Supplementary data

A new Late Cretaceous snake from Patagonia: phylogeny and trends in body size evolution of madtsoiid snakes

*Un nouveau serpent du Crétacé supérieur de Patagonie: phylogénie et tendances de l’évolution de la taille des serpents madtsoiidés*

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**1. Character List**

The following list of characters is a modified version from the character list of Garberoglio et al. (2019a) which in turn is a revised and modified version of the character list from Caldwell et al. (2015). The list presented here is re-ordered from previous versions derived from this data set (e.g., Longrich et al. 2012; Caldwell et al., 2015; Garberoglio et al., 2019a, 2019b), to group together all the characters of the same region that have been incorporated in successive studies. The number from the character list of Garberoglio et al. (2019a) is indicated in brackets. For the sake of clarity, consistency, and ease of scoring the original syntax of some characters was modified. Additional changes made to the dataset from Garberoglio et al. (2019a) are discussed after the list. Of the total of 264 osteological characters included here, 52 are of the vertebrae (204–255) and 1 of the ribs (256). Characters are treated as unordered, with the exceptions of characters 235, 240, 241, 244, 245, 249, and 252 which were treated as ordered.

Characters not previously included in the dataset from Garberoglio et al. (2019a) are denoted by an asterisk (\*).

*1.1. Dentition*

1 (1). Maxillary and dentary teeth: relatively short conical, upright (0); robust, recurved (1); elongate needle-shaped, distinctly recurved (2).

2 (2). Premaxillary dentition: present (0); absent (1).

3 (3). Shape of alveoli and base of teeth: not expanded transversely (0); wider transversely than anteroposteriorly (1).

4 (4). Pterygoid dentition: absent (0); present (1).

5 (64). Pterygoid tooth row, position: anterior to basipterygoid joint (0); tooth row reaches or passes level of basipterygoid joint (1).

6 (153). Interdental ridges: absent (0): present (1).

7 (154). Position of replacement teeth: replacement teeth lie vertically (0); lie horizontally in jaws (1).

8 (155). Number of replacement teeth: single replacement tooth per tooth position (0); two or more replacement teeth per tooth position (1).

9 (156). Type of teeth attachment: ankylosed to jaws (0); teeth loosely attached by connective tissue (1).

10 (157). Teeth size: crowns isodont or enlarged at middle of tooth row (0) crowns large anteriorly, and decrease in size posteriorly (1); anterior teeth conspicuously elongate, length of crown significantly exceeds height of dentary at midlength (2).

11 (185). Maxillary dentition: 15 or more maxillary teeth (0); fewer than 15 maxillary teeth (1); maxilla without teeth (2).

12 (191). Palatine dentition: teeth small relative to lateral teeth (0); enlarged, palatine teeth at least half diameter of posterior maxillary teeth (1); palatine lacking dentition (2).

13 (244). Dentary dentition: present (0); absent (1).

*1.2. Skull*

14 (5). Premaxilla, contact with maxilla: broadly articulated with maxilla (0); loosely contacting maxilla (1).

15 (6). Transverse processes of premaxilla, orientation: curved backwards (0); extending straight laterally or anterolaterally (1).

16 (7). Nasal process of premaxilla, length: elongate, approaching or contacting frontals (0); short, divide nasals only at anterior margin or not at all (1).

17 (158). Ascending process of premaxilla: transversely expanded, partly roofing external nares (0); ascending process mediolaterally compressed, blade-like or spine-like (1).

18 (159). Premaxilla, position: medial to maxillae (0); located anterior to maxillae (1).

19 (8). Dorsal (horizontal) lamina of nasal, anterior width: relatively broad anteriorly (0); dorsal lamina of nasal distinctly tapering anteriorly (1).

20 (9). Medial flanges of nasal, articulation with median frontal pillars: present (0); absent (1)

21 (10). Anterior margin of nasals: restricted to posteromedial margins of nares (0); extend anteriorly toward tip of rostrum (1).

22 (11). Lateral flanges of nasals: articulate with anterior margin of frontals (0); separated from frontals (1).

23 (12). Posterolateral margin of nasal: contacts anteromedian margin of prefrontal (0); elements in contact along most of their length (1); contact between elements with interfingering of nasal and prefrontal margins (2); nasals do not contact prefrontals (3).

24 (142). Medial vertical flanges of nasals: absent (0); present (1).

25 (13). Septomaxilla, posterior dorsal process of lateral vertical flange: absent (0); short (1); long (2).

26 (14). Septomaxilla, articulation with median frontal pillars: absent (0); present (1).

27 (15). Ventral portion of posterior edge of lateral flange of septomaxilla and opening of Jacobsen’s organ: located at level of posterior edge or behind (0); in front (1).

28 (16). Vomeronasal cupola: fenestrated medially (0); closed medially (1).

29 (17). Septomaxilla, participation in lateral margin of opening of Jacobson's organ: forms most of lateral margin of opening of Jacobson’s organ (0); forms only anterolateral part of lateral margin of opening of Jacobson’s organ (1).

30 (18). Vomeronasal nerve exit: does not pierce vomer (0); exits vomer through single large foramen (1); exist vomer through cluster of small foramina (2).

31 (19). Posterior ventral (horizontal) lamina of vomer, shape: parallel edged (0); tapering to pointed tip (1).

32 (20). Posterior dorsal (vertical) lamina of vomer: well developed (0); reduced or absent (1).

33 (143). Preorbital ridge: dorsally exposed (0); overlapped by prefrontal (1).

34 (162). Prefrontal border of naris: weakly developed, without concave anterior margin of prefrontal (0); strongly concave anterior margin of prefrontal (1).

35 (21). Prefrontal, articulation with frontal: articulates with frontal laterally (0); anterolaterally (1).

36 (22). Lateral margin of prefrontal: slanting anteroventrally (0); positioned vertically (1).

37 (23). Lacrimal foramen on prefrontal: not completely enclosed (0); enclosed by prefrontal (1); prefrontal lacking foramen (2).

38 (24). Lateral foot process of prefrontal: absent (0); contacts maxilla only (1); maxilla and palatine (2); palatine only (3).

39 (144). Lateral foot process of prefrontal: articulates with lateral edge of maxilla via thin anteroposteriorly directed lamina (0); articulates with maxilla via large contact that runs from lateral to medial dorsal surface of maxilla (1).

40 (25). Medial foot process of prefrontal: absent (0); present, low (1); present, high (2).

41 (26). Anterior/lateral flange of prefrontal covering nasal gland and roofing auditus conchae: absent (0); present (1).

42 (27). Ventral margin of lateral surface of prefrontal: articulates with dorsal surface of maxilla (0); retains only posterior contact (1).

43 (28). Dorsal lamina of prefrontal: contacts or forms overlapping contact with nasal posteromedially (0); remains separate from nasal (1).

