

Supplementary Notes

1. Character description

The characters are mainly cited and updated from Liu et al.¹, with several other characters from Rieppel² and Benson et al.³. The abbreviation of “L+number, R+number, and B+number” indicates the characters cited from Liu et al.¹, Rieppel² and Benson et al.³ respectively.

[1] Bones in the dermatocranium (L1)

0, distinctly sculptured

1, relatively smooth

[2] Preorbital and postorbital region of skull (L2)

0, of subequal length

1, preorbital region distinctly longer

2, postorbital region distinctly longer

[3] Ratio, condylobasal skull length divided by longitudinal diameter of upper temporal fossa (modified from R16)

0, more than 3.8

1, 3.0-3.4

2, less than 2.9

[4] Ratio, the distance from the snout to the anterior margin of the internal naris divided by the distance from the snout to the anterior margin of the external naris (modified from R6)

0, smaller than 1.2

1, larger than 1.3

[5] Ratio, distance from posterior margin of external naris to anterior margin of orbit divided by the width of the postorbital arch (modified from R13)

0, more than 1.7

1, less than 1.5

[6] Snout (L3)

0, relatively short

1, elongated with broad anterior termination

2, elongated and tapering anteriorly

[7] Rostrum (modified from R1)

0, short

1, long and slender

[8] Snout constriction at the level of the anterolateral margin of the external naris in adult (modified from L4)

0, absent

1, strongly developed

2, weakly developed

[9] Premaxillae (L5)

0, small

1, large, forming most of snout in front of external nares

[10] Premaxilla(e) in adult

0, paired

1, partly or fully fused

[11] Postnarial process of premaxilla (L6)

0, absent

1, present, excluding maxilla from posterior margin of external nares

[12] Maxilla, depression at lateral margin of external nares and a foramen at its bottom

for the exit of a lateral branch of the superior alveolar nerve (R 5)

0, absent

1, present

[13] External nares (L7)

0, not retracted

1, retracted with a longitudinal diameter approaching or exceeding half the longitudinal diameter of the orbit

2, retracted, narrow, and with a longitudinal diameter that is distinctly less than half the longitudinal diameter of the orbit

[14] Nasal(s), length (L8)

0, shorter than frontal(s)

1, longer than frontal(s)

[15] Nasal(s), size (L9)

0, not reduced

1, strongly reduced or absent

[16] Nasals in adult

0, paired

1, fused

[17] Nasal(s) (L10)

0, meet in dorsomedial suture

1, are separated from one another by nasal processes of the premaxillae extending back to the frontal bone(s)

[18] Nasal(s)

0, enter external naris

1, do not enter external naris

[19] Nasal, anterolateral process lining the entire medial margin of external naris (R
4)

0, absent

1, present

[20] Nasal, length behind level of posterior margin of external naris more than twice
of the maximal width (R7)

0, absent

1, present

[21] Nasal, roughly triangular shape with a rectangular angle

0, absent

1, present

[22] Nasal-prefrontal contact

0, present

1, absent

[23] Lacrimal (L11)

0, is present and enters the external naris

1, remains excluded from the external naris

2, absent

[24] Dorsal exposure of prefrontal (L12)

0, large

1, reduced

[25] Prefrontal (L13)

0, without slender anteromedial process

1, with slender anteromedial process entering between maxilla and premaxilla

[26] Frontal (L14)

0, forms the dorsal margin of the orbit

1, excludes from the dorsal margin of the orbit by a contact of prefrontal and postfrontal

[27] Frontal(s) in adult (L15)

0, paired

1, fused

[28] Distinct posterolateral processes of frontal(s) (L16)

0, absent

1, present

[29] Frontal (L17)

0, widely separated from the upper temporal fossa

1, narrowly approaches the upper temporal fossa

2, enters the anteromedial margin of the upper temporal fossa

[30] Postfrontal (L18)

0, large and plate-like

1, with distinct lateral process overlapping the dorsal tip of the postorbital

2, with reduced lateral process and hence more of an elongate shape

[31] Postfrontal, distinct constriction behind the orbit

0, absent

1, present

[32] Postfrontal (R 10)

0, entering upper temporal fossa

1, excluded from upper temporal fossa

[33] Postorbital, forming all of the anterior margin of the upper temporal fossa (R12)

0, absent

1, present

[34] Jugal (modified from R14)

0, absent

1, present

[35] Jugal, anterior extension (modified from L19)

0, entering orbit

1, excluded from posterior margin of orbit

[36] Jugal, posterior extension (L20)

0, extends backwards no farther than to the middle of the cheek region

1, extends nearly to the posterior end of the skull

[37] Jugal (L21)

0, remains excluded from the upper temporal arch

1, enters the upper temporal arch

[38] Jugal-squamosal contact

0, absent

1, present

[39] Parietal(s) in adult (L22)

0, paired

1, fused in their posterior part only

2, fully fused

[40] Parietal skull table (L23)

0, broad

1, weakly constricted

2, strongly constricted (at least posteriorly)

3, forming a sagittal crest

[41] Parietal skull table, constriction in the posteriormost part

0, absent

1, present

[42] Pineal foramen (L24)

0, close to the middle of the skull table

1, weakly displaced posteriorly

2, strongly displaced posteriorly

3, displaced anteriorly

4, absent

[43] Pineal foramen located within a deep trough

0, absent

1, present

[44] Postparietals (L25)

0, present

1, absent

[45] Tabulars (L26)

0, present

1, absent

[46] Supratemporals (L27)

0, present

1, absent

[47] Temporal region of skull (L28)

0, relatively high

1, strongly depressed

[48] Upper temporal fossa (L29)

0, absent

1, present and subequal in size or slightly larger than the orbit

2, present and distinctly larger than orbit

3, present and distinctly smaller than orbit

[49] The anteromedial corner of the upper temporal fossa (L30)

0, is not or only slightly

1, is fully floored by a descensus from the postorbital, which together with neighboring elements (postfrontal, parietal) separates it from orbit

[50] Upper temporal fenestra, constriction of anterior corner (modified from R18)

0, absent

1, present

[51] Lower temporal fossa (L31)

0, absent

1, present and closed ventrally

2, present but open ventrally

[52] Squamosal (L32)

0, descends to ventral margin of skull

1, remains broadly separated from ventral margin of skull

[53] A box-like suspensorium of the squamosal (L33)

0, absent

1, present

[54] Distinct notch of squamosal to receive distal tip of paroccipital process (L34)

0, absent

1, present

[55] Quadratojugal (L35)

0, present

1, absent

[56] Anterior process of quadratojugal (L36)

0, present

1, absent

[57] Quadrate (L37)

0, covered by squamosal and quadratojugal in lateral view

1, exposed in lateral view

[58] Posterior margin of quadrate in lateral view (modified from L38)

0, straight

1, concave

[59] Lateral conch on quadrate in posterior view (modified from L39)

0, absent

1, present

[60] Dorsal wing of epipterygoid (L40)

0, approximately as broad as its base

1, narrower than its base

[61] Braincase (L41)

