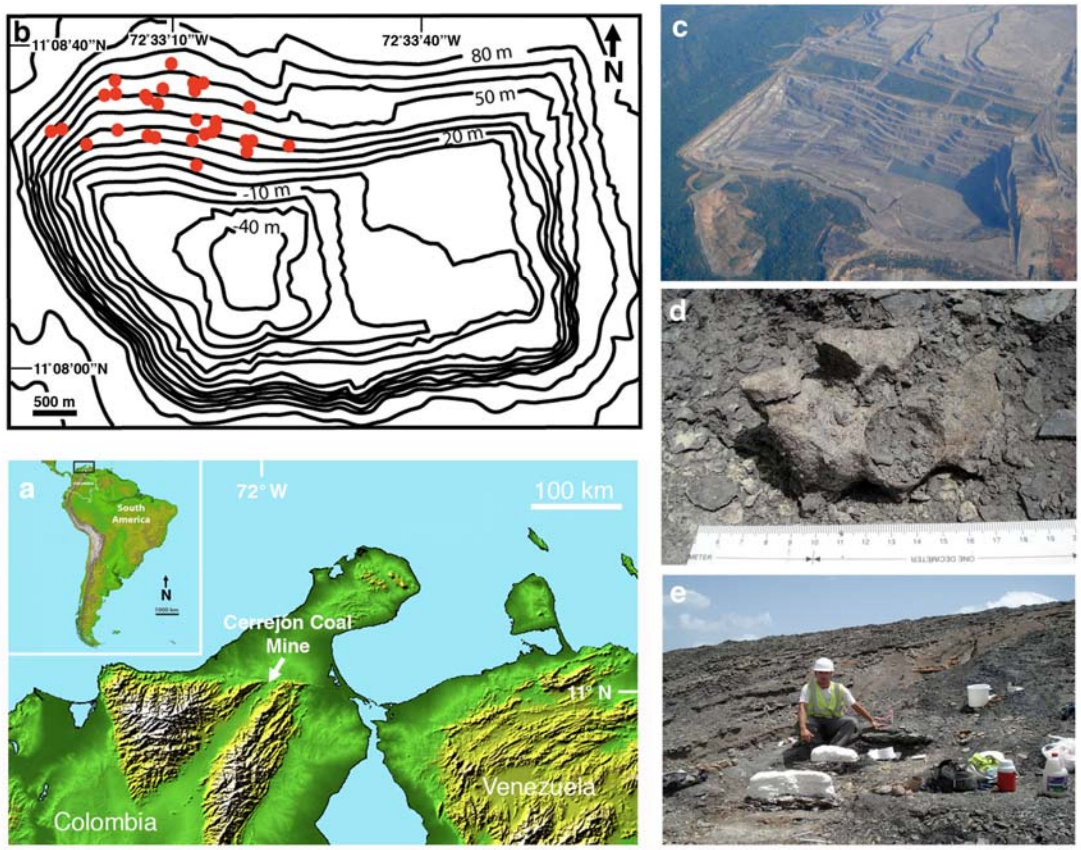
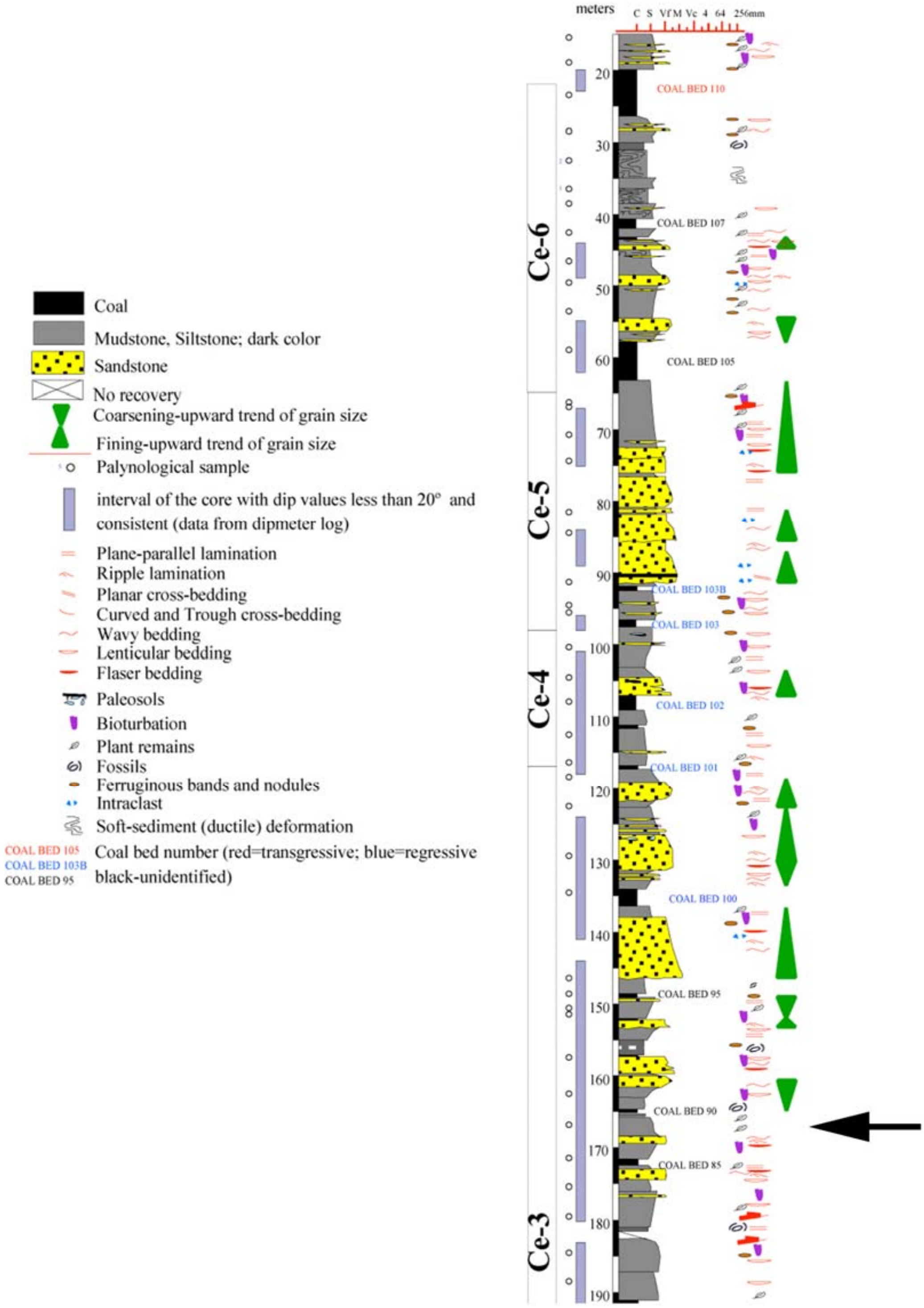
Supplementary figures: geology of Cerrejón Formation snake localities.

