

FOSSIL CALIBRATIONS SERIES CONTRIBUTOR GUIDELINES 2015

INTRODUCTION

Palaeontologia Electronica's Fossil Calibrations Series (Polly et al., 2015) provides a streamlined, peer-reviewed venue for publications dealing with calibration points from the fossil record for divergence dating analyses. Papers submitted to the Fossil Calibrations Series may identify new fossil calibration points, provide an updated series of fossil calibration points for a clade, present the results or a new divergence dating study, or focus broadly on issues in divergence dating.

Papers in the Fossil Calibrations Series are published in *Palaeontologia Electronica* immediately following final acceptance and formatting. The individual fossil calibration data are curated in the Fossil Calibration database (<https://fossilcalibrations.org/>) and linked to the publication.

Authors wishing to submit to the Fossil Calibrations Series are required to provide key data in a standardized format for each individual calibration point proposed in the manuscript. Authors should refer to the best practices outlined by Parham et al. (2012) for the protocol for constructing calibrations. Specific required sections are explained below.

Manuscripts should be formatted according to the instructions in this guide, as well as *PE's* normal Author Guidelines: <http://palaeo-electronica.org/content/files/guide2013.pdf>. Note that section headings for Fossil Calibration papers should be formatted as described here.

REQUIRED SECTIONS FOR FOSSIL CALIBRATION MANUSCRIPTS

Node. The node being calibrated must be explicitly designated. In some cases the node may be well established and widely recognized and can be designated simply by referring to it by name (e.g. "Amniota" or "Theria"). However, an explicit definition should be provided because even common clade names like Aves often have competing usages (Gauthier, 1986; Chiappe, 1992). In some cases the node may not have an existing name. A two-taxon definition (e.g., "the node representing the last common ancestor of *Tetraodon* and *Takifugu*"; de Queiroz and Gauthier, 1990) and citation to a published phylogeny showing the relationships of other taxa to that node will help ensure that the node can be readily identified.

Phylogenetic uncertainty may require careful specification of which node is being calibrated. One example is where a fossil is a stem representative of an extant clade whose extant sister taxon

remains unknown. For example, a basal fossil snake may be unambiguously assigned to the clade Serpentes. However, because the position of Serpentes within Squamata is contentious, the node being calibrated is ambiguous. In such cases, it is recommended that the author identify the node as “Serpentes - other Squamata” or “Stem Serpentes.”

In cases where competing taxonomies exist, authors should be clear which one they are using. For example, the name “Aves” refers to crown group birds in some schemes and total group (stem and crown) birds in others. Designating the node as “Aves (crown group birds)” avoids this issue.

Many users of the Fossil Calibration Series and its associated Fossil Calibration Database will be users of NCBI’s GenBank sequence data. Authors might consider describing how their node relates to the NCBI taxonomy.

Fossil Taxon. Taxonomic name and taxonomic authority of the fossil specimen(s) used to calibrate the node.

Specimen or Collection Number. Provide specimen number(s) for the fossils on which the date of the calibration rests, unless impossible. In cases where specimens are not part of museum repositories, such as microfossils isolated from cores, provide a description of them, figure them, or cite an existing publication. If the calibration is based on multiple specimens referred to a single taxon it is necessary to justify specimen referrals through appropriate citations or argumentation.

Phylogenetic Justification. The phylogenetic relationship of the fossils to the node being calibrated must be explicitly justified. Two methods of phylogenetic justification are acceptable: (1) phylogenetic analysis (preferred) or (2) apomorphy-based assignment to a clade. Where possible, list the characters that support placement of the fossil. If a phylogenetic analysis including the relevant fossil is included in the submitted manuscript, this section may simply specify “Analysis of Morphological Data (see below)” or “Analysis of Combined Data (see below),”

If the phylogenetic justification is based on a previously published phylogenetic analysis is, this section should specify “Combined Analysis (Smith et al. 2009).” Multiple citations should be provided when appropriate. Apomorphy-based justifications may require additional explanatory text, and should be as explicit as possible regarding the phylogenetic distribution of supporting characters (e.g., some characters may diagnose less exclusive clades than the target node, but nonetheless provide additional support).

Minimum Age. This section reports the hard (absolute) minimum age for the calibration given the phylogeny adopted by the author and the estimated age of the fossil. Include only the age, and if available, the most specific geological division that can be designated – e.g., “51 Ma” or “Ypresian, 48.6 Ma.” Because this date is intended as a hard minimum, the youngest possible age **including the error associated with geological dating** should be specified – e.g., the hard minimum age reported for a fossil from an ash bed dated to 50.0 ± 1.5 Ma would be 48.5Ma.

Soft Maximum Age. This section specifies a suggested maximum age for the calibration. Include only the estimate of the absolute maximum age under this heading. Designation of a maximum age is critical for many approaches to node calibration and is thus **encouraged but not required**. The soft maximum should be supported by argumentation placed in the **Age Justification** section below.

Age Justification. An explicit justification should be given for both the hard minimum and soft maximum. If radiometric dates or paleomagnetic data are available, associated errors should be noted. When the age of a fossil is known only from its occurrence within a stratigraphic interval, the age of both the top and bottom of the interval should be reported rather than a single estimated point within the interval. When a chain of inference is used to date a fossil, all steps must be stated (e.g., when overlap between a biochron and a magnetic polarity chron are used to arrive at a more specific age range than could be designated based on one of the units alone).

Discussion. The discussion section presents relevant information about the calibration, phylogeny, dates, and fossils. It may be as long as is necessary and need not be limited only to calibration-related issues. Authors are especially encouraged to discuss any previously proposed calibrations that were rejected due to uncertainty, error or obsolescence.

Phylogenetic tree. A figure of a phylogenetic tree should be provided that explicitly identifies the node and its calibration and the relationship of the fossil to the node. Authors are encouraged to illustrate potential conflicts between alternative phylogenies. The tree should be treated as a figure following the *Palaeontologia Electronica* image guidelines. The tree may be taken from published works or can be based on original analysis. If the latter, then a description of the methods and data used in the analysis should be presented in the manuscript.

HEADERS

Headings should be formatted like the ones in this guide. The name of the node being calibrated should be a First Order header (all capitals, centered). Use the names of the nodes, not a numbering system (e.g., “CARNIVORA” not “NODE 1”). The required sections for each node should be Third Order headers (bold, capital and lowercase, followed by a period and space, with the text continuing on the same line).

REFERENCES

- de Queiroz, K. and J. A. Gauthier. 1990. Phylogeny as a central principle in taxonomy: phylogenetic definitions of taxon names. *Systematic Zoology*, 39: 307-322.
- Parham, J.F., P.C.J. Donoghue, C.J. Bell, T.D. Calway, J.J. Head, P.A. Holroyd, J.G. Inoue, R.B. Irmis, W.G. Joyce, D.T. Ksepka, J.S.L. Patané, N.D. Smith, J.E. Tarver, M. Van Tuinen, Z. Yang, K.D. Angielczyk, J. Greenwood, C.A. Hipsley, L. Jacobs, P.J. Makovicky, J. Müller, K.T. Smith, J.M. Theodor, R.C.M. Warnock, and M.J. Benton. Best practices for justifying fossil calibrations. *Systematic Biology*.

Polly, P.D., Ksepka, D.T., and Parham, J.F. 2015. Announcing the Fossil Calibration Series and Database. *Palaeontologia Electronica* 18.1.1E: 1-5