Re: Animals that are poisonous to ingestion Social Behavior

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- *From*: "Wirt Atmar" <atmar@xxxxxxxxxxxxxxxx>

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drosen0000 asks:

> What finess value does being poisonous upon ingestion have to animal prey? I am not talking about poison that is actually applied to the predator by the prey biting, but to the passive ingestion of posion.
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> There does not seem to be any advantage unless there is a correlated social behaviour involoved. Once eaten, the prey is dead and can't produce descendents anyway. If the predator dies, it does not bring the eaten prey individual back to life. If the predator's species dies, it still doesn't help the descendents of that prey animal since there are none. If the prey animal species is not social, the nonvenomous individuals are protected just as much by the death of the predator as the venomous individuals. The venomous individuals have to pay a metabolic penalty for producing the venom.
>
> Some social behaviors that would make being poisonous to ingestion a benefit to other members of the prey's family (e.g., selfish gene scenarios). However, I never heard of a correlation between social behavior and being poisonous. Do venomous animals tend to be social? Does anyone know if poisonous frogs stick together in family groups?

It sounds as if you're trying too hard to fit your observations in with a bit of simplistic mathematical genetics theory. On the whole, group selection has nothing to do with altruistic behavior.

In general, the physics of mathematical genetics makes either the gene or the individual the "beneficiary" of whatever behavior is under consideration, but such a presumption is clearly not true for a large array of observed behaviors, and the evolution of aposematism is one of them. The "beneficiary" of a phyletic lineage evolving the standard warning colorations of orange, yellow, black, red and white is the lineage itself, not its individuals.

Individuals can be sacrificed if the benefit/cost ratio is high enough.

Evolutionary adaptation is a learning process, and there are three reservoirs where that learned knowledge is retained: (i) in germline DNA ("phylogenetic learning"), (ii) in the neural mass of the species' individuals ("ontogenetic learning"), and (iii) in the the cultures of the species' demes ("sociogenetic learning"). In this case, the "knowledge" pertaining to the evolutionary advantages of aposematism is retained in the lineage's evolving germline, and thus pervades the genome of every individual it produces.

In your accompanying question, you asked how does the process ever get started, given the death of the predator? The answer is simple. Most poisonous animals are not lethally poisonous. Indeed, most are only noxious. Monarch butterflies act only as an emetic to Blue Jays (meaning that ingesting one butterfly makes the bird throw up), but Blue Jays are quite smart and they quickly correlate the warning coloration pattern with the noxiousness of the butterflies.

I doubt that Blue Jays have learned that information "instinctually", meaning that it's not yet incorporated into their germline DNA. I suspect that each individual bird must eat one or two Monarchs before he gets the idea, but once he does, the death of those individuals protects thousands of others.

It's important to understand that by having a vast number of animal taxa all convergently learning to expose the same colorations if they're even slightly noxious, they're all evolving against the same adaptive topography, and in doing so, they're reinforcing one another. In this case the adaptive topography is the eye, mind and intelligence of vertebrate predators, and because of that, the protection that orange, black and white colors affords Monarchs undoubtedly extends to any similarly colored animal, regardless of taxonomic status. I'm sure that Blue Jays, once bitten, twice shy, will stay clear of any similar pattern.

Wirt Atmar

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