A database of conodont occurrences between the Changhsingian (Late Permian) and the Spathian (Olenekian, Early Triassic)

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Introduction

Conodonts are extinct jawless marine vertebrates (Donoghue et al., 2000) that lived from the late Cambrian (ca. 500 Ma) to the Triassic-Jurassic boundary (ca. 200 Ma) (Du et al., 2020; Müller, 1959). They are mainly known as powerful index fossils (Ferretti et al., 2020) and paleothermometers (Rigo et al., 2012; Trotter et al., 2008) thanks to their microscopic and apatitic (Frank-Kamenetskaya et al., 2014; Pietzner et al., 1968) feeding elements called conodont elements. Beside their biostratigraphic and paleoenvironmental interest, conodonts can be used as a model for evolutionary, diversity, biogeography and macroecology studies in deep time (Guenser et al., 2019; Martínez-Pérez et al., 2014; Petryshen et al., 2020; Souquet et al., 2022). Indeed, their global distribution, their taxonomic diversity, their abundance and their quasi-continuous record allows to investigate such topics at high temporal resolution and with a statistical support. These kind of studies are ease thanks to databases of conodont occurrences through time and space. However, few of them are currently available online and as free. The most famous online record of conodont occurrences is integrated in the PaleoBiology DataBase (PBDB) and in the GeoBiology DataBase (GBDB). The GBDB record is known to not be global as it is restricted to China samples. On the contrary, the PBDB should gather global occurrences of extinct taxa. Yet, recent publications have highlighted the incompleteness of the PBDB record (Du et al., 2023; Servais et al., 2023).

We introduce here a database of global occurrences of conodont species around the Permian/Triassic boundary (PTB, ca. 251.9 Ma). The PTB is known for its biotic crisis, i.e. the most important mass extinction event of the whole Phanerozoic (Benton, 2003; Raup and Sepkoski, 1982; Stanley, 2016). According to the literature, the causes of this crisis originated from an intense volcanic activity that built the Siberian trapps and led to a global rise of the temperatures and a modification of oceans chemistry (Algeo et al., 2011a; Benton, 2003; Bond and Wignall, 2014; Foster, 2015; Winguth et al., 2015). The PTB crisis profoundly impacted the marine biosphere and was followed by a complex biotic recovery during the whole Early Triassic Epoch (ca. 5 myrs). Indeed, an alternation of short periods of high and low taxonomic richness (Brayard et al., 2009; Brosse et al., 2017; Dai et al., 2018; Orchard, 2007; Scheyer et al., 2014) and uneven record of $\delta^{13}C$ and $\delta^{18}O$ also show different episodes of environmental disturbances (Grasby et al., 2013; Romano et al., 2013; Sun et al., 2012). While the PTB crisis has been extensively studied and conodonts are a choice model to study the impact of this event on biodiversity, conodont evolution around the PTB was barely studied quantitatively and, when it was, the data were not available online (Charpentier, 1984; Klets, 2008; Martínez-Pérez et al., 2015; Orchard, 2007).

The present database is a csv file of about 12,000 entries. It is a data compilation from the available literature gathering a total of 260 publications dated from 1967 to 2022. It includes taxonomic, sampling, sedimentological, temporal, (paleo)geographical and bibliographical information. The minimum unit, i.e. a row of the table, corresponds to a species in a sample. The database allows different type of investigations. The taxonomic and temporal information allow diversity studies at the stratigraphic stage and sub-stage level around the Permian/Triassic boundary. The paleogeographic information allow biogeographic and macroecological investigations like in Guenser et al (in prep.). The sampling information allow biochronological study such as the application of the Unitary Association Method (Monnet et al., 2011; Savary and Guex, 1999). Finally, thanks to the GPS coordinates associated to each section, all these evocated topics can be investigated either locally, regionally or globally. Compared to similar data available in the PBDB (downloaded on 12/20/2023), our database owns 100 times more entries, 10 times more sections, 4 times more references and twice more species.

Description of the database

Taxonomic information

Each species is listed according to two classifications: the species name used in the publication (*Species_in_paper* column), and the species name currently used (*Gn_Species_current* column), which will be used for analyses. This double classification eases connecting the original name of a species from one publication to its contemporary classification in more recent publications. The most recent genus name, i.e. after taxonomic homogenization, is recorded in *Gn_current* column. Each sampled species is assigned a status: an empty box means that the species in question corresponds to the holotype; the corresponding morphotype (e.g. M1, M2, etc.) or subspecies may also be present; other statuses corresponding to open nomenclature: *confer* (*cf.*), *affinis* (*aff.*, "quoted" status has a similar meaning), *ex grege* (*ex gr.*, *gr.*), *species incerta* (?), and *sensu lato* (*s. l.*). Species left in open nomenclature were excluded from the analyses.

Sampling information

For each species, the corresponding sampling bed is available in the *Sample* column. When the information was available, the number of specimens corresponding to the species found in the sample is recorded in the *Quantity* column; the proportion of each species within a sample calculated in the *Proportion* column. However, these last two columns contain very little information.

Sedimentological information

For each sample, its facies is recorded in the *Facies* column and its associated depositional environment is recorded in the *Environment* column. Additional stratigraphic divisions are noted in the columns *Member*, *Formation*, *Group* and *Unit_Terrane_basin*. These information originate only from the publications in which the conodont samples are described, so articles that did not deal specifically with the sedimentology of the field. Further sedimentological work would be required for most localities to complete the information provided.

Temporal information

Each sample is assigned a stratigraphic stage (*Stage* column), a stratigraphic sub-stage (*Sub_stage* column) and an additional stratigraphic sub-division (*Sub_sub_stage* column). The database is restricted to the Terminal Permian and Lower Triassic, including the Changhsingian, Induan and Olenekian stages. The latter two are respectively divided into two sub-stages: the Griesbachian and the Dienerian; the Smithian and the Spathian. A more precise division (lower, middle, upper) is present in few publications. However, the analyses were performed at the sub-stage level. The Changhsingian was also analysed in its entirety, as it does not include a formal sub-stage.

(Paleo)geographic information

The section where the conodonts were sampled is noted in the *Section* column. Each section is associated with its current GPS coordinates (*Latitude* and *Longitude* columns). When coordinates were not directly available in the publication, they were estimated on Google Map with the help the topographic map provided in the publication. Sections not located in the first or second way were not considered in the analyses. Additional current geographical information are noted for each section using the administrative divisions of each country (*Department_District*, *Region_Province_State*, *Country*, and *Continent* columns).

Current GPS coordinates were converted to paleocoordinates (*PT_paleolat* and *PT_paleolong*) with Rgplate R package (Kocsis et al., 2023; Müller et al., 2018) using the PALEOMAP model dated at 250 Ma. Tectonic movements between the early Changhsingian and late Spathian were deemed negligible given the global nature of the study. However, there are two exceptions with the sections from Japan and Bulgaria. The paleolocations of the Japanese sedimentary deposits are open to debate, particularly those of Triassic age. The Japanese sections are thought to be located off the Panthalassa, at a latitude close to the equator (Algeo et al., 2011b; Choi, 1984; Maruyama et al., 1997; Onoue et al., 2017; Sano et al., 2012; Shi, 2006; Uno et al., 2012). The paleocoordinates estimated by the PALEOMAP model located these sections in the northeastern part of the Tethys, so they needed to be corrected. The Bulgarian sections were located by the PALEOMAP model on the inner western edge of the Tethys. Knowing that they belong to the Moesian platform (Budurov et al., 2004; Dercourt et al., 2000; Ruban et al., 2007), they would be more northerly located, on the inner northern edge of the Tethys.

Bibliography of the database

Agematsu, Sachiko, Michael J. Orchard, and Katsuo Sashida. 2008. “Reconstruction of an Apparatus of *Neostrachanognathus Tahoensis* from Oritate, Japan and Species of *Neostrachanognathus* from Oman.” *Palaeontology* 51 (5). John Wiley & Sons, Ltd: 1201–1211. doi:10.1111/j.1475-4983.2008.00804.x.

Algeo, Thomas, Charles M. Henderson, Brooks Ellwood, Harry Rowe, Erika Elswick, Steven Bates, Timothy Lyons, et al. 2012. “Evidence for a Diachronous Late Permian Marine Crisis from the Canadian Arctic Region.” *GSA Bulletin* 124 (9–10): 1424–1448. doi:10.1130/B30505.1.

Aljinovic, Dunja, Tea Kolar-Jurkovšek, and Bogdan Jurkovšek. 2006. “The Lower Triassic Shallow Marine Succession in Gorski Kotar Region (External Dinarides, Croatia): Lithofacies and Conodont Dating.” *Rivista Italiana Di Paleontologia e Stratigrafia (Research In Paleontology and Stratigraphy)* 112 (1). doi:10.13130/2039-4942/5849.

Aljinovic, Dunja, Tea Kolar-Jurkovsek, Bogdan Jurkovsek, and Hazim Hrvatovic. 2011. “Conodont Dating of the Lower Triassic Sedimentary Rocks in the External Dinarides (Croatia and Bosnia and Herzegovina).” *Rivista Italiana Di Paleontologia e Stratigrafia (Research In Paleontology and Stratigraphy)* 117 (1).

Ampornmaha, Apsorn. 1995. “Triassic Carbonate Rocks in the Phatthalung Area, Peninsular Thailand.” *Gondwana Dispersion and Asian Accretion* 11 (3): 225–236. doi:10.1016/0743-9547(95)00006-E.

Angiolini, L., A. Zanchi, S. Zanchetta, A. Nicora, I. Vuolo, F. Berra, C. Henderson, et al. 2015. “From Rift to Drift in South Pamir (Tajikistan): Permian Evolution of a Cimmerian Terrane.” *Special Issue on CIMMERIAN TERRANES* 102 (April): 146–169. doi:10.1016/j.jseaes.2014.08.001.

Atudorei, Nicu-Viorel. 1998. “Constraints on the Upper Permian to Upper Triassic Marine Carbon Isotope Curve: Case Studies from the Tethys.” PhD Thesis, Université de Lausanne, Faculté des sciences.

BadriKolalo, Nazanin, Bahaeddin Hamidi, Seyed Hamid Vaziri, and Seyed Ali Aghanabati. 2015. “Biostratigraphic Correlation of Elikah Formation in Zal Section (Northwestern Iran) with Ruteh and Type Sections in Alborz Mountains Based on Conodonts.” *Iranian Journal of Earth Sciences* 7 (1): 78–88.

Bai, Ruoyu, Xu Dai, and Haijun Song. 2017. “Conodont and Ammonoid Biostratigraphies around the Permian-Triassic Boundary from the Jianzishan of South China.” *Journal of Earth Science* 28 (4): 595–613. doi:10.1007/s12583-017-0754-4.

Balini, M., V. A. Gavrilova, and A. Nicora. 2000. “Biostratigraphical Revision of the Classic Lower Dolnapa Section (Mangyshlak, West Kazakhstan).” *Epicontinental Triassic*, 11–12.

Baud, Aymon, Sylvain Richoz, Benoit Beauchamp, Fabrice Cordey, Stephen Grasby, Charles M. Henderson, Leopold Krystyn, and Alda Nicora. 2012. “The Buday’ah Formation, Sultanate of Oman: A Middle Permian to Early Triassic Oceanic Record of the Neotethys and the Late Induan Microsphere Bloom.” *Journal of Asian Earth Sciences* 43 (1): 130–144. doi:10.1016/j.jseaes.2011.08.016.

Beatty, Tyler W. 2004. “Biostratigraphy and Multielement Taxonomy of Lower Triassic Conodonts from the Thaynes Formation, Weber River Utah (Unpublished Master Thesis).” Master thesis.

Beauchamp, Benoit, Charles M. Henderson, Stephen E. Grasby, Laura T. Gates, Tyler W. Beatty, John Utting, and Noel P. James. 2009. “Late Permian Sedimentation in the Sverdrup Basin, Canadian Arctic: The Lindström and Black Stripe Formations.” *Bulletin of Canadian Petroleum Geology* 57 (2): 167–191. doi:10.2113/gscpgbull.57.2.167.

Belka, Zdzislaw, and Jost Wiedmann. 1996. “Conodont Stratigraphy of the Lower Triassic in the Thakkhola Region (Eastern Himalaya, Nepal).” *Newsletters on Stratigraphy* 33 (1). Stuttgart, Germany: Schweizerbart Science Publishers: 1–14. doi:10.1127/nos/33/1996/1.

Beranek, Luke P., James K. Mortensen, Michael J. Orchard, and Thomas Ullrich. 2010. “Provenance of North American Triassic Strata from West-Central and Southeastern Yukon: Correlations with Coeval Strata in the Western Canada Sedimentary Basin and Canadian Arctic Islands.” *Canadian Journal of Earth Sciences* 47 (1). NRC Research Press: 53–73. doi:10.1139/E09-065.

Berry, Ronald, Clive Burrett, and Maxwell Banks. 1984. “New Triassic Faunas from East Timor and Their Tectonic Significance.” *Geologica et Palaeontologica* 18: 127–137.

Beyers, J. M., and M.J. Orchard. 1991. “Upper Permian and Triassic Conodont Faunas from the Type Area of the Cache Creek Complex, South-Central British Columbia, Canada.” *Ordovician to Triassic Conodont Paleontology of the Canadian Cordillera. Geological Survey of Canada, Bulletin* 417: 269–297.