44 (160). Prefrontal, socket for dorsal peg of maxilla: absent (0); present (1).

45 (161). Prefrontal, medial extension across width of frontal: less than 75 % of width of frontal (0); 75 % or more of width of frontal (1).

46 (29). Medial frontal pillars: absent (0); present (1).

47 (30). Transverse horizontal shelf of frontal: developed and broadly overlapped by nasals (0); poorly developed and never broadly overlapped by nasals (1); absent (2).

48 (163). Frontal, nasal processes: nasal processes of frontal project between nasals (0); nasal processes absent (1).

49 (164). Frontals, interobital constriction: distinct interorbital constriction (0); frontals broad anteriorly, interorbital region broad (1).

50 (165). Frontal, subolfactory process articulation with prefrontal: subolfactory process abuts prefrontal in immobile articulation (0); subolfactory process articulates with prefrontal in mobile joint (1); subolfactory process with distinct lateral peg or process that clasped dorsally and ventrally by prefrontal (2).

51 (166). Frontals, ventral contact with parietal: absent (0); descending wings of frontals and parietal contact ventrally to enclose optic foramen (1).

52 (148). Frontal subolfactory process: absent or present as simple horizontal lamina (0); present and closing tractus olfactorius medially (1).

53 (31). Lacrimal: present (0); absent (1).

54 (32). Postfrontal: present (0); absent (1).

55 (186). Postfrontal, processes: anterior and posterior processes clasping frontals and parietals (0); anterior and posterior processes present, but postfrontal abuts frontals and parietals (1); anterior and posterior processes absent (2).

56 (33). Jugal: present (0); fused or absent (1).

57 (34). Jugal, ventral tip: Contact or approaches prefrontal (or lacrimal), forming or contributing to ventral margin of orbit (0); contacts or closely approaches ectopterygoid/maxilla, forming almost complete posterior margin of orbit (1); remains separated by wide gap from ectopterygoid (2).

58 (35). Jugal, dorsal head articulation: contacts postorbital (0); contacts parietal and postfrontal (1); contacts only postfrontal (2); lack of dorsal contact (3).

59 (239). Jugal, distinct posterior process for quadratomaxillary ligament: present (0); absent (1).

60 (36). Parietal, lateral wing: without lateral wings meeting postorbital bones (0); with lateral wings meeting postorbital bones (1).

61 (37). Distinct lateral ridge of parietal: extending posteriorly from anterior lateral wing up to prootic: absent (0); present (1).

62 (38). Frontoparietal suture shape: relatively straight (0); frontoparietal suture U-shaped (1).

63 (39). Posterior margin of optic foramen: posteriorly located, straight parietal margin (0), posteriorly located, concave parietal margin (1); anteriorly located, posterior border within frontal (2).

64 (40). Lateral margins of braincase: open anterior to prootic (0); enclosed by descending lateral processes of parietal (1).

65 (41). Supratemporal processes of parietal: distinctly developed (0); not distinctly developed (1).

66 (42). Parietal enters anterior aspect of base of basipterygoid process: absent (0); present (1).

67 (43). Contact between parietal and supraoccipital: V-shaped with apex pointing anteriorly (0); straight transverse line (1); V-shaped with apex pointing posteriorly (2).

68 (167). Parietal, sagittal crest: absent (0); present posteriorly but not anteriorly, and extending for no more than 50% of parietal midline length (1); present anteriorly and posteriorly, and extending more than 50% of parietal midline length (2).

69 (168). Parietal shape: narrow (0); broad (1).

70 (169). Parietal, posterior end: posteriorly broad parietal (0); posteriorly narrow parietal (1)

71 (245). Parietals, fusion: single element (0); remain paired in adult skull (1)

72 (44). Ascending process of maxilla: tall, extending to dorsal margin of prefrontal (0); short (1); absent (2).

73 (45). Small horizontal shelf on medial surface of anterior end of maxilla: present (0); absent (1).

74 (46). Posterior end of maxilla: does not project beyond posterior margin of orbit (0); projects moderately beyond posterior margin of orbit (1); projects distinctly beyond posterior margin of orbit (2).

75 (47). Medial (palatine) process of maxilla, location: in front of orbit (0); below orbit (1).

76 (48). Medial (palatine) process of maxilla: pierced (0); not pierced (1).

77 (173). Medial (palatine) of maxilla, lenght: palatine process short, weakly developed (0); palatine process long, strongly projecting medially (1).

78 (174). Premaxillary process of maxilla, articulation with vomers: medial projection articulating with vomers present (0); premaxillary process does not contact vomers (1).

79 (175). Maxilla, number of mental foramina: 5 or more (0); 4 or fewer (1).

80 (176). Maxilla, supradental shelf development: extending full length of maxilla (0); reduced anterior to palatine process (1).

81 (177). Maxilla, medial surface of facial process with distinct naso-lacrimal recess demarcated dorsally by anteroventrally trending ridge: present (0); absent (1).

82 (178). Maxilla, medial surface of facial process with well-defined fossa for lateral recess of nasal capsule: present (0); reduced and present as small fossa on back of facial process (1); absent, fossa for lateral recess developed entirely on prefrontal (2).

83 (179). Maxilla, contact with nasal: extensive contact of dorsal margin of maxilla with nasal (0); nasal-maxilla contact lost (1).

84 (180). Maxilla, articulation with prefrontal: maxilla overlaps prefrontal laterally in tight sutural connection (0); overlap reduced, mobile articulation (1).

85 (181). Medial (palatine) process of maxilla projection: palatine process of maxilla projects medially (0); palatine process of maxilla downturned (1).

86 (182). Maxilla, superior alveolar foramen: positioned near middle of palatine process, opening posterodorsally (0); positioned near anterior margin of palatine process, opening medially (1).

87 (183). Maxilla, accessory foramen posterior to palatine process: absent (0); present (1).

88 (184). Maxilla, ectopterygoid process: absent (0); present (1).

89 (243). Ascending/facial process of maxilla, posterior notch on medial surface for prefrontal: present (0); absent (1).

90 (49). Anterior end of supratemporal, location: behind or above posterior border of trigeminal foramen (0); anterior to posterior border of trigeminal foramen (1).

91 (50). Supratemporal facet on opisthotic-exoccipital: flat (0); sculptured and delineated with projecting posterior rim that overhangs exoccipital (1).

92 (51). Free-ending posterior process of supratemporal: absent (0); present (1).

93 (52). Supratemporal: present (0); absent (1).

94 (172). Supratemporal, lenght: supratemporal short, does not extend posterior to paroccipital process (0); elongate, extending well beyond paroccipital process (1).

95 (187). Supratemporal, free caudal end projection: free caudal end of supratemporal projects posteroventrally (0); posteriorly or posterodorsally (1).

