

Re: Fossil Records Show Biodiversity Comes and Goes

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From: John Harshman (jharshman.diespamdie_at_pacbell.net)

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George wrote:

> <jtreat@cox.net> wrote in message
> news:1111004999.087065.229890@f14g2000cwb.googlegroups.com...
>
>> John Harshman wrote:
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>>> Some observations on the published diversity curve.
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>>> 1. It doesn't have the shape we would expect from "mass extinction
>>> events". The curve is roughly a cycloid, i.e. the shape created by a
>>> point on a rolling circle. From a trough, diversity rises sharply at
>>> first, then slows as it comes to a peak, then decreases gradually,
>>> accelerating into the trough, and suddenly reverses. What we would
>>> expect from a mass extinction is a more saw-toothed shape: diversity
>>> increases quickly from a trough, perhaps slowing as it reaches a peak
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>> or
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>>> perhaps not, then plunges instantly into another trough. This
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>> observed
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>>> gradual decline is not consistent with either periodic impacts or
>>> episodes of flood volcanism, which are geologically instantaneous
>>> events. Instead it calls for an explanation in which some kind of
>>> environmental stress begins slowly, increasing over millions of years
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>>> (starting some time before a peak and attaining a maximum at the
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>> trough,
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>>> so covering 30ma or more), and then suddenly vanishing. I have no
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>> idea
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>>>what that would be. It might be argued that this curve shape is an
>>>artifact caused by Signor–Lipps effect, but I don't think that's
>>>possible on this timescale, with marine invertebrates.

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>>I wondered why this should be an astronomical or geologic event. It
>>looks very much like a predator/prey or epidimic cycle. It is not
>>unreasonable to be looking at a ecological cause which would tend to
>>have a wave form like this.

>

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> Indeed. If you look at the evolution of many species through the fossil record,
> one thing stands out like a sore thumb to me. As an example, look at crinoids.
> Crinoids most likely evolved from very simple animals found in the Burgess
> shale. By their heyday, they had branched out into many ecological niches, and
> had diversified into many very highly specialized species. The crinoids
> demonstrate a record of diversity that at their heyday in the late Mississippian
> can only be described as bizarre. Similarly, dinosaurs evolved from very simple
> animals, and in their heyday in the Cretaceous had evolved into complex, and
> equally bizarre, and very specialized forms. Such overspecialization tends to
> make species vulnerable to factors such as environmental change. If a species
> evolves to become a specialist in eating Eucalyptus trees, and all the
> Eucalyptus trees die out in some environmental catastrophe (severe drought, for
> instance), so do the Eucalytpus eaters.

Is there any evidence that specialization really is a one–way ratchet? I don't think so. Evolution wanders all over the place. In retrospect, we consider the earliest members of a group to be "simple" or "non–specialized" only because we see them sitting in the middle (in morphospace) of a diverse cloud of descendants. Any one of those descendants could probably be, at some future time, be considered as "simple" if it happened to spawn a large radiation too. Look for example at birds — just one group of theropods. I suppose you would consider the earliest birds "unspecialized" too, compared to the variety of extant birds; but if you're talking about theropods, those same birds would be very strange, "specialized" theropods.

At any rate, you would need some form of coordinated specialization across all groups to produce the pattern you are trying to explain here. It looks to me rather that groups appear and diversify at different times with no real coordination.