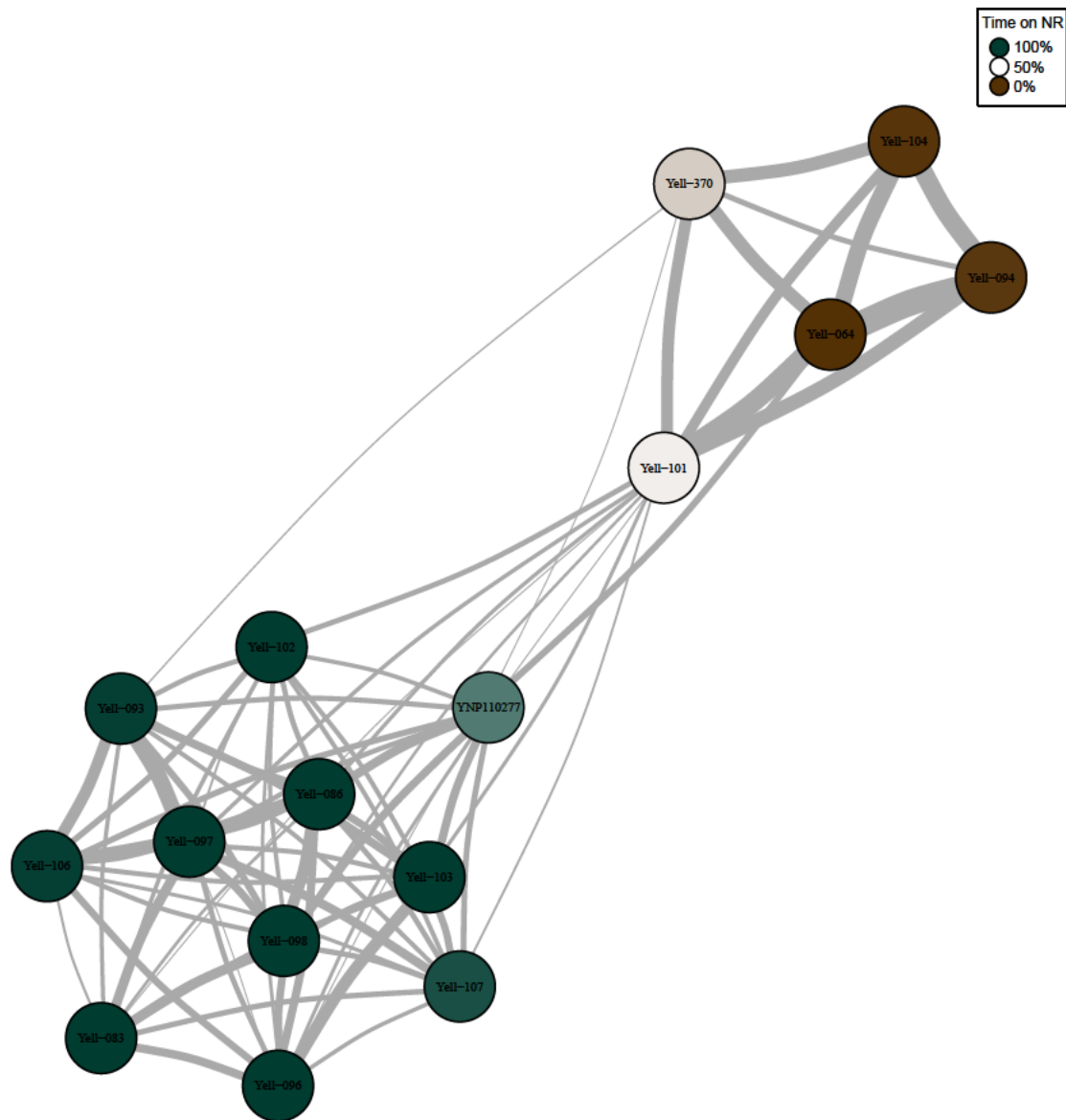
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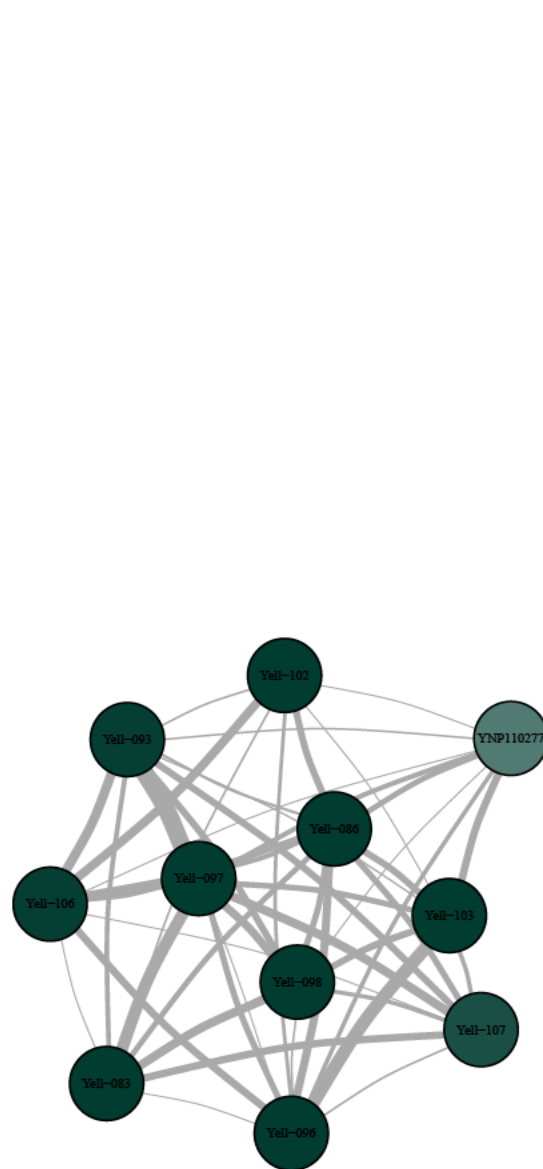
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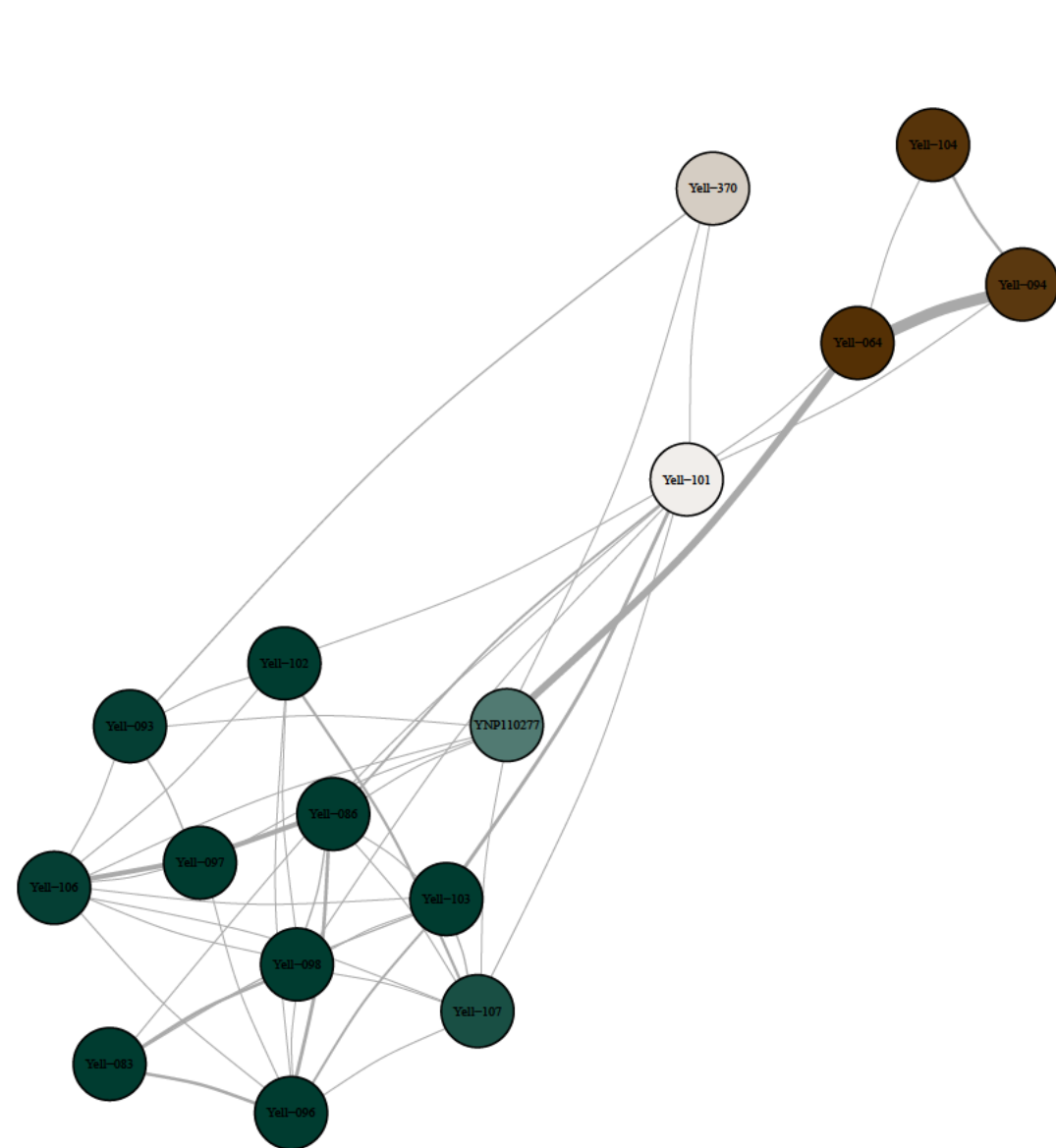
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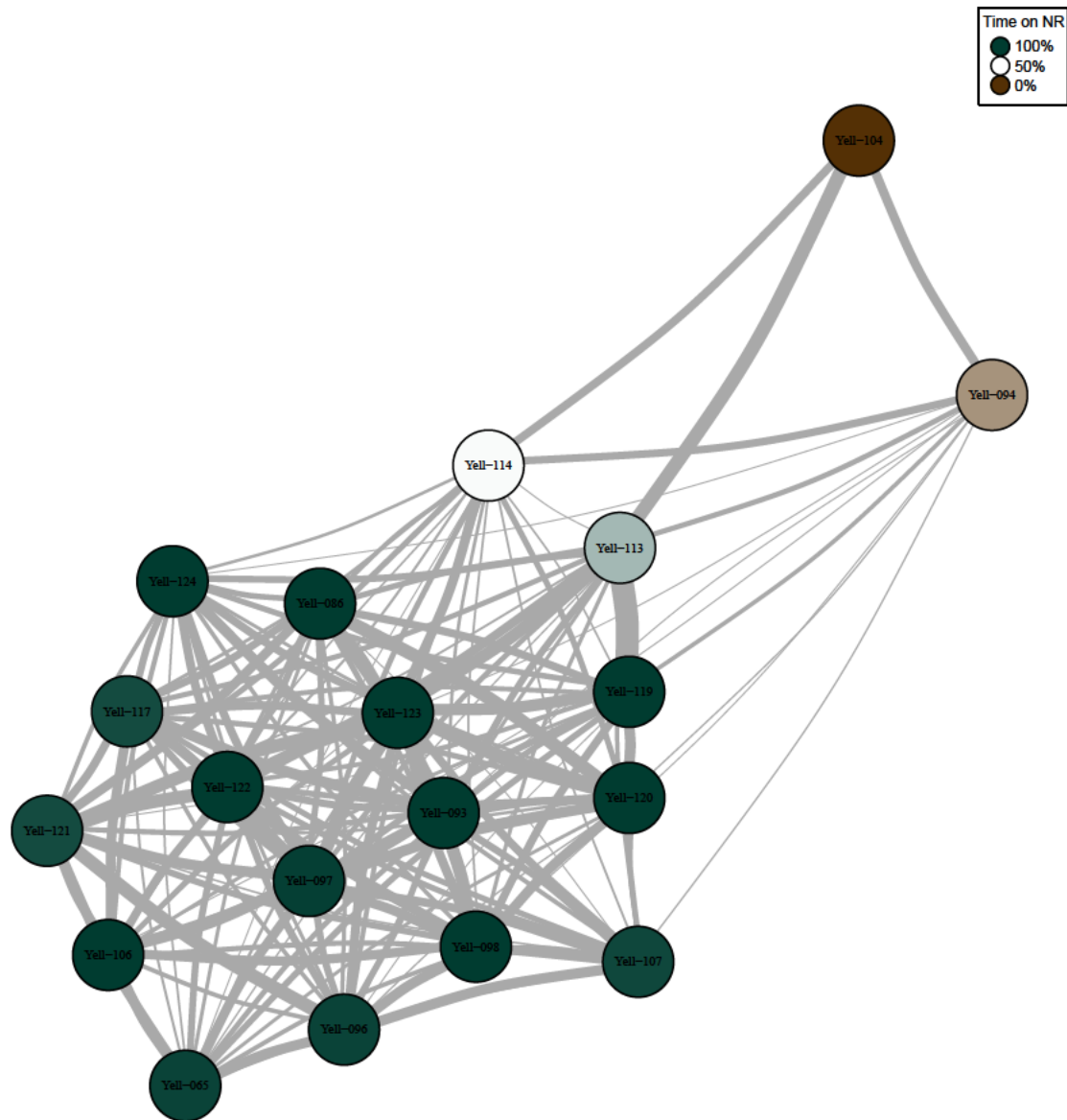
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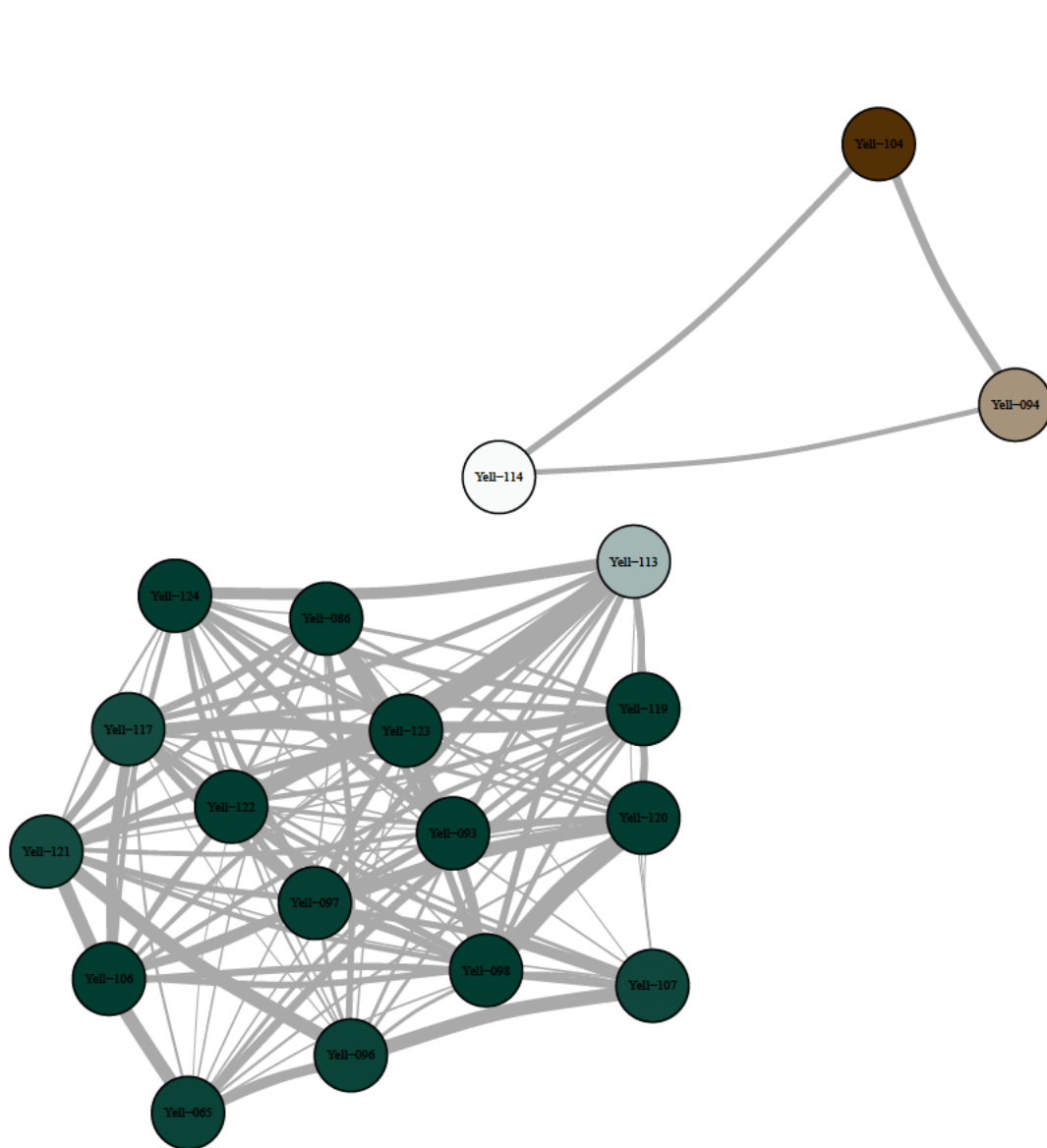
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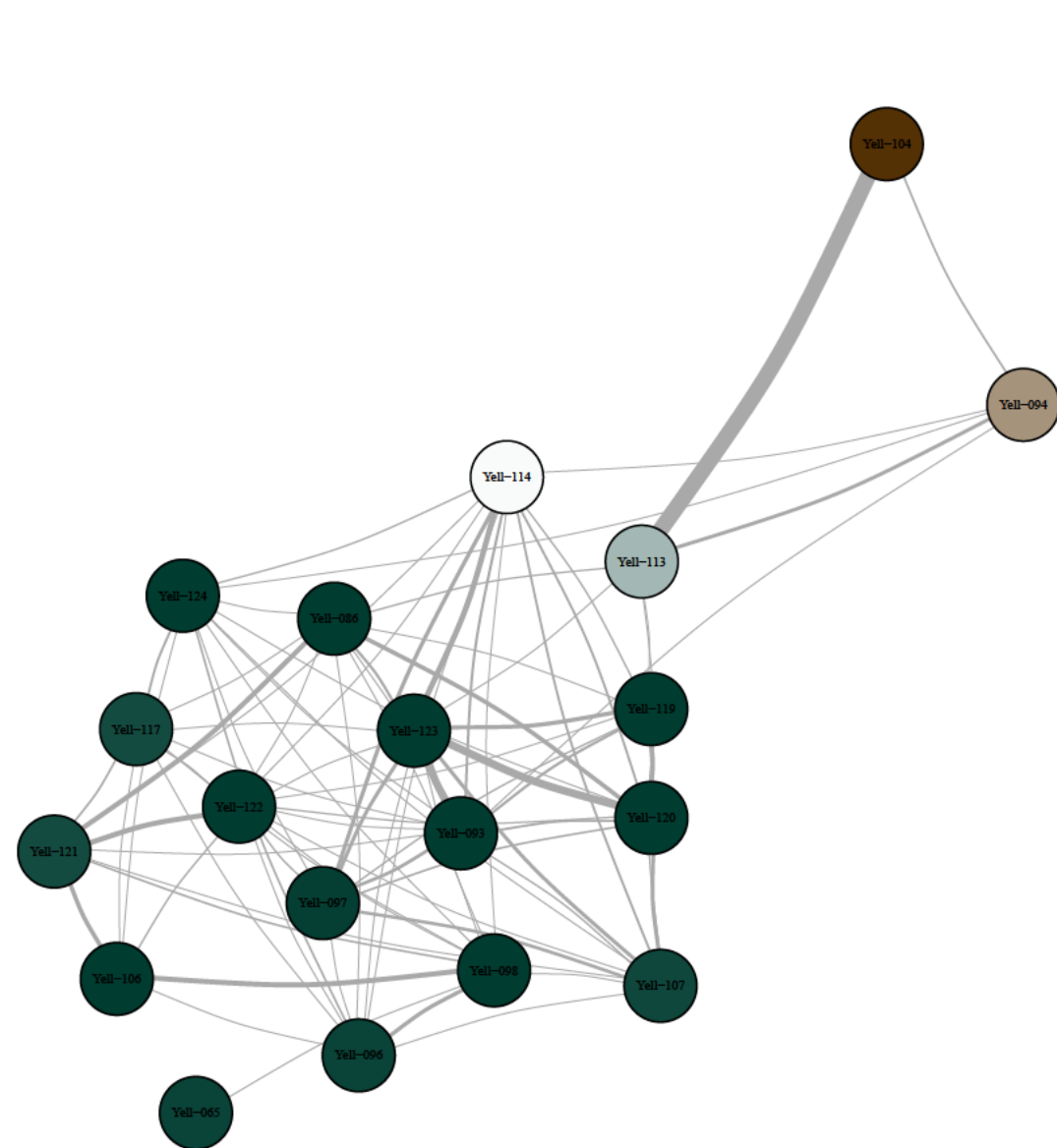
Annual: 2018

