

Advances in the morphological and molecular identification of *Pythiogeton* species

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Cytoplasm evacuation of sporangium of *Pythiogeton*

Background and objectives

1. *Pythiogeton* in the Kingdom Straminipila with its only nine species is a not widely studied genus.
2. In the USA, *P. ramosum* (Minden 1916) and *P. autosytum* (Drechsler 1932) have been reported.
3. Three putative new *Pythiogeton* species were isolated from ornamental plants (cypress, English-ivy and alyssum) which showed root rot symptoms during the summer 2003 in NC, USA.
4. These *Pythiogeton* species were characterized on morphology and the ITS rDNA sequences.

Kingdom: Straminipila

Phylum: Heterokonta

Class: Peronosporomycetes

Order: Pythiales

Family: Pythiaceae

Genus: *Pythium*

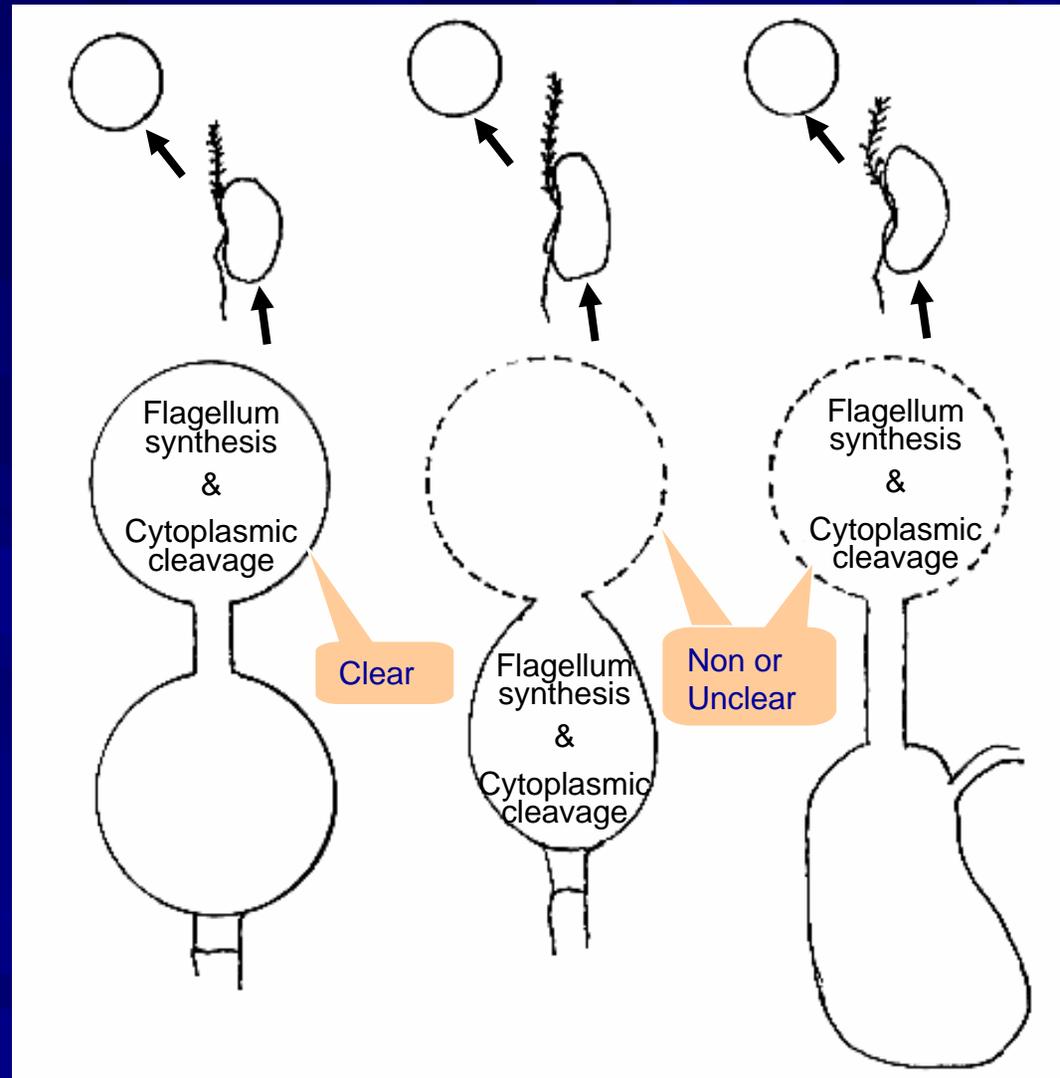
Phytophthora

Halophytophthora

Pythiogeton

Patterns of sporangium development in Pythiaceae

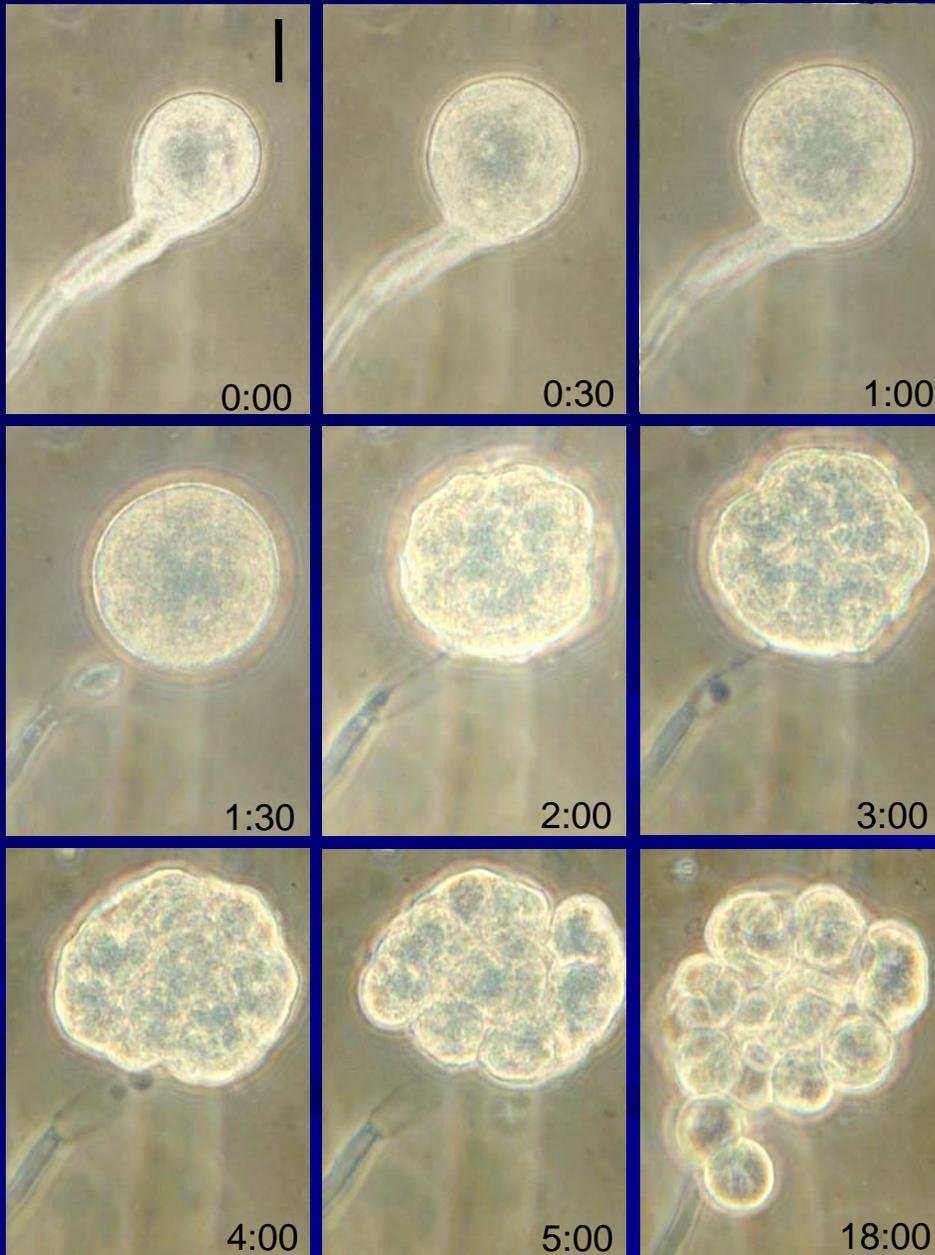
Cysts
.....
Zoospores
.....
Vesicle
.....
Sporangium



