

# A Revision and Phylogeographic Study of *Liocranoides* (Araneae: Zoropsidae)

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# Biodiversity in the Appalachian Mountains



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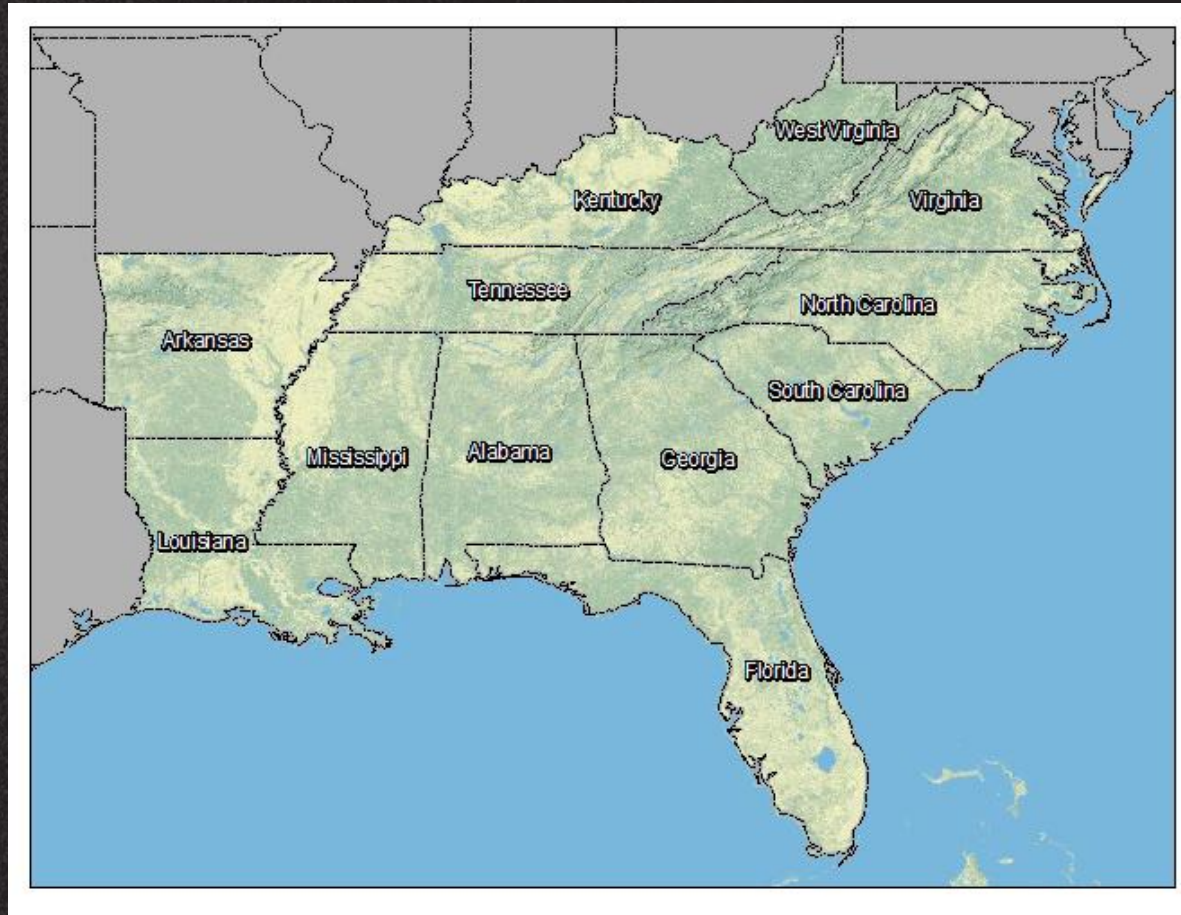
# Introduction to Speciation



