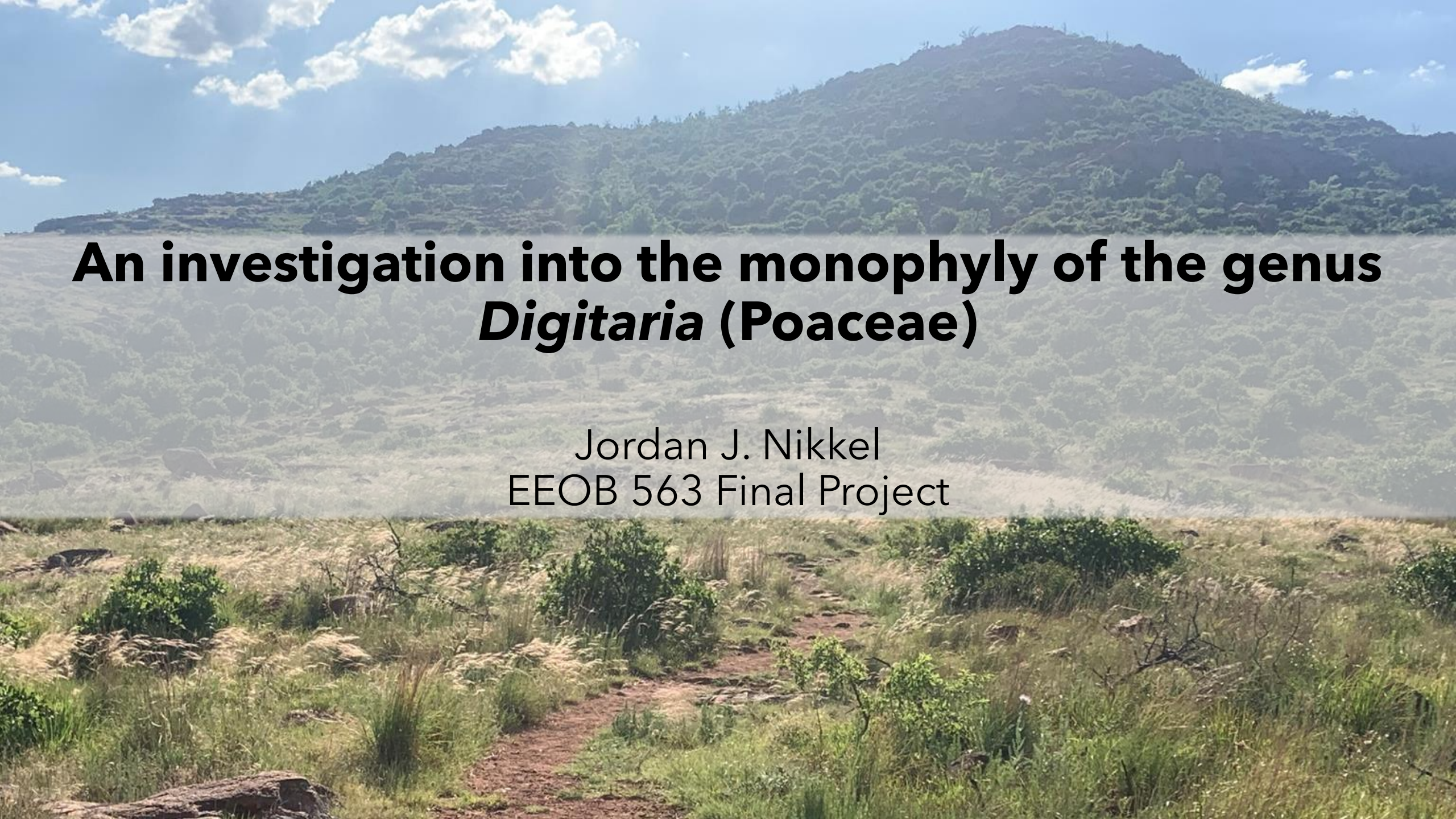

An investigation into the monophyly of the genus *Digitaria* (Poaceae)

Jordan J. Nikkel

EEOB 563 Final Project

Background

- *Leptoloma* is a proposed genus of 5 grasses
  - Closely related to genus *Digitaria*, the "crabgrasses"
  - Many authors consider *Leptoloma* as an infrageneric taxon

