nature portfolio

Corresponding author(s):   Li zhiheng

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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	No software was used to collect the data.
Data analysis	GMM re-analysis were conducted using the function of gpagen(), plotRefToTarget(), and plotTangentSpace() from 'geomorph' in R.

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 major parts of images and all other data pertinent to this research are available in the main text and Supplementary Information. Other related iamge data can also be obtained from the corresponding author lizhiheng@ivpp.ac.cn

Human research participants

Policy information about studies involving human research participants and Sex and Gender in Research.

Reporting on sex and gender	N/A
Population characteristics	N/A
Recruitment	N/A
Ethics oversight	N/A

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

For a reference copy of the document with all sections, see 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	We extracted phytoliths from the stomach content of a stem avialan from Jehol Biota and those phytoliths were recognized as angiosperm leaf which represent the earliest record of leaf feeding habit in early birds.
Research sample	We sample two fragments in the stomach content of the bird specimen.
Sampling strategy	we sampled twice for the fragments in stomach content. the two experiment are repeatable and both yield phyloliths.
Data collection	Phytolith extraction was conducted at the Key Laboratory of Vertebrate Evolution and Human Origins of Chinese Academy of Sciences, Institute of Vertebrate Palaeontology and Palaeoanthropology, Chinese Academy of Sciences. Each phytolith was counted and photographed at 500×magnifcation under the Nikon Eclipse LV100P0L microscope. Mordern plants were collected from China National Botanical Garden South Garden, Gongga Mountain, Sichuan, China, Guangxi Province, China. A phenom Pro X scanning electron microscope (SEM) with EDS was taken in Department of Archaeology and Anthropology, University of Chinese Academy Beijing, China
Timing and spatial scale	The sampling were completed in 2019. Experiments were completed in 2019-2022
Data exclusions	No data were excluded
Reproducibility	We sampled two fragments of the specimen, both of which yield phytoliths; and therefore, the result is reproducible.
Randomization	N/A
Blinding	N/A

Did the study involve field work? ☐ Yes ☒ No

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
☒	☐ 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 | Specimen was acquired from Jiufotang Formation in Western Liaoning province.

Specimen deposition | Specimen have been deposited in fossil collection of Institute of Vertebrate Paleontology and Paleoanthropology (Beijing, China), with a specimen number IVPP V 14978.

Dating methods | No new dating was used.

☒ Tick this box to confirm that the raw and calibrated dates are available in the paper or in Supplementary Information.

Ethics oversight | Destructive samplings of stomach content follow the requirements and guidelines for Institute of Vertebrate Paleontology and Paleoanthropology . Permissions were acquired and granted by collection manager as well as director of the institution.

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