Systematic Botany. Lecture 33

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Outline

Slides from International Botanical Congress

Haptanthus hazlettii, enigmatic central American plant, in the light of new findings

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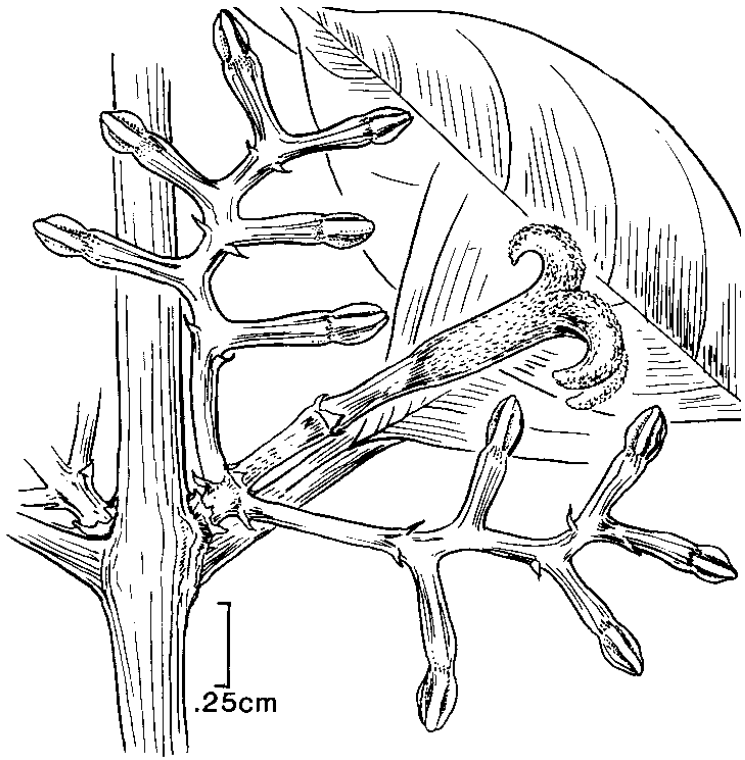
Haptanthus hazlettii

- One of the most rare plants in the world
- Discovered in herbarium collections made in 1980 in North Honduras
- Has unique and unusual reproductive structures which is hard to interpret
- Did not appear to be a member of any described family of angiosperms

Peculiar flower morphology



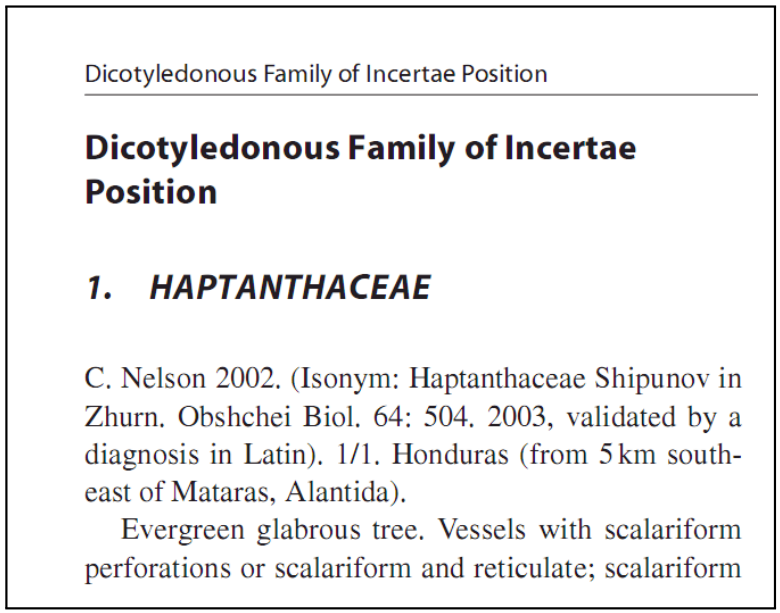
Female organs (pistils with 3 carpels?) are surrounded by branched clusters of male organs (stamens??). In all, reproductive structures superficially resemble R. Melville's (1963, 1968) diagrams of flower evolution.