Pythium

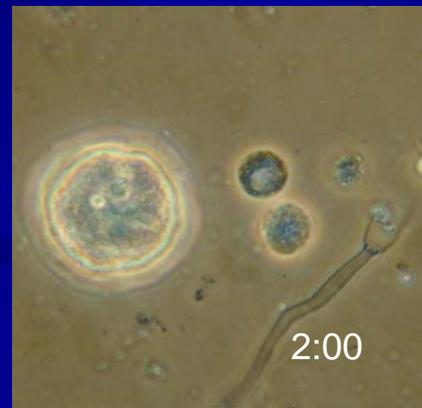
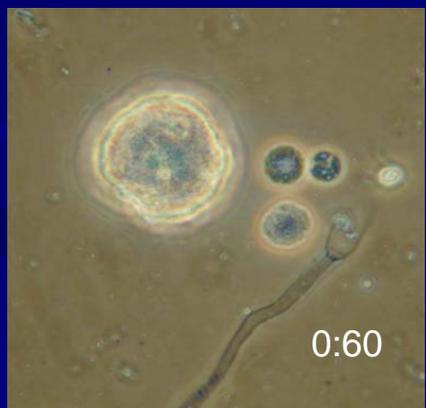
Phytophthora,
Halophytophthora

Pythiogeton



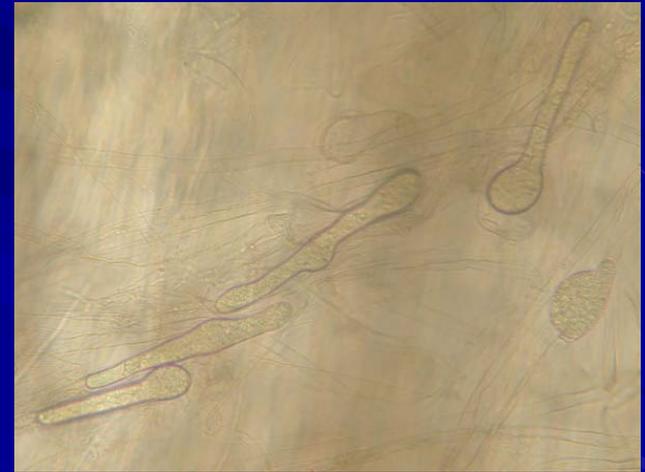
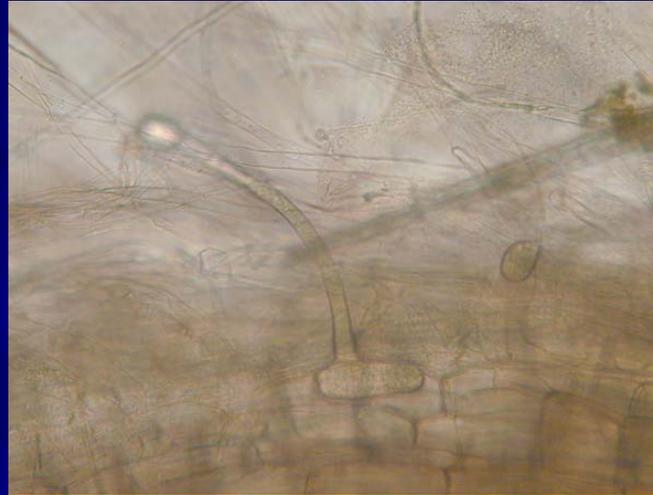
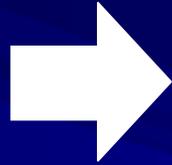
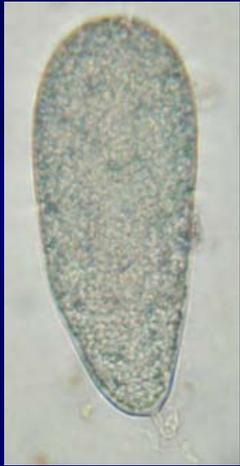
Bars = 20 μ m