Beyers, Joanna Maria. 1989. “Upper Permian and Triassic Conodont Biostratigraphy of the Cache Creek Group, Marble Range, South-Central British Columbia.” PhD Thesis, University of British Columbia.

Bondarenko, L., G. Buryi, Y. Zakharov, X.B. Popov, and A.M. Popov. 2013. “Late Smithian (Early Triassic) Conodonts from Artyom, South Primorye, Russian Far East.” *The Triassic System: New Developments in Stratigraphy and Paleontology: Bulletin 61* 61: 55.

Bondarenko, L. G., Yu D. Zakharov, G. I. Guravskaya, and P. P. Safronov. 2015. “Lower Triassic Zonation of Southern Primorye. Article 2. First Conodont Findings in *Churkites* Cf. *Syaskoi* Beds at the Western Coast of the Ussuri Gulf.” *Russian Journal of Pacific Geology* 9 (3): 203–214. doi:10.1134/S1819714015030021.

Brosse, Morgane, Aymon Baud, Ghulam Mohmmad Bhat, Hugo Bucher, Marc Leu, Torsten Vennemann, and Nicolas Goudemand. 2017. “Conodont-Based Griesbachian Biochronology of the Guryul Ravine Section (Basal Triassic, Kashmir, India).” *Geobios* 50 (5–6): 359–387. doi:10.1016/j.geobios.2017.10.001.

Brosse, Morgane, Hugo Bucher, Borhan Bagherpour, Aymon Baud, Asa M. Frisk, Kuang Guodun, and Nicolas Goudemand. 2015. “Conodonts from the Early Triassic Microbialite of Guangxi (South China): Implications for the Definition of the Base of the Triassic System.” *Palaeontology* 58 (3): 563–584. doi:10.1111/pala.12162.

Brühwiler, Thomas, Nicolas Goudemand, Thomas Galfetti, Hugo Bucher, Aymon Baud, David Ware, Elke Hermann, Peter A. Hochuli, and Rossanna Martini. 2009. “The Lower Triassic Sedimentary and Carbon Isotope Records from Tulong (South Tibet) and Their Significance for Tethyan Palaeoceanography.” *Sedimentary Geology* 222 (3): 314–332. doi:10.1016/j.sedgeo.2009.10.003.

Buch, I. Philip. 1984. “Upper Permian (?) And Lower Triassic Metasedimentary Rocks, Northeastern Baja California, Mexico.” *Pacific Section, SEPM* 39: 31–36.

Buryi, Galina I. 1997. “Early Triassic Conodont Biofacies of Primorye.” *Mémoires de Géologie (Lausanne)* 30: 35–44.

Carey, Stephen P. 1984. “Conodont Biofacies of the Triassic of Northwestern Nevada.” *Conodont Biofacies and Provincialism: Geological Society of America, Special Papers* 196: 295–305.

Catalano, Raimondo, Piero Di Stefano, and Heinz Kozur. 1991. “Permian Circumpacific Deep-Water Faunas from the Western Tethys (Sicily, Italy)—New Evidences for the Position of the Permian Tethys.” *Palaeogeography and Paleoceanography of Tethys* 87 (1): 75–108. doi:10.1016/0031-0182(91)90131-A.

Chen, An-Feng, Yang Zhang, Zheng-Yi Lyu, Hui-Ting Wu, and Ke-Xin Zhang. 2022. “A New Study of Olenekian–Anisian Boundary Conodont Biostratigraphy of the Tulong Section in Himalaya Terrane, Southern Tibet.” *Palaeoworld* 31 (3): 428–442. doi:10.1016/j.palwor.2021.09.008.

Chen, An-feng, Yang Zhang, Dong-xun Yuan, Hui-ting Wu, Jing Dou, and Jing-qi Liu. 2022. “Upper Changhsingian to Lower Olenekian Conodont Successions from the Bozhou Section, Northern Guizhou Province, Southwestern China.” *Palaeogeography, Palaeoclimatology, Palaeoecology* 599 (August): 111054. doi:10.1016/j.palaeo.2022.111054.

Chen, Jun, Tyler W. Beatty, Charles M. Henderson, and Harry Rowe. 2009. “Conodont Biostratigraphy across the Permian–Triassic Boundary at the Dawen Section, Great Bank of Guizhou, Guizhou Province, South China: Implications for the Late Permian Extinction and Correlation with Meishan.” *Journal of Asian Earth Sciences* 36 (6): 442–458. doi:10.1016/j.jseaes.2008.08.002.

Chen, Jun, Charles M. Henderson, and Shu-Zhong Shen. 2008. “Conodont Succession around the Permian-Triassic Boundary at the Huangzhishan Section, Zhejiang and Its Stratigraphic Correlation.” *Acta Palaeontologica Sinica* 47 (1): 91–114.

Chen, Yan, Qian Ye, Haishui Jiang, Paul B. Wignall, and Jinling Yuan. 2019. “Conodonts and Carbon Isotopes during the Permian-Triassic Transition on the Napo Platform, South China.” *Journal of Earth Science* 30 (2): 244–257. doi:10.1007/s12583-018-0884-3.

Chen, Yanlong, Haishui Jiang, Xulong Lai, Chunbo Yan, Sylvain Richoz, Xiaodan Liu, and Lina Wang. 2015. “Early Triassic Conodonts of Jiarong, Nanpanjiang Basin, Southern Guizhou Province, South China.” *Journal of Asian Earth Sciences* 105 (June): 104–121. doi:10.1016/j.jseaes.2015.03.014.

Chen, Yanlong, Michael M. Joachimski, Sylvain Richoz, Leopold Krystyn, Dunja Aljinović, Duje Smirčić, Tea Kolar-Jurkovšek, Xulong Lai, and Zhifei Zhang. 2021. “Smithian and Spathian (Early Triassic) Conodonts from Oman and Croatia and Their Depth Habitat Revealed.” *Global and Planetary Change* 196 (January): 103362. doi:10.1016/j.gloplacha.2020.103362.

Chen, Yanlong, Tea Kolar-Jurkovšek, Bogdan Jurkovšek, Dunja Aljinović, and Sylvain Richoz. 2016. “Early Triassic Conodonts and Carbonate Carbon Isotope Record of the Idrija–Žiri Area, Slovenia.” *Palaeogeography, Palaeoclimatology, Palaeoecology* 444: 84–100. doi:10.1016/j.palaeo.2015.12.013.

Chen, Yanlong, Sylvain Richoz, Leopold Krystyn, and Zhifei Zhang. 2019. “Quantitative Stratigraphic Correlation of Tethyan Conodonts across the Smithian-Spathian (Early Triassic) Extinction Event.” *The Smithian-Spathian Boundary: A Critical Juncture in the Early Triassic Recovery of Marine Ecosystems* 195 (August): 37–51. doi:10.1016/j.earscirev.2019.03.004.

Cheng, Cheng, Shuangying Li, Xiangyang Xie, Tingli Cao, Walter L. Manger, and Arthur B. Busbey. 2019. “Permian Carbon Isotope and Clay Mineral Records from the Xikou Section, Zhen’an, Shaanxi Province, Central China: Climatological Implications for the Easternmost Paleo-Tethys." *Palaeogeography, Palaeoclimatology, Palaeoecology* 514 (January): 407–422. doi:10.1016/j.palaeo.2018.10.023.

Chhabra, N. L., and ASHOK Sahni. 1980. "Late Lower Triassic and Early Triassic Conodont Faunas from Kashmir and Kumaun Sequences in Himalaya." *Journal of Paleontology Society of India* 25: 135–147.

Dagis, A. A. 1990. "Conodonts from the Lower Triassic of the Southeastern Pamirs." *Nauka*, Trias Sibiri (Triassic of Siberia), , 73–81, 84–88.

Dozet, S., and T. Kolar-Jurkovsek. 2007. "Lower Triassic Beds in the Southeastern Borderland of the Ljubljana Depression, Central Slovenia." *Materials and Geoenvironment* 54 (3): 361.

Dürkoop, A., D. K. Richter, and R. Stritzke. 1986. "Facies, Age and Correlation of Triassic Red Limestones ('Hallstatt Type') from Epidavros, Adhami and Hydra (Greece)." *Facies* 14: 105–150.

Ezaki, Yoichi, Jianbo Liu, and Natsuko Adachi. 2003. "Earliest Triassic Microbialite Micro-to Megastructures in the Huaying Area of Sichuan Province, South China: Implications for the Nature of Oceanic Conditions after the End-Permian Extinction." *Palaios* 18 (4–5): 388–402. doi:10.1669/0883-1351(2003)018<0388:ETMMTM>2.0.CO;2.

Ezaki, Yoichi, Jianbo Liu, Tadahiro Nagano, and Natsuko Adachi. 2008. "Geobiological Aspects of the Earliest Triassic Microbialites Along the Southern Periphery of the Tropical Yangtze Platform: Initiation and Cessation of a Microbial Regime." *Palaios* 23 (6): 356–369. doi:10.2110/palo.2007.p07-035r.

Farabegoli, Enzo, and Maria Cristina Perri. 1998. "Stop 4.3 - Permian/Triassic Boundary and Ear1y Triassic of the Bulla Section (Southern Alps, Italy): Lithostratigraphy, Facies and Conodont Biostratigraphy." *Giornale Di Geologia, Ser. 3* 60 (July): 292–312.

Farabegoli, Enzo, and Maria Cristina Perri. 2012. "Millennial Physical Events and the End-Permian Mass Mortality in the Western Palaeotethys: Timing and Primary Causes." In *Earth and Life: Global Biodiversity, Extinction Intervals and Biogeographic Perturbations Through Time*, edited by John A. Talent, 719–758. International Year of Planet Earth. Dordrecht: Springer Netherlands. doi:10.1007/978-90-481-3428-1_24.

Farshid, E., B. Hamdi, V. Hairapetian, and S. A. Aghanabati. 2016. "Conodont Biostratigraphy of the Permian-Triassic Boundary in the Baghuk Mountain Section Northwest of Abadeh." *Scientific Quaterly Journal, Geosciences* 25 (99). GEOSCIENCES.

Gaetani, Maurizio, Volker Jacobshagen, Alda Nicora, Günter Kauffman, Vassili Tselepidis, Nerina Fantini Sestini, Dorothe Mertmann, and Vana Skourtsis-Coroneou. 1992. "The Early-Middle Triassic Boundary at Chios (Greece)." *Rivista Italiana Di Paleontologia e Stratigrafia (Research In Paleontology and Stratigraphy)* 98 (2). doi:10.13130/2039-4942/8934.

Gaetani, Maurizio, Alda Nicora, Charles Henderson, Simonetta Cirilli, Luka Gale, Roberto Rettori, Irene Vuolo, and Viorel Atudorei. 2013. "Refinements in the Upper Permian to Lower Jurassic Stratigraphy of Karakorum, Pakistan." *Facies* 59 (4): 915–948. doi:10.1007/s10347-012-0346-9.

Galivets, Y.E. 2017. "Отложения верхней части разреза нижнеоленёкского подъяруса бухты Абрек в Южном Приморье (предварительное заключение по конодонтам)" 1: 43–44.

Gallet, Yves, Leopold Krystyn, Jean Besse, Abdolah Saidi, and Luc-Emmanuel Ricou. 2000. "New Constraints on the Upper Permian and Lower Triassic Geomagnetic Polarity Timescale from the Abadeh Section (Central Iran)." *Journal of Geophysical Research: Solid Earth* 105 (B2). John Wiley & Sons, Ltd: 2805–2815. doi:10.1029/1999JB900218.

Ganev, M., and S. Stefanov. 1967. "Conodonten Aus Der Unteren Trias Des Luda-Kamčija-Durchbruchs (Ostbalkan): Bulgarian Acad. Sci., Geol. Inst." *Bull., Ser. Paleontology* 16: 87–95.

Garzanti, E., F. Jadoul, A. Nicora, and F. Berra. 1995. “Triassic of Spiti (Tethys Himalaya, N India).” *Rivista Italiana Di Paleontologia e Stratigrafia (Research In Paleontology and Stratigraphy)* 101 (3). doi:10.13130/2039-4942/8588.

Garzanti, E., A. Nicora, and R. Rettori. 1998. “Permo-Triassic Boundary and Lower to Middle Triassic in South Tibet.” *Journal of Asian Earth Sciences* 16 (2): 143–157. doi:10.1016/S0743-9547(98)00007-5.

Garzanti, EDUARDO, ALDA Nicora, and ANDREA Tintori. 1994. “Triassic Stratigraphy and Sedimentary Evolution of the Annapurna Tethys Himalaya (Manang Area, Central Nepal).” *Rivista Italiana Di Paleontologia e Stratigrafia* 100 (2): 195–226.

Gliwa, Jana, Abbas Ghaderi, Lucyna Leda, Martin Schobben, Sara Tomás, William J. Foster, Marie-Béatrice Forel, Nahideh Ghanizadeh Tabrizi, Stephen E. Grasby, and Ulrich Struck. 2020. “Aras Valley (Northwest Iran): High-Resolution Stratigraphy of a Continuous Central Tethyan Permian–Triassic Boundary Section.” *Fossil Record* 23 (1). Copernicus GmbH: 33–69. doi:10.5194/fr-23-33-2020.

Goel, R. K. 1977. “Triassic Conodonts from Spiti (Himachal Pradesh), India.” *Journal of Paleontology* 51 (6). Paleontological Society: 1085–1101.