Only two herbarium samples

- One herbarium sheet is kept in Missouri Botanical Garden, the second—in Lancetilla Botanical Garden (Tela, Honduras)
- All attempts to extract DNA (and even proteins) failed

In search of relationships

- Basal eudicots? (perhaps, Buxaceae)— Doust & Stevens, 2005
- Salicaceae—Euphorbiaceae? (Malpighiales)— Goldberg & Alden, 2005



Dicotyledonous Family of Incertae Position

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1. HAPTANTHACEAE

C. Nelson 2002. (Isonym: Haptanthaceae Shipunov in Zhurn. Obshchei Biol. 64: 504. 2003, validated by a diagnosis in Latin). 1/1. Honduras (from 5 km south-east of Mataras, Alantida).

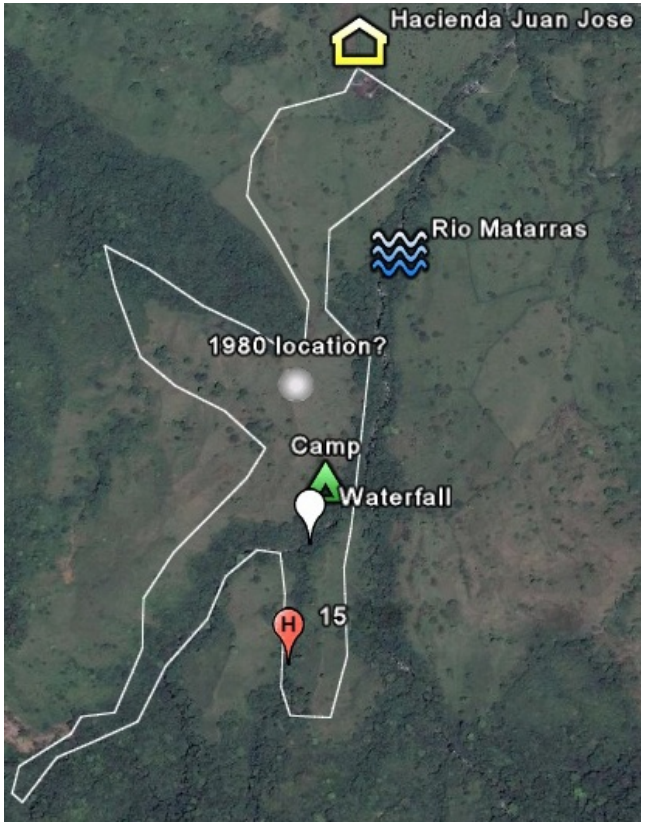
Evergreen glabrous tree. Vessels with scalariform perforations or scalariform and reticulate; scalariform

- Armen Takhtajan (2009) regarded *Haptanthus* as an only unplaced, *incertae sedis* family among angiosperms.

Northern Honduras, Atlantida

In the Northern Honduras, most of the forests, especially on the plains, are now cut

Search strategy



The main strategy was to search along borders of tree cuts/pastures/plantations. Most of flowering small trees are concentrated there