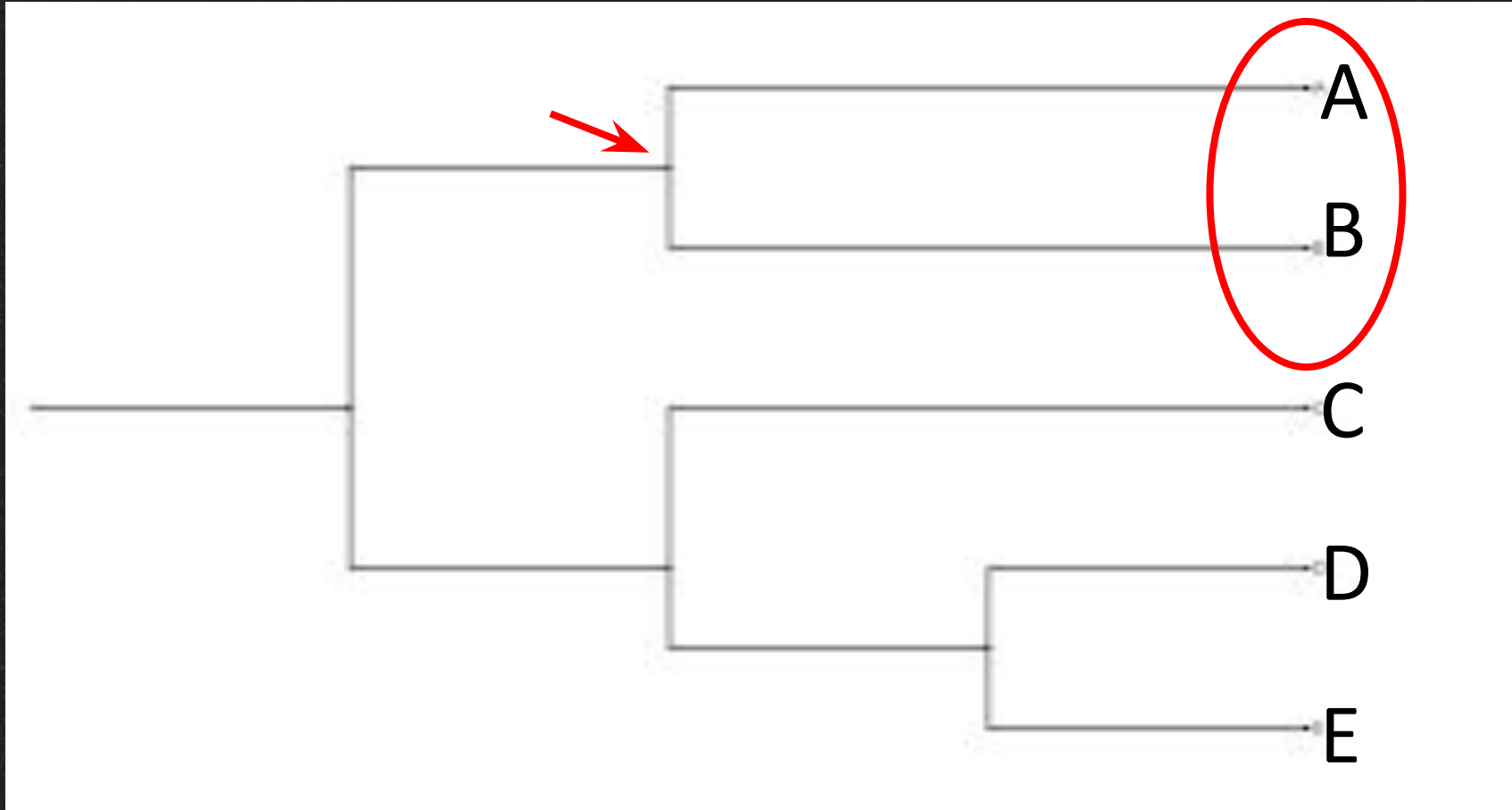
UNIVERSITY OF INDIANAPOLIS



# WHAT IS BIOGEOGRAPHY?



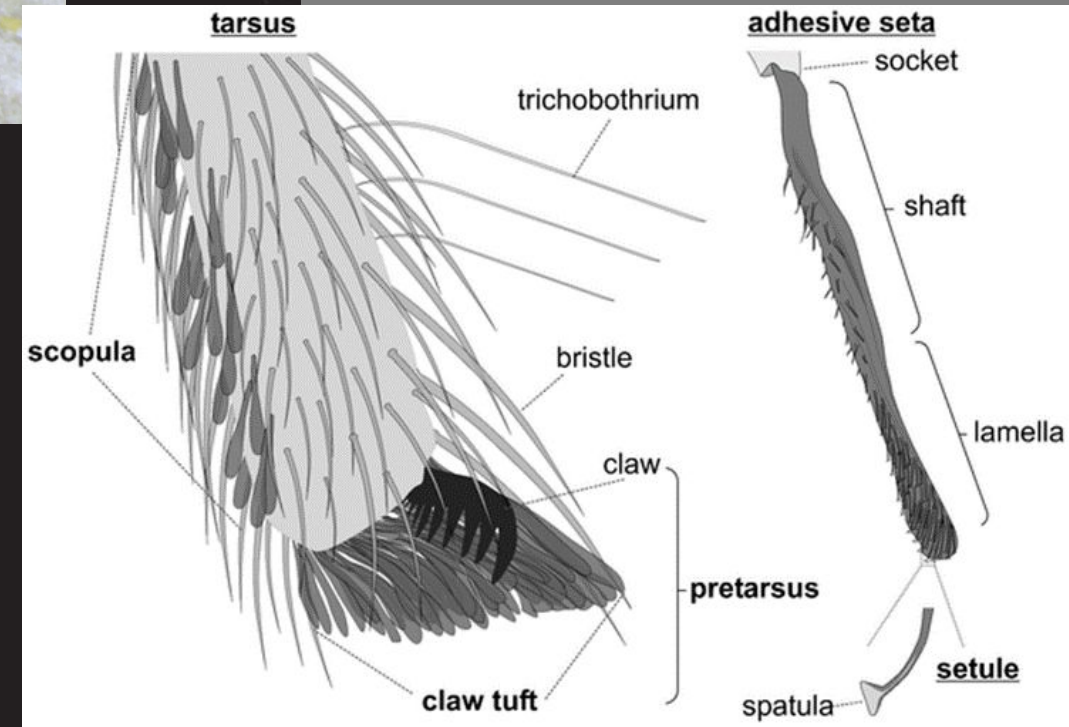
# How Do We Represent Species Relationships?







# Introduction: *Liocranoides*

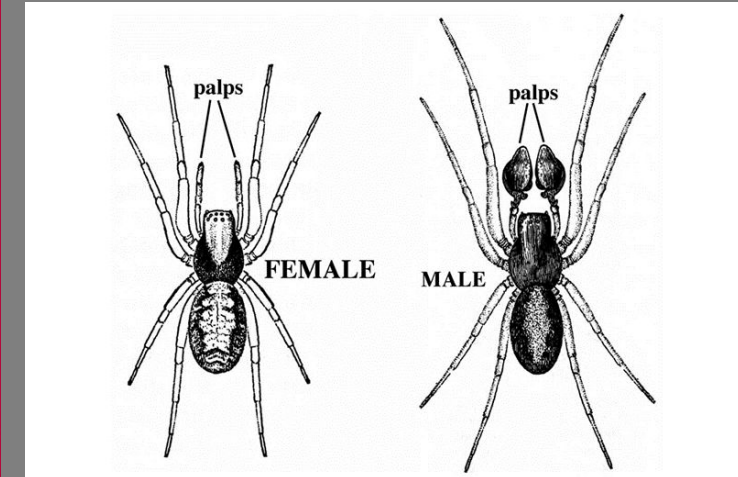
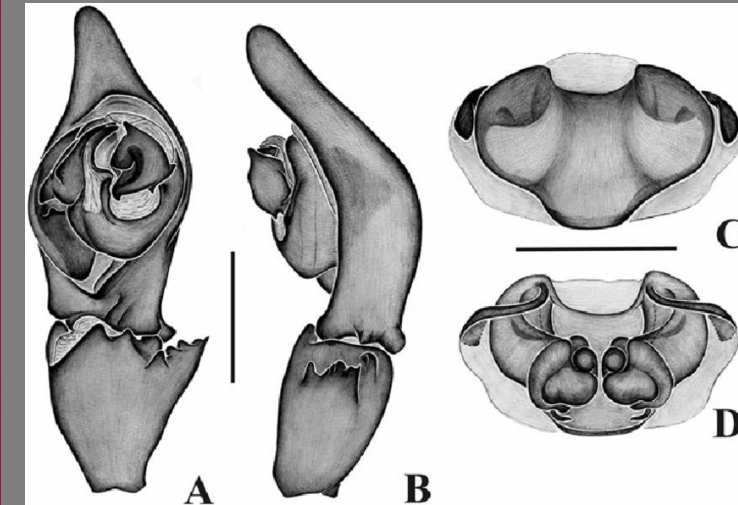




