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Reporting Summary

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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
<i>Only common tests should be described solely by name; describe more complex techniques in the Methods section.</i> |
| ☒ | ☐ | 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
<i>Give P values as exact values whenever suitable.</i> |
| ☒ | ☐ | 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 |

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Software and code

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

Data collection

Data analysis

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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 generated or analysed during this study, which support the results published herein, are included in this article and its Supplementary Information file. The fossils are housed in the Repositorio de Materiales Científicos y Didácticos Dr. Eduardo Musacchio of the Universidad Nacional de la Patagonia San Juan Bosco (UNPSJB) in Comodoro Rivadavia, Chubut Province, Argentina. Correspondence and requests for material should be addressed to L.M.I. Qualified researchers may access the holotypic specimen of *Joaquinraptor casali* (UNPSJB-PV 1112) and the associated crocodyliform humerus (UNPSJB-PV 1113) by contacting Gabriel Casal of the UNPSJB (paleogac@yahoo.com.ar).

Research involving human participants, their data, or biological material

Policy information about studies with [human participants or human data](#). See also policy information about [sex, gender \(identity/presentation\), and sexual orientation](#) and [race, ethnicity and racism](#).

Reporting on sex and gender	Not applicable
Reporting on race, ethnicity, or other socially relevant groupings	Not applicable
Population characteristics	Not applicable
Recruitment	Not applicable
Ethics oversight	Not applicable

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

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

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Ecological, evolutionary & environmental sciences study design

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Study description	Briefly speaking, the study entailed: (1) the collection of the fossils in the field; (2) their scientific preparation (e.g., removal of rock, reassembly, repairing of cracks and other damage, etc.) and curation in the lab; (3) their morphological description and comparison to other non-avian theropod dinosaur (primarily megaraptoran) fossils; (4) phylogenetic analyses to resolve the evolutionary affinities of the new megaraptorid taxon; and (5) the preparation of the manuscript describing the results of this work.
Research sample	Our investigation considers all available specimens of the studied taxa, and the phylogenetic analyses include the most comprehensive sample of megaraptoran theropod operational taxonomic units (OTUs) yet assembled (14 OTUs in analysis 1; 13 OTUs in analysis 2). These OTUs were scored for phylogenetic analysis based on their type specimens and all unambiguously referred specimens. Scoring for most taxa was performed by previous authors (Aranciaga Rolando et al. [2022a] and references therein), whereas scoring for the new megaraptorid taxon described herein was done by the present authors.
Sampling strategy	The taxonomic and character samples of the phylogenetic analyses were intended to be as broad as possible. To that end, we added the new Patagonian megaraptorid taxon described herein to the data matrix of Aranciaga Rolando et al. (2022a), which includes the most comprehensive megaraptoran sample of any phylogenetic dataset yet published; with the addition of the new taxon, this dataset thus becomes even more complete.
Data collection	Morphological and phylogenetic data for the new Patagonian megaraptorid taxon described herein were collected primarily by the first two authors (L.M.I. and M.C.L.) in consultation with one another.
Timing and spatial scale	Morphological data were collected intermittently between late 2019 and early 2025 as the authors' time allowed. The majority of the phylogenetic data were collected in early 2023 during a visit by the first two authors (L.M.I. and M.C.L.) to the Repositorio de Materiales Científicos y Didácticos Dr. Eduardo Musacchio of the UNPSJB (where the fossils are housed).
Data exclusions	Our phylogenetic analysis 1 included all OTUs within the data matrix, whereas analysis 2 excluded the fragmentary taxon <i>Aoniraptor libertatem</i> . <i>A. libertatem</i> was excluded from analysis 2 because it was found to be the least stable megaraptoran OTU in analysis 1, due in large part to its fragmentary preservation (i.e., this taxon is presently known from less than 15% of the skeleton).
Reproducibility	As noted above, our phylogenetic data matrix is modified from that published by Aranciaga Rolando et al. (2022a), which was itself altered from that produced by Aranciaga Rolando et al. (2019) (with character descriptions as edited and presented by Lamanna et al. [2020]). All previous modifications to this matrix are described in Aranciaga Rolando et al. (2022a) and its associated Supplementary Information. The only substantive modification we made to the matrix of Aranciaga Rolando et al. (2022a) for the present project was to add character scores for the new Patagonian megaraptorid taxon we describe; as did Lamanna et al. (2020), we also subtly edited the descriptions of some characters for clarity without changing their meanings. This prior documentation as well as the accessibility of our data matrix (and its source matrices) will allow for the replication of our analyses. Regarding replications in our phylogenetic analyses themselves, each analysis (1 and 2) was conducted under equally weighted parsimony using TNT 1.5 (Goloboff et al., 2008). We employed the traditional search function and the tree bisection-reconnection swapping algorithm with a random seed of 1. Each traditional search included 10,000 replications with ten trees saved per replication.

