CRICKET DAMAGE ON THE KAIPARA CLAY FLATS RUAWAI IN 1982

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SUMMARY

Aerial, postal and ground surveys established that over 80% of the Kaipara clay flats in the Ruawai-Dargaville area of Northland was infested with high numbers of the black field cricket (*Teleogryllus commodus*) and suffered pasture damage in the summer and autumn of 1982. Farms which baited and obtained good control were able to maintain summer milkfat production levels, whereas on farms with high cricket numbers average production was 23-28% lower. The cost of the damage attributable to crickets on the 8,000 ha Ruawai Flats was estimated to be approximately \$1 million.

INTRODUCTION

The black field cricket can cause considerable pasture production losses and pasture damage (Blank 1979a, 1982a; Blank and Olson 1981; Blank and Bell 1982a). Maldison treated grain baits applied in January are recommended to control crickets as considerable damage still occurs when bait is applied late in March (Blank 1979b, 1981, 1982b). In seasons when good patterns of summer and autumn rainfall occur cricket damage is not seen. However, when pasture growth is slow cricket damage is readily apparent.

The Kaipara clay soils bordered by the Northern Wairoa River encompass Dargaville, Te Kopuru and Ruawai with the largest area at Ruawai. Most of this fertile flat land is used for dairying with small areas in cropping. These estuarine clay soils crack extensively in dry summers and have a history of cricket attack. The Ruawai area experienced good summer growing seasons in 1980 and 1981, but 1982 was drier than normal and considerable cricket damage occurred in that year. This paper attempts to quantify damage attributable to crickets in the Ruawai area.

MATERIALS AND METHODS

The effect of crickets on pasture production

The effect of crickets on pasture production was assessed at two sites on Kaipara clay, with five paired plots at Ruawai and three paired plots at Turiwiri. This work is part of an ongoing research programme which is to be reported in detail elsewhere. Crickets were excluded from one end of paired plots (0.5 ha) using maldison treated barley which was first applied in January. Cricket density was measured at 3 weekly intervals using a new 'flushing technique' (Blank and Bell 1982b). Pasture production was measured by cutting pasture from six cages (715 x 466 mm) in each plot.

Postal survey Ruawai dairy farmers

A postal survey was made of dairy farmers on the Ruawai Flats in May 1982 to obtain information on summer milk production, cricket numbers, bait application and management practices for the 1981 and 1982 summers. The effect of crickets on summer milkfat production, from 1st January until drying off, was investigated by expressing 1982 production as a % of 1981. The 1981 summer production thus served as a measure of the normal production of each farm when cricket numbers were low and rainfall above normal. This enhanced the comparisons made by eliminating natural variation which would have otherwise occurred between high and low producing farms, and different management practices, if milkfat per ha (or cow) had been the basis of

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comparison. Farms on which area, cows milked or management differed markedly between seasons were excluded from this comparison. Adjustments were made to the summer milkfat figures for the amount of supplementary feed used, assuming 60 kg DM hay or silage is equivalent to 1 kg milkfat (Scott *et al* 1980). Comparisons were then made between farms to investigate whether cricket density affected milk production in 1982.

Aerial survey and ground-proofing

An aerial survey of the Ruawai Flats was made on 27th April 1982 to establish the extent of pasture damage and to take photographs. From this aerial survey, two groups of four farms differing in apparent pasture cover were selected for a detailed ground-proofing. The farms in each group were in close proximity to each other. Farms A, B, C, and D comprised one group, with farms E, F, G, and H comprised a second group. These two groups were located in different areas of the Ruawai Flats. Farms had a similar area in grass and similar management in the 1981 and 1982 seasons. Information relating to cricket densities, feed supplements, management, fertiliser usage and summer milkfat production was obtained from each farmer and by examination of farms in early May. Cricket densities, for example, were obtained after consultation with farmers and a visual estimate of May populations. Pasture damage was considered severe if there were large areas of bare ground and no green ryegrass, whereas slight damage consisted of small areas of bare pasture. Standing pasture cover was assessed by visually estimating pasture above ground level in each paddock of known area to obtain an average for the whole farm.