# How can we determine species relationships?

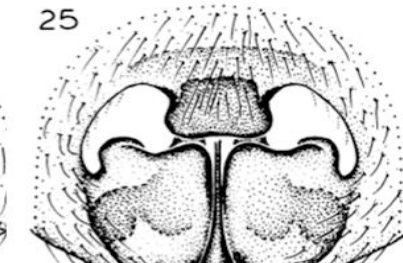
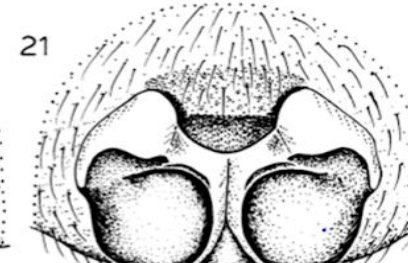
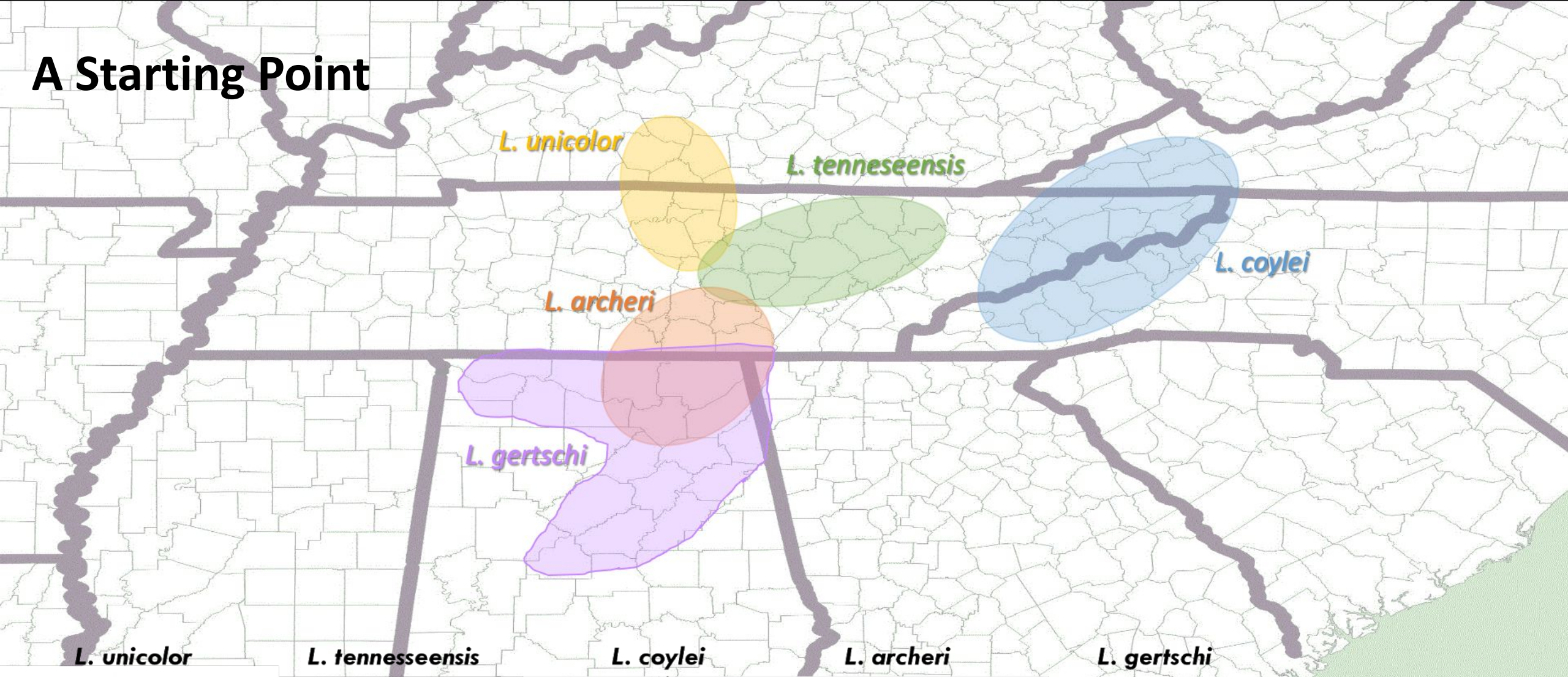
Two methods:

