2. PRESENT INVESTIGATIONS INTO THE BIOLOGICAL CONTROL OF NOOGOORA BURR (*XANTHIUM PUNGENS*)

by George O. Stride.

The main spring/summer crop of Noogoora burr in central and southern Queensland germinates between September and February, depending on the rainfall. Generally, adequate spring or summer rains necessary to promote germination occur earlier in the coastal districts than in the inland areas. Thus germination frequently occurs in September or October near the coast but is often delayed until December or January in western Queensland. Flowering of the main burr crop is largely independent of the time of germination and usually occurs in March or April.

Burr may grow as relatively isolated plants competing with other weeds, grasses, or crop plants, or it may grow in dense stands which completely smother all other vegetation. Such stands may contain up to fifteen times the number of individuals necessary to completely dominate the area, and the growth of each plant is then greatly suppressed by its neighbours.

The Division of Entomology, C.S.I.R.O., has recently been collaborating with the Queensland Department of Public Lands in a reconsideration of the probable efficacy of two cerambycid beetles as controlling agents for Noogoora burr. These beetles are *Mecas saturnina* from North America and *Nupserha antennata* from India.

M. saturnina is a hardy species, probably able to survive the climatic conditions of much of southern and eastern Australia. Adult beetles emerge in early summer and lay their eggs in the main stems and branches of the host plants. The adult girdles or "ringbarks" the stem when ovipositing, thus causing the distal part of the stem to wither and die - the "adult girdling". The larvae hatch a few days after oviposition and tunnel in the main stem, working their way towards the base of the plant. They complete their growth towards the end of the summer and then retreat to the rootstocks in which they construct a small cell in which to pass the winter in a state of diapause. At the time of

cell construction they girdle the plant stem internally just above ground level, and the plant breaks off when subjected to any mechanical strain - the "larval girdling". The larvae remain in diapause for several months until their further development leading to pupation is initiated by the arrival of the warm spring temperatures. Adults emerge about two weeks after pupation.

Laboratory experiments indicate that within a reasonable range of humidities (70% RH and above) the final development of the diapause larva is determined mainly by temperature, and in southern and central Queensland, many beetles may be expected to emerge in the early summer as a result of rising soil temperatures. From this viewpoint conditions would appear to be most suitable for the beetle in coastal Queensland where burr may be expected to be in growth when the beetles emerge. Passing inland towards western Queensland, conditions would become less suitable as there would be an increasing tendency for the beetles to emerge before the burr had grown.

M. saturnina is potentially very destructive to isolated burr plants growing among other weeds or crop plants. The adult girdling would give a severe check to a plant's upward growth, and possibly allow surrounding plants to gain ascendancy. Larval girdling would frequently occur before the burr plant had flowered, thus completely eliminating seed production.

The effect of the attack of Mecas adults on burr stands is likely to be more complex. Observations on stands of burr grown under glass-house conditions indicate that burr plants artificially girdled in a manner resembling that of Mecas attack are rapidly and permanently swamped by their neighbours. They develop only into weakened and somewhat spindly plants. The elimination of such plants by larval girdling might not significantly affect the vigour or burr production of the stand. Several variable factors, including the density of plants, the density of attacked plants and the time of attack, would greatly influence the results of Mecas attack on burr stands.

Nupserha antennata is likely to be better suited by the warmer climates of Australia. The life history is somewhat similar to that of M. saturnina, but the adult does not girdle when laying, and the larva does not girdle internally when passing into diapause. Larval diapause generally occurs in a cell in the soil.

Damage to burr plants arises from the activity of the young larva which frequently bores into and destroys the growing point of the burr, thus checking its upward growth, and from the boring activities of the older larva, which may seriously weaken the plant and reduce burr production.

Permission has been obtained for the importation of two other cerambycid beetles, Dectes spinosus and D. brevisetosus, for further investigation under quarantine. These species are somewhat similar in their general biology to M. saturnina. There is, however, no adult girdling associated with oviposition, and the characters of the larval diapause probably differ from those of M. saturnina. The species were originally discarded as unsuitable for liberation because under caged conditions some oviposition and larval development was obtained on cucumber and English potato. The investigations now proposed will examine the scientific validity of discarding the insects on this evidence alone.

On occasions, larvae of a small moth of the genus Eublemma have been reported as seriously damaging the flowers and green burrs of Xanthium in India. The species had been identified as Eublemma rivula and E. parva, both of which are said to occur in Australia. Preliminary investigations by Mr. I. F. B. Common have shown, however, that the Indian species does not belong to either of the species referred to as E. parva and E. rivula in Australia. It is proposed that the Indian species should be further investigated.