Golding, M.L. 2021. “Abundant Conodont Faunas from the Olenekian (Early Triassic) of Subsurface British Columbia, Canada and Diversification of the Neogondolellinae around the Smithian–Spathian Boundary.” *Global and Planetary Change* 205 (October): 103613. doi:10.1016/j.gloplacha.2021.103613.

Golding, M.L., M.J. Orchard, J.-P. Zonneveld, C.M. Henderson, and L. Dunn. 2014. “An Exceptional Record of the Sedimentology and Biostratigraphy of the Montney and Doig Formations in British Columbia.” *Bulletin of Canadian Petroleum Geology* 62 (3): 157–176. doi:10.2113/gscpgbull.62.3.157.

Golding, M.L., M.J. Orchard, J.-P. Zonneveld, and N.S.F. Wilson. 2015. “Determining the Age and Depositional Model of the Doig Phosphate Zone in Northeastern British Columbia Using Conodont Biostratigraphy.” *Bulletin of Canadian Petroleum Geology* 63 (2): 143–170. doi:10.2113/gscpgbull.63.2.143.

Gong, Lei, Xianzhi Gao, Dorrik Stow, Futao Qu, Guangya Zhang, and Puyu Liu. 2022. “What Continued after the Mass Extinction: Insights from Carbonate Microfacies and Biological Evolution around the Permian–Triassic Boundary in the Middle Upper Yangtze Platform, SW China.” *Geological Magazine*. Cambridge University Press, 1–25. doi:10.1017/S0016756822000632.

Gordey, Steven P., and R.G. Anderson. 1993. “Evolution of the Northern Cordilleran Miogeocline, Nahanni Map Area (105I), Yukon and Northwest Territories.” *Geological Survey of Canada* 428: 214.

Grãdinaru, Eugen, Heinz W. Kozur, Alda Nicora, and Michael J. Orchard. 2006. “The *Chiosella Timorensis* Lineage and Correlation of the Ammonoids and Conodonts around the Base of the Anisian in the GSSP Candidate at Deşli Caira (North Dobrogea, Romania).” *Albertiana* 34: 34–39.

Gullo, M., and H. Kozur. 1993. “First Evidence of Scythian Conodonts in Sicily.” *Neues Jahrbuch Fur Geologie Und Palaontologie Monatshefte*, 477–477. doi:10.1127/njgpm/1993/1993/477.

Guoqing, Wang, and Xia Wenchen. 2004. “Conodont Zonation across the Permian-Triassic Boundary at the Xiakou Section, Yichang City, Hubei Province and Its Correlation with the Global Stratotype Section and Point of the PTB.” *Canadian Journal of Earth Sciences* 41 (3). NRC Research Press: 323–330. doi:10.1139/e04-008.

Ha, Thuy Thi Nhu, Takumi Maekawa, Hideko Takayanagi, and Yasufumi Iryu. 2021. “Spathian to Aegean (Upper Lower Triassic to Lower Middle Triassic) Carbon Isotope Stratigraphy Constrained by the Conodont Biostratigraphy of Carbonates on Top of a Mid-Oceanic Seamount Formed in the Panthalassic Ocean.” *Island Arc* 30 (1). John Wiley & Sons, Ltd: e12391. doi:10.1111/iar.12391.

Han, Chen, Michael J. Orchard, Shunling Wu, Laishi Zhao, Zhong-Qiang Chen, Martyn L. Golding, Irfan U. Jan, Zhengyi Lyu, and Syed I. Hashmi. 2022. “Improved Taxonomic Definition Based on the Ontogenetic Series of Griesbachian-Dienerian Conodonts from the Early Triassic of Northwestern Pakistan.” *Global and Planetary Change* 208 (January): 103703. doi:10.1016/j.gloplacha.2021.103703.

Hatleberg, E. W., and D. L. Clark. 1984. “Lower Triassic Conodonts and Biofacies Interpretations: Nepal and Svalbard.” *Geologica et Palaeontologica* 18: 101–125.

Hauser, Marc, Rossana Martini, S. Burns, P. Dumitrica, L. Krystyn, Albert Matter, Tjerk Peters, and Louisette Zaninetti. 2001. “Triassic Stratigraphic Evolution of the Arabian-Greater India Embayment of the Southern Tethys Margin.” *Eclogae Geologicae Helvetiae* 94 (1): 29–62.

Henderson, Charles M. 1997. “Uppermost Permian Conodonts and the Permian-Triassic Boundary in the Western Canada Sedimentary Basin.” *Bulletin of Canadian Petroleum Geology* 45 (4): 693–707. doi:10.35767/gscpgbull.45.4.693.

Henderson, CHARLES M., and AYMON Baud. 1997. “Correlation of the Permian–Triassic Boundary in Arctic Canada and Comparison with Meishan, China.” In *Proceedings of the 30th International Geological Congress*, 11:143–152. VSP Scientific Publishers.

Henderson, Charles M., Martyn L. Golding, and Michael J. Orchard. 2018. “Conodont Sequence Biostratigraphy of the Lower Triassic Montney Formation.” *Bulletin of Canadian Petroleum Geology* 66 (1): 7–22.

Herak, M., B. Scavnicar, A. Susnjara, Z. DURDANIVIC, L. Krystyn, and B. Gruber. 1983. “The Lower Triassic of Muc. Proposal for a Standard Section of the European Upper Scythian.” *Neue Beiträge Zur Biostratigraphie Der Tethys-Trias: Schriftenreihe Erdwissenschaftlichen Kommissionen, Osterreichische Akademie Wissenschaften* 5: 93–106.

Hirsch, F., and P. Süssli. 1973. “Lower Triassic Condonts from the Lower Elikah Formation, Central Alborz Mountains (North Iran).” *Eclogae Geol. Helv.* 66 (3): 525–531.

Hori, Rie S., Satoshi Yamakita, Minoru Ikehara, Kazuto Kodama, Yoshiaki Aita, Toyosaburo Sakai, Atsushi Takemura, et al. 2011. “Early Triassic (Induan) Radiolaria and Carbon-Isotope Ratios of a Deep-Sea Sequence from Waiheke Island, North Island, New Zealand.” *Radiolarians through Time: Systematics, Biostratigraphy and Paleoceanographic Significance. Proceedings of the 12th Meeting of the International Association of Radiolarian Paleontologists* 20 (2): 166–178. doi:10.1016/j.palwor.2011.02.001.

Imoto, N., and H. W. Kozur. 1997. “The Age of Triassic Conodonts from Shale Intercalations in Cherts from Kyoto Prefecture, Japan.” *News Osaka Micropalaeontol, Spec* 10: 115–126.

Iranian-Japanese Research Group. 1981. “The Permian and the Lower Triassic Systems in Abadeh Region, Central Iran.” *Memoirs of the Faculty of Science, Kyoto University, Series of Geology & Mineralogy* 47: 61–133.

Isaa, Aber, Abbas Ghaderi, Ali Reza Ashouri, and Dieter Korn. 2016. “Late Permian Early Triassic conodonts of the Zal section at the northwest of Iran.” *Journal of Stratigraphy and Sedimentology Researches* 32 (3): 55–74. doi:10.22108/jssr.2016.20876.

Isozaki, Yukio, Noriei Shimizu, Jianxin Yao, Zhansheng Ji, and Tetsuo Matsuda. 2007. “End-Permian Extinction and Volcanism-Induced Environmental Stress: The Permian–Triassic Boundary Interval of Lower-Slope Facies at Chaotian, South China.” *The Permian-Triassic Boundary Crisis and Early Triassic Biotic Recovery* 252 (1): 218–238. doi:10.1016/j.palaeo.2006.11.051.

Jacobshagen, Volker, M. Gaetani, A. Nicora, Βασίλης Τσελεπίδης, G. Kauffman, D. Mertmann, Βασιλική Σκούρτση-Κορωναίου, and Sestini Nerina Fantini. 1993. “The Early/Middle Triassic Boundary on Chios Island: Preliminary Results of a Reinvestigation.” *Δελτιον Της Ελληνικης Γεωλογικης Εταιριας* 28 (3): 25.

Jelaska, Vladimir, Tea Kolar-Jurkovšek, Bogdan Jurkovšek, and Ivan Gušić. 2003. “Triassic Beds in the Basement of the Adriatic-Dinaric Carbonate Platform of Mt. Svilaja (Croatia).” *Geologija* 46 (2): 225–230.

Ji, Wenting, Jinnan Tong, Laishi Zhao, Shiqin Zhou, and Jing Chen. 2011. “Lower–Middle Triassic Conodont Biostratigraphy of the Qingyan Section, Guizhou Province, Southwest China.” *Permian - Triassic Ecosystems: Collapse and Rebuilding* 308 (1): 213–223. doi:10.1016/j.palaeo.2010.08.020.

Ji, Zhansheng, Jianxin Yao, Yukio Isozaki, Tetsuo Matsuda, and Guichun Wu. 2007. “Conodont Biostratigraphy across the Permian–Triassic Boundary at Chaotian, in Northern Sichuan, China.” *The Permian-Triassic Boundary Crisis and Early Triassic Biotic Recovery* 252 (1): 39–55. doi:10.1016/j.palaeo.2006.11.033.

Jiang, Haishui, Michael M. Joachimski, Paul B. Wignall, Muhui Zhang, and Xulong Lai. 2015. “A Delayed End-Permian Extinction in Deep-Water Locations and Its Relationship to Temperature Trends (Bianyang, Guizhou Province, South China).” *Palaeogeography, Palaeoclimatology, Palaeoecology* 440 (December): 690–695. doi:10.1016/j.palaeo.2015.10.002.

Jiang, Haishui, Xulong Lai, Genming Luo, Richard Aldridge, Kexin Zhang, and Paul Wignall. 2007. “Restudy of Conodont Zonation and Evolution across the P/T Boundary at Meishan Section, Changxing, Zhejiang, China.” *Environmental and Biotic Changes during the Paleozoic-Mesozoic Transition* 55 (1): 39–55. doi:10.1016/j.gloplacha.2006.06.007.

Jiang, Haishui, Xulong Lai, Yadong Sun, Paul B. Wignall, Jianbo Liu, and Chunbo Yan. 2014. “Permian-Triassic Conodonts from Dajiang (Guizhou, South China) and Their Implication for the Age of Microbialite Deposition in the Aftermath of the End-Permian Mass Extinction.” *Journal of Earth Science* 25 (3): 413–430. doi:10.1007/s12583-014-0444-4.

Jiang, Haishui, Xulong Lai, Chunbo Yan, Richard J. Aldridge, Paul Wignall, and Yadong Sun. 2011. “Revised Conodont Zonation and Conodont Evolution across the Permian–Triassic Boundary at the Shangsi Section, Guangyuan, Sichuan, South China.” *Global and Planetary Change* 77 (3): 103–115. doi:10.1016/j.gloplacha.2011.04.003.

Jurkovšek, Bogdan, Bojan Ogorelec, and Tea Kolar-Jurkovšek. 1998. “Lower Triassic Beds from Tehovec (Polhov Gradec Hills, Slovenian).” *Geologija* 41 (unknown): 29–40.

Kapoor, H. M. 1996. “The Guryul Ravine Section, Candidate of the Global Stratotype and Point (GSSP) of the Permian–Triassic Boundary (PTB).” In *The Paleozoic-Mesozoic Boundary: Candidates of the Global Stratotype Section and Point of the Permian-Triassic*, China University of Geosciences Press, Wuhan, 99–110.

Kelley, Neil P., Ryosuke Motani, Patrick Embree, and Michael J. Orchard. 2016. “A New Lower Triassic Ichthyopterygian Assemblage from Fossil Hill, Nevada.” Edited by Andrew Farke. *PeerJ* 4 (January): e1626. doi:10.7717/peerj.1626.

Klets, T. V., and A. V. Yadrenkin. 2001. “Lower Triassic Conodonts from Kotelny Island (Taxonomic Composition, Correlation).” *Novosti Paleontologii i Stratigrafii [News in Paleontology and Stratigraphy]* 4: 14–21.

Klets, Tatyana V. 2003. “Facies Control over the Early Olenekian Conodonts in the North of Siberia.”

Klets, T. B., and A. B. Kopylova. 2008. “Первая Находка Рода Chiosella Kozur 1989 (Конодонты, Верхний Оленек) На Северо-Востоке России [The First Find of the Genus Chiosella Kozur 1989 (Conodonta, Verkhniy Olenyok) in the North-East of Russia].” *Новости Палеонтологии и Стратиграфии: Приложение к Журналу*, no. 10–11: 222–227.

Koike, Toshio. 1982. “Triassic Conodont Biostratigraphy in Kedah, West Malaysia. Contribution to the Geology and Palaeontology of Southeast Asia, 220.” *Geology and Palaeontology of Southeast Asia* 23: 9–51.

Koike, Toshio. 1988. “Lower Triassic Conodonts *Platyvillosus* from the Taho Limestone in Japan.” *Sci. Repts. Yokohama Natl. Univ., Sec. II*, no. 35: 61–79.

Koike, Toshio. 1996. “The First Occurrence of Griesbachian Conodonts in Japan.” In *Transactions and Proceedings of the Paleontological Society of Japan. New Series*, 1996:337–346. Palaeontological Society of Japan. doi:10.14825/prpsj1951.1996.181_337.

Koike, Toshio. 1998. “Triassic Coniform Conodont Genera *Aduncodina* and *Neostrachanognathus*.” *Paleontological Research* 2 (2): 120–129. doi:10.2517/prpsj.2.120.