Finding

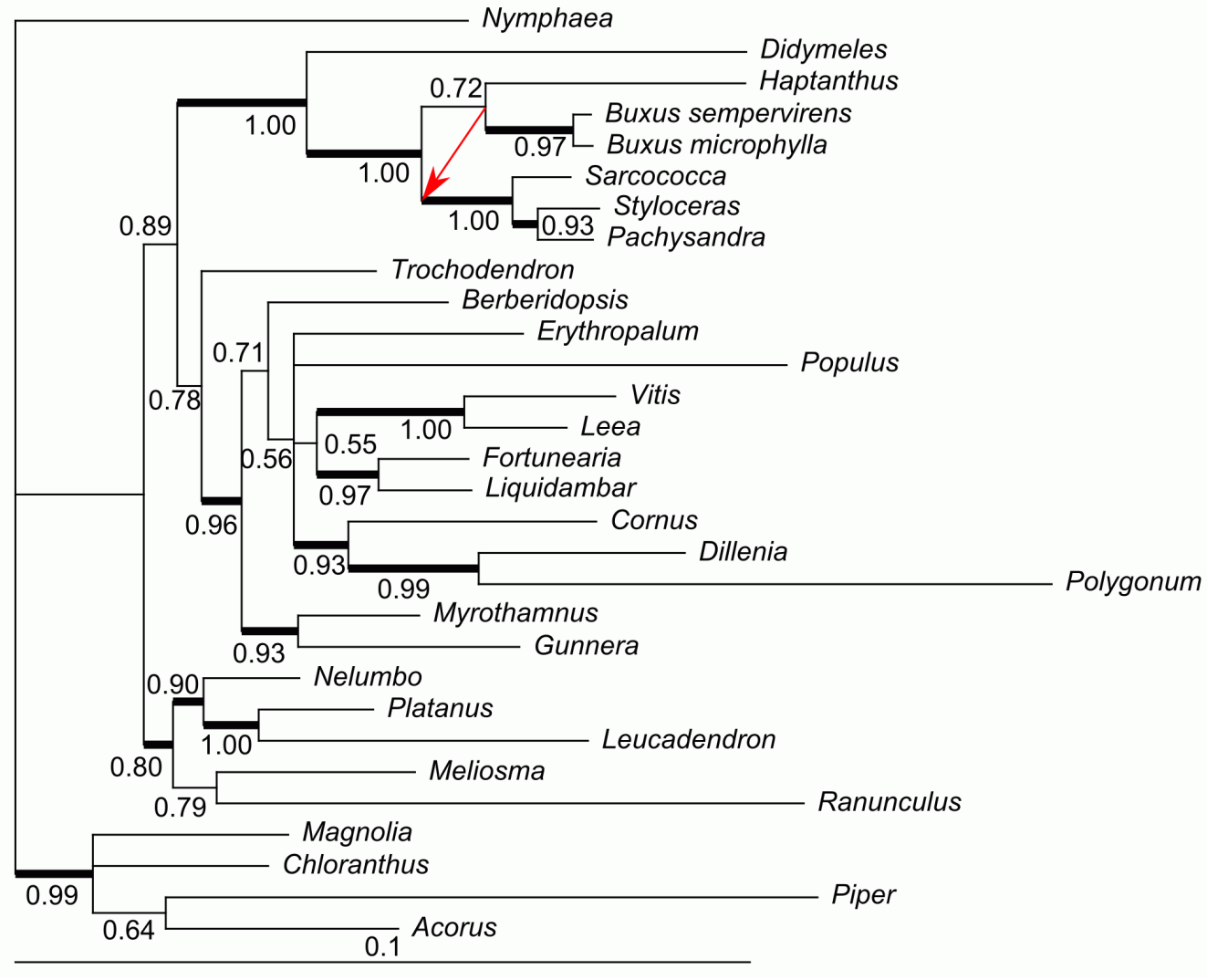
Finally, from the top of the hill ($\approx$ 400 m altitude) we saw with binoculars unusual small tree, and that was *Haptanthus*!

Haptanthus is alive!

