

INSECT LIFE
IN
THE TROPICS

INSECT LIFE IN THE TROPICS

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M.A., Dip.Agric., F.R.E.S.

"There are yet hid greater things than these be,
For we have seen but a few of His works."
ECCLESIASTICUS, xliii



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PREFACE

"It is a foolish thing to make a long prologue." *Maccabees* ii, 32.

A CERTAIN American publisher once remarked that "any book can be sold by its title". If this is true, then this book should be a best-seller, for there are few more fascinating subjects than the natural history of insects. In the tropics the diversity of the forms and habits of insects far exceeds that found in temperate countries and, since they have been much less studied, much more remains to be discovered. It must, however, be admitted that the title is, if not entirely misleading, at least an exaggeration. A complete natural history of tropical insects covering all that is known today—and that is but a small fraction of the whole—will never be written. Even if it were, few people could afford to buy a work that would run into dozens of volumes. This book is therefore intended to give some idea of the life histories and habits of tropical insects so that anyone living permanently or temporarily in a tropical country may gain a little knowledge of what is going on around him in the insect world. It is not addressed primarily to trained entomologists but rather to that much larger class of people who show an interest, even if initially a slight one, in general natural history. Such people on first coming to a tropical country are inclined to be bewildered by the variety and abundance of insect life, and it is hoped that this book may in some measure serve as a guide to personal observations.

The use of scientific names is inevitable, for few tropical insects have been given generally accepted English names. It is true that some Latin names of insects are ridiculously and unnecessarily polysyllabic, but even the name given to a certain mosquito, *Pseudoheptaphlebomyia madagascariensis*, is scarcely more absurd than many of the English names of moths, for instance the "Setaceous Hebrew Character". Again, even when referring to an order, it is much simpler to write, say, Orthoptera, than "Locusts, grasshoppers, stick-insects, praying mantids, cockroaches, crickets and their allies".

However, more emphasis has been laid on types of life histories and behaviour than on those of specific insects, though it is obviously necessary to quote specific examples. Wherever possible, these have been personally observed by me, though it is not claimed that all or even many of the observations are original. Most of the examples are of East African or Trinidadian insects, though a few are of

subtropical species, especially those of Egypt and the Sudan, where I served for a number of years. It has not been thought necessary to encumber the text with numerous references, but where it has been desirable to quote facts that have not come to my personal notice, the observer's name is given.

Some technical terms for the parts of an insect's body are unavoidable, but it is hoped that these are adequately explained in Chapter II. It is a curious fact that people who readily learn and use words like carburettor and differential, or even such revolting mongrels as superheterodyne, and who scarcely realize that these are technical terms, often fight shy of simple biological words such as trachea and tarsus.

A certain inconsistency will be noticed in the method of indicating measurements, but this is deliberate. Approximate sizes, especially when large, are given in inches, for it is thought that "about six inches" conveys a better idea of size to most English-speaking readers than "152 millimetres". On the other hand, where greater accuracy in the measurement of small insects is desirable, the metric system is used, for "a third of a millimetre" will be more readily understood by most people than "thirteen thousandths of an inch". For those not conversant with both systems it may be mentioned that one inch is 25.4 millimetres; one millimetre is therefore about one twenty-fifth of an inch.

Most of the line illustrations have been drawn by Miss M. Otter under my supervision, or by myself. Figs. 36, 37 and 48-50 are adapted from figures in one of my previous publications, and Figs. 145 and 146 are redrawn from *Zoologica*, Vol. III, by the kind permission of the New York Zoological Society. The photographs have been taken by, or under the direction of, Mr. P. B. Hutchinson of the Imperial College of Tropical Agriculture, except for those reproduced in Figs. 77, 128, 129, 130 and 142, which have been contributed by Mr. W. V. Harris of the Colonial Termite Research Unit. I am most grateful to both these gentlemen for their ready cooperation.

I am greatly indebted to Mr. M. H. Breese, Senior Lecturer in Entomology at the Imperial College of Tropical Agriculture, for carefully reading over the first draft and making many valuable criticisms.