Zoospore
development in
Pythiogeton sp. 1



Zoospore
development in
Pythiogeton sp. 3

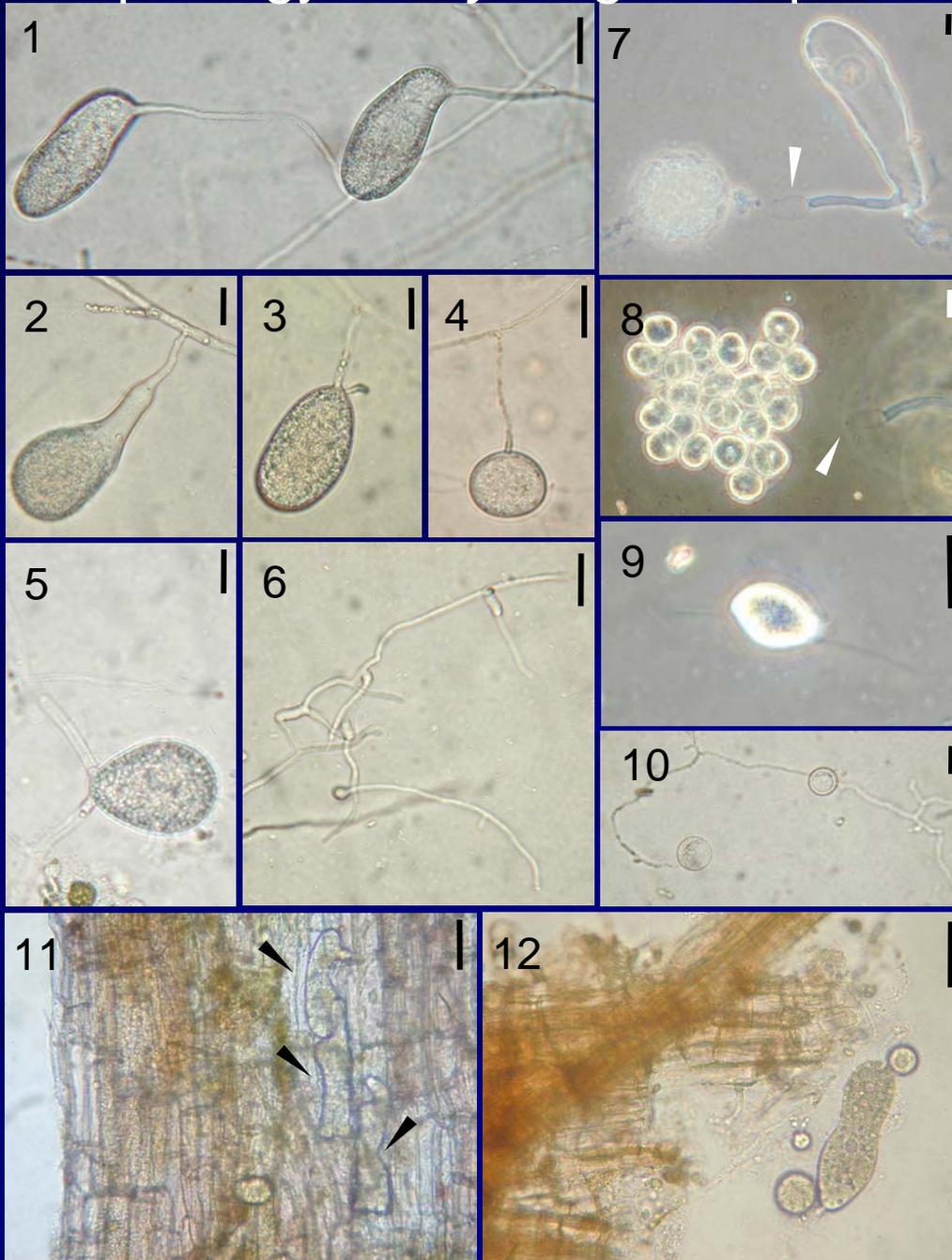
Bars = 20 μ m



Sporangium of *Pythiogeton* sp. 1 produced in water culture

Sporangium of *Pythiogeton* sp. 1 produced in radish root hairs. No obvious symptom was observed

Morphology of *Pythiogeton* sp. 1



1-5. Sporangia

6. Appressoria

7, 8. Cytoplasm evacuation and zoospore development through vesicles (arrowhead)