0, located at posterior end

1, deeply recessed below parietal skull roof (or parietal sagittal crest)

[62] Occipital crest (L42)

0, absent

1, present but squamosals do not meet behind parietal

2, present and squamosals meet behind parietal

[63] Occiput (L43)

0, with paroccipital process forming the lower margin of the posttemporal fossa and extending laterally

1, paroccipital processes trending posteriorly

2, plate-like with no distinct paroccipital process and with strongly reduced posttemporal fossae

[64] Mandibular articulations (L44)

0, approximately at level with occipital condyle

1, displaced to a level distinctly behind occipital condyle

2, positioned anterior to the occipital condyle

[65] Supraoccipital (L45)

0, exposed more or less vertically on occiput

1, exposed more or less horizontally at posterior end of parietal skull table

2, U-shaped

[66] Supraoccipital, sagittal crest

0, absent

1, reduced

2, prominent

3, knob-like

[67] Contact between exoccipitals above the basioccipital condyle (L46)

0, present

1, absent

[68] Basioccipital tubera (L47)

0, free

1, in complex relation to the pterygoid, as they extend ventrally

2, in complex relation to the pterygoid, as they extend laterally

[69] Palate (L48)

0, kinetic

1, akinetic

[70] Premaxillae (L49)

0, enter internal naris

1, are excluded from internal naris

[71] Posterior palatine vacuities (L50)

0, absent

1, present

[72] Pterygoids (L51)

0, longer than palatines

1, shorter than palatines

[73] Pterygoid flanges (L52)

0, well developed and transversely oriented

1, well developed and longitudinally oriented

2, strongly reduced

[74] Ectopterygoid (L53)

0, present

1, absent

[75] Suborbital fenestra (L54)

0, absent

1, present

[76] Internal carotid passage (L55)

0, enters basicranium

1, enters quadrate ramus of pterygoid

[77] Splenial bone (L56)

0, enters the mandibular symphysis

1, remains excluded therefrom

[78] Distinct coronoid process of lower jaw (L57)

0, absent

1, present

[79] Strongly projecting lateral ridge of surangular defining the insertion area for superficial adductor muscle fibers on the lateral surface of the lower jaw (L58)

0, absent

1, present

[80] Mandibular symphysis (L59)

0, short

1, elongated and "scoop"-like

[81] Mandibular symphysis, anterior fusion

0, absent

1, present

[82] Mandible, anterior constriction

0, absent

1, present

[83] Retroarticular process of lower jaw (L60)

0, absent

1, present

[84] Retroarticular process

0, short

1, long

[85] Trough on dorsal surface of retroarticular process (L61)

0, absent

1, present

[86] Retroarticular process dorsal surface, foramen for the innervation of chorda

tympani nerve

0, absent

1, present

[87] Retroarticular process, trough on lateral surface for the insertion of the depressor

mandibulae muscle/superficial pterygoideus muscle

0, absent

1, weak

2, strong

[88] Retroarticular process, trough on medial surface for the insertion of posterior fibers of pterygoideus internus muscle

0, absent

1, present

2, small distal notch present

[89] Teeth (L62)

0, set in shallow or deep sockets

1, superficially attached to bone

[90] Durophagous dentition, including much enlarged palatine tooth plates (L63)

0, absent

1, present

[91] Anterior (premaxillary and dentary) teeth (L65)

0, upright or only slightly procumbent

1, strongly procumbent

[92] Enlarged premaxillary and anterior dentary teeth (L66)

0, absent

1, present

[93] Premaxillary teeth (Modified after L64)

0, 4,

1, more than 5

2, 5

3, 3 or less

[94] Premaxillary fangs (modified from R2)

0, absent

1, present but less than 5

2, 5 or more

[95] One or two enlarged teeth on maxilla (L67)

0, present

1, absent

[96] The maxillary tooth row (L68)

0, is restricted to a level in front of the posterior margin of the orbit

1, extends backwards to a level below the posterior corner of the orbit and/or the anterior corner of the upper temporal fossa

2, extends backwards to a level below the anterior one third to one half of the upper temporal fossa

[97] Number of small maxillary teeth anterior to the maxillary fang(s)

0, 3 or less

1, 4,

2, 5 or more

[98] Dentary fangs

0, absent

1, present but less than 5

2, 5 or more

[99] Teeth on pterygoid flange (L69)

0, present

1, absent

[100] Vertebrae (L70)

0, notochordal

1, non-notochordal

[101] Vertebrae, shape (L71)

0, amphicoelous

1, platycoelous

2, or other

[102] Vertebral centrum (L72)

0, distinctly constricted in ventral view

1, with parallel lateral edges

[103] Subcentral foramina (L73)

0, absent

1, present

[104] Zygosphenes-zygantrum articulation (L74)

0, absent

1, present

[105] Zygapophyseal pachyostosis (L75)

0, absent

1, present

[106] Number of cervical vertebrae (modified from L76)

0, less than 13,

1, 14-27

2, more than 28

[107] Cervical centra (L77)

0, rounded ventrally

1, keeled ventrally

[108] Parapophysis (L78)

0, does not shift backwards on centrum along the cervical vertebral column

1, does shift backwards on centrum along the cervical vertebral column

[109] Cervical intercentra (L79)

0, present

1, absent

[110] Cervical vertebrae, proportions of anterior cervical neural spines (modified from B131)

0, taller than their anteroposterior length

1, longer than tall

[111] Rib facets of the anterior-middle cervical vertebrae (modified from B122)

0, separated

1, co-jointed

[112] Neural spines on dorsal vertebrae (modified from R25)

0, low

1, tall

[113] Distal articular surface on transverse processes of dorsal vertebrae (L80)

0, oblong

1, evenly rounded

[114] Transverse processes of neural arches of the dorsal region (L81)

0, relatively short

1, distinctly elongated

[115] Distal end of transverse processes of dorsal vertebrae (L82)

0, not increasing in diameter

1, distinctly thickened

[116] Sutural facets receiving the pedicels of the neural arch on the dorsal surface of the centrum in the dorsal region (L83)

0, narrow

1, expanded into a cruciform or "butterfly-shaped" platform

[117] Dorsal intercentra (L84)

0, present

1, absent

[118] Anteroposterior trend of increasing inclination of pre- and postzygapophyses within the dorsal and sacral region (L85)

0, absent

1, present

[119] Elongation of neural spines in proximal tail region (R125)

0, absent

1, present

[120] A distinct free anterior process of cervical ribs (L86)

0, absent

1, present

[121] Pachyostosis of dorsal ribs (L87)

0, absent

1, present

[122] Distinct groove on the posterior aspect of the proximal shoulder region of the

dorsal ribs

0, absent

1, present

[123] The number of sacral ribs (modified from L88)

0, two

1, three

2, four

3, five

[124] Distinct expansion of distal head of sacral ribs (L89)

0, present

1, absent

[125] Sacral (and caudal) ribs or transverse processes and their respective centrum

(L90)

0, sutured

1, fused

[126] Mineralized sternum (L91)

0, absent

1, present

[127] Median gastral element (L92)

