Supplemental Data 1—

List of character changes across reweighted tree (Fig. 4). Characters and character states are described in Table 3. Numbered nodes are illustrated on Figure 4. Underlined characters have a consistency index (c.i.) greater than the ensemble Consistency Index (CI).

Character	c.i.	Steps	Changes
1	0.400	1	node 48 0 → 2 node 43
		1	node 38 2 → 0 node 31
		1	node 29 0 → 2 node 28
		1	node 35 2 → 1 node 34
		1	node 32 1 → 0 *Cryptopora*
2	0.375	1	node 30 0 → 1 node 29
		1	node 26 1 → 2 *Rhytirhynchia*
		1	node 27 1 → 0 *Basiliolella*
		1	node 29 1 → 3 *Acanthobasiliola*
		1	node 33 0 → 3 *Tethyrhynchia*
		1	node 40 0 → 1 node 39
		1	node 45 0 → 1 *Wellerella*
		1	node 46 0 → 3 *Bryorhynchus*
3	0.250	1	node 27 0 → 1 *Basiliolella*
		1	node 28 0 → 2 *Neorhynchia*
		1	node 31 0 → 1 *Manithyris*
		1	node 35 0 → 1 node 34
		1	node 32 1 → 2 *Aulites*
		1	node 37 0 → 2 node 36

Character	c.i.	Steps	Changes
		1	node 43 0 → 2 node 42
		1	node 48 0 → 1 *Ancistrorhyncha*
4	0.333	1	node 29 1 → 0 *Acanthobasiliola*
		1	node 34 1 → 2 node 33
		1	node 41 1 → 0 node 40
		1	node 39 0 → 1 *Notosaria*
		1	node 42 1 → 2 *Frieleia*
		1	node 48 1 → 0 node 47
5	1.000	1	node 48 0 → 1 node 43
6	0.286	1	node 48 0 → 2 node 43
		1	node 38 2 → 0 node 31
		1	node 27 0 → 2 node 26
		1	node 35 2 → 0 *Abyssorhynchia*
		1	node 41 2 → 1 node 40
		1	node 44 0 → 1 *Rhynchotrema*
		1	node 45 0 → 1 *Wellerella*
7	0.500	1	node 28 0 → 2 node 27
		1	node 26 2 → 1 *Basiliola*
		1	node 41 0 → 1 node 40
		1	node 47 0 → 1 node 46
8	0.375	1	node 29 0 → 2 node 28
		1	node 28 2 → 3 node 27
		1	node 26 3 → 0 *Basiliola*

Character	c.i.	Steps	Changes
		1	node 31 0 → 2 *Manithyris*
		1	node 38 0 → 1 node 37
		1	node 33 1 → 0 node 32
		1	node 32 0 → 2 *Cryptopora*
		1	node 35 1 → 2 *Abyssorhynchia*
9	0.250	1	node 48 0 → 1 node 43
		1	node 30 1 → 2 node 29
		1	node 28 2 → 1 node 27
		1	node 26 1 → 0 *Rhytirhynchia*
		1	node 32 1 → 2 *Cryptopora*
		1	node 33 1 → 0 *Tethyrhynchia*
		1	node 39 1 → 0 *Pemphixina*
		1	node 47 0 → 2 node 46
10	0.167	1	node 28 0 → 1 *Neorhynchia*
		1	node 35 0 → 1 node 34
		1	node 41 0 → 1 node 40
		1	node 39 1 → 0 *Pemphixina*
		1	node 42 0 → 1 *Compsothyris*
		1	node 45 0 → 1 *Wellerella*
11	0.250	1	node 29 0 → 1 node 28
		1	node 26 1 → 0 *Rhytirhynchia*
		1	node 37 0 → 1 node 35
		1	node 42 0 → 1 *Frieleia*

Character	c.i.	Steps	Changes
12	0.500	1	node 40 0 → 1 node 39
		1	node 44 0 → 1 *Rhynchotrema*
13	0.500	1	node 41 1 → 0 node 40
		1	node 48 1 → 0 node 47
14	0.250	1	node 29 0 → 1 node 28
		1	node 48 0 → 1 node 47
		1	node 44 1 → 0 *Rhynchotrema*
		1	node 45 1 → 0 *Uncinunellina*
15	0.667	1	node 38 0 → 1 node 37
		1	node 42 0 → 1 *Frieleia*
		1	node 46 0 → 2 *Bryorhynchus*
16	0.500	1	node 31 0 → 1 node 30
		1	node 47 0 → 1 node 46
17	0.500	1	node 41 0 → 2 node 38
		1	node 34 2 → 1 *Parasphenarina*
		1	node 36 2 → 1 *Grammetaria*
		1	node 46 0 → 2 node 45
18	0.250	1	node 41 0 → 1 node 38
		1	node 30 1 → 2 node 29
		1	node 26 2 → 1 *Rhytirhynchia*
		1	node 28 2 → 1 *Neorhynchia*
		1	node 32 1 → 2 *Cryptopora*
		1	node 34 1 → 0 *Parasphenarina*