Koike, Toshio, Fumio Kobayashi, and Tomowo Ozawa. 1985. “Smithian (Lower Triassic) Conodonts from Iwai, Hinode-Machi, Nishitama-Gun, Tokyo-to, Japan.” *Sci. Repts. Yokohama Natl. Univ., Sec. II*, no. 32: 45–56.

Kolar-Jurkovšek, T., Y. L. Chen, B. Jurkovšek, M. Poljak, D. Aljinović, and S. Richoz. 2017. “Conodont Biostratigraphy of the Early Triassic in Eastern Slovenia.” *Paleontological Journal* 51 (7): 687–703. doi:10.1134/S003103011707005X.

Kolar-Jurkovšek, T., and B. Jurkovšek. 1995. “Lower Triassic Conodont Fauna from Trzic (Karavanke Mts, Slovenia).” *Eclogae Geologicae Helvetiae* 88 (3): 789–801.

Kolar-Jurkovšek, Tea. 1990. “Smithian (Lower Triassic) Conodonts from Slovenia, NW Yugoslavia.” *N. Jb. Geol. Paläont. Mh.* 9: 536–546. doi:10.1127/njgpm/1990/1990/536.

Kolar-Jurkovšek, Tea, Hazim Hrvatović, Dunja Aljinović, Galina P. Nestell, Bogdan Jurkovšek, and Ferid Skopljak. 2021. “Permian-Triassic Biofacies of the Teočak Section, Bosnia and Herzegovina.” *Global and Planetary Change* 200 (May): 103458. doi:10.1016/j.gloplacha.2021.103458.

Kolar-Jurkovsek, Tea, Bogdan Jurkovsek, and Dunja Aljinovic. 2011. “Conodont Biostratigraphy and Lithostratigraphy across the Permian-Triassic Boundary at the Lukac Section in Western Slovenia.” *Rivista Italiana Di Paleontologia e Stratigrafia (Research In Paleontology and Stratigraphy)* 117 (1).

Kolar-Jurkovšek, Tea, Bogdan Jurkovšek, Galina P. Nestell, and Dunja Aljinović. 2018. “Biostratigraphy and Sedimentology of Upper Permian and Lower Triassic Strata at Masore, Western Slovenia.” *Palaeogeography, Palaeoclimatology, Palaeoecology* 490 (January): 38–54. doi:10.1016/j.palaeo.2017.09.013.

Kolar-Jurkovšek, Tea, Bogdan Jurkovšek, Valery Ja Vuks, Hazim Hrvatović, Dunja Aljinović, Ćazim Šarić, and Ferid Skopljak. 2014. “The Lower Triassic Platy Limestone in the Jajce Area (Bosnia and Herzegovina).” *Geologija* 57 (2): 105–118. doi:10.5474/geologija.2014.010.

Kolar-Jurkovšek, Tea, Valery J. Vuks, Dunja Aljinović, Michael Hautmann, Andrzej Kaim, and Bogdan Jurkovšek. 2013. “Olenekian (Early Triassic) Fossil Assemblage from Eastern Julian Alps (Slovenia).” In *Annales Societatis Geologorum Poloniae*, 83(3):213–227. doi:10.5167/uzh-94540.

Komatsu, Toshifumi, Reishi Takashima, Yasunari Shigeta, Takumi Maekawa, Huyen Dang Tran, Tien Dinh Cong, Susumu Sakata, Hung Doan Dinh, and Osamu Takahashi. 2016. “Carbon Isotopic Excursions and Detailed Ammonoid and Conodont Biostratigraphies around Smithian–Spathian Boundary in the Bac Thuy Formation, Vietnam.” *Palaeogeography, Palaeoclimatology, Palaeoecology* 454 (July): 65–74. doi:10.1016/j.palaeo.2016.04.017.

Konstantinov, A.G., E.S. Sobolev, and A.V. Yadrenkin. 2013. “Triassic Stratigraphy of the Eastern Laptev Sea Coast and New Siberian Islands.” *Problems of the Geology and Petroleum Potential of the Arctic* 54 (8): 792–807. doi:10.1016/j.rgg.2013.07.004.

Kozur, H., Orhan Kaya, and Helfried Mostler. 1996. “First Evidence of Lower to Middle Scythian (Dienerian-Lower Olenekian) Radiolarians from the Karakaya Zone of Northwestern Turkey.” *Geologisch-Palaontologische Mitteilungen Innsbruck, Sonderband* 4: 271–285.

Kozur, H., H. Krainer, and H. Mostler. 1997. “*Neospathodus Sosioensis* n. Sp., a New Conodont Species from the Late Olenekian (Uppermost Scythian) of Western Sicily, Italy. News of Osaka Micropaleontologists, Special Volume.” In *Proceedings of the Fifth Radioalarian Symposium*, 109–113.

Kozur, H. W. 2005. *Pelagic Uppermost Permian and the Permian-Triassic Boundary Conodonts of Iran: Part II: Investigated Sections and Evaluation of the Conodont Faunas*. Vol. 19. Hallesches Jahrbuch Für Geowissenschaften. Halle (Saale): na.

Kozur, Heinz, and Helfried Mostler. 1996. "*Lranognathus Sosioensis* n. Sp., a New Conodont Species from the Changxingian (Late Permian) of Western Sicily." *Geologia Croatica* 49 (2): 129–134.

Kozur, Heinz W. 1996. "The Conodonts *Hindeodus*, *Isarcicella* and *Sweetohindeodus* in the Uppermost Permian and Lowermost Triassic." *Geologia Croatica* 49 (1): 81–115.

Krystyn, L., M. Balini, and A. Nicora. 2004. "Lower and Middle Triassic Stage and Substage Boundaries in Spiti." *Albertiana* 30: 40–53.

Krystyn, L., S. Richoz, and O. N. Bhargava. 2007. "The Induan-Olenekian Boundary (IOB) in Mud-an Update of the Candidate GSSP Section M04." *Albertiana* 36: 33–45.

Krystyn, Leo, Sylvain Richoz, Aymon Baud, and Richard J. Twitchett. 2003. "A Unique Permian–Triassic Boundary Section from the Neotethyan Hawasina Basin, Central Oman Mountains." *Pangea Special Issue - Selected Papers from the Pangea Symposium, Muscat, January 2001* 191 (3): 329–344. doi:10.1016/S0031-0182(02)00670-3.

Lehrmann, Daniel J., Leanne Stepchinski, Demir Altiner, Michael J. Orchard, Paul Montgomery, Paul Enos, Brooks B. Ellwood, et al. 2015. "An Integrated Biostratigraphy (Conodonts and Foraminifers) and Chronostratigraphy (Paleomagnetic Reversals, Magnetic Susceptibility, Elemental Chemistry, Carbon Isotopes and Geochronology) for the Permian–Upper Triassic Strata of Guandao Section, Nanpanjiang Basin, South China." *Journal of Asian Earth Sciences* 108 (August): 117–135. doi:10.1016/j.jseaes.2015.04.030.

Leu, Marc. 2021. "Conodont Taxonomy, Quantitative Biochronology and Evolutionary Trends during the Smithian-Spathian Interval (Early Triassic)." PhD Thesis, University of Zurich.

Leu, Marc, Hugo Bucher, Torsten Vennemann, Borhan Bagherpour, Cheng Ji, Morgane Brosse, and Nicolas Goudemand. 2022. "A Unitary Association-Based Conodont Biozonation of the Smithian–Spathian Boundary (Early Triassic) and Associated Biotic Crisis from South China." *Swiss Journal of Palaeontology* 141 (1): 19. doi:10.1186/s13358-022-00259-x.

Li, Hanxiao, Hanxinshuo Dong, Haishui Jiang, Paul B. Wignall, Yanlong Chen, Muhui Zhang, Zhumin Ouyang, et al. 2022. "Integrated Conodont Biostratigraphy and δ^{13}Ccarb Records from End Permian to Early Triassic at Yiwagou Section, Gansu Province, Northwestern China and Their Implications." *Palaeogeography, Palaeoclimatology, Palaeoecology* 601 (September): 111079. doi:10.1016/j.palaeo.2022.111079.

Li, Hanxiao, Haishui Jiang, Yanlong Chen, Paul B. Wignall, Baojin Wu, Zaitian Zhang, Muhui Zhang, Zhumin Ouyang, and Xulong Lai. 2019. "Smithian Platform-Bearing Gondolellid Conodonts from Yiwagou Section, Northwestern China and Implications for Their Geographic Distribution in the Early Triassic." *Journal of Paleontology* 93 (3): 496–511. doi:10.1017/jpa.2018.93.

Liang, Dan, JinNan Tong, and LaiShi Zhao. 2011. "Lower Triassic Smithian-Spathian Boundary at West Pingdingshan Section in Chaohu, Anhui Province." *Science China Earth Sciences* 54 (3): 372–379. doi:10.1007/s11430-010-4145-2.

Liang, Lei, Jinnan Tong, Haijun Song, Ting Song, Li Tian, Huyue Song, and Haiou Qiu. 2016. "Lower-Middle Triassic Conodont Biostratigraphy of the Mingtang Section, Nanpanjiang Basin, South China." *Palaeogeography, Palaeoclimatology, Palaeoecology* 459 (October): 381–393. doi:10.1016/j.palaeo.2016.07.027.

Liu, Shuang, Zuoyu Sun, Cheng Ji, Min Zhou, and Dayong Jiang. 2020. "Conodont Biostratigraphy and Age of the Early Triassic Fish-Bearing-Nodule Levels from Nanjing and Jurong, Jiangsu Province, South China." *Journal of Earth Science* 31 (1): 9–22. doi:10.1007/s12583-019-1232-y.

Lucas, S. G., J. W. Estep, C. M. Gonzalez-Leon, R. K. Paull, N. J. Silberling, M. B. Steiner, and J. E. Marzolf. 1997. "Early Triassic Ammonites and Conodonts from Sonora, Northwestern Mexico."

Neues Jahrbuch Fur Geologie Und Palaontologie-Monatshefte, no. 12: 562–574. doi:10.1127/njgpm/1997/1997/562.

Lucas, S. G., K Krainer, and A. C. Milner. 2007. “The Type Section and Age of the Timpoweap Member and Stratigraphic Nomenclature of the Triassic Moenkopi Group in Southwestern Utah.” *Triassic of the American West*, New Mexico Museum of Natural History & Science, Bulletin 40: 109–118.

Lucas, S. G., and M. J. Orchard. 2007. “Triassic Lithostratigraphy and Biostratigraphy, North of Currie, Elko County, Nevada.” *Triassic of the American West*, New Mexico Museum of Natural History & Science, Bulletin 40: 119–126.

Luo, GenMing, XuLong Lai, QingLai Feng, HaiShui Jiang, Paul Wignall, KeXin Zhang, YaDong Sun, and Jun Wu. 2008. “End-Permian Conodont Fauna from Dongpan Section: Correlation between the Deep-and Shallow-Water Facies.” *Science in China Series D: Earth Sciences* 51 (11): 1611. doi:10.1007/s11430-008-0125-1.

Luppold, F. W. 2001. “New Biostratigraphic Data from West Spitsbergen Based on Conodonts.” *Geol. Jb.* B91: 603–633.

Lyu, Zhengyi, Michael J. Orchard, Zhong-Qiang Chen, Xiangdong Wang, Laishi Zhao, and Chen Han. 2019. “Uppermost Permian to Lower Triassic Conodont Successions from the Enshi Area, Western Hubei Province, South China.” *The Palaeozoic-Mesozoic Transition in South China* 519 (April): 49–64. doi:10.1016/j.palaeo.2017.08.015.

Lyu, Zhengyi, Michael J. Orchard, Zhong-Qiang Chen, Laishi Zhao, Lei Zhang, and Xiumei Zhang. 2018. “A Taxonomic Re-Assessment of the *Novispathodus Waageni* Group and Its Role in Defining the Base of the Olenekian (Lower Triassic).” *Journal of Earth Science* 29 (4): 824–836. doi:10.1007/s12583-018-0795-3.

Lyu, Zhengyi, Michael J. Orchard, Martyn L. Golding, Charles M. Henderson, Zhong-Qiang Chen, Lei Zhang, Chen Han, et al. 2021. “Lower Triassic Conodont Biostratigraphy of the Guryul Ravine Section, Kashmir.” *Global and Planetary Change* 207 (December): 103671. doi:10.1016/j.gloplacha.2021.103671.

Maekawa, Takumi, Toshifumi Komatsu, and Toshio Koike. 2018. “Early Triassic Conodonts from the Tahogawa Member of the Taho Formation, Ehime Prefecture, Southwest Japan.” *Paleontological Research* 22 (s1): 1–62. doi:10.2517/2018PR001.

Maekawa, Takumi, Toshifumi Komatsu, Yasunari Shigeta, Dang Tran Huyen, and Dinh Cong Tien. 2015. “First Occurrence of Early Triassic Conodonts from the Lang Son Formation, Northeastern Vietnam.” *Paleontological Research* 19 (4): 312–321. doi:10.2517/2015PR014.

Maekawa, Takumi, Toshifumi Komatsu, Yasunari Shigeta, Reishi Takashima, and Tatsuhiko Yamaguchi. 2021. “Carbon Isotope Chemostratigraphy and Conodont Biostratigraphy around the Smithian–Spathian Boundary in the Panthalassan Carbonate Succession (SW Japan).” *Journal of Asian Earth Sciences* 205 (January): 104570. doi:10.1016/j.jseaes.2020.104570.

