

Peer Review Information

Journal: Nature Ecology & Evolution

Manuscript Title: A Late Devonian actinopterygian suggests high lineage survivorship across the end-Devonian Mass Extinction

Corresponding author name(s): Sam Giles

Editorial Notes:

Reviewer Comments & Decisions:

Decision Letter, initial version:
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18th May 2022

*Please ensure you delete the link to your author homepage in this e-mail if you wish to forward it to your co-authors.

Dear Sam,

Your manuscript entitled "High lineage survivorship across the end-Devonian Mass Extinction suggested by a remarkable new Late Devonian actinopterygian" has now been seen by three reviewers, whose comments are attached. The reviewers have raised a number of concerns which will need to be addressed before we can offer publication in Nature Ecology & Evolution. We will therefore need to see your responses to the criticisms raised and to some editorial concerns, along with a revised manuscript, before we can reach a final decision regarding publication.

We therefore invite you to revise your manuscript taking into account all reviewer and editor comments. Please highlight all changes in the manuscript text file.

We are committed to providing a fair and constructive peer-review process. Do not hesitate to contact us if there are specific requests from the reviewers that you believe are technically impossible or unlikely to yield a meaningful outcome.

When revising your manuscript:

* Include a "Response to reviewers" document detailing, point-by-point, how you addressed each

reviewer comment. If no action was taken to address a point, you must provide a compelling argument. This response will be sent back to the reviewers along with the revised manuscript.

* If you have not done so already please begin to revise your manuscript so that it conforms to our Article format instructions at <http://www.nature.com/natecolevol/info/final-submission>. Refer also to any guidelines provided in this letter.

* Include a revised version of any required reporting checklist. It will be available to referees (and, potentially, statisticians) to aid in their evaluation if the manuscript goes back for peer review. A revised checklist is essential for re-review of the paper.

Please use the link below to submit your revised manuscript and related files:

[REDACTED]

Note: This URL links to your confidential home page and associated information about manuscripts you may have submitted, or that you are reviewing for us. If you wish to forward this email to co-authors, please delete the link to your homepage.

We hope to receive your revised manuscript within four to eight weeks. If you cannot send it within this time, please let us know. We will be happy to consider your revision so long as nothing similar has been accepted for publication at Nature Ecology & Evolution or published elsewhere.

Nature Ecology & Evolution is committed to improving transparency in authorship. As part of our efforts in this direction, we are now requesting that all authors identified as 'corresponding author' on published papers create and link their Open Researcher and Contributor Identifier (ORCID) with their account on the Manuscript Tracking System (MTS), prior to acceptance. ORCID helps the scientific community achieve unambiguous attribution of all scholarly contributions. You can create and link your ORCID from the home page of the MTS by clicking on 'Modify my Springer Nature account'. For more information please visit www.springernature.com/orcid.

Please do not hesitate to contact me if you have any questions or would like to discuss these revisions further.

We look forward to seeing the revised manuscript and thank you for the opportunity to review your work.

[REDACTED]

Reviewer expertise:

Reviewer #1: macroevolution



Reviewer #2: fossil fish

Reviewer #3: Devonian fish evolution

Reviewers' comments:

Reviewer #1 (Remarks to the Author):

Dear Editor and Authors,

I have read and considered the manuscript "High lineage survivorship across the end-Devonian Mass Extinction suggested by a remarkable new Late Devonian actinopterygian." This manuscript reports a new exceptional little fossil fish from the Devonian of Pennsylvania along with a phylogenetic analysis and downstream analyses on timing and dynamics of the actinopterygian diversification. The impact of the End-Devonian mass extinction on vertebrate diversity has been a subject of great interest in recent years and one major outstanding question has been the impact on the poorly-understood but important actinopterygians, which include the ancestors of the overwhelming majority of aquatic vertebrates today. This manuscript shows that the End-Devonian mass extinction did not have a measurable effect on actinopterygian diversity as currently understood. This contrasts with the prevailing hypotheses concerning the End-Devonian Extinction, but is in line with recent suggestions from isolated material (e.g. Wilson et al. 2018, 2021, cited by the authors) but the data presented here goes above and beyond the anecdotal evidence provided by those previous studies and provides a strong comparative framework to assess these questions. The descriptive and phylogenetic work here is of excellent quality and is effectively ready for publication as is. I expect this work will be of great interest to the broader readership of Nature Ecology & Evolution and will be highly cited, and I am happy to recommend it for publication.