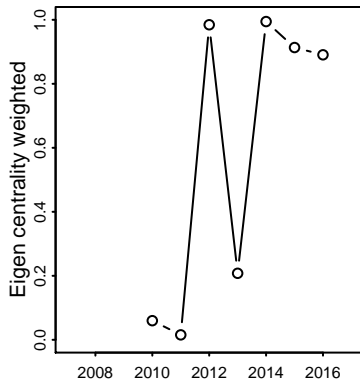
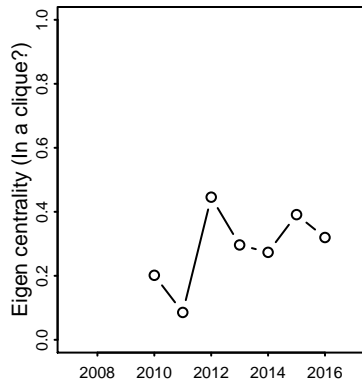
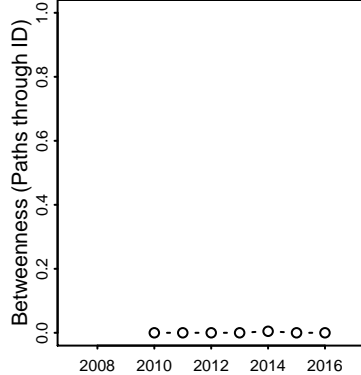
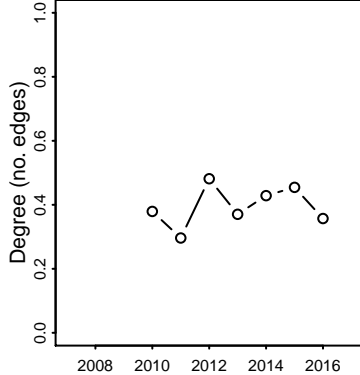
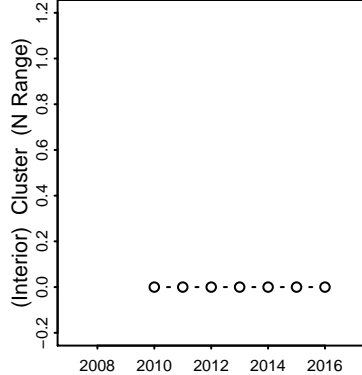


