

Morphology & Phylogeny of the genus *Hydrangea* sensu lato



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& Yannick De Smet***

Ghent University

***BDB 2016
Study Day***

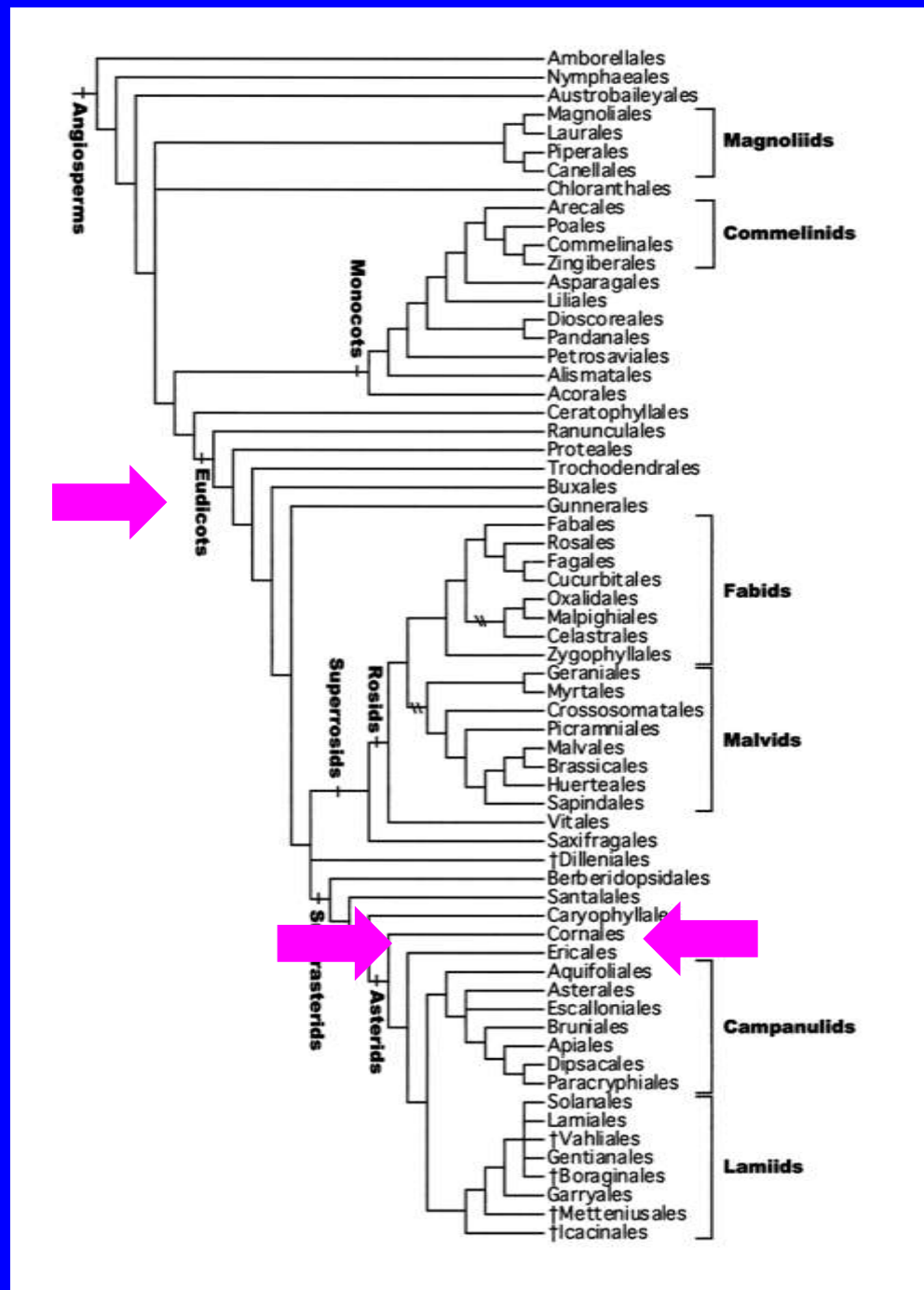
Position of Hydrangeaceae ? *

Classification
APG IV 2016 :

Eudicots

Basal Asterids

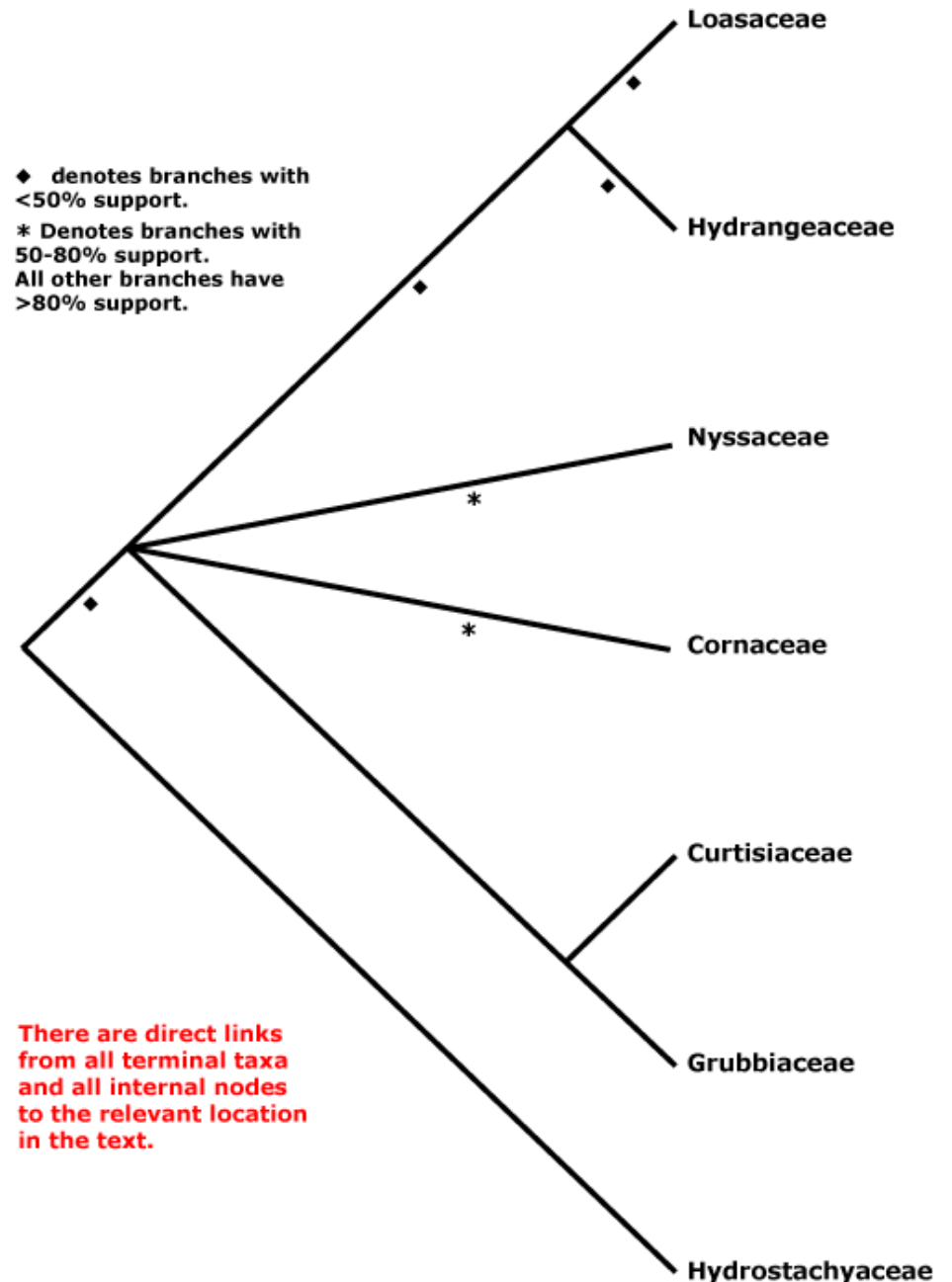
Cornales



Recent data on phylogeny of Cornales

Hydrangeaceae with sistergroup Loasaceae

(Stevens, APWeb 2016)



Molecular phylogeny * (*rbcL* sequence data)

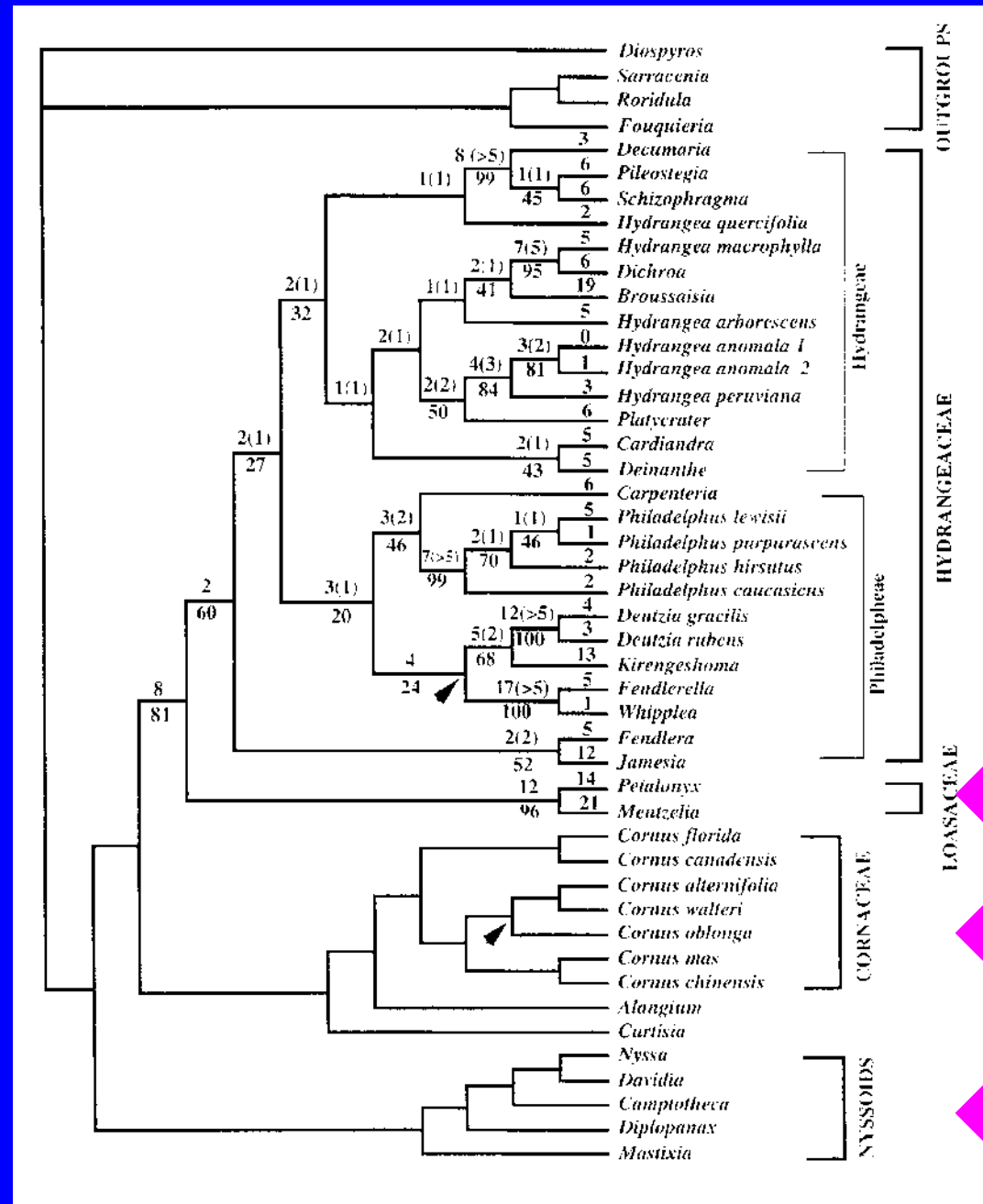
Hydrangeaceae with sister groups :

* *Loasaceae*

* *Cornaceae*

* *Nyssaceae*

(Soltis et al. 1995)



Loasa family (Loasaceae) : Blumenbachia insignis



Karl Blossfeldt

Dogwood family (Cornaceae) : Cornus sanguinea



Dogwood family (Cornaceae) : Cornus kousa



Tupelo family (Nyssaceae) : Nyssa sylvatica



Molecular phylogeny * (*rbcL* sequence data)

