**SUPPORTING INFORMATION**

**Revision of *Erpetosuchus* (Archosauria: Pseudosuchia) and new erpetosuchid material from the Late Triassic ‘Elgin Reptile’ fauna based on µCT scanning techniques**

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Suggested RH – Erpetosuchids from the ‘Elgin Reptile’ fauna

**Supporting Table S1.** µCT specifications BGS GSM 91072-82, 91085-6 blocks; *Erpetosuchus granti* (NMS G.1992.37.1A-B), and *Erpetosuchus* sp. (AMNH 29300). For more details see source file at [MORPHOSOURCE link to be added here upon acceptance].

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| --- | --- | --- | --- |
| **Specimen number** | **Voxel size [mm]** | **Number of slices** | **Number of projections** |
| BGS GSM 91081, 91085 | 0.0836 | X=1006  Y=1434  Z=1999 | 3141 |
| BGS GSM 91086, 91073 | 0.0234 | X=1567  Y=1847  Z=2000 | 3141 |
| BGS GSM 91072 | 0.0390 | X=1187  Y=2000  Z=1998 | 3141 |
| BGS GSM 91075 | 0.0489 | X=924  Y=1759  Z=1999 | 3141 |
| BGS GSM 91075 (close-up) | 0.0248 | X=1837  Y=2000  Z=1999 | 3141 |
| BGS GSM 91077,91074 | 0.0618 | X=1546  Y=928  Z=2000 | 3141 |
| BGS GSM 91076, 91078 | 0.0733 | X=827  Y=1462  Z=2000 | 3141 |
| BGS GSM 91076, 91078 (close-up) | 0.0369 | X=1411  Y=2000  Z=1999 | 3141 |
| NMS G.1992.37.1A | 0.0624 | X=2000  Y=2000  Z=2000 | 3141 |
| NMS G.1992.37.1B | 0.0678 | X=2000  Y=2000  Z=2000 | 3141 |
| AMNH 29300 | 0.0678 | Z=1075 | NA |

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**Fig. S1. (**A) µCT of BGS GSM 91076, 91078 (close-up) and (B) NMS G.1992.37.1A showing two different style of preservation in the Lossiemouth Sandstone Formation. Abbreviations: h, humerus; ma, manus; ra, radius; ul, ulna; sc, scapula. Scale bars equal 10 mm.



**Fig. S2.** Complete strict consensus of 110 MPTs. Numbers indicate Bremer Support values higher than zero.

# **Score changes from Müller *et al.* (2020) with comments on *Erpetosuchus* sp. (AMNH 29300) based on CT scan dataset.**

In this section we report here the scores that we changed in the datamatrix of Müller *et al.* (2020). New data for *Erpetosuchus granti* are based on examination of the holotype (NHMUK PV R3139: both the blocks and multiple generations of moulds/casts) and on the µCT scans of *Erpetosuchus granti* (NMS G.1992.37.1). The latter are marked with \* and are described in detail the main text.

Character 8 (2->?): it is unclear whether in the holotype the dorsal surface of the temporal region bears a thin, blade-like sagittal crest because it is broken, and its dorsal surface is not visible.

Character 28 (2->?): the premaxilla-maxilla suture is unclear in the holotype, as such the proportions of the premaxilla main body are difficult to accurately determine.

Character 42 (?->0): the anterior alveoli of the premaxilla are not anterolaterally opened but vertically oriented.

Character 55 (0->0&1): the length of the antorbital fossa anterior to the antorbital fenestra compared to the latter is 0.24.

Character 81 (-->?): descending process of the nasal.

Character 105 (?->1): the jugal posterior process lies ventral to the anterior process of the quadratojugal.

Character 112 (1->?): it is unclear whether the frontals are fused along the midline.

Character 113 (0->?): it is unclear whether the nasofrontal suture is indeed ‘transverse’ as originally scored.

Character 263 (2->1&2): the ratio of the external mandibular fenestra compared to the dentary anterior to the fenestra is 0.59 in NHMUK PV R3139. This value is intermediate between state 1 and 2.

Character (266: 0->1): the ratio between the minimum dentary height *vs* dentary alveolar margin is 0.17 in NHMUK PV R3139.