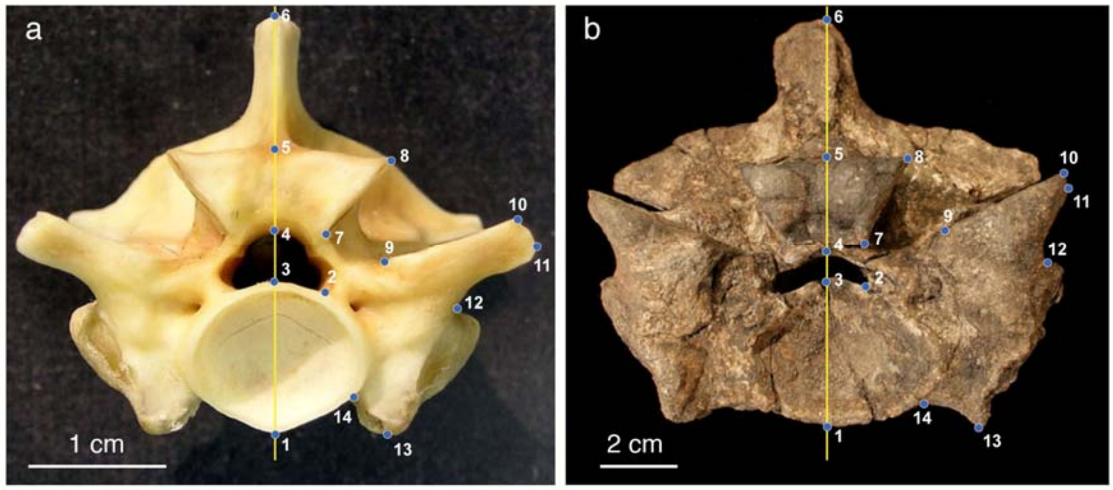


Supplementary Figure 1. A. Location of Cerrejón Coal Mine in northern Colombia, image courtesy NASA/JPL-Caltech http://www.jpl.nasa.gov/images/policy/index.cfm. B. Topographic map view of La Puente Pit, Cerrejón Coal Mine, red points indicate *Titanoboa cerrejonensis* localities. Fossils representing 28 individuals were recovered along a 1.5 km long southeast trending dipslope. C. Aerial photograph of La Puente Pit. D. Vertebra of *T. cerrejonensis* exposed in footwall of La Puente Pit. E. Articulated vertebral series of *T. cerrejonensis* in field jackets.