Conservation

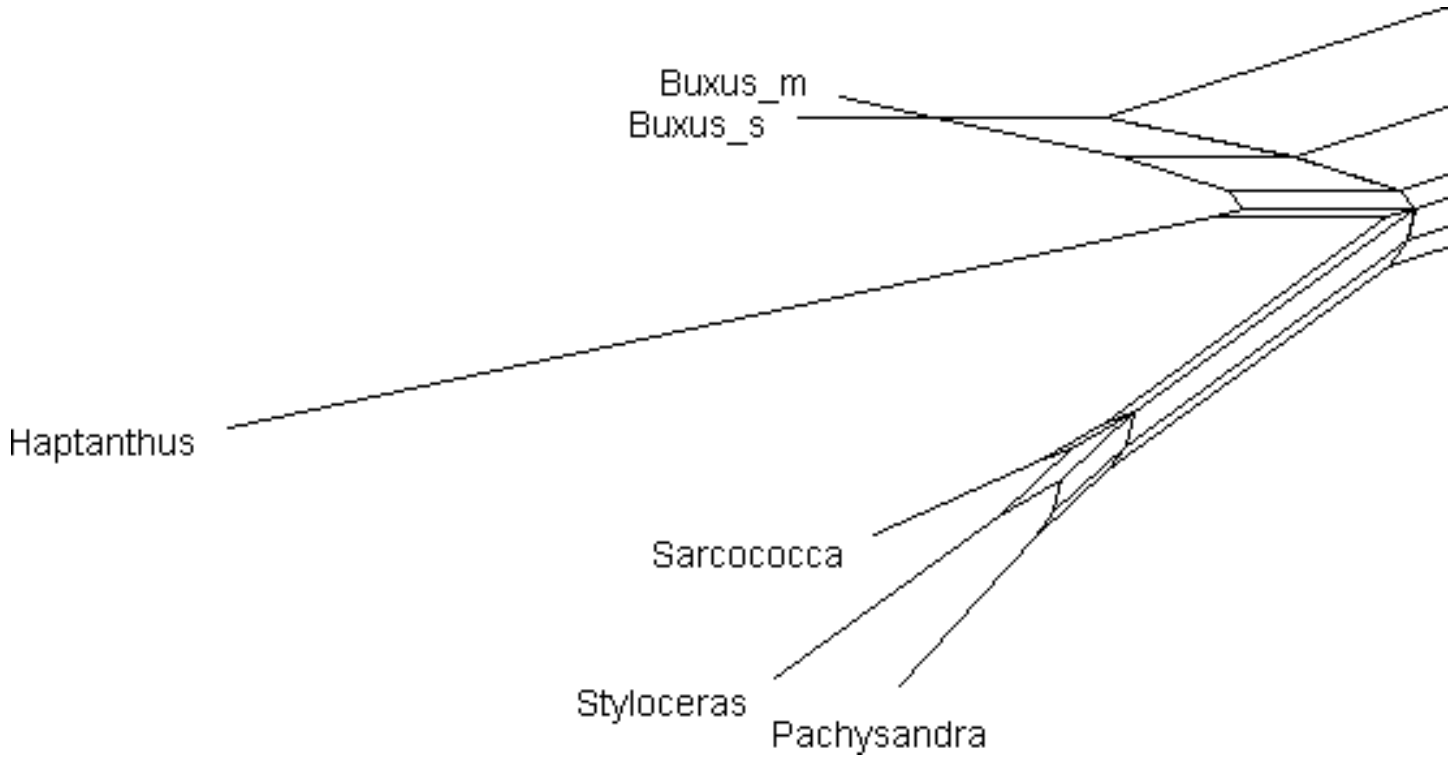
We found only one tree, but mared the point with GPS so two months later almost twenty trees have been found, and the one branch has been rooted and planted in Lancetilla Botanical Garden

Molecular phylogeny: 100% Buxaceae



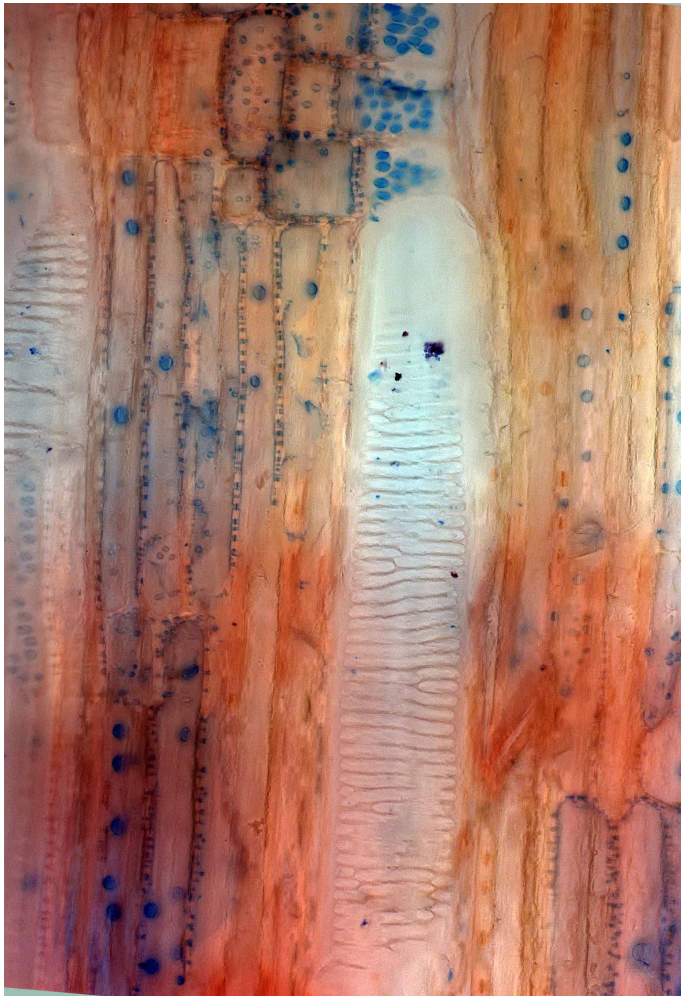
[From Shipunov & Shipunova, 2011]