\* Character 321 (1&3->3): our re-examination of NMS G.1992.37.1 shows that expanded spine tables are present on both cervical and dorsal (thoracic) vertebra (Figs. 3-4). However, note that they are considerably reduced in posterior dorsals (post-thoracic = posterior dorsal vertebrae with parapophyses on the centrum).

\* Character 337 (?->0): our re-examination of NMS G.1992.37.1 revealed no excavations at the base of the neural spine in cervical vertebrae (Figs. 3-4).

\* Character 335 (?->0): the postaxial cervical vertebrae of NMS G.1992.37.1 have a smooth posterior portion of the neural arch ventral to the postzygapophysis (Figs. 3-4).

\* Character 338 (?->0): the postzygapophyses of the preserved cervical vertebrae of NMS G.1992.37.1 are well separated posteriorly (Figs. 3-4).

\* Character 347 (?->1): in NMS G.1992.37.1 the tubercula of cervical and anterior dorsal ribs are long and distinct (Figs. 3-4).

\* Character 351 (?->1): in NMS G.1992.37.1, the ratio between the length and height of anterior dorsal centrum is ~1.9 (7.2 mm / 3.7 mm) (Figs. 3-4).

\* Character 352 (?->2?): in NMS G.1992.37.1, the ratio between the length and height of the most posterior preserved dorsal centrum is ~1.91 (7.00 mm / 3.60 mm), however we did not score this character because these measurements were taken on a middle/posterior caudal (see Description).

\* Character 353 (?->0): the ventral side of the centra of middle dorsal vertebrae in NMS G.1992.37.1 is transversely convex, without ridges, keel or swollen sides (Figs. 3-4).

\* Character 357 (?->1): in NMS G.1992.37.1 the ratio between the width of diapophysis and length of the centrum of the anterior dorsal is ~ (>0.75) (12 mm / 7.31 mm = 1.58) (Figs. 3-4).

\* Character 358 (?->1): the middle dorsal vertebrae of NMS G.1992.37.1 have a moderately long transverse process (Figs. 3-4).

\* Character 359 (?->0): no trace of hypospehne-hypantrum intervertebral articulation can be seen in any of the available middle dorsals of NMS G.1992.37.1.

\* Character 360 (?->0): no zygosphene-zygantrum articulation can be seen in any of NMS G.1992.37.1 dorsal vertebrae.

\* Character 361 (?->0): no dorsally opening pit at the base of the dorsal neural spines in NMS G.1992.37.1 (Figs. 3-4).

\* Character 362 (?->0): the neural spine of the anterior and middle dorsals in NMS G.1992.37.1 have a vertical anterior margin (slightly posterodorsally inclined) (Figs. 3-4).

\* Character 363 (?->0): the neural spines of the dorsal vertebrae in NMS G.1992.37.1 are rectangular (not markedly fan-shaped) in lateral view (Figs. 3-4).

\* Character 364 (?->1): neural spines of the middle dorsals of NMS G.1992.37.1 are posteriorly displaced in lateral view (from mid-length to between the zygapophyses) (Figs. 3-4).

\* Character 367 (?->0): the angle between heads and shafts of anterior dorsal ribs of NMS 1992.37.1~90 degrees.

\* Character 368 (?->0): the mid dorsal ribs of NMS G.1992.37.1 are dicephalous.

\* Character 393 (?->0): there is no tuber on the lateral scapula just distal to the glenoid fossa in either NHMUK PV R3139 or NMS G.1992.37.1 (see also Nesbitt and Butler 2013) (Figs. 1-2).

\* Character 394 (?->0): no diagonal ridge can be seen on the medial surface of the scapula blade of either scapula in NMS G.1992.37.1.

Character 397 (?->0): coracoid anterior border is round in lateral view.

Character 402 (?->1): the postglenoid process is separated from the glenoid process by a notch.

Character 403 (?->0): the postglenoid process is rounded.

\* Character 424 (?->1): the deltopectoral crest of both NHMUK PV R3139 and NMS G.1992.37.1 is ~1/3 of total humerus length (Figs. 3-4).

\* Character 426 (?->1): the complete humerus of NMS G.1992.37.1 shows that no entepicondylar foramen is present (Figs. 3-4).

\* Character 427 (?->2): there is no supinator process, groove or foramen on the ectepicondylar region of the humerus of NMS G.1992.37.1 (Figs. 3-4).

