

End-Botomian mass extinction

The **end-Botomian mass extinction event**, also known as the **late early Cambrian extinctions**, refer to two extinction intervals that occurred during Stages 4 and 5 of the Cambrian Period, approximately 513 to 509 million years ago. Estimates for the decline in global diversity over these events range from 50% of marine genera^[1] up to 80%^[2]. Among the organisms affected by this event were the small shelly fossils, archaeocyathids (an extinct group of sponges), trilobites, brachiopods, hyoliths, and mollusks ^{[1][3][4][5]}.

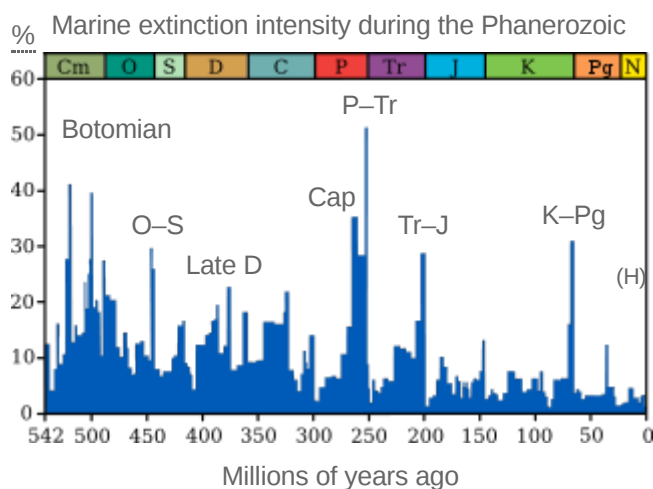
Causes

There are several hypotheses for the causes of these extinctions. There is evidence that major changes in the carbon cycle ^{[6][7][8][9]} and sea level occurred during this time ^{[1][10]}. Evidence also exists for the development of anoxia (a loss of oxygen) in some environments in the oceans ^{[1][11] [12]}.

One hypothesis that unifies this evidence links these environmental changes to widespread volcanic eruptions caused by the emplacement of the Kalkarindji Large Igneous Province or LIP ^{[13][14]}. These widespread eruptions would have injected large amounts of greenhouse gases into the atmosphere causing warming of the climate and subsequent acidification and loss of oxygen in the oceans ^[13]. However the precise timing between the eruptions and the extinction events remain unresolved ^[14].

References

- Zhuravlev, Andrey Yu.; Wood, Rachel A. (1996). "Anoxia as the cause of the mid-Early Cambrian (Botomian) extinction event" (<https://pubs.geoscienceworld.org/geology/article/24/4/311-314/206497>). *Geology*. **24** (4): 311. doi:10.1130/0091-7613(1996)024<0311:aatcot>2.3.co;2 (<https://doi.org/10.1130%2F0091-7613%281996%29024%3C0311%3Aaatcot%3E2.3.co%3B2>). ISSN 0091-7613 (<https://www.worldcat.org/issn/0091-7613>).
- Signor, Philip W. (1992). "Taxonomic diversity and faunal turnover in the Early Cambrian: Did the most severe mass extinction of the Phanerozoic occur in the Botomian stage?". *The Paleontological Society Special Publications*. **6**: 272. doi:10.1017/S2475262200008327 (<https://doi.org/10.1017%2FS2475262200008327>). ISSN 2475-2622 (<https://www.worldcat.org/issn/2475-2622>).
- Zhuravlev, Andrey Yu. (1996). "Reef ecosystem recovery after the Early Cambrian extinction". *Geological Society, London, Special Publications*. **102** (1): 79–96. doi:10.1144/GSL.SP.1996.001.01.06 (<https://doi.org/10.1144%2FGSL.SP.1996.001.01.06>). ISSN 0305-8719 (<https://www.worldcat.org/issn/0305-8719>).



Apparent extinction intensity, i.e. the fraction of genera going extinct at any given time, as reconstructed from the fossil record. (Graph not meant to include recent epoch of Holocene extinction event)