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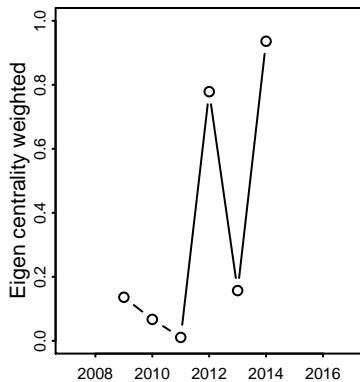
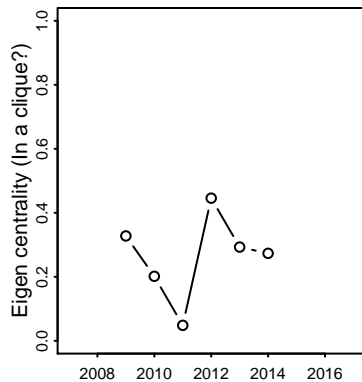
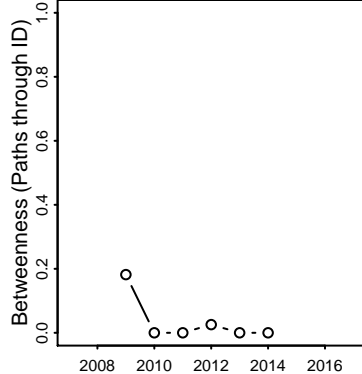
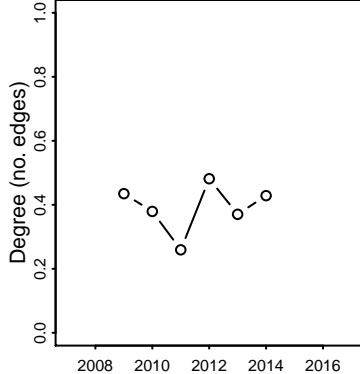
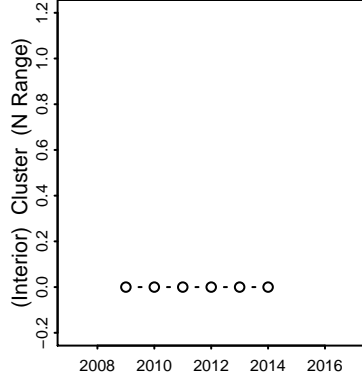


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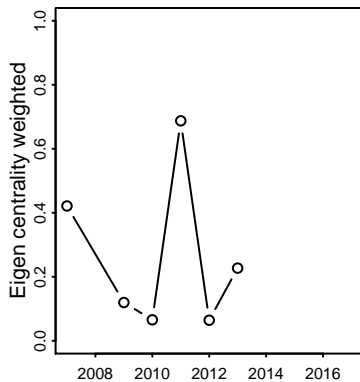
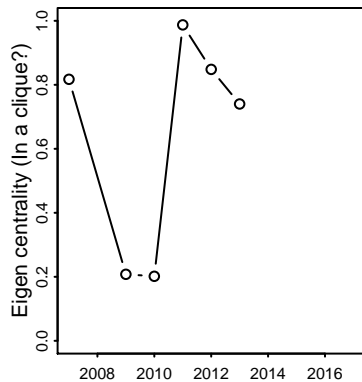
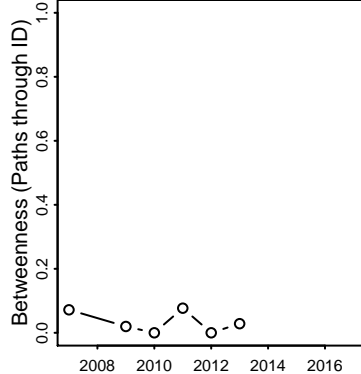
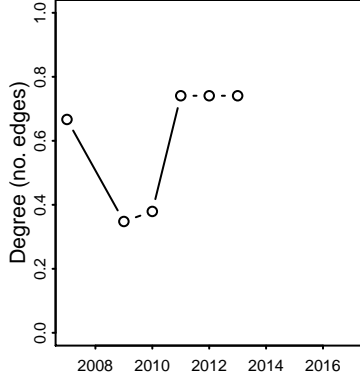
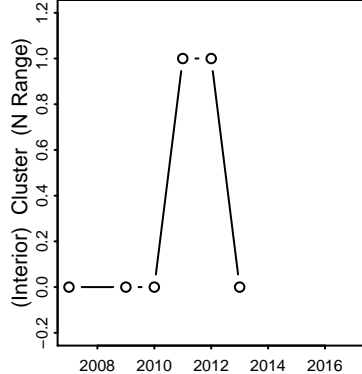




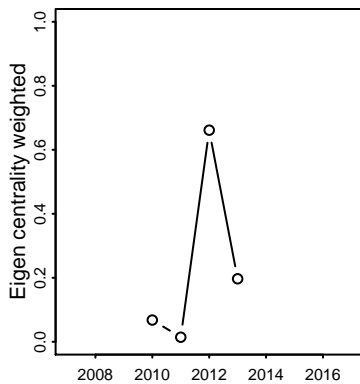
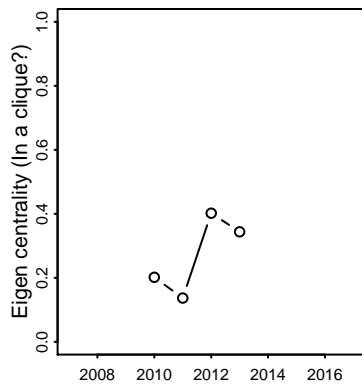
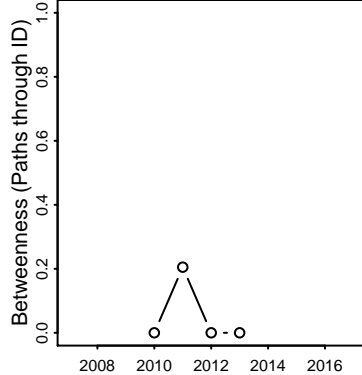
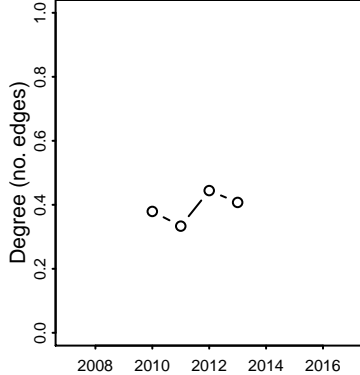
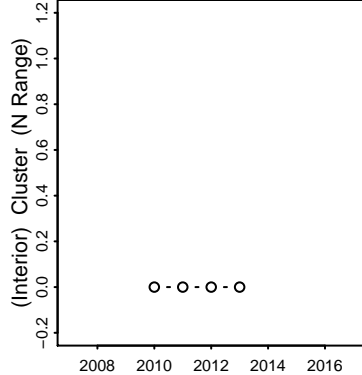
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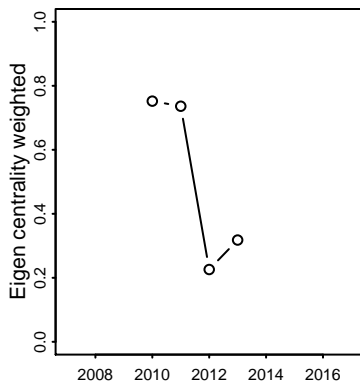
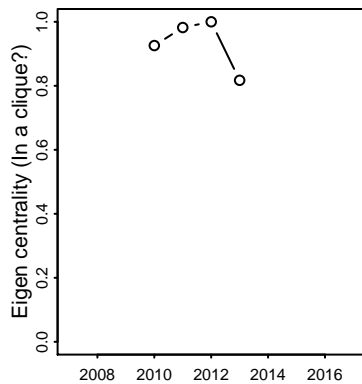
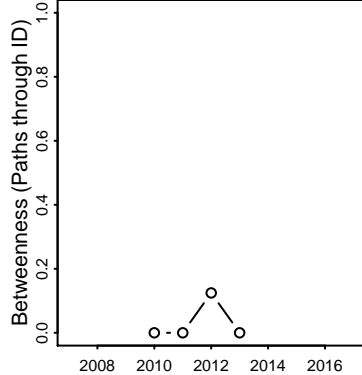
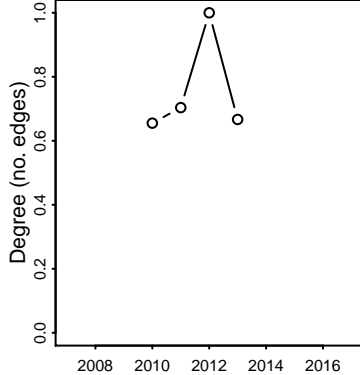
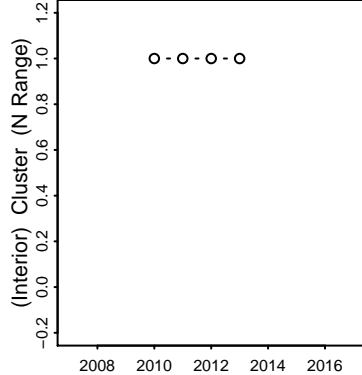
Yell-017



Yell-020

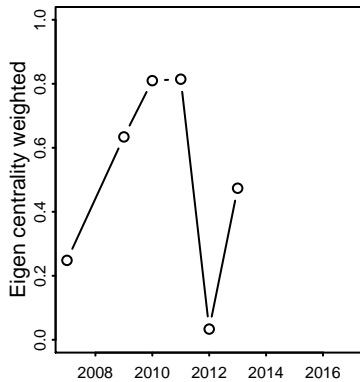
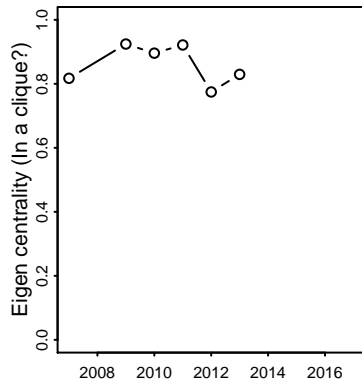
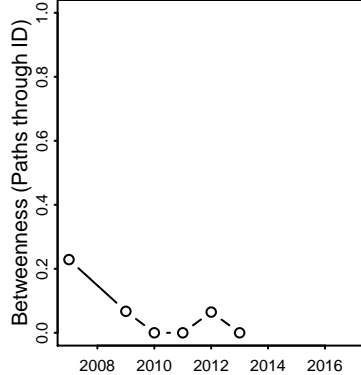
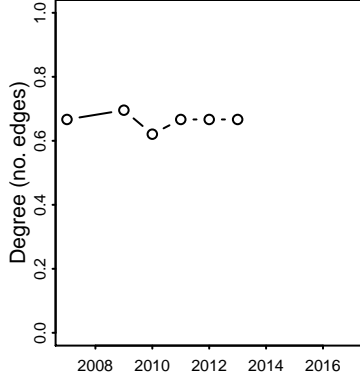
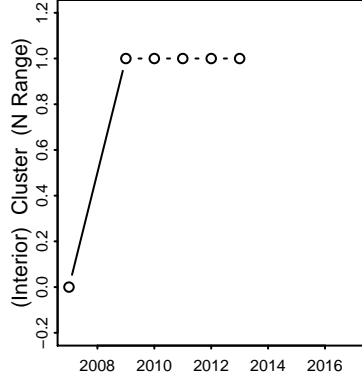


Yell-025

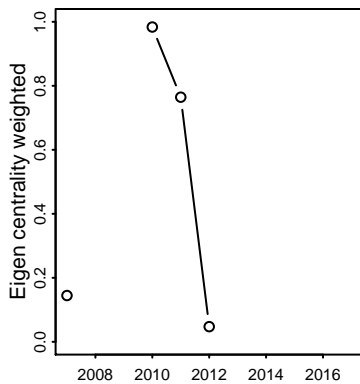
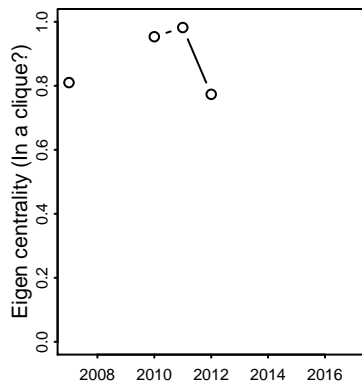
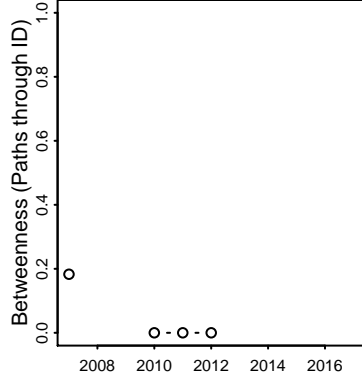
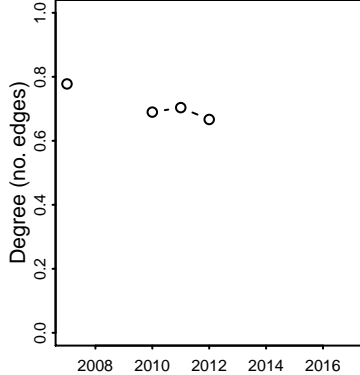
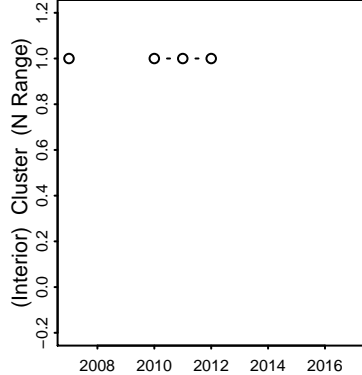