RESULTS

The effect of crickets on pasture production

There was no difference in production between baited and non baited plots for the first pasture cuts taken in early January. This demonstrated that plots were similar at the start of the trial. A significant ($P < 0.001$) relationship was found between January to April pasture production kg DM/ha (Y) and mean cricket density/m² over that period (X).

$$Y = 330 - 84X \quad r^2 = 0.52$$

Postal survey Ruawai dairy farmers

Fifty-eight of the 115 questionnaires were returned. The total area covered by the survey was 3,314 ha in 1982 and 3,161 ha in 1981. Based on farmer estimates, cricket numbers were low (0-10/m²) on 76% of the area in 1981 (Table 1). Cricket numbers were high (> 10 /m²) on 84% of the area in 1982.

TABLE 1: Cricket densities in 1981 and 1982 in terms of area infested and % of the total area, based on farmer estimates of March/April populations.

	1981			1982		
crickets/m ²	0-10	10-20	>20	0-10	10-20	>20
area infested ha	2404	757	0	548	1111	1655
% of total area	76	24	0	16	34	50

In 1981 11% of the area (10% of respondents) was baited compared with 53% (61% of respondents) in 1982. Approximately 70% of this bait was applied in March and April or at a low rate and there were many repeat baitings (Table 2).

Summer milkfat production was compared between farms with high cricket populations and which had baited early (February), late (March or April) or not at all (Table 3). Also compared were farms with low cricket populations on which no bait was applied. In 1981 there was no apparent difference in summer milkfat production between these groups with an average of 95 ± 28 to 123 ± 25 kg milkfat/ha. In 1982 summer milkfat production was significantly higher ($P < 0.05$) on farms with low cricket populations and farms where bait had been applied early compared to farms with high cricket populations over the summer.

TABLE 2: Timing and rate of bait application for cricket control by Ruawai dairy farmers.

Rate kg/ha:	1981			1982			
	0	2-5	5-10	0	2-5	5-10	10-20
Jan + Feb or Mar	-	1	0	-	1	0	0
Feb	-	1	1	-	0	5	2
Feb + Mar or Apr	-	0	1	-	2	9	1
Mar	-	1	0	-	3	1	0
Mar + Apr	-	0	0	-	2	0	2
Apr	-	0	0	-	3	2	0
Total	47	3	2	21	11	17	5

TABLE 3: Differences in summer milk production (mean $\pm$ SE) on farms with different cricket densities and time of bait application.

Cricket density (No./m ²)	Bait application	No. of farms	Summer milkfat (1982/1981 %)
0-10	none	4	109 $\pm$ 10 ^a
10	Feb(+ latter)	15	81 $\pm$ 19 ^b
10	Mar or Apr	6	58 $\pm$ 19 ^c
10	none	15	62 $\pm$ 10 ^c

Milk production means with different letters are significantly different ($P < 0.05$), Newman-Keuls test.

Aerial survey and ground-proofing

Widespread pasture damage throughout the Ruawai Flats was observed from the aerial survey. The worst affected farms comprised about 20% of the area and appeared almost devoid of pasture cover. Approximately 60% of farms had little pasture cover and large areas of damage. Some farms, comprising about 20% of the area, had a good dense pasture cover. Farms with a known history of cricket baiting appeared lush and green in contrast to neighbours which had not baited.

The eight farms which were followed up in detail after the aerial survey all had had low cricket numbers and no noticeable pasture damage in 1981. In marked contrast all farms had high cricket populations in 1982 and, where farms were not baited populations were 20/m² or greater (Table 4). Farm E did not control crickets adequately possibly because of the low rate of bait used. Farms where bait was applied had little pasture damage in terms of the amount of bare ground compared to non baited farms. Baited farms had an average of 650 kg DM/ha more pasture feed than non baited farms. There were no obvious differences in fertiliser policies, or use of supplementary feeds between baited and non baited farm groups.

