

August 4, 1998

## REPOSITORY MATERIALS

**Kowalewski, M., Dulai, A., and Fürsich, F.T. -- A fossil record full of holes:  
The Phanerozoic history of drilling predation.**

**Appendix 1. References for drilled specimens shown on Figure 2. List  
arranged in geochronological order from oldest to youngest occurrences.**

1. Kazanian/Tatarian, Brazil, drillings in bivalves -- Simões, M. G., and Kowalewski, M., 1998, Genetic complexity and geobiological implications of "simple" shell beds: an example from the Upper Permian of the Parana Basin, Brazil, in Gondwana 10: event stratigraphy of Gondwana (abstracts): Journal of African Earth Sciences, v. 27, no. 1A, p. 179-180.
2. Carnian, Italy, drillings in bivalves -- Fürsich, F. T., and Jablonski, D., 1984, Late Triassic naticid drillholes: carnivorous gastropods gain a major adaptation but fail to radiate: Science, v. 224, p. 78-80.
3. Norian, USA, drillings in bivalves -- Newton, C. R., 1983, Triassic origin of shell boring gastropods: Geological Society of America, Abstracts with Programs, v. 15, p. 652-653.
4. Sinemurian, Hungary, drillings in brachiopods -- Kowalewski, M., Dulai, A., and Fürsich, F.T., this study.
5. Pliensbachian, Spain, drillings in brachiopods -- Cisneros, D. J., 1923, La fauna de los estratos de 'Pygope aspasia' Menegh, del Liásico medio del rincón de egea en el NW. de la provincia de Murica: Trab. Mus. Nac. Cent. Natur. Madrid, Geol., v. 30, p. 1-16.
6. Inferior Oolite, ?Bajocian, England, drillings in mollusks -- Sohl, N. F., 1969, The fossil record of shell boring by snails: American Zoologist, v. 9, p. 725-734.
7. Callovian, India, drillings in bivalves - Kowalewski, M., Dulai, A., and Fürsich, F.T., this study.
8. Lower Kimmeridgian, drillings in bivalves - Bromley, R. G., 1981, Concept in ichnotaxonomy illustrated by small round holes in shells: Acta Geologica Hispanica, v. 16, p. 55-64.
9. Barremian, the Crimea, drillings in brachiopods -- Karakasch, N. I., 1907, Le crétacé inférieur de la Crimée et sa faune: Trav. Soc. Imper. Natur. St Petersbourg, v. 32, p. 1-483.
10. Albian, England, drillings in mollusks -- Taylor, J. D., Cleevely, R. J., and Morris, N. J., 1983, Predatory gastropods and their activities in the Blackdown Greensand (Albian) of England: Palaeontology, v. 26, p. 521-553.

**Appendix 2. Reference sources for Figure 3A arranged in alphabetic order.**

Author	Reference	Year
1. Adegoke & Tevesz	Lethaia 7:17-24	1974
2. Allmon et al.	Palaeontology 33:595-611	1990
3. Anderson	Palaios 7:602-620	1992
4. Anderson et al.	Palaeog.Palaeoclim.Palaeoec. 85:29-46	1991
5. Arua & Hoque	Palaeog.Palaeoclim.Palaeoec. 72:357-362	1989
6. Ausich & Gurrola	Journal of Paleontology 53:335-344	1978
7. Baumiller	Palaeontology 33:743-748	1990
8. Baumiller	Lethaia 26:41-47	1993
9. Baumiller	Journal of Paleontology 69:1084-1089	1995
10.Baumiller	Palaeog.Palaeoclim.Palaeoec. 123:343-351	1996
11.Bengtson	Lethaia 1:325-351	1968
12.Bengtson & Zhao	Science 257:367-369	1992
13.Berg & Nishenko	Paleobiology 1:256-260	1975
14.Brett & Bordeaux	In MacKinnon et al. Brachiopods through time, 219-226	1990
15.Bromley	Acta Geologica Hispanica 16:55-64	1981
16.Bromley	Bull.Geol.Soc. Danm. 40:167-173	1993
17.Brunton	Palaeontology 9:355-359	1966
18.Bucher	Amer. Jour. Sci. 236:1-7	1938
19.Buechler	Journal of Paleontology 43:1219	1969
20.Cameron	Journal of Paleontology 41:147-150	1967
21.Carriker & Yochelson	US Geol. Surv. Prof. Pap. 593: B1-B26	1968