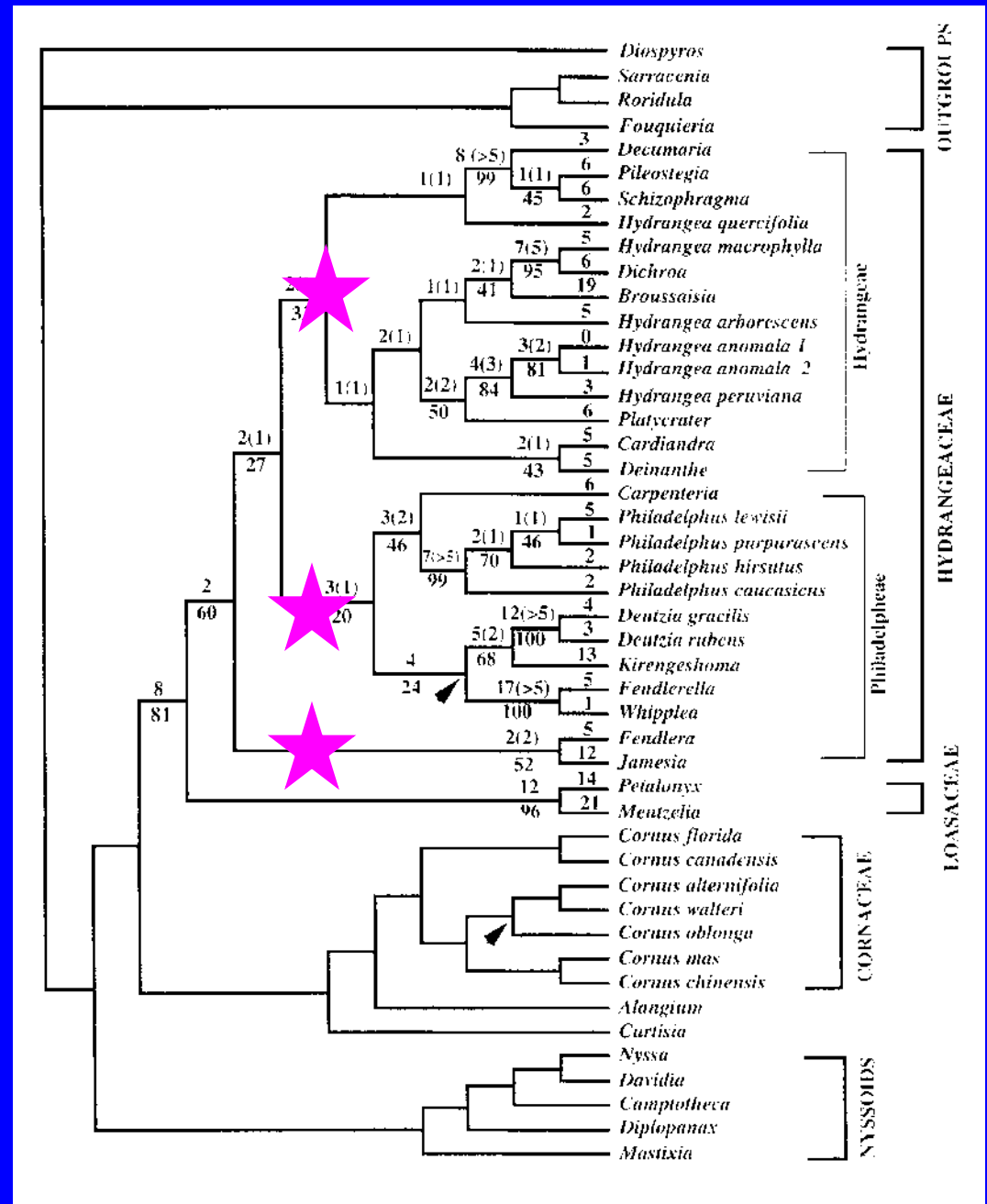
Hydrangeaceae with 3 clades

* *Jamesia* clade

* *Philadelphus* clade

* *Hydrangea* clade

(Soltis et al. 1995)



Hydrangeaceae sensu lato

Jamesia
Fendlera

Whipplea
Fendlerella

Kirengeshoma
Deutzia

Philadelphus
Carpenteria

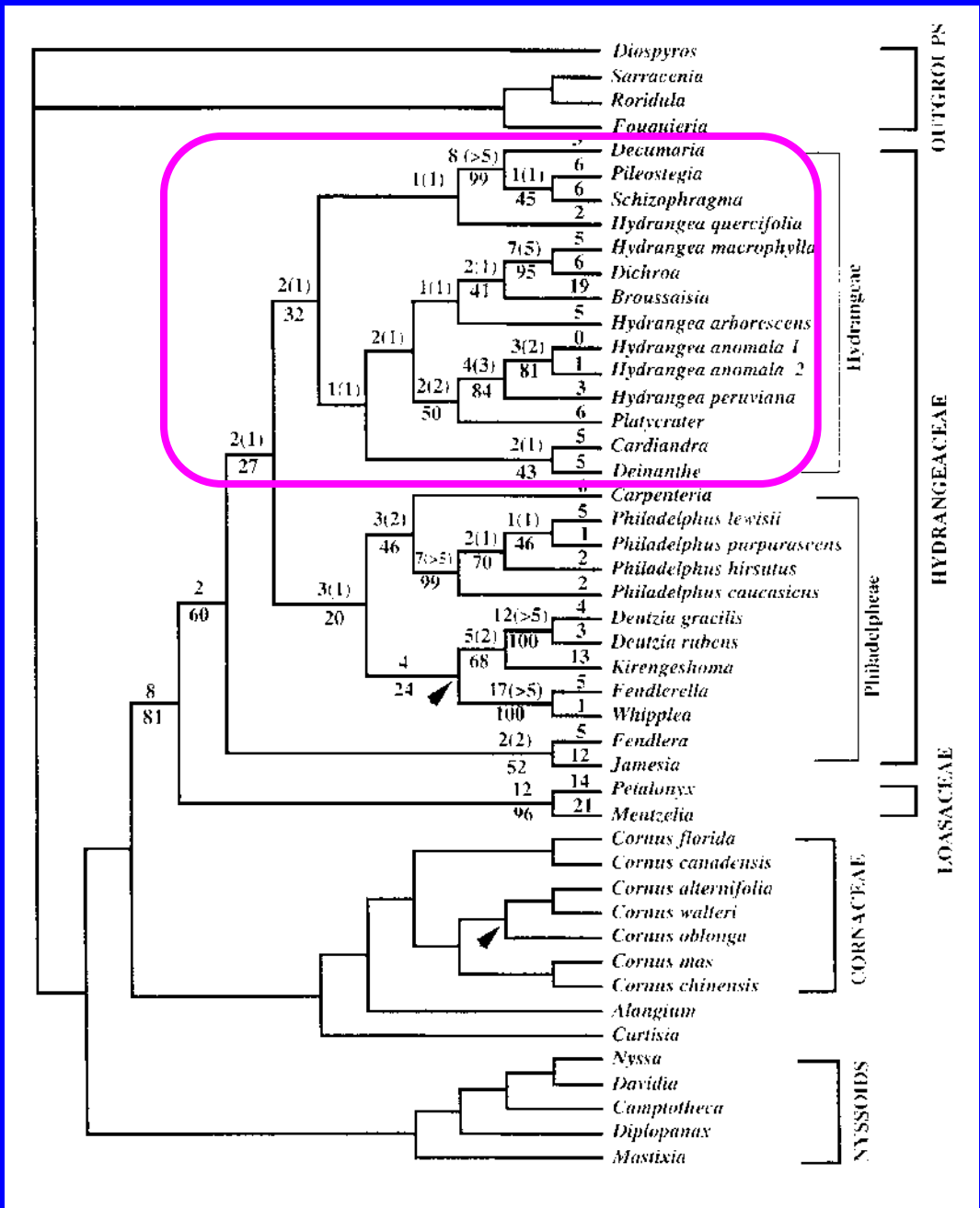
+ *tribus Hydrangeae*

Molecular phylogeny * (*rbcL* sequence data)

Hydrangea with nested genera :

- *Decumaria*
- *Pileostegia*
- *Schizophragma*
- *Dichroa*
- *Broussaisia*
- *Platycrater*

(Soltis et al. 1995)



Hydrangeaceae sensu stricto

= tribus *Hydrangeeae*, with 8 genera + 1

Broussaisia

Cardiandra

Decumaria

Deinanthé

Dichroa

Pileostegia

Platycrater

Schizophragma

now all are nested in *Hydrangea sensu lato*

***Hydrangea* inflorescence : corymb
marginal flowers with enlarged sepals !**

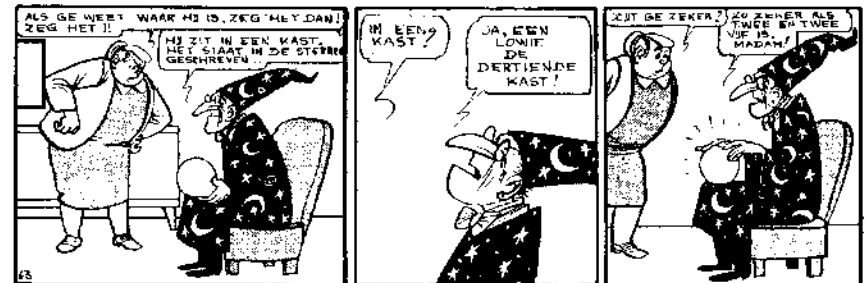
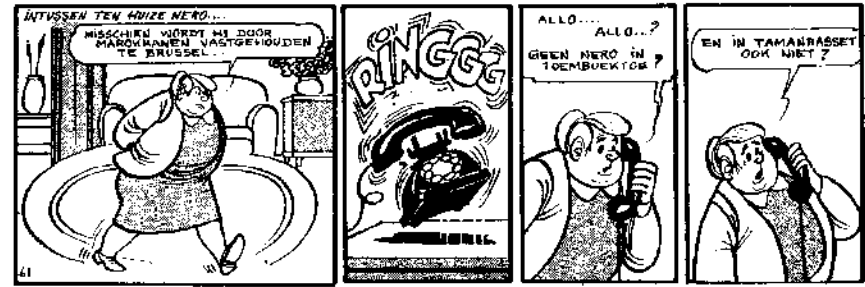


Marginal flowers with enlarged sepals



De avonturen van Nero en C°

De Lowie Treizekast

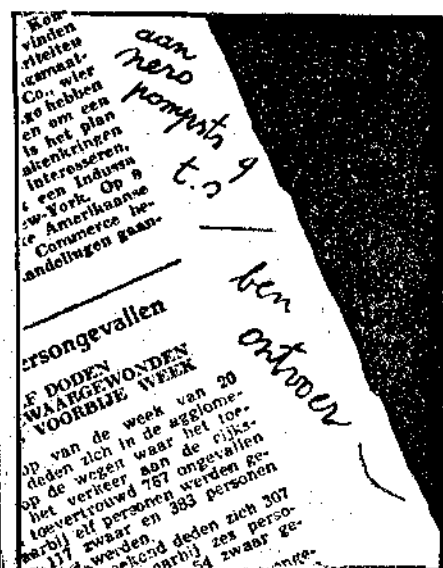


De avonturen van Nero en C°

De Lowie Treizekast (1965)



De avonturen van Nero en C° een ouder adres... (De vliegende handschoen, 1958)



Hydrangea : IG classification (McClintock 1957)

sectio Hydrangea

subsectio Americanae

subsectio Asperae

subsectio Calyptranthe

subsectio Petalanthae

subsectio Heteromallae

subsectio Macrophyllae

sectio Cornidia

subsectio Monosegia

subsectio Polysegia

Towards a new (molecular) classification...

