



FIG. 18.—Map of New Zealand and adjacent islands. Broken line encloses area in which Lucanidae occur.

FIGS. 19-23.—Maps showing distribution of flightless Lucanidae in the New Zealand area. (19) and (20) *Dorcus* species; (21)-(23) *Lissotes* species. Symbols indicate areas in which the species occur, not necessarily single specimens.

above; rather they tend to be taking place simultaneously within a species. The rates and extent of wing atrophy can vary markedly within a group of related species (see Figs. 2-7, 8-14). The morphological changes listed above are similar to those occurring in atrophied wings of carabid beetles (Darlington, 1936).

The atrophied wings of one species of *Lissotes* contain an almost complete set of veins (see *L. rufipes*, Fig. 8); the colonizing ancestor of the *Lissotes* group must have had hindwings that were at least as well developed as those of *L. rufipes*, and I would judge that it reached New Zealand as a flying species. Similarly, since the atrophied hindwings of *D. novaezealandiae* (Fig. 2) have retained many of the veins that occur in fully winged species the ancestral species of the *Dorcus* group probably arrived in New Zealand as a flying beetle. The New Zealand species of *Lissotes* and *Dorcus* have small eyes, and elytra that interlock firmly along the elytral suture. These features, which often are correlated with flight-