The one factor that gives me pause is that sampling of Carboniferous actinopterygians is relatively incomplete. This is understandable given the state of knowledge in this part of the phylogeny and the lack of recent work on many of the relevant taxa. However, I do worry that exclusion of some faunas, such as the Tournaisian fishes of the Upper Witteberg of South Africa and some of the stranger faunal components of Visean/Serpukhovian faunas (e.g. Paratarrasius or Paphosiscus from Bear Gulch Limestone), might be obscuring greater diversification rates in the Tournaisian. Even if this would have an impact on Carboniferous diversity, that will not change the key conclusions of this paper, which relate to End-Devonian survivorship. The authors offer some caveats in that discussion but these could perhaps be made more explicit, especially with respect to implied rates of diversification in the early Carboniferous.

Otherwise, this is an extremely strong paper with broad implications for the study of mass extinctions and high quality of work. Congratulations to the authors, I look forward to seeing this in print.

Reviewer #2 (Remarks to the Author):

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The central premise of this ms. is that actinopterygian fishes radiated more extensively in the late Devonian than has been previously recognized. The primary evidence used to support this is a new genus and species of late Devonian stem actinopt described in the paper, and the ensuing phylogenetic analysis that in the authors' interpretation pulls several actinopt lineages previously thought to be Carboniferous down into the Devonian.

The anatomical description of the new taxon is well-executed, although I felt that the figures of the new taxon used in the ms. (as opposed to those included only in the supplemental files) should be more informative. For example, 'ornament' (presumably of dermal cranial elements? – this should be specified) is used as a diagnostic feature for the new taxon, but is not figured in the main ms.

The authors do indicate that the new taxon may be a juvenile; this should be supported by more detail on which specific features support this: e.g. development of scale cover? Given that the authors discuss body size as an important factor in the early evolution of actinopts, they should be clearer re: whether the quite small body size of the new taxon they describe is because it is a juvenile, or a reflection of selection for small body size in early actinopts. On a related note, a more specific indication re what the authors think is small vs. medium-sized vs. large body size should be included.

In different places in the ms. the authors use terms such as 'high lineage survivorship,' 'multiple lineages,' and 'a handful of surviving groups.' It would be helpful to know what the authors constitutes e.g. 'multiple lineages' vs. 'a handful' in terms of actual numbers, especially given that the number of Devonian actinopt taxa is small – on line 276 they state that 'at least 10 lineages' survive from the Devonian into the Carboniferous – is this 'high lineage survivorship?'

How many of the lineages present in the Devonian are based on actual Devonian fossils vs. predictions based on their model?

I was not completely convinced by the authors' assertion that the new taxon uniquely has a substantial list of features that are 'unanticipated' in a Devonian actinopt. On line 245 they state that some of the 'unanticipated' features are in fact present 'sporadically' on other Devonian actinopts, including the relatively well-known genus *Moythomasia*. How many instances of this are there? How many instances constitute a 'sporadic' presence?

Which members of the actinopt crown group were present in the late Devonian, as shown on Fig. 4D?

On Fig. 4D the 'sarcopterygian total group' appears to go extinct before the end of the Devonian.

Reviewer #3 (Remarks to the Author):

The content of this manuscript is important and the methods are state-of-the-art. This is an experienced group of researchers and the morphological and phylogenetic analyses seem solid to me,

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though the descriptive morphological section is very verbose for the non-specialist. I have a few issues with the structure of the presentation and treatment of the "end Devonian mass extinction".