Species	Geographic Range	Diagnostic characters
Leptoloma arenicola Swallen	Gulf Coast, Texas into N. Mexico	Spikelets 3.5–4.6 mm, solitary; upper glume 5-7 veined; rhizomatous
L. clarkiae (Sánchez-Ken) Wipff & Shaw	Central Mexico	Spikelets 2.7-3.2 mm long, paired; upper glume 3-veined; lower lemma 7-veined; without rhizomes
L. cognatum (Schult.) Chase	Eastern U.S., as far west as Texas	Spikelets 2.2-3.3 mm, solitary; upper glume 3(-5)-veined; lower lemma 7-veined; without rhizomes
L. pubiflorum (Vasey) Wipff & Shaw	Southern Oklahoma, Texas, west to Arizona and south into N. Mexico	Spikelets 2.2-3.3 mm, solitary; upper glume 3(-5) veined; lower lemma 5-veined, densely pubescent; without rhizomes
L. syrticola Wipff & Shaw	Texas and S.E. New Mexico	Spikelets 2.2-3.3 mm, solitary; upper glume 3(-5) veined; lower lemma 5-veined, densely pubescent; rhizomatous

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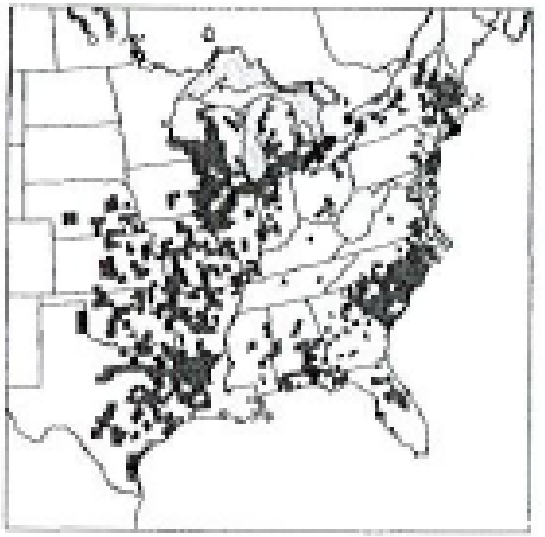