Character	c.i.	Steps	Changes
		1	node 42 0 → 1 *Compsothyris*
		1	node 46 0 → 2 node 45
19	0.250	1	node 33 0 → 1 *Tethyrhynchia*
		1	node 41 0 → 1 node 40
		1	node 44 0 → 1 *Camerella*
		1	node 48 0 → 1 *Ancistrorhyncha*
20	0.250	1	node 38 1 → 0 node 31
		1	node 34 1 → 0 node 33
		1	node 44 1 → 0 *Rhynchotrema*
		1	node 46 1 → 0 node 45
21	0.333	1	node 39 0 → 1 *Pemphixina*
		1	node 42 0 → 1 *Compsothyris*
		1	node 44 0 → 1 *Rhynchotrema*
22	0.333	1	node 31 0 → 1 node 30
		1	node 33 0 → 1 *Tethyrhynchia*
		1	node 46 0 → 1 node 45
23	1.000	1	node 33 0 → 1 *Tethyrhynchia*
25	0.429	1	node 41 0 → 2 node 38
		1	node 31 2 → 1 node 30
		1	node 33 2 → 0 *Tethyrhynchia*
		1	node 34 2 → 3 *Parasphenarina*
		1	node 42 0 → 2 *Frieleia*
		1	node 47 0 → 1 node 46

Character	c.i.	Steps	Changes
		1	node 46 1 → 2 Bryorhynchus
26	0.500	1	node 33 0 → 1 *Tethyrhynchia*
		1	node 42 0 → 1 *Compsothyris*
27	0.167	1	node 27 0 → 1 node 26
		1	node 30 0 → 1 Striarina
		1	node 35 0 → 1 node 34
		1	node 33 1 → 0 node 32
		1	node 45 0 → 1 *Uncinunellina*
		1	node 48 0 → 1 *Ancistrorhyncha*
28	1.000	1	node 35 1 → 2 node 34
		1	node 47 1 → 0 node 44
29	0.167	1	node 41 0 → 1 node 38
		1	node 31 1 → 0 node 30
		1	node 35 1 → 0 node 34
		1	node 39 0 → 1 *Notosaria*
		1	node 42 0 → 1 *Compsothyris*
		1	node 44 0 → 1 *Camerella*
30	0.500	1	node 32 0 → 1 *Aulites*
		1	node 44 0 → 1 *Camerella*
31	1.000	1	node 48 1 → 0 node 47
32	0.250	1	node 26 0 → 1 *Rhytirhynchia*
		1	node 29 0 → 1 *Acanthobasiliola*
		1	node 34 0 → 1 node 33

Character	c.i.	Steps	Changes
		1	node 32 1 → 0 *Cryptopora*
33	0.400	1	node 48 0 → 1 node 43
		1	node 28 1 → 0 *Neorhynchia*
		1	node 38 1 → 2 node 37
		1	node 35 2 → 0 node 34
		1	node 40 1 → 0 node 39
34	0.222	1	node 28 1 → 2 node 27
		1	node 34 1 → 0 *Parasphenarina*
		1	node 37 1 → 0 node 36
		1	node 40 1 → 0 *Hemithiris*
		1	node 39 1 → 2 *Pemphixina*
		1	node 42 1 → 2 *Compsothyris*
		1	node 48 1 → 0 node 47
		1	node 44 0 → 2 *Camerella*
		1	node 46 0 → 2 *Bryorhynchus*
35	0.200	1	node 32 0 → 1 *Cryptopora*
		1	node 36 0 → 1 *Grammetaria*
		1	node 40 0 → 1 *Hemithiris*
		1	node 42 0 → 1 *Frieleia*
		1	node 44 0 → 1 *Camerella*
36	0.333	1	node 48 0 → 1 node 43
		1	node 37 1 → 0 node 35
		1	node 46 0 → 1 *Bryorhynchus*

Character	c.i.	Steps	Changes
37	0.500	1	node 48 0 → 1 node 43
		1	node 37 1 → 0 node 35
38	0.200	1	node 28 0 → 1 node 27
		1	node 26 1 → 0 *Basiliola*
		1	node 30 0 → 1 *Striarina*
		1	node 41 0 → 1 node 40
		1	node 47 0 → 1 node 46
39	0.250	1	node 43 0 → 2 node 41
		1	node 27 2 → 0 node 26
		1	node 30 2 → 1 *Striarina*
		1	node 34 2 → 1 node 33
		1	node 32 1 → 0 *Cryptopora*
		1	node 35 2 → 0 *Abyssorhynchia*
		1	node 36 2 → 0 *Grammetaria*
		1	node 40 2 → 0 node 39
40	1.000	1	node 47 1 → 0 node 44
41	0.200	1	node 30 0 → 1 node 29
		1	node 28 1 → 0 *Neorhynchia*
		1	node 36 0 → 1 *Grammetaria*
		1	node 47 0 → 1 node 46
		1	node 45 1 → 0 *Uncinunellina*
42	0.500	1	node 28 0 → 1 node 27
		1	node 36 0 → 1 *Grammetaria*