Stocking rate was similar on all farms, around 18 su/ha, except for Farm F which had 13 su/ha. Overwintering management was aimed at minimising pugging damage either by grazing stock away on run-offs, or by using barns and/or sawdust pads under wet conditions as well as careful stock management through block grazing. There was no apparent difference in overwintering practices between farms but the non baited farms showed signs of extensive pugging. None of the baited farms had much evidence of pugging, although two farms had either rolled or used a levelling bar.

Three of the 'baited' farms undersowed with improved pasture species or cultivars as part of an overall farm improvement programme, whereas none of the severely damaged farms undersowed. This illustrates the different overall management, or

TABLE 4: The effect of cricket densities and baiting strategies on pasture damage, summer milk production and autumn pasture feed supplies from two groups of dairy farms on the Ruawai Flats.

Farm:	Baited				Non baited			
	A	B	E	F	C	D	G	H
crickets/m ²	<5	<5	10	<5	>20	20	20	>20
bait application	Feb	Feb	Feb + Mar	Feb + Mar	-	-	-	-
rate kg/ha	8	5	4	7	-	-	-	-
damage	slight	slight	slight	none	severe	severe	severe	severe
% area affected	10	5	5	0	100	75	100	100
pasture kg DM/ha	1350	1250	1400	1300	650	800	550	700
summer milkfat $\frac{(82\%)}{(81\%)}$	94	101	44	107	60	50	59	42

availability of capital, between the two groups of farms. Baited farms were characterised by greater paddock numbers, and better sward composition, surface maintenance, drainage, general maintenance and production per ha than the non baited farms.

Baited farms obtained an average 28% of their total annual milkfat production after the 1st January compared to 17% on non baited farms. This was due to the early drying off of herds on the non baited farms as calving dates (10-25 July) were similar between farms. Farms which baited and obtained good cricket control (A, B and F) were able to maintain summer milk production levels similar to the 1981 season, whereas on farms with high cricket numbers summer production was markedly reduced. Milk production on Farm E dropped rapidly in February even though bait was applied. Crickets were still abundant in March and further bait was applied, but there was insufficient soil moisture for the pastures to recover and cows had to be dried off. Following the April rain pastures recovered well and there was little evidence of cricket damage (Table 4).

DISCUSSION

A dry spring in combination with a delay in the autumn rains contributed to the autumn drought in the Ruawai Flats area in 1982, compared to the more favourable growth conditions in 1981. The dry conditions over the spring and summer were favourable for the survival of crickets which built up to high numbers on the cracked Kaipara clay soils. Considerable nightly cricket flight was recorded during February at light traps situated at Ruawai and Dargaville (Blank and Olson, unpublished) and must have contributed to the widespread distribution throughout this area. Cricket damage was apparent in February and some farmers baited then. With the onset of cooler weather in March and April crickets suddenly appeared on the surface and many farmers then realised the extent of the populations and baited. Many farmers who had baited in February applied further bait as crickets were still plentiful. A large group of farmers did not apply any bait and suffered moderate to severe pasture damage. The lack of a good autumn rainfall enabled maximum expression of the cricket damage which in other years is disguised by good autumn pasture growth.

Pasture production losses due to crickets during the summer of 1982 were similar to those obtained in 1979 (Blank 1979a, 1982a). The postal survey confirmed the estimate of cricket abundance in 1982 and hence the damage estimate obtained from the aerial and ground survey, with over 80% of the 8,000 ha of flats moderately to severely affected. From the postal survey, shown in Table 1, 50% of the flats (or 4,000 ha) supported densities of 25/m², 34% (or 2,720 ha) densities of 15/m², and 16% (or 1,280 ha) densities of 5/m². The area infested can be reduced by 30% to allow for successful baiting of crickets (i.e. bait applied in February at > 5 kg/ha — Table 2).

Interpolation of the pasture production regression equation at cricket densities of 25/m², 15/m² and 5/m² gives losses of 2,100, 1,260 and 420 kg DM/ha respectively. Assuming that 30 kg DM pasture is equivalent to 1 kg milkfat (worth \$3.20), it is estimated that crickets could have been responsible for \$923,000 in lost summer milk production.