96 (53). Anterior dentigerous process of palatine: absent (0); present (1).

97 (54). Medial (choanal) process of palatine: forms extensive concave surface dorsal to ductus nasopharyngeus (0); narrows abruptly to form curved finger-like process (1); forms short horizontal lamina (2).

98 (55). Choanal process of palatine, anterior flange articulating with vomer: absent (0); present (1).

99 (56). Pterygoid articulation with palatine: complex and finger-like articulations (0); tongue-in-groove joint (1); reduced to flap-overlap (2).

100 (57). Palatine, contact with ectopterygoid: present (0); absent (1).

101 (58). Dentigerous process of palatine contact with vomer and/or septomaxilla posterolateral to opening for Jacobson’s organ: present (0); absent (1).

102 (59). Maxillary process of palatine, location: anterior to posterior end of palatine (0); at posterior end of palatine (1).

103 (60). Lateral (maxillary) process of palatine and maxilla: in well-defined articulation (0); loosely overlapping medial (palatine) process of maxilla, or absent (1).

104 (61). Maxillary branch of trigeminal nerve: pierces lateral (maxillary) process of palatine (0); passes dorsally between palatine and prefrontal (1).

105 (62). Vomerine (choanal) process of palatine: articulates broadly with posterior end of vomer (0); meets vomer in well-defined articular facet (1); touches or abuts vomer without articulation or remains separated from vomer (2).

106 (63). Internal articulation of palatine with pterygoid: short (0); long (1).

107 (150). Maxillary process of palatine, ventral exposure: main element bridging contact with maxilla and palatine in ventral view (0); covered ventrally by expanded palatine process of maxilla (1).

108 (192). Palatine, elongate lateral process projecting to lateral edge of orbit to articulate with caudal margin of prefrontal: absent (0); present (1).

109 (65). Distinct longitudinal groove on quadrate ramus of pterygoid,: absent (0): present (1).

110 (66). Transverse (lateral) process of pterygoid: forms distinct, well-defined lateral projection (0); gently curved lateral expansion of pterygoid, or absent (1).

111 (67). Lateral edge of ectopterygoid, shape: straight (0); angulated at contact with maxilla (1).

112 (68). Anterior end of ectopterygoid expansion on maxilla: restricted to posteromedial edge of maxilla (0); invades dorsal surface of maxilla (1).

113 (145). Medial finger-like process of ectopterygoid articulating with medial surface of maxilla: present (0); absent (1).

114 (149). Ectopterygoid expansion on pterygoid: restricted to transverse (lateral) process of pterygoid (0); contact expanded significantly on dorsal surface of pterygoid body (1).

115 (194). Ectopterygoid, type of contact with pterygoid: clasps pterygoid anteromedially (0); ectopterygoid overlaps pterygoid (1); ectopterygoid abuts pterygoid medially (2).

116 (248). Ectopterygoid: present (0); highly reduced or absent (1).

117 (69). Pterygoid attached to basicranium: by strong ligaments at palatobasal articulation (0); pterygoid free from basicranium in dried skulls (1).

118 (70). Quadrate, shape: slender (0); broad (1).

119 (71). Quadrate, orientation: slanted clearly anteriorly, posterior tip of pterygoid dislocated anteriorly from mandibular condyle of quadrate (0); positioned slight anteriorly or vertically (cephalic condyle positioned behind or at same level of mandibular condyle) (1); slanted posteriorly (cephalic condyle positioned in front of mandibular condyle) (2).

120 (72). Suprastapedial process of quadrate: cephalic condyle of quadrate elaborated into posteriorly projecting suprastapedial process (0); suprastapedial process absent or vestigial (1).

121 (188). Quadrate lateral conch: present (0); absent (1).

122 (189). Quadrate, maximum length relative to proximal width: quadrate elongate, maximum length at least 125% of maximum width of quadrate head (0); quadrate short, length less than 125% of width of quadrate head (1).

123 (190). Quadrate, proximal end plate-like: absent (0); present (1).

124 (73). Stapedial footplate: broad and massive (0); narrow and thin (1).

125 (74). Stylohyal: not fused to quadrate (0); fuses to posterior tip of suprastapedial process (1); fuses to ventral aspect of reduced suprastapedial process (2); stylohyal fuses to quadrate shaft (3).

126 (75). Stapedial shaft: straight (0); angulated (1).

127 (76). Stapedial shaft, thickness: slender and longer than diameter of stapedial foot-plate (0); thick, and equal to, or shorter than diameter of stapedial footplate (1).

128 (77). Paroccipital process of otooccipital: well developed and laterally projected (0); reduced to short projection or absent (1).

129 (78). Juxtastapedial space defined by a crista prootica, crista tuberalis and crista interfenestralis: absent (0); present, but not completely enclosed ("incipient" crista circumfenestralis) (1); present and enclosed (i.e., fully developed crista circumfenestralis) (2).

130 (79). Stapedial footplate: mostly exposed laterally (0); prootic and otoocipital converges upon stapedial footplate (1).

131 (80). Crista interfenestralis: does not form individualized component around the juxtastapedial space (0); does form individualized component around juxtastapedial space (1).

132 (81). Jugular foramen, exposition: exposed in lateral view by crista tuberalis (0); concealed in lateral view by crista tuberalis (1).

133 (82). Otooccipitals, dorsal contact: do not contact each other dorsally (0); contact each other dorsally (1).

134 (196). Crista tuberalis: horizontal, wing-like crista tuberalis absent (0); present (1).

135 (197). Otooccipitals, posterior projection: do not project posteriorly to level of occipital condyle (0); project posteriorly to conceal occipital condyle in dorsal view (1).

136 (84). Supraoccipital contact with prootic: narrow (0); broad (1).

137 (171). Nuchal crests on supraoccipital region of skull: absent (0); present (1).

138 (236). Supraoccipital, shape of dorsal exposure: broad and square (0); wider than longer, with broad edges (rectangular) (1); wider than long, with pointed medial edges (2); diamond-shaped (3); ‘M’-shaped (4); absent or fused (5).

139 (237). Supraoccipital, size of dorsal exposure, expressed as ratio of supraoccipital length (measured at the midline) to parietal width (measured at the line delimited by the anterior borders of the prootic): big, ratio of 0.5 or more (0); small, ratio clearly less than 0.5 (1).

140 (246). Supraoccpitals, fusion: single element (0); remain paired in adult skull (1)

141 (85). Prootic exclusion of parietal from trigeminal foramen: absent (0); present (1).

142 (86). Laterosphenoid: absent (0): present (1).

143 (87). Prootic ledge underlap of posterior trigeminal foramen: absent (0); present (1).

144 (88). Prootic, dorsal exposure: exposed in dorsal view medial to supratemporal or to supratemporal process of parietal (0); fully concealed by supratemporal or parietal in dorsal view (1).