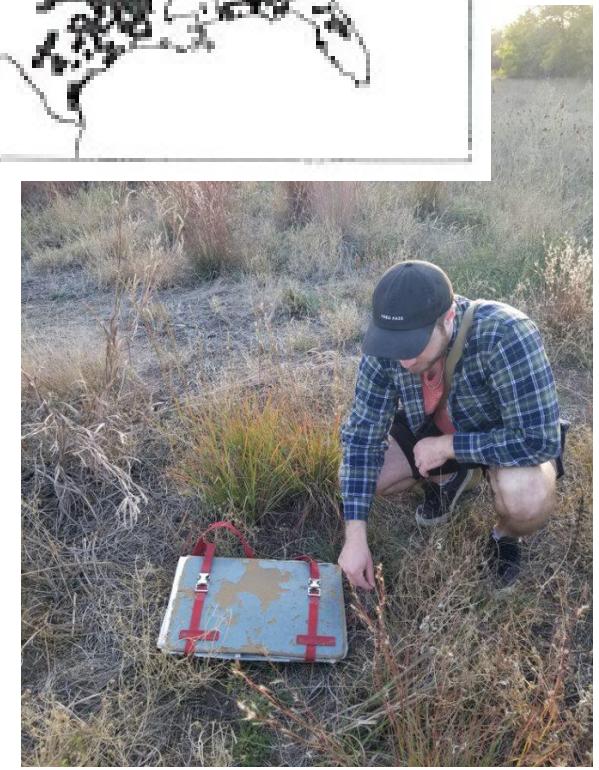

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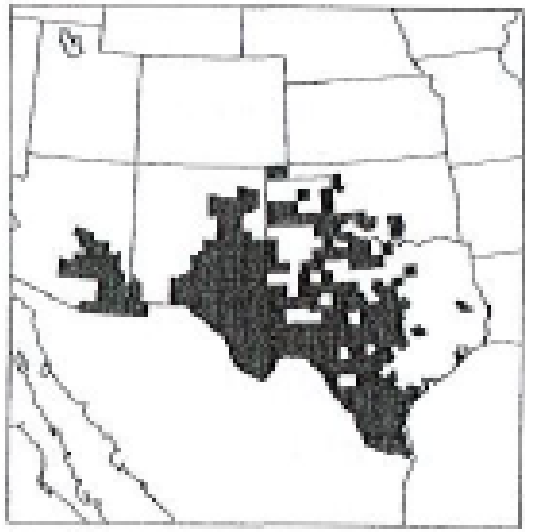
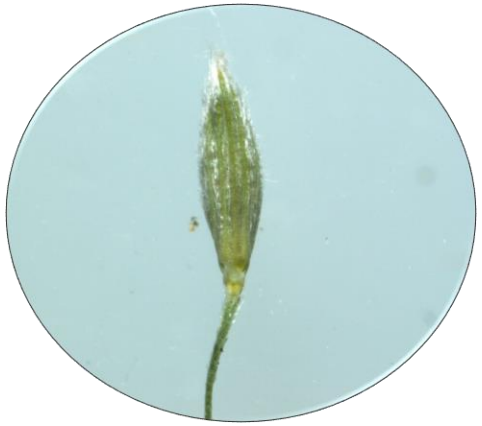


Center of diversity is Texas

Background

- *Leptoloma* is distinguished from *Digitaria* morphologically in having an **open panicle** type inflorescence with **spikelets often solitary** on **elongated pedicels**
  - Entire inflorescence often dehisces at maturity – ‘tumbleweed’

