

AN APPRECIATION OF THE CONTRIBUTION OF J. GORDON BLOWER TO THE STUDY OF LIFE-CYCLES OF MILLIPEDES

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INTRODUCTION

I first met Gordon Blower in Hamburg in April of 1975, at the 3rd International Congress of Myriapodology. As a young PhD student I was delighted with the friendly and familiar atmosphere among Myriapodologists. At that time I was starting my work on millipedes in the Central Alps of Austria, having read the papers of Blower & Gabbutt (1964), and Blower (1970) on the post embryonic development and life cycles of British millipedes. I soon entered into conversation with Gordon Blower and Colin Fairhurst and was very happy to receive a spontaneous invitation to spend some weeks in Manchester and Salford learning to determine stadia in Julida and Chordeumatida and working on the life cycles and ecology of millipedes. I am very grateful for that time where I gained valuable experiences personally and scientifically.

POST-EMBRYONIC DEVELOPMENT AND DETERMINATION OF STADIA

Millipedes develop by anamorphosis. With each moult certain features (numbers of segments, defence glands and ocelli) change, as well as overall size and weight. In their detailed study on the millipedes of a Devon oak wood Blower & Gabbutt (1964) critically discussed and summarized the knowledge on post-embryonic development and determination of stadia in the Julidae. At that time it had been usual to quote defence glands or the overall number of body rings. Blower & Gabbutt (1964) introduced a much more sensible new method of presenting this information by giving the number of podous rings followed by the number of apodous rings. Additionally they suggested characterising the stadia by measuring the length of each animal and analysing the measurements on arithmetic probability paper. It should be noted that in none of the works of previous authors was there a separation of stadia with overlapping numbers of segments, nor were the data related to field occurrences.

Blower (1970) extended his method to determine stadia by including the number and arrangement of ocelli in the ocular field, a method of stadium determination described by Vachon (1947). The stadium number is obtained by adding one to the number of rows. Since Blower's work many authors have produced similar tables on the anamorphosis in several species. A tabular comparison of anamorphosis in British species is summarized in his best known book, published in the synopses of the British Fauna series (Blower 1985).

Being able to accurately determine the stadia of a particular species, to know the stadium and the chronological age in which maturity is first achieved and to know if the species is semelparous (breeding once) or iteroparous (breeding more than once) one may then continue to try to describe the whole life cycle and further ecological parameters of the population. The characters used in the various studies are outlined in the Table 1.

TABLE 1**THE LIFE HISTORY CHARACTERS IN MILLIPEDES AS USED BY J. GORDON BLOWER IN HIS STUDIES**

- Anamorphosis
 - Variation in the increments of new segments
 - Number of podous and apodous rings
 - Dimensions (length) of each stadium
 - Growth of the ocular field
 - Determination of stadia
 - Stadium in which maturity is first achieved
 - The chronological age at which maturity is first achieved
 - Single breeding (semelparity) or repeated breeding (iteroparity)
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LIFE-CYCLES AND ECOLOGY

To determine the life cycle it is necessary to follow the sequential changes in the proportions of different stadia, that is to translate the stadial age into true age. Based on quantitative field data Blower & Miller (1974) gave the most comprehensive and detailed description of the anamorphosis, life-cycle, fecundity and survival, vertical distribution, standing crop, consumption and production of a millipede species (*Ophiulus pilosus*) in Britain. This paper was directional for numerous others as the results were based on intensive field work, taking samples at monthly intervals throughout the year.

Blower (1969) also gave attention to the ecological significance of the strategies such as semelparity and iteroparity and its relation to activity and dispersion. He noted that the aggregation of iteroparous species is greater than semelparous species, semelparous species are more numerous and more evenly dispersed. Blower & Fairhurst (1968) have suggested that repeated broods in successive years in *Tachypodoiulus niger* adapt the species to disperse to widely scattered habitats.

By describing the entire millipede fauna of certain woodland sites Blower (1979) took tentative steps towards defining and understanding some principles governing the structure of millipede associations, such as abundance, age structures and life-cycle characteristics.

In my mind Gordon Blower is remembered for his guiding, comprehensive and thorough work on the life histories and ecology of millipedes. In this field he was an international authority.

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