145 (247). Prootic: separated element (0); fused to braincase (1)

146 (89). Exit hyomandibular branch of facial nerve inside opening for mandibular branch of trigeminal nerve: absent (0); present (1).

147 (90). Vidian canal: does not open intracranially (0); open intracranially (1).

148 (91). Anterior opening of Vidian canal: single (0); divided (1).

149 (195). Vidian canals symmetry: posterior openings symmetrical (0); asymmetrical (1).

150 (92). Sella turcica, dorsum sellae: sella turcica bordered posteriorly by well-developed dorsum sellae (0); dorsum sellae low (1); dorsum sellae not developed, (2).

151 (93). ‘Lateral wings of basisphenoid’: absent (0); present (1).

152 (94). Ventral surface of basisphenoid: smooth (0); with weakly developed sagittal crest from which protractor pterygoidei originates (1); with strongly projecting sagittal crest (2).

153 (96). Basisphenoid-basioccipital suture: smooth (0); transversely crested (1).

154 (97). Basipterygoid (= basitrabecular) processes: present (0); absent (1).

155 (98). Crista trabeculares: short and or indistinct (0); elongate and distinct in lateral view (1).

156 (99). Cultriform process of parabasisphenoid: does not extend anteriorly to approach posterior margin of choanae (0); approaches posterior margin of vomer (1).

157 (100). Parabasisphenoidal rostrum behind optic foramen: narrow (0); broad (1).

158 (101). Parabasisphenoid rostroventral surface: flat or broadly convex (0); concave (1).

159 (103). Parasphenoid rostrum interchoanal process: absent (0); present, broad (1); present, narrow (2).

160 (146). Posterolateral corners of basisphenoid: strongly ventrolaterally projected (0); not projected (1).

161 (83). Basioccipital posterolateral processes: short and narrow, do not extend toward posterior margin of occipital condyle (0); wider than condyle and long, combine with crista tuberalis to extend to approximate posterior margin of occipital condyle (1).

162 (95). Basioccipital contribution to foramen magnum: contributes to ventral margin of foramen magnum (0); basioccipital excluded by medial contact of otooccipitals (1).

163 (102). Basioccipital suture with parabasisphenoid: suture located at level of fenestra ovalis (0); located at or behind trigeminal foramen (1); basioccipital and parabasisphenoid fused (2).

164 (147). Basioccipital contribution to lateral aperture of recessus scalae tympani: basioccipital expanded laterally to form floor of recessus scalae tympani (0); excluded from floor of recessus scalae tympani by otooccipital (1).

165 (230). Basioccipital, ventral surface: smooth (0); sagittal crest of parabasisphenoid extends into basiocciptal (1).

166 (170). Skull, postorbital region relative length: short, less than half (0); elongate, half or more (1).

167 (193). Epipterygoid: present (0); absent (1).

168 (198). Sclerotic ring: present (0); absent (1).

169 (240). Postorbital: present (0); absent (1)

*1.3. Mandible*

170 (104). Anteromedial margin of dentaries: symphyseal articular facet (0); no symphyseal facet (1).

171 (105). Posterior dentigerous process of dentary: absent (0); present, short (1); present, long (2).

172 (107). Mental foramina on lateral surface of dentary, number: two or more (0); one (1).

173 (199). Dentary, mental foramen size: small, mental foramen size less than a third of dentary height at midlength (0); big, mental foramen around third or more of dentary height at midlenght (1).

174 (200). Dentary, depth of Meckelian groove anteriorly: deep slot (0); shallow sulcus (1).

175 (201). Dentary, orientation of angular process: angular process weakly projected medially around underside of jaw (0); angular process projected nearly horizontally (1).

176 (202). Dentary, angular process length relative to coronoid process: angular process distinctly shorter than coronoid process, former terminating well anterior to latter (0); subequal in length posteriorly (1).

177 (203). Dentary, symphysis medial projection: weakly projecting medially (0); hooked inward and strongly projecting medially (1).

178 (204). Dentary, expansion of ventral margin: unexpanded, medial margin of dentary straight in ventral view (0); expanded, medial margin crescentic in ventral view (1).

179 (205). Dentary, coronoid process: wraps around surangular laterally and medially (0); broad and sits atop surangular (1).

180 (206). Dentary, coronoid process with slot for medial tab of surangular: absent (0) or present (1).

181 (207). Dentary, subdental shelf: present along entire tooth row (0); present only along posterior portion of tooth row (1); absent (2).

182 (106). Medial margin of adductor fossa: relatively low and smoothly rounded (0); forms distinct dorsally projecting crest (1).

183 (108). Coronoid process of coronoid bone: high, tapering distally (0); high, with rectangular shape (1); low, not exceeding significantly coronoid process of compound bone (2).

184 (109). Coronoid bone: present (0); absent (1).

185 (110). Posteroventral process of coronoid: present (0); absent (1).

186 (111). Coronoid process on lower jaw: formed by coronoid bone only (0); formed by coronoid and compound bone (1); formed by compound bone only (i.e. coronoid absent) (2).

187 (151). Coronoid bone, contribution to anterior margin of adductor fossa: present (0); absent (1).

188 (152). Coronoid bone, placement: sits mostly on dorsal and dorsomedial surfaces of compound bone, being exposed in both lateral and medial views of mandible (0); applied to medial surface of compound bone (1).

189 (211). Coronoid bone, lateral overlap of coronoid onto dentary: absent (0); present (1).

190 (112). Surangular and articular: present as separate elements (0); fused into compound bone (1).

191 (208). Surangular, dentary process with distinct triradiate cross-section: absent (0); present (1).

192 (209). Surangular, adductor fossa: small or absent (0); extended caudally towards jaw articulation (1).

193 (210). Surangular, ventrolateral surface of surangular bearing distinct crest for attachment of adductor muscles: absent (0); present (1).

194 (218). Enlarged anterior surangular foramen: absent (0); present (1).

195 (219). Coronoid eminence: well-developed (0); weakly developed or absent (1).

196 (220). Glenoid shape: shallow quadrate cotyle (0), anteroposteriorly concave and transversely arched, ‘saddle shaped’ quadrate cotyle (1).

197 (221). Retroarticular process, lenght: retroarticular process elongate (0) or shortened (1).

198 (212). Splenial attachment to dentary above Meckel’s canal: close throughout length (0); loose, with dorsal dentary suture confined to posterodorsal corner of splenial (1); contact with subdental shelf reduced to small spur of bone or contact lost entirely (2).

199 (213). Splenial articulation with angular: splenial overlaps angular (0); splenial abuts against angular to form hinge joint (1).

200 (214). Splenial, size: splenial elongate, extends more than half distance from angular to dentary symphysis (0); splenial short, extends less than half distance from angular to symphysis (1).