9. Zoospore with flagella

10. Encysted and germinated zoospores

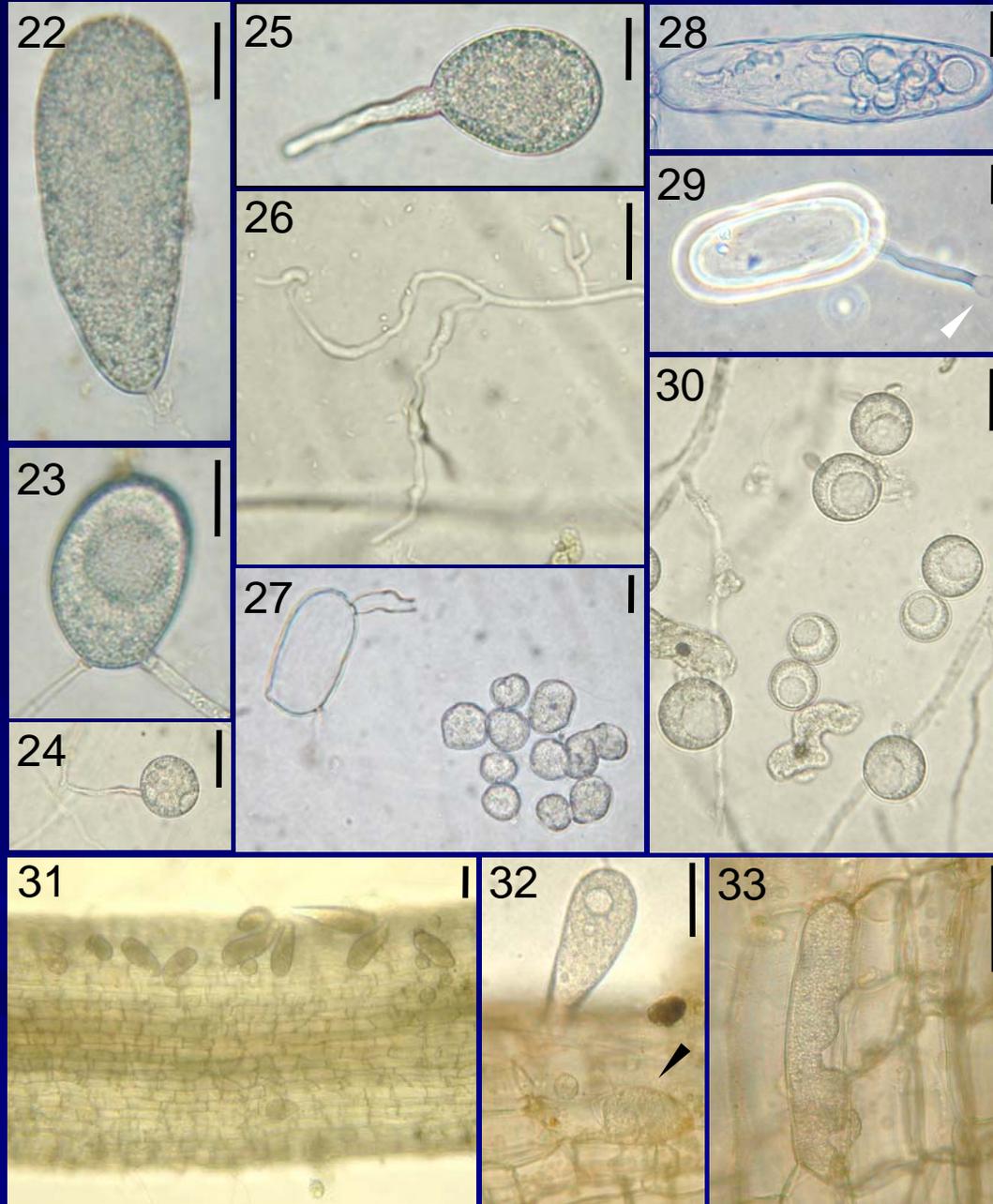
11. Sporangia formed in cypress roots after artificial inoculation (arrow heads)

12. Sporangia formed around cypress roots after artificial inoculation

Bars: 1-10 = 20 μ m

Bars: 11, 12 = 50 μ m

Morphology of *Pythiogeton* sp. 2.



