Common reed in the Southeastern United States

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Outline

• Background on *Phragmites australis*
• Sampling methods
• Results
• Implications
Worldwide Distribution of *Phragmites australis*


*P. australis* may have the widest distribution of any flowering plant (Tucker 1990)
History of *Phragmites australis* in North America

- Found in ground sloth dung 40,000 years ago
- Artifacts made of *Phragmites* from 1400 years ago
- Herbarium records from 1800s indicate its presence in the US, but not common
- Early 20th century evidence of expansion in the coastal northeast
Why expansion?

- Disturbance of wetlands: 53% of all tidal and non-tidal wetlands were altered or destroyed from 1780 to 1980 (Dahl 1990)
- Increased nutrient load in wetlands especially nitrogen from human activities (Chambers et al. 1999).
Introduction of new genotypes

- First evidence of introduction in 1880 when *Phragmites* was found growing in Philadelphia where ships’ ballast was off-loaded.
- In 2002, Saltonstall conducted genetic studies on 283 leaf tissue samples collected worldwide and 62 N. America herbarium samples collected before 1910.
Phragmites australis subsp. americanus

Phragmites australis subsp. berlandieri
a.k.a. Gulf Coast – recently Ward (2010) indicated it was a different species, P. karka

Phragmites australis subsp. australis
a.k.a. Exotic
Evidence of competitive advantage of exotic haplotype over native haplotypes

• Experimental plantings of Gulf Coast and exotic *Phragmites* in a Louisiana marsh revealed that the exotic occupied 82% of plots after 14 months, compared to 18% for the Gulf coast type (Howard et al. 2008).

• Comparison of photosynthesis of exotic and native haplotypes in a Maryland tidal marsh showed that the exotic had 51% greater photosynthesis, 100% greater stomatal conductivity and 38-83% greater photosynthetic canopy than the native types. The native performed better than the exotic under low N (Mozdzer and Zieman 2010).
Prior DNA analyses of Florida plants

- 5 early herbaria samples (prior to 1910)
- 7 modern samples (1997-2001), 6 from Brevard Co. and one from around Miami

All 12 samples were identified as the Gulf Coast type

Blue Cypress Lake

Little Sawgrass Lake, Brevard Co.

Chocktawhatchee Bay, Walton Co.

Caloosahatchee River, Lee Co.
DNA Analysis – Texas Christian University
518 samples collected from 102 locations
- Florida (69)
- Alabama (4)
- Mississippi (4)
- Georgia (2)
- South Carolina (5)
- Louisiana (16)

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## Morphological comparison of Gulf Coast and Eurasian *Phragmites*

<table>
<thead>
<tr>
<th>Type</th>
<th>Stem texture</th>
<th>Stem color</th>
<th>Panicle form</th>
<th>Density</th>
<th>Height (m)</th>
<th>Upper glume (mm)</th>
<th>Lower glume (mm)</th>
<th>Ligule (mm)</th>
<th>Seeds</th>
</tr>
</thead>
<tbody>
<tr>
<td>Gulf Coast</td>
<td>Smooth, shiny</td>
<td>Red where exposed to sunlight</td>
<td>Open</td>
<td>94/m² a</td>
<td>3.57 a</td>
<td>6.04 a</td>
<td>3.92 a</td>
<td>0.90 a</td>
<td>Absent</td>
</tr>
<tr>
<td>Eurasian</td>
<td>Ribbed, slightly dull</td>
<td>Green where exposed to sunlight</td>
<td>Compact</td>
<td>167/m² b</td>
<td>2.47 b</td>
<td>5.95 a</td>
<td>4.38 b</td>
<td>0.95 a</td>
<td>Absent</td>
</tr>
</tbody>
</table>

**Upper glume**

**Lower glume**

**Ligule**
Panicle

Gulf Coast type
• Open
• Drooping

Eurasian type
• Compact
• Erect
Ribbing on the stem

Gulf Coast type
• Smooth
• Shiny

Eurasian type
• Finely ribbed
• Dull
Color of the stem

Gulf Coast type
- When exposed, red
- Behind leaf-sheath, green

Eurasian type
- When exposed, green
- Behind leaf-sheath, green
Eurasian type

Mississippi River Delta, South of New Orleans

Gulf Coast type

Dauphin Island, Alabama
According to Dan Ward (UF, Dept. Biology), Gulf Coast *Phragmites* is morphologically the same as Australian/Polynesian *Phragmites*, which is considered to be *Phragmites karka*.

*Phragmites karka* growing near Cairns, Queensland, Australia, 2011
Legend
- P. australis
- P. karka

North American Haplotypes

Gulf coast
Distribution of *Phragmites karka*
Reed boats??

‘Reed boats are depicted in early petroglyphs and were common in Ancient Egypt.... They were also constructed from early times in Peru and Bolivia, and boats with remarkably similar design have been found in Easter Island. Reed boats are still used in Peru, Bolivia, Ethiopia, and until recently in Corfu.’

Wikipedia

New Zealand reed boat

Ra II – sailed by Thor Heyerdahl from Morocco to Barbados in 1970

Peruvian fishing boats
Expansion of *Phragmites* in Apalachicola Bay?
Nitrates in Apalachicola Bay 2002-2007


\[ y = 8.58 \times 10^{-5} - 2.95, \ P=0.03 \]
Conclusions

• The exotic type of *Phragmites* was not found in Florida – this doesn’t mean that it’s not here, but if it is, it has a very restricted distribution

• The closest an exotic population was found to Florida was 40 miles north of the FL/GA border along I95.

• To the west of Florida, and exotic population was found on Petit Bois Island, about 62 miles west of Florida.

• Morphological and DNA evidence indicate that Florida *Phragmites* is *Phragmites karka*.