201 (215). Splenial, anterior mylohyoid foramen: present (0); absent (1).

202 (216). Angular, lateral exposure (with coronoid region pointing dorsally): angular broadly exposed laterally along length (0); angular narrowly exposed laterally (1).

203 (217). Angular, length posteriorly relative to glenoid (quadrate articulation): relatively long, extends more than half distance from anterior end of angular to glenoid; (0) relatively short, half or less of distance to glenoid (1); very short, one third or less of distance to glenoid (2).

*1.4. Vertebrae and ribs*

204 (113). Chevrons: present (0); absent (1).

205 (114). Hemapophyses: absent (0); present, short (1); present, long (2).

206 (115). Hypapophyses, distribution: restricted to anterior-most precloacal vertebrae (0); present throughout precloacal skeleton (1).

207 (116). Para-diapophysis: confluent (0); separated into dorsal and ventral facet (1).

208 (117). Prezygapophyseal accessory processes: absent (0); present (1).

209 (118). Subcentralparalymphatic fossae on posterior precloacal vertebrae: absent (0); present (1).

210 (119). Subcentral foramina: absent (0); present, consistently small (1); present, of variable size (2).

211 (120). Well-developed paracotylar foramina: absent (0); present (1).

212 (121). Ventral margin of centra: smooth (0); median prominence from cotyle to condyle (1).

213 (122). Axis intercentrum articulation: not fused to anterior region of axis centrum (0); fused (1).

214 (123). Neural spine height: well-developed process (0); low ridge or absent (1).

215 (124). Posterior margin of neural arch: shallowly concave in dorsal view (0); with deep V-shaped embayment in dorsal view (1).

216 (125). Cotyle shape of precloacal vertebrae: oval (0); circular (1).

217 (126). Parazygantral foramen: absent (0); present (1).

218 (127). Lymphapophyses: absent (0); present (1).

219 (128). Lymphapophyses: three or fewer (0); three lymphapophyses and one forked rib (1); more than three lymphapophyses and one forked rib (2).

220 (129). Sacral vertebrae: present (0); absent (1).

221 (130). Position of synapophyses in relation to lateral edge of prezygapophyses: at same level or slightly more projected laterally (0); clearly medial to edge of prezygapophyses (1).

222 (131). Pachyostotic vertebrae: absent (0); present (1).

223 (132). Precloacal vertebrae number: fewer than 100 (0); more than 100 (1).

224 (133). Caudal vertebrae number: greater than 50% of precloacal number (0); approximately 10% or less than precloacal number (1).

225 (222). Hypapophyses of anterior precloacals: short, about 50% length of centrum (0); long, subequal to or longer than centrum (1).

226 (224). Dorsolateral ridges (= parasagittal ridges) of neural arch: absent (0); present (1).

227 (225). Vertebral centrum: narrow in ventral view (0); broad and subtriangular in shape (1); broad and square (2).

228 (226). Arterial grooves: absent in neural arch (0); present (1).

229 (227). Posterior condyle: confluent with centrum ventrally (0); distinctly separated from centrum by groove/constriction between centrum and condyle (1).

230 (228). Vertebrae, width: narrow, width across zygapophyses not significantly greater than distance from prezygapophyses to postzygapophyses (0); vertebrae wide, width across zygapophyses 150% of length or more (1).

231 (229). Zygosphene anterior margin: deeply concave anterior edge (0); shallowly concave anterior edge (1); straight or slightly sinuous anterior edge (2).

232 (231). Zygosphene width, expressed as ratio of zygosphene width to cotyle width, in anterior view: wide, ratio close to or more than 1 (0); narrow, ratio significantly less than 1 (1).

233 (232). Vertebrae constriction index, expressed as neural arch minimal width to total width, measured at the level of the prezygapophyseal lateral edge: slight constriction, ratio equal to or more than 0.67 (0); marked constriction, ratio less than 0.67 (1).

234 (233). Narrow and sharp haemal keel on middle precloacal vertebrea: absent (0); present (1).

235 (234). Vertebrae, cotyle size, expressed as ratio of cotyle width to total width (measured as the interdiapophyseal width): big cotyle, ratio more than 0.5 (0); middle-sized cotyle, ratio between 0.5 and 0.3 (1); small cotyle, ratio less than 0.3 (2).

236 (235). Small lateral ridge on precloacal vertebrae extending from the parapophyses, below lateral foramen: absent (0); present (1).

237 (238). Unfused intercentra in precloacal vertebrae posterior to the axis: present (0); absent (1).

238 (241). Arqual ridges on middle precloacal vertebrae: absent (0); present (1)

\*239. Condyles of middle precloacal verterbrae, orientation: facing very dorsally, ventral edge (at most) of condyle surface exposed in ventral view (0); facing posteriorly, or posterodorsally, much of condyle surface exposed in ventral view (1).

\*240. Orientation of zygapophyses of middle precloacal vertebrae: steeply inclined medially, 30° or more from the horizontal (0); moderately inclined medially, between 15-30° from the horizontal (1); not inclined medially, <15° from horizontal (2).

\*241. Vertebrae elongation index, expressed as ratio of minimal neural arch width to centrum length:, ratio <09 (0);, ratio close to 1 (1);, ratio >1.2 (2).

\*242. Neural canal shape: vaulted (0); trifoliate (1).

\*243. Neural canal relative size: small, cross-sectional area about half or less than that of cotyle (0); large, cross-sectional area close to that of cotyle (1).

\*244. Prezygapophyseal articular facet projection: long axis antero-laterally oriented (<60° from sagittal plane) (0); moderately laterally oriented, long axis diverging between 60- 80° from sagittal plane (1); laterally everted, long axis diverging 80° or more from sagittal plane (2).

\*245. Zygosphene facet inclination from vertical: slightly inclined, angle <25° (0); moderately inclined, angle between 25-35° (1); markedly sloping, angle >35° (2).

\*246. Zygosphene shape index, expressed as zygosphene width to zygosphene roof thickness ratio: thin, ratio >3.5 (0); thick, ratio <3.5 (1).

\*247. Zygosphene roof morphology: dorsally concave (0); dorsally convex (1); horizontal (2).

\*248. Parapophysis ventral margin: high, placed dorsal to the ventral margin of cotyle (0); ventrally projected, level with or below ventral margin of cotyle (1).

\*249. Absolute size of neural spine, expressed as neural spine height (measured from dorsal edge of zygosphene) to total height of vertebra: high, >30% (0); moderate, between 15-30% (1); low, less than 15% (2).

\*250. Posterior tubercle on neural spine: absent (0); present (1).

\*251. Lateral foramina, dorsal to subcentral ridges: absent (0); present (1).

\*252. Position of the dorsal margin of the diapophysis relative to the neural canal in posterior precloacal vertebrae: at or below the neural canal floor (0); up to and including the dorsoventral midpoint of the neural canal (1); above the midpoint of the neural canal (2).