Marie-Stéphanie Samain

Carolina Granados Mendoza

Yannick De Smet



Hydrangea : new classification (De Smet et al. 2015)

sectio *Chinenses*

sectio *Hirtae*

sectio *Macrophyllae*

sectio *Dichroa*

sectio *Stylosae* ?

sectio *Broussaisia*

sectio *Hydrangea*

sectio *Asperae* (incl. *Platycrater*)

sectio *Cornidia*

sectio *Calyptranthe*

sectio *Cardiandra*

sectio *Deinanthè*

sectio *Pileostegia*

sectio *Decumaria*

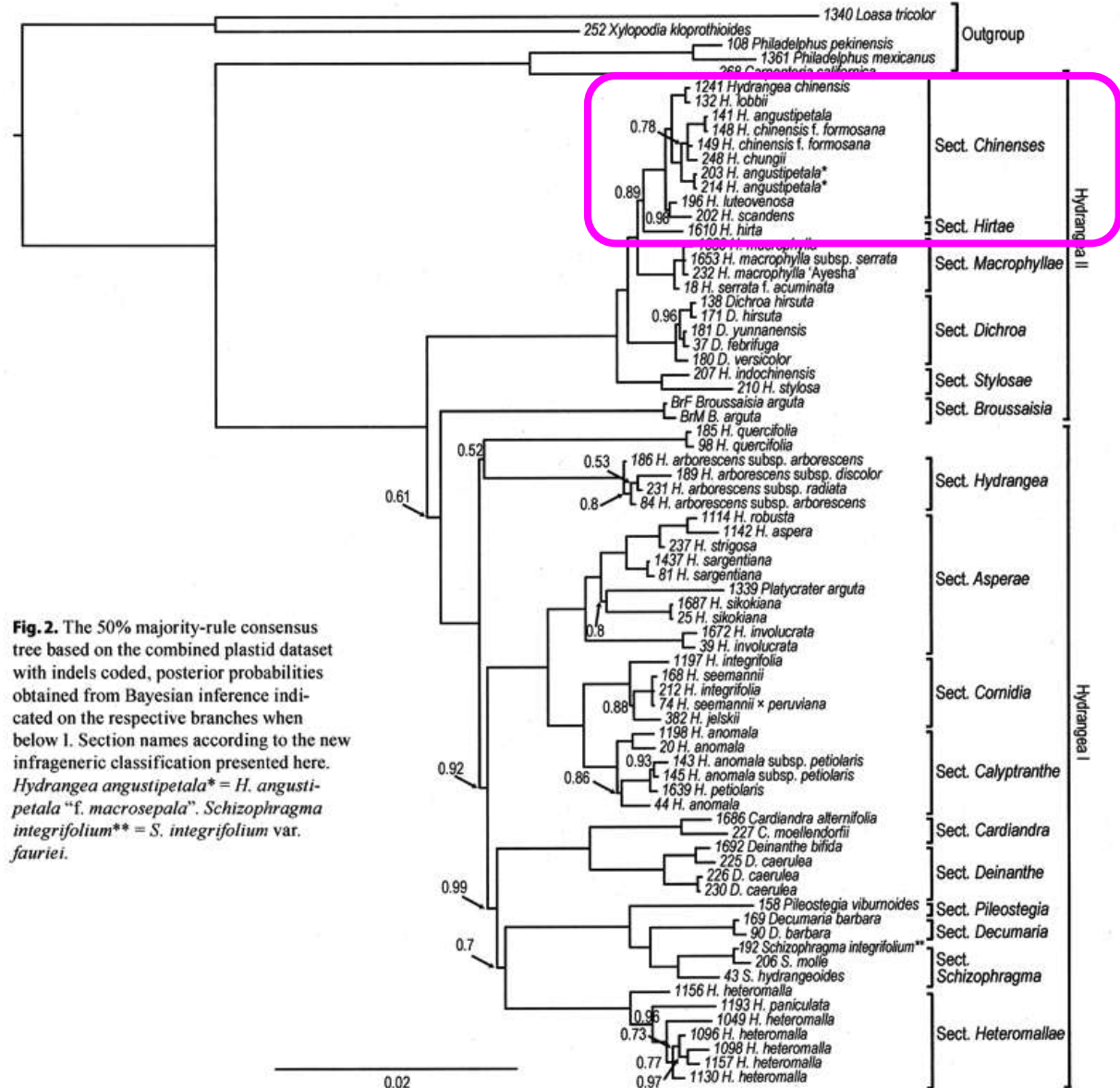
sectio *Schizophragma*

sectio *Heteromallae*

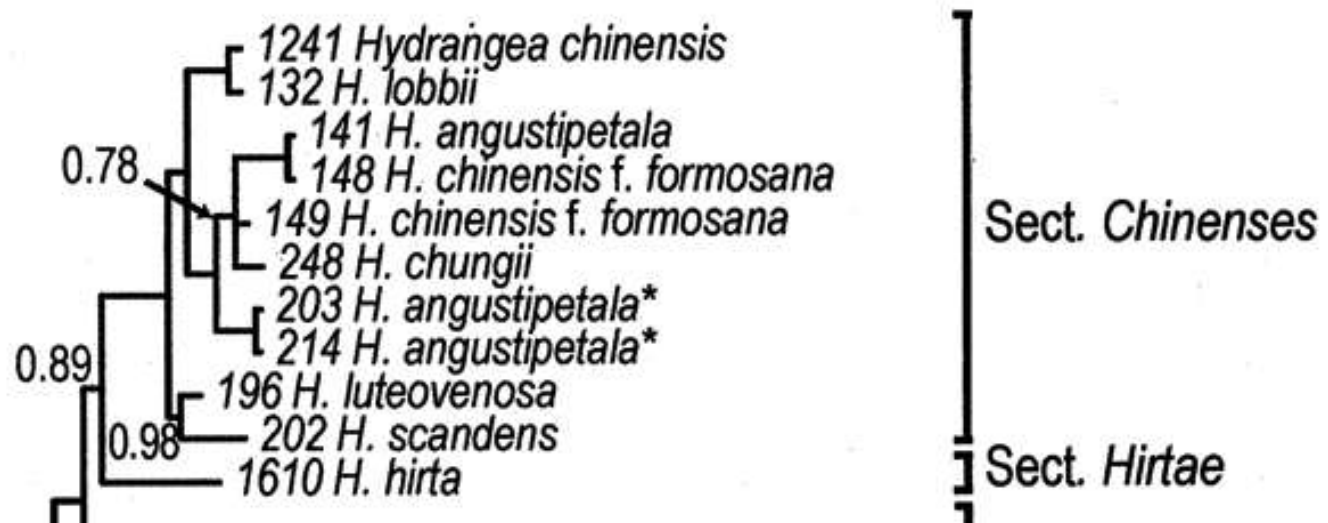
Hydrangeaceae

combined phylogeny (cpDNA)

(De Smet et al. 2015)



Hydrangea sectio *Chinenses* & *Hirtae*



(De Smet et al. 2015)

Hydrangea sectio Chinenses* *H. chinensis
Shima-konterigi



Hydrangea
sectio Chinenses

H. lobbii



Hydrangea sectio Chinenses *H. scandens*
Gaku-utsugi



Hydrangea sectio Chinenses* *H. scandens



Hydrangea sectio Hirtae *H. hirta*
Ko-ajisai



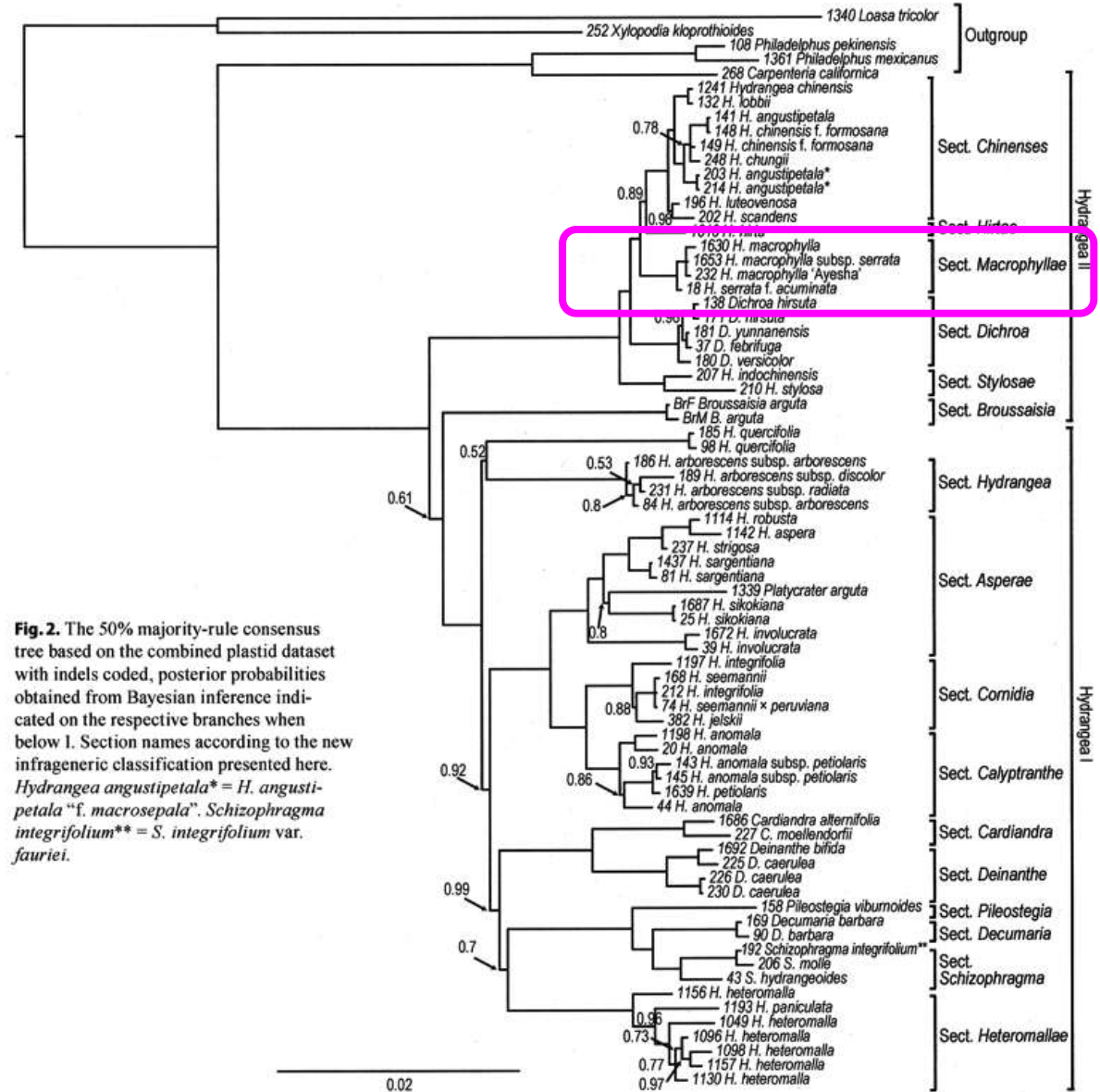
Hydrangea sectio Hirtae H. hirta



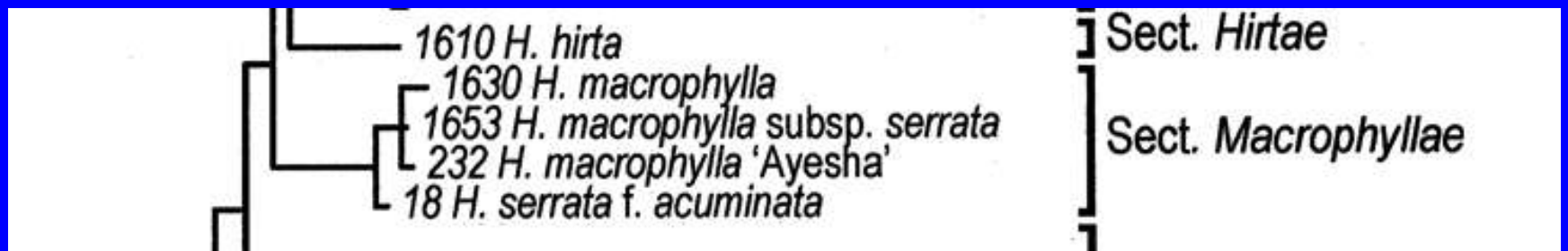
Hydrangeaceae

combined phylogeny (cpDNA)

(De Smet et al. 2015)

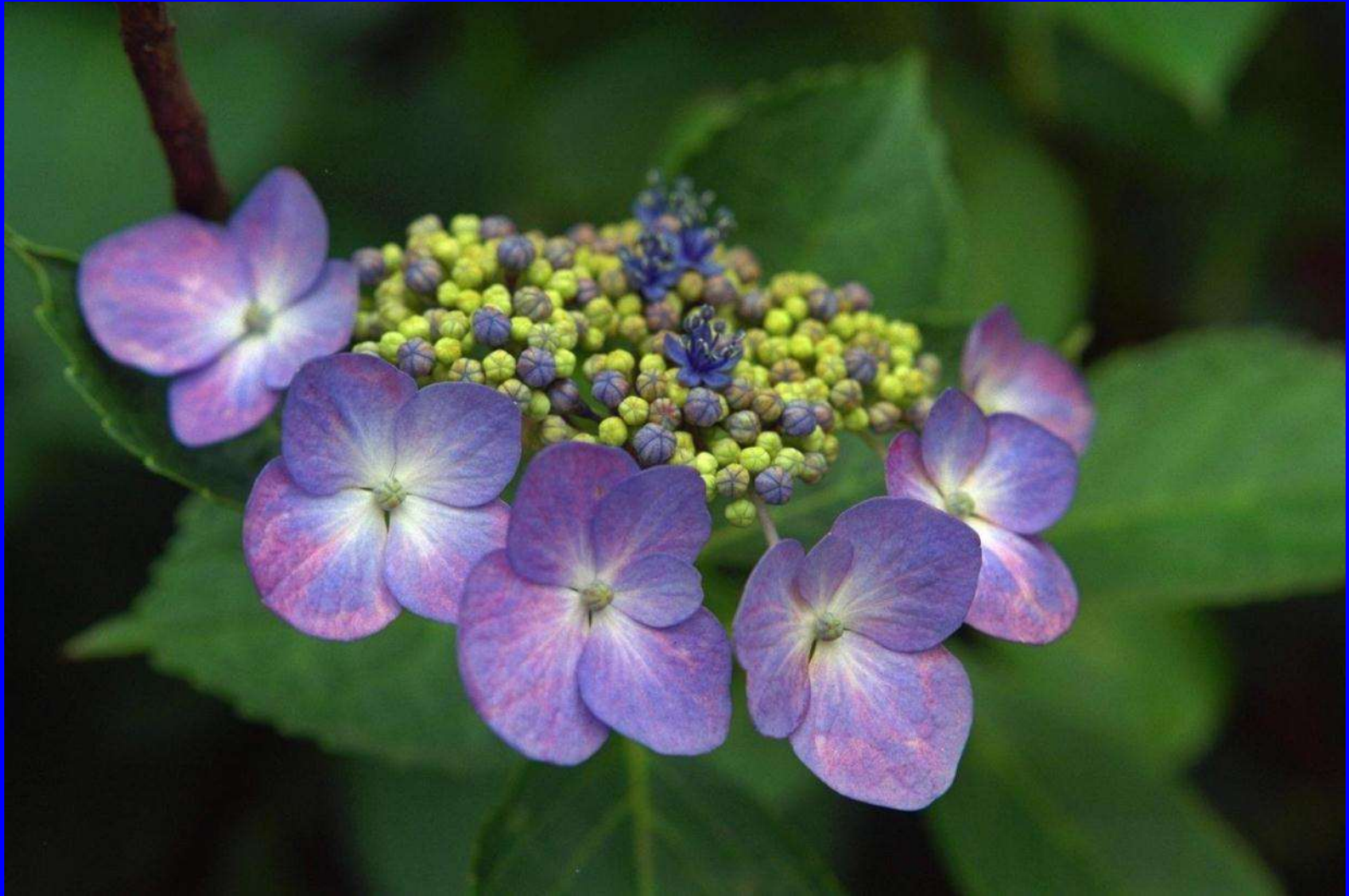


Hydrangea sectio Macrophyllae



(De Smet et al. 2015)