Character	c.i.	Steps	Changes
43	0.167	1	node 29 0 → 1 node 28
		1	node 27 1 → 0 node 26
		1	node 33 0 → 1 node 32
		1	node 41 0 → 1 node 40
		1	node 42 0 → 1 *Frieleia*
		1	node 44 0 → 1 *Rhynchotrema*
44	1.000	1	node 43 1 → 2 node 41
45	0.500	1	node 28 0 → 1 node 27
		1	node 41 0 → 1 node 40
46	0.200	1	node 30 0 → 2 node 29
		1	node 28 2 → 1 *Neorhynchia*
		1	node 31 0 → 1 *Manithyris*
		1	node 34 0 → 1 *Parasphenarina*
		1	node 40 0 → 1 *Hemithiris*
		1	node 39 0 → 2 *Pemphixina*
		1	node 42 0 → 1 *Compsothyris*
		1	node 44 0 → 2 *Rhynchotrema*
		1	node 46 0 → 1 node 45
		1	node 45 1 → 2 *Uncinunellina*
47	0.500	1	node 28 0 → 1 node 27
		1	node 46 0 → 1 node 45
48	0.182	1	node 48 0 → 1 node 43
		1	node 30 1 → 0 node 29

Character	c.i.	Steps	Changes
		1	node 28 0 → 1 *Neorhynchia*
		1	node 34 1 → 0 node 33
		1	node 33 0 → 2 node 32
		1	node 37 1 → 0 node 36
		1	node 39 1 → 0 *Notosaria*
		1	node 42 1 → 0 *Frieleia*
		1	node 44 0 → 2 *Camerella*
		1	node 45 0 → 1 *Wellerella*
		1	node 46 0 → 2 *Bryorhynchus*
49	0.111	1	node 30 0 → 1 node 29
		1	node 28 1 → 0 node 27
		1	node 32 0 → 1 Aulites
		1	node 34 0 → 1 *Parasphenarina*
		1	node 37 0 → 1 node 36
		1	node 43 0 → 1 node 42
		1	node 48 0 → 1 node 47
		1	node 44 1 → 0 *Rhynchotrema*
		1	node 45 1 → 0 *Wellerella*
50	0.167	1	node 29 0 → 1 *Acanthobasiliola*
		1	node 32 0 → 1 *Aulites*
		1	node 34 0 → 1 *Parasphenarina*
		1	node 48 0 → 1 node 47
		1	node 44 1 → 0 *Rhynchotrema*

Character	c.i.	Steps	Changes
		1	node 45 1 → 0 *Wellerella*
51	0.222	1	node 26 0 → 1 *Rhytirhynchia*
		1	node 28 0 → 1 *Neorhynchia*
		1	node 34 0 → 1 *Parasphenarina*
		1	node 36 0 → 1 *Hispanirhynchia*
		1	node 43 0 → 1 node 42
		1	node 42 1 → 2 *Frieleia*
		1	node 44 0 → 2 *Rhynchotrema*
		1	node 47 0 → 1 node 46
		1	node 45 1 → 0 *Wellerella*
52	0.333	1	node 26 0 → 1 *Basiliola*
		1	node 28 0 → 1 *Neorhynchia*
		1	node 34 0 → 2 node 33
		1	node 32 2 → 1 *Aulites*
		1	node 39 0 → 2 *Notosaria*
		1	node 45 0 → 1 *Uncinunellina*
53	0.333	1	node 48 0 → 1 node 43
		1	node 28 1 → 0 *Neorhynchia*
		1	node 46 0 → 1 *Bryorhynchus*
54	0.500	1	node 38 0 → 1 node 31
		1	node 30 1 → 0 node 29
		1	node 33 0 → 1 *Tethyrhynchia*
		1	node 41 0 → 2 node 40

Character	c.i.	Steps	Changes
55	0.250	1	node 48 0 → 1 node 43
		1	node 29 1 → 0 *Acanthobasiliola*
		1	node 34 1 → 0 *Parasphenarina*
		1	node 40 1 → 0 *Hemithiris*
56	1.000	1	node 41 0 → 2 node 40
		1	node 43 0 → 1 node 42
57	1.000	1	node 33 1 → 0 node 32
58	0.143	1	node 38 0 → 1 node 31
		1	node 26 1 → 0 *Basiliola*
		1	node 28 1 → 0 *Neorhynchia*
		1	node 33 0 → 1 node 32
		1	node 40 0 → 1 node 39
		1	node 42 0 → 1 *Frieleia*
		1	node 48 0 → 1 node 47