0, angulated

1, straight

[128] The medial gastral rib element (L93)

0, always only has a single lateral process

1, may have a two-pronged lateral process

2, with the lateral process contributing to the formation of the plastron

[129] Cleithrum (L94)

0, present

1, absent

[130] Clavicles, shape (L95)

0, broad medially

1, narrow medially

[131] Clavicles (L96)

0, do not meet in front of the interclavicle

1, meet in an interdigitating anteromedial suture

[132] Anterolaterally expanded corners of clavicles (L97)

0, absent

1, present

[133] Clavicle (L98)

0, applied to the anterior (lateral) surface of scapula

1, applied to the medial surface of scapula

[134] The relationship between clavicles and interclavicle (L99)

0, in simple overlapping contact

1, anteromedioventral end of clavicle embraces lateral tip of interclavicle in a complex contact

[135] Interclavicle (modified from L100)

0, rhomboidal

1, T-shaped

2, Triangular

[136] Posterior process on (T-shaped) interclavicle (L101)

0, elongate

1, short

2, rudimentary or absent

[137] Scapula (L102)

0, represented by a broad blade of bone

1, with a constriction separating a ventral glenoidal portion from a posteriorly directed dorsal wing

[138] The dorsal wing or process of the eosauropterygian scapula (L103)

0, tapers to a blunt tip

1, is ventrally expanded at its posterior end

[139] Supraglenoid buttress (L104)

0, present

1, absent

[140] Number of coracoid ossifications (L105)

0, one

1, two

[141] Coracoid in ventral view (modified from L106)

0, with roughly rounded contours

1, strongly waisted

2, with expanded medial symphysis

3, co-ossified with scapula

[142] Coracoid foramen (L107)

0, enclosed by coracoid ossification

1, between coracoid and scapula

[143] Pectoral fenestration (L108)

0, absent

1, present

[144] Limbs (L109)

0, short and stout

1, long and slender

[145] Humerus (L111)

0, rather straight

1, curved

[146] Humerus, preaxial margin of shaft in dorsal-ventral view

0, with straight angle

1, smoothly curved

2, straight

[147] Humerus, proximal width compared with the mid-shaft (R123)

0, greater

1, less

[148] Deltopectoral crest (L112)

0, well developed

1, reduced or absent

[149] Insertional crest for latissimus dorsi muscle (L113)

0, prominent

1, reduced

[150] Epicondyles of humerus (L114)

0, prominent

1, reduced

[151] Ectepicondylar groove (L115)

0, open and notched anteriorly

1, open without anterior notch

2, closed

3, absent

[152] Entepicondylar foramen (L116)

0, present

1, absent

[153] Radius (L117)

0, shorter than ulna

1, longer than ulna

2, approximately of the same length with ulna

[154] Ulna, distinctly broadened proximal head compared with the radius (modified from R121)

0, absent

1, present

[155] Ulna, middiaphysis (R120)

0, as slender as radius

1, distinctly broadened compared with radius

[156] Distal end of ulna (Modified after L118)

0, not expanded compared with the middle shaft

1, distinctly expanded compared with the middle shaft (Sander et al., 1997)

[157] Ulna, anterior margin

0, smooth

1, with a tuberosity

[158] Total number of carpal ossifications (L119)

0, more than 3,

1, 3,

2, 2

[159] Hyperphalangy in manus (R122)

0, absent

1, present

[160] Iliac blade (L120)

0, well developed

1, reduced but projecting beyond level of posterior margin of acetabular portion of ilium

2, reduced and no longer projecting beyond posterior margin of acetabular portion of ilium

3, absent, i.e. reduced to simple dorsal stub

[161] Acetabular portion of ilium

0, broadened

1, rod-like

[162] An elongated iliac shaft

0, absent

1, present

[163] Spina praeacetabuli

0, absent

1, weakly developed

2, well developed

[164] Pubis (L121)

0, with convex ventral (medial) margin

1, with concave ventral (medial) margin

[165] Obturator foramen in adult (L122)

0, closed

1, open

2, forming the thyroid fenestra

[166] Thyroid fenestra (L123)

0, absent

1, present

[167] Acetabulum (L124)

0, oval

1, circular

[168] Foot (L110)

0, short and broad

1, long and slender

[169] Femoral shaft (L125)

0, stout and straight

1, slender and sigmoidally curved

[170] Internal trochanter (L126)

0, well developed

1, reduced

[171] Intertrochanteric fossa (L127)

0, deep

1, distinct but reduced

2, rudimentary or absent

[172] Distal femoral condyles (L128)

0, prominent

1, not projecting markedly beyond shaft

[173] Anterior femoral condyle relative to posterior condyle (L129)

0, larger and extending further distally

1, smaller/equisized and of subequal extent distally

[174] Total number of tarsal ossifications (L130)

0, four or more

1, three

2, two

[175] Perforating artery (L131)

0, passes between astragalus and calcaneum

1, between the distal heads of tibia and fibula proximal to the astragalus

[176] The proximal concavity of astragalus (L132)

0, absent

1, present

[177] Calcaneal tuber (L133)

0, absent

1, present

[178] Distal tarsal 1 (L134)

0, present

1, absent

[179] Distal tarsal 5 (L135)

0, present

1, absent

[180] Metatarsal 5, length (L136)

0, long and slender

1, distinctly shorter than the other metatarsals and with a broad base

[181] Metatarsal 5 (L137)

0, straight

1, "hooked"

2. Notes on character modifications

When the character coding is different from Liu et al.¹ and several others, the modification and the reason (where possible) are given below.

CHARACTER 2: *Placodus* is recoded as 2. *Augustasaurus* is recoded as 1 (see Rieppel et al.⁴, p.581, Fig. 3A). *Hanosaurus* is recoded as 2.

CHARACTER 8: An additional state of a weakly snout constriction in adult is added, which is present in *Keichousaurus* (noted by Rieppel and Lin⁵), *Augustasaurus*⁴, and also in *Dianopachysaurus* (LPV 31365)¹. A weakly developed snout constriction is also developed in some juvenile specimens of *Simosaurus* and a few *Lariosaurus* specimens (noted by Rieppel⁶). However, they are still coded as 0. The preservation of the holotype of *Hanosaurus* cannot allow the unequivocal decision for this character.

CHARACTER 13: *Corosaurus* is recoded as 2.

CHARACTER 14: *Augustasaurus* and *Pistosaurus* are coded as ? where the presence/absence of nasals cannot be unequivocally determined.

CHARACTER 15: *Cymatosaurus* is recoded as 1, as noticed by Cheng et al.⁷. Preservation of *Pistosaurus* and *Augustasaurus* is not good enough to decide the coding of this character and they are coded as either reduced or absent. *Simosaurus* is recoded as 0 (see Rieppel⁸, p.59, Fig. 47A).

CHARACTER 26: *Cyamodus* is recoded as 0.

CHARACTER 28: *Pistosaurus* is recoded from 1 to 0.

CHARACTER 39: *Yunguisaurus* was originally coded as 0 by Chen et al.⁷.