1. Morphological Differences
1. Genetic Differences





# A Starting Point





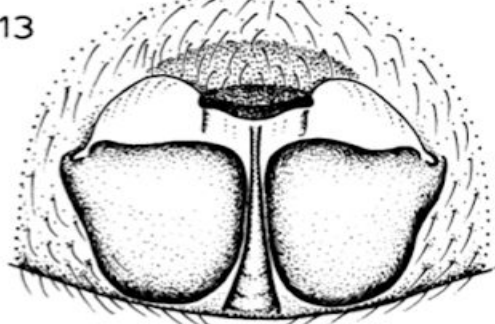
***L. unicolor***

9



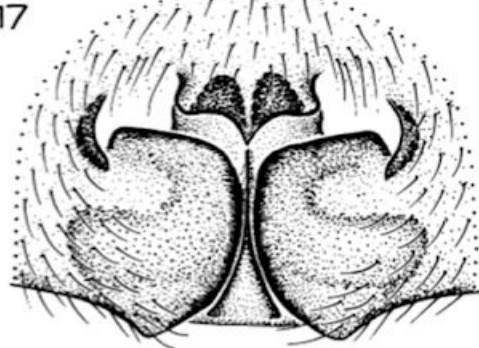
***L. tennesseensis***

13



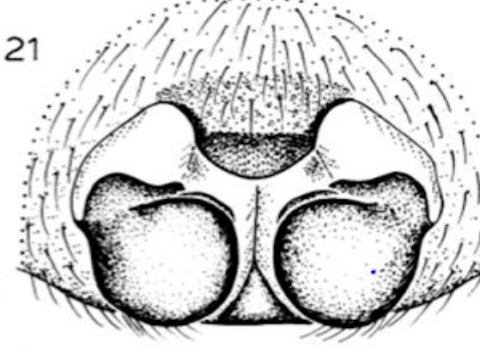
***L. coylei***

17



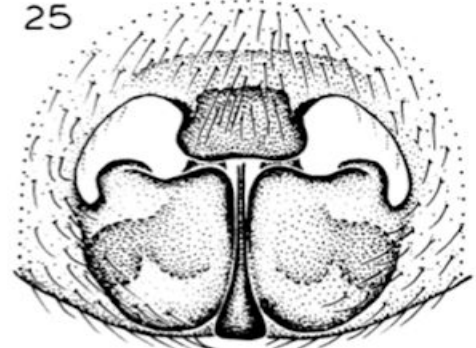
***L. archeri***

21



***L. gertschi***

25

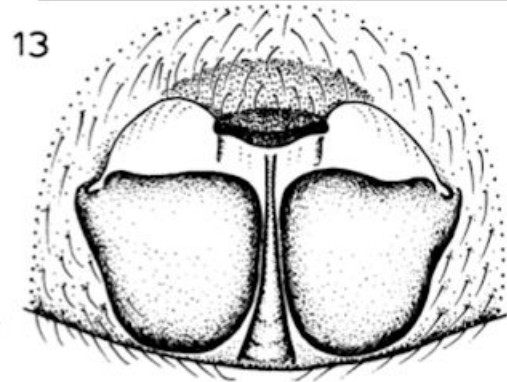




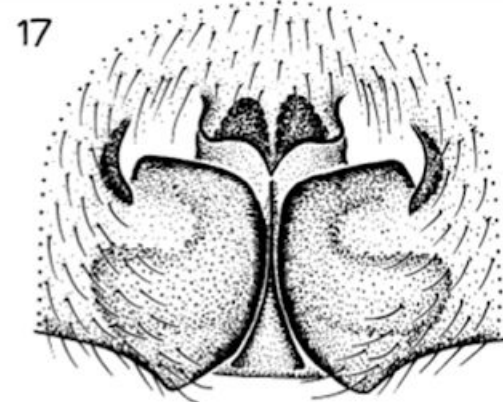
*L. unicolor*



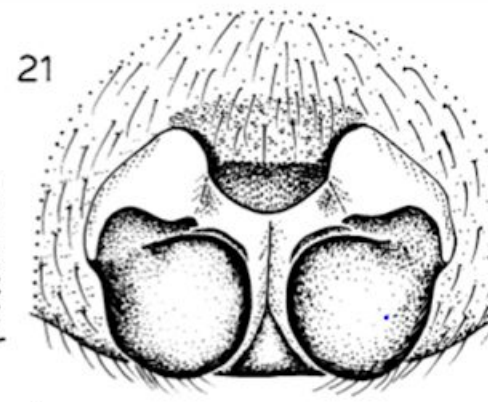
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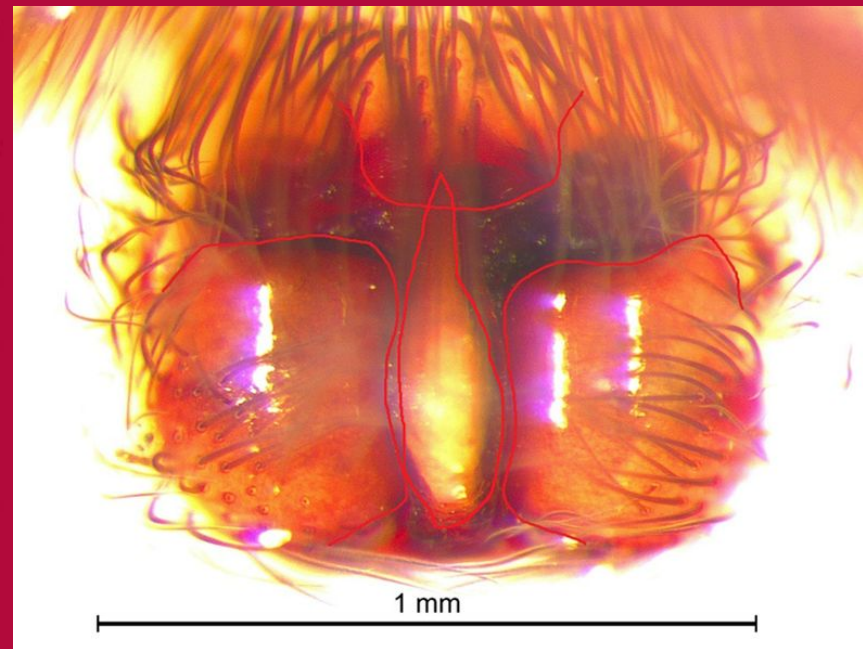
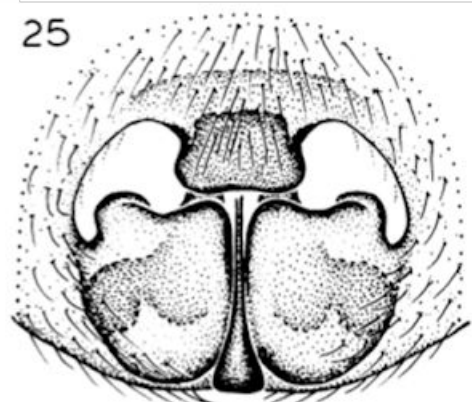
*L. coylei*