Makino, Y. 1976. “On the Stratigraphy of the Chichibu System in the Kashiwagi District, Central Part of the Kii Mountainland, Central Japan.” *J. Geol. Soc. Japan* 82: 297–310. doi:10.5575/geosoc.82.297.

Matsuda, Tetsuo. 1981. “Early Triassic Conodonts from Kashmir, India Part 1: *Hindeodus* and *Isarcicella*.” *Journal of Geosciences, Osaka City University* 24: 75–108.

McTavish, R. A. 1973. “Triassic Conodont Faunas from Western Australia.” *Neues Jahrbuch Für Geologie Und Paläontologie Abhandlungen* 143 (3): 275–303.

Meço, S. 1999. “Conodont Biostratigraphy of Triassic Pelagic Strata, Albania.” *Rivista Italiana Di Paleontologia e Stratigrafia* 105 (2): 251–266.

Meço, Selam. 2010. “Litho-Biostratigraphy and the Conodonts of Palaeozoic/Triassic Deposits in Albania.” *Palaeontographica Abteilung A*, no. 4–6: 131–197. doi:10.1127/pala/290/2010/131.

Metcalfe, I. 1981. “Permian and Early Triassic Conodonts from Northwest Peninsular Malaysia.” *Geological Society of Malaysia Bulletin* 14: 119–126.

Metcalfe, I. 1990. “Lower and Middle Triassic Conodonts from the Jerus Limestone, Pahang, Peninsular Malaysia.” *Journal of Southeast Asian Earth Sciences* 4 (2): 141–146. doi:10.1016/0743-9547(90)90013-4.

Metcalfe, I. 1992. “Lower Triassic (Smithian) Conodonts from Northwest Pahang Peninsular Malaysia.” *Journal of Micropalaeontology* 11 (1): 13. doi:10.1144/jm.11.1.13.

Metcalfe, I. 2012. “Changhsingian (Late Permian) Conodonts from Son La, Northwest Vietnam and Their Stratigraphic and Tectonic Implications.” *Journal of Asian Earth Sciences* 50 (May): 141–149. doi:10.1016/j.jseaes.2012.01.002.

Metcalfe, I., and J.L. Crowley. 2020. “Upper Permian and Lower Triassic Conodonts, High-Precision U-Pb Zircon Ages and the Permian-Triassic Boundary in the Malay Peninsula.” *Journal of Asian Earth Sciences* 199 (September): 104403. doi:10.1016/j.jseaes.2020.104403.

Metcalfe, I., R. S. Nicoll, and R. J. Willink. 2008. “Conodonts from the Permian–Triassic Transition in Australia and Position of the Permian–Triassic Boundary.” *Australian Journal of Earth Sciences* 55 (3). Taylor & Francis: 365–377. doi:10.1080/08120090701769480.

Metcalfe, I., R.S. Nicoll, R. Willink, M. Ladjavadi, and K. Grice. 2013. “Early Triassic (Induan–Olenekian) Conodont Biostratigraphy, Global Anoxia, Carbon Isotope Excursions and Environmental Perturbations: New Data from Western Australian Gondwana.” *Ultrahigh-Pressure and High-Pressure Metamorphic Terranes in Orogenic Belts: Reactions, Fluids and Geological Processes* 23 (3): 1136–1150. doi:10.1016/j.gr.2012.07.002.

Mietto, P., R. Panzanelli Fratoni, and M. C. Perri. 1991. “Spathian and Aegean Conodonts from the Capelluzzo Calcarenites of the Monte Facito Group (Lagonegro Sequence-Southern Apennines).”

Mørk, Atle, Geir Elvebakk, Arne W. Forsberg, Mark W. Hounslow, Hans Arne Nakrem, Jorunn Os Vigran, and Wolfgang Weitschat. 1999. “The Type Section of the Vikinghogda Formation: A New Lower Triassic Unit in Central and Eastern Svalbard.” *Polar Research* 18 (1): 51–82. doi:10.1111/j.1751-8369.1999.tb00277.x.

Moslow, Thomas F., Beth Haverslew, and Charles M. Henderson. 2018. “Sedimentary Facies, Petrology, Reservoir Characteristics, Conodont Biostratigraphy and Sequence Stratigraphic Framework of a Continuous (395m) Full Diameter Core of the Lower Triassic Montney Fm, Northeastern British Columbia.” *Bulletin of Canadian Petroleum Geology* 66 (1): 259–287.

Muto, Shun. 2021. “Recurrent Deposition of Organic-Rich Sediments in Early Triassic Pelagic Panthalassa and Its Relationship with Global Oceanic Anoxia: New Data from Kyoto, Southwest Japan.” *Global and Planetary Change* 197 (February): 103402. doi:10.1016/j.gloplacha.2020.103402.

Muto, Shun, Satoshi Takahashi, Satoshi Yamakita, and Tetsuji Onoue. 2020. “Scarcity of Chert in Upper Lower Triassic Panthalassic Deep-Sea Successions of Japan Records Elevated Clastic Inputs Rather than Depressed Biogenic Silica Burial Flux Following the End-Permian Extinction.” *Global and Planetary Change* 195 (December): 103330. doi:10.1016/j.gloplacha.2020.103330.

Muto, Shun, Satoshi Takahashi, Satoshi Yamakita, Katsuhito Soda, and Tetsuji Onoue. 2019. “Conodont-Based Age Calibration of the Middle Triassic Anisian Radiolarian Biozones in Pelagic Deep-Sea Bedded Chert.” *Bulletin of the Geological Survey of Japan* 70 (1–2): 43–89. doi:10.9795/bullgsj.70.43.

Muto, Shun, Satoshi Takahashi, Satoshi Yamakita, Noritoshi Suzuki, Nozomi Suzuki, and Yoshiaki Aita. 2018. “High Sediment Input and Possible Oceanic Anoxia in the Pelagic Panthalassa during the Latest Olenekian and Early Anisian: Insights from a New Deep-Sea Section in Ogama, Tochigi, Japan.” *Palaeogeography, Palaeoclimatology, Palaeoecology* 490 (January): 687–707. doi:10.1016/j.palaeo.2017.11.060.

Muttoni, G., D.V. Kent, and M. Gaetani. 1995. “Magnetostratigraphy of a Lower-Middle Triassic Boundary Section from Chios (Greece).” *Physics of the Earth and Planetary Interiors* 92 (3): 245–260. doi:10.1016/0031-9201(95)03021-4.

Nakazawa, Keiji, Hari Mohan Kapoor, Ken-ichi Ishii, Yuji Bando, Tadashi Maegoya, Daikichiro Shimizu, Yasuo Nogami, Takao Tokuoka, and Susumu Nohda. 1970. “Preliminary Report on the Permo-Trias of Kashmir.” *Memoirs of the Faculty of Science, Kyoto University, Series of Geology & Mineralogy* 37 (2): 163–172.

Nakrem, Hans Arne, Hubert Szaniawski, and A. Mork. 2001. “Permian-Triassic Scolecodonts and Conodonts from the Svalis Dome, Central Barents Sea, Norway.” *Acta Palaeontologica Polonica* 46 (1).

Nazarevich, Bronislav P., and Krystyna Zawidzka. 1981. “Lower Triassic Conodonts from the Eastern Caucasian Foreland.” *Acta Geologica Polonica* 31 (1–2): 35–40.

Nicora, Alda. 1992. “Conodonts from the Lower Triassic Sequence of Central Dolpo, Nepal.” *Rivista Italiana Di Paleontologia e Stratigrafia (Research In Paleontology and Stratigraphy)* 97 (3–4). doi:10.13130/2039-4942/8950.

Orchard, M. J. 1995. “Taxonomy and Correlation of Lower Triassic (Spathian) Segminate Conodonts from Oman and Revision of Some Species of *Neospathodus*.” *Journal of Paleontology* 69 (1). Paleontological Society: 110–122.

Orchard, M. J., and Leopold Krystyn. 1998. “Conodonts of the Lowermost Triassic of Spiti, and New Zonation Based on *Neogondolella* Successions.” *Rivista Italiana Di Paleontologia e Stratigrafia (Research In Paleontology and Stratigraphy)* 104 (3). doi:10.13130/2039-4942/5339.

Orchard, M. J., W. W. Nassichuk, and Lin Rui. 1994. “Conodonts from the Lower Griesbachian *Otoceras Latilobatum* Bed of Selong, Tibet and the Position of the Permian—Triassic Boundary.” *Pangea: Global Environments and Ressources - Memoir* 17: 823–843.

Orchard, M. J., L. C. Struik, H. Taylor, and M. Quat. 1999. “Carboniferous–Triassic Conodont Biostratigraphy, Nechako NATMAP Project Area, Central British Columbia.” *Current Research*, 97–108.

Orchard, M. J., and J.-P. Zonneveld. 2009. “The Lower Triassic Sulphur Mountain Formation in the Wapiti Lake Area: Lithostratigraphy, Conodont Biostratigraphy, and a New Biozonation for the Lower Olenekian (Smithian) Earth Science Sector (ESS) Contribution 20080714.” *Canadian Journal of Earth Sciences* 46 (10): 757–790. doi:10.1139/E09-051.

Orchard, Michael J. 2008. “Lower Triassic Conodonts from the Canadian Arctic, Their Intercalibration with Ammonoid-Based Stages and a Comparison with Other North American Olenekian Faunas.” *Polar Research* 27 (3). Routledge: 393–412. doi:10.1111/j.1751-8369.2008.00072.x.

Orchard, Michael J. 2022. “North American Spathian (Upper Olenekian, Lower Triassic) Neogondolellin Conodonts.” *Papers in Palaeontology* 8 (1). John Wiley & Sons, Ltd: e1409. doi:10.1002/spp2.1409.

Orchard, Michael J., Eugengr Dinaru, and Alda Nicora. 2007. “A Summary of the Conodont Succession around the Olenakian-Anisian Boundary at Desli Caira, North Dobrogea, Romania.” *The Global Triassic, New Mexico Museum of Natural History and Science Bulletin* 41: 341–346.

Orchard, Mike J., and Hugo Bucher. 1992. “Conodont-Ammonoid Intercalibration around the Lower-Middle Triassic Boundary: Nevadan Clocks Help Tell British Columbian Time.” *Geological Survey of Canada Paper 92-1E*, 133–140.

Orchard, M.J., F. Cordey, L. Rui, E.W. Bamber, B. Mamet, L.C. Struik, H. Sano, and H.J. Taylor. 2001. “Biostratigraphic and Biogeographic Constraints on the Carboniferous to Jurassic Cache Creek Terrane in Central British Columbia1.” *Canadian Journal of Earth Sciences* 38 (4): 551–578. doi:10.1139/e00-120.

Ovtcharova, Maria, Nicolas Goudemand, Øyvind Hammer, Kuang Guodun, Fabrice Cordey, Thomas Galfetti, Urs Schaltegger, and Hugo Bucher. 2015. “Developing a Strategy for Accurate Definition of a Geological Boundary through Radio-Isotopic and Biochronological Dating: The Early–Middle Triassic Boundary (South China).” *Earth-Science Reviews* 146 (July): 65–76. doi:10.1016/j.earscirev.2015.03.006.

Pakistani-Japanese Research Group. 1985. “Permian and Triassic Systems in the Salt Range and Surghar Range, Pakistan.” *The Tethys: Her Palaeogeography and Palaeobiogeography from Paleozoic to Mesozoic*, 221–312.

Paull, R. K., J. D. Campbell, and D. S. Coombs. 1996. “New Information on the Age and Thermal History of a Probable Early Triassic Siltstone near Kaka Point, South Island, New Zealand.” *New Zealand Journal of Geology and Geophysics* 39 (4). Taylor & Francis: 581–584. doi:10.1080/00288306.1996.9514735.

Paull, Rachel K., and Richard A. Paull. 1983. “Revision of Type Lower Triassic Dinwoody Formation, Wyoming, and Designation of Principal Reference Section.” *Rocky Mountain Geology* 22 (2): 83–90.

Paull, Rachel K., Richard A. Paull, and Thomas S. Laudon. 1997. “Conodont Biostratigraphy of the Lower Triassic Mackenzie Dolomite Lentil, Sulphur Mountain Formation in the Cadomin Area, Alberta.” *Bulletin of Canadian Petroleum Geology* 45 (4): 708–714. doi:10.35767/gscpgbull.45.4.708.

Paull, Richard A., and Rachel K. Paull. 1991. “Allochthonous Rocks from the Western Part of the Early Triassic Miogeocline; Hawley Creek Area, East-Central Idaho.” *Rocky Mountain Geology* 28 (2): 145–154.

Paull, R.K. 1980. “Conodont Biostratigraphy of the Lower Triassic Dinwoody Formation in Northwestern Utah, Northeastern Nevada, and Southeastern Idaho [Unpub. Ph.D. Thesis].” University of Wisconsin, Madison.

Perri, M. C. 1985. “A Spathian Conodont Fauna from the Cencenighe Member of the Werfen Formation (Scythian), Southeastern Dolomites, Italy.” *Bollettino Della Soc. Paleo. Italiana* 24: 23–28.

Perri, M. C. 1991. “Conodont Biostratigraphy of the Werfen Formation (Lower Triassic), Southern Alps, Italy.” *Bolletino Della Societa Paleontologica Italiana* 30: 23–46.

Perri, M. C., and M. Andraghetti. 1987. “Permian-Triassic Boundary and Early Triassic Conodonts from the Southern Alps, Italy.” *Rivista Italiana Di Paleontologia e Di Stratigrafia* 93 (3): 291–328.