Paired parietals were also confirmed by Zhao et al.⁹. Most recently Sato et al.¹⁰ recoded this character as unknown for *Yunguisaurus*, but they indicated that the parietals are paired and the suture separate the parietals are visible posterior to the pineal foramen, which is located at the fronto-parietal boundary. We code *Yunguisaurus* here as 0 as in Chen et al.⁷ based on personal observation. *Pistosaurus* is recoded from 1 to 0.

CHARACTER 44: *Yunguisaurus* is recoded from ? to 1.

CHARACTER 45: *Yunguisaurus* is recoded from ? to 1.

CHARACTER 46: *Yunguisaurus* is recoded from ? to 1.

CHARACTER 47: *Simosaurus* is recoded as 1.

CHARACTER 55: *Placodus* is recoded as 1 here because an absence of quadratojugal in other sauropterygians is also probably caused by the fusion of quadratojugal and squamosal. We can never decide if the absence of a quadratojugal is caused by the fusion of the quadratojugal and squamosal or the truncated development unless an ontogenetic sequence is available.

CHARACTER 56: *Placodus* is recoded as ?.

CHARACTER 59: *Yunguisaurus* is recoded from ? to 0.

CHARACTER 60: *Yunguisaurus* is recoded from ? to 1.

CHARACTER 61: *Yunguisaurus* is recoded from ? to 1.

CHARACTER 62: The occipital crest is absent in *Keichousaurus* based on personal observation. *Simosaurus* is recoded from 0 to 1. *Yunguisaurus* is recoded from ? to 2.

CHARACTER 65: *Germanosaurus* is recoded from ? to 0.

CHARACTER 76: *Yunguisaurus* is recoded from 0 to 1.

CHARACTER 78: *Dianopachysaurus* is recoded as 1.

CHARACTER 79: *Yunguisaurus* is recoded from 0 to 1.'

CHARACTER 80: *Keichousaurus* is recoded as 0. *Yunguisaurus* is recoded as 2.

CHARACTER 92: The premaxillary and anterior dentary fangs are clear present in *Yunguisaurus*. *Dianopachysaurus* and *Keichousaurus* are recoded as 1.

CHARACTER 95: Caniniform teeth are present in *Yunguisaurus* as pointed out by Zhao et al.⁹. *Anarosaurus* is recoded from 1 to 0 based on Klein¹¹.

CHARACTER 98: *Anarosaurus* is recoded from ? to 1+2 based on Klein¹¹.

CHARACTER 103: *Yunguisaurus* is recoded as 1.

CHARACTER 107: *Yunguisaurus* is recoded as 1.

CHARACTER 113: *Yunguisaurus* and *Bobosaurus* are recoded as 0.

CHARACTER 114: *Bobosaurus* is recoded from ? to 0.

CHARACTER 121: *Keichousaurus* is recoded from 1 to 0+1; *Bobosaurus* is

recoded from ? to 0.

CHARACTER 126: *Bobosaurus* is recoded from ? to 0.

CHARACTER 130: *Dianopachysaurus* is recoded as ?.

CHARACTER 136: *Anarosaurus* is recoded from ? to 2 based on Klein¹².

Yunguisaurus is recoded from ? to 2 based on Shang et al.¹³.

CHARACTER 153: *Anarosaurus* is recoded from ? to 2 based on Klein¹².

CHARACTER 156: The short ulna of plesiosaurs with a convex postaxial margin is here treated as inapplicable; *Anarosaurus* is recoded from ? to 0 based on Klein¹².

CHARACTER 158: The holotype of *Yunguisaurus liae* is undoubtedly a juvenile specimen compared with ZMNH M8738 described by Zhao et al.⁹. There are apparently more than three carpal ossifications in the adult specimens of *Yunguisaurus* as present in ZMNH M8738; *Diandongosaurus* is recoded from 2 to 1+2.

CHARACTER 160: The sacral head of the ilium of *Hanosaurus* has reduced to simple stub. Different from Cheng et al.⁷, *Yunguisaurus* is coded as 2 here. *Anarosaurus* is recoded from ? to 2 based on Klein¹².

CHARACTER 165: Obturator foramen in *Bobosaurus* is also absent as in *Yunguisaurus*.

CHARACTER 174: *Anarosaurus* is recoded from ? to 0 based on Klein¹².

CHARACTER 175: *Anarosaurus* is recoded from ? to 1 based on Klein¹².

CHARACTER 176: *Anarosaurus* is recoded from ? to 0 based on Klein¹².

CHARACTER 177: *Anarosaurus* is recoded from ? to 0 based on Klein¹².

CHARACTER 178: *Anarosaurus* is recoded from ? to 1 based on Klein¹².

CHARACTER 179: *Majiashanosaurus* is recoded from ? to 1. *Anarosaurus* is recoded from ? to 1 based on Klein¹².

CHARACTER 180: *Anarosaurus* is recoded from ? to 0 based on Klein¹².

CHARACTER 181: *Anarosaurus* is recoded from ? to 0 based on Klein¹².

Supplementary Table 1. List of specimens examined personally by J.L. and literature referred to. *Nothosaurus* and *Lariosaurus* are abbreviated.

Institutional abbreviations as below:

AGM	Anhui Geological Museum, Hefei, Anhui, China.
BGM	Bath Geological Museum, Bath, England.
BGR	Bundesanstalt für Geowissenschaften und Rohstoffe, Berlin, Germany.
BSP	Bayerische Staatssammlung für Paläontologie und Historische Geologie, Munich, Germany.
FMNH	Field Museum of Natural History, Chicago, USA.
GMPKU	Geological Museum of Peking University, Beijing, China.
Gö	Institut und Museum für Geologie und Paläontologie, Georg-August-Universität, Göttingen, Germany.
GPIT	Geologisch-Paläontologisches Institut, Universität Tübingen, Germany.
HFUT	Paleontological lab of Hefei University, Hefei, Anhui, China.
IVPP	Institute for Vertebrate Paleontology and Paleoanthropology, Beijing, China.
CCCGS	Chengdu Center of China Geological Survey, Chengdu, China.
LWL	Museum für Naturkunde, Münster, Germany.
MB. R	Natural History Museum (Fossil Reptile Collection), Humboldt University, Berlin, Germany.
MCSNIO	Museo Civico di Scienze Naturali, Induno Olona, Italy.
MCSNM	Museo Civico di Storia Naturale, Milano, Italy.
MFSN	Museo Friulano di Storia Naturale, Udine, Italy.
MGSB	Museo y Laboratorio de Geología, Seminario de Barcelona, Spain.
MNHN	Muséum National d'Histoire Naturelle, Paris, France.
NMNS	National Museum of Natural Science, Taiwan, China.
PIMUZ	Paläontologisches Institut und Museum der Universität Zürich, Zürich, Switzerland.
SMF	Forschungsinstitut und Naturmuseum Senckenberg, Frankfurt a.M., Germany.
SMNS	Staatliches Museum für Naturkunde, Stuttgart, Germany.
UMO	Urwelt-Museum Oberfranken, Bayreuth, Germany.
UW	University of Wyoming Museum of Natural History, Laramie, Wyoming, USA.
XNGM	Xingyi National Geopark Museum, Xingyi, Guizhou, China.
ZMNH	Zhejiang Museum of Natural History, Hangzhou, Zhejiang, China.