Within a family, position is unstable



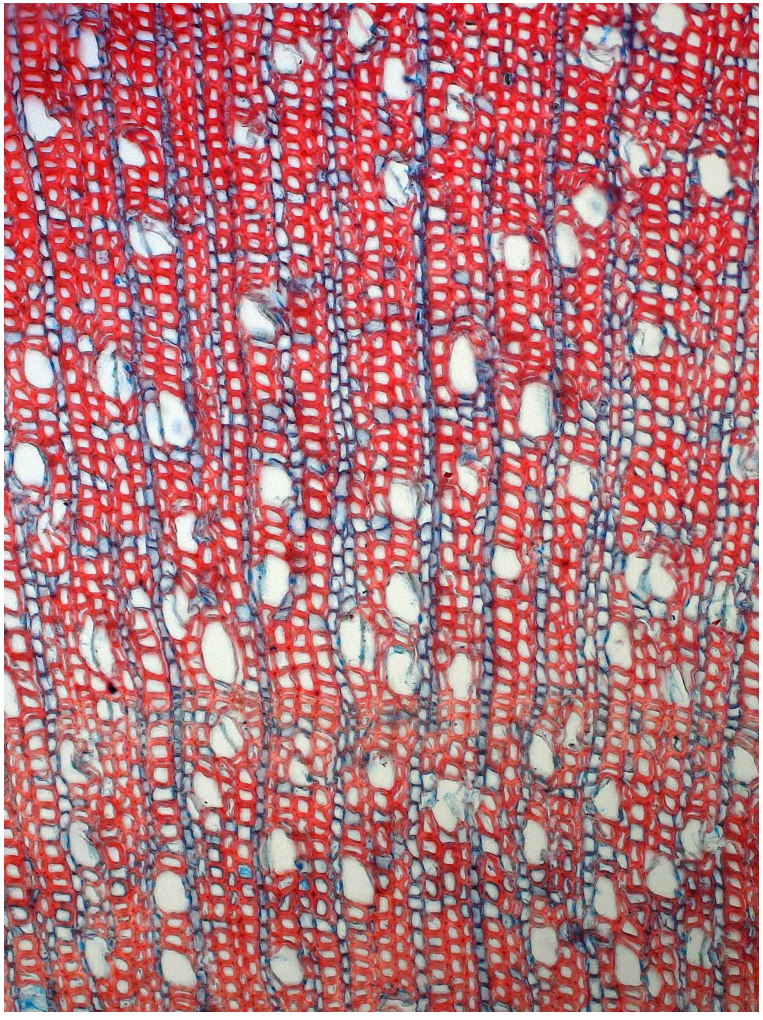
- Either *Buxus* branch, or *Sarcococca–Styloceras–Pachysandra* branch
- More markers are needed

Wood



- Vessel lumina narrow (< 50 μm), mostly solitary
- Axial parenchyma diffuse-in-aggregates
- Fibre walls with distinctly bordered pits
- Exclusively scalariform perforation plates with numerous (18–62) bars
- Multiseriate rays with long uniseriate wings composed of upright cells (Kribs' Heterogeneous Type I)

Wood structure



Wood structure: comparison

	Av. length of vessel elements (μm)	Av. length of fibres (μm)	Av. bar number per perforation plate	Type of axial parenchyma	Kribs' type of ray parenchyma
Buxus	351-688	457-915	8,0-17,5	Diffuse-in-aggregates, diffuse	Heterogeneous IIA
Nothobuxus	440-540	580-905	5,8-9,9	Scanty paratracheal	Heterogeneous IIA
Sarcococca	970-1125	1098-1267	45,3-55,3	Diffuse	Heterogeneous IIA
Styloceras	1150-1570	1298-1772	10,1-45,2	Diffuse	Heterogeneous I
Haptanthus	1463	1796	36	Diffuse-in-aggregates	Heterogeneous I

[Comparison with Sh. Carlquist (1982) data on the genera of Buxaceae]

Haptanthus is similar to *Styloceras* and *Sarcococca* (with lesser degree)