\*253. Posteriorly canted neural spine: absent (1); present (2).

\*254. Process on the posterior haemal keel: absent (0); present (1).

\*255. Type of process on the haemal keel: bifid (0); arrow shaped (1); triangular (2).

256 (134). Ribs, tuber costae: absent from ribs (0); present (1).

*1.5. Appendicular skeleton*

257 (135). Pectoral girdle and forelimbs: present (0); absent (1).

258 (136). Tibia, fibula, and hind foot: present (0); absent (1).

259 (137). Trochanter externus: present (0); absent (1).

260 (138). Pelvis, position: external to sacral-cloacal ribs (0); internal to sacral-cloacal ribs (1).

261 (139). Ilium and pubis length: ilium longer than pubis (0); ilium and pubis of same size (1); pubis much longer than ilium (2).

262 (140). Pelvic elements, type of contact: with strongly sutured contact (0); with weak (cartilaginous) contact (1); fused together (2).

263 (141). Pelvic elements: present (0); absent (1).

264 (242). Pubis, obturator foramen: present (0); absent (1).

**2. Changes from previous matrices**

*2.1. Characters*

The Character 223 from the original list of Garberoglio et al. (2019a) was removed as it was redundant with characters 212 and 234.

Characters 239 to 255 were added to this data set. These were extracted from the data set from Rio and Mannion (2017), as modified from Vasile et al. (2013).

*2.2. Taxa*

Besides the new madtsoiid snake, we also added to previous taxonomic samplings the marine snake *Simoliophis rochebrunei* and the basal snake *Seismophis septentrionalis*.

*2.3. Character scoring*

Scores were generally taken from the dataset of Rio and Mannion (2017), additional scoring are based on:

*Dinilysia*: Garberoglio et al. (2019b)

*Najash*: Garberoglio et al. (2019a, 2019b).

*Adinophis fisaka*: Pritchard et al. (2014).

*Alamitophis elongatus*: observed specimens (MML-PV 61‒75), Albino (1994, 2007).

*Eomadtsoia ragei*: based on observed specimens (MPEF-PV 2378‒2389).

*Gigantophis garstini*: Rio and Mannion (2017).

“*Gigantophis*” sp. CPAG-RANKT-V-1‒2: Rage et al. (2014).

*Heresungea caristiorum* and *Menarana laurasiae*: Rage (1996), Pereda-Suberbiola et al. (2015).

*Madtsoia bai*: Simpson (1933).

*Madtsoia madgascariensis*: LaDuke et al. (2010).

*Madtsoia pisdurensis*: Mohabey et al. (2011).

*Nanowana schrenki* and *Nanowana godthelpi*: Scanlon (1997).

*Nidophis insularis*: Vasile et al. (2013).

*Patagoniophis autraliensis* and *Alamitophis tingamarra*: Scanlon (2005).

*Platyspondylophis tadkeshwarensis:* Smith et al. (2016).

*Rionegrophis madtsoioides:* observed specimens (MML-PV 91‒115), Albino (2007).

*Seismophis septentrionalis*: Hsiou et al. (2014).

*Simoliophis rochebrunei*: Rage et al. (2016).

**3. Matrix in Nexus format**

#NEXUS

BEGIN TAXA;

DIMENSIONS NTAX=54;

TAXLABELS

END;

BEGIN CHARACTERS;

DIMENSIONS NCHAR=264;

FORMAT DATATYPE = STANDARD GAP = ‑ MISSING = ? SYMBOLS = " 0 1 2 3 4 5 A B C D" A = (0 1) B = (0 2) C = (1 2) D = (1 5) E= (3 5) F = (0 1 2);

MATRIX

Varanus 0010‑000001200000011003000000001000000‑00000000000000000031000‑000100000000‑000000000000100000‑00000‑000000000100000001000010000001000000000000‑0000000000000000000000000000000100000000000?000000000000?00010000000000000‑00000001000‑‑100000000000‑‑‑000020‑‑000000000

Acrochordidae 210111110101011111011131100112111011121001100111111110‑1121110?11?00110212111111?211110111010011001110112010111111101021101120010??010010100110101100111011100010011011111211010?11110?1‑2??1110?1111211012121111111A01101211010101110201010101120111121001010‑A11‑‑‑‑1‑

Anilius 101111100010010010001001200001001010111100010111121111‑1‑‑‑001010?1200010100111112111110000000‑100110011111000000010001011011110100010000200010000100210001101111001011111111111100020200111111101011??10??110111101010101111011100110201010101101101021201000‑111111101

Anomalepipidae 1110‑10001120111000110110000001110002???00000021111011‑0231000211?A010A1?A1‑011112110000100000‑01021‑‑‑1100‑01001A10000011011111B10010000E10000‑10?002000101110100010111110011?0001020000010110001000211102100011200110001?1101110010020101010110010101120?000‑111‑11201

Anomochilus 1110‑1100012000110001011100001001010011100000111121111‑1‑‑‑001010?11100100001111121111101000A0‑00011‑01011100000001000101101111110001000021001000010021001?11111010101111111111100102020011111?001011111012????????????????????????????????????????????????????111111101

Basal\_Colubroides 210111110101010111AA113111011211101A0B1AA110011112111A?A1C1100111?0111021FA11111?2110‑111101011100111010201011A1111010211011300121A110111110110101AA01A001110A010011A11111211110111021‑1‑2??1111011102110121211110110A110121101010011120?11010?????????????????111‑‑‑‑1‑

Boinae 21011111020101A1111011A1201101101011A11211001111121111‑011A1A01111221102121011111211111111110111C01111112010111110200011101120012111A0101410A111010111121011002100111111112111111011212011111111110111110121201111A1001101211010111111C01110100221120111001000‑111112201

Bolyeriidae 21011111010101011110113120010100101101110100011112111021‑‑1100111?01110212001111?21111011101010110111011211011011010001110112011201110101C10010101??011001110021001101111121111111112120111111A111A11211012120111111001101211010100110201110101110111021101000‑111‑‑‑‑1‑

Cylindrophis 11111110001001011000100110000100101001110001011112111021‑‑1011010?1200010100111112111110100000‑10011001011100000001000101101111010001000021001000010021000111111010101111111111100002020011111?001011111012110111101010101111011100110201010101011111001201000‑111111101

Erycinae 2101111102AC0111111011A11011011010110112A10001111C111A?AC21100111AC1100211101111?21111101101011A10111111211011A1102000111011200120111010A110A10101A?111CA011A00100110111112111111011212011111111A101121101C120111100001101211010101111C01010101021121121101000‑111112201

