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Reporting Summary

Nature Research 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 Research policies, see Authors & Referees 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	Materialise 3-matic Research 12.0 (software for manipulating three-dimensional virtual objects in space; used for constructing model of pectoral girdle of Parmastega).
Data analysis	PAUP* version 4.0a and MrBayes version 3.2.6 (for 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/reviewers. We strongly encourage code deposition in a community repository (e.g. GitHub). See the Nature Research 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 list of figures that have associated raw data
- A description of any restrictions on data availability

All specimens figured and described in the paper are accessioned to the Institute of Geology, Komi Science Centre, Ural Branch of the Russian Academy of Sciences, Syktyvkar, Russia, and are deposited there. The accession code is IG KSC 705/. All the specimens are available for examination.

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	Description of fossil material of the Devonian tetrapod Parmastega aelidae.
Research sample	All known specimens of this taxon.
Sampling strategy	We excavated the fossil locality (Sosnovskiy Geological Monument, at Sosnogorsk on the bank of the Izhma River) and collected all the fossils we could find. The fossils were freed from the rock with dilute acetic acid by Pavel Beznosov.
Data collection	The primary interpretation of the fossils and the assembly of the reconstruction were undertaken by Pavel Beznosov and Per Ahlberg, working with the specimens in Syktyvkar during a series of visits by Per Ahlberg.
Timing and spatial scale	Excavations were carried out during 2002-2012.
Data exclusions	No data were excluded.
Reproducibility	Not applicable.
Randomization	Not applicable.
Blinding	Not applicable.

Did the study involve field work? ☒ Yes ☐ No

Field work, collection and transport

Field conditions	Typical summer weather in northern Russia. The weather conditions had no impact on data gathering.
Location	Sosnovskiy Geological Monument, Sosnogorsk, right bank of Izhma River, Komi Republic, Russia.
Access and import/export	The fieldwork was carried out by the Geological Institute of the Komi Science Center, Uralian Branch of the Russian Academy of Sciences, in accordance with local and national regulations. The material was not exported from Russia.
Disturbance	Blocks of limestone were removed from the riverbank. The annual ice-melt and spring flood of the Izhma River vigorously scours the banks and soon removes any trace of human disturbance.

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
☒	☐ Animals and other organisms
☒	☐ Human research participants
☒	☐ Clinical data

Methods

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

Palaeontology

Specimen provenance	The specimens come from the Sosnovskiy Geological Monument, Sosnogorsk, right bank of Izhma River, Komi Republic, Russia, and were collected by the Geological Institute of the Komi Science Center, Uralian Branch of the Russian Academy of Sciences in accordance with local and national regulations.
Specimen deposition	Geological Institute of the Komi Science Center, Uralian Branch of the Russian Academy of Sciences
Dating methods	Not applicable

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