Yell-029

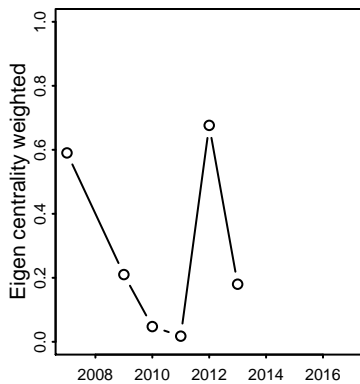
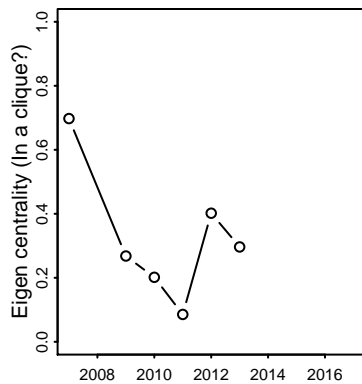
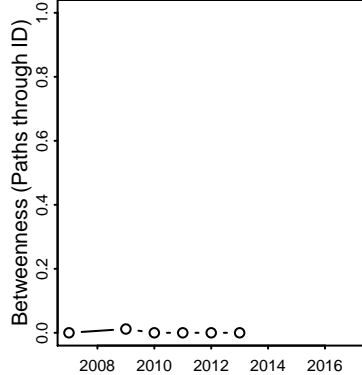
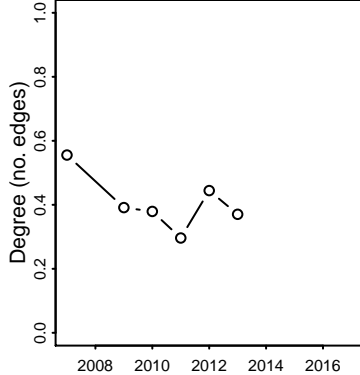
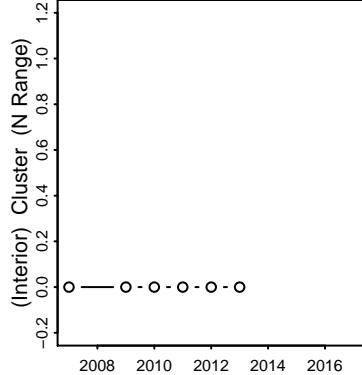




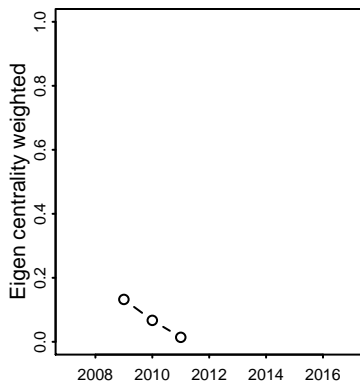
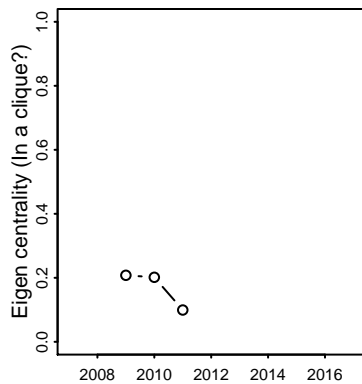
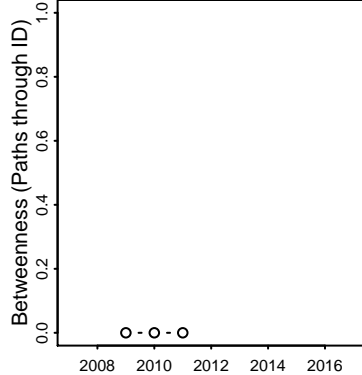
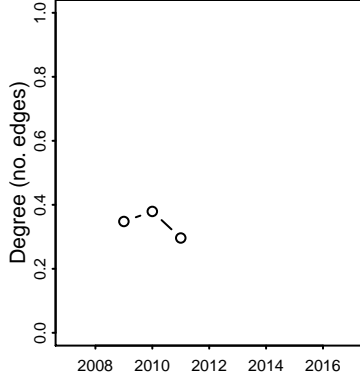
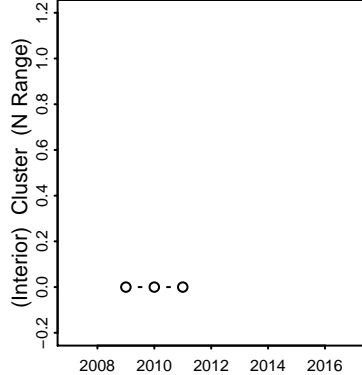
Yell-031



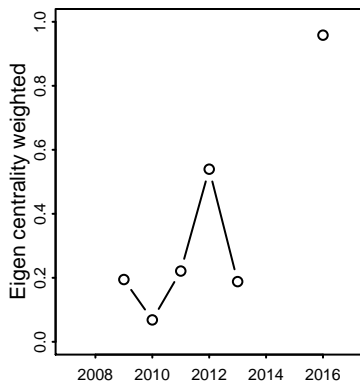
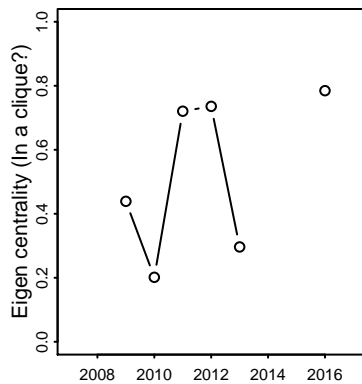
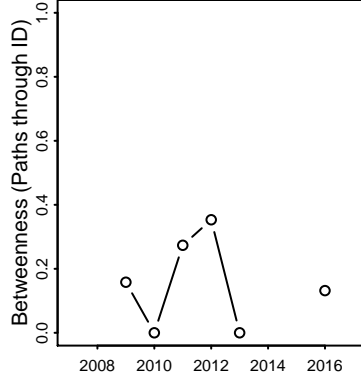
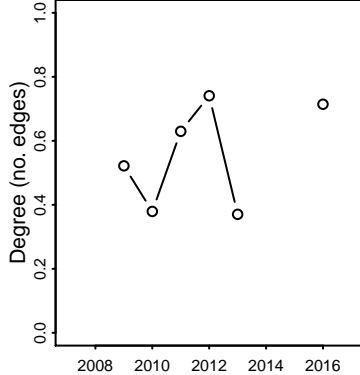
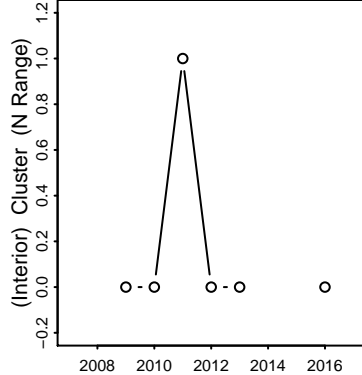
Yell-033



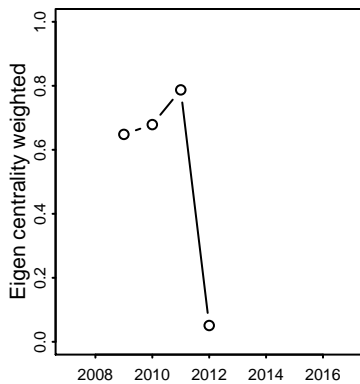
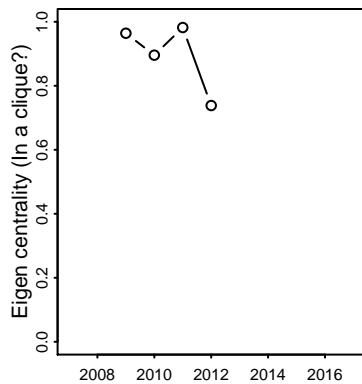
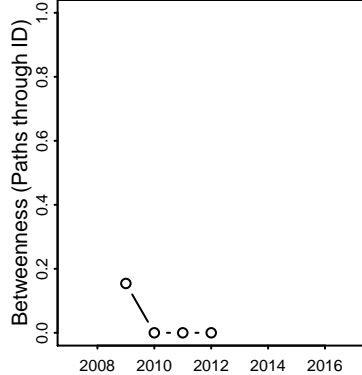
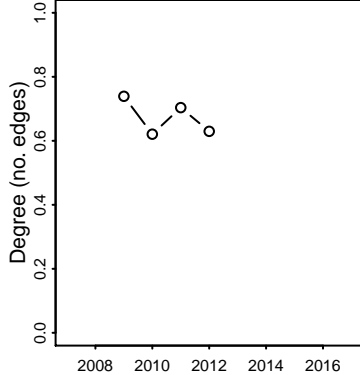
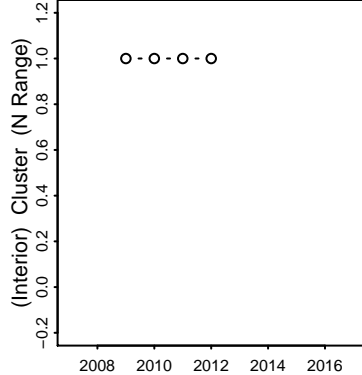
Yell-036



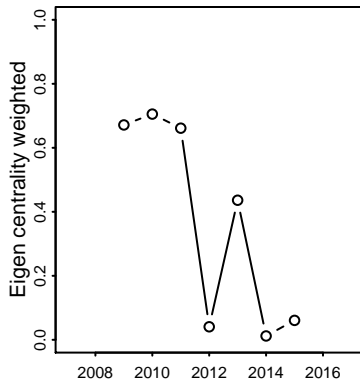
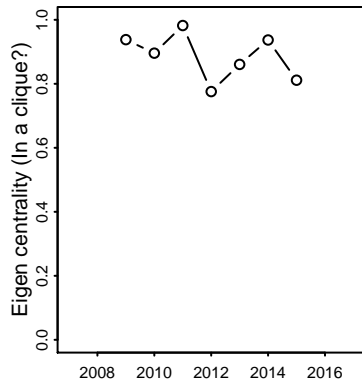
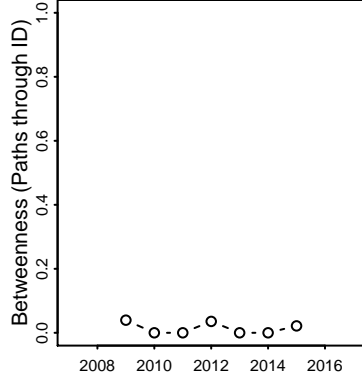
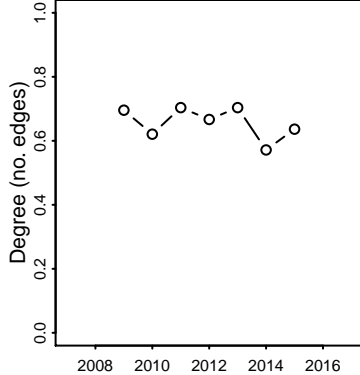
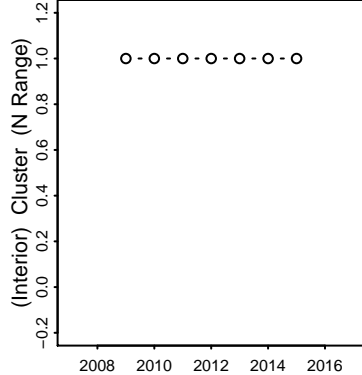
Yell-038