In the Abstract and the Introduction the consensus view is presented as if it is preparing the reader for the content of the manuscript, and only later in those sections is that view shot-down as out-of-date with the introduction of *Palaeoneiros clackorum*. For me, the manuscript should begin with something like "Most accounts of the evolution of early actinopterygians but new data from the Late Devonian of Pennsylvania suggest a different pattern".

The description and illustration of the new taxon are solid work, but I wonder if the level of detail may be too much for non-specialist readers, especially without a comparative context presented. I think the description would be better if uninformative details (eg. "Maxillary teeth are arranged in a row along the ventral margin of the bone") were omitted, and more comparative detail provided on the phylogenetic importance of the features of greatest interest. The first paragraph of the Discussion does some of this but given the hypothesis that the new taxon significantly alters our understanding of character evolution, I feel like that should be more fully explored rather than more than half of the text providing dry, descriptive details that few readers can appreciate.

The manuscript does not seem to contemplate the temporal complexity of the Late Devonian extinction event. The end-Devonian event was a part of a prolonged series of events, and it is not clear if the manuscript is considering the totality of the Late Devonian event, or only the end-Devonian piece of it. The potential impact of the totality of the event(s) should not be simplified into a single event.

*****END*****

Author Rebuttal to Initial comments

Please find attached our revised manuscript entitled "**High lineage survivorship across the end-Devonian Mass Extinction suggested by a remarkable new Late Devonian actinopterygian**" for consideration as an article in *Nature Ecology and Evolution*. We thank all three reviewers for their positive and helpful comments and have edited the manuscript as suggested. Where we have not made edits in line with the reviewer's suggestion, we have carefully justified why. Notably, we have addressed concerns about sampling of Carboniferous actinopterygians, explained our justification for why we consider this taxon to be adult or near-adult, and clarified aspects of the anatomy and our analyses. We have also streamlined the description, added an additional figure to capture more details of the anatomy in the main text, and moved the supplementary figures into the main text.

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Please find our detailed responses below.

Best wishes,

Sam Giles

Reviewer #1 (Remarks to the Author):

Reviewer: *“The one factor that gives me pause is that sampling of Carboniferous actinopterygians is relatively incomplete. This is understandable given the state of knowledge in this part of the phylogeny and the lack of recent work on many of the relevant taxa. However, I do worry that exclusion of some faunas, such as the Tournaisian fishes of the Upper Witteberg of South Africa and some of the stranger faunal components of Visean/Serpukhovian faunas (e.g. Paratarrasius or Paphosiscus from Bear Gulch Limestone), might be obscuring greater diversification rates in the Tournaisian. Even if this would have an impact on Carboniferous diversity, that will not change the key conclusions of this paper, which relate to End-Devonian survivorship. The authors offer some caveats in that discussion but these could perhaps be made more explicit, especially with respect to implied rates of diversification in the early Carboniferous.”*

Response: We agree with the reviewer that there is a great diversity of early ray-finned fishes that are not included in our phylogenetic analysis and incorporating these will be vital for understanding detailed patterns of diversification. However, we do not believe that their inclusion is necessary in the current analysis, although it will be important for downstream analyses assessing diversification rates and shifts in evolutionary mode and tempo. We have works in progress that will expand geographic sampling in actinopt phylogenies (see also <https://eartharxiv.org/repository/view/2613/>) via detailed redescription of these and allied taxa. This approach will also involve consideration of new anatomical characters, which is more likely to recover accurate relationships than adding incompletely known taxa to an existing phylogeny.

We have expanded a sentence in the discussion to communicate this more explicitly: “More densely sampled phylogenetic hypotheses that incorporate taxa currently excluded from many analyses (Henderson et al.) will be necessary for assessing impacts of the Devonian-Carboniferous extinction on the trajectory of body-size evolution in ray-finned fishes, as well as analyses on rates of diversification.”