Flower morphology: *Haptanthus* vs. other Buxaceae

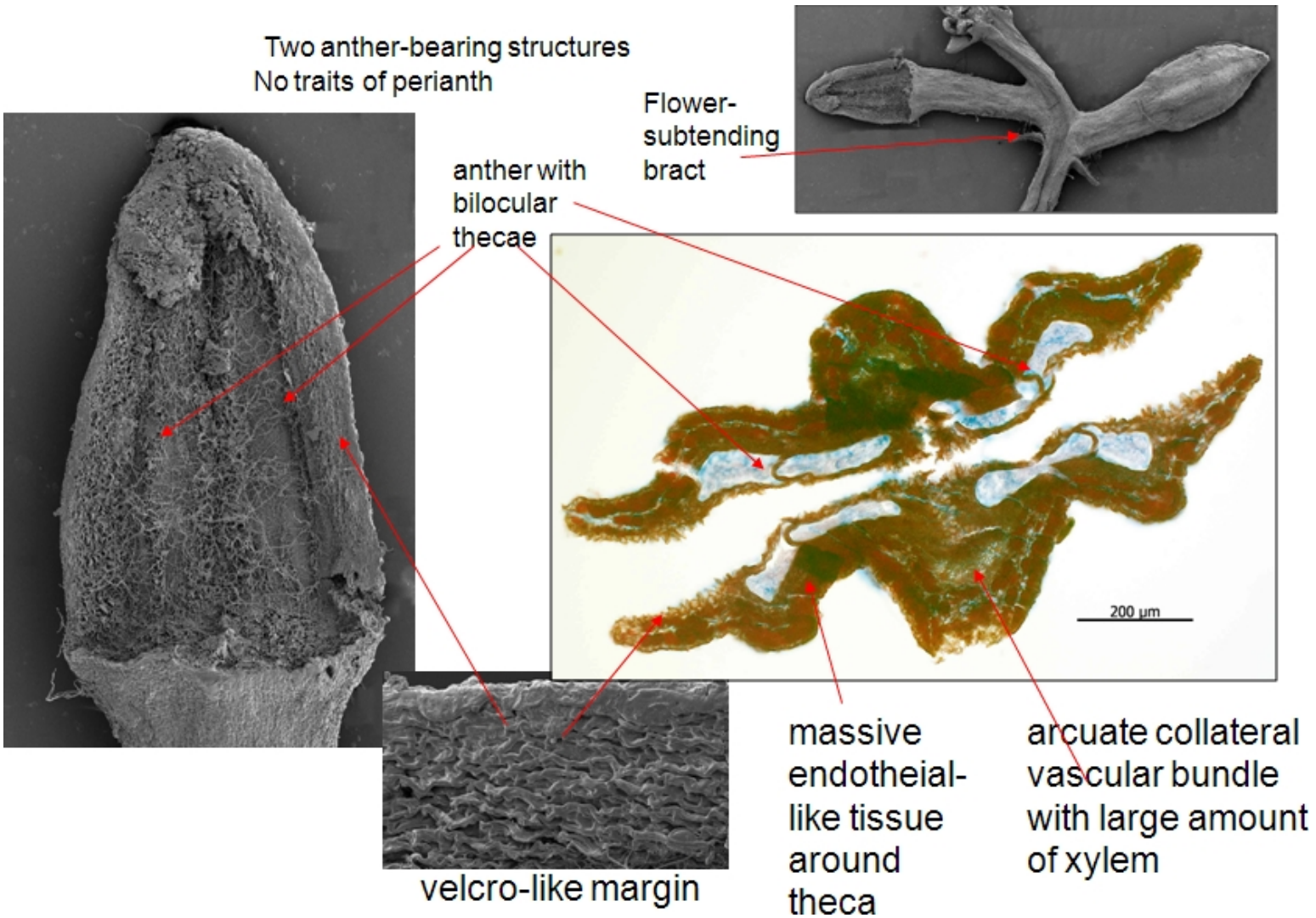
Pro:

- Flowers unisexual: all Buxaceae
- Inflorescence with terminal female flower and lateral male racemes: *Buxus*, *Notobuxus*, *Styloceras kunthianum*
- Male flower without prominent tepals and pistilode: *Styloceras*
- Male flowers with two stamens: 4 stamens in most Buxaceae, but variable stamen number (3–45) in *Styloceras*
- Tricarpelate female flowers: *Buxus* and others

Contra:

- Morphological nature of staminate flower in *Haptanthus* is obscure
- Gynoecium is distinctive: parietal placentation and 8–15 ovules per carpel vs. axile placentation and 2 ovules per carpel in other Buxaceae