*L. archeri*



*L. gertschi*



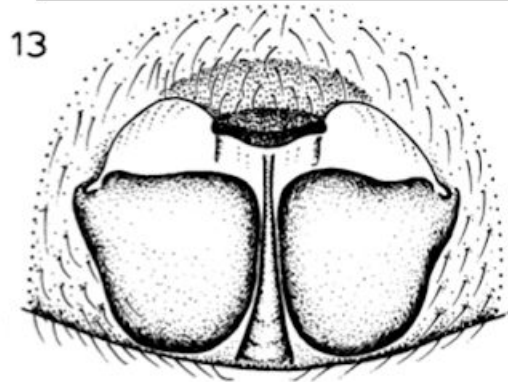
Scholar Showcase



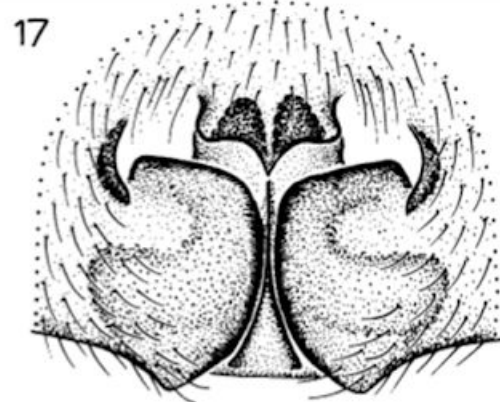
*L. unicolor*



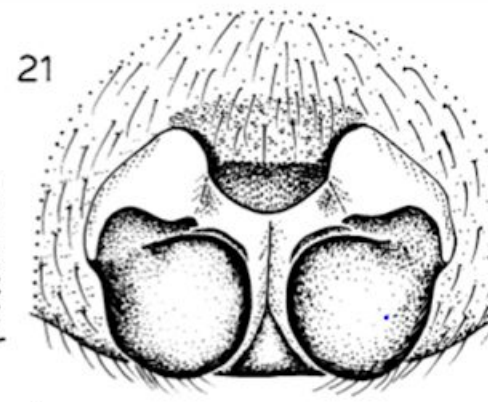
*L. tennesseensis*



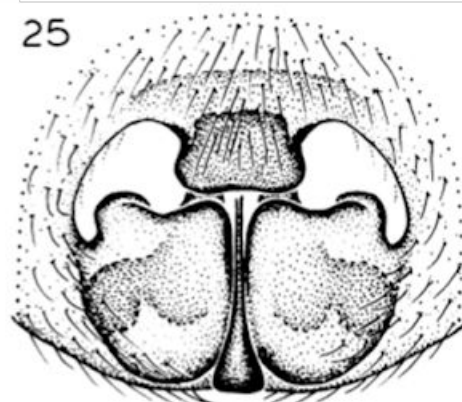
*L. coylei*



*L. archeri*



*L. gertschi*



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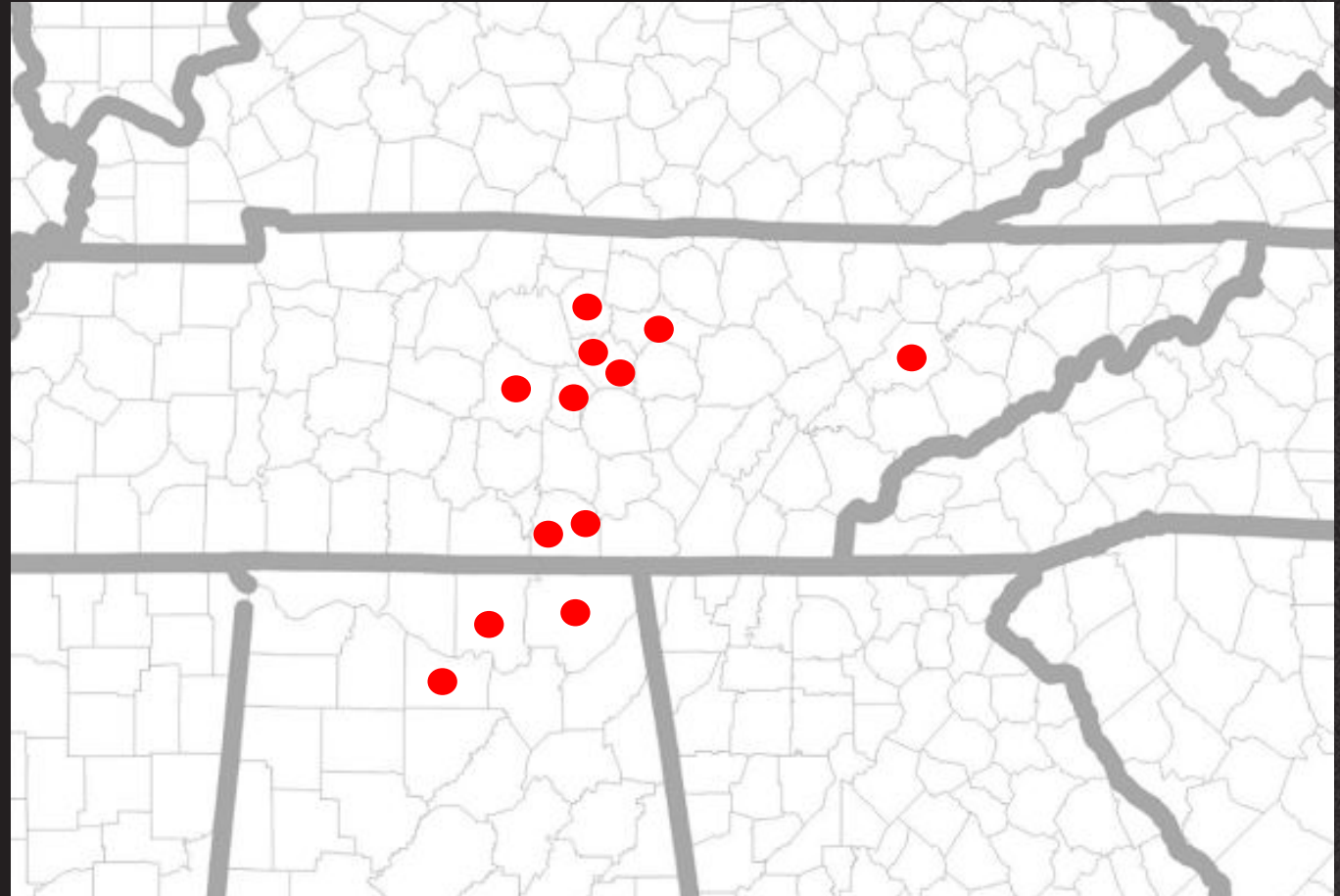
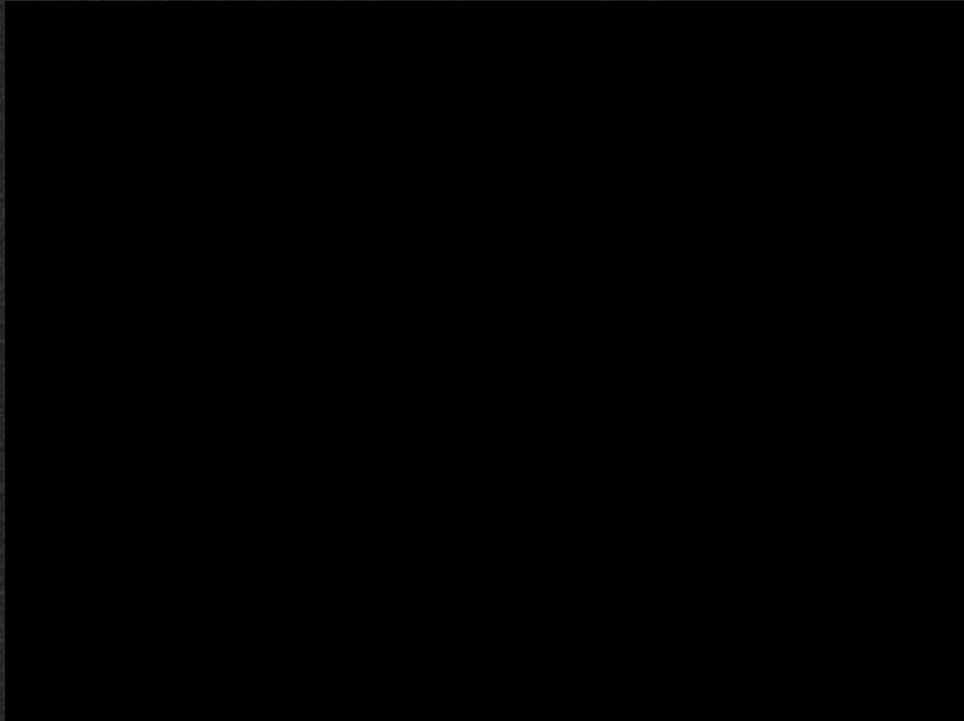




**Our Question:** What is the phylogenetic relationship among *Liocranoides* from various caves, and how do these species relate biogeographically?



# Caves Sampled





# Methods

Looked at four genes that coded for the following:

1. A histone Protein (H3)
2. DNA between the large and small ribosomal subunit genes (ITS2)
3. The small ribosomal subunit (18S)
4. The large ribosomal subunit (28S)