Taxa	Personally examined specimens	Referred literature
<i>Trilophosaurus</i>	FMNH PR259 (cast)	Gregory, 1945 ¹⁴ Demar and Bolt, 1981 ¹⁵ Heckert et al., 2001 ¹⁶ Spielmann et al., 2005 ¹⁷ Heckert et al., 2006 ¹⁸ Mueller and Parker, 2006 ¹⁹ Spielmann et al., 2007 ²⁰ Nesbitt et al., 2015 ²¹
<i>Macrocnemus</i>	PIMUZ T 1559 PIMUZ T 2470 PIMUZ T 2472 PIMUZ T 2473 PIMUZ T 2474 PIMUZ T 2475 PIMUZ T 2476 PIMUZ T 2816 PIMUZ T 5918 PIMUZ T 2477 PIMUZ T 4822 GMPKU-P-3001 IVPP V 15001	Peyer, 1937 ²² Kuhn-Schnyder, 1962 ²³ Rieppel and Gronowske, 1981 ²⁴ Rieppel, 1989 ²⁵ Li et al., 2007 ²⁶ Zhang et al., 2010 ²⁷ Jiang et al., 2011 ²⁸ Fraser and Furrer, 2013 ²⁹ Pritchard et al., 2015 ³⁰
<i>Langobardisaurus</i>	MCSNB 2883 MCSNB 4860 MFSN 1921	Renesto, 1994 ³¹ Renesto and Dalla Vecchia, 2000 ³² Renesto et al., 2002 ³³ Saller et al., 2013 ³⁴ Pritchard et al., 2015 ³⁰
<i>Tanystropheus</i>	MCSNM BES SC 111 MCSNM BES SC 265 MCSNM BES SC 1018 MCSNM V3663 MCSNM V3730 MFSN 25761 MFSN 26829 MFSN 31573 PIMUZ T 2482 PIMUZ T 2483 PIMUZ T 2484 PIMUZ T 2790 PIMUZ T 1277 PIMUZ T 2791 GMPKU-P-1527	Peyer, 1931 ³⁵ Wild, 1973 ³⁶ Wild, 1980a ³⁷ Wild, 1980 ³⁸ Wild and Oosterink, 1984 ³⁹ Dalla Vecchia, 2000 ⁴⁰ Rieppel, 2001 ² Renesto, 2005 ⁴¹ dalla Vecchia, 2006 ⁴² Li, 2007 ⁴³ Nosotti, 2007 ⁴⁴ Rieppel et al., 2010 ⁴⁵ Pritchard et al., 2015 ³⁰

	IVPP V 14472	
<i>Dinocephalosaurus</i>	IVPP V13767 IVPP V13898 LPV 30280 LPV 30174	Li, 2003 ⁴⁶ Li et al., 2004 ⁴⁷ Rieppel et al., 2008 ⁴⁸ Liu et al., 2017 ⁴⁹
<i>Protorosaurus</i>	NHMW 194314 NHMW 1974-1635 (cast)	Seeley, 1887 ⁵⁰ Romer, 1947 ⁵¹ Evans and King, 1993 ⁵² Gottmann-Quesada and Sander, 2009 ⁵³
<i>Jesairosaurus</i>	MNHN ZAR 6 MNHN ZAR 15	Jalil, 1997 ⁵⁴
<i>Placodus</i>	UMO uncatologued UMO BT 13 UMO BT 725 UMO BT 742 UMO BT 745 UMO BT 746 UMO BT 747 UMO BT 1210 UMO BT 2174 BGR 5578 SMF R.359 SMF R.360 SMF R.368 SMF R.4110 SMF R.4112 GMPKU-P-1054 BSP 1912 I 75 SMNS 51982 SMNS 54547 SMNS 54552 SMNS 54571 SMNS 59824 SMNS 59826 SMNS 91424	Rieppel, 1995 ⁵⁵ Meyer, 1863 ⁵⁶ Broili, 1912 ⁵⁷ Rieppel, 2000 ⁵⁸ Jiang et al., 2008 ⁵⁹ Diedrich, 2010 ⁶⁰
<i>Corosaurus</i>	FMNH PR 135 FMNH PR 243 FMNH PR 244 FMNH PR 480 FMNH PR 1382 UW 5485 cast in MCSNM	Case, 1936 ⁶¹ Kuhn, 1964 ⁶² Rieppel, 1998 ⁶³

<i>Cymatosaurus</i>	BGR X612 BGR X613 BGR X614 BGR X1489 BGR X1490 BGR X1491 BGR X9218 BGR X9882 BGR X9883 SMNS 10109 SMNS 10977	Schrammen, 1899 ⁶⁴ Huene, 1944 ⁶⁵ Rieppel, 1997 ⁶⁶ Maisch, 2014 ⁶⁷
<i>Bobosaurus</i>	MFSN 27285	Dalla Vecchia, 2006 ⁶⁸ Fabbri et al., 2014 ⁶⁹
<i>Yunguisaurus</i>	ZMNH M 8738	Sato et al., 2010 ⁷⁰ Sato et al, 2013 ⁷¹ Shang et al., 2017 ¹³
<i>Augustasaurus</i>	FMNH PR 1974	Sander et al., 1997 ⁷² Rieppel et al., 2002 ⁷³
<i>Pistosaurus</i>	UMO uncataloged SMF R4041 SMNS 1932 SMNS 56984 SMNS 90076 SMNS 90765 GPIT 1753 (cast)	Meyer, 1839 ⁷⁴ Meyer, 1847-55 ⁷⁵ Sues, 1987 ⁷⁶
<i>Simosaurus</i>	MB.R 52 FMNH 405 (cast of UC 405) MNHN AC 9025 MNHN AC 9028 SMNS 7861 SMNS 7862 SMNS 7956 SMNS 10360 SMNS 11364 SMNS 14733 SMNS 15012 SMNS 16363 SMNS 16700 SMNS 17590 SMNS 18220 GPIT VIII & IX GPIT NC03K07 MFSN 31870	Meyer, 1847-55 ⁷⁵ Huene, 1921 ⁷⁷ Rieppel, 1994 ⁶ Rieppel, 1994 ⁷⁸ Rieppel, 2000 ⁷⁹ Dalla Vecchia, 2008 ⁸⁰