Another approach to estimating milk production losses attributable to crickets was to compare farms which had low cricket populations with farms which had high populations. The difference in summer milk production between farms with high cricket numbers on which bait was applied in February compared to non baited and late baited farms (Table 3), illustrates that cricket damage can be distinguished from drought damage. The 23-28% reduction in summer milkfat (19-23% in terms of 1981 production) on farms which did not achieve control of crickets compared to farms which did, was equivalent to 24 kg milkfat/ha or \$77/ha. On individual farms losses could be considerably greater than this, as shown by the 40 to 58% losses obtained by the non baited farms shown in Table 4. The combined effects of drought and crickets very quickly lowered milk production on non baited farms whereas many farms which controlled crickets were able to maintain production at levels similar to the previous season. From the detailed farm studies, it was apparent that cricket damaged farms would need to buy in winter feed to maintain stock numbers and next season's production. Feed supplements equivalent to 400 kg/ha of pasture may be a more realistic estimate for the Ruawai Flats area than the 650 kg/ha pasture difference obtained from a comparison of four severely infested farms with four baited farms. If it is assumed that 1.6 kg DM hay is equivalent to 1.0 kg DM pasture and a 20 kg bale costs \$3 then it would cost approximately \$96/ha to bring feed supplies up to the level of the undamaged farms. Assuming, as before, that 6,700 ha of flats were damaged by crickets, then milkfat losses in the order of \$516,000 and winter feed losses of \$643,000 combined give a damage estimate of \$1,159,000. Few of the baited farms used in this analysis applied bait at the optimum time (late January) or rate (10-20 kg/ha) (Blank 1979a, 1982b), which could have enhanced the comparisons made.

Milkfat collection from January to May 1982 by the Mid-Northland Dairy Company for the Ruawai Flats was 20% or 105,000 kg down on 1981. The Northern Wairoa Dairy Company had 30% or 650,000 kg lower summer milk production but only 25% of these suppliers (or 163,000 kg) are from the Ruawai Flats. The total potential loss in summer milk production from the Ruawai Flats between seasons is thus approximately \$880,000 and much of this loss can be attributed to cricket damage.

It was apparent during this study that loss of summer milk production and loss of autumn pasture were only a part of the damage caused by crickets. Large areas on the Ruawai Flats have been undersowed as a direct result of cricket damage. There were also a number of ways of disguising damage by supplementary feeding, understocking, quitting stock, leasing grazing, poor cow condition and deferring feed deficits into the winter. Not so easy to disguise was the damage to pasture and poor autumn growth, both of which contributed to the approaching winter feed deficit.

Many of the farmers who did not bait for crickets blamed their low summer milk production and poor autumn growth on the drought, although conceding that crickets and drought go together. Rainfall cannot be controlled, but crickets can be, at a cost of \$4-8/ha (1982) for materials. This is only a fraction of the cost of damage that crickets can cause. Application of bait to control crickets is just one of many management decisions that must be made by a farmer. It was not a coincidence that farmers considered to have good management practices applied bait. Farmer management could also be important in indirectly minimising damage due to crickets. For example, severely pugged pastures appear to be more severely affected than pastures with no pugging damage.

Cricket damage was not confined to the Ruawai Flats in 1982. From information provided by Farm Advisory Officers, large areas of clay flats and hills in Kaitia (250,00 ha), Kaikohe (82,000 ha) and Dargaville (84,000 ha) were moderately to severely affected. The Whangarei region was much less affected because of a high February rainfall and virtually no crickets were present in the Warkworth region. When damage

in a relatively small (8,000 ha), but high producing area such as the Ruawai Flats, can be estimated at well over a million dollars in loss of milk production and winter feed, then the cost to the Northland region must be considerable. It is hoped that this account of cricket damage may help to prevent such widespread damage from occurring in the future through the application of known and publicised control measures (Blank 1979b, 1981).

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