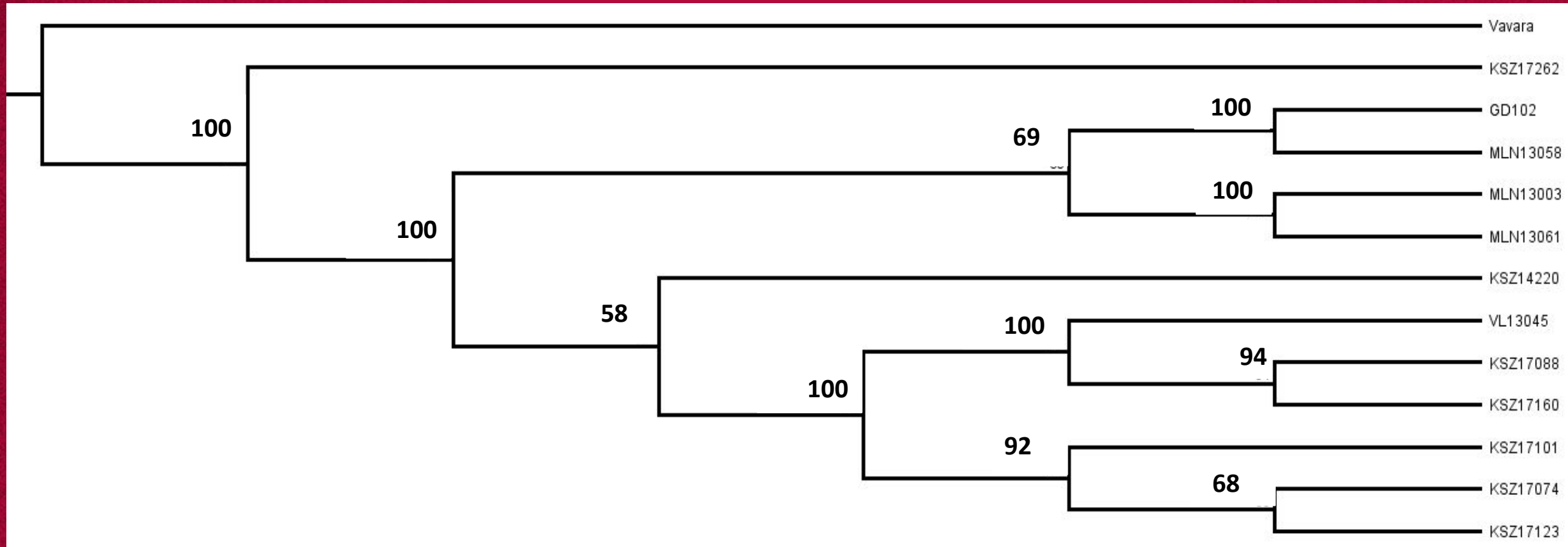
# Methods

1. **Extracted DNA** – Used Qiagen DNeasy Blood & Tissue Kit
2. **PCR for all Four Genes** – Using primer pairs purchased from IDT
3. **Gel Electrophoresis** – Determine whether or not the gene was amplified
4. **Purification** – Used QIAquick PCR Purification Kit
5. **Sequencing** – Done by Genewiz
6. **Sequence Alignment, concatenation, and tree creation**
  - Done with Geneious Prime.
  - Confidence of nodes determined by bootstrapping with 100 replicates.