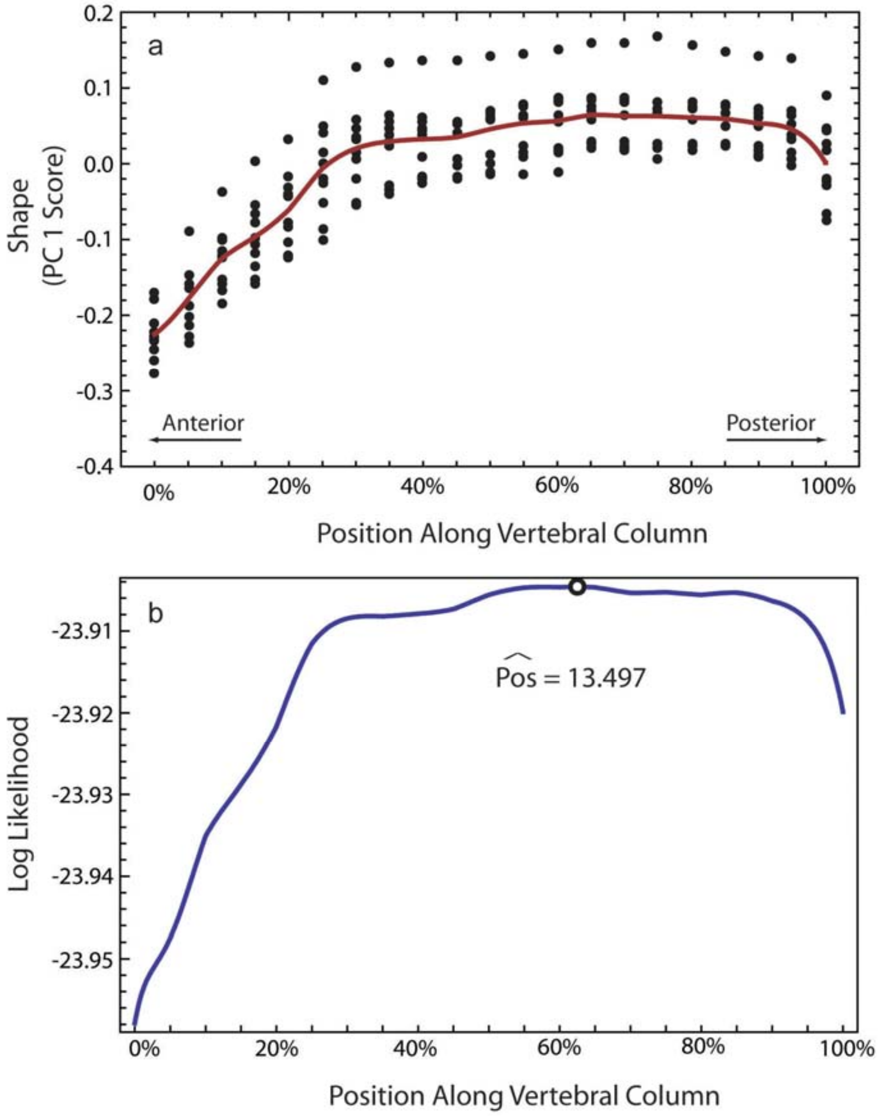


Supplementary Figure 2. Stratigraphy of the Cerrejón Formation. *Titanoboa* fossils were found in a gray claystone layer underlying coal seam 90. Column drawn by German Bayona.

Supplementary figures: Online Methods



Supplementary Figure 3. 2D homologous landmarks used in morphometric analysis demonstrated on a) *Boa constrictor* (USNM 220299) precloacal vertebrae 155, and b) *Titanoboa cerrejonensis* (holotype, UF/IGM 1), in anterior view. Morphology described by individual landmarks is as follows: 1) midline ventral margin of centrum, 2) medial contact between neural arch and centrum, 3) midline dorsal margin of centrum, 4) midline ventral margin of zygosphene, 5) midline dorsal margin of zygosphene, 6) dorsal margin of neural spine, 7) ventromedial margin of zygosphene articular facet, 8) dorsolateral margin of zygosphene articular facet, 9) ventromedial margin of prezygapophyseal articular facet, 10) dorsolateral margin of prezygapophyseal articular facet, 11) lateral margin of prezygapophyseal accessory process, 12) dorsal margin of synapophyseal articular facet, 13) ventral margin of synapophyseal articular facet, 14) contact of synapophysis with centrum. All specimens except for UF/IGM 2 were digitized on both sides of the sagittal plane and landmark coordinates were reflected to one side and averaged to minimize asymmetry and taphonomic distortion to UF/IGM 1. All specimens were digitized using TPSDig 2.1[28].