Hydrangea sectio Macrophyllae H. macrophylla
Gaku-ajisai (azu sa ai)



***Hydrangea* sectio *Macrophyllae* *H. macrophylla*
marginal flowers “double”**



***Hydrangea* sectio *Macrophyllae* *H. macrophylla*
all flowers “double”**



Hydrangea sectio Macrophyllae H. serrata
Yama-ajisai



Hydrangea
sectio Macrophyllae

H. serrata
'Amagi Amacha'

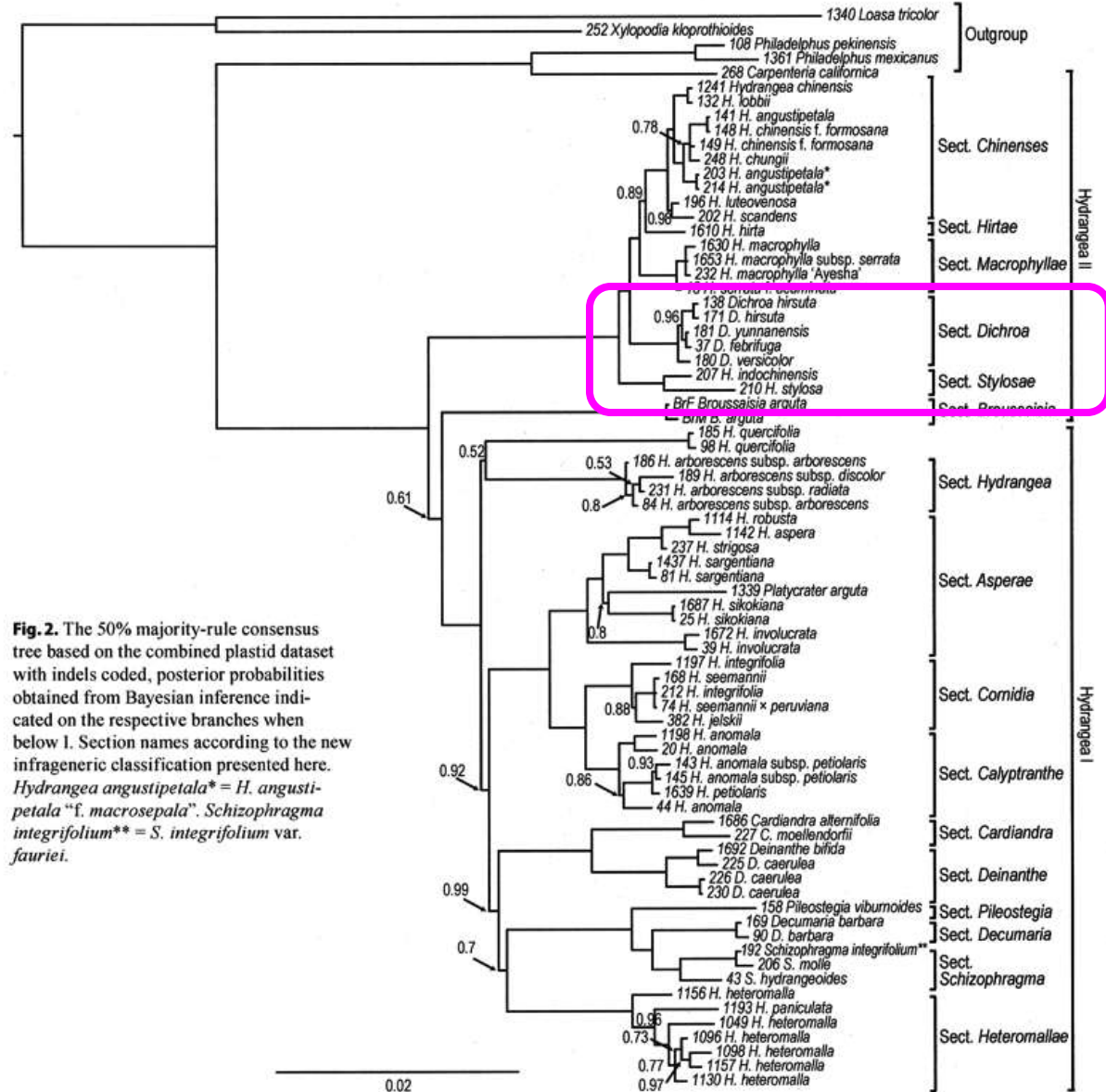
Ama-cha



Hydrangeaceae

combined phylogeny (cpDNA)

(De Smet et al. 2015)



Hydrangea sectio Dichroa H. febrifuga



Hydrangea sectio Dichroa *H. febrifuga*



Hydrangea sectio Stylosae H. stylosa



Hydrangea *sectio Stylosae*

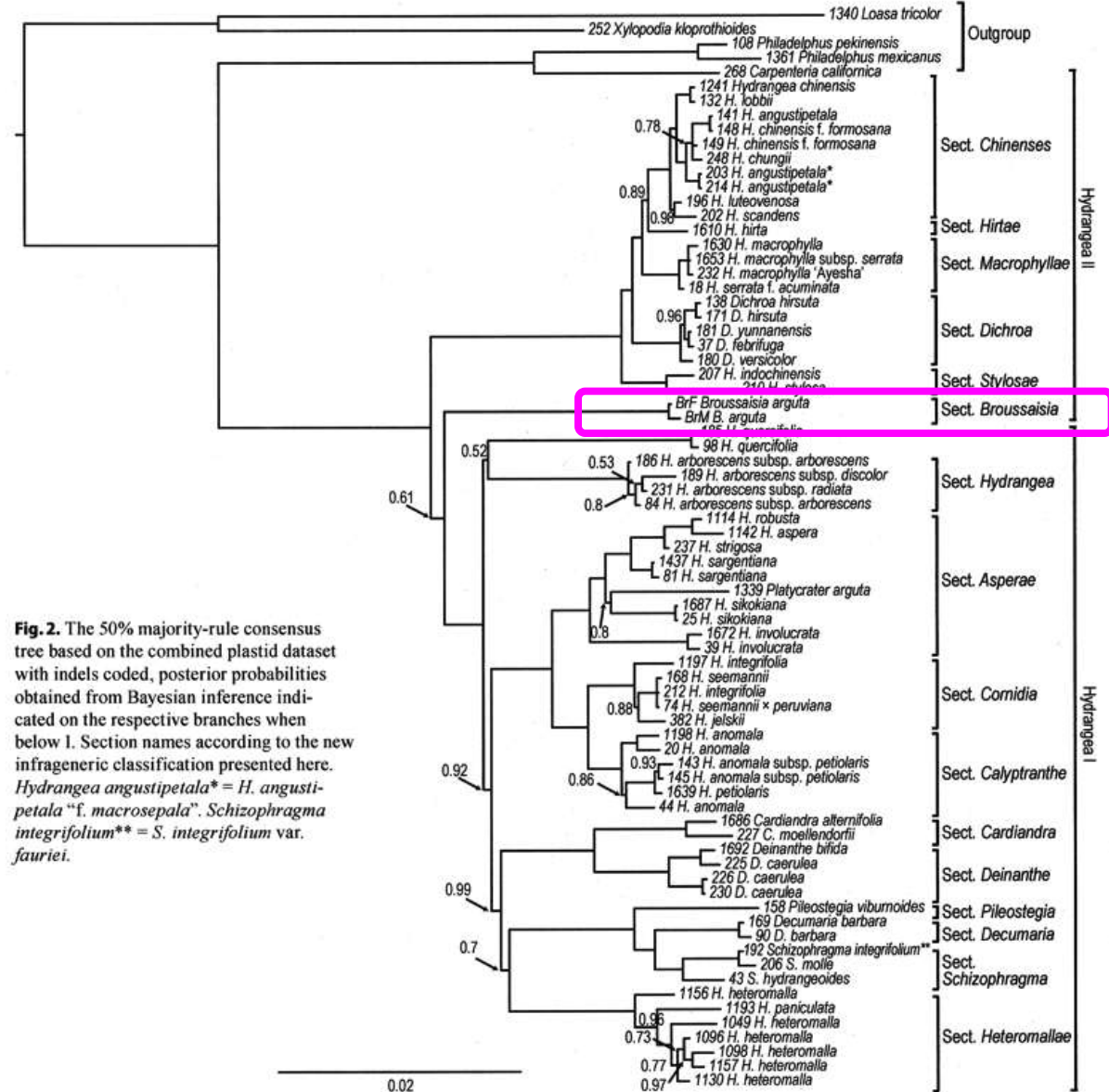
H. stylosa



Figure 296. 1-5. *Hydrangea chungii* Rehder, 福建绣球 fu jian xiu qiu. —1. Fruiting branch. —2. Leaf blade portion adaxial view showing hairs. —3. Leaf blade portion abaxial view showing hairs. —4. Fruit. —5. Seed. 6-8. *H. stylosa* J. D. Hooker & Thomson, 长柱绣球 chang zhu xiu qiu. —6. Fruiting branch. —7. Fruit. —8. Seed. (FOC 416, 417; FRPS 35(1): 222, pl. 47. 1995. —邓盛丰 Deng Yingfeng).

Hydrangeaceae

combined phylogeny (cpDNA)



(De Smet et al. 2015)

Hydrangea sectio Broussaisia



(De Smet et al. 2015)

Hydrangea sectio *Broussaisia* *H. arguta*



Broussaisia arguta
Hydrangeaceae
© G. D. Carr

Hydrangea sectio *Broussaisia* *H. arguta*



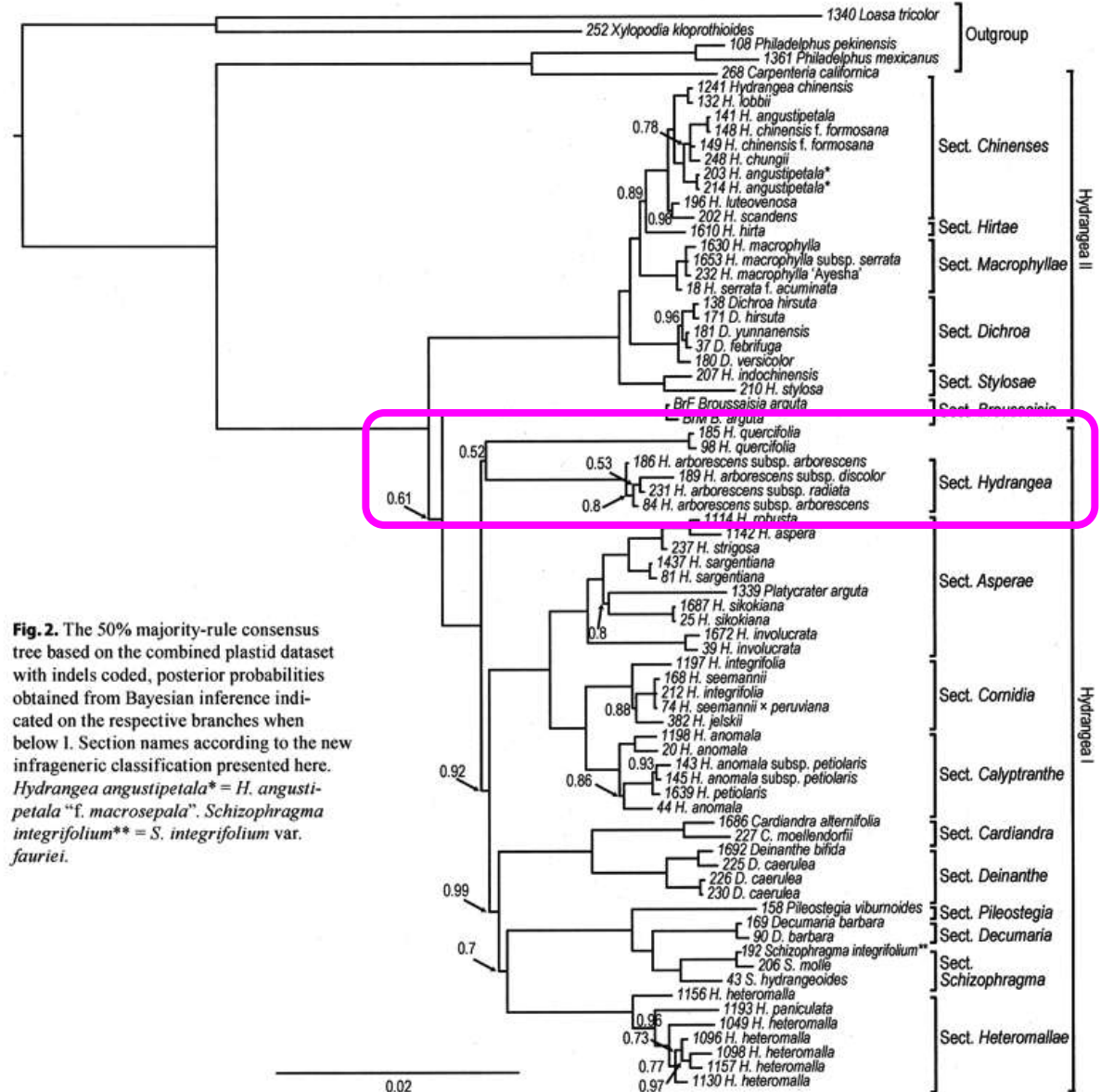
Hydrangea sectio *Broussaisia* *H. arguta*