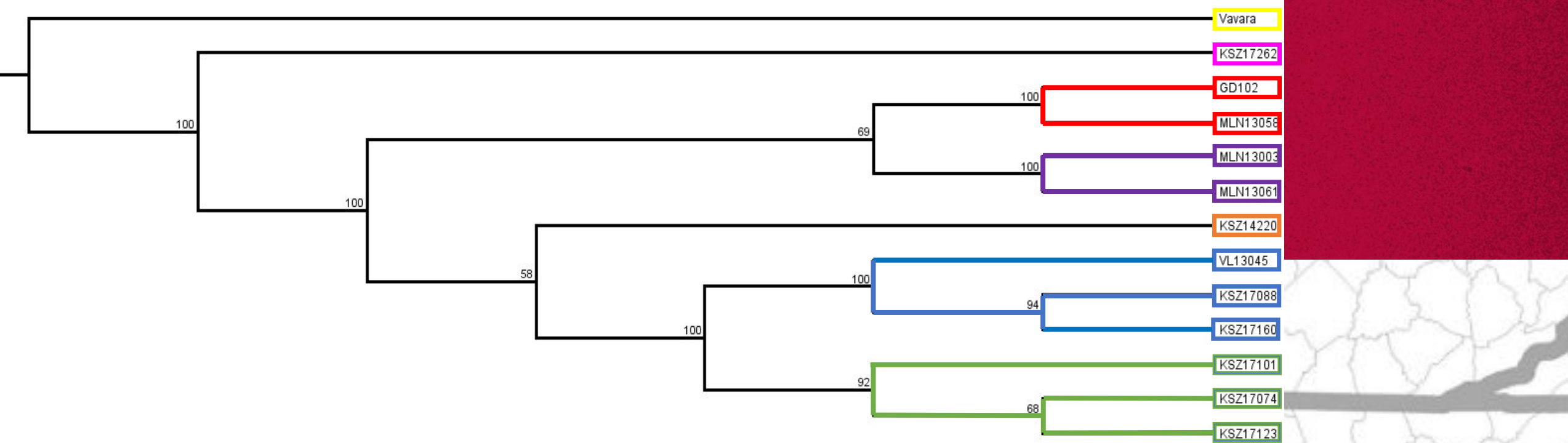


## RESULTS

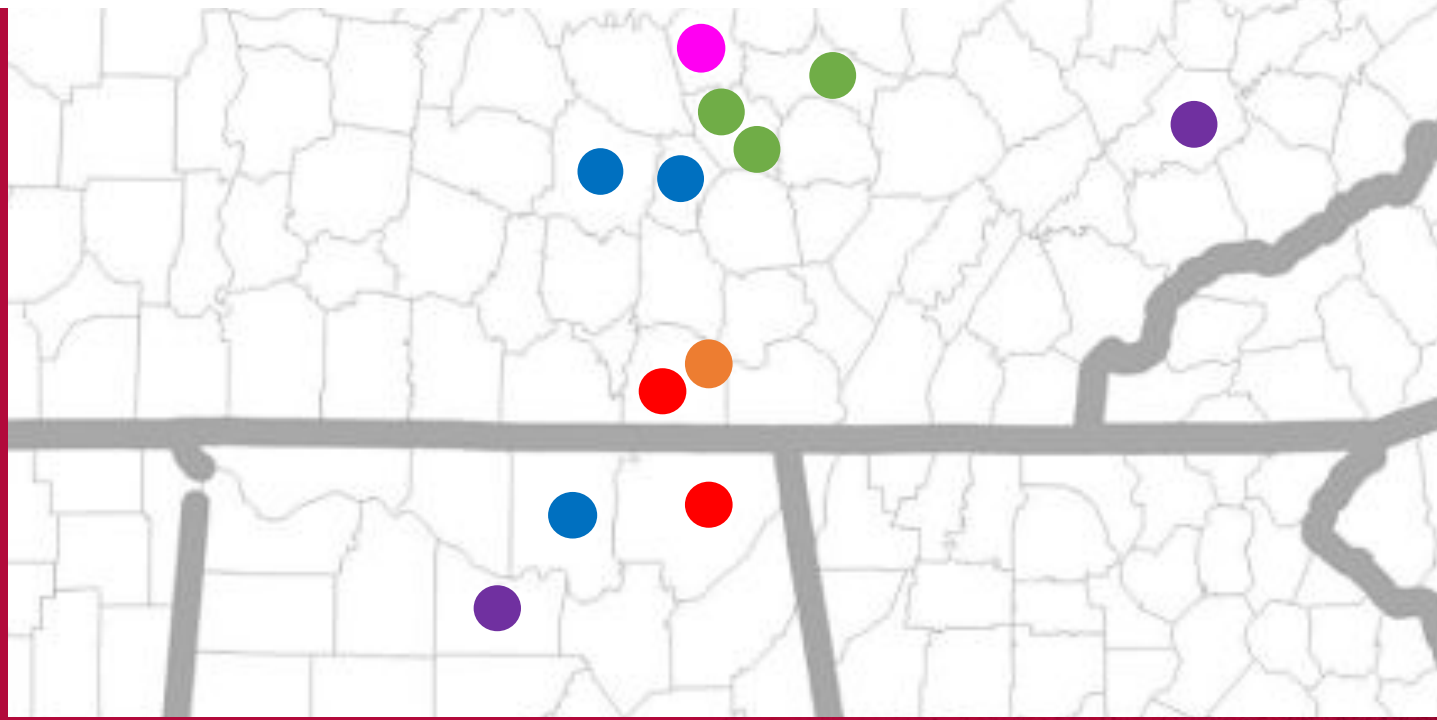


*Phylogenetic tree with associated bootstrap values for sequenced specimens*

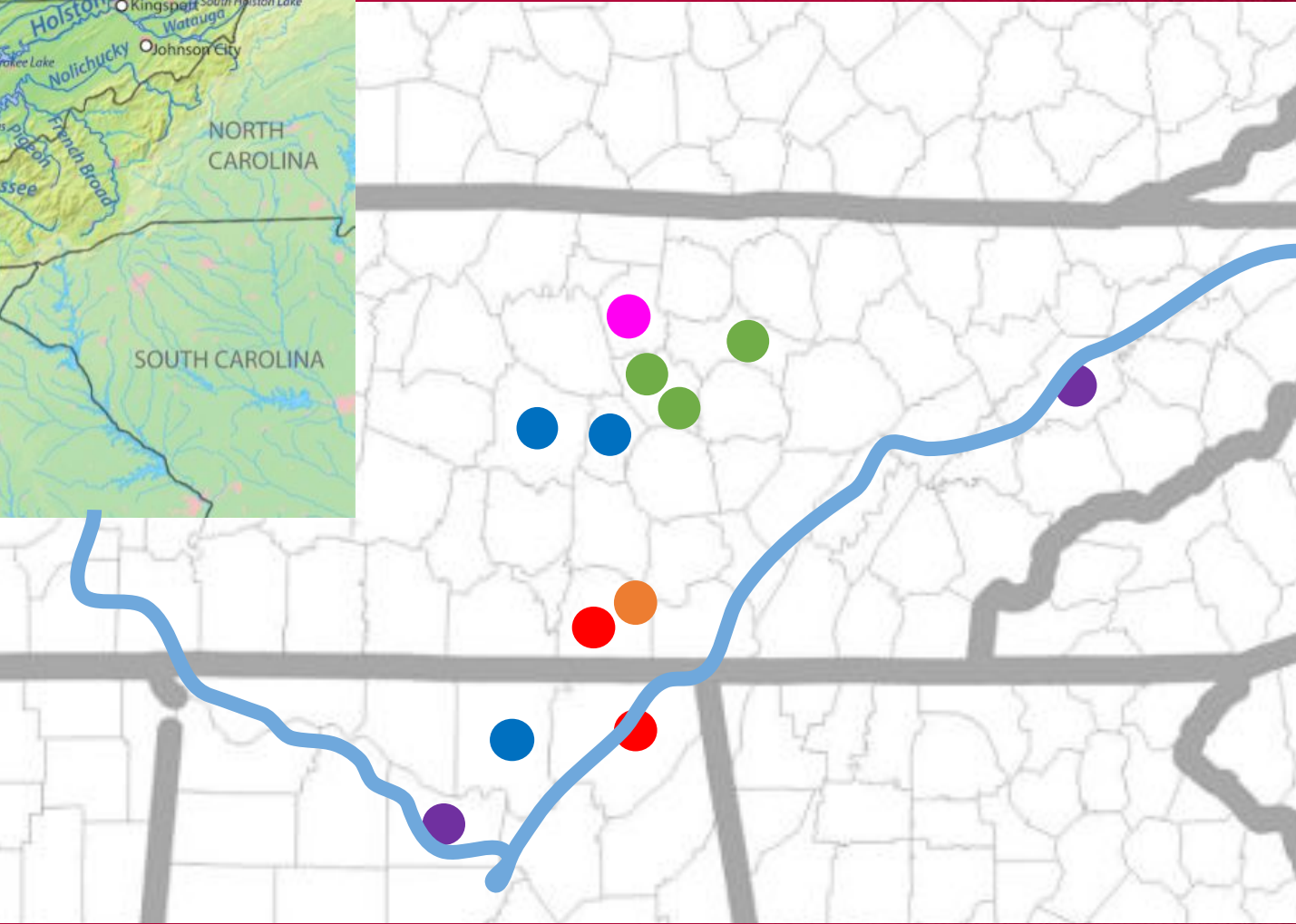
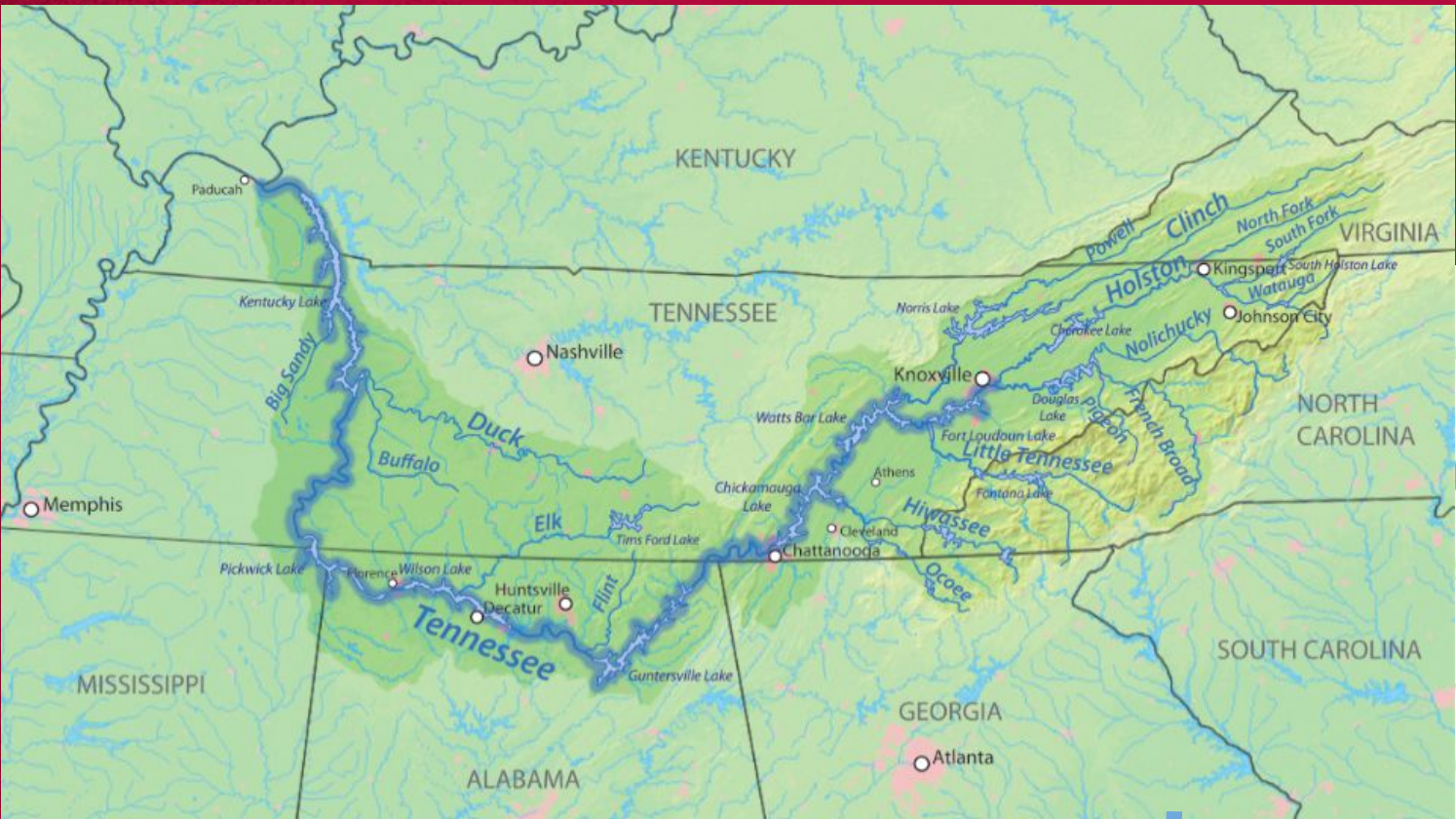