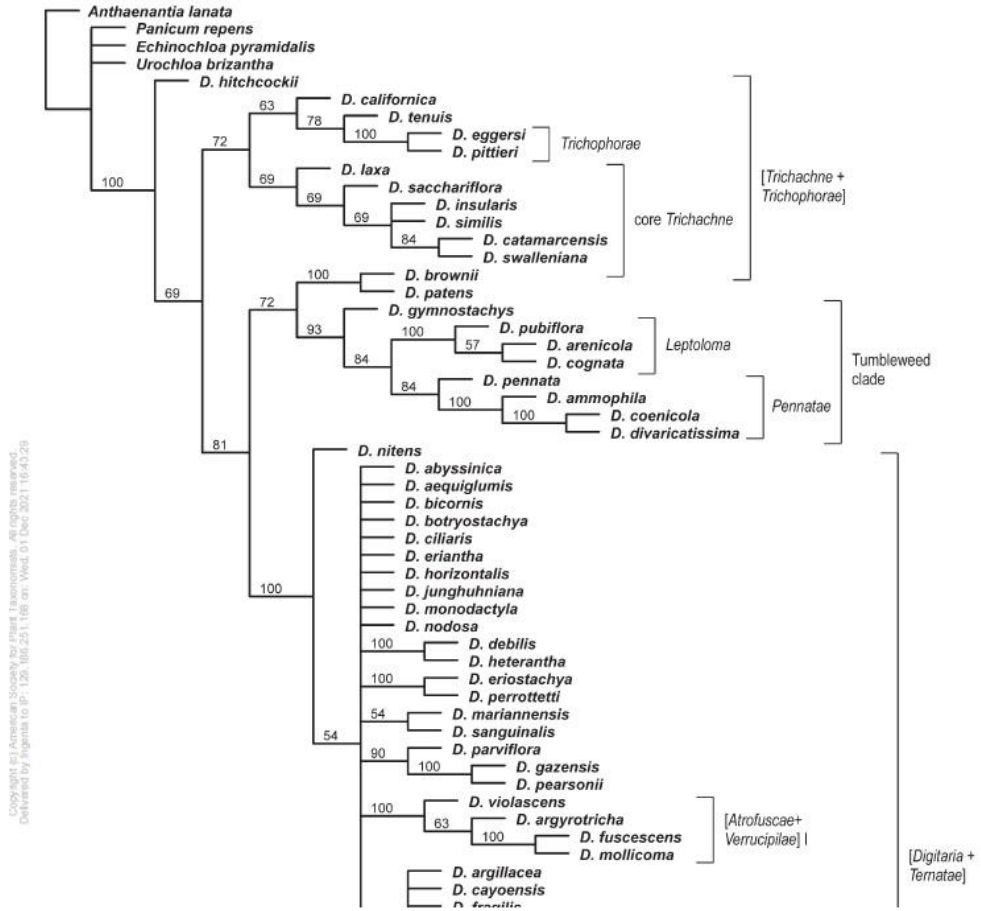


L. cognatum

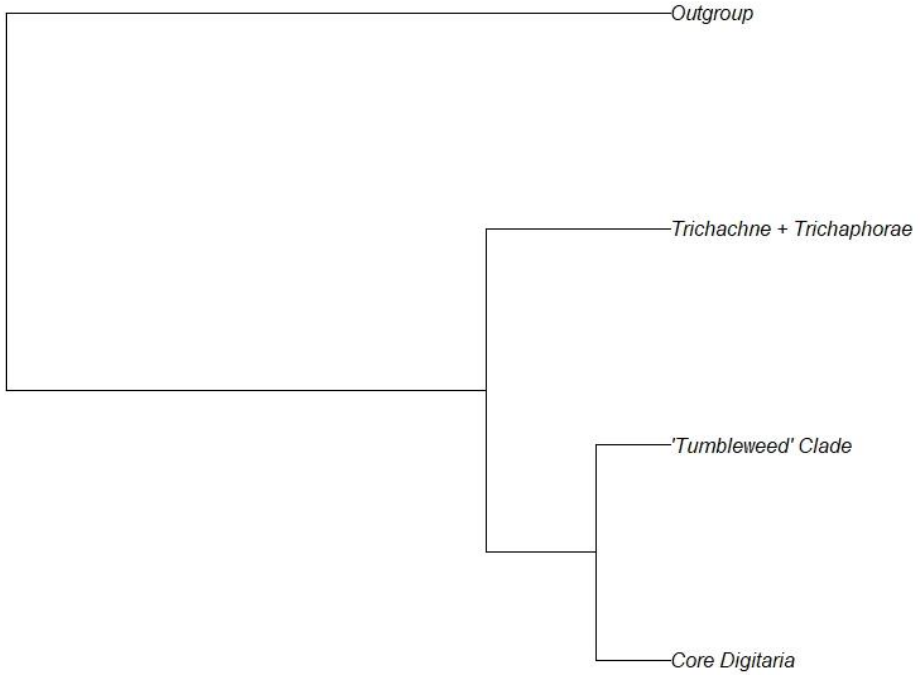
D. sanguinalis

Background

- The taxonomic placement of *Leptoloma* is currently unclear



Phylogeny from Vega (2009) generated using morphological data



Revised phylogeny from Vega (2009) showing the three major clades

Background

- Additionally, the monophyly of *Digitaria* itself is uncertain
  - Although mostly found in tropical and subtropical regions, there are over 270 species of *Digitaria*, found on every continent except Antarctica
- *Anthephora pubescens* and *Chaetopoa pilosa* commonly nest within *Digitaria*