22-25. Sporangia

26. Appressoria

27, 28. Development of zoospores out and inside of sporangia

29. Empty sporangium with a vesicle (arrowhead)

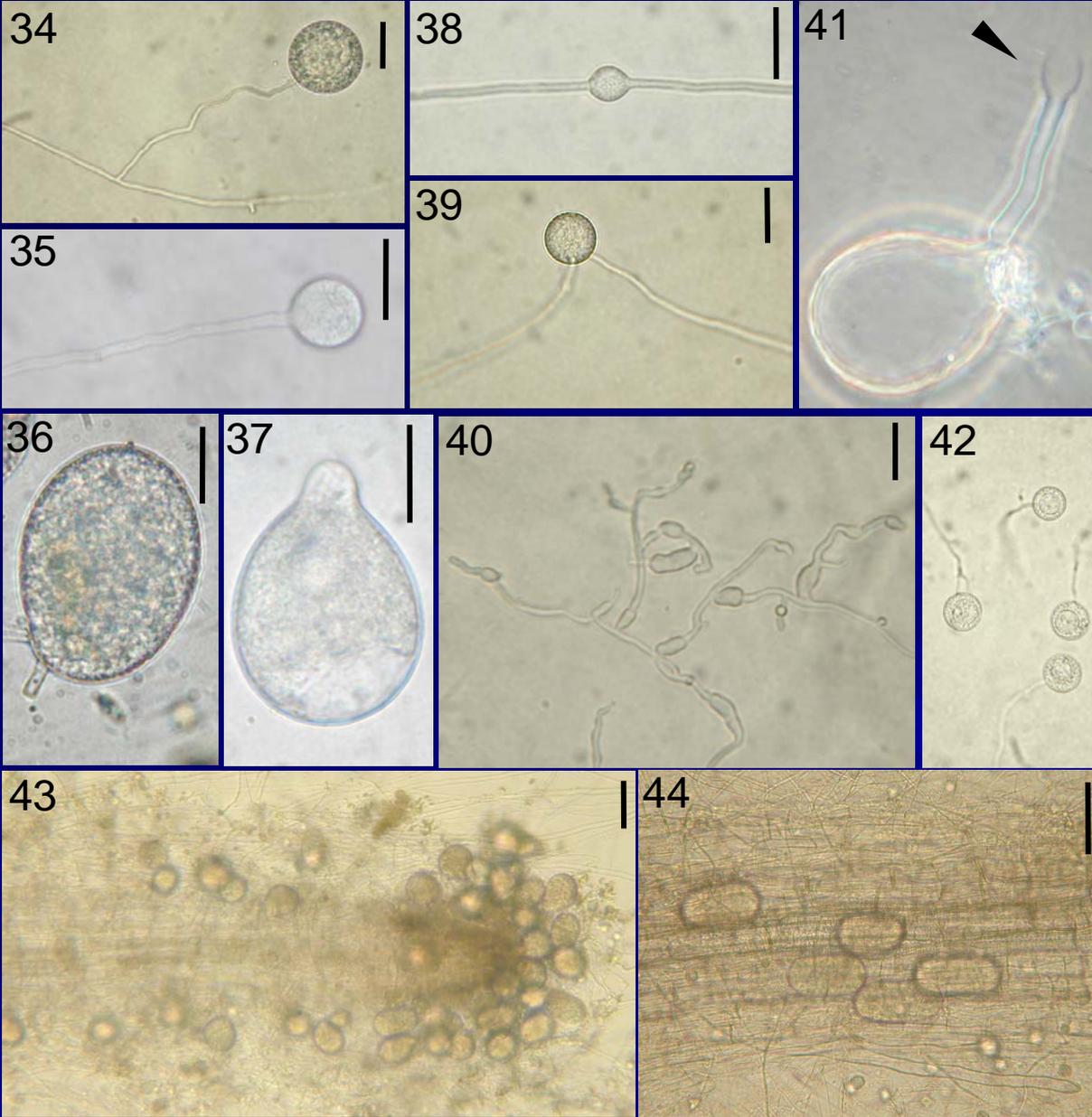
30. Encysted zoospores

31-33 Sporangia formed in and around English Ivy roots after artificial inoculation