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Reviewer #2 (Remarks to the Author):

Reviewer: *“The anatomical description of the new taxon is well-executed, although I felt that the figures of the new taxon used in the ms. (as opposed to those included only in the supplemental files) should be more informative. For example, ‘ornament’ (presumably of dermal cranial elements? – this should be specified) is used as a diagnostic feature for the new taxon, but is not figured in the main ms.”*

Response: we have added an additional main text figure (now Figure 2) showing key parts of the anatomy originally included in the supplementary figures, including the cheek, braincase, hyoid and branchial arches. We have also added a panel showing the ornament on the dermal cheek bones (now Figure 2a), and have clarified this in the diagnosis as follows: “ornament on dermal cranial bones comprising broad ridges incised with narrow grooves”. We have moved the additional figures from the supplement to the extended data so that they will be visible online in the same document as the main text rather than a separate file

Reviewer: *“The authors do indicate that the new taxon may be a juvenile; this should be supported by more detail on which specific features support this: e.g. development of scale cover? Given that the authors discuss body size as an important factor in the early evolution of actinoptes, they should be clearer re: whether the quite small body size of the new taxon they describe is because it is a juvenile, or a reflection of selection for small body size in early actinoptes. On a related note, a more specific indication re what the authors think is small vs. medium-sized vs. large body size should be included.”*

Response: It is difficult to conclusively determine whether this specimen is a juvenile or adult due to the very limited literature on this topic and the lack of any additional specimens of Palaeoneiros. However, we have added more information about its likely ontogenetic stage by adding the following to the Remarks section: “Palaeoneiros is small (total length ~50 mm), but not exceptionally so. Some aspects of its anatomy, including incomplete mineralization of the braincase and palatoquadrate, may be consistent with an immature ontogenetic stage. However, dermal bones are robust with well-developed ornament, and scale cover is complete across the body. Limited ontogenetic data is reported for early actinopterygians, but comparison suggests this individual may be near-adult (Lowney PhD 1980, Coates 1993).”



We have also added a panel showing standard and lower jaw length of Devonian-Carboniferous actinoptos to figure 5, and added the following sentence to the discussion: “While *Palaeoneiros* is small, it is comfortably within the size range of other mature Devonian-Carboniferous actinopterygians (Fig. 5A).”. We are reluctant to provide specific indications of small vs medium vs large taxa as these represent arbitrary categories, but we hope that the addition of this figure panel will allow the reader to in order to contextualise the size of *Palaeoneiros* and other taxa.

Reviewer: “*In different places in the ms. the authors use terms such as ‘high lineage survivorship,’ ‘multiple lineages,’ and ‘a handful of surviving groups.’ It would be helpful to know what to the authors constitutes e.g. ‘multiple lineages’ vs. ‘a handful’ in terms of actual numbers, especially given that the number of Devonian actinopt taxa is small – on line 276 they state that ‘at least 10 lineages’ survive from the Devonian into the Carboniferous – is this ‘high lineage survivorship?’*”

Response: We have amended the text to try and be more specific when referring to the number of surviving lineages, in particular clarifying that past hypotheses suggest that just one or two lineages survived. In this context, we do consider ‘at least 10 lineages’ to be ‘high lineage survivorship’ relative to standing diversity in the Devonian, and have added a clause to this effect in the discussion: “The maximum clade credibility tree suggests that at least ten lineages—an order of magnitude more than inferred by most recent analyses^{16,50}, and representing high survivorship relative to standing diversity—persisted into the Carboniferous, indicating substantial and hitherto cryptic diversification before the end-Devonian extinction.”.

Reviewer: “*How many of the lineages present in the Devonian are based on actual Devonian fossils vs. predictions based on their model?*”

Response: In our figure, the tip position for each branch corresponds to the mean estimated age of an individual taxon within the uniform prior interval that corresponds to the known age uncertainty: this uncertainty is because none of the fossils can be dated to a specific age, but only to a conodont/ammonite zone or stage. The nodes (i.e. divergences between lineages) are inferred based on the FBD model. Branches that terminate in the Devonian represent taxa sampled directly in that time interval. Branches that begin in the Devonian but extend across the Devonian-Carboniferous boundary are inferred by the model to have survived at least into the Carboniferous. We have added the following to the figure caption to clarify this: “tip position for each branch corresponds to the mean estimated age of taxon sampled”.



