Bionomics

The basic developmental biology of larger grain borer was studied on maize (Bell and Watters, 1982; Howard, 1983; Shires, 1977, 1979 & 1980) and on cassava (Nyakunga, 1982). The results were reviewed in some detail by Hodges (1986), who drew attention to a number of apparent discrepancies, which may or may not have been attributable to differences in experimental design. The possible effects of differing experimental conditions are discussed in detail by Ramírez (1990).

The possible role of biodiversity within the species, as an explanation for differing study results and pest status, has only recently been considered. Nissen (1989) studied in the laboratory, under uniform conditions, populations of larger grain borer originating from Tanzania, Togo, Mexico, Guatemala and Costa Rica. Populations derived from these various sources differed considerably in their longevity, pattern and level of egg production and surviving progeny. The resulting intrinsic rates of increase (r) varied from 0.74 for the Mexican population (Guadalajara) to 0.49 for the Costa Rican one; African populations from Togo and Tanzania were intermediate, at 0.67 and 0.59, respectively. Differences between populations were also considered in terms of iso-enzyme polymorphism. From these comparisons it was concluded that larger grain borer was introduced to Africa from Mexico (Nissen *et al.*, 1991).

The importance of grain stability to the reproductive success of larger grain borer was noted by Cowley *et al.* (1980). Studies of the life strategy of the insect by Li (1988), throw further light on the biological basis for this. Females were found to construct tunnels and side chambers for oviposition in an orderly progression, with the amount of tunnelling and the size of egg batches (mean: 8.37 eggs per blind tunnel) dependent on the hardness of the substrate. Total egg production (mean: 320 per female), assessed by dissection of grains with oviposition chambers, was considerably higher than previously noted. The fact that females were allowed to continue (as in nature) boring a single tunnel, without having to re-establish on undamaged grain at frequent intervals, reduced mortality and allowed more energy to be devoted to reproduction (Li, 1988). Similar results were obtained in laboratory studies in Mexico by Ríos (1991), who recorded the average number of eggs per batch as 7, though the mean total lifetime egg production of 154 was considerably lower. Ramírez (1990), considering the frequency of daily egg production, noted that females usually lay either no eggs in a day or a group of six to eight. Demianyk and Sinha (1988),