22.Carter	Palaeog.Palaeoclim.Palaeoec. 4:29-65	1967
23.Cauwer De	Ann. Soc. zool. Bel. 115:183-196	1985
24.Chatterton & Whitehead	Lethaia 20:67-74	1987
25.Cisneros	Trab. Mus. Nac. Cent. Natur. Madrid, Geol. 30:1-16	1923
26.Colbath	Journal of Paleontology 59:849-869	1985
27.Conway-Morris & Bengtson	Journal of Paleontology 68:1-23	1994
28.Darragh & Kendrick	Jour. R. Soc. Western Australia 63:5-20	1980
29.Donovan	Geological Journal 26:1-10	1991
30.Dudley & Dudley	Nautilus 94:63-66	1978
31.Dudley & Vermeij	Paleobiology 4: 436-441	1978
32.Fischer	Journal Conchyliologie 67:1-56	1922
33.Fischer	Journal Conchyliologie 102:68-78	1962
34.Fischer	Journal Conchyliologie 103:29-31	1963
35.Fischer	Journal Conchyliologie 104:45-47	1964
36.Fischer	Journal Conchyliologie 105:66-96	1966
37.Fenton & Fenton	Am. Midland Nat. 12:522-528	1931
38.Fürsich & Jablonski	Science 224:78-80	1984
39.Gibson & Watson	Palaeog.Palaeoclim.Palaeoec. 71:309-321	1989
40.Guerrero & Reyment	Est. Geol. Inst. Invest. Geol. Lucas Malladas 44:317-328	1988
41.Hagadorn & Boyajian	Palaios 12:372-379	1997
42.Hecker	Introduction to paleoecology, Amer. Elsvier, New York	1965
43.Hingston	Proc. R. Soc. Victoria 97:49-57	1985
44.Hinz	Palaeontographica Abt. A 198:41-100	1987
45.Hoffman et al.	Acta Geologica Polonica 24:249-260	1974
46.Hoffman & Martinell	Neues Jhb. Geol. Paläont. Monat. 1984:393-399	1984
47.Illina	Paleontological Journal 21: 23-30	1987
48.Kabat & Kohn	Palaeog.Palaeoclim.Palaeoec. 53:255-269	1986
49.Karakasch	Trav. Soc. Imper. Natur. St Petersburg 32:1-483	1907
50.Kelley	Palaios 3:436-448	1988
51.Kelley & Hansen	Palaios 8:358-375	1993
52.Klähn	Sitzungsberichte Abhan. Natur. Gesell. Rostock 3:89-103	1932
53.Kojumdjieva	Bulg. Acad. Sci. Bull. Geol. Inst. Ser. Pal. 23:5-24	1974
54.Kowalewski	Acta Geologica Polonica 40:183-213.	1990
55.Liljedahl	Lethaia 18:53-66	1985
56.Macurda	Journal of Paleontology 39:1045-1096	1965
57.Martinsson	Förening. Stockholm Förhand. 87:181-230	1962
58.Matthews & Missarzhevsky	Journal of the Geological Society 131:289-304	1975
59.Matsukuma	Venus 37:29-45	1978
60.Miller & Sundberg	Lethaia 17:185-190	1984
61.Newton	Geol. Soc. Amer. Abstr. Prog. 15:652-653	1983
62.Pelman	Trudy Inst. Geol. Geofiz. Akad. Nauk SSSR 169:93-95	1973
63.Reyment	Paläont. Zeit. 37:283-291	1963
64.Reyment	Stockholm Contributions to Geology 14:1-151	1966
65.Reyment et al.	Cretaceous Research 8:189-209	1987
66.Robba & Ostinelli	Riv. Ital. Paleont. Stratigr. 81:309-372	1975
67.Rodriguez & Gutschick	Trace Fossils 2, Geol. J. Spec. Issue	1970
68.Rohr	Journal of Paleontology 50:1175-1179	1976
69.Rohr	Journal of Paleontology 65:687-688	1991
70.Ruggiero	In MacKinnon et al. Brachiopods through time, 203-210	1990
71.Sheehan & Lesperance	Journal of Paleontology 52:812-817	1978
72.Siler	Texas Journal of Science 17:213-218	1965
73.Sliter	Journal of Foraminiferal Research 1:20-29	1971
74.Smith et al.	Science 250:1033-1037	1985
75.Sohl	American Zoologists 9:725-734	1969
76.Stanton & Nelson	Journal of Paleontology 54:118-135	1980
77.Stanton et al.	Malacologia 20:451-469	1981
78.Stevanovic	Ann. Geol. Penin. Balkan. 18:129-142	1970
79.Stump	Palaeog.Palaeoclim.Palaeoec. 17:177-226.	1975
80.Taylor	Palaeontology 13:255-260	1970
81.Taylor et al.	Palaeontology 26:521-553	1983
82.Taylor	Lethaia 15:67-74	1982
83.Thomas	Journal of Paleontology 50:488-499	1976
84.Vermeij & Dudley	Cretaceous Research 3:397-403	1982
85.Vermeij et al.	Paleobiology 6:352-364	1980