Perri, M. C., and Enzo Farabegoli. 2003. “Conodonts across the Permian–Triassic Boundary in the Southern Alps.” *Courier Forschungsinstitut Senckenberg* 245: 281–313.

Perri, Maria Cristina, P. D. Molloy, and John A. Talent. 2004. “Earliest Triassic Conodonts from Chitral, Northernmost Pakistan.” *Rivista Italiana Di Paleontologia e Stratigrafia (Research In Paleontology and Stratigraphy)* 110 (2).

Poole, Forrest G., and Bruce R. Wardlaw. 1978. “Candelaria (Triassic) and Diablo (Permian) Formations in Southern Toquima Range, Central Nevada.” *Pacific Section, SEPM*.

Richoz, S. 2006. “Stratigraphie et Variations Isotopiques Du Carbone Dans Le Permien Superieur et Le Trias Inferieur de Quelques Localites de La Neotethys (Turquie, Oman et Iran).” PhD Thesis, Université de Lausanne, Faculté des géosciences et de l’environnement.

Richoz, Sylvain, Leopold Krystyn, Aymon Baud, Rainer Brandner, Micha Horacek, and Parvin Mohtat-Aghai. 2010. “Permian–Triassic Boundary Interval in the Middle East (Iran and N. Oman): Progressive Environmental Change from Detailed Carbonate Carbon Isotope Marine Curve and Sedimentary Evolution.” *Journal of Asian Earth Sciences* 39 (4): 236–253. doi:10.1016/j.jseaes.2009.12.014.

Romano, Carlo, Ilia Kogan, Jim Jenks, Iwan Jerjen, and Winand Brinkmann. 2012. “Saurichthys and Other Fossil Fishes from the Late Smithian (Early Triassic) of Bear Lake County (Idaho, USA), with a Discussion of Saurichthyid Palaeogeography and Evolution.” *Bulletin of Geosciences* 87 (3). doi:10.3140/bull.geosci.1337.

Samankassou, E. 1995. “Early Triassic (Scythian) Conodonts from the Werfen Formation, Southern Alps, Italy.” *Neues Jahrbuch Fur Geologie Und Palaontologie-Monatshefte*, no. 4: 248. doi:10.1127/njgpm/1995/1995/248.

Sano, Hiroyoshi, Kiyoko Kuwahara, Akira Yao, and Sachiko Agematsu. 2010. “Panthalassan Seamount-Associated Permian-Triassic Boundary Siliceous Rocks, Mino Terrane, Central Japan.” *Paleontological Research* 14 (4): 293–315. doi:10.2517/1342-8144-14.4.293.

Sano, Hiroyoshi, Kiyoko Kuwahara, Akira Yao, and Sachiko Agematsu. 2012. “Stratigraphy and Age of the Permian-Triassic Boundary Siliceous Rocks of the Mino Terrane in the Mt. Funabuseyama Area, Central Japan.” *Paleontological Research* 16 (2): 124–146. doi:10.2517/1342-8144-16.2.124.

Sano, Hiroyoshi, Tetsuji Onoue, Michael J. Orchard, and Rossana Martini. 2012. “Early Triassic Peritidal Carbonate Sedimentation on a Panthalassan Seamount: The Jesmond Succession, Cache Creek Terrane, British Columbia, Canada.” *Facies* 58 (1): 113–130. doi:10.1007/s10347-011-0270-4.

Savage, N. M., M. J. Orchard, A. Sardsud, and P. Lutat. 2006. “Early Triassic (Dienerian) Conodonts from Northern Thailand and Their Bearing on the Evolution of Multielement Apparatuses.” Oral presentation presented at the International Conodont Symposium, Leicester.

Schönlaub, HANS P. 1991. “The Permian–Triassic of the Gartnerkofel-1 Core (Carnic Alps, Austria): Conodont Biostratigraphy.” *Abhandlungen Der Geologischen Bundesanstalt* 45: 79–98.

Shen, Shu Zhong, Chang-Qun Cao, Charles M. Henderson, Xiang-Dong Wang, Guang R. Shi, Yue Wang, and Wei Wang. 2006. “End-Permian Mass Extinction Pattern in the Northern Peri-Gondwanan Region.” *Palaeoworld* 15 (1): 3–30. doi:10.1016/j.palwor.2006.03.005.

Shen, Shu-Zhong, and Shi-Long Mei. 2010. “Lopingian (Late Permian) High-Resolution Conodont Biostratigraphy in Iran with Comparison to South China Zonation.” *Geological Journal* 45 (2-3). John Wiley & Sons, Ltd: 135–161. doi:10.1002/gj.1231.

Shi, Zejin, Leixun Lu, Guan Yin, Hongyu Long, Wenjie Li, Huaixin Yang, Rui Cao, et al. 2017. “Remains of Trilobites and Other Species Discovered in a Volcanic Ash Bed of the End-Permian, Yangtze Craton, South China.” *International Geology Review* 59 (7). Taylor & Francis: 905–917. doi:10.1080/00206814.2016.1244777.

Shigeta, Yasunari, Toshifumi Komatsu, Takumi Maekawa, and Huyen Dang Tran. 2014. *Olenekian (Early Triassic) Stratigraphy and Fossil Assemblages in Northeastern Vietnam*. 45. National Museum of Nature and Science.

Shigeta, Yasunari, Jurij D. Zaharov, Haruyoshi Maeda, and Alexander M. Popov. 2009. *The Lower Triassic System in the Abrek Bay Area, South Primorye, Russia*. 38. National Museum of Nature and Science Tokyo.

Shooshtarizadeh, P., and M. Yazdi. 2013. “Conodont Biostratigraphy of Permian-Triassic Boundary Deposits in Koh-e-Chah Kaland, North of Abadeh, Iran.” *Tanner, L.H., Spielmann, J.A. and Lucas, S.G., Eds.*, The Triassic System, , no. 61: 543–555.

Solien, Mark A. 1979. “Conodont Biostratigraphy of the Lower Triassic Thaynes Formation, Utah.” *Journal of Paleontology* 53 (2). Paleontological Society: 276–306.

Stone, Paul, Calvin H. Stevens, and M. J. Orchard. 1991. “Stratigraphy of the Lower and Middle (?) Triassic Union Wash Formation, East-Central California.” *U.S. Geological Survey* Bulletin 1928.

Sudar, M. 1986. “Triassic Microfossils and Biostratigraphy of the Inner Dinarides between Gučevo and Ljubisnja Mts. Jugoslavia.” *Ann. Géol. de La Pén. Balk* 50: 151–382.

Sudar, Milan, Divna Jovanović, and Tea Kolar-Jurkovšek. 2007. “Late Permian Conodonts from Jadar Block (Vardar Zone, Northwestern Serbia).” *Geologica Carpathica* 58 (2): 145–152.

Sudar, Milan N., Yanlong Chen, Tea Kolar-Jurkovšek, Bogdan Jurkovšek, Divna Jovanović, and Marie-Beatrice Forel. 2014. “Lower Triassic (Olenekian) Microfauna from Jadar Block (Gučevo Mt., Nw Serbia).” *Geoloski Anali Balkanskoga Poluostrva*, no. 75: 1–15. doi:10.2298/GABP1475001S.

Sudar, Milan N., Tea Kolar-Jurkovšek, Galina P. Nestell, Divna Jovanović, Bogdan Jurkovšek, Jeremy Williams, Michael Brookfield, and Alan Stebbins. 2018. “New Results of Microfaunal and Geochemical Investigations in the Permian–Triassic Boundary Interval from the Jadar Block (NW Serbia).” *Geologica Carpathica* 69 (2): 169–186. doi:10.1515/geoca-2018-0010.

Sudar, Milan, Maria Cristina Perri, and János Haas. 2008. “Conodonts across the Permian-Triassic Boundary in the Bükk Mountains (NE Hungary).” *Geologica Carpathica* 59 (6): 491–502.

Sun, Dongying, Jinnan Tong, Yanlin Xiong, Li Tian, and Hongfu Yin. 2012. “Conodont Biostratigraphy and Evolution across Permian-Triassic Boundary at Yangou Section, Leping, Jiangxi Province, South China.” *Journal of Earth Science* 23 (3): 311–325. doi:10.1007/s12583-012-0255-4.

Sun, Y.D., S. Richoz, L. Krystyn, S.E. Grasby, Y.L. Chen, D. Banerjee, and M.M. Joachimski. 2021. “Integrated Bio-Chemostratigraphy of Lower and Middle Triassic Marine Successions at Spiti in the Indian Himalaya: Implications for the Early Triassic Nutrient Crisis.” *Global and Planetary Change* 196 (January): 103363. doi:10.1016/j.gloplacha.2020.103363.

Sun, Y.D., P.B. Wignall, M.M. Joachimski, D.P.G. Bond, S.E. Grasby, S. Sun, C.B. Yan, L.N. Wang, Y.L. Chen, and X.L. Lai. 2015. “High Amplitude Redox Changes in the Late Early Triassic of South China and the Smithian–Spathian Extinction.” *Palaeogeography, Palaeoclimatology, Palaeoecology* 427 (June): 62–78. doi:10.1016/j.palaeo.2015.03.038.

Sweet, W. C. 1976. “Conodonts from the Permian-Triassic Boundary Beds at Kap Stosch, East Greenland.” *Meddelelser Om Gronland* 197 (5): 1–54.

Sweet, Walter C. 1970. “Uppermost Permian and Lower Triassic Conodonts of the Salt Range and Trans-Indus Range, West Pakistan.” *Stratigraphic Boundary Problems, Permian and Triassic of West Pakistan* 4: 207–275.

Takahashi, Satoshi, Satoshi Yamakita, and Noritoshi Suzuki. 2019. “Natural Assemblages of the Conodont *Clarkina* in Lowermost Triassic Deep-Sea Black Claystone from Northeastern Japan, with Probable Soft-Tissue Impressions.” *Palaeogeography, Palaeoclimatology, Palaeoecology* 524 (June): 212–229. doi:10.1016/j.palaeo.2019.03.034.

Takahashi, Satoshi, Satoshi Yamakita, Noritoshi Suzuki, Kunio Kaiho, and Masayuki Ehiro. 2009. “High Organic Carbon Content and a Decrease in Radiolarians at the End of the Permian in a Newly Discovered Continuous Pelagic Section: A Coincidence?” *Palaeogeography, Palaeoclimatology, Palaeoecology* 271 (1): 1–12. doi:10.1016/j.palaeo.2008.08.016.

Tanaka, K. 1980. “Kanoashi Group, an Olistostrome, in the Nichihara Area, Shimane Prefecture.” *J. Geol. Soc. Japan* 86 (9): 613–628. doi:10.5575/geosoc.86.613.

Teichert, Curt, Bernhard Kummel, and Walter C. Sweet. 1973. “Permian-Triassic Strata, Kuh-e-Ali Bashi, Northwestern Iran.”

Thang, Bui Duc. 1989. “Lower Triassic Conodonts from North Vietnam.” *Acta Palaeontologica Polonica* 34 (4).

Wang, Chengyuan. 1995. “Conodonts of Permian-Triassic boundary beds and biostratigraphic boundary.” *Acta palaeontologica Sinica* 34 (2): 129–151.

Wang, Lina, Paul B. Wignall, Yadong Sun, Chunbo Yan, Zaitian Zhang, and Xulong Lai. 2017. “New Permian-Triassic Conodont Data from Selong (Tibet) and the Youngest Occurrence of *Vjalovognathus*.” *Journal of Asian Earth Sciences* 146: 152–167. doi:10.1016/j.jseaes.2017.05.014.

Wang, Lina, Paul B. Wignall, Yongbiao Wang, Haishui Jiang, Yadong Sun, Guoshan Li, Jinling Yuan, and Xulong Lai. 2016. “Depositional Conditions and Revised Age of the Permo-Triassic Microbialites at

Gaohua Section, Cili County (Hunan Province, South China)." *Palaeogeography, Palaeoclimatology, Palaeoecology* 443 (February): 156–166. doi:10.1016/j.palaeo.2015.11.032.

Wardlaw, Bruce R., and David L. Jones. 1980. "Triassic Conodonts from Eugeoclinal Rocks of Western North America and Their Tectonic Significance." *Rivista Italiana Di Paleontologia e Stratigrafia* 85: 895–908.

Wardlaw, Bruce R., Merlynd K. Nestell, Galina P. Nestell, Brooks B. Ellwood, and Luu Thi Phuong Lan. 2015. "Conodont Biostratigraphy of the Permian-Triassic Boundary Sequence at Lung Cam, Vietnam." *Micropaleontology* 61 (4/5). The Micropaleontology Project., Inc.: 313–334.

Wardlaw, Bruce R., and Kevin R. Pogue. 1995. "The Permian of Pakistan." In *The Permian of Northern Pangea*, 215–224. Springer.

Weitschat, WOLFGANG, and ULRICH Lehmann. 1978. "Biostratigraphy of the Uppermost Part of the Smithian Stage (Lower Triassic) at the Botneheia, W-Spitsbergen." *Mitteilungen Geologisch-Paläontologischen Institut Universität Hamburg* 48: 85–100.

Wignall, Paul B., and Richard J. Twitchett. 2002. "Permian–Triassic Sedimentology of Jameson Land, East Greenland: Incised Submarine Channels in an Anoxic Basin." *Journal of the Geological Society* 159 (6): 691–703. doi:10.1144/0016-764900-120.