Supplementary Figure 4. A) Regression of vertebral shape on vertebral position for extant boine species. Only the first dimension of the shape space, PC 1, is shown here, though the regression was done. The spline function (red line) runs through the shape mean at each position and is interpolated between positions. We performed the same analysis with a discrete function that runs through the means but is undefined between them. B) Plot of the log likelihood function for an unknown vertebra on the continuous shape gradient function. The log likelihood is highest where the shape of the unknown best fits the shape gradient (here that position is 13.497 [60-65% along the precloacal column], where positions range from 1 to 21). The likelihood function shown here is calculated over all the PC dimensions. The similarity between the likelihood curve and fitted line in part A is coincidental. The discrete likelihood function matches unknown vertebrae only to integer positions along the shape gradient.

Institutional abbreviations- UF/IGM, University of Florida/Instituto Nacional de Investigaciones Geologico-Mineras, Bogota, Colombia; ROMV-R, Royal Ontario Museum, Recent Collection; USNM, United States National Museum, Smithsonian Institution

Supplementary Table 1. ***Titanoboa cerrejonensis*** **specimens.** The official fossil repository is Instituto Nacional de Investigaciones Geologico-Mineras, Bogota, Colombia. Complete cast collections will also be housed at the Florida Museum of Natural History, University of Florida, Gainesville.

Specimen Number	# Vertebrae	# Ribs	Max. vertebral width (mm)
UF/IGM 1	1	0	120.0
UF/IGM 2	2	0	119.0
UF/IGM 3	24	21	105.1
UF/IGM 4	13	3	110.5
UF/IGM 5	3	0	124.1
UF/IGM 6	1	0	-
UF/IGM 7	3	0	96.6
UF/IGM 8	12	1	105.7
UF/IGM 9	1	0	-
UF/IGM 10	1	0	95.9
UF/IGM 11	1	0	-
UF/IGM 12	1	0	101.4
UF/IGM 13	12	15	114.0
UF/IGM 14	15	4	54.5
UF/IGM 15	1	0	76.9
UF/IGM 16	26	0	80.2
UF/IGM 17	2	0	115.4
UF/IGM 18	2	0	121.0
UF/IGM 19	1	0	-
UF/IGM 20	1	0	-
UF/IGM 21	1	0	-
UF/IGM 22	1	0	-
UF/IGM 23	1	0	-
UF/IGM 24	6	0	-
UF/IGM 25	2	0	-
UF/IGM 26	1	0	72.0
UF/IGM 27	4	0	-
UF/IGM 28	1	0	-

Supplementary Table 2. Examined specimens (extant).

Taxon	Specimen #	SVL (mm)	TBL (mm)	Vertebral width 60% (mm)	Vertebral width 65% (mm)
Acrantophis dumerili	USNM 497683	1423	1535	6.38	6.53
Acrantophis dumerili	ROMV-R 7864	1900	2040	19.66	19.04
Acrantophis dumerili	ROMV-R 7833	2390	2480	23.50	21.42
Boa constrictor	USNM-348597	1355	1606	12.92	12.64
Boa constrictor	ROMV-R 7182	2970	3220	27.69	27.08
Boa constrictor	USNM 220299	3129	3434	28.20	28.01
Candoia carinata	USNM 348502	803	867	11.22	10.96
Corallus caninus	ROMV-R7498	1216	1450	12.20	11.80
Corallus enhydris	ROMV-R 4075	1360	1734	10.79	10.54
Epicrates anguilifer	ROMV-R 7842	1960	2330	17.61	17.97
Epicrates cenchria	ROMV-R 7902	1195	1380	11.54	11.27
Epicrates cenchria	ROMV-R 5345	1070	1210	10.65	10.22
Epicrates inornatus	ROMV-R 7900	1450	1700	11.66	11.58
Epicrates striatus	ROMV-R 7901	1385	1770	11.20	10.85
Epicrates striatus	UF63866	1950	2250	15.09	15.08
Epicrates subflavus	UF69268	1490	1720	10.80	10.66
Eunectes murinus	ROMV-R 7340	2110	2470	17.10	17.26
Eunectes murinus	ROMV-R 7285	2910	3320	24.32	23.99
Eunectes notaeus	ROMV-R 7307	2190	2510	17.67	17.24
Eunectes notaeus	ROMV-R 7286	2310	2690	24.33	23.12
Sanzinia madagascarensis	USNM 220313	1610	1760	16.15	15.69