86.Watkins	Journal of Paleontology 48:1264-1282	1974
87.Yakovlev	Soc. Paleontol. Russ. Ann. 6:95-97	1926
88.Yochelson et al.	U.S. Geol. Survey Prof. Pap., 1282: 1-13	1983
89.Ziegelmeier	Helgoländer wissenschaft. Meeresuntersuchun. 5:1-33	1954

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**Appendix 3. Data for Figure 3B** (see Appendix 2 above for references) arranged by geological periods (or epochs) and listed in stratigraphic order. The values represent predation rates as reported by the original authors or calculated here on the basis of the raw data provided by the original authors. For disarticulated valves of bivalved preys the rates are corrected. All included rates were calculated for all potential preys (e.g., all mollusks in the sample) rather than for individual taxa. The data based on individual taxa are included only when selected taxon overwhelmingly dominates the entire sampled assemblage (e.g., Chatterton and Whitehead, 1987).

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**Cambrian:**

Miller and Sundberg, 1984 - < 0.01

**Silurian:**

Chatterton and Whitehead, 1987 - 0.09

**Devonian:**

Smith et al., 1985, -- 0.06, 0.07, 0.06, 0.01, 0.12, 0.03

**Carboniferous:**

Ausich and Gurrola, 1979 - 0.04

**Permian:**

Simoes and Kowalewski, 1998, personal communication - 0.02

**Triassic:**

Fürsich and Jablonski, 1984 (and Fürsich, pers. comm. 1998) - < 0.01

**Jurassic:**

Kowalewski et al., this study - < 0.01

**Early Cretaceous:**

Taylor et al., 1983 - 0.05

**Late Cretaceous:**

Kelley and Hansen, 1993 - 0.07, 0.11, 0.06

**Paleogeone:**

Arua and Houque 1989 -- 0.11

Kelley and Hansen, 1993 -- 0.03, 0.34, 0.36, 0.34, 0.35, 0.22, 0.07, 0.09, 0.21, 0.18, 0.15

**Neogene:**

Robba and Ostinelli, 1975 -- 0.14

Hoffman and Martnell, 1984 -- 0.23

Colbath 1985 - 0.11

Kowalewski, 1990 -- 0.17

Kelley, written communication, 1998 - 0.35

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