BOTANY 300S J.E. Eckenwalder
Systematic Botany 8 March 2005

TERM TEST II

Section 1. Nomenclatural problems in scale-leaved Podocarpaceae

The coral pine, a strange, reddish purple, coralloid, rare shrub from New Caledonia presently known as *Parasitaxus ustus* (ustus means "burned," for the shrub's colour), is the only known parasitic gymnosperm. A member of the largely southern hemisphere conifer family Podocarpaceae, its only host is another podocarp, *Falcatifolium taxoides*, a fairly common tree throughout the island. It (the parasite) was first described in *Dacrydium*, a genus with many scale-leaved species. Later it was transferred to *Podocarpus*, all other species of which have expanded leaf blades. These anomalies led to it being made the basis of a new monotypic genus in 1972. Subsequently, it has been shown to have its closest relationships with two other Australasian scale-leaved species once included in *Dacrydium*, silver pine of New Zealand and Huon pine of Tasmania. The nomenclature of these three conifers is explored here. The following relevant names have been published and associated with the corresponding types:

Dacrydium Solander, 1786	(type: *D. cupressinum* Solander)
Nageia Gaertner, 1788	(type: *Myrica nagi* Thunberg)
Podocarpus L'Heritier, 1807, *nom. cons.*	(type: *Taxus elongata* Aiton)
Podocarpus L'Her. sect. *Microcarpus* Engler, 1903	(type: *Dacrydium ustum* Vieillard)
Parasitaxus de Laubenfels, 1972	(type: *D. ustum* Vieillard)
Lagarostrobos Quinn, 1982	(type: *D. franklinii* J. Hooker)
Manoao Molloy, 1995	(type: *D. colensoi* W. Hooker)

Myrica nagi Thunberg, 1784	(type: specimen '**A**')
Dacrydium cupressinum Solander, 1786	(type: specimen '**B**')
Taxus elongata Aiton, 1789	(type: specimen '**C**')
Dacrydium colensoi W. Hooker, 1843	(type: specimen '**D**')
Dacrydium franklinii J. Hooker, 1845	(type: specimen '**E**')
Dacrydium ustum Vieillard, 1861	(type: specimen '**F**')

In addition, the following combinations based upon the above names have been published:

Podocarpus elongatus (Aiton) L'Heritier, 1807
Podocarpus ustus (Vieillard) Brongniart & Gris, 1866
Nageia elongata (Aiton) Mueller, 1876
Nageia nagi (Thunberg) Kuntze, 1891
Nageia usta (Vieillard) Kuntze, 1891
Parasitaxus ustus (Vieillard) de Laubenfels, 1972
Lagarostrobos colensoi (W. Hooker) Quinn, 1982
Lagarostrobos franklinii (J. Hooker) Quinn, 1982
Manoao colensoi (W. Hooker) Molloy, 1995

In the following problems, you have made a series of taxonomic judgments concerning the disposition of the types cited above. For each problem, choose the correct name(s) with author citations, or make new combinations or propose new names as necessary. All taxa are considered distinct until appropriate taxonomic changes are made as stated and conditions cited in earlier questions hold until they are explicitly changed. Note that while specimens '**A**' and '**C**' are both Podocarpaceae, the genera to which they were first wrongly assigned (*Myrica* & *Taxus*) are not.

1) If we consider the silver pine (including specimen '**D**'), the Huon pine (including specimen '**E**'), and the coral pine (including specimen '**F**') to be members of genera distinct from each other and from the genera containing specimens '**A**', '**B**', and '**C**', what are the correct names of these
three species? [9 pts.]

***Manoao colensoi* (W. Hooker) Molloy**
***Lagarostrobos franklinii* (J. Hooker) Quinn**
***Parasitaxus ustus* (Vieillard) de Laubenfels**

2) Further research reveals that all three species are really closely enough related that they should be placed in the same genus. What then are their correct names? [7 pts.]

***Parasitaxus colensoi* (W. Hooker) 'Student'**
***Parasitaxus franklinii* (J. Hooker) 'Student'**
***Parasitaxus ustus* (Vieillard) de Laubenfels**

3) In fact, silver pine and coral pine are actually so closely related that they should be treated as
varieties of a single species. What are the correct names of these two varieties? [5 pts.]

Parasitaxus colensoi* (W. Hooker) 'Student' var. *colensoi
***Parasitaxus colensoi* (W. Hooker) 'Student' var. *ustus* (Vieillard) 'Student' is preferred**

4) If you now decide that the three pines in question really belong to the same genus as specimen '**B**', what is the correct name for the coral pine? [3 pts.]

***Dacrydium colensoi* W. Hooker var. *ustum* (Vieillard) 'Student'**

5) Nonetheless, you still consider the coral, silver, and Huon pines distinct enough from their closest relatives to merit taxonomic recognition, so you place them in a section distinct from that of specimen **'B'.** What are the correct names for the two sections? [4 pts.]