A. pubescens

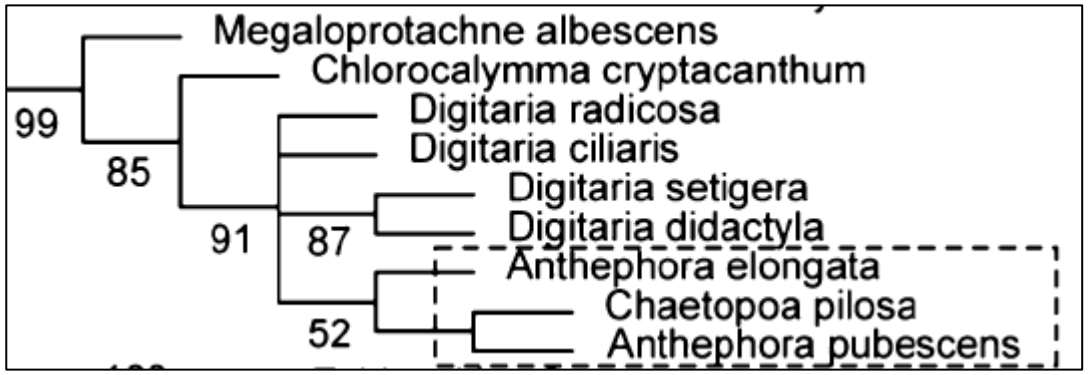
C. pilosa

Background

- Despite these challenges, very limited molecular work has included *Leptoloma*
  - Only species from *Leptoloma* to be included in a molecular phylogeny is *L. cognatum* (Vorontsova, unpublished)

Background

- Determining the relationship of *Leptoloma* to *Digitaria* is important
  - Will add novel molecular data and increase sampling size to help resolve phylogenies at higher taxonomic levels



From Morrone et al. (2012)

?

From Washburn et al. (2015)

These are subsets of molecular phylogenies of the entire tribe Paniceae

Background

- Understanding the phylogenetics of *Digitaria* is important
  - *Digitaria* is a large genus with many species used as grains for cattle or human consumption
  - Many species are noxious weeds – detrimental to agriculture

Fonio is an widely used grain for human consumption that comes from *Digitaria exilis*

Pangola grass (*Digitaria eriantha*) is an important crop for livestock in tropical regions

Objectives

Understand the placement of *Leptoloma* in relation to *Digitaria*

Investigate whether or not *Anthephora* and *Chaetopoa* group within *Digitaria*

Compare different methods of phylogenetic inference

Methods

- Sequences for the *rbcL* gene were downloaded from GenBank for 12 different taxa

Species	GenBank Accession Number	*rbcL* Sequence Length (bp)
Leptoloma cognatum	KY627334.1	561
Anthephora pubescens	FN870763.1	637
Digitaria sanguinalis	HQ590067.1	607
Digitaria californica	MF963129.1	1237
Digitaria ciliaris	KX282695.1	580
Digitaria bicornis	KY627255.1	559
Digitaria eriantha	HE573375.1	1342
Digitaria villosa	KY626716.1	561
Digitaria ischaemum	MF596731.1	603
Chaetopoa pilosa	HE573362.1	1342
Dichanthelium acuminatum subsp. *acuminatum*	KY627164.1	557
Panicum repens	GU135141.1	567

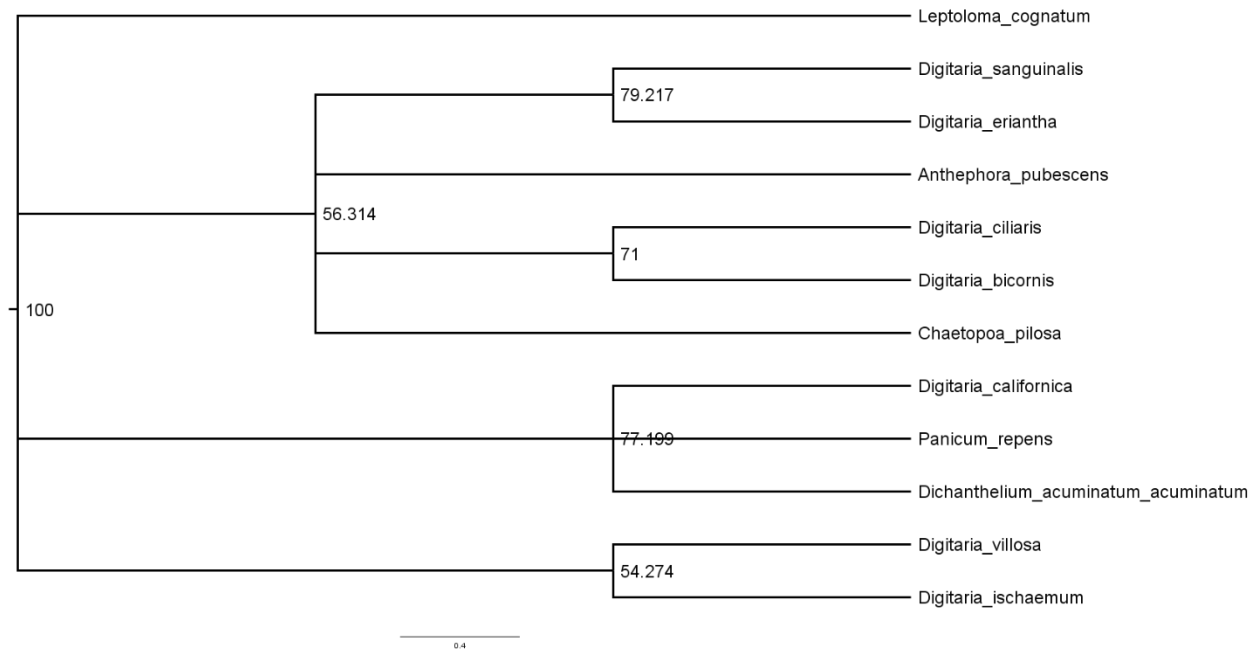
Alignment done using MAFFT with default settings