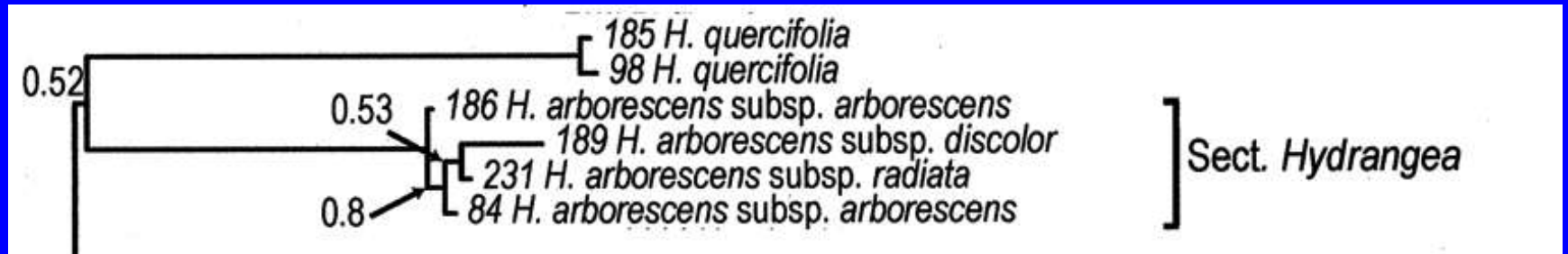
Hydrangeaceae

combined phylogeny (cpDNA)

(De Smet et al. 2015)



Hydrangea sectio *Hydrangea*



(De Smet et al. 2015)

Hydrangea sectio Hydrangea H. arborescens



Hydrangea sectio *Hydrangea* *H. arborescens*



Hydrangea
sectio Hydrangea
H. arborescens

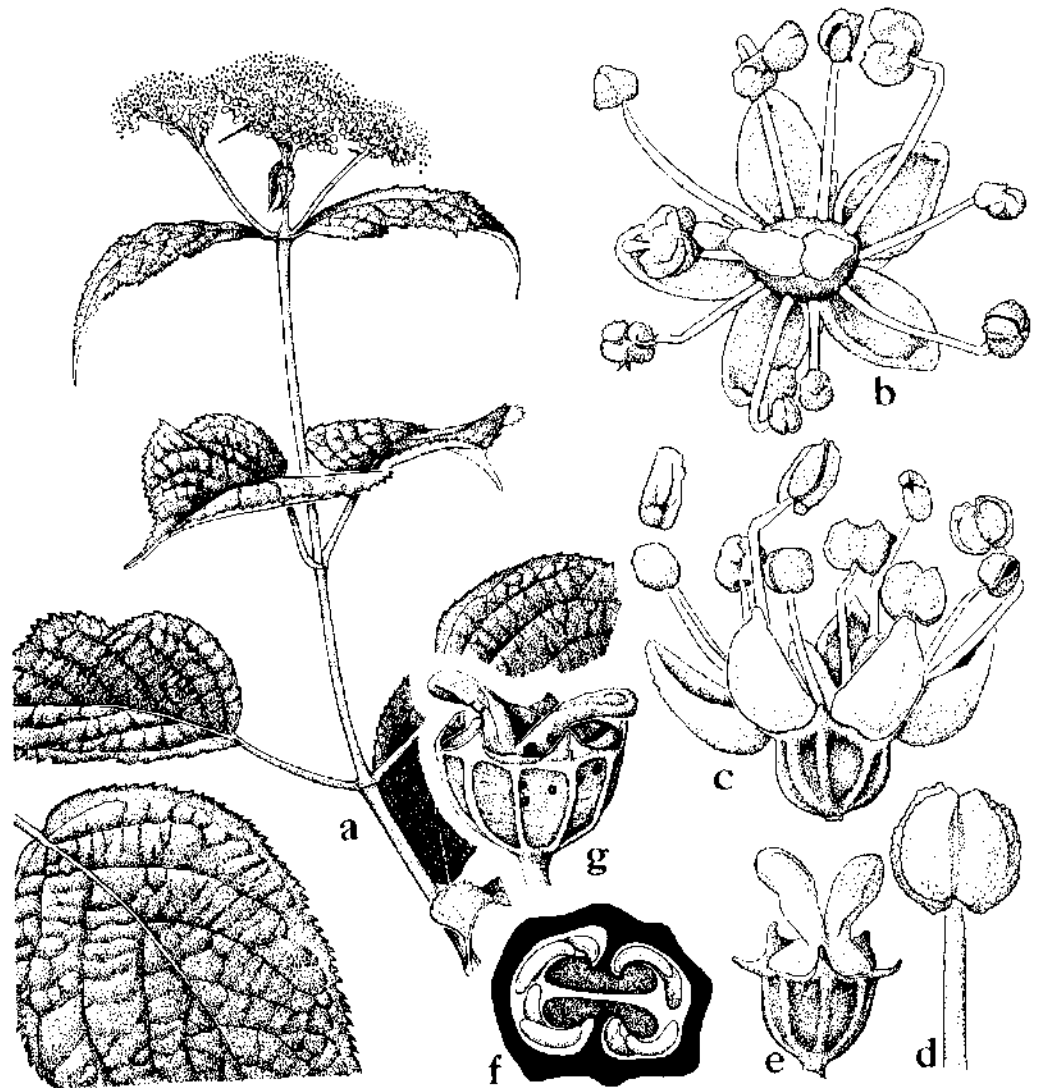


FIG. 5.6 Hydrangeaceae. *Hydrangea arborescens* L. a, habit, $\times \frac{1}{2}$; b, c, flower, from above and from the side, $\times 8$; d, stamen, $\times 16$; e, ovary and sepals, $\times 8$; f, schematic cross-section of ovary, $\times 16$; g, fruit, $\times 8$.

Hydrangea sectio Hydrangea ? H. quercifolia

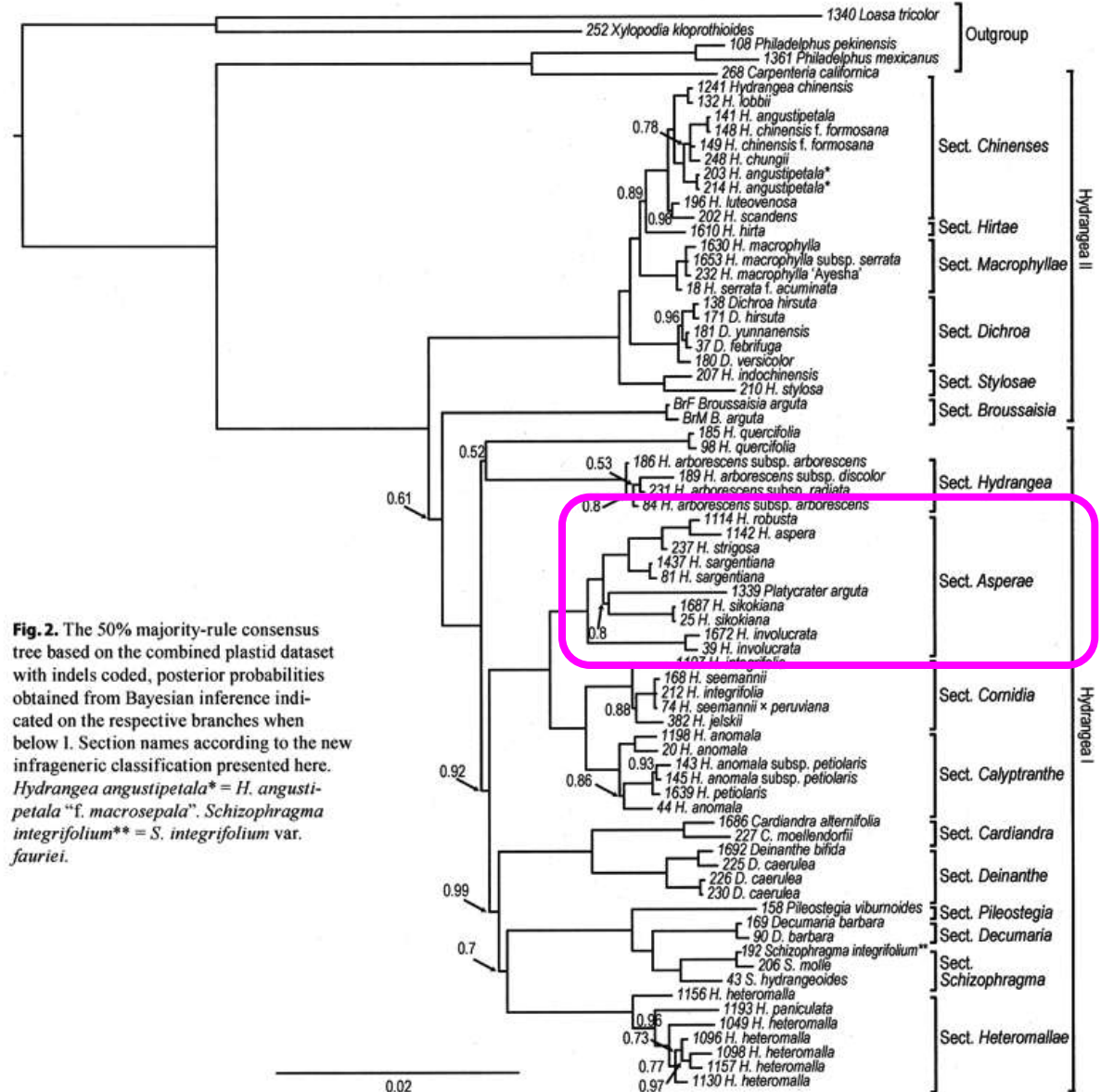


Hydrangea sectio Hydrangea ? H. quercifolia



Hydrangeaceae

combined phylogeny (cpDNA)



(De Smet et al. 2015)

Hydrangea sectio *Asperae* (incl. *Platycrater*)



(De Smet et al. 2015)

Hydrangea sectio Asperae H. aspera



Hydrangea sectio Asperae H. aspera 'Mauvette'