Wu, Gui-chun, Zhan-sheng Ji, Tea Kolar-Jurkovšek, Jian-xin Yao, and Gary G. Lash. 2021. "Early Triassic *Pachycladina* Fauna Newly Found in the Southern Lhasa Terrane of Tibet and Its Palaeogeographic Implications." *Palaeogeography, Palaeoclimatology, Palaeoecology* 562 (January): 110030. doi:10.1016/j.palaeo.2020.110030.

Wu, Guichun, Zhansheng Ji, Gary G. Lash, Jianxin Yao, Shaowen Zhang, and Yongxi Li. 2021. "Newly Discovered Wuchiapingian to Olenekian Conodonts from the Longgar Area, Southern Lhasa Terrane and Their Palaeobiogeographical Implications." *Lethaia* 54 (5). John Wiley & Sons, Ltd: 723–735. doi:10.1111/let.12435.

Wu, Gui-chun, Zhan-sheng Ji, Wei-hua Liao, and Jian-xin Yao. 2019. "New Biostratigraphic Evidence of Late Permian to Late Triassic Deposits from Central Tibet and Their Paleogeographic Implications." *Lithosphere* 11 (5): 683–696. doi:10.1130/L1046.1.

Wu, Guichun, Zhansheng Ji, Julie A. Trotter, Jianxin Yao, and Liqin Zhou. 2014. "Conodont Biostratigraphy of a New Permo-Triassic Boundary Section at Wenbudangsang, North Tibet." *Palaeogeography, Palaeoclimatology, Palaeoecology* 411: 188–207. doi:10.1016/j.palaeo.2014.06.016.

Wu, Kui, Li Tian, Lei Liang, Ian Metcalfe, Daoliang Chu, and Jinnan Tong. 2019. "Recurrent Biotic Rebounds during the Early Triassic: Biostratigraphy and Temporal Size Variation of Conodonts from the Nanpanjiang Basin, South China." *Journal of the Geological Society* 176 (6): 1232. doi:10.1144/jgs2019-065.

Xia, Wenchen, Ning Zhang, Guoqing Wang, and Kakuwa Youshitaka. 2004. "Pelagic Radiolarian and Conodont Biozonation in the Permo-Triassic Boundary Interval and Correlation to the Meishan GSSP." *Micropaleontology* 50 (1): 27–44.

Xiao, Yifan, Kui Wu, Li Tian, Michael J. Benton, Yong Du, Hao Yang, and Jinnan Tong. 2018. "Framboidal Pyrite Evidence for Persistent Low Oxygen Levels in Shallow-Marine Facies of the Nanpanjiang Basin during the Permian-Triassic Transition." *Palaeogeography, Palaeoclimatology, Palaeoecology* 511 (December): 243–255. doi:10.1016/j.palaeo.2018.08.012.

Xie, Chao-ming, Cai Li, Yun-sheng Ren, Ming Wang, and Li Su. 2018. "Detrital Provenance, Depositional Environment, and Palaeogeographic Implications of Lower Triassic Marine Sediments in Central Tibet." *International Geology Review* 60 (4). Taylor & Francis: 418–430. doi:10.1080/00206814.2017.1336945.

Xulong, Lai, Cui Wie, Xiong Wie Peng Ruixia, and Liu Zhenzuo. 1999. "Primary Study on Late Permian Conodont Fauna from Xifanli Section, Daye County, Southeast Hubei Province, China. In; Yin, Hongfu and Tong, Yinnan (Eds): Proc.” In *International Conference on Pangea and the Paleozoic-Mesozoic Transition, Wuhan (China Univ. Geosci. Press)*, 15–21.

Yamakita, S. 2007. “A Conodont Biostratigraphic Framework of a Permian/Triassic Ocean-Floor Sequence in the Accretionary Waipapa Terrane at Arrow Rocks, Northland, New Zealand.” *GNS Science Monograph* 24: 69–85.

Yamakita, Satoshi, Naoki Kadota, Takuya Kato, Ryuji Tada, Shigenori Ogihara, Eiichi Tajika, and Yoshitaka Hamada. 1999. “Confirmation of the Permian/Triassic Boundary in Deep-Sea Sedimentary Rocks: Earliest Triassic Conodonts from Black Carbonaceous Claystone of the Ubara Section in the Tamba Belt, Southwest Japan.” *The Journal of the Geological Society of Japan* 105 (12): 895–898. doi:10.5575/geosoc.105.895.

Yan, Chunbo, Lina Wang, Haishui Jiang, Paul B. Wignall, Yadong Sun, Yanlong Chen, and Xulong Lai. 2013. “Uppermost Permian to Lower Triassic Conodonts at Bianyang Section, Guihzou Province, South China.” *Palaios* 28 (8): 509–522. doi:10.2110/palo.2012.p12-077r.

Yang, Bo, Xulong Lai, Paul B. Wignall, Haishui Jiang, Chunbo Yan, and Yadong Sun. 2012. “A Newly Discovered Earliest Triassic Chert at Gaimao Section, Guizhou, Southwestern China.” *Palaeogeography, Palaeoclimatology, Palaeoecology* 344–345 (August): 69–77. doi:10.1016/j.palaeo.2012.05.019.

Yang, Bo, Dong-Xun Yuan, Charles M. Henderson, and Shu-Zhong Shen. 2014. “*Parafurnishius*, an Induan (Lower Triassic) Conodont New Genus from Northeastern Sichuan Province, Southwest China and Its Evolutionary Implications.” *Palaeoworld* 23 (3): 263–275. doi:10.1016/j.palwor.2014.10.003.

Yang, F., Y.D. Sun, P.J. Frings, L. Luo, J.W. E, L.N. Wang, Y.F. Huang, T. Wang, J. Müller, and S.C. Xie. 2022. “Collapse of Late Permian Chert Factories in the Equatorial Tethys and the Nature of the Early Triassic Chert Gap.” *Earth and Planetary Science Letters* 600 (December): 117861. doi:10.1016/j.epsl.2022.117861.

Yao, Jianxin, Zhansheng Ji, Liting Wang, Yanbin Wang, Zhenjie Wu, Dunyi Liu, Guichun Wu, Jianwei Zhang, and Suping Li. 2011. “Conodont Biostratigraphy and Age Determination of the Lower-Middle Triassic Boundary in South Guizhou Province, China.” *Acta Geologica Sinica - English Edition* 85 (2): 408–420. doi:10.1111/j.1755-6724.2011.00409.x.

Yao, Jianxin, Akira Yao, and Kiyoko Kuwahara. 2001. “Upper Permian Biostratigraphic Correlation between Conodont and Radiolarian Zones in the Tamba-Mino Terrane, Southwest Japan.” *Journal of Geosciences-Osaka City University* 44. Osaka City University: 97–120.

Yousefirad, Mostafa, Somayeh Ghanbari, and Mahnaz Parvanehnejad Shirazi. 2013. “Using Conodont Elements to Distinguish Permian-Triassic Boundary Disconformity near Haftad Gholleh, Central Iran.” *Earth Sciences Research Journal* 17 (1): 61–65.

Yuan, Dong-xun, Jun Chen, Yi-chun Zhang, Quan-feng Zheng, and Shu-zhong Shen. 2015. “Changhsingian Conodont Succession and the End-Permian Mass Extinction Event at the Daijiagou Section in Chongqing, Southwest China.” *Journal of Asian Earth Sciences* 105 (June): 234–251. doi:10.1016/j.jseaes.2015.04.002.

Yuan, Dong-xun, Shu-zhong Shen, Charles M. Henderson, Jun Chen, Hua Zhang, and Hong-zhen Feng. 2014. “Revised Conodont-Based Integrated High-Resolution Timescale for the Changhsingian Stage and End-Permian Extinction Interval at the Meishan Sections, South China.” *Special Issue Permian Large Igneous Provinces: Characteristics, Mineralization and Paleo-Environment Effects* 204 (September): 220–245. doi:10.1016/j.lithos.2014.03.026.

Yuan, Dong-Xun, Shu-zhong Shen, Charles M. Henderson, Jun Chen, Hua Zhang, Quan-feng Zheng, and Huaichun Wu. 2019. “Integrative Timescale for the Lopingian (Late Permian): A Review and Update from Shangsi, South China.” *Earth-Science Reviews* 188 (January): 190–209. doi:10.1016/j.earscirev.2018.11.002.

Yuan, Dong-Xun, Yi-Chun Zhang, and Shu-Zhong Shen. 2018. “Conodont Succession and Reassessment of Major Events around the Permian-Triassic Boundary at the Selong Xishan Section, Southern Tibet, China.” *Global and Planetary Change* 161 (February): 194–210. doi:10.1016/j.gloplacha.2017.12.024.

Yuan, D.X., and S.Z. Shen. 2011. “Conodont succession across the Permian-Triassic boundary of the Liangfengya section, Chongqing, South China.” *Acta Palaeontologica Sinica* 50: 420–438.

Zakharov, Yuri D., Alexander S. Biakov, Aymon Baud, and Heinz Kozur. 2005. “Significance of Caucasian Sections for Working out Carbon-Isotope Standard for Upper Permian and Lower Triassic (Induan) and Their Correlation with the Permian of North-Eastern Russia.” *Journal of China University of Geosciences* 16 (2): 141–151.

Zakharov, Yuri D., and Heinz Kozur. 2010. “Conodont and Ammonoid Assem- Blages from the Permian/Triassic Boundary Interval: New Evidence from the Dorasham Area, Transcaucasia.” *Albertiana* 38: 16–22.

Zakharov, Yuri D., Alexander M. Popov, and Galina I. Buryi. 2005. “Unique Marine Olenekian-Anisian Boundary Section from South Primorye, Russian Far East.” *Journal of China University of Geosciences* 16 (3): 219–230.

Zhang, Kexin, Jinnan Tong, G.R. Shi, Xulong Lai, Jianxin Yu, Weihong He, Yuanqiao Peng, and Yali Jin. 2007. “Early Triassic Conodont–Palynological Biostratigraphy of the Meishan D Section in Changxing, Zhejiang Province, South China.” *The Permian-Triassic Boundary Crisis and Early Triassic Biotic Recovery* 252 (1): 4–23. doi:10.1016/j.palaeo.2006.11.031.

Zhang, Lei, Michael J. Orchard, Thomas J. Algeo, Zhong-Qiang Chen, Zhengyi Lyu, Laishi Zhao, Kunio Kaiho, Biao Ma, and Shijie Liu. 2017. “An Intercalibrated Triassic Conodont Succession and Carbonate Carbon Isotope Profile, Kamura, Japan.” *The Palaeozoic-Mesozoic Transition in South China* 519 (April): 65–83. doi:10.1016/j.palaeo.2017.09.001.

Zhang, Lei, Michael J. Orchard, Arnaud Brayard, Thomas J. Algeo, Laishi Zhao, Zhong-Qiang Chen, and Zhengyi Lyu. 2019. “The Smithian/Spathian Boundary (Late Early Triassic): A Review of Ammonoid, Conodont, and Carbon-Isotopic Criteria.” *The Smithian-Spathian Boundary: A Critical Juncture in the Early Triassic Recovery of Marine Ecosystems* 195 (August): 7–36. doi:10.1016/j.earscirev.2019.02.014.

Zhang, Ning, Haishui Jiang, Wenli Zhong, Haohao Huang, and Wenchen Xia. 2014. “Conodont Biostratigraphy across the Permian-Triassic Boundary at the Xinmin Section, Guizhou, South China.” *Journal of Earth Science* 25 (5): 779–786. doi:10.1007/s12583-014-0472-0.

Zhang, Yang, Ke-Xin Zhang, G. R. Shi, Wei-Hong He, Dong-Xun Yuan, Ming-Liang Yue, and Ting-Lu Yang. 2014. “Restudy of Conodont Biostratigraphy of the Permian–Triassic Boundary Section in Zhongzhai, Southwestern Guizhou Province, South China.” *Journal of Asian Earth Sciences* 80 (February): 75–83. doi:10.1016/j.jseaes.2013.10.032.

Zhao, He, Zhengyi Lyu, Zhong-Qiang Chen, Thomas J. Algeo, Michael J. Orchard, Yongsheng Liu, Zhaochu Hu, Lei Zhang, and Xiumei Zhang. 2021. “Integrated Biochemostratigraphy of the Permian-Triassic Boundary Beds in a Shallow Carbonate Platform Setting (Yangou, South China).” *Global and Planetary Change* 206 (November): 103583. doi:10.1016/j.gloplacha.2021.103583.

Zhao, Laishi, Yonglin Chen, Zhong-Qiang Chen, and Ling Cao. 2013. “Uppermost Permian to Lower Triassic Conodont Zonation from Three Gorges Area, South China.” *Palaios* 28 (8): 523–540. doi:10.2110/palo.2012.p12-107r.

Zhao, Laishi, Michael J. Orchard, Tong Jinnan, Sun Zhiming, Zuo Jinxun, Zhang Suxin, and Yun Ailing. 2007. “Lower Triassic Conodont Sequence in Chaohu, Anhui Province, China and Its Global Correlation.” *The Permian-Triassic Boundary Crisis and Early Triassic Biotic Recovery* 252 (1): 24–38. doi:10.1016/j.palaeo.2006.11.032.