	MFSN 34884 MFSN 34904 MFSN 34905 MFSN 34913	
<i>Germanosaurus</i>	NHMW uncatalogued	Gürich, 1891 ⁸¹ Koken, 1893 ⁸² Nopcsa, 1928 ⁸³ Rieppel, 1997 ⁶⁶
<i>Ceresiosaurus</i>	PIMUZ T2460 (cast) PIMUZ T 2461 PIMUZ T 5151 PIMUZ T 5559	Peyer, 1931 ⁸⁴ Hänni, 2004 ⁸⁵ Quesada and Aguera, 2005 ⁸⁶
<i>L. balsami</i>	PIMUZ T 4829 (cast) PIMUZ T 4849 (cast) PIMUZ T 4850 (cast) PIMUZ T 4853 (cast) PIMUZ T 4854 (cast) PIMUZ T 4856 (cast) SMF R. 13 MGSB M-502 MGSB M-506 MGSB M-509	Curioni, 1847 ⁸⁷ Boulenger, 1896 ⁸⁸ Bassani, 1886 ⁸⁹ Mariani, 1923 ⁹⁰ Zapfe and König, 1980 ⁹¹ Ticli, 1984 ⁹² Mazin, 1985 ⁹³ Kuhn-Schnyder, 1987 ⁹⁴ Renesto, 1993 ⁹⁵ Rieppel, 1994 ⁹⁶
<i>L. buzzii</i>	PIMUZ T 2804	Tschanz, 1989 ⁹⁷ Rieppel, 1998 ⁹⁸
<i>L. curionii</i>	PHVR 1	Kuhn-Schnyder, 1987 ⁹⁴ Rieppel, 1998 ⁹⁸
<i>L. hongguoensis</i>	GMPKU-P-1011	Jiang et al., 2006 ⁹⁹
<i>L. valceresii</i>	MCSNIO P701	Tintori and Renesto, 1990 ¹⁰⁰ Renesto, 2004 ¹⁰¹
<i>L. xingyiensis</i>	IVPP V 11866 XNGM WS-30-R19	Li and Rieppel, 2002 ¹⁰² Lin et al., 2017 ¹⁰³
<i>N. marchicus</i>	MB.R.1 MB.R.4 MB.R.5 MB.R.6 MB.R.27 SMF R-4572 SMNS 80460	Koken, 1893 ⁸² Edinger, 1921 ¹⁰⁴ Rieppel and Wild, 1996 ¹⁰⁵
<i>N. venustus</i> (<i>N. marchicus</i>)	SMF R4537	Koken, 1893 ⁸²
<i>N. schroederi</i> (<i>N. marchicus</i>)	BGR X611 BGR X9790	Huene, 1944 ⁶⁵

	BGR X9892	
<i>N. mirabilis</i>	BSP 1935 I 16 BSP 1952 XV 108 SMF R473 SMNS 7214 SMNS 10806 SMNS 16433 SMNS 16851 SMNS 17213 SMNS 17822 SMNS 18001 SMNS 18058 SMNS 18210 SMNS 18475 SMNS 51972 SMNS 55298 SMNS 56685 SMNS 56286 SMNS 57047 SMNS 58815 SMNS 59074 SMNS 80204 SMNS 81311 SMNS 81655 SMNS 82025 SMNS 84575 SMNS 91468 UMO 1000 UMO BT667 UMO BT669 UMO BT671 UMO BT690 UMO BT724	Münster, 1834 ¹⁰⁶ Meyer, 1847-55 ⁷⁵ Quenstedt, 1852 ¹⁰⁷ Berckhemer, 1930 ¹⁰⁸ Rieppel, 1993 ¹⁰⁹ Rieppel and Wild, 1996 ¹⁰⁵
<i>N. bergeri (N. mirabilis)</i>	G ö 756-1	Meyer, 1847-55 ⁷⁵
<i>N. jagisteus</i>	SMNS 56618	Rieppel, 2001 ¹¹⁰
<i>Paranothosaurus</i>	MFSN 15329 MFSN 16849 MFSN 16850 MFSN 16851 MFSN 19288 MFSN 19866 PIMUZ T 4829 SMNS 55298	Peyer, 1939 ¹¹¹ Kuhn-Schnyder, 1966 ¹¹²
<i>N. yangjuanensis</i>	GMPKU-P-1080	Jiang et al., 2006 ¹¹³

	GMPKU-P-3014 IVPP V 14294 IVPP V 14301	Shang et al., 2006 ¹¹⁴ Yin et al., 2014 ¹¹⁵
<i>N. youngi</i>	IVPP V 13590 XNGM WS-30-R19	Li et al., 2004 ¹¹⁶ Ji et al., 2014 ¹¹⁷
<i>Anarosaurus</i>	Gö Orig. Nr. 409-1 (cast)	Dames, 1890 ¹¹⁸ Rieppel, 1995 ¹¹⁹ Klein, 2009 ¹¹ ; Klein, 2012 ¹²
<i>Dactylosaurus</i>	BGR X10000 SMNF R-4097 (cast) FMNH PR2660 (cast)	Gürich, 1884 ¹²⁰ Nopcsa, 1928 ⁸³ Sues and Carroll, 1985 ¹²¹ Rieppel, 1993 ¹²²
<i>Neusticosaurus pusillus</i>	FMNH PR 421 FMNH PR 2020 FMNH PR 2657	Nopcsa, 1928 ⁸³ Sues and Carroll, 1985 ¹²¹ Rieppel, 1993 ¹²² Curioni, 1847 ⁸⁷ Seeley, 1882 ¹²³ Nopcsa, 1928 ⁸³ Pinna, 1967 ¹²⁴ Carroll and Gaskill, 1985 ¹²⁵ Sander, 1989 ¹²⁶ Rieppel and Lin, 1995 ⁵ Renesto, 2006 ¹²⁷
<i>Serpianosaurus</i>	MCSNM BES SC 1017 MCSNM BES SC 1280 PIMUZ T 90 PIMUZ T 1071 PIMUZ T 3675 PIMUZ T 3931	Rieppel, 1989 ¹²⁸ Rieppel and Lin, 1995 ⁵ Rieppel and Hagdorn, 1997 ¹²⁹ Hugi and Scheyer, 2012 ¹³⁰ Beardmore et al., 2012 ¹³¹
<i>Keichousaurus</i>	GMPKU-P-1962 GMPKU-P-1154 HFUT JYS 15-001 HFUT JYS 15-002 HFUT JYS 15-003 HFUT JYS 15-004 HFUT JYS 15-005 HFUT JYS 15-006 HFUT JYS 15-007 HFUT JYS 15-008 HFUT JYS 15-009 HFUT JYS 15-010 HFUT JYS 15-011	Young, 1958 ¹³² Lin and Rieppel, 1998 ¹³³ Holmes et al., 2008 ¹³⁴ Cheng et al., 2009 ¹³⁵ Motani et al., 2015 ¹³⁶ Xue et al., 2015 ¹³⁷

	HFUT JYS 15-012 HFUT JYS 15-013 HFUT JYS 15-014 HFUT JYS 15-015 HFUT JYS 15-016 HFUT JYS 15-017 HFUT JYS 15-018 HFUT JYS 15-019 HFUT JYS 15-020 HFUT JYS 16-001 HFUT JYS 16-002 HFUT JYS 16-003 HFUT JYS 16-004 HFUT JYS 16-005 SMF R 4941 SMF R 4944 XNGM WS-31-R9 XNGM WS-31-R10 XNGM WS-31-R11 XNGM WS-31-R18 XNGM WS-31-R41 BSP 1995 I 42	
<i>Dianopachysaurus</i>	LPV 31365	Liu et al., 2011 ¹
<i>Diandongosaurus</i>	IVPP V17661 PKU NMNS-000933-F0349 8	Shang et al., 2011 ¹³⁸ Sato et al., 2014 ¹³⁹ Liu et al., 2015 ¹⁴⁰
<i>Hanosaurus</i>	IVPP V 3231	Young, 1972 ¹⁴¹ Rieppel, 1998 ¹⁴²
<i>Majiashanosaurus</i>	AGM-AGB5954	Jiang et al., 2014 ¹⁴³
<i>Rhaeticosaurus</i>	LWL-MFN P 64047	Wintrich et al., 2017 ¹⁴⁴

Supplementary Table 2. List of all complete specimens of Triassic

eosauropterygians with the measurements of total length (TL) and standard length

(SL). *Nothosaurus* and *Lariosaurus* are abbreviated.