Reviewer: “I was not completely convinced by the authors’ assertion that the new taxon uniquely has a substantial list of features that are ‘unanticipated’ in a Devonian actinopt. On line 245 they state that some of the ‘unanticipated’ features are in fact present ‘sporadically’ on other Devonian actinopts, including the relatively well-known genus *Moythomasia*. How many instances of this are there? How many instances constitute a ‘sporadic’ presence?”

Response: Suborbitals are reported in only two other Devonian species, *Moythomasia nitida* and *Osorioichthys marginis*. Multiple rami of the jugular canal are tentatively interpreted as present only in *Moythomasia lineata*. None of the other features discussed are known in any Devonian taxon, including the most well-known species of *Moythomasia* (*M. durgaringa* from the Gogo Formation). We have clarified the number of species in the text as follows: “that are only known in one or two Devonian species^{46,47,48}”.

Reviewer: “Which members of the actinopt crown group were present in the late Devonian, as shown on Fig. 4D?”

Response: As discussed above, nodes in our figure (i.e. divergences between lineages), including the actinopt crown node, are inferred by our Bayesian tip-dating analysis, which is informed by the ages of terminal taxa and our morphological character matrix. The mean estimate of the crown age in our model is 364.4 Ma. The age of the oldest fossil recovered in the actinopterygian crown is *Platysomus superbus*, (340–335 Ma). The age of the crown divergence is necessarily inferred by the model to be older than this taxon, rather than representing a fossil-based minimum age.

Reviewer: “On Fig. 4D the ‘sarcopterygian total group’ appears to go extinct before the end of the Devonian.”

Response: We have amended the figure and caption to make it clear that both crown groups extend to the present day.

Reviewer #3 (Remarks to the Author):

Reviewer: In the Abstract and the Introduction the consensus view is presented as if it is

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preparing the reader for the content of the manuscript, and only later in those sections is that view shot-down as out-of-date with the introduction of Palaeoneiros clackorum. For me, the manuscript should be begin with something like "Most accounts of the evolution of early actinopterygians but new data from the Late Devonian of Pennsylvania suggest a different pattern".

Response: Thank you for pointing this out. We have amended the abstract to hint that existing hypotheses may not be completely accurate and that there is some uncertainty. However, it seemed to us that the best way to illustrate the impact of the new fossil was to establish this conventional view very clearly at the outset. We thought for a general journal that additional preamble might be necessary, since the example here is not as famous as, say, the Cenozoic radiation of mammals.

Reviewer: "The description and illustration of the new taxon are solid work, but I wonder if the level of detail may be too much for non-specialist readers, especially without a comparative context presented. I think the description would be better if uninformative details (eg. "Maxillary teeth are arranged in a row along the ventral margin of the bone") were omitted, and more comparative detail provided on the phylogenetic importance of the features of greatest interest. The first paragraph of the Discussion does some of this but given the hypothesis that the new taxon significantly alters our understanding of character evolution, I feel like that should be more fully explored rather than more than half of the text providing dry, descriptive details that few readers can appreciate."

Response: We are reluctant to reduce the length of the description as the anatomy provides the fundamental data that are central to understanding the significance of this taxon. However, we have streamlined the results section to remove uninformative phrases and make it slightly shorter. The significance of this animal is not that it significantly alters our understanding of character evolution in terms of where changes happen in the tree, but rather the timing of these changes, i.e. that they happened within the Devonian, rather than in the Carboniferous after the end-Devonian Mass Extinction. We have added a sentence to the discussion to make this clearer: "The presence of this character suite in a Devonian actinopterygian has significant implications for the timing of these anatomical changes."

Reviewer: "The manuscript does not seem to contemplate the temporal complexity of the Late Devonian extinction event. The end-Devonian event was a part of a prolonged series of events, and it is not clear if the manuscript is considering the totality of the Late Devonian event, or only the end-Devonian piece of it. The potential impact of the totality of the event(s) should not be simplified into a single event."