Supplementary Table 3. Total Body length (TBL) minima and maxima of major snake taxa. Only maxima are reported for monotypic *Anilius scytale*. TBLs for pachyophiids are based on observations by J.J.H. Reported maximum TBLs for extant Boines and Pythonids are poorly constrained and are often anecdotal. We relied on the maximum verifiable first-hand measurements for both *Eunectes* and *Python*[1] Two fossil records of giant boids are not considered here: *Chubutophis*[29] is represented by a vertebrae estimated to be from a juvenile individual 5-7 meters in TBL with adult lengths for the taxon estimated to be 10-12 meters[7,29]. The ontogenetic status of the specimen is poorly constrained, however, because the characters used to assign juvenile status (poor development of a haemal keel, angle of centrum, thickness of zygosphene) are subject to considerable intracolumnar and interspecific variation. The specimen additionally includes somatically mature vertebral morphology, including a tall, well-developed neural spine. A large partial vertebral centrum from Paleogene sediments of Argentina was considered to represent a snake 15-20 meters TBL[7]. The specimen is approximately 60% the size of the *Titanoboa* paratype UF/IGM 2 (centrum length of partial centrum = ~3.2 cm, centrum length of UF/IGM 2 = 5.4 cm), but is too incomplete to determine intracolumnar position or systematic interrelationships. Methods for calculating TBL from vertebral size in both *Chubutophis* and the partial centrum were not defined. Size data for other recent and fossil snakes from literature sources [6,8,9,30-47].

Taxon	Minimum TBL	Maximum TBL

Elapidae	*Simoselaps anomalus* (21 cm)	*Ophiophagus hannah* (~5.5 m)
Lamprophiinae	*Aparallactus jacksonii* (26 cm)	*Mehelya capensis* (1.6 m)
Colubridae	*Tantilla atriceps* (23 cm)	*Pytas mucosus* (~3.5 m)
Homalopsinae	*Enhydris indica* (35 cm)	*Homalopsis buccata* (1.3 m)
Viperidae	*Bitis scheideri* (20 cm)	*Lachesis muta* (2.5 m)
Xenodermatidae	*Achalinus rufescens* (39 cm)	*Xenodermus javanicus* (67 cm)
Acrochordus	*A. granulatus* (1.6 m)	*A. dehmi* (~3 m)
Pareatidae	*Pareas margaritophorous* (43 cm)	*Alopeltura boa* (87 cm)
Bolyeriidae	*Bolyeria multicarinata* (95 cm)	*Casarea dussumieri* (1.28 m)
Tropidophiinae	*Tropidophis pardalis* (34 cm)	*Tropidophis melanurus* (1.06 m)
Ungaliophiinae	*Exiliboa placata* (41 cm)	*Ungaliophis continentalis* (75 cm)
Boinae	*Candoia carinata (paulsoni)* (137 cm)	*Titanoboa cerrejonensis* (12.8 m)
Pythonidae	*Antaresia stimsoni* (87 cm)	*Python reticulatus* (~8.3 m)/ *Liasis dubudingala* (~9 m)
Erycinae	*Eryx millaris* (50 cm)	*Lichanura trivirgata* (112 cm)
Uropeltinae	*Rhinophis travancoricus* (18 cm)	*Uropeltis macrorhynchus* (74 cm)
Cylindrophis	*C. maculatus* (60 cm)	*C. rufus* (87 cm)
Anilius scytale	-	~1 m
Typhlopidae	*Typhlops zenkeri* (13 cm)	*Rhinotyphlops schlegelii* (82 cm)
Anomalopedidae	*Helminthophis petersi* (11 cm)	*Liotyphlops albirostris* (30 cm)
Leptotyphlopidae	*Leptotyphlops carlae* (10 cm)	*Leptotyphlops humilis* (40 cm)
Madtsoiidae	*Patagoniophis australiensis* (50 cm)	*Gigantophis garstini* (10.7 m)
Palaeopheidae	*Palaeophis casei* (50 cm)	*Palaeophis colossaeus* (~9 m)
Pachyophiidae	*Pachyophis woodwardi* (~50 cm)	*Pachyrhachis problematicus* (~1.5 m)

Supplementary Notes

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