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Chapter I

THE TROPICAL ENVIRONMENT

"And I will cause the shower to come down in his season."
Ezekiel xxxiv, 26.

ALMOST every conceivable habitat, from the poles to the equator, is occupied by one or more species of insects. (Some indeed scarcely are conceivable, such as the pools of crude oil in the oil-fields of South California and Trinidad, in which are found large numbers of the maggots of a fly, *Psilopa petrolei*, which depend for their food on insects that get entrapped in the oil (p.152).) The geographical distribution of most insects is to a great extent limited by the climate, either directly or through its influence on their food. There are, it is true, a few almost cosmopolitan species such as the painted lady butterfly, *Pyrameis cardui*, which is equally at home in the damp tropics, the hot dry subtropics and the temperate regions. There are also many species that live in habitats that are only to a slight degree affected by the climate of the country, such as human lice and other domestic insects, and the pests of stored products; most of these have a wide distribution. As a rule, however, environments vary enormously, even in any one locality. There is, for instance, little in common between the physical conditions deep in the trunk of a tree, in a mine in a leaf exposed to the sun on the same tree, or in another leaf that is permanently shaded, or in the soil at the base of the tree. Yet all such ecological niches are subject to a greater or lesser extent to the influence of meteorological factors. It will therefore be of interest to give a very short account of the climate of the tropics.

Geographically the tropics are that part of the earth between latitudes 23.5° north and south. It is convenient to refer to the tropics of the Old World, comprising the Ethiopian, Oriental and northern part of the Australian regions, as the palaeotropics, and to the tropical parts of the New World as the neotropics. In these regions the sun is vertical at noon twice during the year except actually on the two tropics; on the northern tropic of Cancer it is vertical about June 22nd and on the southern tropic of Capricorn about December 22nd. The whole of this area should not, however, be considered tropical from the biological viewpoint; for instance, the arid Sahara extends south of the tropic of Cancer, and the

Pacific coast of the northern part of South America is, on account of the cold Peru current, much cooler than would be expected from its proximity to the equator. Apart from such exceptions and many others due to altitude and other local topographical features, the broad characteristics of the tropical climate are as follows. Because the length of the day varies at most between ten and a half and thirteen and a half hours and the noonday sun is always at least 43° above the horizon, the average temperature is high but its variation throughout the year is small and less than the daily variation, and there is very little difference between one year and another. As in temperate climates, though to a lesser extent, both the daily and annual range of temperature are greater in the interior of a continent than near the sea. At least as regards temperature, the tropics are more truly temperate than the so-called temperate zones. For instance, at Mombasa the average maximum and minimum for the hottest month are 90° and 78° F. (32.2° and 25.8° C.) and for the coolest month 82° and 71° F. (27.8° and 21.9° C.), and the absolute extremes recorded over a period of years are 96° and 66° F. (35.5° and 18.9° C.). Similar figures for London are 72° and 55° F. (22.2° and 12.8° C.) for July, and 43° and 35° F. (6.1° and 1.7° C.) for January, with absolute extremes of 100° and 4° F. (37.8° and -15.5° C.). Tropical insects therefore run little danger from extremes of temperature, though a few of them find it necessary to seek shelter from the midday sun. Moreover, a very large number live in habitats such as the soil, tree-trunks or ponds and streams, where the temperatures are very different from that of the air. The life cycles of many are adapted for tiding over unfavourable periods of heat, drought or absence of food: some examples are given in Chapter IV.

Although the temperature is liable to much smaller fluctuations in the tropics than in the temperate zones, and very much smaller than in the subtropical desert country which in continental areas lies between the tropical and temperate regions, the rainfall (and the humidity of the air which is largely determined by the rainfall) shows great variations according to the time of year, and from year to year. Topographical features also exert more influence than they do in the temperate zones. Near the equator the rainfall tends to be heavy throughout the year, though with two maxima in April and October, i.e. shortly after the sun has passed the zenith. With increasing distance from the equator the intervals between the sun being vertical at noon become progressively of unequal duration, and so do the intervals between the rainfall maxima, and there tends to be a marked dry season during the longer of the periods

between the maxima. Near the two tropics, where the sun is overhead at virtually only one time of the year, there is only one rainy season, at and following this time, and a definite dry season when the sun is at its lowest; although the average total rainfall is less, there is more variation from year to year than there is closer to the equator. There are consequently two main types of vegetation in the tropics, the rain-forest type which is mainly found near the equator, and the savannah type further away from it, though between these there may be intermediate types such as evergreen seasonal forest and deciduous forest. ("Seasonal" means that there is a more or less well-marked dry season in which the evaporation exceeds the available moisture.)

