1-1-1981

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Controlling cattle dung and the bush fly

By Dr T. J. Ridsdill-Smith* and J. N. Matthiessen*

Western Australia has more than two million cattle, each of which produces about 10 pats of dung a day. Since the average area covered by a pat is 600 square centimetres, the dung potentially covers a total of 120 ha/day. These dung pats are a significant part of the grazing animal ecosystem, and are the source of a number of problems for graziers. The pats smother pasture plants which are then unavailable for stock, and they represent a considerable pool of nutrients tied up in an unused form. The pats also are the breeding ground for a number of pest species, notably the Australian bush fly, Musca vetustissima, and the buffalo fly, Haematobia irritans exigua.

CSIRO has been introducing dung beetles to Australia since 1968 to assist the native dung fauna to break up the cattle dung and bury it. Dung beetles have mouth parts adapted to feed only on dung and thus cannot become agricultural pests.

The beetles bury dung and form it into brood balls in which they lay their eggs. The larval development is completed in the brood ball and the resulting adults emerge to search for fresh dung. The beetle species now present in the South-West bury dung from inside the pat, leaving an outside dry crust. Sometimes large numbers of beetles feed in the pat without burying any dung, resulting in the pat being shredded on the surface of the pasture. When shedding takes place the whole pat may be destroyed.

The bush fly lays its eggs only in the fresh droppings of animals, including humans, but its main breeding medium since European settlement has been cattle dung. Experiments in the laboratory have shown that when dung beetles are working in cattle dung, bush fly survival is reduced significantly because the beetles make the pat unsuitable for the flies. Suppression of flies is greater when the beetles shred the dung than when they only bury it. Obviously if the whole pat is buried no flies survive, but this is not the usual field situation. Other factors, including predators and parasites, are responsible for killing fly eggs and larvae in the dung.

The dung beetles will provide benefits to man through dung dispersal by reducing pasture smothering, recycling nutrients and by helping to control nuisance flies.

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† Introduced dung beetles make short work of a dung pat.

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Bush fly problem

In south-western Australia it is not uncommon for up to 2,000 bush flies to develop in a single cattle dung pat at the height of the breeding season, but numbers at other times are much lower. The value of the dung as food for bush fly larvae in the field, changes in response to the growth of pasture on which the cattle feed. Thus it is lowest during the dry summer and reaches a peak as the pasture plants mature in spring. Larval survival is highest in the dung produced in spring, and the large flies which are produced are more successful breeders because they lay more eggs than the smaller flies which result from the poorer dung in summer.

Bush fly breeding occurs year-round in much of the northern and eastern agricultural areas but in the southern and western areas the populations die out each winter. In the north and east, breeding increases rapidly in early spring because of the favourable dung and warmer, drier weather. The resulting large populations are the source of flies which disperse into the cooler and wetter south-western parts of the...
Onthophagus ferox (native).

Onitis a/lexis (introduced).

Onthophagus ferox (introduced).

Selecting dung beetles

There are more than 4,500 dung beetle species in the world. A major task of the CSIRO programme has been to evaluate the performance of some of these species in their natural habitat overseas and select those which are likely to be of greatest benefit in Australia. Different species need to be selected from each of many different regions which match with the many different climate areas in Australia. It is also necessary to select species which are active at different times of year, so that they complement each other rather than compete. Eventually, researchers hope to have effective dung-destroying beetles active at all times of year and in all regions.

Many of the species selected for Australia have complex life cycles. Thus another important part of the work overseas is to determine how best to produce large numbers of beetles in the laboratory. Strict quarantine conditions are maintained to prevent any chance of dangerous diseases being introduced with the beetles. They are reared in quarantine laboratories in Pretoria, South Africa, and only the surface-sterilised eggs are shipped to Australia.

These eggs are reared through to adults under quarantine in Canberra and then mass-reared in the laboratories for release in the field. Therefore it is a considerable undertaking to get each beetle species released in Australia. However, in biological control projects, such as the dung beetle programme, once the organisms are established the benefits continue even though no more money is being spent.

Five of the dung beetles selected for winter rainfall climate areas of Australia and released in the Southwest are now well established at many sites in the area. The most spectacular of these are Onthophagus binodis which is very abundant near Albany and Bunbury, and Onitis a/lexis which is most abundant in the Geraldton region. The greatest populations of the five established species occur in the summer months when many dung pats are buried or shredded. It seems likely now that the species already released will become established eventually in most areas with substantial cattle numbers.

There may, however, still be certain habitats where none of these species can survive; perhaps limited by climatic, soil type or vegetation factors. Further beetles will be selected for these habitats where possible.

The native dung beetles are mostly forest and woodland species. They usually do not live in open pasture habitats. One species which has made the move to open pastures is Onthophagus ferox. It is very widespread in the agricultural area but most abundant along the south coast. It is active mainly in winter and early spring. The period when bush flies are laying most of their eggs in this region is late spring, so there is still a gap between the spring activity of the native species and the summer activity of most of the present by established introduced beetles. This is another gap for which additional species are needed.

Millions of dung beetles are present in south-western Australia as a result of this programme, burying and breaking up cattle dung. Previously the dung remained on the pasture substantially undisturbed. The beetles will spread naturally into new areas until they reach the biological limits of their distribution. The rate of spread has been accelerated by CSIRO and the Department of Agriculture by cropping beetles from areas where they are abundant and redistributing them into new sites.

Further general information on this programme can be obtained in:
- Ecos 26, 29-25 (1980)
- Farmnote, W. A. Department of Agriculture 9/79. The control of flies by dung beetles.