Leptotyphlops 1110‑10001220111000110110000001110002???00000021111011‑1‑‑‑000211?C010A1?A1‑0111121100001‑‑‑1‑‑00021‑‑‑1000‑01??1?‑100001001111121001000011A000‑00?002000101110100110111110011?0001020000010110001011211100100011200A10A01C11011A0010020101010020010101120?000‑111111101

Loxocemus 20011110110101011110102110010100111102110000011112111020211001011101100202001111?21111101101010110110011111111111010001010112101101010001110A10100101111111100210011011111211111111120201111111101011111111120111101110101211010101111201010101111111101111000‑11111?201

Pythoninae 2A011111020101A1111010012001011010111112110011111211102011A100111?02110212101111121111101111011120111A10211011111020001110112001211110101410A1010A001112101100210A11111111211111101121201111111111011111111120111101001101211010111111201110101220120111001010‑111112201

Tropidophiidae 210111110101011111101131200101001011011101100111121111‑0111100111?01110210111111?21111111101010100111011211011011110001110112001201110111110110101100111011100?10011011111211110111121201211111111111211012121111111001101111010100110201110101221111011001?00‑1111122A1

Typhlops 2110‑10001121111000110110000001110002???00000021111011‑1‑‑‑000211?1010A1?A1‑0111121100001‑‑01‑‑01021‑‑‑1100‑01‑‑1‑‑1000011011111210010000D1A000‑A0?002000101110100010111110011?0101020000011110001000211102100011200A10A01C11011100100201010100100100010201000‑111‑11201

Ungaliophiidae 2101111A011101011110110120110110101A011201000111121110?1C21100111?0111021B1011111211111010010101101111112A1011011020001110112001201010101110010101101110011100?10011011111211111111121?1‑2??111111011211112110111101001101211010100110201010101110111010101?00‑111112201

Uropeltidae 1110‑110A01B00AA10A01011100A010010100111000A0111121111‑1‑‑1001010?1AA0010C0010111211A11A1‑‑‑10‑00011‑0101110000A00100010110111111A0010000D10010‑A010021001A111110021011111C1111000AA2020011111A001011111AA21?0111101A101011110111001A0201010101020101??120??00‑111111101

Xenopeltis 200111101101010111101021200101001111031100001111121111‑1‑‑‑001011101100202000110?211‑1111001010110110011111111111010001011100111001010001100010100100111001100210011011111211110101020201111111111111211112120111101110101211010100110201110101210101021201?00‑111‑‑‑‑1‑

aff.Parviraptorestesi ??????????????????????????????????0??????????0?????1?0????????????????????????????????????????????????????????????????????????????????????????????????????????????????????????????????????????????????????????1000?0?001????10???00?102??0?0??100??0????100?00‑?????????

Coniophis 2?1??1??0???0???????????????????????????????????????????????????????????0?????0?????????????????????????????????????????????????????????????????????????????????????????????11????1?1????????????????????????0001201?10A01??10??000100101010?01110101021201100‑?????????

Diablophis\_gilmorei 2?1??1??0???0??????????????????????????????????????????????????????????1??011??012??0‑??0??????????????????????????????????????????????????????????????????????????????????0101??0??0?????????????????????????1000?0?001????10???00110210000?01001000?00100200‑?????????

Dinilysia 2?1101????0001????111000??????0?00010211000000011200101011011001001200010100111111110100000000‑00?01‑0000000000000000010110001100010110002100000001A010000?111001000011?112?1011101010000000110001011110011010101111000A010?101?011111100010011110011121001010‑1????????

Eophis\_woodwardi ??1??1??????0????????????????????????????????????????????????????????????????????????????????????????????????????????????????????????????????????????????????????????????1?0101?00??0???????????????????????????????????????????????????????????????????????????????????

Eupodophis 2?0111???1?101?1????10???????????????1??????????1??????0??1????1??????01101??1?1??1????????10??11?11????2???01???0?0?1?1?01????1???????????0????0??????1???1????????0??11121?1??????101000???1????0?1??1???010001111?00??0?11111112??101?01??0?02101011??00?10‑11011?101

Haasiophis 2?1111???10101?1?0??10????????0??000????00??0??11???1??0???0?1?11?0C1001121??1????1??????00100‑1??11?11??11??111?0?0?011101????1????0????300??110??????10??10???????01?1112111?0????2010001111???101111101?010101111?10??121?1101?2??1???0??00???????????00?00‑110111101

Najash 1?1A01?????20??11?1110?020000?0000010111001?000112001010010A100100020001?10?1?????110?00001000‑00101‑00000000000000000101100?1?0001001000300000A00??0100001111?1100A011?10201011101?2000000011000?011110011?1010111100011100001?011110A00121011111111021001010‑1?0001100

Pachyrhachis 2??111????‑101?110??10???????????000????00??0??1????10?0111??0?11??2??0112????1???1???????010?‑1??11????????0111?0?0?111101?20?1???????????0???10??????????10???????01?1112111?0?1???01000??11?11?011?????1??0101111?001?120111?1021?1??00???0??2????????00?10‑110111101

Parviraptor\_estesi 2?1??1??0????1?????????????????????????????????????????????????????????101011??012??0‑??????????????????????????????????????????????????????????????????????????????????????????????????????????????????????????????????????????????????????????????????????????????????

Portugalophis\_lignites 2?1??1??00??01?????????????????????????????????????????????????????????101011?0012??0‑1?0??????????????????????????????????????????????????????????????????????????????????0101??0??0???????????????????????????????????????????????????????????????????????????????????

Seismophis\_septentrionalis ??????????????????????????????????????????????????????????????????????????????????????????????????????????????????????????????????????????????????????????????????????????????????????????????????????????????101111?1011???00???111?0200110?112110110202?10?0‑?????????

Simoliophis\_rochebrunei ??????????????????????????????????????????????????????????????????????????????????????????????????????????????????????????????????????????????????????????????????????????????????????????????????????????????001?11?0010???01???02101010010?00121010121000010‑?????????

Xiaophis ???????????????????????????????????????????????????????????????????????????????????????????????????????????????????????????????????????????????????????????????????????????????????????????????????????????0??1112?1?000????101??01??1??1010?01210?21??0101?10‑1????????

Adinophis\_fisaka ??????????????????????????????????????????????????????????????????????????????????????????????????????????????????????????????????????????????????????????????????????????????????????????????????????????????101?11?0111???0????01111?10010?1112010??10201200‑?????????

Alamitophis\_elongatus ????????????????????????????????????????????????????????????????????????????????????????????????????????????????????????????????????????????????????????????????????????????????????????????????????????????1?101111?0111???00???11110211110?11200100011111000‑?????????

Alamitophis\_tingamarra ????????????????????????????????????????????????????????????????????????????????????????????????????????????????????????????????????????????????????????????????????????????????????????????????????????????1?101111?0011???00???11110201110?11210112101?01000‑1????????