4. Porter, S.M. (May 2004). "Halkieriids in Middle Cambrian Phosphatic Limestones from Australia" (http://findarticles.com/p/articles/mi_qa3790/is_200405/ai_n9377598/pg_1?tag=artBody;col1). *Journal of Paleontology*. **78** (3): 574–590. CiteSeerX 10.1.1.573.6134 (<https://citeseerx.ist.psu.edu/viewdoc/summary?doi=10.1.1.573.6134>). doi:10.1666/0022-3360(2004)078<0574:HIMCPL>2.0.CO;2 (<https://doi.org/10.1666%2F0022-3360%282004%29078%3C0574%3AHIMCPL%3E2.0.CO%3B2>). Retrieved 2008-08-01.
5. Debrenne, Françoise (1991). "Extinction of the Archaeocyatha". *Historical Biology*. **5** (2–4): 95–106. doi:10.1080/10292389109380393 (<https://doi.org/10.1080%2F10292389109380393>). ISSN 0891-2963 (<https://www.worldcat.org/issn/0891-2963>).
6. Brasier, M. D.; Corfield, R. M.; Derry, L. A.; Rozanov, A. Yu.; Zhuravlev, A. Yu. (1994). "Multiple $\delta^{13}\text{C}$ excursions spanning the Cambrian explosion to the Botomian crisis in Siberia" (<https://pubs.geoscienceworld.org/geology/article/22/5/455-458/206101>). *Geology*. **22** (5): 455. doi:10.1130/0091-7613(1994)022<0455:mcestc>2.3.co;2 (<https://doi.org/10.1130%2F0091-7613%281994%29022%3C0455%3Amcestc%3E2.3.co%3B2>). ISSN 0091-7613 (<https://www.worldcat.org/issn/0091-7613>).
7. Brasier, M D; Sukhov, S S (1998). "The falling amplitude of carbon isotopic oscillations through the Lower to Middle Cambrian: northern Siberia data". *Canadian Journal of Earth Sciences*. **35** (4): 353–373. doi:10.1139/e97-122 (<https://doi.org/10.1139%2Fe97-122>). ISSN 0008-4077 (<https://www.worldcat.org/issn/0008-4077>).
8. Faggetter, Luke E.; Wignall, Paul B.; Pruss, Sara B.; Newton, Robert J.; Sun, Yadong; Crowley, Stephen F. (2017). "Trilobite extinctions, facies changes and the ROECE carbon isotope excursion at the Cambrian Series 2–3 boundary, Great Basin, western USA" (<http://eprints.whiterose.ac.uk/115157/1/Faggetter%20et%20al.%2C%202017..pdf>) (PDF). *Palaeogeography, Palaeoclimatology, Palaeoecology*. **478**: 53–66. doi:10.1016/j.palaeo.2017.04.009 (<https://doi.org/10.1016%2Fj.palaeo.2017.04.009>).
9. Zhu, Mao-Yan; Zhang, Jun-Ming; Li, Guo-Xiang; Yang, Ai-Hua (2004). "Evolution of C isotopes in the Cambrian of China: implications for Cambrian subdivision and trilobite mass extinctions". *Geobios*. **37** (2): 287–301. doi:10.1016/j.geobios.2003.06.001 (<https://doi.org/10.1016%2Fj.geobios.2003.06.001>).
10. Hallam, A (1999). "Mass extinctions and sea-level changes". *Earth-Science Reviews*. **48** (4): 217–250. doi:10.1016/S0012-8252(99)00055-0 (<https://doi.org/10.1016%2FS0012-8252%2899%2900055-0>).
11. Hough, M.L.; Shields, G.A.; Evins, L.Z.; Strauss, H.; Henderson, R.A.; Mackenzie, S. (2006). "A major sulphur isotope event at c . 510 Ma: a possible anoxia-extinction-volcanism connection during the Early-Middle Cambrian transition?: Global warming as a major determining factor in biosphere evolution". *Terra Nova*. **18** (4): 257–263. doi:10.1111/j.1365-3121.2006.00687.x (<https://doi.org/10.1111%2Fj.1365-3121.2006.00687.x>).
12. Pagès, Anais; Schmid, Susanne; Edwards, Dianne; Barnes, Stephen; He, Nannan; Grice, Kliti (2016). "A molecular and isotopic study of palaeoenvironmental conditions through the middle Cambrian in the Georgina Basin, central Australia". *Earth and Planetary Science Letters*. **447**: 21–32. doi:10.1016/j.epsl.2016.04.032 (<https://doi.org/10.1016%2Fj.epsl.2016.04.032>).
13. Evins, Lena Z.; Jourdan, Fred; Phillips, David (2009). "The Cambrian Kalkarindji Large Igneous Province: Extent and characteristics based on new $^{40}\text{Ar}/^{39}\text{Ar}$ and geochemical data". *Lithos*. **110** (1–4): 294–304. doi:10.1016/j.lithos.2009.01.014 (<https://doi.org/10.1016%2Fj.lithos.2009.01.014>). hdl:20.500.11937/35356 (<https://hdl.handle.net/20.500.11937%2F35356>).
14. Glass, Linda M; Phillips, David (2006). "The Kalkarindji continental flood basalt province: A new Cambrian large igneous province in Australia with possible links to faunal extinctions". *Geology*. **34** (6): 461. doi:10.1130/G22122.1 (<https://doi.org/10.1130%2FG22122.1>). ISSN 0091-7613 (<https://www.worldcat.org/issn/0091-7613>).

External links

- [Palaeos: Botomian \(https://web.archive.org/web/20080803011232/http://www.palaeos.com/Paleozoic/Cambrian/Botomian.htm\)](https://web.archive.org/web/20080803011232/http://www.palaeos.com/Paleozoic/Cambrian/Botomian.htm)
 - [Tommotian fauna \(http://www.fossilmuseum.net/Paleobiology/Tommotian_fauna.htm\)](http://www.fossilmuseum.net/Paleobiology/Tommotian_fauna.htm)
-

Retrieved from "https://en.wikipedia.org/w/index.php?title=End-Botomian_mass_extinction&oldid=935556994"

This page was last edited on 13 January 2020, at 08:51 (UTC).

Text is available under the [Creative Commons Attribution-ShareAlike License](#); additional terms may apply. By using this site, you agree to the [Terms of Use](#) and [Privacy Policy](#). Wikipedia® is a registered trademark of the [Wikimedia Foundation, Inc.](#), a non-profit organization.