

The Mayfly¹ Subimago: A Possible Explanation²

CARL W. SCHAEFER

Biological Sciences Group, University of
Connecticut, Storrs 06268

Adult insects reproduce and disperse. Indeed, adulthood is recognized by the possession of functional genitalia and, in pterygotes, of wings. These adult structures are attained simultaneously, at ecdysis, in all living pterygotes except the mayflies. In the mayflies functional wings occur first, in a subimago that can fly but cannot mate; after the subimaginal molt the genitalia are functional. There seems no adaptive basis for this double molt to maturity, and I suggest there may indeed be none.

Simultaneity of maturity of genitalia and wings presumably depends upon these organs responding at the same time to the hormonal balance in the insect, the balance between neotenin and ecdysone. It seems unlikely that two such different target organs should always—from the start—have responded at the same time to the hormones: it seems more likely that simultaneity would

¹ Ephemera. Note that "Ephemera" means "ephemeral beings"; "Ephemeroptera" means "ephemeral wings," a term perhaps better suited to queen ants. Not knowing which term has priority, I choose the former, for etymological reasons.

² Received for publication July 11, 1974.

have evolved from a system in which one organ achieves maturity before the other. Simultaneity could only be selected for in insects which live long enough for its advantages to be translated into increased reproductive potential. Insects which live only briefly might well be immune to such selective pressures, that is, exempt from them.

Such insects are the mayflies, which emerge in a crowd, so need not travel to find mates. Remaining congregated and existing so briefly, they can swamp out predators long enough to undergo the second molt, mate, and lay eggs. Primitive mayflies may not have emerged so synchronously as modern ones (G. F. Edmunds, letter, 1974), but early conditions may have lacked the intensity of aerial predation with which mayflies today cope. More recent mayflies tend to emerge synchronously and their adult lives, already primitively brief, are shortened further (Edmunds, *ibid.*). These relatively recent adaptations seem to protect mayflies effectively from predation. Thus, in the long history of these insects, the need was never felt for a single molt to dispersing and reproducing maturity, and the ancient double molt remains, a relict.

ACKNOWLEDGMENT

I am grateful to Ms. Diane Calabrese, at whose Masters exam these ideas first occurred to me, and to Drs. G. F. Edmunds, Jr. (University of Utah) and W. L. Peters (Florida A&M University) for reading and much improving this note.