Hydrangea sectio Asperae H. sargentiana



***Hydrangea* sectio *Asperae* *H. platyarguta*
*Baika-amacha***



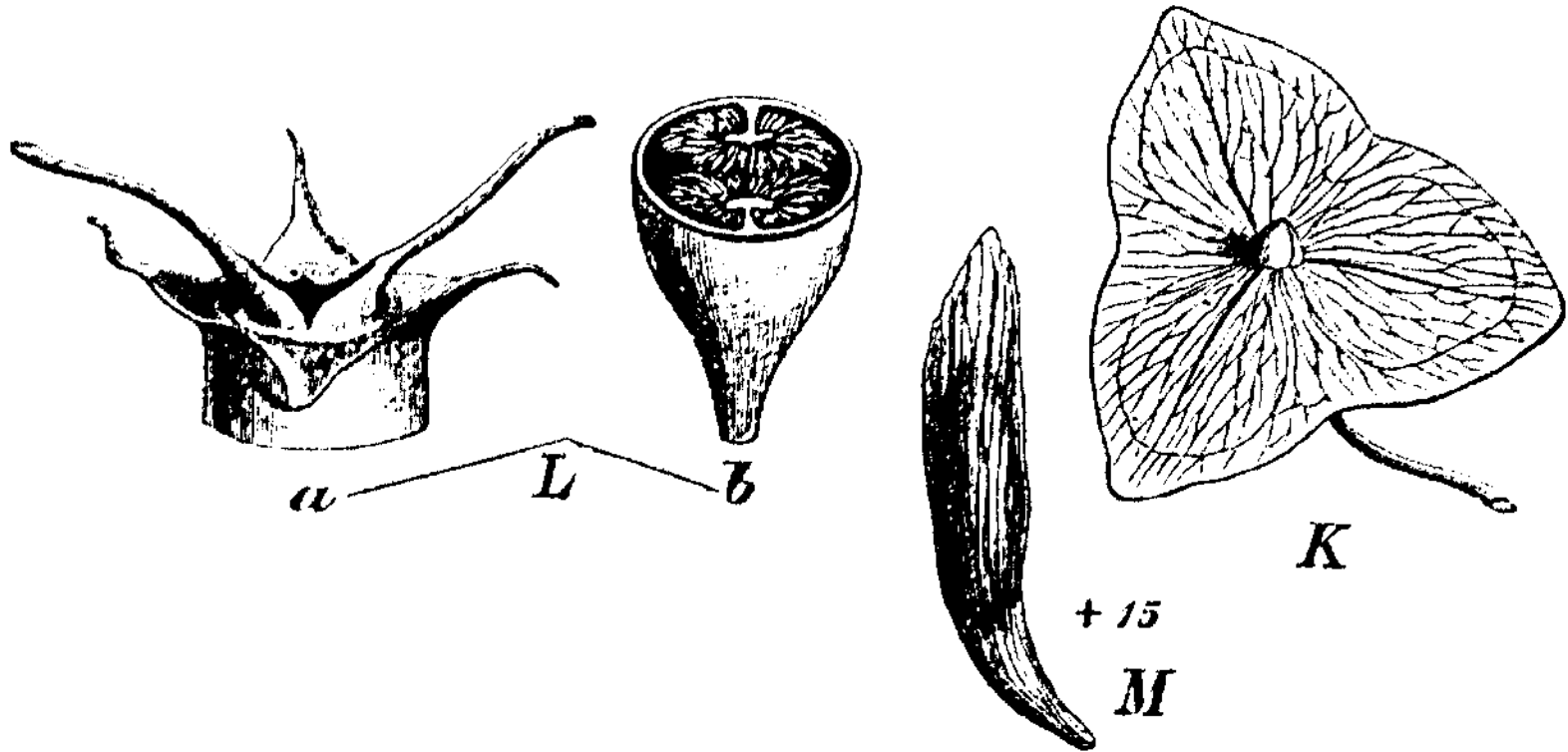
***Hydrangea*
sectio *Asperae***

H. platyarguta

(von Siebold & Zuccarini 1870)



Hydrangea sectio Asperae H. platyarguta



(Engler 1928)

Hydrangea sectio Asperae H. sikokiana
Yahazu-ajisai



Hydrangea sectio Asperae H. sikokiana



Hydrangea sectio Asperae H. involucrata
Tama-ajisai



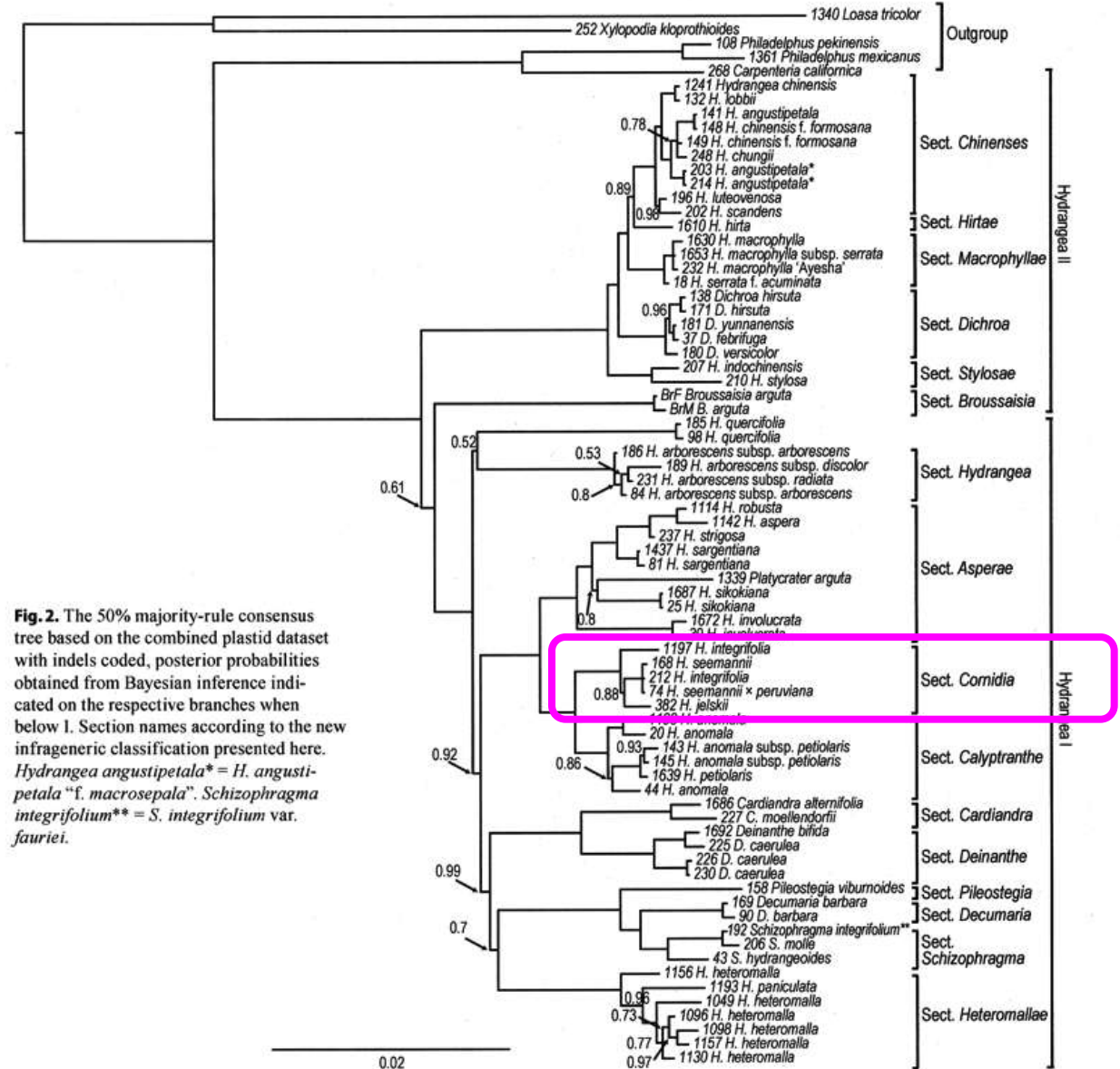
Hydrangea sectio Asperae H. involucrata



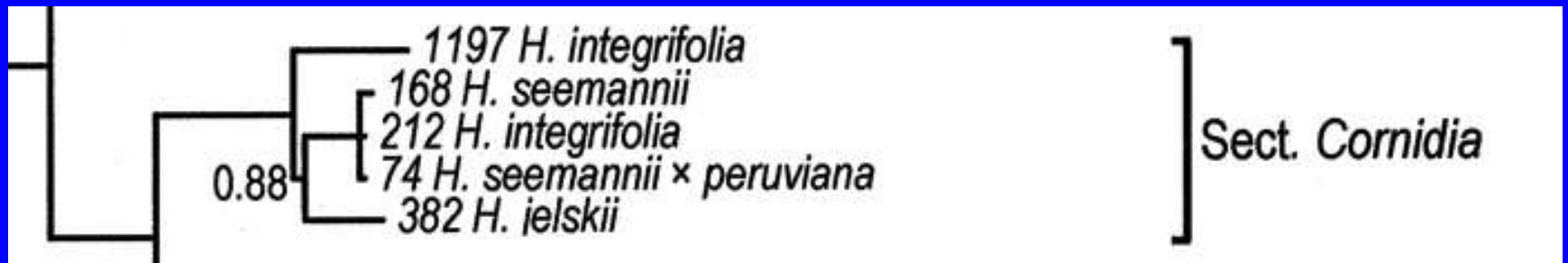
Hydrangeaceae

combined phylogeny (cpDNA)

(De Smet et al. 2015)



Hydrangea sectio Cornidia



(De Smet et al. 2015)

Hydrangea
sectio Cornidia

H. integrifolia



Hydrangea sectio Cornidia H. seemannii



Hydrangea
sectio Cornidia
H. seemannii



***Hydrangea* sectio *Cornidia* *H. serratifolia* ?**



Hydrangea
sectio Cornidia

H. albostellata



Hydrangea
sectio Cornidia

H. albostellata



Hydrangea sectio Cornidia H. peruviana

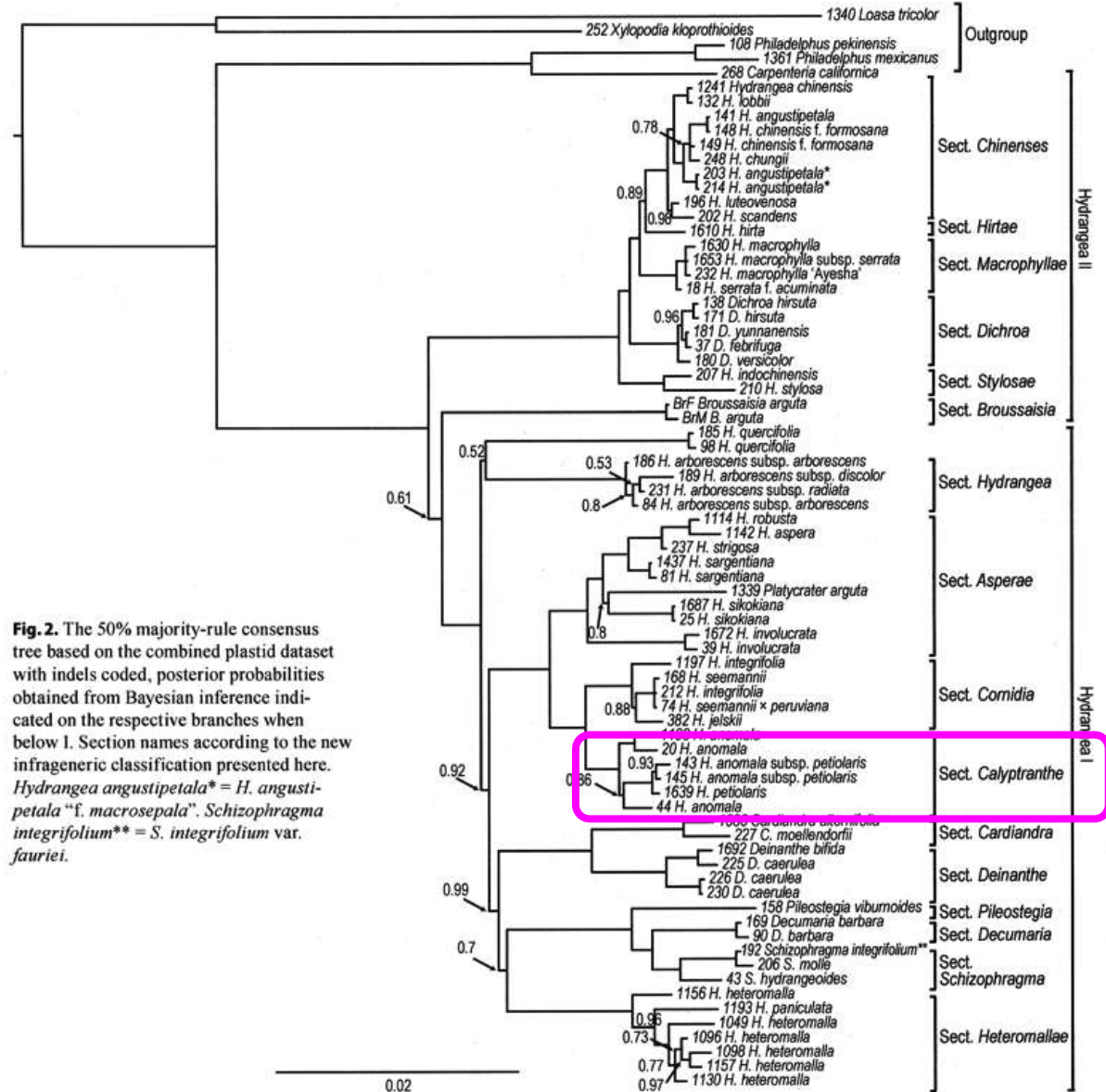


Hydrangea sectio Cornidia H. peruviana



Hydrangeaceae

combined phylogeny (cpDNA)



