

Reporting Summary

Nature Portfolio wishes to improve the reproducibility of the work that we publish. This form provides structure for consistency and transparency in reporting. For further information on Nature Portfolio policies, see our [Editorial Policies](#) and the [Editorial Policy Checklist](#).

Statistics

For all statistical analyses, confirm that the following items are present in the figure legend, table legend, main text, or Methods section.

n/a Confirmed

- ☐ ☒ The exact sample size (n) for each experimental group/condition, given as a discrete number and unit of measurement
- ☐ ☒ A statement on whether measurements were taken from distinct samples or whether the same sample was measured repeatedly
- ☐ ☒ The statistical test(s) used AND whether they are one- or two-sided
Only common tests should be described solely by name; describe more complex techniques in the Methods section.
- ☒ ☐ A description of all covariates tested
- ☒ ☐ A description of any assumptions or corrections, such as tests of normality and adjustment for multiple comparisons
- ☒ ☐ A full description of the statistical parameters including central tendency (e.g. means) or other basic estimates (e.g. regression coefficient) AND variation (e.g. standard deviation) or associated estimates of uncertainty (e.g. confidence intervals)
- ☒ ☐ For null hypothesis testing, the test statistic (e.g. F , t , r) with confidence intervals, effect sizes, degrees of freedom and P value noted
Give P values as exact values whenever suitable.
- ☒ ☐ For Bayesian analysis, information on the choice of priors and Markov chain Monte Carlo settings
- ☒ ☐ For hierarchical and complex designs, identification of the appropriate level for tests and full reporting of outcomes
- ☒ ☐ Estimates of effect sizes (e.g. Cohen's d , Pearson's r), indicating how they were calculated

Our web collection on [statistics for biologists](#) contains articles on many of the points above.

Software and code

Policy information about [availability of computer code](#)

Data collection CT volumes were segmented and analyzed in VGSTUDIO MAX 3.2, no additional software was used for data collection.

Data analysis PAST 4.0 (Taphonomic directional analysis); TNT 1.5 (Phylogenetic analysis)

For manuscripts utilizing custom algorithms or software that are central to the research but not yet described in published literature, software must be made available to editors and reviewers. We strongly encourage code deposition in a community repository (e.g. GitHub). See the Nature Portfolio [guidelines for submitting code & software](#) for further information.

Data

Policy information about [availability of data](#)

All manuscripts must include a [data availability statement](#). This statement should provide the following information, where applicable:

- Accession codes, unique identifiers, or web links for publicly available datasets
- A description of any restrictions on data availability
- For clinical datasets or third party data, please ensure that the statement adheres to our [policy](#)

The authors declare that all data supporting the findings of this study are available in the paper and its Supplementary Information. Raw data from all CT-Scans is available at https://www.morphosource.org/concern/biological_specimens/000382748. LSID ZooBank code: urn:lsid:zoobank.org:act:992A259B-75EE-4206-89FB-6666FBCBDA6. TNT files for phylogenetic analysis are provided at doi:10.5061/dryad.pk0p2ngpj

Field-specific reporting

Please select the one below that is the best fit for your research. If you are not sure, read the appropriate sections before making your selection.

☐ Life sciences ☐ Behavioural & social sciences ☒ Ecological, evolutionary & environmental sciences

For a reference copy of the document with all sections, see [nature.com/documents/nr-reporting-summary-flat.pdf](https://www.nature.com/documents/nr-reporting-summary-flat.pdf)

Ecological, evolutionary & environmental sciences study design

All studies must disclose on these points even when the disclosure is negative.

Study description	The present study comprises the description, taphonomic assessment and phylogenetic analysis of a new Ankylosaur fossil specimen. Given the limited nature of the data no replicates were included.
Research sample	The research sample consists exclusively of the holotype of <i>Stegouros elengassen</i> . Additionally the phylogenetic analyses use five Ankylosaur character matrices published in Han et al. (2018), Raven and Maidment (2018), Arbour et al (2016), Wiersma and Irmis (2018) and Norman (2020a). Additional characters were coded for all these matrices.
Sampling strategy	A single holotype specimen was available
Data collection	The morphological data of the fossil specimen was collected and codified as discrete characters by Sergio Soto-Acuña. Morphology of the specimen was assessed directly and through 3D reconstructions based on the digital segmentation of CTscan volumes generated by José Palma-Liberona.
Timing and spatial scale	The timing of data collection is irrelevant for the present study.
Data exclusions	No data was excluded from this study.
Reproducibility	The present study does not include experimental procedures. As such, no measures were taken to verify the reproducibility of experimental findings.
Randomization	Given that the present study considers the description and phylogenetic analysis of a single fossil specimen, no randomization procedure was applicable besides the bootstrap methods applied in the phylogenetic analyses.
Blinding	Since the present study describes a single fossil specimen, no blinding procedure was used.
Did the study involve field work?	☒ Yes ☐ No

Field work, collection and transport

Field conditions	Annual rainfall is 307.5 mm and mean annual temperature is 6,5 C. These are not relevant for paleontological fieldwork studies (taphonomy, stratigraphy)
Location	50° 42' 42.72" S / 72° 32' 29, 08" W. Altitude 1128 M
Access & import/export	Access and collection was carried out with permission of landowners of Estancia Cerro Guido and of the Chilean government through permit CMN° 6079 (18.12.2017) extended to Marcelo Leppe by the National Monuments Council (CMN, Consejo de Monumentos Nacionales), Government of Chile.
Disturbance	Only transient disturbance was carried out by digging in soils and rocks not covered by vegetation (the study area consists of cold steppe, with sparse vegetation cover of altitudinal cushions and grasslands). Excavation sites were covered to protect them from erosion and left with a similar appearance as before the intervention

Reporting for specific materials, systems and methods

We require information from authors about some types of materials, experimental systems and methods used in many studies. Here, indicate whether each material, system or method listed is relevant to your study. If you are not sure if a list item applies to your research, read the appropriate section before selecting a response.

Materials & experimental systems

n/a	Involved in the study
☒	☐ Antibodies
☒	☐ Eukaryotic cell lines
☐	☒ Palaeontology and archaeology
☒	☐ Animals and other organisms
☒	☐ Human research participants
☒	☐ Clinical data
☒	☐ Dual use research of concern

Methods

n/a	Involved in the study
☒	☐ ChIP-seq
☒	☐ Flow cytometry
☒	☐ MRI-based neuroimaging

Palaeontology and Archaeology

Specimen provenance	The site of provenance (SP17) it is located in the Río de Las Chinas Valley, which is part of the Cerro Guido farm, Última Esperanza Province, Magallanes Region, southern Chile. The fossil-bearing level is located within the lower to mid section of Dorotea Formation.
Specimen deposition	CPAP-3165 is housed in the Palaeontological Collection of Antarctica and Patagonia of the Instituto Antártico Chileno (INACH), Punta Arenas, Chile
Dating methods	No new dates are provided. Datation is based on previously published studies: U-Pb maximum depositional age above and below the fossil-bearing horizons provides values between 71.7 ± 1.2 Ma and 74.9 ± 2.1 Ma (Gutiérrez et al., 2017) http://dx.doi.org/10.1016/j.tecto.2016.12.014
☐ Tick this box to confirm that the raw and calibrated dates are available in the paper or in Supplementary Information.	
Ethics oversight	No ethical approval or guidance was required. Ethical aspects deal with access and collection of fossils which was carried out with the appropriate legal permits detailed above.

Note that full information on the approval of the study protocol must also be provided in the manuscript.