Gigantophis\_garstini ?????????????????????????????????????????????????????????????????????????????????????????????????????????????????????????????????????????????????????????????????????????????????????????????????????????????1101?11?0111???00???11111101010?111210111B010?0011?????????

“Gigantophis”\_sp\_CPAG‑RANKT‑V‑1‑2 ??????????????????????????????????????????????????????????????????????????????????????????????????????????????????????????????????????????????????????????????????????????????????????????????????????????????101?11???11???00????11??00??10???121101100100??0‑?????????

Herensugea\_caristiorum ??????????????????????????????????????????????????????????????????????????????????????????????????????????????????????????????????????????????????????????????????????????????????????????????????????????????10?111?1011???10???01110201010?11201102020210?00‑?????????

Madtsoia\_bai ?????????????????????????????????????????????????????????????????????????????????????????????????????????????????????????????????????????????????????????????????????????????????????????????????????????????110?111?0111???001??11111010010??0221020100000?0101????????

Madtsoia\_camposi ??1??1??0??101???????????????????????2?????????????????????????????????10??????1???????????????1?1???1?12??0?????????????????????????????????????????????????????????????1?011???0??????????????????????????10101111?01111??00??111111200010??112100110010110111????????

Madtsoia\_madagascariensis ????????????????????????????????????????????????????????????????????????????????????????????????????????????????????????????????????????????????????????????????????????????????????????????????????????????11101111?01111??00???11111000010?1112102112000011101????????

Madtsoia\_pisdurensis ??????????????????????????????????????????????????????????????????????????????????????????????????????????????????????????????????????????????????????????????????????????????????????????????????????????????101?11?0111???00???11111200010?1112101110110?0112?????????

Menarana\_laurasiae ??????????????????????????????????????????????????????????????????????????????????????????????????????????????????????????????????????????????????????????????????????????????????????????????????????????????10??11?0111???00???11111010010?00121001000100?00‑?????????

Menarana\_nosymena ????????????????????????????????????????????????????????????????????????????????????????????????????????????????????????????????0?1??1???????????0???101???????11??01?????????????????????????????????????????101111?0011????0???11111010010??0220000120101100‑1????????

Nanowana\_godthelpi ??1111????0101?????????????????????????????????????????????????????????102001?1111??01000??????10101?00110?000?1?0?0?????????????????????????????????????????????????????1201110101110??????11?11??111????1??0101111?00111??00??111110111110?11111101111101000‑?????????

Nanowana\_schrenki 2?1??1??02?101???????????????????????2?????????????????????????????????10?001??11???010?0??????1??01?0?1?0?0?????????????????????????????????????????????????????????????120111010?11???????1????????1????????10???1?1011???00???11110100110??111010201011?100‑?????????

Nidophis\_insularis ????????????????????????????????????????????????????????????????????????????????????????????????????????????????????????????????????????????????????????????????????????????????????????????????????????????1?101111?0011???00???11110201110?11210102021111000‑1????????

Patagoniophis\_australiensis ?????????????????????????????????????????????????????????????????????????????????????????????????????????????????????????????????????????????????????????????????????????????????????????????????????????????1101111?0011???00???11110001110?11110102011111100‑1????????

Platyspondylophis\_tadkeshwarensis ?????????????????????????????????????????????????????????????????????????????????????????????????????????????????????????????????????????????????????????????????????????????????????????????????????????????11011?1?0111???0????11111110010????21101120100200‑?????????

Rionegrophis\_madtsoioides ??????????????????????????????????????????????????????????????????????????????????????????????????????????????????????????????????????????????????????????????????????????????????????????????????????????????10?111?0111???00???11111200110?11111111121011?00‑?????????

Sanajeh 1????????1??0????????????????????????2??????????????1??????????10?0?0101020????????????????????????????????????1???????????0?110001?11?0030000??00??0?1210?????11?1?1????1211???????????????11????????????????10?????0111???001?11???02??????1?????1?????0?????1????????

Wonambi 2?1111??010101???????0????????????0??2??????0?11120??0?????11011001201010200110111110100011?0??10101?01110?0?0?1?0‑0???????0???010111100????000?00010112101?11?1111111???1211110111110?0????1110010111???1101010?111?01111??001?111111110010?1012001011000001101????1201

Yurlunggur 211111??0101010110??1031??0?0100000001??00?0011112001010110111010??2010102001101??110??0001?0??101010011101000110000?0101100???01011?10?0400000?00010112101111?1111111??1120??10??1?1????????1???????1?00???1010111100111???001A111111100010?1012002012120100101????????

Eomadtsoia\_ragei ??????????????????????????????????????????????????????????????????????????????????????????????????????????????????????????????????????????????????????????????????????????????????????????????????????????????10?111?0011???10???011?120011A?111210111212?1?00‑?????????

;

END;

BEGIN ASSUMPTIONS;

TYPESET \* UNTITLED = unord: 1 - 234 236 - 239 242 - 243 246 - 248 250 - 251 253 - 264, ord: 235 240 - 241 244 - 245 249 - 252\3;

END;

**4. Phylogenetic results**



**Fig. S1.** Strict consensus of 42 most parsimonious trees of 803 steps from the parsimony analysis. Bremer support and jackknife absolute values are depicted above and below branches, respectively.

**5. Body size**

**Table S1**

Measurements of maximum cotyle width (in mm) in madtsoiids and a few outgroup taxa.

|  |  |
| --- | --- |
|  | Cotyle width |
| *Coniophis* | 1.5 |
| *Diablophis gilmorei* | 2.6 |
| *Dinilysia* | 13.0 |
| *Najash* | 2.4 |
| *Seismophis septentrionalis* | 3.0 |
| *Adinophis fisaka* | 4.6 |
| *Alamitophis elongatus* | 4.0 |
| *Alamitophis tingamarra* | 1.5 |
| *Eomadtsoia ragei* | 10.7 |
| *Gigantophis garstini* | 31.5 |
| ‘*Gigantophis’* sp. CPAG-RANKT-V-1-2 | 20 |
| *Herensugea caristiorum* | 2.0 |
| *Madtsoia bai* | 30.5 |
| *Madtsoia camposi* | 8.6 |
| *Madtsoia madagascariensis* | 17.0 |
| *Madtsoia pisdurensis* | 16.9 |
| *Menarana laurasiae* | 10.0 |
| *Menarana nosymena* | 8.6 |
| *Nanowana godthelpi* | 4.5 |
| *Nanowana schrenki* | 4.5 |
| *Nidophis insularis* | 2.0 |
| *Patagoniophis australiensis* | 1.4 |
| *Platyspondylophis tadkeshwarensis* | 13.0 |
| *Rionegrophis madtsoioides* | 6.8 |
| *Sanajeh* | 8.5 |
| *Wonambi* | 12.1 |
| *Yurlunggur* | 17.9 |