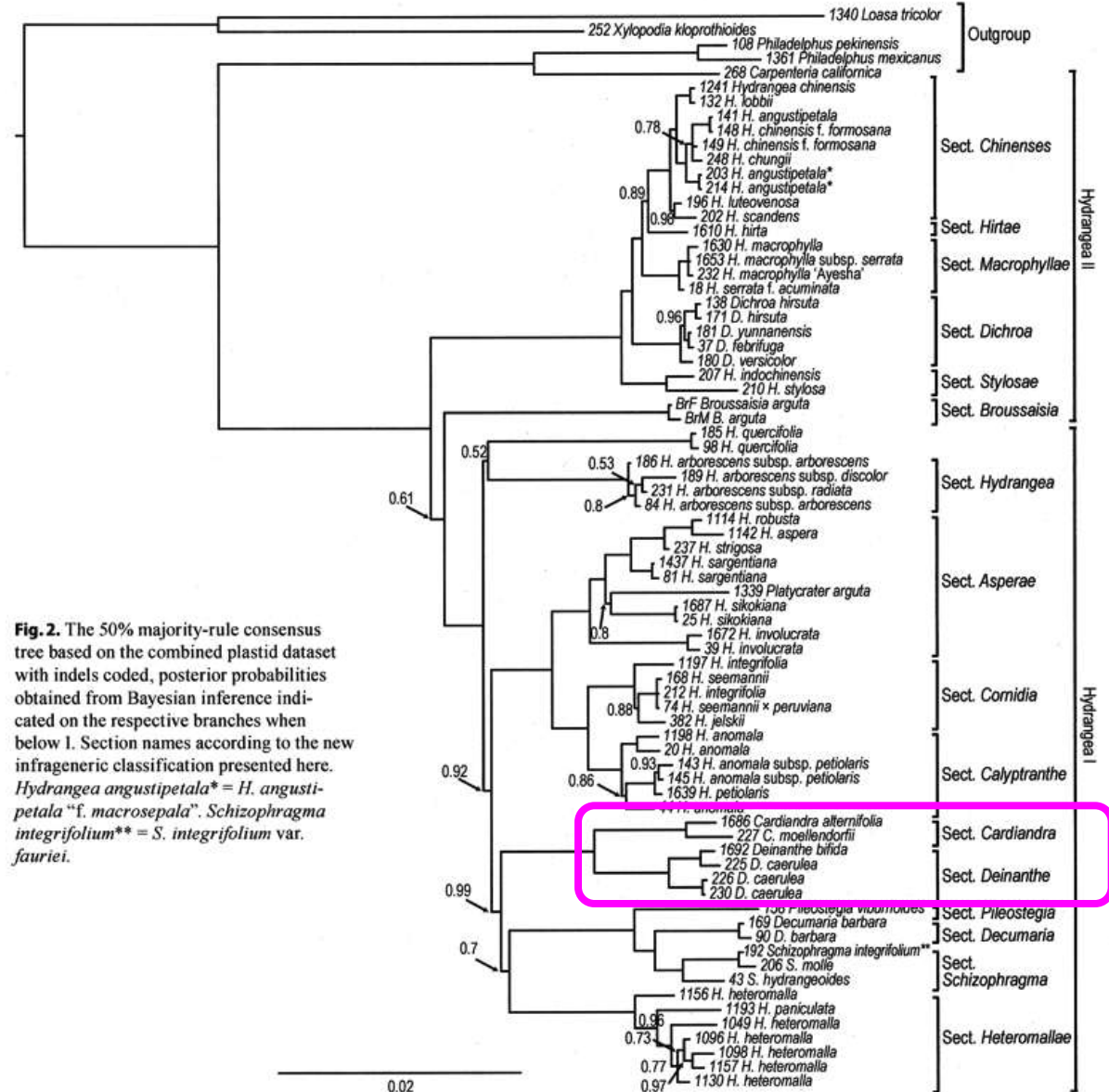
(De Smet et al. 2015)

Hydrangea sectio Calyptranthae *H. petiolaris*
Tsuru-ajisai



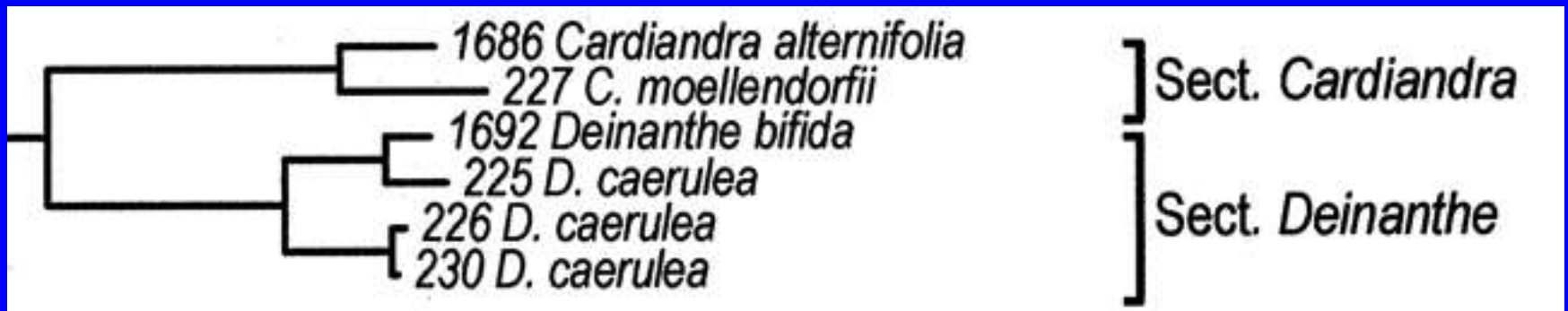
Hydrangeaceae

combined phylogeny (cpDNA)



(De Smet et al. 2015)

Hydrangea sectio *Cardiandra* & *Deinanth*e



(De Smet et al. 2015)

Hydrangea sectio Cardiandra H. alternifolia
Kusa-ajisai

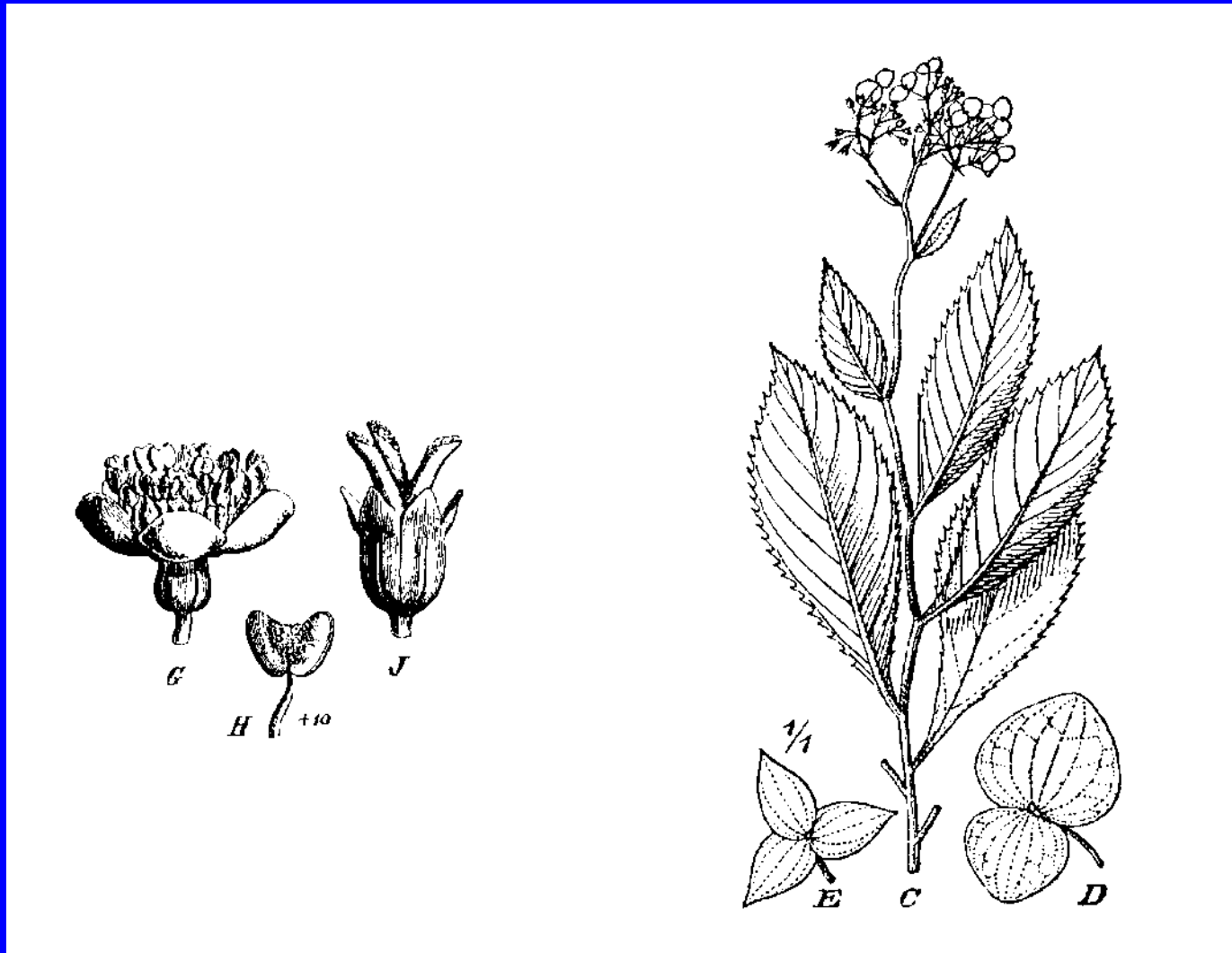


Hydrangea
sectio Cardiandra

H. alternifolia



Hydrangea sectio Cardiandra H. alternifolia



(Engler 1928)

