THE ELEGANT AND THE VARIEGATED GRASSHOPPERS (*Zonocerus elegans*, Thunb., and *Z. variegatus*, L.).

Adult of the Elegant Grasshopper (Fig. 111).—Of medium size, rather clumsy, brilliantly coloured. Antennæ black, with the apex and several rings orange. Head above black, sometimes with yellowish lines and small spots, but the black colour predominates; face and sides of the head black, with yellow stripes and small knobs. Pronotum conical, without any keels,

yellowish-olivaceous, paler at margins. Elytra covering about two abdominal segments (or fully developed), pale olivaceous or pinkish-black at the base; wings absent (or fully developed and then pinkish, smoky towards the apex). Abdomen yellowish-olivaceous, the base of each segment black. Legs

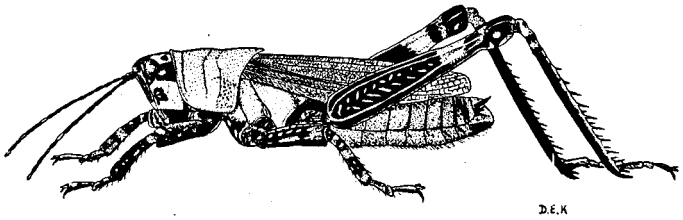

FIG. 110.—Variegated Grasshopper, twice natural size (original).

variegated with black, yellow, and red. Hind femora olivaceous; outer face near the apex black. Length, male 28–36 mm., female 35–50 mm.; elytra, male 5–9 (or 29–35) mm., female 10–12 (or 27–31) mm.

Adult of the Variegated Grasshopper (Fig. 110).—Very similar to the preceding, but the head above mainly yellow with reduced black pattern; antennæ with only 1–2 yellow rings; elytra practically always developed, green, without pink colour; wings developed, decidedly smoky; legs more gaudily variegated in black, red, and yellow; hind femora mostly black, with a yellow ring before the knees; abdomen with black spots not rings. Measurements as in the other species.

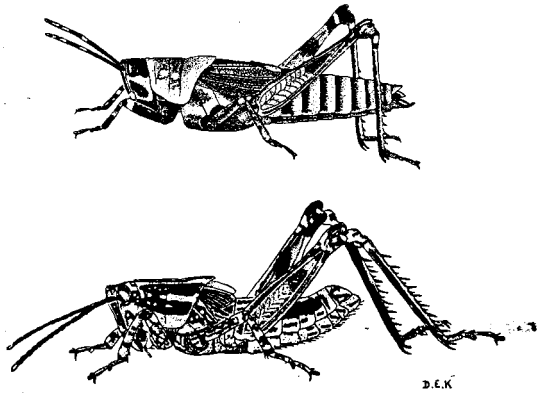

FIG. 111.—Elegant Grasshopper; above, an adult of the brachypterous form, natural size; below, a hopper, enlarged (both original).

Hoppers of the Elegant Grasshopper (Fig. 111).—Strikingly coloured in black and white (or yellowish). Antennæ black with white tips. Face with white spots. A narrow white line runs along the back, and it is included between two broader black stripes; sides with a broad white stripe and, below, a black one.

Front and median legs with white spots; hind legs with white marginal lines.

Hoppers of the Variegated Grasshopper.—These have never been described, and their points of difference from those of the other species are not known, but in general appearance they must be very similar.

Egg-pods of the Elegant Grasshopper.—Outer covering brittle; length about 25 mm., diameter 6–9 mm. Eggs yellow just after being laid, but turn brown later; their number varies from 23 to 116; length about 6 mm., diameter 1·5 mm.

Distribution and Ecology.—Both species seem to be distributed all over Tropical and South Africa, but the Elegant Grasshopper is apparently more at home in South Africa, where it replaces the other species entirely, while the latter occurs alone in the more northern areas (Senegal, Nigeria, etc.); the exact areas of distribution of both species are, however, not sufficiently known, partly owing to the fact that they are very often confused.

Ecological data are practically lacking. In South Africa the Elegant Grasshopper prefers more humid parts, such as the Natal Coast and Zululand (van der Merwe and Kent, 1925; the paper of these authors is the main source of information on the species). Both species are phytophilous in habits, climbing various low-growing shrubs.

Bionomics.—The Elegant Grasshopper in South Africa hatches from the end of September to the end of October, the hatching usually taking place after rains. Young hoppers congregate in dense clusters on the tips of plants, but scatter later. The adult stage is reached 73–78 days after hatching, but the number of larval stages is not known. The adults sometimes congregate in large numbers, but do not form really dense swarms and do not wander together, except for short distances. Even the individuals with fully developed wings, which occur occasionally, are very poor fliers. Pairing takes place soon after the adult stage is reached, and as the eggs are laid about four weeks later, it may be presumed that there is a short imaginal diapause. Oviposition occurs from February to May, so that the eggs remain in the ground for about six months, there being only one generation a year (van der Merwe and Kent). The dates of appearance of the stages in East Africa differ but little, the hoppers hatching in October; in January the adults appear, and they disappear after oviposition in May (Zacher, 1926).

The annual cycle of the Variegated Grasshopper in French Equatorial Africa is similar, there being also only one annual generation; the hoppers hatch in the middle of February and in March; the adults pair in September–October (Vayssière and Mimeur, 1925).

South African observations show that the Elegant Grasshopper has some preferences among wild food plants, such as a milkweed, *Asclepias fruticosa*, and species of *Senecio*. Apart from these, however, a large number of very different plants are subject to attacks, including almost any cultivated plants, though grasses are not touched.

Economic Importance and Control.—Both species being practically omnivorous and occurring often in very large numbers, a great deal of damage is done to various crops, particularly to cotton, cacao, coffee, rubber,

camphor, etc. Since, however, the grasshoppers feed also on various weeds, the damage they do is not so serious as it might otherwise be; it may be suggested that they would be more dangerous to very clean crops that are free from weeds.

As regards control, these grasshoppers are so sluggish that there is little danger of them spreading over large areas; accordingly, they must be regarded as pests of very localised importance and control measures may be taken individually by farmers, there being hardly any need even for co-operative efforts, though these might be more effective. From the technical point of view, spraying with any internal poison may be recommended, while contact insecticides may be also used with success against younger hoppers clustered on plants. Van der Merwe and Kent, after making some experiments with baits of *Senecio* dipped in poison, came to the conclusion that there is little hope of finding baits that would be more attractive than natural fresh food; this conclusion can hardly be drawn from the very few and imperfect experiments made, and further attempts in the same direction would be desirable. It may be worth while studying the chemical properties of *Senecio*, *Asclepias*, and other favourite food plants, in order to discover the attractive substance. In East Africa baits of horse dung, sugar, and salt have been used with success (Zacher, 1926).