Response: Past hypotheses have always framed vertebrate transition in the context of the end-Devonian Hangenberg event, with the Frasnian extinction principally discussed in the context of invertebrates. We have modified the introduction to indicate that the end-Devonian mass extinction was not a single event, and have also clarified in the context of vertebrate survivorship that we are talking about the Hangenberg extinction: "These models contrast with the emerging picture for other vertebrate survivors of the end-Devonian Hangenberg extinction."

Decision Letter, first revision:

20th July 2022

Dear Sam,

Thank you for submitting your revised manuscript "High lineage survivorship across the end-Devonian Mass Extinction suggested by a remarkable new Late Devonian actinopterygian" (NATECOLEVOL-220316119A). It has now been seen again by the original reviewers and their comments are below. The reviewers find that the paper has improved in revision, and therefore we'll be happy in principle to publish it in Nature Ecology & Evolution, pending minor revisions to satisfy the reviewers' final requests and to comply with our editorial and formatting guidelines.

If the current version of your manuscript is in a PDF format, please email us a copy of the file in an editable format (Microsoft Word or LaTeX)-- we can not proceed with PDFs at this stage.

We are now performing detailed checks on your paper and will send you a checklist detailing our editorial and formatting requirements in about a week. Please do not upload the final materials and make any revisions until you receive this additional information from us.

Thank you again for your interest in Nature Ecology & Evolution. Please do not hesitate to contact me if you have any questions.

[REDACTED]

Reviewer #1 (Remarks to the Author):

Dear Editor and Authors,

Thank you for the opportunity to review the revised version of the manuscript, "High lineage survivorship across the end-Devonian Mass Extinction suggested by a remarkable new Late Devonian actinopterygian." I have read the authors' responses to all three reviewers as well as the revised manuscript and supplementary information. I am satisfied with the work the authors have done to

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revise the manuscript and agree with their approach to issues raised, particularly the decision to keep the anatomical work in the main article text rather than the supplement. I'm happy to recommend publication at this time. Congratulations to the authors on a fine piece of work.

Reviewer #2 (Remarks to the Author):

In general, the authors have responded effectively to most of the criticisms in the earlier set of reviews, and their description of the new taxon, and the accompanying figures, are fine. I recommend publishing the paper, but there are still a few points that I think could be considered further, as follows:

The authors mention 'other vertebrate clades' that show comparative patterns of late Devonian vs. early Carboniferous radiations, but there are only two – lungfishes and tetrapods -- which of course are both within Sarcopterygii. The language used in the ms. makes it sound like there are several groups being compared, but it is really just actinopt and sarcopts.

On line 71 they use the term 'prolific' to refer to what they interpret as a previously unrecognized radiation of late Devonian actinopt – this seems overstated given the relatively small number of taxa in play, and also given that it is largely based on interpretations drawn from a single specimen.

There is one reference not cited that should be – Schultze and Bardack, 1987, JVP 7[1], which deals with size and anatomical changes during growth in 'palaeoniscoids' from Mazon Creek – this is relevant to their still waffling discussion on whether the specimen they describe is adult or not.

The authors do rationalize their use of 'small' vs. 'mid-sized' vs. 'large' but still won't be pinned down on actual numbers and size ranges for these categories – I can understand their reluctance, but this still seems too casually non-specified.

Related to the above point, the authors state that further study with denser taxon sampling is needed to better resolve the issue of body size evolution. Given that this denser sampling is not part of the present ms., and that body size is not actually essential to the case they are making for a previously unrecognized Devonian actinopt radiation, I suggest they simply take the body size stuff out of the paper, which would eliminate much of the ambiguity.

Reviewer #3 (Remarks to the Author):

Thank you for considering and addressing comments on the manuscript. I am satisfied with the revised version and look forward to seeing the manuscript published.