\* Character 430 (?->1): the ulna of NMS G.1992.37.1 has a prominent olecranon process, which is lower than its anteroposterior depth at the base (Figs. 3-4).

\* Character 431 (?->0): the olecranon process on the ulna of NMS G.1992.37.1 tapers towards its distal end (Figs. 3-4).

\* Character 432 (?->0): the olecranon process on the ulna of NMS G.1992.37.1 is not a separate ossification (Figs. 3-4).

\* Character 433 (?->1): the proximal ulna of NMS G.1992.37.1 has a weakly developed lateral/radius tuber (Figs. 3-4).

\* Character 434 (?->0): the distal end of the ulna in NMS G.1992.37.1 is rounded (Figs. 3-4).

\* Character 435 (?->1): the ratio between the radius and humerus in NMS G.1992.37.1 is ~0.77 (36.2 / 46.4 = 0.77).

\* Character 436 (?->0): the radius is slightly shorter than the ulna in NMS G.1992.37.1, but they are subequal in length if the olecranon process is excluded from the measurement [36.2 mm *vs* 37mm (or 40 mm if considering the olecranon process)] (Figs. 3-4).

\* Character 448 (?->0): the ratio between the width of distal metacarpal I *vs* its total length (2.05/7.35= 0.27). However, note that metacarpal I of NMS G.1992.37.1 is affected by a pathology (Figs. 3-4).

\* Character 449 (?->0): there is no extensor pit on metacarpal I-III in NMS G.1992.37.1.

Character 592 (?->1): in *Erpetosuchus granti* (and BGS GSM Elgin A) the osteoderms are thinner than in other erpetosuchids, but are comparatively thick compared to the taxa in the matrix that are scored ‘0’. In accordance with these scores, we consider *Erpetosuchus granti* osteoderms as ‘thick’.

Character 593 (?->0): in *Erpetosuchus granti*, as well as other erpetosuchids there is a one-to-one osteoderms to vertebrae ratio. However, the osteoderms are aligned with the neural spines such that they cover the posterior half each vertebra and the anterior half of the one posterior to it. This is a consequence of the neural spine being placed in the posterior half of each vertebra. However, the one-to-one ratio is still maintained.

\* Character 600 (?->2): a row of ventral osteoderms is present in NMS G.1992.37.1 (Figs. 3-4).

\* Character 602 (?->2): the scapula of NMS G.1992.37.1 is transversely smoothed (there is no the posterior edge dorsal to the glenoid region) (Figs. 3-4).

\* Character 659 (?->1): the position of the parapophyses of the middle-posterior dorsal vertebrae of NMS G.1992.37.1 are placed entirely on the neural arch (they do not touch the lateral margin of the centrum) (Figs. 3-4).

\* Character 660 (?->1): the diapophyses of the dorsal vertebrae of NMS G.1992.37.1 are aligned with the middle portion of the neural arch/centrum (Figs. 3-4).

\* Character 661 (?->0): the ribs of the posterior dorsal vertebrae of NMS 1992.37.1 are unfused to the centrum (Figs. 3-4).

\* Character 662 (?->0): in NMS G.1992.37.1, the neural spines of the dorsal vertebrae are approximately the same height as the neural spines of the posterior cervical vertebrae (Figs. 3-4).

The novel observations on *Erpetosuchus* sp. (AMNH 29300), described in the main text, warrant changing the scores of 20 character states in this taxon in Müller *et al.* (2020) dataset:

Character 15 (?->0): absence of secondary antorbital fenestra.

Character 54 (1&2&3->3): antorbital fossa anterior and ventral to the antorbital fenestra.

Character 69 (?->0): absence of anterior edentulous portion of the maxilla.

Character 101 (?->1): the jugal posterior process has a distinct lateroventral orientation with respect to the skull axis.

Character 105 (?->1): the jugal posterior process lies ventral to the anterior process of the quadratojugal.

Character 203 (?->1): the ectopterygoid body curves anterodorsally.

Character 204 (?->1): the ectopterygoid has a complex overlap with the pterygoid.

Character 205 (?->1): the ectopterygoid reaches the posterolateral corner of the transverse flange.

Character 206 (?->0): the ectopterygoid does not reach the maxilla.

Character 207 (?->1): the ectopterygoid has a posterior expansion in contact with the jugal.

