

SUPPLEMENTARY DATA. Detailed argumentation of character scoring changes to the data matrix of Sullivan (2003) based on re-interpretation of *Colepiocephale lambei*. We chose only to re-evaluate *Colepiocephale lambei* in this study, but recognize that further revisions are necessary.

Character 6—Same as main text.

Character 7—Same as main text.

Character 9—Nodes in rows: background texture (minute nodes) present (0); reduction in background texture and presence of row(s) of nodes (1). Sullivan (2003) claims he retains Sereno's (2000) coding for this character except for *Stygimoloch spinifer* and *Pachycephalosaurus wyomingensis*, but he changed the coding for *Colepiocephale lambei* and *Hanssuesia sternbergi* to absent (1) as well. Since the squamosals are not preserved in *C. lambei* its ornamentation is unknown and therefore this character must be recoded as missing (?). This character needs to be clarified and revised, but for the purposes of this study it is simply recoded for *C. lambei*.

Character 16—Squamosal tubercle row: nodes on squamosal absent (0); present (1). Sullivan (2003) codes *Colepiocephale lambei* as having squamosals with nodes (1), but since the squamosals in *C. lambei* are not preserved this character is recoded as missing (?).

Character 34—Same as main text.

Character 35—Frontoparietal doming extent: incomplete (0); complete, posteriorly and laterally (1). Sullivan (2003) recognizes that the degree of doming is subjective and ontogenetically variable, and that doming in *Stegoceras validum* more

closely resembles that seen in other domed taxa than that seen in the flat-headed taxa. Despite this, he codes *Stegoceras validum* as having incomplete doming (0). This character is poorly defined as described in Sullivan (2003), but for the purpose of this study we retain this character pending further revision. We believe that *S. validum* (e.g., CMN 138, UALVP 2) is similar to *Colepiocephale lambei* in the extent of cranial doming. The peripheral elements in *C. lambei* (particularly the supraorbitals) are not incorporated into the dome to the extent seen in many other pachycephalosaurs (e.g., *Prenocephale*, *Pachycephalosaurus*) as evidenced by the low sutural surfaces for these elements on the lateral sides of the highly sloped dome. Based on this, we recode *C. lambei* as having incomplete doming (0).

Character 39—Nodes as prominent clusters on squamosals: absent (0); present (1). Sullivan (2003) codes *Colepiocephale lambei* as not having squamosal node clusters (1), but because the squamosals are not preserved, this character is recoded as missing (?).

Character 41—Loss of minute nodes and retention of nodes in a linear row: presence of minute clusters of nodes (0); absence and retention of a linear row of nodes (1). Sullivan (2003) codes *Colepiocephale lambei* as having minute clusters of nodes on the squamosals and lateral sides of the skull (0), but these elements are not preserved and this character is recoded as unknown (?) for this taxon.

Character 42—Four or less distinct nodes in a linear row on the posterior margin of the squamosal (with medial part of the squamosal reduced and lacking nodes): absent (0); present (1). Since the squamosals are not preserved in *Colepiocephale lambei* the

number of nodes they may or may not have had is unknown. As a result this character is recoded as missing (?) for this taxon.

Character 43—Three or less distinct nodes in a linear row on the posterior margin of the squamosal with the fourth (medial-most) node straddling the squamosal/parietal: absent (0); present (1). Since the squamosals are not preserved in *Colepiocephale lambei*, the number of nodes (if present) is unknown. As a result this character is recoded as missing (?) for *C. lambei*.

Character 44—Medial-most nodes partly or wholly on the posterior medial extension of the parietal: present (0); absent (1). Sullivan (2003) codes this character as absent (1) for *Colepiocephale lambei*. The posteromedial extension of the parietal is not preserved in any of the available *C. lambei* material, and therefore we recode *C. lambei* as missing (?).

Character 45—Medial extension of the parietal strongly down-turned: non-down-turned (0); strongly down-turned (1). Sullivan (2003) codes *Colepiocephale lambei* as derived (1). We re-coded this character as missing (?) for *C. lambei* because the posteromedial extension of the parietal is not preserved in the available material.

Character 47—Squamosal present posteriorly: present (0); absent (1). This character is essentially the same as Character 7, but with reversed polarity. Sullivan (2003) coded *Colepiocephale lambei* as not having a squamosal present posteriorly, however we have shown that the squamosal is in fact not preserved in the available material due to breakage, and that it is best to recode this character as missing (?).

Character 48—Same as main text.

Character 49—Parietosquamosal shelf reduced posteriorly with minute tubercles: not reduced (0); reduced with minute tubercles (1). Many taxa with reduced shelves were coded as not having reduced shelves, presumably because they lacked these minute tubercles. Sullivan (2003) codes *Colepiocephale lambei* as having a reduced parietosquamosal shelf, however, since this area of the skull is not preserved in the available material, we code *C. lambei* as missing (?) for this character.