Southeastern Section–56th Annual Meeting (29–30 March 2007)

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THE SECONDARY EVOLUTIONARY ESCALATION HYPOTHESIS REVISITED: THE DRILLING HISTORY OF BRACHIOPODS AND BIVALVE MOLLUSKS FROM THE CENOZOIC OF SOUTH AMERICA

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The “Secondary Evolutionary Escalation Hypothesis” (Kowalewski et al., Science, 2005), based primarily on Paleozoic data, postulates that the persistent rarity of drilling in brachiopods through time was a result of opportunistic/erroneous attacks by various drillers. However, the post-Paleozoic fossil record of drilling in brachiopods is still poorly documented. We evaluate the history of drilling in an austral clade of Cenozoic brachiopods (bouchardiids) and associated bivalves. Combined field, museum, and literature data encompass samples from polar to subtropical shallow shelf environments. Drilling frequencies (DF) and the standardized hole disparity (SHD) were calculated for 5485 Bouchardia shells [Paleocene (B. conspicua, n=29), Eocene (B. antarctica, n=27), Oligocene (B. zitteli, n=88), Miocene (B. transplatina, n=37) and Holocene (B. rosea, n=5204)], and 9431 bivalves from the Paleocene to Miocene (25 units), and Holocene. Data for Pliocene/Pleistocene fossils and for Paleocene bivalves are not available. Within each time interval (except the Holocene), comparable DFs are observed for both groups, with generally low frequencies (except the Oligocene): (1) Bouchardiids: Paleocene/Eocene=0%; Oligocene=25%, Miocene=2.9%, and Holocene=0.4%; and (2) Bivalves: Eocene=3.7%; Oligocene=23.5%; Miocene=2.5%; and Holocene=5.6%. Also, a similar range of SHD values is observed for both groups: from 0.4 to 1 for brachiopods, and from 0.3 to 1.2 for bivalves. The anomalously high Oligocene DFs and concurrent low SHDs observed for both groups coincide with the appearance and diversification of muricids (Trophon). All in all, comparable DFs and SHDs for both groups contradict the predictions of the Secondary Evolutionary Escalation Hypothesis: Brachiopods were attacked at comparable rates to bivalves through most of the studied time interval and did not produce holes more variable in shape comparing with bivalve drillers. These contradictory results may suggest that either the Cenozoic and Paleozoic brachiopod-driller interactions were fundamentally different in nature or the secondary escalation hypothesis is of a limited general validity. However, given the limited sample sizes for some time intervals, the results reported here need to be validated in future studies.

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