Male flower: features



Male flower: hypotheses

I. *Flattened filaments with introrse anthers*:

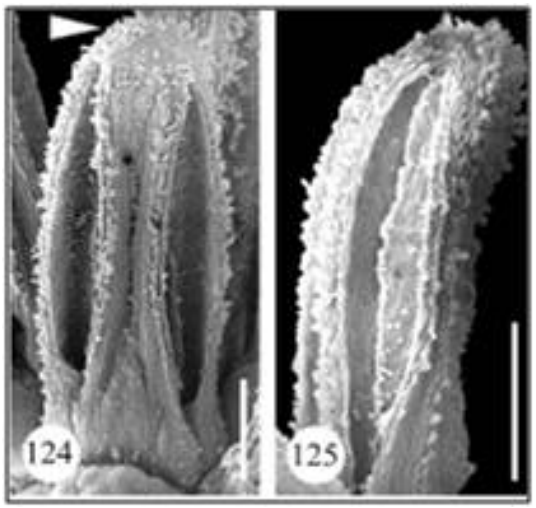
- BUT: arcuate collateral vascular bundles with large amount of xylem are are not common in stamen filaments
- BUT: no remnants of a perianth

II. *Perianth members with adnate stamens*:

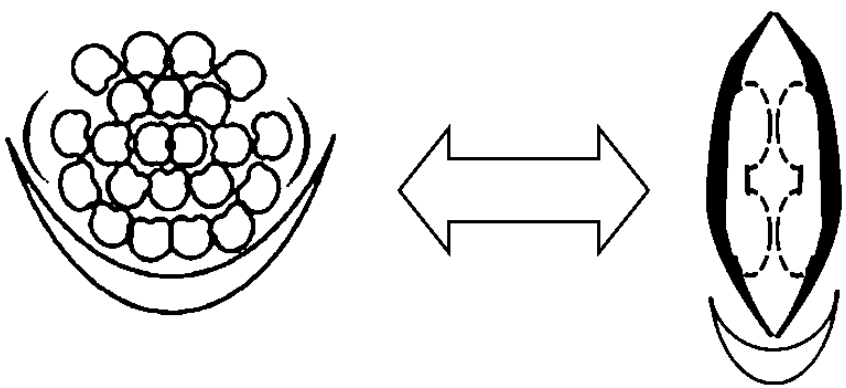
- BUT: single conductive bundle is not typical for perianth members
- Male flower of *Styloceras* (Buxaceae) could be a tentative key:
  - Variable number of stamens (3–45)
  - Occurrence of paired bractlike phylomes (tepals) with single vascular bundles in lateral position
  - Flattened filaments with basifix anthers
  - Large amount of endothecium-like tissue in connectives

[Following M. von Balthazar and P. Endress (2002a, b) data]