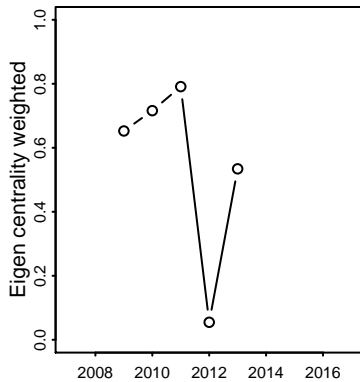
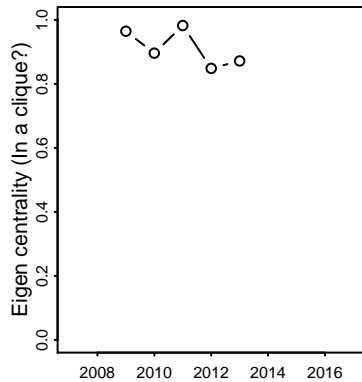
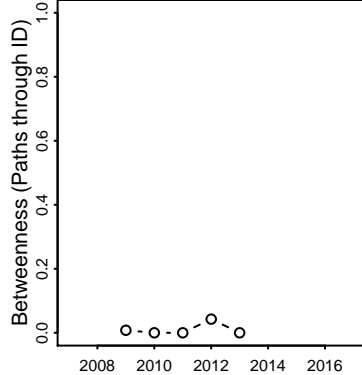
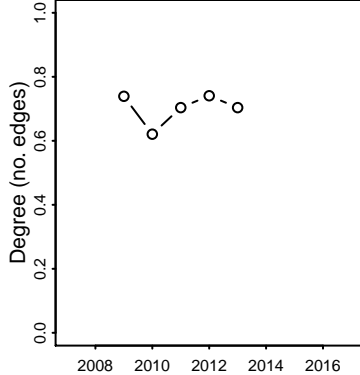
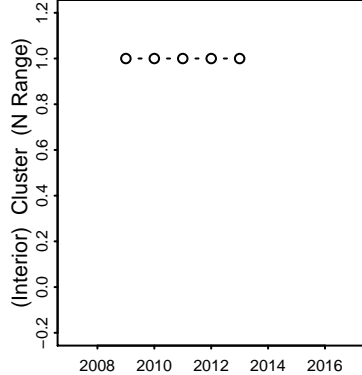
Yell-040



Yell-046

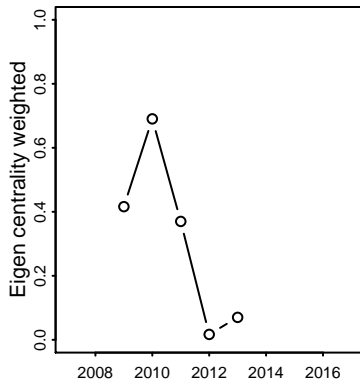
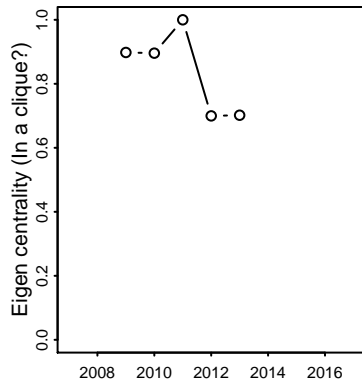
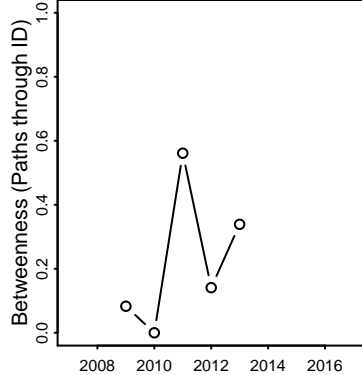
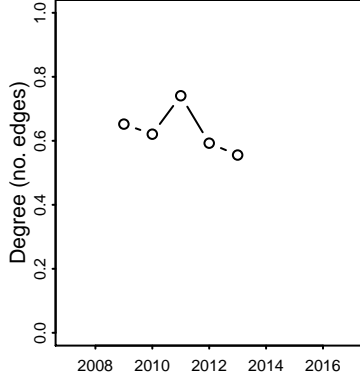
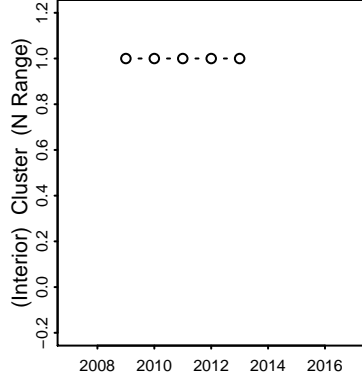


Yell-047

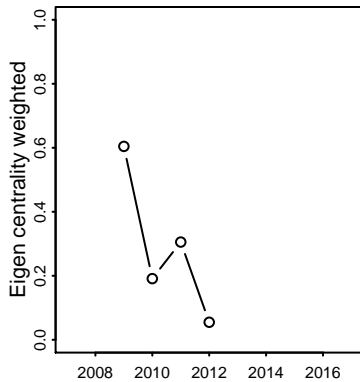
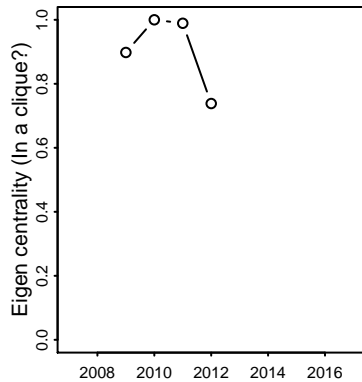
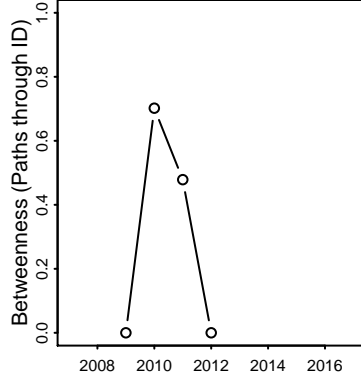
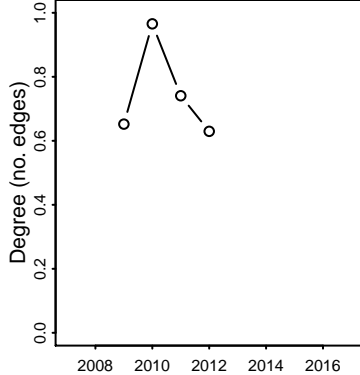
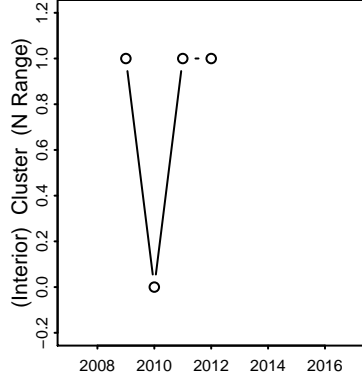


Yell-050

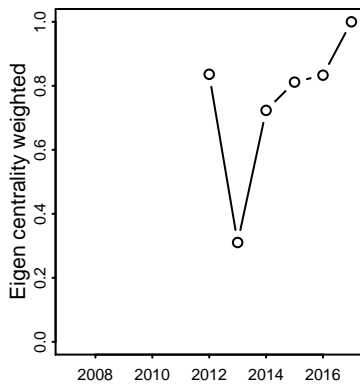
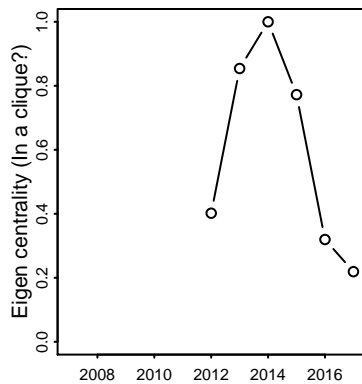
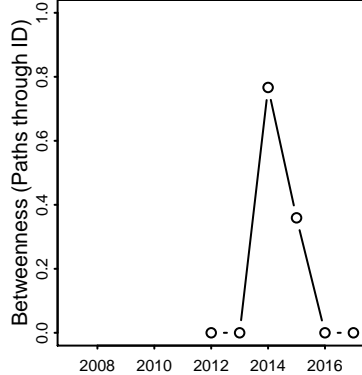
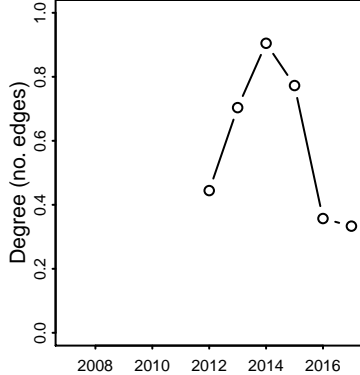
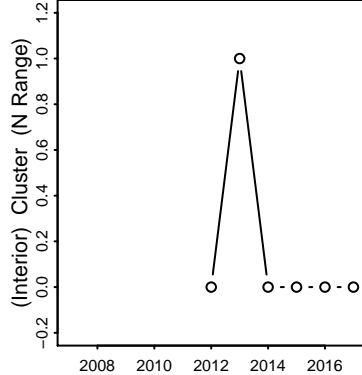




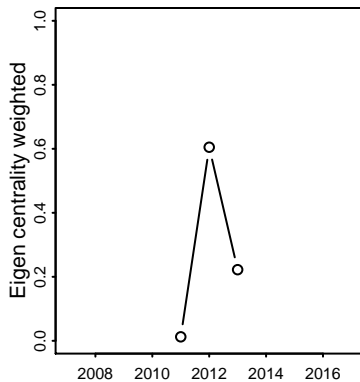
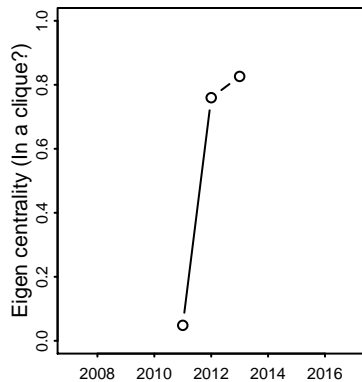
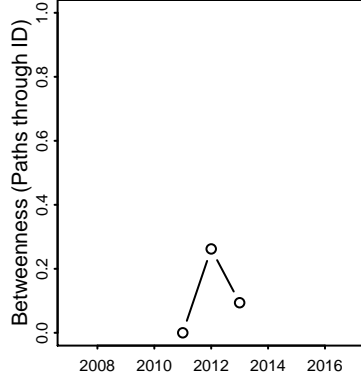
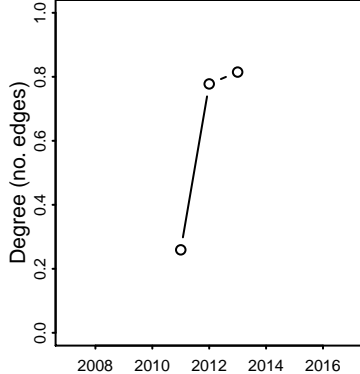
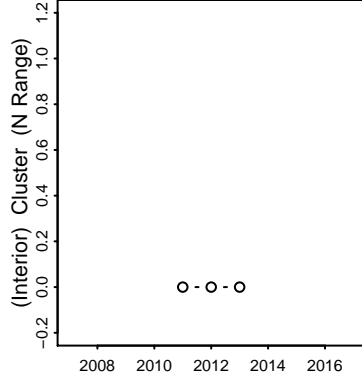
Yell-055



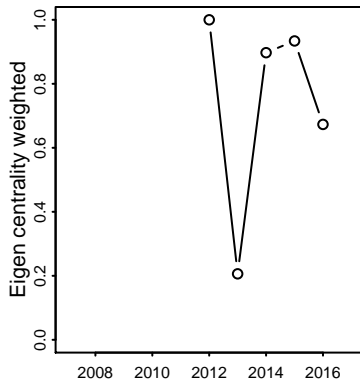
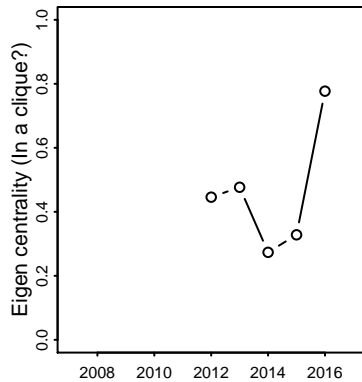
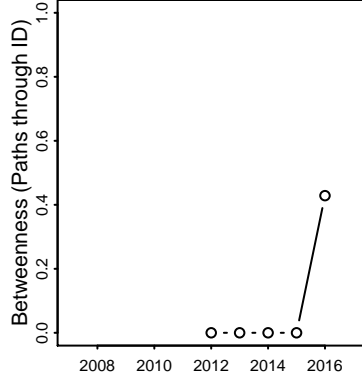
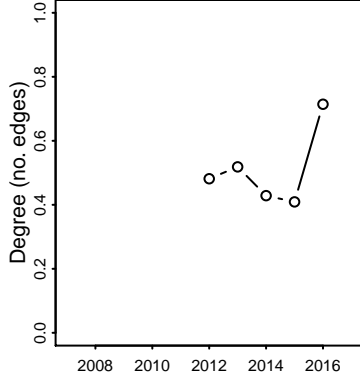
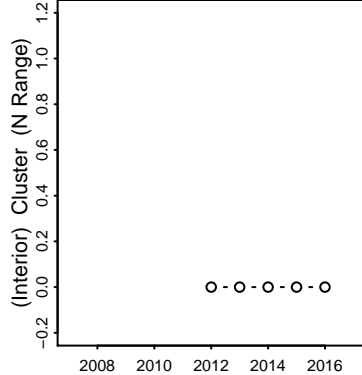
Yell-056



