Seasonality and population fluctuations in the *Drosophila* of Western Ghats

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MS received 18 November 1978

Abstract. Population fluctuations of various species of *Drosophila* in the 5 localities of Bababudangiri and Kemmangundi Hill ranges (Western Ghats) were analysed with reference to the seasons of the year. The radical changes in the environmental factors caused by the alterations of seasons were found to influence greatly the size of *Drosophila* populations. The quantitative differences in the monthly collections of *Drosophila* species such as *D. giriensis*, *D. takahashii*, *D. mysorensis*, *D. nasuta* and *D. immigrans* were found to be closely related to the climatic variations. The differential magnitude of the population peaks and their asynchronous formation by different species as observed in the present study were found to be a reflection of differential responses of these species to the ambient and changing ecological factors. The cyclical changes in the size of *Drosophila* populations under study appears to be regulated by the seasonal rainfall and the related changes in the environment (extrinsic factors) coupled with genetic and physiological factors (intrinsic factors) generated within the populations.

Keywords. Western Ghats; Tropical seasonality; *Drosophila*; Population fluctuations.

1. Introduction

The population biology of many species of plants and animals is intimately associated with fluctuation of the climate. The different seasons of a year bring about profound changes in the physical and biotic factors of the environment invoking different responses from different species resulting in considerable variations in the population size of many species.

A population is a heterogenous complex of different species having unique way of interacting with the environment. The ecological fitness of a population may increase or decrease the reproductive fitness of a species resulting in the cyclical changes in the population structure. Natural populations of *Drosophila* are ideally suited to unravel the complicated interrelationships between the ecological factors and the rhythmic population fluctuations in relation to the seasons of the year.

Seasonal changes in the population size of *Drosophila* in temperate regions have been studied by many workers (Patterson 1943; Dobzhansky 1943; Dobzhansky
and Pavan 1950; Williams and Miller 1952; Basden 1954; Mather 1956; Nozawa 1956; Wakahama 1956, 1957a, b, 1961, 1962a, b, 1963; Paik 1957). However, such a study in the tropics is meagre (Pipkin 1953; Gupta 1974; Reddy and Krishnamurthy 1977, 1978). Therefore, the seasonal changes in the population size of *Drosophila* in the 5 localities of Bababudangiri and Kemmangundi Hill ranges (a part of second phytogeographical region of Western Ghats) have been investigated in order to understand the mechanism of population fluctuations in tropics.

2. Materials and methods

*Drosophila* collections were made once a month in the 5 localities of Western Ghats from March 1977 to February 1978. The localities chosen were 8 km apart covering a distance of 40 km between Bababudangiri and Kemmangundi Hill ranges. The area covered is the important part of monsoonland where the vegetation is influenced more by the abundance and distribution of seasonal rainfall than the atmospheric temperature. The collection spots are mostly confined to the mountain valleys with running water streams having more or less moist surroundings. Many epiphytes and mosses are found to hang on the branches of trees providing a dense tangle understory. The valleys and the adjoining bluffs are studded with large number of bushes and timber producing trees in addition to certain tropical fruit bearing trees. During rainy season a large number of species of fungi grow on the decaying trees and rotting logs. Such an environmental complex is able to support a large and varied population of *Drosophila*. In addition to these advantages, meteorological records on temperature, humidity and rainfall for the area are available from the Regional Meteorological Centre, Government of India, Bangalore.

The collection technique employed is the usual trapping method. Every month a constant number of 10 traps of 250 ml milk bottles with ripe banana mash sprayed with a few drops of yeast solution were used. Bottles containing bait were tied to the branches of trees and bushes in shaded and cool surroundings. Great care was taken to have the bait placed at the same position so that any difference in the relative frequencies of *Drosophila* could not be ascribed to local variations in the position of food distribution and other microhabitat differentiation. The traps were collected 48 hr after the exposure of the bait; the flies were etherised, categorised and the number of dominant species as well as the total population size of each locality have been indicated in figures 1-5.

For the study of the problem of fluctuation in population size of *Drosophila*, the yearly season has been divided into 3 periods. (i) Pre-monsoon period (March to May): characterised by high temperature, moderate humidity and no rainfall except for a few showers in the later part of May. (ii) Monsoon period (June to October): characterised by moderate temperature, high humidity and moderate to heavy rainfall. (iii) Post-monsoon period (December to February): characterised by moderate temperature, moderate humidity and no rainfall except for a few showers in the later part of February (table 1). Only the species which were found comparatively in large numbers have been chosen to study the seasonal variations in the population size. A statistical approach