Our ref: NATECOLEVOL-220316119A

16th August 2022

Dear Dr. Giles,

Thank you for your patience as we've prepared the guidelines for final submission of your Nature Ecology & Evolution manuscript, "High lineage survivorship across the end-Devonian Mass Extinction suggested by a remarkable new Late Devonian actinopterygian" (NATECOLEVOL-220316119A). Please carefully follow the step-by-step instructions provided in the attached file, and add a response in each row of the table to indicate the changes that you have made. Please also check and comment on any additional marked-up edits we have proposed within the text. Ensuring that each point is addressed will help to ensure that your revised manuscript can be swiftly handed over to our production team.

****We would like to start working on your revised paper, with all of the requested files and forms, as soon as possible (preferably within two weeks). Please get in contact with us immediately if you anticipate it taking more than two weeks to submit these revised files.****

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If you have not done so already, please alert us to any related manuscripts from your group that are under consideration or in press at other journals, or are being written up for submission to other journals (see: <https://www.nature.com/nature-research/editorial-policies/plagiarism#policy-on-duplicate-publication> for details).

In recognition of the time and expertise our reviewers provide to Nature Ecology & Evolution's editorial process, we would like to formally acknowledge their contribution to the external peer review of your manuscript entitled "High lineage survivorship across the end-Devonian Mass Extinction suggested by a remarkable new Late Devonian actinopterygian". For those reviewers who give their assent, we will be publishing their names alongside the published article.

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Reviewer #1:

Remarks to the Author:

Dear Editor and Authors,

Thank you for the opportunity to review the revised version of the manuscript, "High lineage survivorship across the end-Devonian Mass Extinction suggested by a remarkable new Late Devonian actinopterygian." I have read the authors' responses to all three reviewers as well as the revised manuscript and supplementary information. I am satisfied with the work the authors have done to revise the manuscript and agree with their approach to issues raised, particularly the decision to keep the anatomical work in the main article text rather than the supplement. I'm happy to recommend publication at this time. Congratulations to the authors on a fine piece of work.

Reviewer #2:

Remarks to the Author:

In general, the authors have responded effectively to most of the criticisms in the earlier set of reviews, and their description of the new taxon, and the accompanying figures, are fine. I recommend publishing the paper, but there are still a few points that I think could be considered further, as follows:

The authors mention 'other vertebrate clades' that show comparative patterns of late Devonian vs. early Carboniferous radiations, but there are only two – lungfishes and tetrapods -- which of course are both within Sarcopterygii. The language used in the ms. makes it sound like there are several groups being compared, but it is really just actinopt and sarcopt.

On line 71 they use the term 'prolific' to refer to what they interpret as a previously unrecognized

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radiation of late Devonian actinoptes – this seems overstated given the relatively small number of taxa in play, and also given that it is largely based on interpretations drawn from a single specimen.

There is one reference not cited that should be – Schultze and Bardack, 1987, JVP 7[1], which deals with size and anatomical changes during growth in 'palaeoniscoids' from Mazon Creek – this is relevant to their still waffling discussion on whether the specimen they describe is adult or not.

The authors do rationalize their use of 'small' vs. 'mid-sized' vs. 'large' but still won't be pinned down on actual numbers and size ranges for these categories – I can understand their reluctance, but this still seems too casually non-specified.

Related to the above point, the authors state that further study with denser taxon sampling is needed to better resolve the issue of body size evolution. Given that this denser sampling is not part of the present ms., and that body size is not actually essential to the case they are making for a previously unrecognized Devonian actinopt radiation, I suggest they simply take the body size stuff out of the paper, which would eliminate much of the ambiguity.

Reviewer #3:

Remarks to the Author:

Thank you for considering and addressing comments on the manuscript. I am satisfied with the revised version and look forward to seeing the manuscript published.

Final Decision Letter:

29th September 2022

Dear Sam,

We are pleased to inform you that your Article entitled "A Late Devonian actinopterygian suggests high lineage survivorship across the end-Devonian Mass Extinction", has now been accepted for publication in Nature Ecology & Evolution.

Over the next few weeks, your paper will be copyedited to ensure that it conforms to Nature Ecology and Evolution style. Once your paper is typeset, you will receive an email with a link to choose the appropriate publishing options for your paper and our Author Services team will be in touch regarding any additional information that may be required

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