Randomization	Not applicable. All available fossil material was included and the incomplete nature of the vertebrate fossil record acts as a natural randomization process.
Blinding	All megaraptoran theropod taxa are known from single (e.g., <i>Murusraptor barrosaensis</i> , <i>Tratayenia rosalesi</i>) or only a few (e.g., <i>Megaraptor namunhuaiquii</i>) relatively completely preserved specimens (at best). Thus, in our analyses, it was possible to include all available specimens for character scoring in each sampled OTU; blinding was not necessary.
Did the study involve field work?	☒ Yes ☐ No

Field work, collection and transport

Field conditions	The holotypic specimen of the new megaraptorid theropod taxon described herein (UNPSJB-PV 1112) and the associated crocodyliform humerus (UNPSJB-PV 1113) were collected during a series of brief (ca. 1–2 week) field forays between early 2019 and early 2023. Predictably, then, environmental conditions varied from year to year and field trip to field trip, although they were generally mild to warm with little precipitation but high winds.
Location	The fossils were recovered from the informally named Valle Joaquín site, near the headwaters of the Río Chico and east of the southeastern shore of Lago Colhué Huapi, in south-central Chubut Province, central Patagonia, Argentina. Geographic coordinates: 45°37'55" S, 68°25'5" W.
Access & import/export	Personnel from the Laboratorio de Paleontología de Vertebrados Dr. Rubén Martínez of the UNPSJB obtained all necessary permissions from the Subsecretaría de Cultura de la Provincia del Chubut (Argentina) and the relevant landowner to conduct the research (including field research).
Disturbance	The Valle Joaquín quarry that yielded the fossils was excavated using hand tools (e.g., pickaxes, rock hammers, chisels) and encompasses an area of approximately 15 square meters; hence, the disturbance to the local landscape was minimal.

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

Methods

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

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

Palaeontology and Archaeology

Specimen provenance	The holotypic and only known specimen of the new megaraptorid theropod taxon and the closely associated crocodyliform humerus described herein were collected by our team from the Valle Joaquín site near the headwaters of the Río Chico, east of the southeastern shore of Lago Colhué Huapi, in Chubut Province, central Patagonia, Argentina. The fossil-bearing quarry is within an upper (Maastrichtian, probably late Maastrichtian) stratum of the Upper Cretaceous Lago Colhué Huapi Formation. The specimens were collected under the auspices of permits issued by the Subsecretaría de Cultura de la Provincia del Chubut to Gabriel A. Casal from 2019–2023.
Specimen deposition	The new megaraptorid partial skeleton and the associated crocodyliform humerus are permanently repositied in the fossil vertebrate collection of the Repositorio de Materiales Científicos y Didácticos Dr. Eduardo Musacchio of the UNPSJB in Comodoro Rivadavia, Chubut Province, Argentina, under the catalog numbers UNPSJB-PV 1112 and UNPSJB-PV 1113, respectively. Both specimens are available for study by qualified researchers upon request.
Dating methods	No new numerical geochronological or biostratigraphic age dates are provided herein; nevertheless, we argue that the Valle Joaquín site and the fossils it produces are latest Cretaceous (Maastrichtian, probably late Maastrichtian) in age based on proposed correlation with and comparisons (including close similarities in clay mineralogy) to a nearby stratigraphic section that yields fossil palynomorphs that were regarded as late Maastrichtian in age by Vallati et al. (2016, 2020).
☐ 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 because our study is based on previously collected fossil specimens.

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

Plants

Seed stocks

Not applicable

Novel plant genotypes

Not applicable

Authentication

Not applicable