Dinosaur extinction essay

Ever since the history of Earth has been studied using fossil records, extinctions have always been the object of fascination and interest, particularly the mass extinctions that occurred throughout Earth's history. A mass extinction can be caused by disruptive global environmental changes, where large numbers of species have become extinct (Urry et al. 2008). There have been five major extinctions documented based on fossil records over the past 500 million years, but the Cretaceous (KT boundary extinction – a name that meant it began the Tertiary era) extinction caught a lot of attention (Elewa et al 2009). This event extinguished more than half of all marine species and eliminated many families of land (terrestrial) plants and animals, including most of the dinosaurs. Finding out how this extinction occurred included theories about a combination of natural disasters, the already decreasing population of the dinosaurs and an asteroid impact that either magnified the already reduced population of dinosaurs to extinction, or single-handedly did the damage. An evaluation of theories and hypotheses is essential in order to really understand what caused the dinosaurs' demise, through analyzing evidence presented.

The survival rates of all the organisms during the KT boundary (Cretaceous period), are a strong indication that no single cause is sufficient to explain the extinction that occurred (Brusatte et al. 2010). Together, however, almost everything that could go wrong did so surrounding the K/T boundary: shrinkage of habitats, climate change, Deccan volcanism, and the asteroid impact all occurred.

The combination of these biotic stresses led not only to the dinosaurs' extinction, but the extinction of a variety of plants, marine reptiles, diatoms,

dinoflagellates, and nannoplankton (Elewa et al. 2009). Dinosaurs, because most of them are large vertebrates, are the first to experience biotic stresses as the their habitats regressed, leading to decline and extinction. Smaller terrestrial vertebrates were also declining, but because they have shorter life spans and quicker turnover rates, they adapted more quickly to the stresses caused by the loss and fragmentation of the coastal plains (Barrett et al. 009). Meanwhile in the waters, freshwater species fared better than their terrestrial counterparts, largely because the size of their habitat was at least holding its own as extended streams followed the retreating seas.

Another event that occurred was the waxing and waning of the eruptions of the Deccan Traps (Keller et al. 2009). Deccan volcanism resulted in the added particulate matter in the atmosphere that slowly began to cool and dry some areas of the globe (Keller et al. 2009). As the 10-km wide asteroid struck around 65 million years ago in the Yucatan Peninsula, material injected into the upper atmosphere blanketed the sun up to the point that photosynthetic activity either ceased or diminished for many weeks, depending upon location (Alvarez et al. 1980), (Elewa et al. 2009). The effects were especially acute at lower latitudes and closer to the impact, such as in North America.

Plants unaccustomed to less light caused by the seasonal changes in the Sun’s position were hit hard. Higher latitude plants accustomed to seasonally less light were better able to survive, as were the animals that fed upon them (Schulte et al. 2010). Higher latitude plants and animals were also affected, but the effects were tempered by which season they were experiencing when impact occurred. The multitude of events magnified the

scarcity of the dinosaurs, as well as other organisms that did not fare well in the KT boundary.

Their populations could not recover very quickly from this great combo of disasters, eventually driving them to extinction. This is the multi-causal theory. There is some belief that this or a version of something like these events actually happened, but some prove otherwise. According to the research made by Alvarez (1980), it was due to an asteroid impact that single-handedly destroyed dinosaurs to extinction.

Advocacy of this mechanism has been aided by the availability and tangibility of supporting evidence in the form of impact craters- the Chicxulub crater in the Yucatan Peninsula’s date and timing of impact (dating produced an almost exact date of 65 million years ago), location, enormous size-170 km (Hildebrand et al. 991) and its high iridium content (a metal not commonly found at the Earth’s surface) make it seem that with a theoretical asteroid 10 km big caused the crater great damage at the end of the Cretaceous (Alvarez et al. 1980). How exactly the asteroid damaged the Earth remains unclear, but the power released by such an impact is unquestionable. Effects possibly include reduced sunlight over a period of several months which possibly led to the decline or even total halt of primary production (via photosynthesis). One of the dominant signatures of the extinction at the KT boundary was the low activity of primary production, the possibility of reduced sunlight is high (Schulte et al.

2010) . Even if the primary production proved to be on a decline when this impact occurred, there is still some uncertainties as to where exactly the

impact hit. This was why asymmetries in subsurface features of the Chicxulub crater were observed via geophysical methods were analyzed and it was calculated from estimates that the impact must have occurred at a low angle (~30°) from the Southeast (Schulte et al. 010). If this was taken into account, the greatest devastation should have occurred in the Northern Hemisphere at relatively low latitudes. Indeed, what is known of the pattern of extinctions approximates this hypothesis (Alvarez et al. 1980).

The research of the Alvarez team is the most widely known and accepted theory/mechanism of how this extinction came to be: A single but destructive asteroid impact has done its job. The extinction of the KT boundary organisms is still a mind boggling puzzle piece that needs to be solved, but until then, theories will always surround as to how this event happened. Whatever theory it is, the damage it had done during the Cretaceous is beyond human capacity, and it serves as a reminder that nothing is ever permanent. Whether they disappeared due to a combo of disasters or just a single and destructive asteroid impact, it still does not change the fact that these large organisms once ruled the Earth are now gone.

The ramifications of massive impacts are poorly understood- an asteroid impact with that kind of magnitude is not within human experience: allowing some calculation and/or estimation mistakes to occur. The fossil records are incomplete, and the survival of the organisms can also have some dependence on luck. Further evaluation of all possible theories, mechanisms and hypotheses is needed. One thing is for sure, this extinction changed the course of evolution forever: it paved way for the adaptive radiations of

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