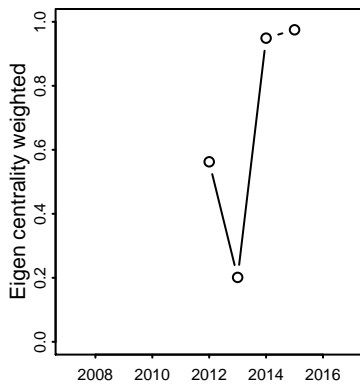
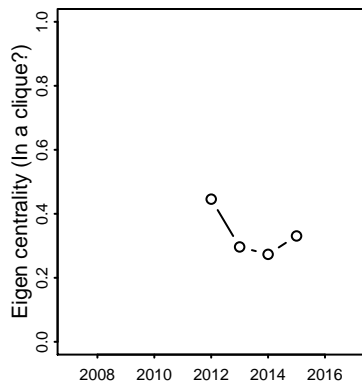
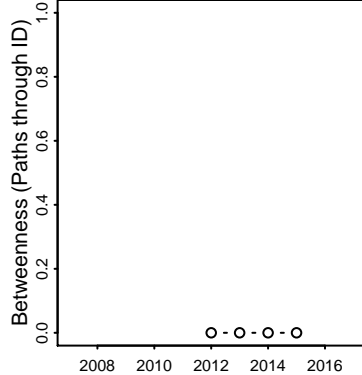
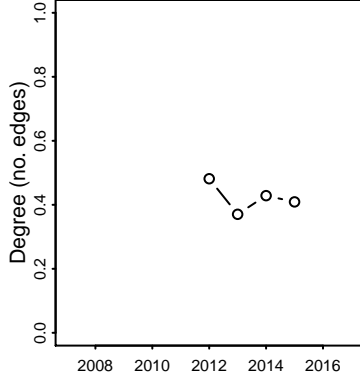
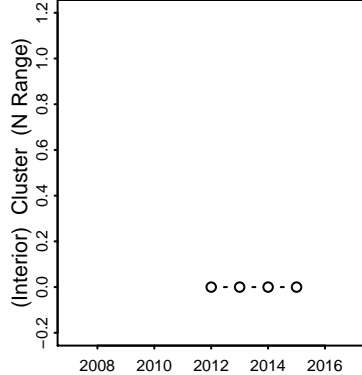
Yell-064



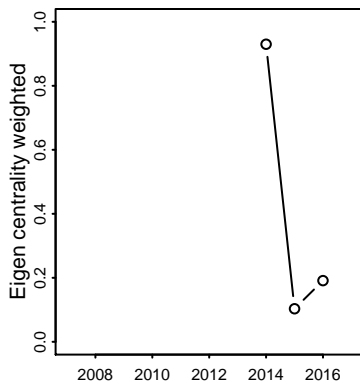
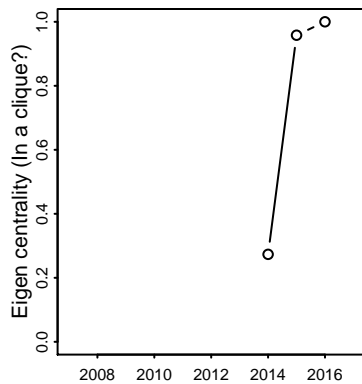
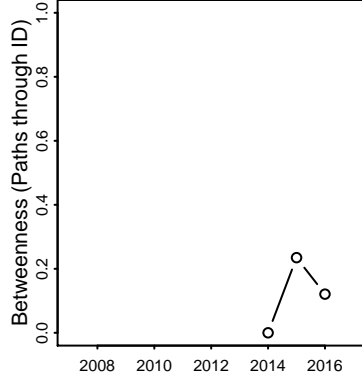
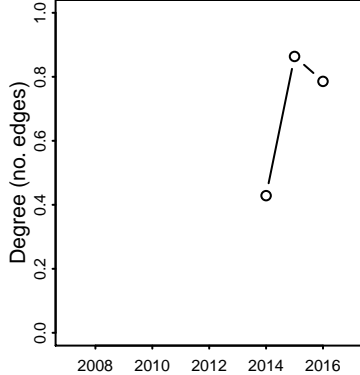
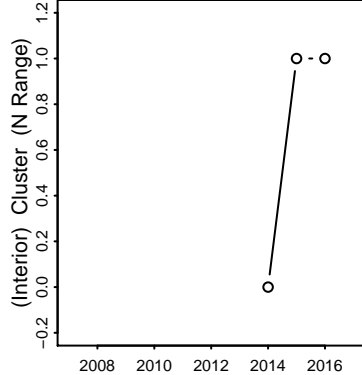
Yell-066



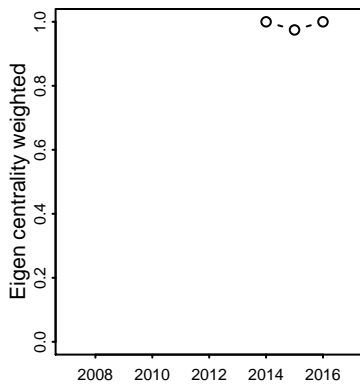
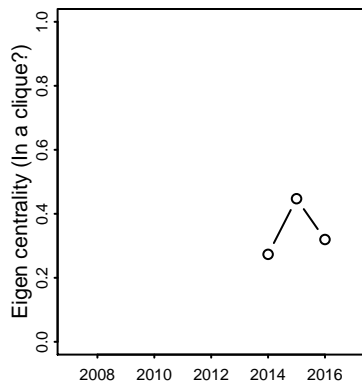
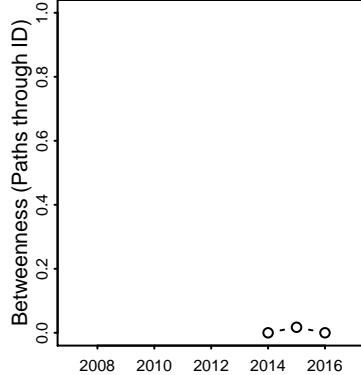
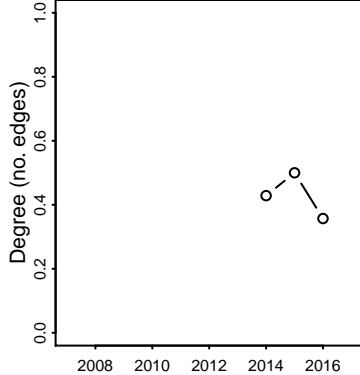
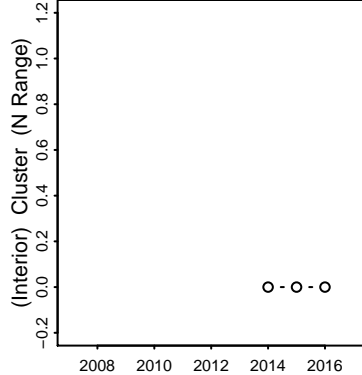
Yell-067



Yell-070

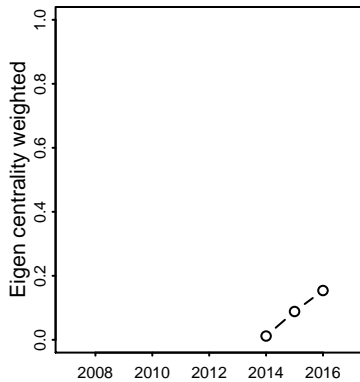
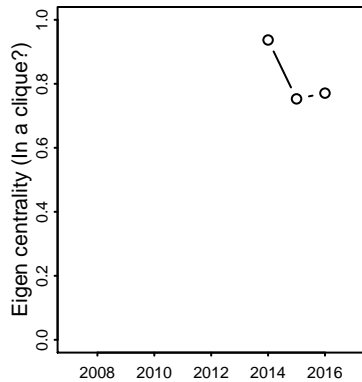
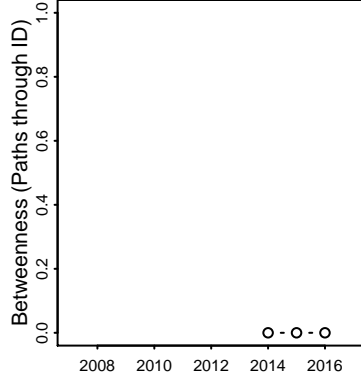
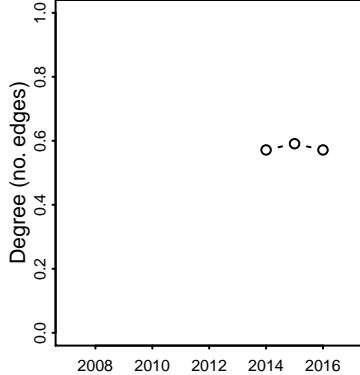
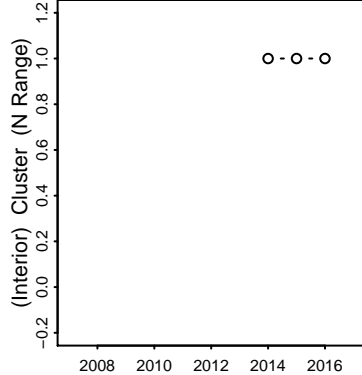


Yell-072

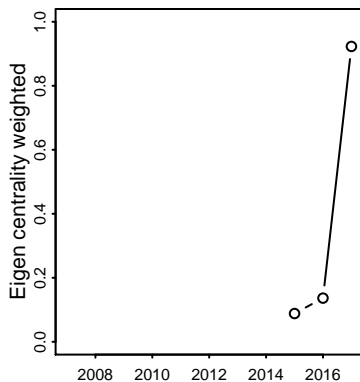
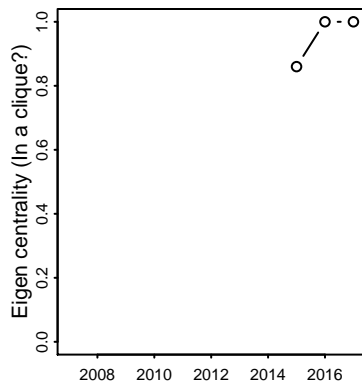
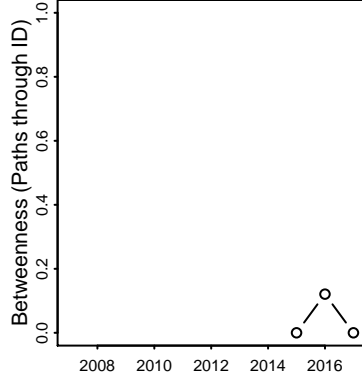
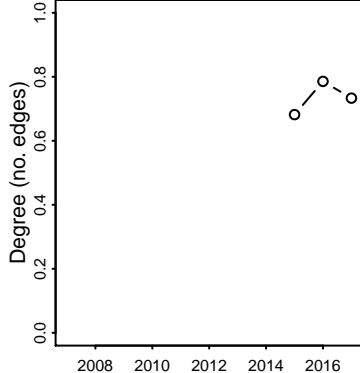
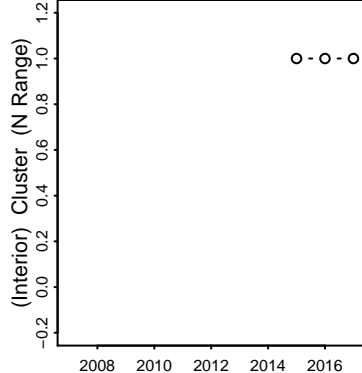


