Botany 422 — Plant Geography
Exam 2, Take-Home Portion

Name: _____

Below is question 1, from the 2nd exam, which is a take-home portion of the exam. Please do the work yourself, but you are entitled to consult your notes or text to refresh your memory on the analysis or the interpretation of the results. **Please bring this completed question to class by Monday (April 3) or earlier** (print out your discussion; you can attach other sheets). This question is worth 25 points out of 100 total. Your final grade will be based on the points from the 75 points of exam 2 plus this take home portion.

1. Provided is a morphological data set for three groups of temperate Southern Hemisphere organisms (mammals, fungi, trees). For each of the three groups the data set is comprised of four morphological characters for five species from the Southern Hemisphere. For each of the three groups there is also a sixth "outgroup" species from the Northern Hemisphere to be used for "ordering" or "polarizing" the morphological character changes.

   Analysis: Using the technique of cladistic biogeography, (1) derive a species cladogram for each of the three groups, (2) convert each of the three species cladograms into area cladograms, and (3) combine them into one general area cladogram — i.e., all and only the information consistent between the three area cladograms.

   [Hint 1: remember to use the outgroup to figure out what is the derived character state, and then look for shared derived character states. Hint 2: the species cladograms may or may not be fully resolved (i.e., some nodes may not be dichotomies or 2-forked, but maybe 3-forked). Hint 3: if one area cladogram lacks resolution (three, instead of two, branches come off at one point), but the other is fully resolved, the general area cladogram can be still fully resolved.]

   Thus, I expect to get from you 3 species cladograms (one for mammals, one for fungi, one for trees), 3 area cladograms, and 1 general area cladogram.

   Discussion (please consider these questions in your answer):

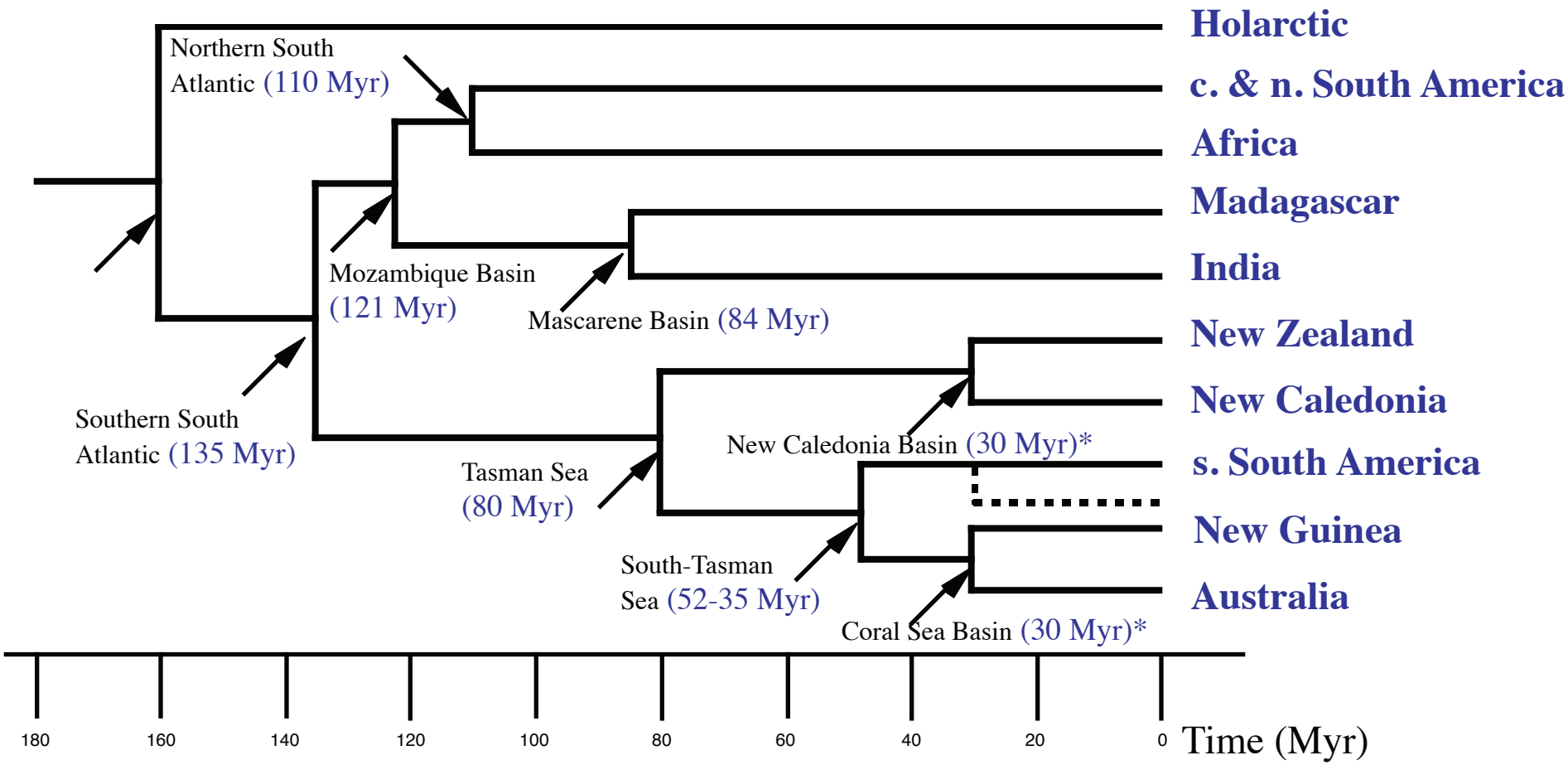
   Is the resulting general area cladogram consistent with what is known about floristic & faunistic relationships among these southern hemisphere temperate areas? (hint: remember the *Nothofagus* and *Fuchsia* and ratite bird examples).

   How does our knowledge of continental movements / separations / attachments bear on these results? You can use the attached sheet ("geological cladogram") - that summarizes relationships of these southern (and more northern) areas based on continental drift evidence – in your answer.

Mammal species	Characters			
	1	2	3	4
A [Africa]	0	1	1	1
B [S. Am.]	0	0	1	1
C [Austr.]	0	0	0	0
D [New Guinea]	0	0	1	0
E [New Zeal.]	0	0	0	0
F [N. Hemisph.]	1	1	1	1

Fungi species	Characters			
	1	2	3	4
J [Africa]	1	1	0	1
K [S. Am.]	0	1	0	1
L [Austr.]	0	1	0	0
M [New Guinea]	0	0	0	0
N [New Zeal.]	0	1	0	0
O [N. Hemisph.]	1	1	1	1

Tree species	Characters			
	1	2	3	4
S [Africa]	1	0	1	1
T [S. Am.]	1	0	1	0
U [Austr.]	0	0	0	0
V [New Guinea]	1	0	0	0
W [New Zeal.]	0	0	0	0
X [N. Hemisph.]	1	1	1	1



Geological History of Major Continental Areas