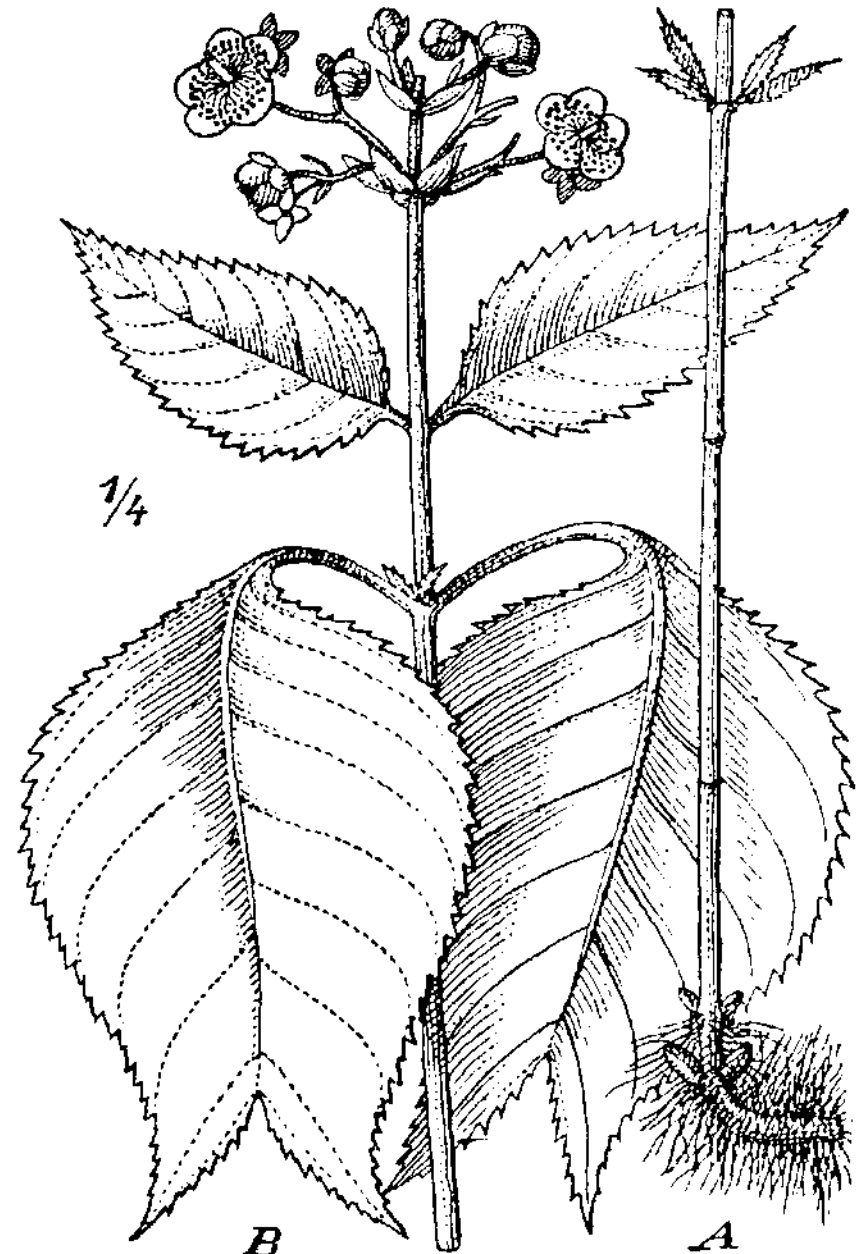
Hydrangea sectio Deinanthe H. caerulea



Deinanthë bifida
Gin-bai-sô



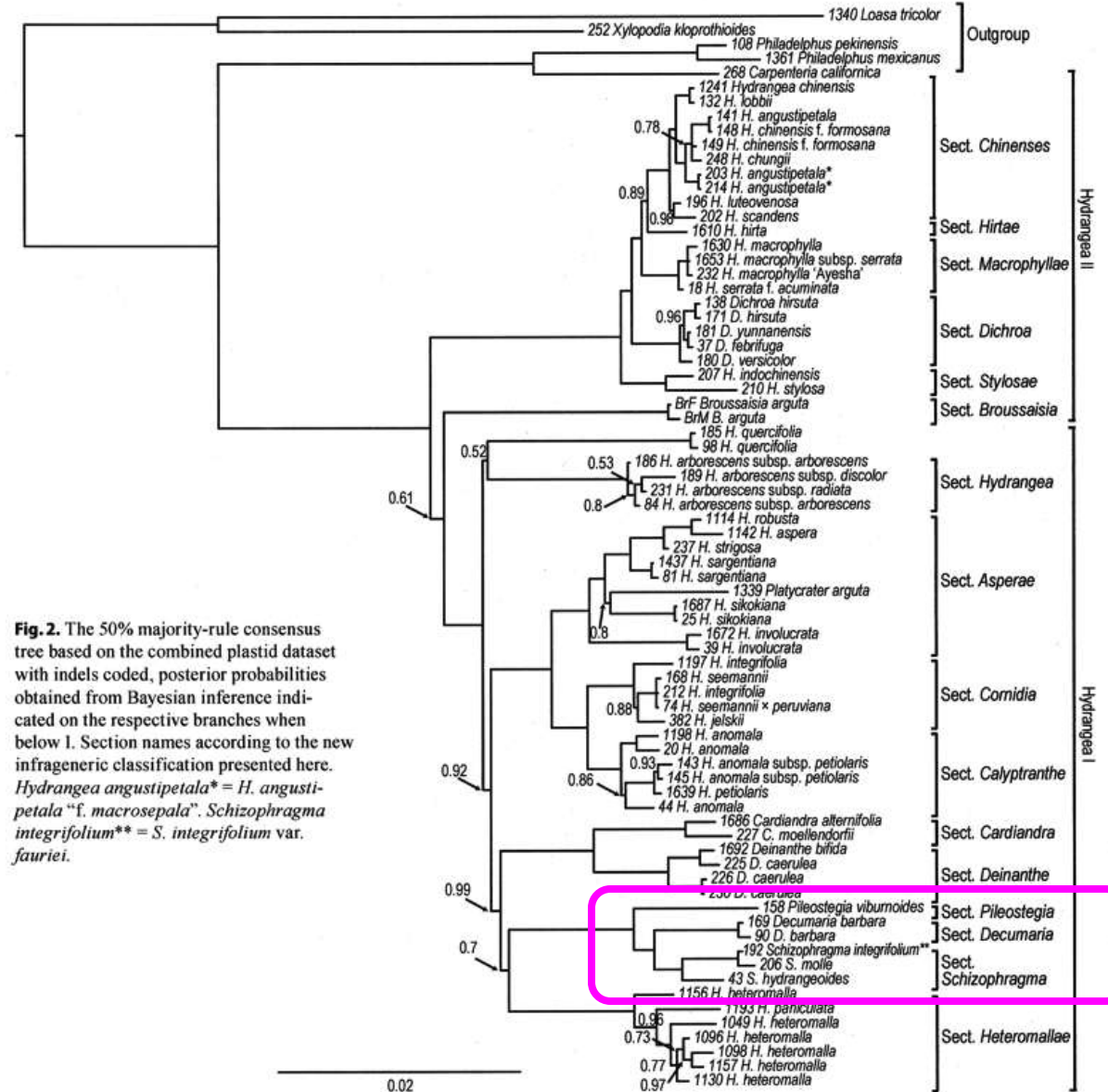
Deinanthë bifida



(Engler 1928)

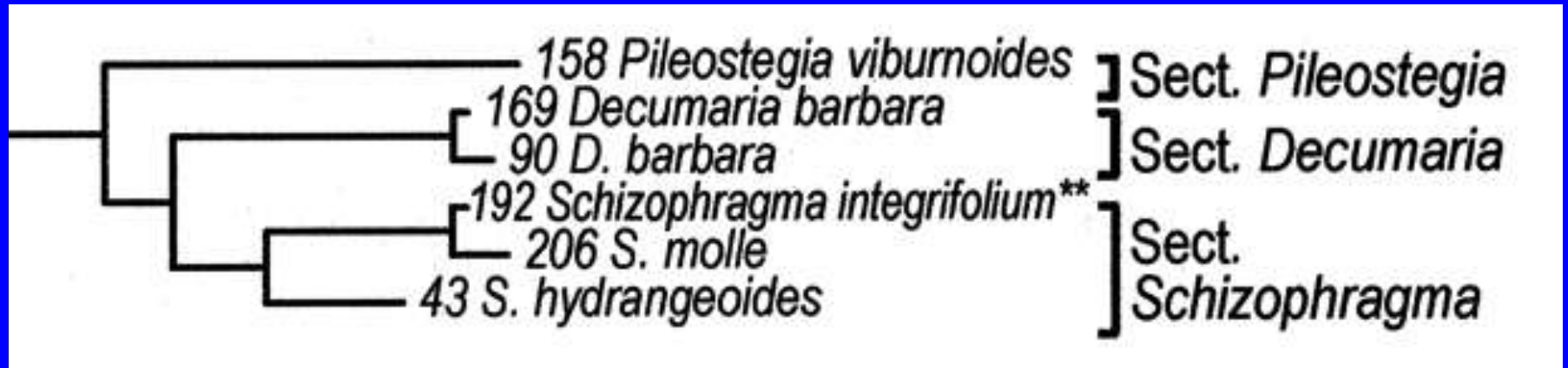
Hydrangeaceae

combined phylogeny (cpDNA)



(De Smet et al. 2015)

Hydrangea sectio *Pileostegia*, *Decumaria*, *Schizophragma*



(De Smet et al. 2015)

Hydrangea
sectio
Pileostegia

H. viburnoides

Shima-yuki-kazura



Hydrangea sectio *Decumaria* *H. barbara*



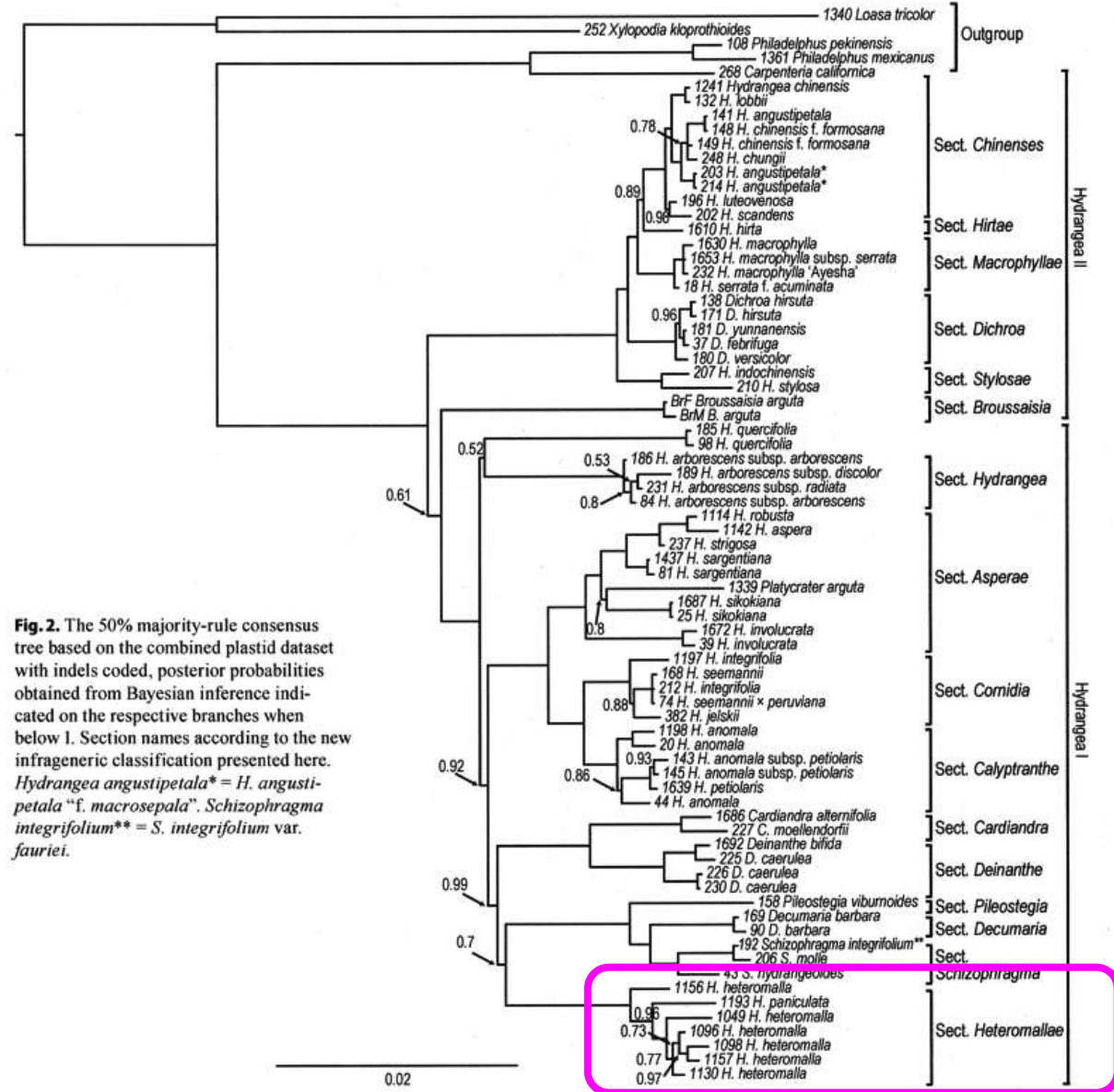
Hydrangea sectio Schizophragma H. hydrangeoides
Iwa-garami



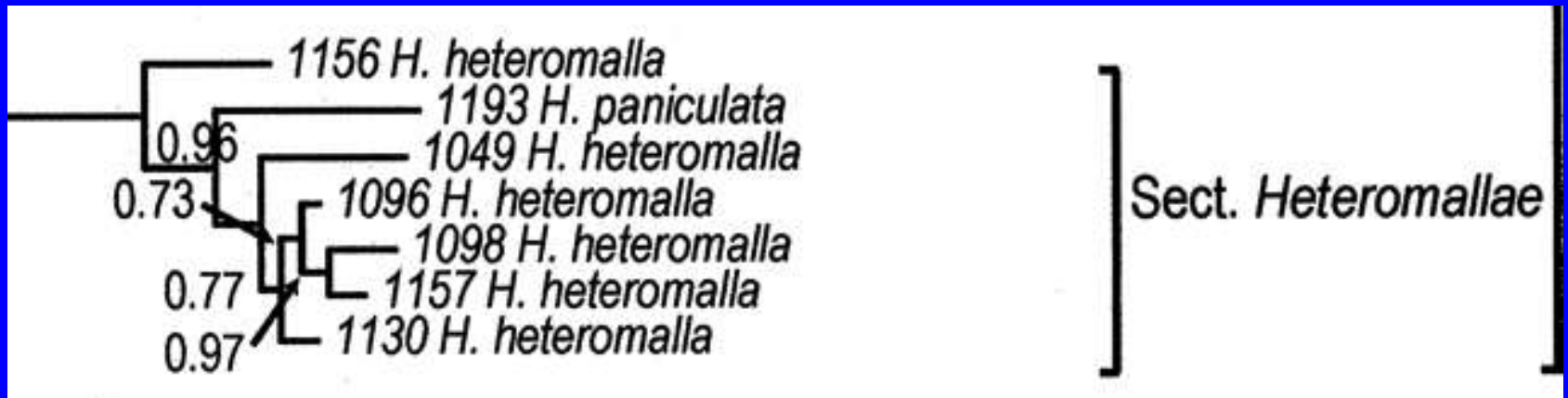
Hydrangeaceae

combined phylogeny (cpDNA)

(De Smet et al. 2015)



Hydrangea sectio *Heteromallae*



(De Smet et al. 2015)

Hydrangea sectio Heteromallae H. heteromalla



Hydrangea
sectio Heteromallae

H. paniculata

Nori-utsugi



Hydrangea sectio *Heteromallae*
H. paniculata 'Pinky Winky'



The take home message *

Hydrangeaceae belong to the basal Asterids, order Cornales

Hydrangeaceae form a monophyletic group of “17” genera (now : 9)

The tribe Hydrangeae is monophyletic, now with one single genus

All of the “hydrangeoid” genera are nested in Hydrangea s.s.

***The infrageneric classification of McClintock is rather well supported,
as to the units***

***Many more sections are recognized for accommodating the old
genera into Hydrangea sensu lato***

Our sincere thanks to : *

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