Yell-074

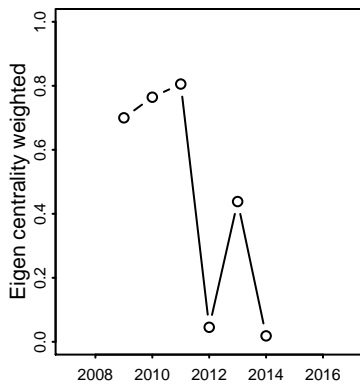
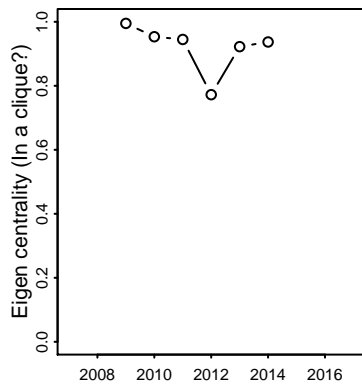
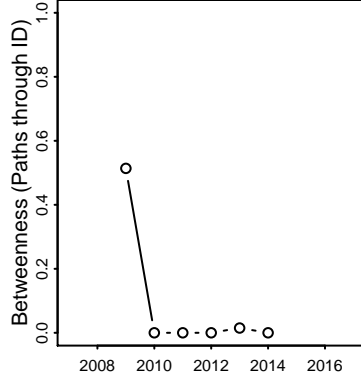
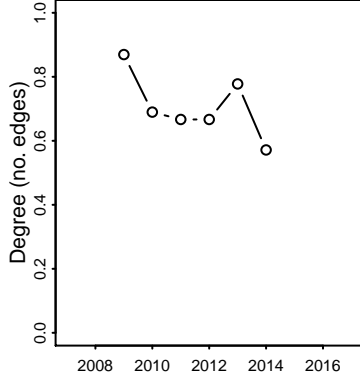
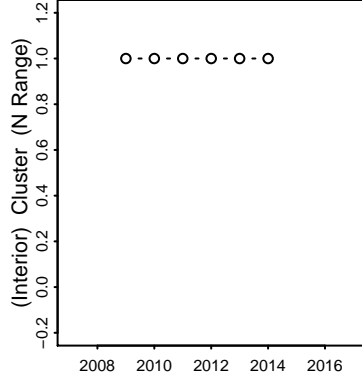




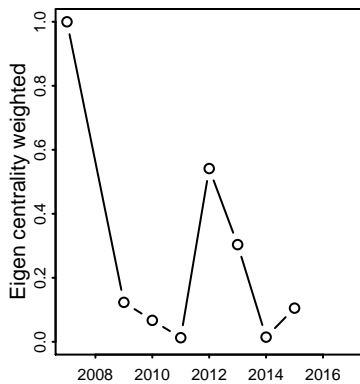
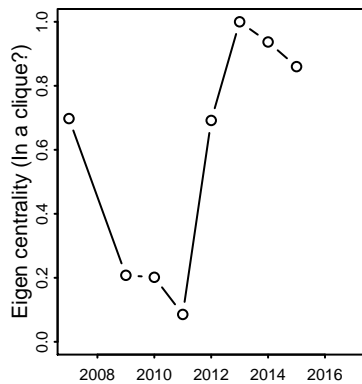
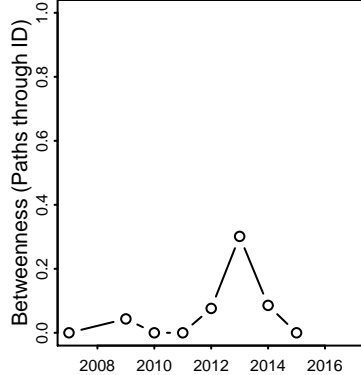
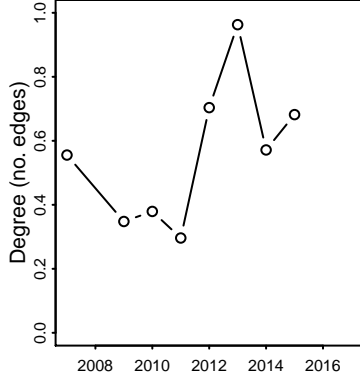
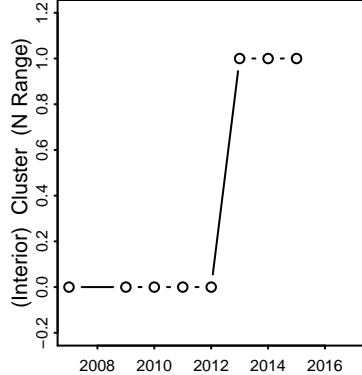
Yell-077



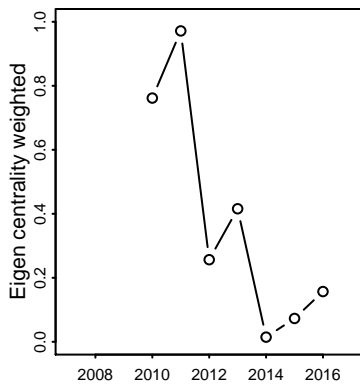
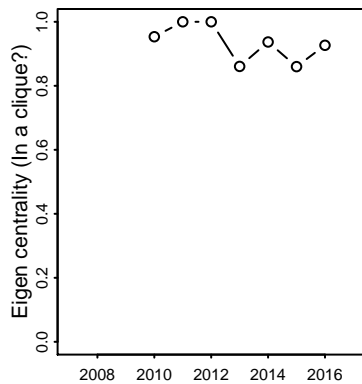
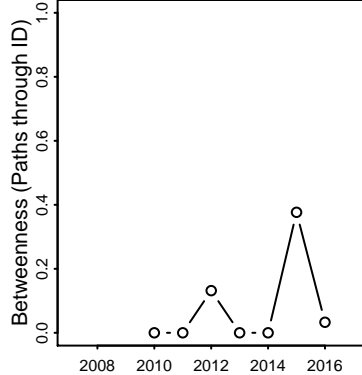
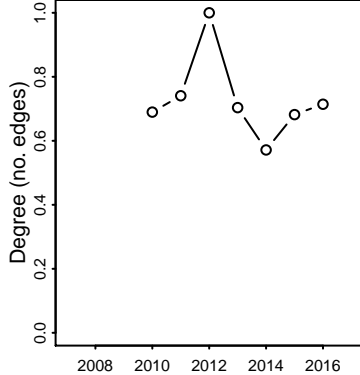
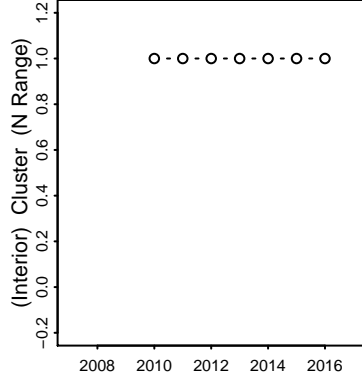
Yell-086



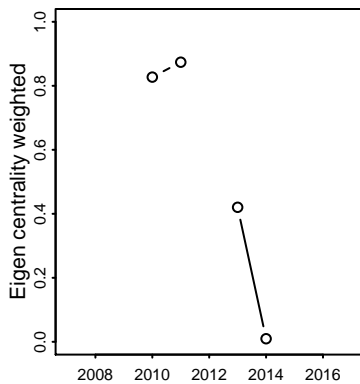
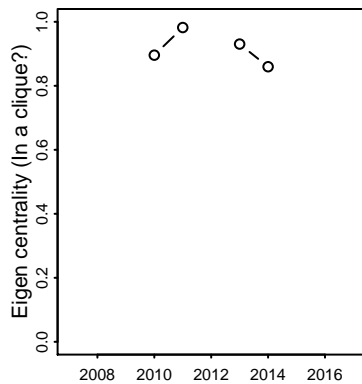
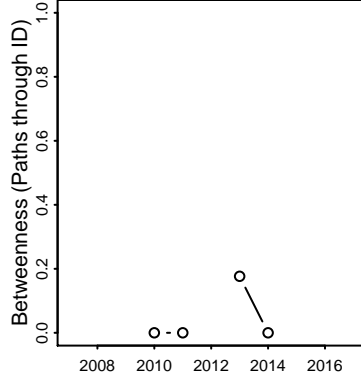
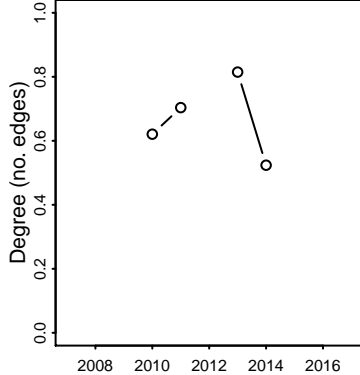
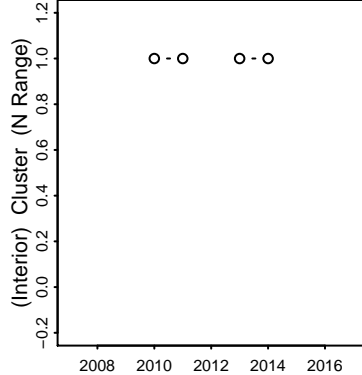
Yell-301



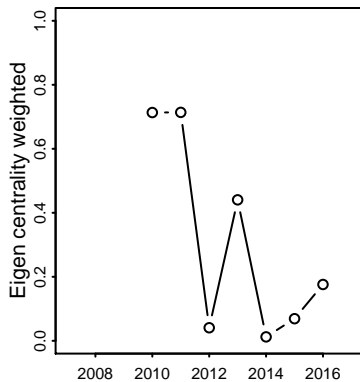
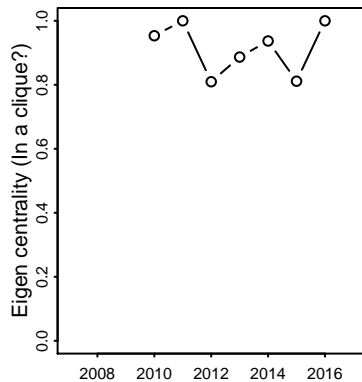
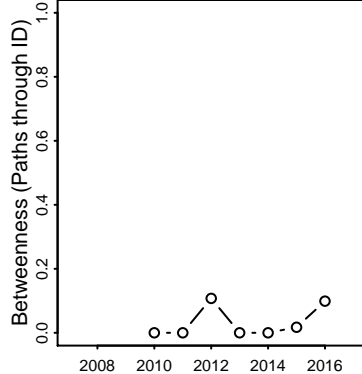
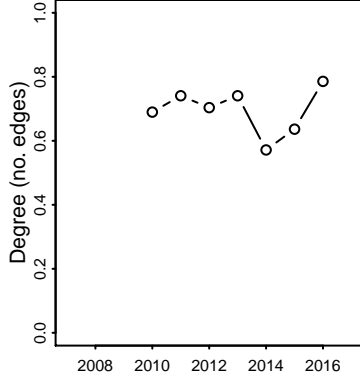
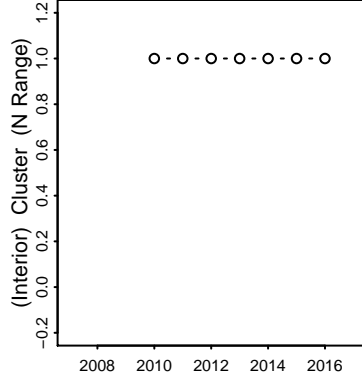
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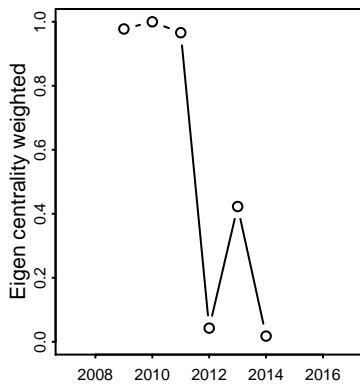
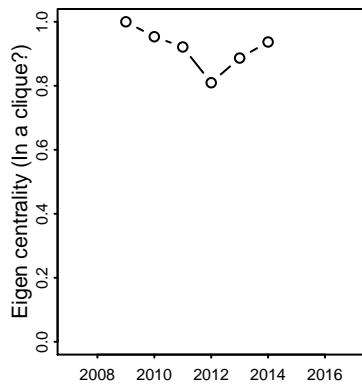
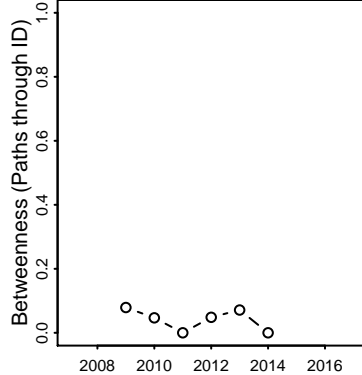
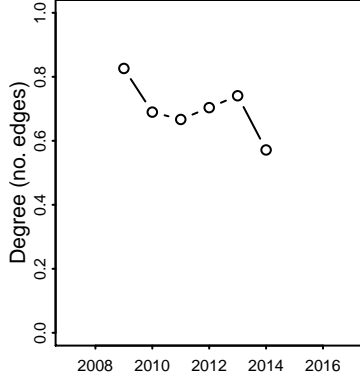
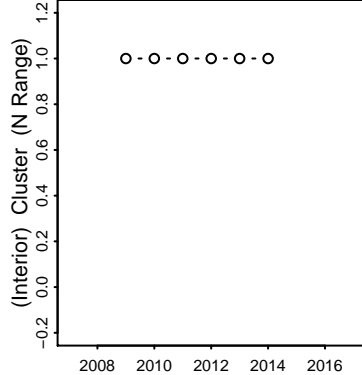
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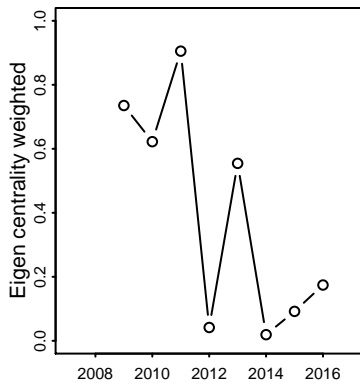
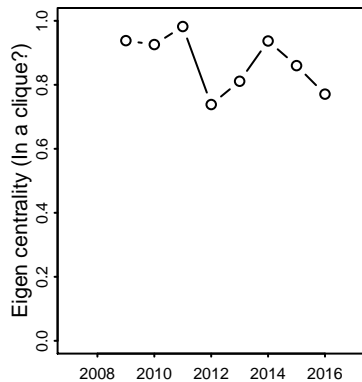
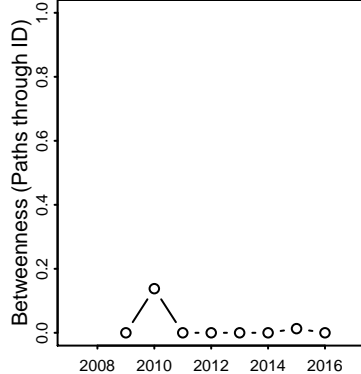
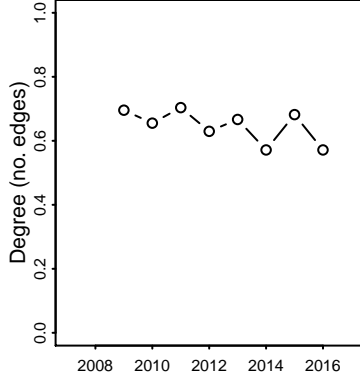
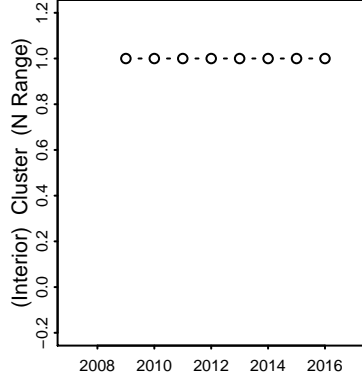


