Journal of the Lepidopterists' Society
59(1), 2005, 44

ROLAND TRIMEN'S OBSERVATIONS ON TOUGHNESS IN UNPALATABLE AFRICAN BUTTERFLIES: A HISTORICAL ANNOTATION TO DEVRIES 2003

Additional key words: aposematism beak mark Danainae Heliconiinae

DeVries' (2003) recent experimental demonstration that the unpalatable danaine *Amauris albimaculata* Butler has significantly tougher wings than its palatable nymphaline mimic *Pseudacraea lucretia* Neave is an elegant study in comparative functional morphology. However, the observation that unpalatable models' wings are tough with respect to other species was discussed by Roland Trimen (1870), in one of the first papers documenting aposematism and mimicry among African butterflies. The relevant passage is quoted here in its charming entirety:

> "Most species of *Danais* (sic) and *Acraea* feign death very readily; and they possess another means of defence which, as far as I am aware, has not hitherto been recorded, viz. the remarkable elasticity of their entire structure. No pressure of the thorax, short of absolute crushing of the tissues, suffices to kill or even paralyze these Butterflies; and the collector who treats them as he would species of other families soon finds his collecting-box alive with its struggling occupants. So flexible are their wings, that the insect generally succeeds in withdrawing them from the crossed fences of pins which form a complete barrier to any motion on the part of ordinary Butterflies; and however bent and distorted the wings may become in such exertions, I have never known a fracture of nervures or membrane to result, the organs resuming their natural position even after having been bent double for some hours. While entomologizing in Natal, my Kafir collector used often to bring me numerous examples of the commonest species in his box, and when engaged in the necessary work of rejection, I constantly found the limp-winged Danaidae and Acraeidae, as soon as they were released from the transfixing pin, fly off with perfect ease and apparent nonchalance.
>
> It is not difficult to perceive how important, as a reserve means of defence, this unusual elasticity of structure may prove. That birds, and other eaters of insects, may occasionally capture a Butterfly of these malodorous tribes before discovering its distasteful character is not an unreasonable supposition, especially in seasons when an exceptional scarcity of some favourite food may prevail. In such a case it may be safely stated that the chances are very greatly in favour of a *Danais* or an *Acraea* escaping, if not wholly unhurt, yet without serious injury, after rough treatment that would have proved fatal to a harder but less elastic animal."

If, as Smith (1979) suggested, beak marks are the result of intentional release of bad-tasting butterflies, then it would be surprising if Batesian mimics in general had tougher wings than their non-mimetic close relatives, unless the adaptation in question is the weakening, rather than the toughening, of the wings, to improve the probability of escape. Perhaps Batesian mimics can afford to have tougher wings, which would likely be advantageous in the absence of predators, because they are less likely to be sampled and therefore do not need to escape by tearing away parts of their wings. In any event, this is a rich area for further empirical study, and will be particularly illuminating if conducted in a phylogenetic context (cf. Brower 1995).

LITERATURE CITED

BROWER A. V. Z. 1995. Locomotor mimicry in butterflies? A critical review of the evidence. Phil. Trans. R. Soc. Lond. B 347: 413-425.

DE VRIES, P. J. 2003. Tough African models and weak mimics: new horizons in the evolution of bad taste. J. Lepid. Soc. 57: 235-238.

SMITH, D. A. S. 1979. The significance of beak marks on the wings of an aposematic, distasteful and polymorphic butterfly. Nature 281: 215-216.

TRIMEN, R. 1870. On some remarkable mimetic analogies among African butterflies. Trans. Linn. Soc. Lond. 26: 497-522; 2 plates.

ANDREW V. Z. BROWER, *Department of Zoology, Oregon State University, Corvallis, OR 97331; Email: browera@science.oregonstate.edu*

Received for publication 13 October 2003; revised and accepted 9 January 2004