Zhao, Laishi, Jinnan Tong, Zhiming Sun, and Michael J. Orchard. 2008. "A Detailed Lower Triassic Conodont Biostratigraphy and Its Implications for the GSSP Candidate of the Induan–Olenekian Boundary in Chaohu, Anhui Province." *Progress in Natural Science* 18 (1): 79–90. doi:10.1016/j.pnsc.2007.07.001.

Zhao Laishi, Tong Jinnan, Zhang Suxin, and Sun Zhimin. 2008. "An Update of Conodonts in the Induan-Olenekian Boundary Strata at West Pingdingshan Section, Chaohu, Anhui Province." *Journal of China University of Geosciences* 19 (3): 207–216. doi:10.1016/S1002-0705(08)60040-0.

Zhao, Xiwen, and Kexin Zhang. 1991. "Triassic Conodonts from the Ngari Area, Xizang (Tibet), China." *Acta Micropalaeontologica Sinica* 3: 433–440.

Zheng, YouYe, RongKe Xu, ChengYuan Wang, GuoTao Ma, XuLong Lai, DeJin Ye, Liang Cao, and JiWei Liang. 2007. "Discovery of Early Triassic Conodonts in Western Gangdisê and the Establishment of the Tangnale Formation." *Science in China Series D: Earth Sciences* 50 (12): 1767–1772. doi:10.1007/s11430-007-0099-4.

Константинов, А. Г., Е. С. Соболев, Н. И. Курушин, Т. В. Клец, and А. В. Ядренкин. 1997. "ЗОНАЛЬНОЕ РАСЧЛЕНЕНИЕ ТРИАСОВЫХ ОТЛОЖЕНИЙ ОМУЛЕВСКОГО ПОДНЯТИЯ (бассейн р. Колыма) [Zonal subdivision of Triassic deposits of the Omulevka Uplift (Kolyma basin)]." *ГеоJWгия и геофизика* 38 (10): 1653–1669.

References

Algeo, T.J., Chen, Z.Q., Fraiser, M.L., Twitchett, R.J., 2011a. Terrestrial–marine teleconnections in the collapse and rebuilding of Early Triassic marine ecosystems. Palaeogeography, Palaeoclimatology, Palaeoecology 308, 1–11. https://doi.org/10.1016/j.palaeo.2011.01.011

Algeo, T.J., Kuwahara, K., Sano, H., Bates, S., Lyons, T., Elswick, E., Hinnov, L., Ellwood, B., Moser, J., Maynard, J.B., 2011b. Spatial variation in sediment fluxes, redox conditions, and productivity in the Permian–Triassic Panthalassic Ocean. Palaeogeography, Palaeoclimatology, Palaeoecology 308, 65–83. https://doi.org/10.1016/j.palaeo.2010.07.007

Benton, M.J., 2003. When life nearly died: the greatest mass extinction of all time. Thames & Hudson.

Bond, D.P.G., Wignall, P.B., 2014. Large igneous provinces and mass extinctions: An update, in: Volcanism, Impacts, and Mass Extinctions: Causes and Effects, Special Paper 505. Geological Society of America, pp. 29–56. https://doi.org/10.1130/2014.2505(02)

Brayard, A., Escarguel, G., Bucher, H., Monnet, C., Brühwiler, T., Goudemand, N., Galfetti, T., Guex, J., 2009. Good genes and good luck: ammonoid diversity and the end-Permian mass extinction. Science 325, 1118–1121. https://doi.org/10.1126/science.1174638

Brosse, M., Bucher, H., Baud, A., Hagdorn, H., Nützel, A., Ware, D., Frisk, A.M., Goudemand, N., 2017. The biotic recovery in the aftermath of the Permian-Triassic Boundary: New data from The Griesbachian of Oman.

Budurov, K., Ivanova, D., Koleva-Rekalova, E., Petrunova, L., Tchoumatchenco, P., Yaneva, M., Zagorcev, I., 2004. The Triassic and Jurassic sediments in eastern Stara Planina mts. (Bulgaria) - An example of classification of geosites in sedimentary rocks. Geological heritage concept, conservation and protection policy in Central Europe. Geological Institute, Warsaw.

Charpentier, R.R., 1984. Conodonts through time and space: studies in conodont provincialism, in: Conodont Biofacies and Provincialism, Special Paper 196. Geological Society of America, pp. 11–32.

Choi, D.R., 1984. Late Permian–Early Triassic paleogeography of northern Japan: Did Pacific microplates accrete to Japan? Geology 12, 728–731. https://doi.org/10.1130/0091-7613(1984)12<728:LPTPON>2.0.CO;2

Dai, X., Song, H., Wignall, P.B., Jia, E., Bai, R., Wang, F., Chen, J., Tian, L., 2018. Rapid biotic rebound during the late Griesbachian indicates heterogeneous recovery patterns after the Permian-Triassic mass extinction. GSA Bulletin 130, 2015–2030. https://doi.org/10.1130/B31969.1

Dercourt, J., Gaetani, M., Vrielynck, B., Barrier, E., Biju-Duval, B., Brunet, M.-F., Cadet, J.P., Crasquin, S., Sandulescu, M., 2000. Atlas Peri-Tethys Palaeogeographical Maps, (Eds). ed. CCGM/CGMW Paris.

Donoghue, P.C.J., Forey, P.L., Aldridge, R.J., 2000. Conodont affinity and chordate phylogeny. Biological Reviews 75, 191–251. https://doi.org/10.1017/S0006323199005472

Du, M., Li, H., Tan, J., Wang, Z., Wang, W., 2023. The bias types and drivers of the Furongian Biodiversity Gap. Palaeogeography, Palaeoclimatology, Palaeoecology 612, 111394. https://doi.org/10.1016/j.palaeo.2023.111394

Du, Y., Chiari, M., Karádi, V., Nicora, A., Onoue, T., Pálfy, J., Roghi, G., Tomimatsu, Y., Rigo, M., 2020. The asynchronous disappearance of conodonts: New constraints from Triassic-Jurassic boundary sections in the Tethys and Panthalassa. Earth-Science Reviews 203, 103176. https://doi.org/10.1016/j.earscirev.2020.103176

Ferretti, A., Bancroft, A.M., Repetski, J.E., 2020. GECkO: Global Events impacting COnodont evolution. Palaeogeography, Palaeoclimatology, Palaeoecology 549, 109677. https://doi.org/10.1016/j.palaeo.2020.109677

Foster, W.J., 2015. Palaeoecology of the late Permian mass extinction and subsequent recovery.

Frank-Kamenetskaya, O.V., Rozhdestvenskaya, I.V., Rosseeva, E.V., Zhuravlev, A.V., 2014. Refinement of apatite atomic structure of albid tissue of Late Devon conodont. Crystallography Reports 59, 41–47. https://doi.org/10.1134/S1063774514010039

Grasby, S.E., Beauchamp, B., Embry, A., Sanei, H., 2013. Recurrent Early Triassic ocean anoxia. Geology 41, 175–178.

Guenser, P., Souquet, L., Dolédec, S., Mazza, M., Rigo, M., Goudemand, N., 2019. Deciphering the roles of environment and development in the evolution of a Late Triassic assemblage of conodont elements. Paleobiology 45, 440–457. https://doi.org/10.1017/pab.2019.14

Klets, T.V., 2008. Paleogeographic regionalization of Triassic seas based on conodontophorids. Stratigraphy and Geological Correlation 16, 467–489.

Kocsis, Á.T., Raja, N.B., Williams, S., 2023. rgplates: R interface for the GPlates Web Service and Desktop Application.

Martínez-Pérez, C., Cascales-Miñana, B., Plasencia, P., Botella, H., 2015. Exploring the major depletions of conodont diversity during the Triassic. Historical Biology 27, 503–507.

Martínez-Pérez, C., Plasencia, P., Cascales-Miñana, B., Mazza, M., Botella, H., 2014. New insights into the diversity dynamics of Triassic conodonts. Historical Biology 26, 591–602.

Maruyama, S., Isozaki, Y., Kimura, G., Terabayashi, M., 1997. Paleogeographic maps of the Japanese Islands: Plate tectonic synthesis from 750 Ma to the present. Island Arc 6, 121–142. https://doi.org/10.1111/j.1440-1738.1997.tb00043.x

Monnet, C., Klug, C., Goudemand, N., De Baets, K., Bucher, H., 2011. Quantitative biochronology of Devonian ammonoids from Morocco and proposals for a refined unitary association method. Lethaia 44, 469–489.

Müller, K.J., 1959. Kambrische conodonten. Zeitschrift der deutschen geologischen Gesellschaft 111, 434–485.

Müller, R.D., Cannon, J., Qin, X., Watson, R.J., Gurnis, M., Williams, S., Pfaffelmoser, T., Seton, M., Russell, S.H.J., Zahirovic, S., 2018. GPlates: Building a Virtual Earth Through Deep Time. Geochemistry, Geophysics, Geosystems 19, 2243–2261. https://doi.org/10.1029/2018GC007584

Onoue, T., Hori, R.S., Kojima, S., 2017. Triassic and Jurassic radiolarian response to global catastrophic events in the Panthalassa Ocean, as recorded in the Mino Belt, central Japan. Sci. Rep. Niigata Univ.(Geol.) 29–69.

Orchard, M.J., 2007. Conodont diversity and evolution through the latest Permian and Early Triassic upheavals. Palaeogeography, Palaeoclimatology, Palaeoecology 252, 93–117.

Petryshen, W., Henderson, C.M., De Baets, K., Jarochowska, E., 2020. Evidence of parallel evolution in the dental elements of Sweetognathus conodonts. Proceedings of the Royal Society B: Biological Sciences 287, 20201922. https://doi.org/10.1098/rspb.2020.1922

Pietzner, H., Vahl, J., Werner, H., Ziegler, W., 1968. Zur chemischen zusammensetzung und mikromorphologie der conodonten. Palaeontographica Abteilung A 115–152.

Raup, D.M., Sepkoski, J.J., 1982. Mass extinctions in the marine fossil record. Science 215, 1501–1503.

Rigo, M., Trotter, J.A., Preto, N., Williams, I.S., 2012. Oxygen isotopic evidence for Late Triassic monsoonal upwelling in the northwestern Tethys. Geology 40, 515–518.

Romano, C., Goudemand, N., Vennemann, T.W., Ware, D., Schneebeli-Hermann, E., Hochuli, P.A., Brühwiler, T., Brinkmann, W., Bucher, H., 2013. Climatic and biotic upheavals following the end-Permian mass extinction. Nature Geoscience 6, 57–60.

Ruban, D.A., Al-Husseini, M.I., Iwasaki, Y., 2007. Review of Middle East Paleozoic plate tectonics. GeoArabia 12, 35–56.

Sano, H., Kuwahara, K., Yao, A., Agematsu, S., 2012. Stratigraphy and age of the Permian-Triassic boundary siliceous rocks of the Mino terrane in the Mt. Funabuseyama area, central Japan. Paleontological Research 16, 124–146. https://doi.org/10.2517/1342-8144-16.2.124

Savary, J., Guex, J., 1999. Discrete biochronological scales and unitary associations: description of the BioGraph computer program. Section des sciences de la terre, Institut de géologie et paléontologie ….

Scheyer, T.M., Romano, C., Jenks, J., Bucher, H., 2014. Early Triassic marine biotic recovery: the predators' perspective. PLoS One 9, e88987.

Servais, T., Cascales-Miñana, B., Harper, D.A.T., Lefebvre, B., Munnecke, A., Wang, W., Zhang, Y., 2023. No (Cambrian) explosion and no (Ordovician) event: A single long-term radiation in the early Palaeozoic. Palaeogeography, Palaeoclimatology, Palaeoecology 111592. https://doi.org/10.1016/j.palaeo.2023.111592

Shi, G.R., 2006. The marine Permian of East and Northeast Asia: an overview of biostratigraphy, palaeobiogeography and palaeogeographical implications. Journal of Asian Earth Sciences 26, 175–206. https://doi.org/10.1016/j.jseaes.2005.11.004

Souquet, L., Guenser, P., Girard, C., Mazza, M., Rigo, M., Goudemand, N., 2022. Temperature-driven heterochrony as a main evolutionary response to climate changes in conodonts. Proceedings of the Royal Society B: Biological Sciences 289, 20220614. https://doi.org/10.1098/rspb.2022.0614

Stanley, S.M., 2016. Estimates of the magnitudes of major marine mass extinctions in earth history. Proc Natl Acad Sci USA 113, E6325. https://doi.org/10.1073/pnas.1613094113

Sun, Y., Joachimski, M.M., Wignall, P.B., Yan, C., Chen, Y., Jiang, H., Wang, L., Lai, X., 2012. Lethally hot temperatures during the Early Triassic greenhouse. Science 338, 366–370.

Trotter, J.A., Williams, I.S., Barnes, C.R., Lécuyer, C., Nicoll, R.S., 2008. Did cooling oceans trigger Ordovician biodiversification? Evidence from conodont thermometry. Science 321, 550–554.

Uno, K., Onoue, T., Hamada, K., Hamami, S., 2012. Palaeomagnetism of Middle Triassic red bedded cherts from southwest Japan: equatorial palaeolatitude of primary magnetization and widespread secondary magnetization. Geophysical Journal International 189, 1383–1398. https://doi.org/10.1111/j.1365-246X.2012.05462.x

Winguth, A.M.E., Shields, C.A., Winguth, C., 2015. Transition into a Hothouse World at the Permian–Triassic boundary—A model study. Palaeogeography, Palaeoclimatology, Palaeoecology 440, 316–327. https://doi.org/10.1016/j.palaeo.2015.09.008