Dacrydium* Solander sect. *Dacrydium
***Dacrydium* Solander sect. *Microcarpum* (Engler) 'Student'**

Section 2. Taxonomic evidence

6A) Construct and explain [how did you assign points?] an advancement index based on Bessey's dicta for flowers of five different genera with the following floral formulas: [10 pts.]

				AI D K C A G F
Aster	K 2	(C 5	(A 5))	G[inferior] 1 (2)	**13 = 1+3+1+1+3+4**
Dillenia	K 5	C 5	A many	G 5	**4 = 1+0+1+0+2+0**
Hamamelis	K 4	C 4	A 4	G 2	**9 = 1+1+2+2+3+0**
Magnolia	P 3 + 6		A many	G many	**2 = 0+2+0+0+0+0**
Rosa	(K 5	C 5	A many)	G 10	**5 = 1+0+1+0+1+2**

Assignment of points:

Differentiation (D above)

P ? K + C = 1 pt

Reduction

K 5 = 0 pts, 4 = 1 pt, 3 = 2 pts, 2 = 3 pts

C 6 = 0 pts, 5 = 1 pt, 4 = 2 pts

A many = 0 pts, 5 = 1 pt, 4 = 2 pts

G many = 0 pts, 10 = 1 pt, 5 = 2 pts, 2 = 3 pts

Fusions (F above)

sympetalous corolla = 1 pt

epipetalous stamens = 1 pt

syncarpous gynoecium = 1 pt

hypanthium = 2 pts (K + C & C + A)

inferior ovary = an extra 2 pts over the epipetalous stamens here (K +C & A + G)

6B) Based on the index, which genus most closely approximates the ancestral condition assumed by Bessey's dicta? [1 pt.]

Magnolia

6C) What is the morphological term (not taxonomic group) for the kind of flower considered ancestral under Bessey's dicta? [1 pt.]

strobiloid flower

6D) Is this flower type still considered ancestral today? [1 pt.]

no, basal angiosperms revealed by molecular phylogenies have much simpler flowers

6E) To which Cronquist superorder does the genus you chose in Q6B belong? [1 pt.]

Magnolianae

6F) Is this superorder required to have a type under the ICBN? [1 pt.]

no, the requirement for typification extends up only to the rank of family

6G) Identify to which superorder any one of the other genera in Q6A belongs. [1 pt.]

take your pick

Asteranae (*Aster*), Dillenianae (*Dillenia*), Hamamelidanae (*Hamamelis*), or Rosanae (*Rosa*)

6H) Is there any evidence for differentiation between whorls among the above floral formulas? If so, which whorls are involved? [1 pt.]

yes, the undifferentiated perianth of *Magnolia* becomes the calyx and corolla of the other genera

7A) In which of the three kinds of wood section can you best distinguish homogeneous (or homocellular) and heterogeneous (or heterocellular) rays? [1 pt.]

radial sections show the rays laid out like brick walls in which the squarish outlines of the marginal cells found only in heterocellular rays are easily distinguished from the more horizontal cells found in both heterocellular and homocellular rays

7B) Briefly discuss why you cannot assume that different flowering plants with an embryo sac containing an egg cell, 2 synergids, 3 antipodals, and 2 polar nuclei are particularly closely related
to one another. [2 pts.]

there are 2 main (and slightly inter-contradictory) points:

i) this is the most common mature type of embryo sac among the angiosperms and hence is of little value in recognizing relationships

ii) this mature pattern is achieved by at least 4 different developmental pathways so it is not really a single character state

7C) What is the central thing that an ovule and an anther sac have in common? What chromosome constitution do you expect them to have. [2 pts.]

they are both basically sporangia and hence diploid, sporophytic tissues

7D) For each of xylotomical (wood anatomical), embryological, and palynological data, indicate at what taxonomic level each line of evidence is generally useful: i) species and below, ii) genus, iii) family or order. This will be an intelligent guess on your part, so very briefly tell me why you
chose the levels you did. [4 pts.]

None of them is commonly useful at the level of species and below, although anything may be in certain particular cases. They basically represent fairly conservative lines of taxonomic evidence, with features that do not vary very much among related species, which tend to inhabit similar environments.

Xylotomical characters are most useful at the <u>generic level</u> (as you know from your recent lab exercise in keying out woods), although they may sometimes show some common features among genera within a family.

Embryological characters are generally most useful at the <u>family or order level</u>. Embryo sac and embryo development take place within the ovaries where they have no direct interaction with the external environment and so remain highly evolutionarily conservative.

Palynological characters are most useful at the <u>generic level</u> since they are strongly related to pollination systems, which tend to be fairly conservative within genera while often varying between them.

The explanations, of course, are considerably more complex than this, but I haven't really talked much about these issues and this is about as far as I would expect you to reason it out for yourselves.

total: 54 pts.