Taxon	TL (mm)	SL (mm)	lg TL	lg SL	Specimen Number	Referred Literature
<i>Ceresiosaurus</i>	1010	43	3.0043	1.6335	PIMUZ T2460	Peyer, 1931 ⁸⁴
	2470	111	3.3927	2.0453	PIMUZ T4836	Peyer, 1931 ⁸⁴
<i>L. valceresii</i>	1100	40	3.0414	1.6021	MSCNIO P 500	Tintori and Renesto, 1990 ¹⁰⁰
<i>L. xingyiensis</i>	1400	67	3.1461	1.8261	V 11866	Li and Rieppel, 2002 ¹⁰²
	740	37	2.8692	1.5682	XNGM WS-30-R-19	Lin et al., 2017 ¹⁰³
<i>Paranothosaurus</i>	4010	200	3.6031	2.3010	PIMUZ T4829	Peyer, 1939 ¹¹¹
<i>N. yangjuanensis</i>	2400	100	3.3802	2.0000	GMPKU-P-3014	Yin et al., 2014 ¹¹⁵
<i>N. youngi</i>	1550	72	3.1903	1.8573	WS-30-R24	Ji et al., 2014 ¹¹⁷
<i>Serpianosaurus</i>	680	32	2.8325	1.5051	PIMUZ T 3931	Rieppel, 1989 ¹²⁸
	510	22	2.7076	1.3424	PIMUZ T 3675	Personal observation
<i>Dactylosaurus</i>	260	15	2.4150	1.1761	SMF R 4097a	Sues and Carroll, 1985 ¹²¹
<i>Neusticosaurus</i>	288	14.2	2.4594	1.1523	PIMUZ T 3671	Sander, 1989 ¹²⁶
	330	16.7	2.5185	1.2227	PIMUZ T 3934	
	210	13	2.3222	1.1139	PIMUZ T 3615	
	450	25	2.6532	1.3979	PIMUZ T 3430	
	310	17	2.4914	1.2304	PIMUZ T 3932	

	170	8.5	2.2304	0.9294	PIMUZ T 3393	Carroll and Gaskill, 1985 ¹²⁵
	430	24	2.6335	1.3802	PIMUZ T 3445	
	490	33	2.6902	1.5185	MSNM V 3549	
<i>Keichousaurus</i>	49.5	2.5	1.6946	0.3979	NMNS-chw-01	Cheng et al., 2009 ¹³⁵
	74.5	4	1.8722	0.6021	NMNS-chw-02	
	55	3	1.7404	0.4771	NMNS-chw-03	
	55.2	3	1.7419	0.4771	NMNS-chw-04	
	297	18.2	2.4728	1.2601	NMNS-cyn 2002-01	
	241	13	2.3820	1.1139	NMNS-cyn 2002-02	
	212.5	12.5	2.3274	1.0969	NMNS-cyn 2002-03	
	286	15.5	2.4564	1.1903	NMNS-cyn 2002-04	
	216	11	2.3345	1.0414	NMNS-cyn 2002-05	
	325	18.5	2.5119	1.2672	NMNS-cyn 2002-06	
	296	16	2.4713	1.2041	NMNS-cyn 2002-07	
	283.8	14.5	2.4530	1.1614	NMNS-cyn 2002-08	
	230	13.8	2.3617	1.1399	NMNS-cyn 2002-10	
	248.5	15	2.3953	1.1761	NMNS-cyn 2002-11	
	300	17	2.4771	1.2304	NMNS-cyn 2002-12	
	87.5	4.8	1.9420	0.6812	NMNS-cyn 2002-13	
	206	11.5	2.3139	1.0607	NMNS-cyn 2002-14	
	308	16.5	2.4886	1.2175	NMNS-cyn 2003-15	
	228	12	2.3579	1.0792	NMNS-cyn 2003-16	
	434	21	2.6375	1.3222	NMNS-cyn 2003-17	

	241.8	12.8	2.3835	1.1072	NMNS-cyn 2003-18	
	160	8.5	2.2041	0.9294	NMNS-cyn 2003-19	
	264	17	2.4216	1.2304	NMNS-cyn 2003-21	
	197	16	2.2945	1.2041	NMNS-cyn 2003-22	
	182	9	2.2601	0.9542	NMNS-cyn 2003-23	
	249	13.8	2.3962	1.1399	NMNS-cyn 2003-24	
	281	17	2.4487	1.2304	NMNS-cyn 2003-25	
	223	11	2.3483	1.0414	NMNS-cyn 2003-26	
	240	14	2.3802	1.1461	NMNS-cyn 2003-27	
	327	16.5	2.5145	1.2175	NMNS-cyn 2005-01	
	231	12	2.3636	1.0792	NMNS-cyn 2005-02	
	319	18	2.5038	1.2553	NMNS-cyn 2005-03	
	176.5	9.2	2.2467	0.9638	NMNS-cyn 2005-04	
	207.5	11.2	2.3170	1.0492	NMNS-cyn 2005-05	
	284	16	2.4533	1.2041	NMNS-cyn 2005-06	
	211.8	11	2.3259	1.0414	NMNS-cyn 2005-07	
	282	15	2.4502	1.1761	NMNS-cyn 2005-08	
	281	12	2.4487	1.0792	NMNS-cyn 2005-09	
	256	16	2.4082	1.2041	NMNS-cyn 2005-10	
	287	15.8	2.4579	1.1987	NMNS-cyn 2005-11	
	290	16	2.4624	1.2041	NMNS-cyn 2005-12	
	169	8.8	2.2279	0.9445	NMNS-cyn 2005-13	
	231.5	12.2	2.3646	1.0864	NMNS-cyn 2005-14	
	263	14	2.4200	1.1461	NMNS-cyn 2005-15	