The intensity of the rainfall is usually greater in the tropics than in temperate countries. Much of it is convective "instability" rain which tends to be very heavy though of short duration and often extremely localized. A considerable proportion of a heavy shower may run off into the rivers, so that the effective rainfall is often much less than the actual.

The normal activities of nearly all aerial insects are curtailed during rain, but since tropical rainstorms seldom continue without intermission for very long and the temperature is always high enough for activity to be resumed as soon as the rain stops, this may not be of much importance. Some termites and ants are an exception in that the winged males and females of many species leave the nest on their nuptial flight only when it is raining. Torrential showers cause some mortality of certain insects, especially by washing away eggs laid in exposed places, but larvae and adults are on the whole remarkably resistant to drowning, and deaths from this cause are probably less than would be expected. It is through its influence on the vegetation that rainfall so largely regulates life in the tropics. For insects, like all other animals, depend for their food either directly or indirectly on plants, and plant life depends on the soil and climate.

Compared with the insect fauna of a temperate country, the tropical fauna is remarkable in three ways: the larger number of species, the apparently greater proportion of species with brilliant colours and the greater variety of fantastic forms. It is worth while examining these briefly.

The total number of insects in an English wood on a summer's day may not be far short of that in a comparable environment in the tropics, but the number of species in the latter is likely to be much higher. This is mainly due to the greater variety of plant life. One of the most striking aspects of a tropical rain forest is the large number of species of trees; thirty or forty different kinds to the acre

is not unusual, and it is seldom that one or a few species are noticeably more dominant than the rest. Apart from the trees, though the undergrowth may not be much more varied than that of temperate woodland, there is always a very large epiphytic flora. Secondary forest, and areas partly cleared for native cultivation, probably support an even greater number of plant species. Other factors that contribute to the abundance of insect species are that food is available throughout the year and the climate permits continuous breeding. Moreover, in a given period of geological time, insects in the tropics will have passed through many times the number of generations possible in a cool climate, with correspondingly greater possibilities of mutations. Because of competition from the numerous species, populations of individual species are not as a rule large, though there are of course many exceptions, especially among termites and ants and other highly specialized insects, or where agriculture has replaced the natural vegetation by a pure stand of one crop.

Whether or not the high temperature and humidity accounts for the brilliant colours of many tropical insects is rather doubtful. Actually most of them are as dull-coloured as those of cooler climates, and the apparent preponderance of brightly coloured species may perhaps be an illusion due to the greater number of species and the obvious fact that the conspicuous ones are more readily observed. That colour can be influenced by climate is, however, suggested by the fact that there are certain tropical butterflies with distinct wet and dry season forms, and the wet season one is nearly always the more brightly coloured. It has been suggested that this is because butterflies and insects generally are less abundant in the dry season and therefore more eagerly sought after by predators. Consequently a moderately distasteful species would profit most from bright warning colours when insect food is abundant and from cryptic coloration when it is in short supply.

That the tropical insect fauna is comparatively rich in curious and often bizarre forms is a matter of common observation. Yet the great majority of tropical insects are quite ordinary in appearance and the existence of the strangely shaped species (which again are more readily noticed than the ordinary ones) is less likely to be directly due to the climate than to the more frequent mutations which, as mentioned above, must have occurred. There is also no doubt that both mimicry and protective adaptations, which are discussed in Chapter VIII, are more prevalent in the tropics than elsewhere, and this would also tend to the preservation of queer forms. A possible explanation for the great size of some tropical insects is given in Chapter II.