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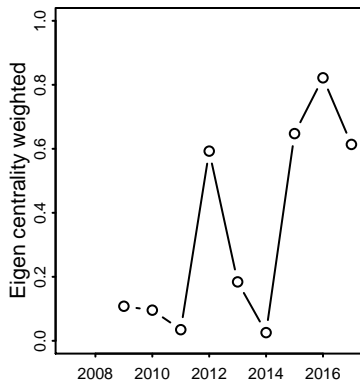
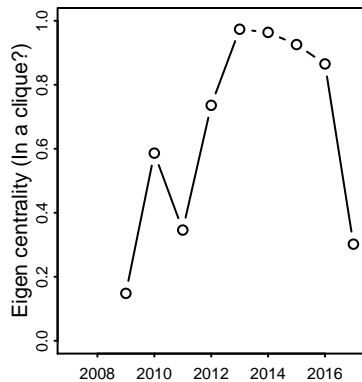
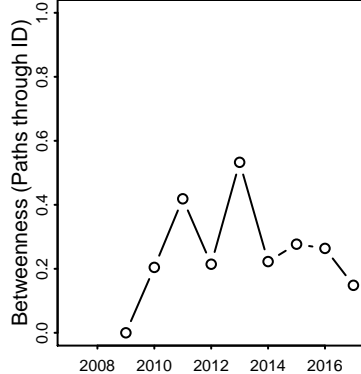
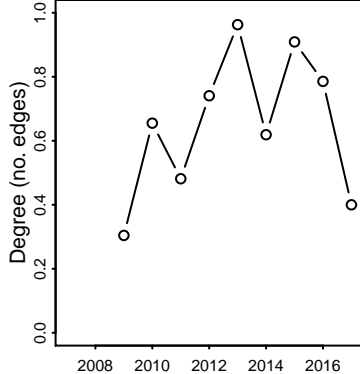
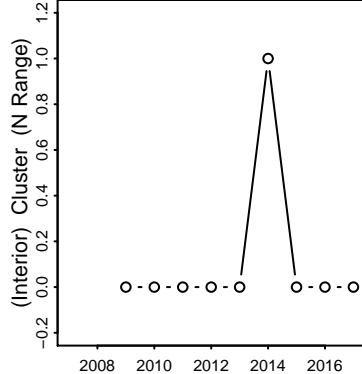


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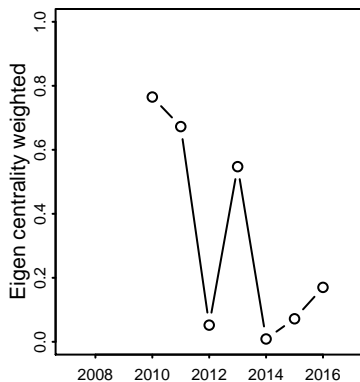
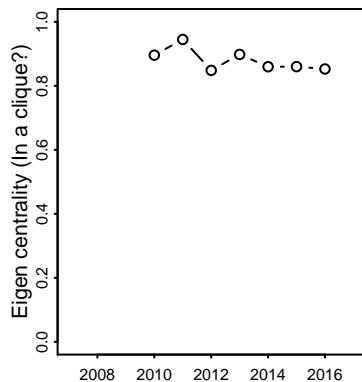
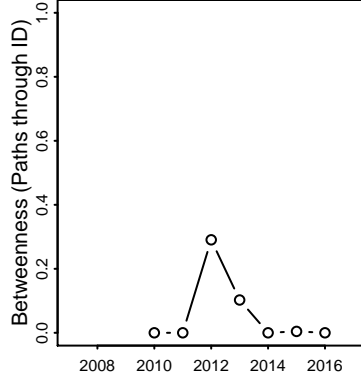
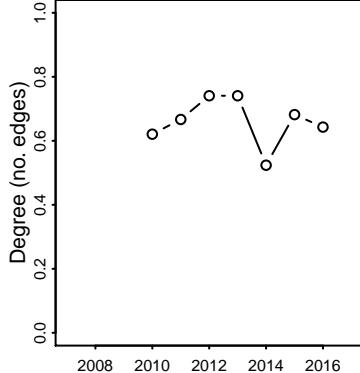
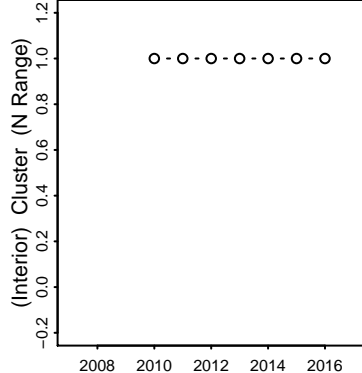




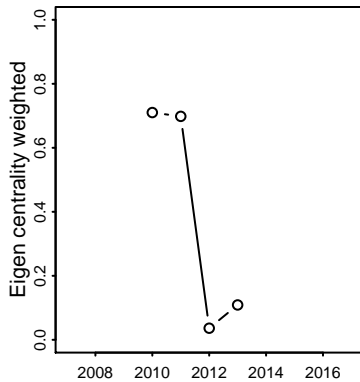
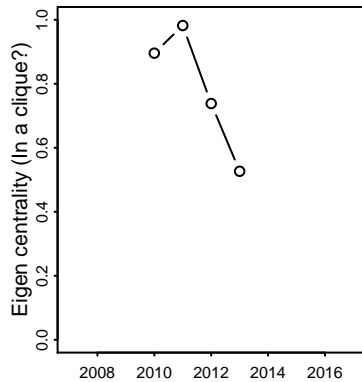
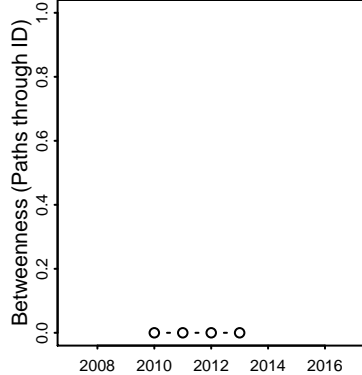
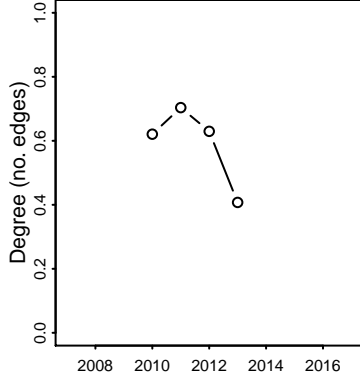
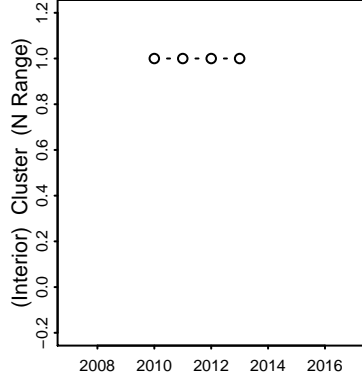
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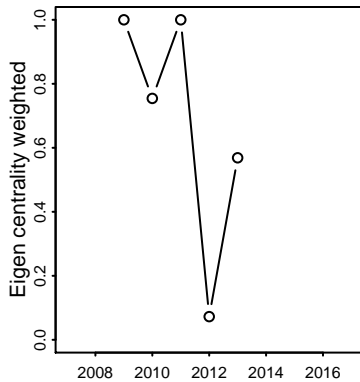
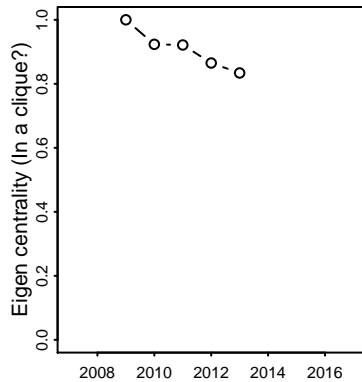
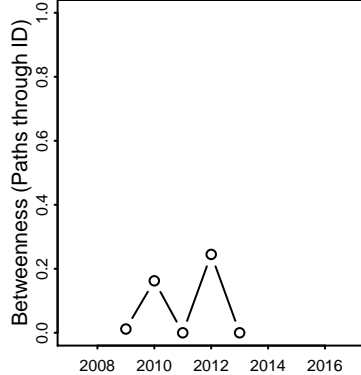
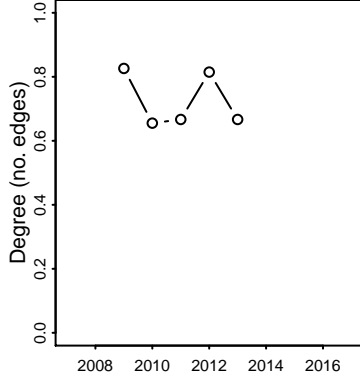
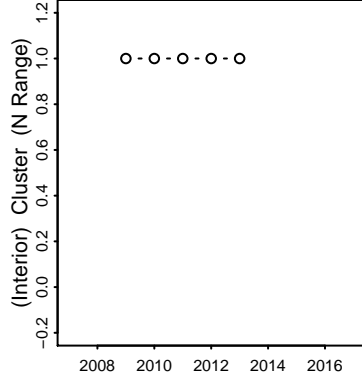
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