Trichachne + Trichophorae clade

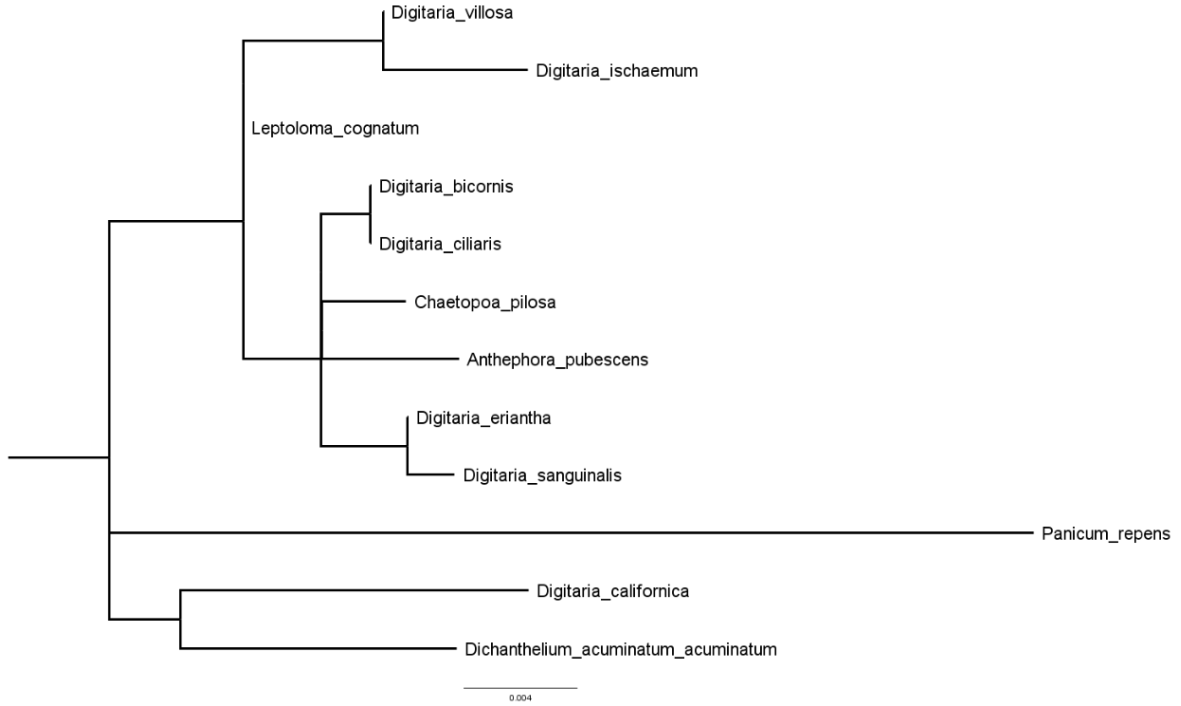
Outgroup taxa

Results

Parsimony bootstrap analysis tree generated using PAUP*

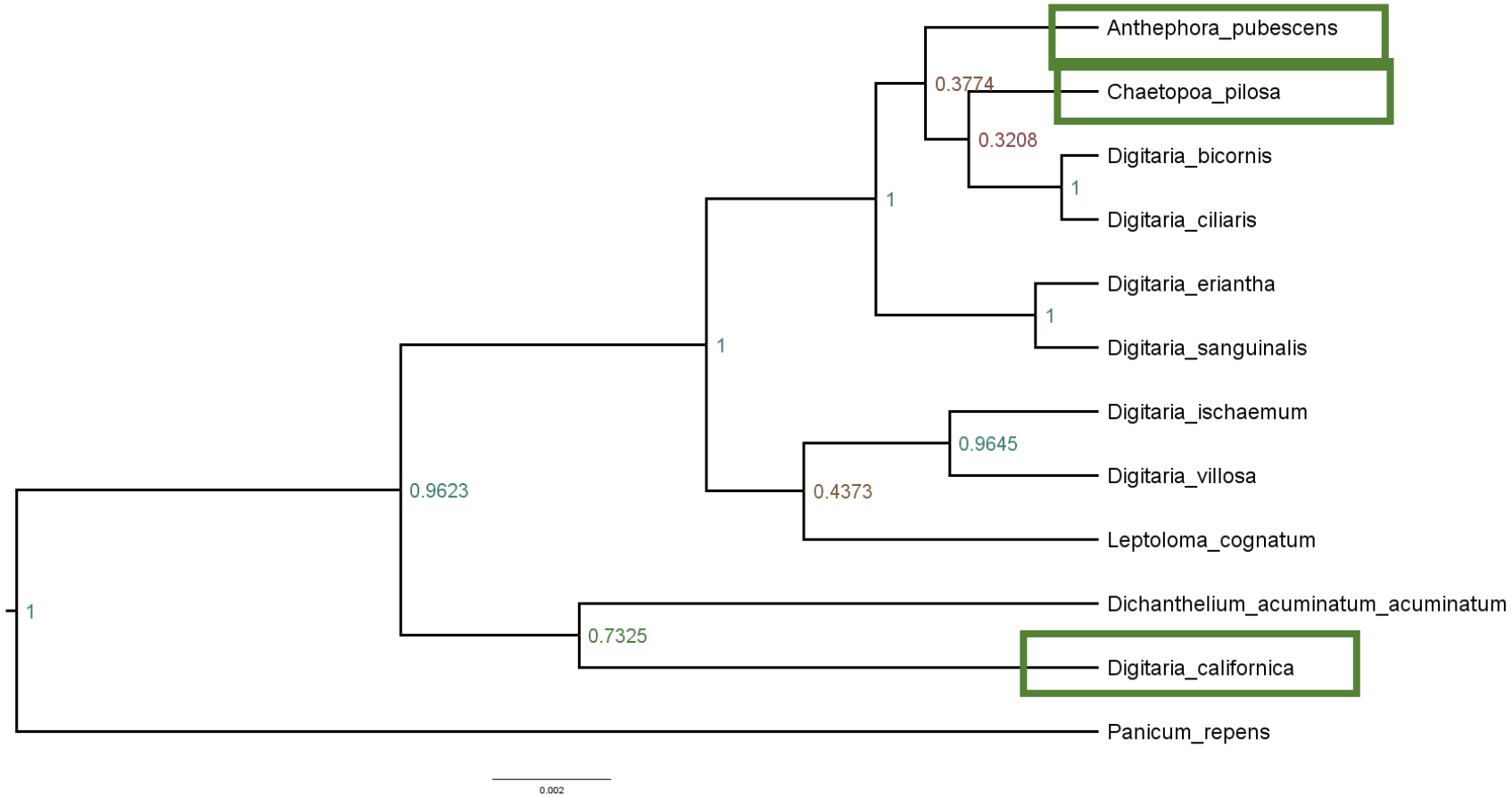


Maximum likelihood tree generated using RRAxML-NG (GTR+G model)



Results

Maximum clade credibility tree generated in MrBayes



Final thoughts

Leptoloma does not appear to be separate from the rest of *Digitaria*

Anthephora and *Chaetopoa* seem to be apart of the same clade as *Digitaria*

Digitaria californica appears as an outgroup

Increased taxon sampling and use of additional genes could've strengthened this study

Questions?

Thanks for listening!