	232	13	2.3655	1.1139	NMNS-cyn 2005-16	
<i>Keichousaurus</i>	207	10	2.3160	1.0000	NMNS-cyn 2005-17	
	281	16.5	2.4487	1.2175	NMNS-cyn 2005-18	
	207	11	2.3160	1.0414	NMNS-cyn 2005-19	
	178.5	9	2.2516	0.9542	NMNS-cyn 2005-20	
	268	15.5	2.4281	1.1903	NMNS-cyn 2005-21	
	258	14	2.4116	1.1461	NMNS-cyn 2005-22	
	213	11	2.3284	1.0414	NMNS-cyn 2005-23	
	280	15	2.4472	1.1761	NMNS-cyn 2005-24	
	175	10.5	2.2430	1.0212	NMNS-cyn 2005-25	
	227	11	2.3560	1.0414	NMNS-cyn 2005-26	
	186	10.5	2.2695	1.0212	NMNS-cyn 2005-27	
	281	16.5	2.4487	1.2175	NMNS-cyn 2005-28	
	93	4.8	1.9685	0.6812	NMNS-cyn 2005-29	
	217	11	2.3365	1.0414	NMNS-cyn 2005-30	
	185	10.5	2.2672	1.0212	NMNS-cyn 2005-31	
	224	12	2.3502	1.0792	NMNS-cyn 2005-32	
	65	3.2	1.8129	0.5051	NMNS-kiko 2004-01	
	52.3	3	1.7185	0.4771	NMNS-kiko 2004-03	
	143	8	2.1553	0.9031	NMNS-kiko 2005-X	
	120	6.5	2.0792	0.8129	NMNS-kiko 2005-Y	
	328	17	2.5159	1.2304	NMNS-kiko 2005-XX	
	117.5	6.5	2.0700	0.8129	NMNS-kiko 2005-YY	
	118	7	2.0719	0.8451	NMNS000933-F0034394	

	194	10.5	2.2878	1.0212	NMNS-VL-191	Peraonal observation
	335	16.5	2.5250	1.2175	HFUT JYS-15-001	
	245	13.2	2.3892	1.1206	HFUT JYS-15-002	
	160	8.1	2.2041	0.9085	HFUT JYS-15-011	
<i>Dianopachysaurus</i>	170	9.5	2.2304	0.9777	LPV 31365	Liu et al., 2011 ¹
<i>Diandongosaurus</i>	288	16.4	2.4594	1.2148	IVPP V 17761	Shang et al., 2011 ¹³⁸
	348	18.6	2.5416	1.2695	PKU NMNSS00093-F034398	Sato et al., 2014 ¹³⁹
	275	16.2	2.4393	1.2095	BGPDB-R0001	Liu et al., 2015 ¹⁴⁰
<i>Dianmeisaurus</i>	315	16.1	2.4983	1.2068	IVPP V 18630	Shang et al., 2015 ¹⁴⁵
	250	13.5	2.3979	1.1303	IVPP V 17054	Shang et al., 2017 ¹⁴⁶
<i>Dawazisaurus</i>	423.8	23	2.6272	1.3617	NMNS000933-F034397	Cheng et al., 2016 ¹⁴⁷
<i>Panzhousaurus</i>	344	22.7	2.5366	1.3560	GMPKU-P-1059	Jiang et al., 2019 ¹⁴⁸
<i>Yunguisaurus</i>	2000	80	3.3010	1.9031	NMNS 004529/F003862	Sato et al., 2010 ⁷⁰
	4200	150	3.6232	2.1761	ZMNH M8738	Sato et al, 2013 ⁷¹
<i>Wangosauurus</i>	3000	111	3.4771	2.0453	GMPKU-P-1529	Ma et al., 2015 ¹⁴⁹
<i>L. sanxiaensis</i>	1496	70	3.1749	1.8451	HFUT YZS-16-01	

Supplementary Table 3. Dataset of geological stage boundaries of 36 taxa with first appearance datum (FAD) and last appearance datum (LAD) in this study (data compiled from references in Supplementary Table 1).

	FAD (Ma)	LAD (Ma)
Araeoscelidia	303.7	272.5
Younginiformes	251.9	247.2
Archosauromorpha	251.9	227
<i>Placodus</i>	247.2	237
<i>Corosaurus</i>	251.2	247.2
<i>Majiashanosaurus</i>	251.2	247.2
<i>Hanosaurus</i>	251.2	247.2
<i>L. buzzii</i>	247.2	237.0
<i>L. hongguoensis</i>	247.2	242.0
<i>L. sanxiaensis</i>	251.2	247.2
<i>L. balsami</i>	242.0	237.0
<i>L. curionii</i>	242.0	237.0
<i>L. valceresii</i>	242.0	237.0
<i>N. marchicus</i>	242.0	237.0
<i>N. yangjuanensis</i>	247.2	242.0
<i>N. mirabilis</i>	242.0	237.0
<i>Paranothosaurus</i>	242.0	237.0
<i>Ceresiosaurus</i>	242.0	237.0

<i>N. jagisteus</i>	242.0	237.0
<i>Simosaurus</i>	242.0	227.0
<i>Germanosaurus</i>	247.2	242.0
<i>N. youngi</i>	242.0	237.0
<i>L. xingyiensis</i>	242.0	237.0
<i>Diandongosaurus</i>	247.2	242.0
<i>Dianopachysaurus</i>	247.2	242.0
<i>Keichousaurus</i>	242.0	232.0
<i>Dactylosaurus</i>	247.2	242.0
<i>Anarosaurus</i>	247.2	242.0
<i>Serpianosaurus</i>	242.0	237.0
<i>Neusticosaurus pusillus</i>	242.0	237.0
<i>Cymatosaurus</i>	247.2	242.0
<i>Augustasaurus</i>	247.2	242.0
<i>Pistosaurus</i>	247.2	242.0
<i>Yunguisaurus</i>	242.0	235
<i>Bobosaurus</i>	237.0	232.0
Plesiosauria	208.5	66.0

Supplementary Table 4. Dataset of geological stage boundaries of 24

eosauropterygian taxa¹⁴⁸ with FAD and LAD (compiled from the references in Supplementary Table 1).

	FAD (Ma)	LAD (Ma)
<i>Hanosaurus</i>	251.2	247.2
<i>Wumengosaurus</i>	247.2	242.0
<i>Qianxisaurus</i>	242.0	237.0
<i>Serpianosaurus-Neusticosaurus</i>	242.0	237.0
<i>Anarosaurus-Dactylosaurus</i>	247.2	242.0
<i>Panzhousaurus</i>	247.2	242.0
<i>Dianopachysaurus</i>	247.2	242.0
<i>Keichousaurus</i>	242.0	232.0
<i>Simosaurus</i>	242.0	227.0
<i>Corosaurus</i>	251.2	247.2
<i>Cymatosaurus</i>	247.2	242
<i>Germanosaurus</i>	247.2	242
<i>Nothosaurus</i>	247.2	237.0
<i>Lariosaurus</i>	247.2	237.0
<i>Wangosaurus</i>	242	235
<i>Yunguisaurus</i>	242	235
<i>Augustasaurus</i>	247.2	242
<i>Pistosaurus</i>	247.2	242

<i>Plesiosaurus</i>	208.5	66
<i>Bobosaurus</i>	237	232
<i>Majiashanosaurus</i>	251.2	247.2
<i>Diandongosaurus</i>	247.2	242
<i>Dianmeisaurus</i>	247.2	242

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