# RESULTS







RESULTS



- High diversity within this genus
- Phylogenetics gives us the opportunity to better understand the relationships within the genus
- Able to use data to show biogeographic patterns



## Conclusions



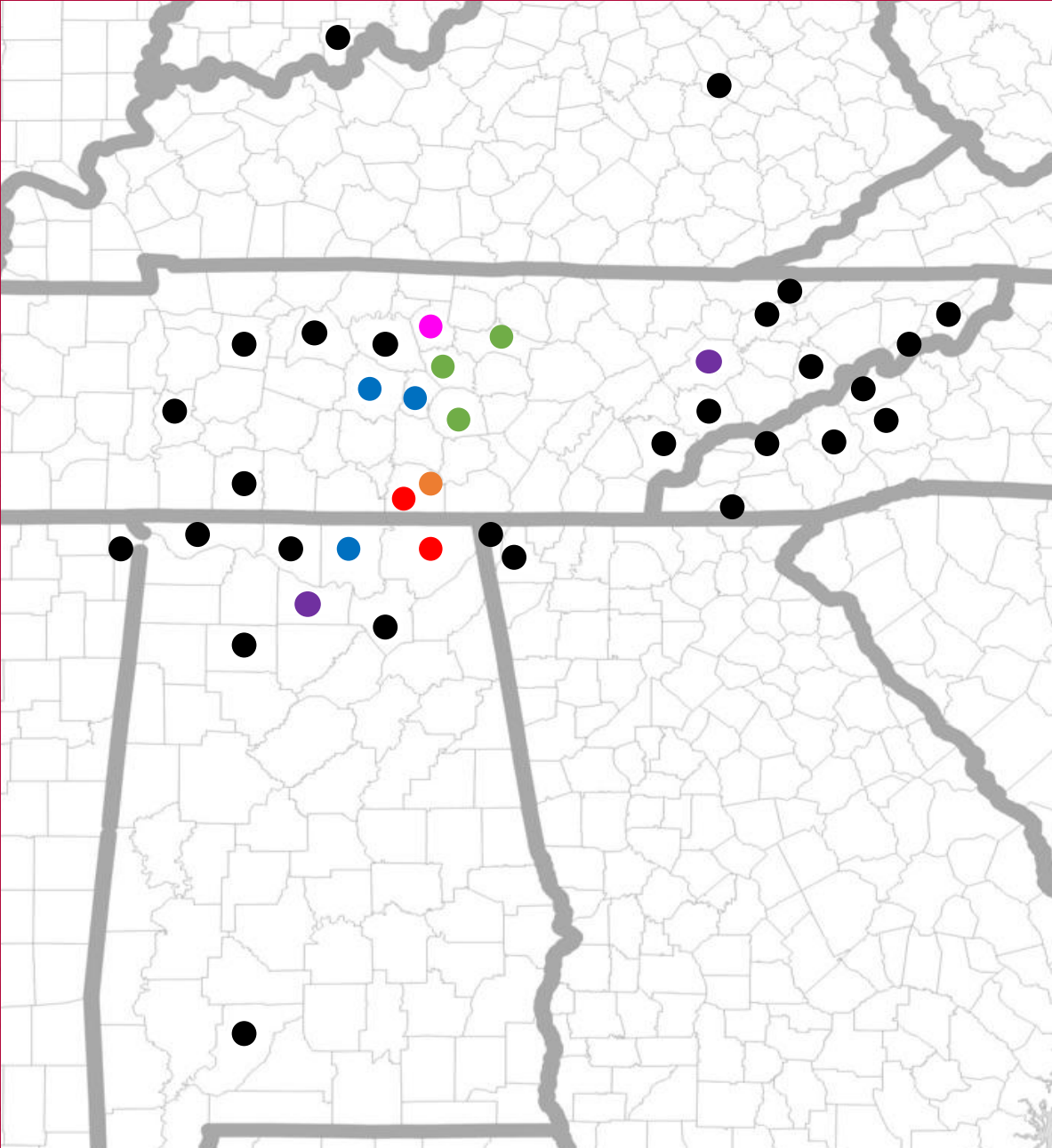
## What's Next?



- Continue molecular work on specimen in *Liocranoides*
- Increase sampling volume and range to include more species from more areas in phylogenetic tree
- Use morphology of specimen to reinforce molecular findings

Sample	Date collected	State
KSZ17-025	5/23/2017	Tennessee
KSZ17-072	7/24/2017	Tennessee
KSZ17-074	7/12/2017	Tennessee
KSZ17-087	7/24/2017	Tennessee
KSZ17-088	7/14/2017	Tennessee
KSZ17-101	7/12/2017	Tennessee
KSZ17-123	7/12/2017	Tennessee
KSZ17-160	7/21/2017	Tennessee
KSZ17-190	7/29/2017	Tennessee
KSZ17-191	7/29/2017	Tennessee
KSZ17-216	8/2/2017	Tennessee
KSZ17-262	8/8/2017	Tennessee
KSZ17-290	10/12/2016	Tennessee
	6/2/2017	Tennessee
WC13-166	16-Jul-13	TN
WC13-166	16-Jul-13	TN
WC13-188	22-Jul-13	TN
WC13-210	4-Aug-13	TN
WC13-210	4-Aug-13	TN
WC13-210	4-Aug-13	TN
KSZ14-260	28-Sep-14	TN
KSZ14-220	29-Mar-14	TN
KSZ13-203	31-Jul-13	TN
KSZ13-160	11-Jun-14	GA
KSZ15-316	19-May-15	GA
KSZ15-316	19-May-15	GA
KSZ15-344	21-May-15	GA
GD 101	21-Jul-09	TN
GD 47	22-Jun-09	TN
GD 102	22-Jul-09	TN
GD 106	21-Jul-09	TN
GD 113	26-Jul-09	TN
	12-Aug-09	TN
MLN13-061	23-Aug-13	AL
MLN13-058	12-Aug-13	AL
MLN13-006	5-Jun-13	TN
MLN12-046	18-Oct-12	TN
MLN13-003	16-May-13	TN
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LADC1	November ?, 2006	TN
LAKC1	November ?, 2006	TN
LAKC2	November ?, 2006	TN
LAMC2	21-Jul-09	TN
LAMC4	21-Jul-09	TN
LAMC5	21-Jul-09	TN







# Acknowledgements

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Platnick



Platnick N. 1999. A  
Revision of the  
Appalachian Spider Genus  
*Liocranoides* (Araneae:  
Tengellidae). American  
Museum Novitates. 3285:  
1-16