Character 264 (?->0): the Meckelian fossa is primarily dorsomedially oriented.

Character 280 (?->2): long retroarticular process.

Character 286 (?->3): extensive surangular lateral shelf.

Character 287 (?->0): straight margin of the dorsal surangular margin.

Character 290 (?->0): angular widely exposed in lateral view.

Character 292 (?->1): angular posteroventral surface is transversely convex.

Character 293 (?->0): the articular is not fused with the prearticular.

Character 294 (?->1): foramen on the medial side of the articular.

Character 295 (?->1): articular with a ventromedially directed process.

Character 299 (0&2&4->4): thecodont tooth implantation.

# **Support for selected clades.**

Pseudosuchia is supported by six unambiguous (shared in all trees – in bold) character states, and 14 more in some trees:

All trees:

**Char. 142: 0 --> 1**

**Char. 194: 0 --> 1**

**Char. 321: 0 --> 3**

**Char. 512: 1 --> 0**

**Char. 523: 0 --> 1**

**Char. 549: 0 --> 1**

Some trees:

Char. 5: 0 --> 1

Char. 96: 0 --> 1

Char. 239: 0 --> 1

Char. 275: 1 --> 2

Char. 295: 0 --> 1

Char. 349: 2 --> 1

Char. 402: 0 --> 1

Char. 518: 0 --> 1

Char. 525: 1 --> 0

Char. 529: 1 --> 2

Char. 547: 0 --> 1

Char. 553: 0 --> 1

Char. 586: 0 --> 2

Char. 673: 1 --> 0

The monophyly of Ornithosuchidae + Erpetosuchidae is supported by six unambiguous (shared in all trees – in bold) character states, and nine more in some trees:

All trees:

**Char. 60: 0 --> 1**

**Char. 284: 1 --> 0**

**Char. 286: 1/2 --> 3**

**Char. 541: 0 --> 1**

**Char. 624: 0 --> 1**

**Char. 636: 0 --> 1**

Some trees:

Char. 54: 2 --> 3

Char. 55: 0 --> 1

Char. 92: 1 --> 2

Char. 96: 1 --> 0

Char. 146: 0 --> 1

Char. 276: 0 --> 1

Char. 327: 1 --> 2

[Char. 358: 1 --> 0] additionally present in the Strict Consensus tree

Char. 387: 0 --> 1

Char. 399: 0 --> 1

Erpetosuchidae is supported by one unambiguous character state (present in all trees – in bold), and 22 only in some trees (\* indicate characters present in the unnamed erpetosuchid, BGS GSM Elgin A):

All trees:

**Char. 101: 0 --> 1**

Some trees:

Char. 5: 1 --> 2

Char. 7: 0 --> 1

Char. 16: 2 --> 0 – but not in the Strict Consensus tree

Char. 19: 1 --> 2 – but not in the Strict Consensus tree

Char. 22: 1 --> 0

Char. 28: 2 --> 1 – but not in the Strict Consensus tree

Char. 75: 1 --> 0

Char. 111: 0 --> 1

Char. 206: 1 --> 0 – but not in the Strict Consensus tree

Char. 212: 0 --> 1

Char. 248: 0 --> 1

Char. 316: 1 --> 0

Char. 322: 1 --> 2

Char. 417: 0 --> 1

Char. 510: 1 --> 2

Char. 588: 2 --> 3

Char. 589: 0 --> 1

Char. 592: 0 --> 1

Char. 598: 0 --> 1 – but not in the Strict Consensus tree

Char. 610: 0 --> 1

Char. 613: 0 --> 1

Char. 652: 0 --> 1 – but not in the Strict Consensus tree

The clade *Erpetosuchus* + BGS GSM A + *Parringtonia* is not supported by unambiguous characters but by 12 character states present in some trees.

Some trees:

Char. 100: 1 --> 2

Char. 105: 0 --> 1

Char. 113: 0 --> 1

Char. 126: 1 --> 0

Char. 161: 1 --> 0

Char. 283: 1 --> 2

Char. 304: 2 --> 0

Char. 305: 1 --> 0

Char. 398: 1 --> 0

Char. 595: 2 --> 1

Char. 600: 0 --> 2

Char. 650: 0 --> 1

[Char. 666: 0 --> 1] additionally present in the Strict Consensus tree