

THE POLYMORPHISM OF *S. arguta*

The morphs in this species, in common with most corixids, do not show clear differences at moulting to the imago so that analysis of the population is far more difficult than in *Anisops*. The category, newly moulted imagines, contains both normal and flightless bugs and provides no information of the way the polymorphism is changing. Mature normal bugs, and teneral bugs after some development, are clearly recognisable through their pigmentation and muscle development and can be readily sorted from the remainder of the sample. Flightless bugs have no such obvious differences from newly moulted imagines and the success of the analysis depends largely on the ability to identify them. They become recognisable from newly moulted bugs when the cuticle becomes hardened and brittle rather than flexible; or pigment, often rather blotched and uneven, develops over the mesonotum beyond the patterning arising soon after moulting; or the gonads enlarge and mature beyond the newly moulted condition; or the fat bodies in the thorax, which are at first pale and tenuous, enlarge and yellow as fat is deposited. When any of these features are found in bugs with undeveloped musculature it is generally safe to assume that the bug is flightless. Techniques of ageing based on growth patterns of the cuticle are inconvenient for routine analysis of large samples and moreover would not separate flightless bugs from teneral normal bugs during periods of slow teneral growth.

In practice the best method of identifying flightless bugs in summer, before cuticle or fat body differences develop, is by examination of the ovaries of female bugs and subsequent sorting of male bugs with similar pigmentation and overall appearance. The ovaries enlarge very quickly after moulting, at about the same rate as the flight muscles develop in normal bugs, so that bugs with enlarged ovaries and undeveloped musculature can be certainly identified as flightless. The comparable technique for the male is more difficult to use as the testes are well developed in moulting bugs and development is limited to growth of the accessory glands. Unfortunately ovarian development does not begin in moulting bugs through the full length of summer. In the Kainga pond no development occurred in bugs moulting to adult after February 5, and in Leithfield Lagoon there was none later than mid-January, even though bugs with gonads that had matured earlier continued to lay eggs until at least the end of February.

Thus to summarise, in early or mid-summer four groups of imagines can be distinguished; newly moulted bugs which will mature into one or other of the two morphs, a composite group of maturing and mature flightless bugs, which are generally not separable, and the teneral and mature normal bugs separable by differences in pigment and muscle development. After the end of January recognition of flightless bugs becomes more difficult, although mature bugs still carry ovarian eggs, and from the end of February only three groups are certainly recognisable: teneral normal bugs, mature normal bugs and all the remainder, comprising flightless bugs and newly moulted bugs of both morphs. These levels of working accuracy in the parts of the year have been acknowledged in the graphs showing population changes by combining the numbers of flightless and newly moulted bugs at the end of summer, even though some information is lost.

The pattern of the changing development of the morphs through the season, in contrast to simple analysis of structure at each date, is indicated by the change in the relative frequencies of the morphs with time, assuming limited migration and mortality, and the occurrence of the maturing stages of each of the morphs. For most of the year it is the occurrence and importance of teneral normal bugs that gives the most definitive indication of the development occurring in the population.

The following section describes briefly the characteristics of the four groups of imagines recognisable in populations in early and mid-summer.