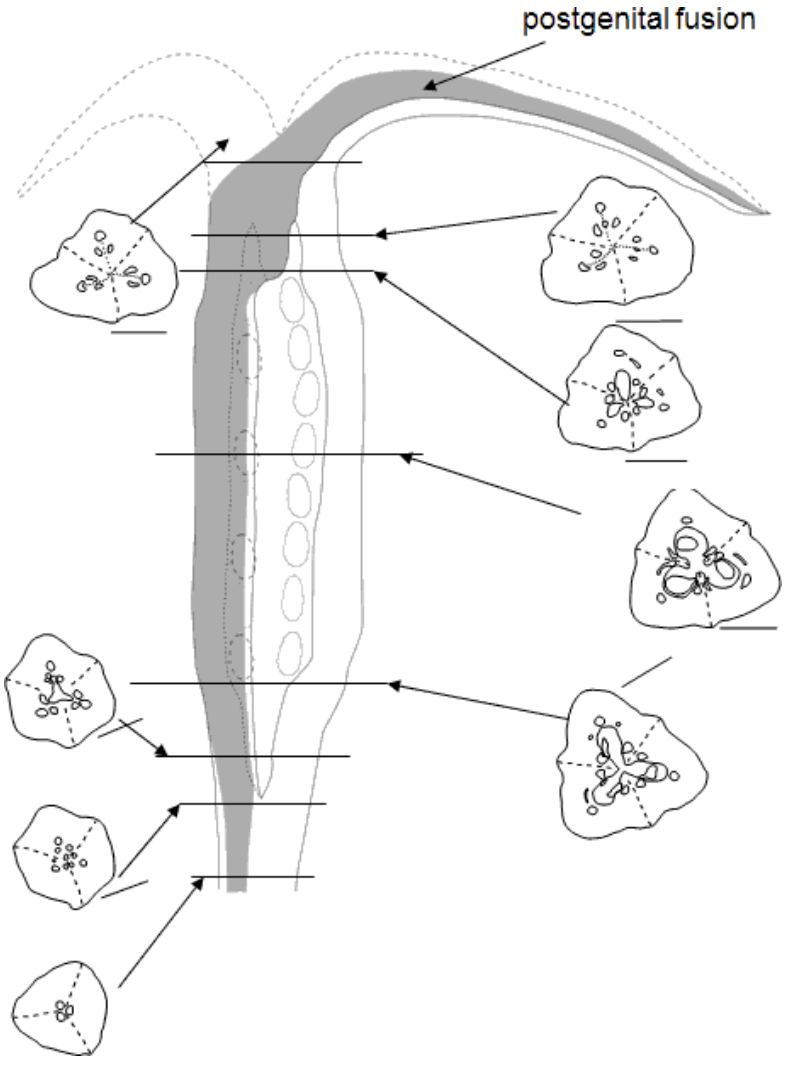
Styloceras vs. *Haptanthus*



[Photo from M. von Balthazar and P. Endress (2002a, b)]



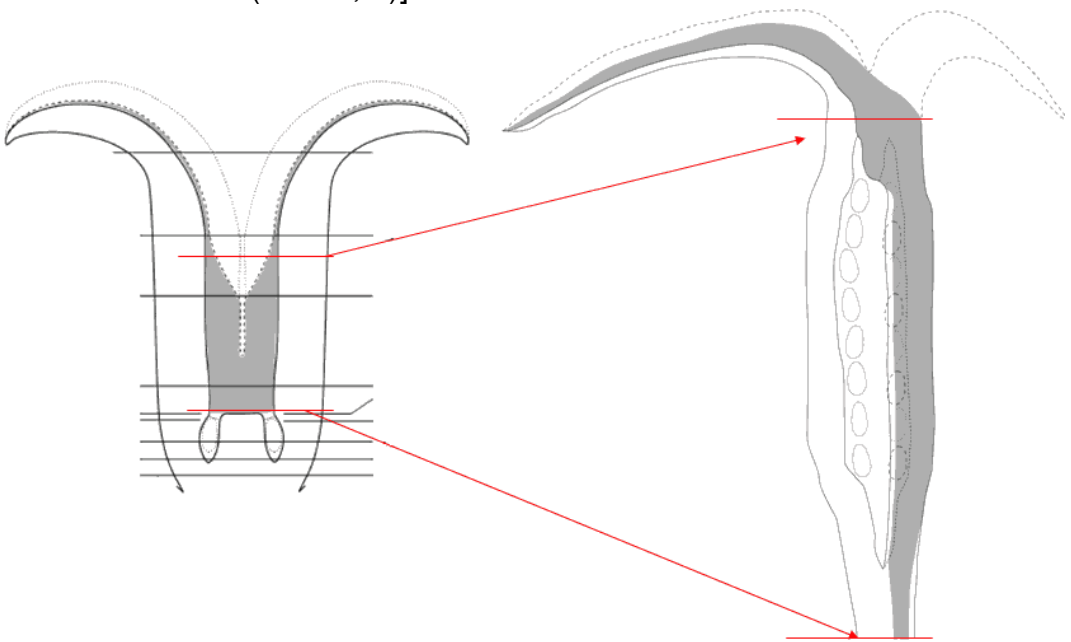
Female flower



- Parietal placentation
- 8–15 ovules per carpel
- No synascidiate zone (only symplicate zone)
- Two rows of ovules in each carpel (cf. with two ovules per carpel in other Buxaceae)
- Vascular anatomy is also similar to other Buxaceae

Sarcococca vs. *Haptanthus*

[Picture of *Sarcococca*
from M. von Balthazar and P. Endress (2002a, b)]



- *Sarcococca* has the most prominent symplicate zone (but two carpels only)
- Parietal placentation is maybe a result of *symplicate zone elongation*—a possible way to increase the seed number per fruit, similar to Pittosporaceae (with parietal placentation) vs. other Apiales (with axile placentation)

Simple lessons from *Haptanthus* story

- Sometimes, they come back
- One man **is** a man
- We already knew

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