Bars: 22-30 = 20 μ m

Bars: 31-33 = 50 μ m

Morphology of *Pythiogeton* sp. 3



34-39. Sporangia

40. Appressoria

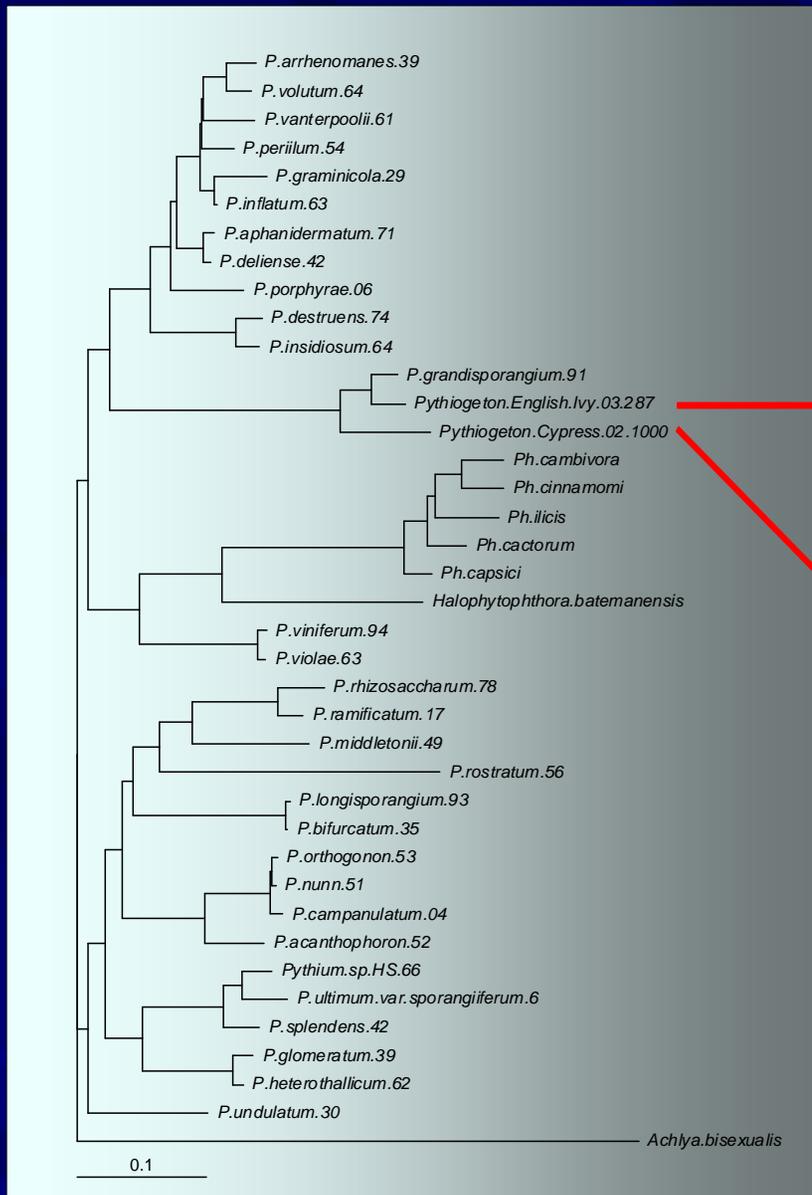
41. Empty sporangium with vesicle (arrowhead)

42. Encysted and germinated zoospores

31-33 Sporangia formed in and around root of *Alyssum* roots after artificial inoculation

Bars: 34-42 = 20 μ m

Bars: 43, 44 = 50 μ m



Pythiogeton sp. 1

Pythiogeton sp. 2

Phylogenetic tree based in internal transcribed spacer ribosomal DNA region [ITS rDNA (ITS1, 5.8S, ITS2)] sequences constructed using Neighbour-joining analysis. *Achlya bisexualis* was used as outgroup.

Summary

1. Three putative new species, *Pythiogeton* sp. 1, 2 and 3 were isolated from ornamental plant roots in North Carolina, USA.
2. The all species infected to roots of their host plants and radish, but had no visible symptom in an inoculation test performed in Petri dish.
3. The phylogenetic tree based in ITS rDNA shows that all *Pythiogeton* are a solid species and the closest are members that belong to *Pythium* (*P. grandisporangium*) than *Phytophthora*.