LEPIDOPTERA
(BUTTERFLIES AND MOTHS)

Insects with 2 pairs of membranous wings; cross-veins few in number. The body, wings and appendages clothed with broad scales. Mandibles almost always vestigial or absent, and the principal mouthparts generally represented by a suctorial proboscis formed by the maxillae. Larvae eruciform, peripneustic, frequently with 8 pairs of limbs. Pupae usually adecticous and more or less obtect, and generally enclosed in a cocoon or an earthen cell; a few primitive forms decticous and exarate. Wing tracheation complete.

Lepidoptera are the most familiar and easily recognizable of all insects, and it is in this order that coloration has reached the highest degree of specialization. These insects have always been popular objects for study, and more than 100 000 species have been described. Staudinger and Rebel (1901) enumerated over 9500 Palaearctic species which are represented by about 2400 in the British Isles.

On the whole the imagines exhibit a remarkable constancy as regards their fundamental structure, and this uniformity has led to great difficulties in evolving a division of the order into major groups for classificatory purposes. On the other hand, the more superficial or adaptive characters exhibit almost endless variation in the larvae. As might be anticipated from this structural similarity, the habits of these insects are remarkably uniform. The imagines live entirely upon the juices of flowers, over-ripe fruit, honey-dew and other liquid substances: in a considerable number of species the mouthparts have atrophied. The larvae possess masticatory mouthparts and differ from those of other orders in feeding, with but few exceptions, entirely upon phanerogamic plants.

Economically Lepidoptera are of a great importance in the larval stage. The majority of injurious species devour the foliage and shoots of trees and crops; a smaller number bore into the stems or attack underground parts, and several species are injurious to timber; others attack manufactured goods such as carpets, clothing and their like, while a few are extremely destructive to stored products, including grain, flour, etc. Several predacious species are enemies of Laccifer lacca and injurious to lac cultivation, and one or two species live in beehives, destroying and fouling the combs. The Saturniidae
and *Bombyx mori* (Rolet, 1913), on the other hand, confer a direct benefit upon man from the fact that they yield silk of commercial value.

Among the more recent general works on the order are those of Seitz (1906 *et seq.*) on the larger Lepidoptera of the world, and Hering (1933) on the European forms. Snodgrass (1961) also provides a very good short introduction. The world’s species are listed in the catalogue edited by Wagner (1911, etc.) and those of the Palearctic region by Staudinger and Rebel (1901). The leading treatises on the British species are those of Meyrick (1928), Barrett (1893–1907) and Tutt (1899–1909). The work of the last-mentioned author contains a great deal of biological information but was not completed. Vorbrodt and Müller-Rutz (1911–14) have dealt with the Swiss species. Works on the butterflies (that is superfamilies Hesperioidea and Papilionoidea) are particularly numerous: the Swedish and Italian species have been dealt with by Nordström, Wahlgren, and Tullgren (1935–41) and by Verity (1940–50), respectively; those of North America by Edwards (1868–97) and Clark (1932), both works also containing much general information. Among numerous other works, the volumes by Godman and Salvin (1879–1901) on Central America, by Corbet and Pendlebury (1956), Talbot (1939, 1947), and by Woodhouse and Henry (1942) on the Oriental region, and by Common and Waterhouse (1972) on the butterflies of Australia, are important.

Head-capsules of Lepidopterous larvae have been found in Cretaceous amber (Mackay, 1970) and the evolution of the order probably paralleled that of the flowering plants.

**The Imago**

**EXTERNAL ANATOMY**

**The Head** (Fig. 488) – The greater part of the head is formed by the *fronto-clypeus* and large globular compound eyes. The *ocelli* are two in number and lie close behind the eyes: they are seldom conspicuous, and generally much concealed by scales or often apparently absent though they may be concealed within the head (Eaton, 1971; Dickens and Eaton, 1973). In some families a pair of sensory organs known as the *chaetosemata* (Jordan, 1923; Eltringham, 1925c) are also present. The anterior region of the head (Short, 1951) is occupied by the large *fronto-clypeus* which is frequently delimited dorsally by a *transfrontal sulcus* (Duporte, 1956). The labrum is narrow and pointed in *Micropterix* and its allies but forms a short transverse plate in other Lepidoptera. It is provided with a small pointed median projection which is usually regarded as an extension of the *epipharynx* and often also with lateral ones known as *pilifers*. Between the fronto-clypeus and the eyes are the narrow *genae* and, when mandibular rudiments are present, they either articulate or fuse with the latter sclerites. The *antennae* (Jordan, 1898) are composed of an indefinite number of segments and vary greatly in length.