Flytrapping in Tasmania: use of traps for flystrike control and monitoring fly populations

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Summary

Lucitraps® were used on 60 properties (2 to 4 traps each) throughout Tasmania for between 1 and 3 years to monitor fly numbers and compare these with reports of flystrike. The number of flies trapped varied widely between different properties in the same district but individual properties had consistently high or low fly catches. This was related to the actual risk of flystrike at each property.

On 16 other properties fly-traps were used at 1 trap per 100 sheep and provided information on the areas of high fly activity within the property. This could be used to find safer paddocks for sheep at most risk or indicate which mobs require protective treatment and mobs that can safely be left untreated. Monitoring can also be used to determine the number of active flies at different times during the fly season.

The owners of the properties with a high trap density believed that flystrike would have been worse without the fly-traps, particularly in the second year of the 3 year study when the incidence of flystrike was high throughout the state. However, the traps did not provide a major reduction in flystrike, nor allow a substantial reduction in treatments. We suggest that the rate of use of 1 trap per 100 sheep may not be adequate in all cases.

Keywords

Flystrike, Lucitrap®, monitoring flies, monitor traps

Introduction

In 1936 Mackerras *et al*. showed that bait bins containing liver and sodium sulphide were effective in reducing flystrike by approximately 50%. However, the traps were labour intensive and large numbers were needed so they were not economical given the flystrike reduction obtained. Anderson *et al*. (1990) described an improved bait bin which reduced flystrike and these were thought to be cost effective, but they still needed attention every 1-2 weeks

Urech *et al.* (1993) described the development of an artificial lure (Luci-lure®) that lasts about 3 months and can be used in small traps (Lucitraps®). This makes it possible to use large numbers of traps which do not require frequent attention. Under some conditions these fly-traps can reduce the number of flies (Scholtz *et al*., 2000) and flystrike (Ward, 2001). This paper reports a range of findings using these traps in Tasmania.

For two years before commencing the trials reported here, fly-traps had been used on 5 other properties but at less than the currently recommended rate, usually 1 per 400 to 800 sheep rather than 1 per 100 sheep. Although the property owners had claimed that they received some benefits from the trapping these studies indicated that low rates of trapping were inadequate to obtain significant reduction of flystrike or significant reduction in the need for flystrike protective treatment.

Methods

As part of a program to study management options related to flystrike, 60 properties were selected for a survey, with 24 in the first year (1997/98) and extras added each subsequent year over three years. On each property 2 fly-traps were placed to sample the flies on that property (3 or 4 traps were used on some large properties). The traps were placed at least 1 km apart in paddocks where the owner or manager responsible for the sheep, considered they were most likely to be struck. This was usually where the weaners or two-tooths would be grazed during summer.

In 1998/99 and 1999/2000 the new properties had new traps installed, while those in their second and third years re-used traps from the previous season. All these properties were provided with clean traps for the second half of the 1999/2000 fly season (the period when most of the flies are captured in Tasmania). Monitor traps in this project were set in September and checked in November, January (fresh lures), March and May.

Bruny Island

A property on Bruny Island (43° 18'S; 147° 16'E) was selected for more intensive trapping because it was large and isolated from other sheep-grazing properties. The property of 4,300 ha runs 18,000 sheep for wool production and has no other major enterprises. There are no immediate neighbours with sheep, although there are a few other properties on Bruny Island with 500 to 2000 sheep. The island is about 5 km from the mainland of Tasmania and there are few sheep on the closest points to the Tasmanian mainland, so it is very isolated from other sheep grazing properties. Fly-traps were used at 1 trap per 100 sheep for four years to determine whether the population of flies could be reduced substantially by flytrapping.

After agreeing to take part in the study the manager advised that he had been considering omitting the annual flystrike preventive treatment with cyromazine, normally given to all the sheep in February. All sheep were shorn in early December and were rarely affected by flystrike before mid-February. We advised the manager to maintain normal flystrike control measures during the first year but he decided to only apply treatment if necessary.

Groups

Two groups of neighbouring properties in Northern Tasmania were selected for intensive trapping - at Royal George (41° 49'S; 147° 53'E) and Longford (41° 35'S; 147° 07'E).

The Royal George Group contains ten adjacent properties in the east of Tasmania with a total area of 14,000 ha about half of which is 'bush runs'. The properties are in a valley surrounded on three sides with native bush (where there are no sheep), with a single large property at the head of the valley. The properties normally have moderate flystrike levels, particularly for sheep on the higher quality pasture flats near the river that runs through the valley. They are at a higher elevation than the other properties in this study, 250 m above sea level on the river flats. The cooler climate results in a slightly shorter fly season than the Longford group.

Most of the properties run 2,000 to 8,000 sheep with a total of 25,000 in the trapped area. There are other minor enterprises on each property, but no irrigation and there is little land suitable for cropping. All properties were supplied with traps at the rate of 1 trap per 100 sheep. The large property at the head of the valley was not included in the group but did have 2 monitor traps.

The Longford group is in the Northern Midlands about 20 km south of Launceston, consisting of 6 properties covering an area of 5,100 ha, mostly of improved pasture or cropping. The area is bounded on three sides by large rivers, which provide a humid area ideal for flies and as a result flystrike is normally high. Most properties have 4,000 to 8,000 sheep (25,000 in total) and all have additional cropping enterprises for which irrigation is available.

Traps for these groups were checked every 2 to 3 months between September and May each year and the numbers of flies was counted, if less than 100, or weighed to estimate the number of flies, as described by Horton *et al*. (1999) if more than 100. Meetings were held with all participants twice a year to discuss flystrike management.

Results

1997/98

Flystrike was average or below average throughout Tasmania

Bruny Island
In previous years all sheep had been jetted with cyromazine. In this year only 5 sheep were struck, and because 2 of these were rams, all rams were jetted but no other mobs were treated. The number of flies trapped was much lower than other areas throughout Tasmania where traps were in use (Table 1).

1998/99
There was heavy rain followed by warm humid weather in late January, February and March. This resulted in a much more severe fly season than usual throughout Tasmania. Producers on monitor trap properties reported serious flystrike problems and the need to treat sheep late in the fly season.

Bruny Island
Fly-traps were removed from bush run areas where no flies had been detected and flystrike had not been observed. These spare traps were used on other small sheep properties on the North part of Bruny Island although these were not adjacent to the main trapped property.

Approximately 30 weaners were struck and the weaner mobs were all given protective treatment. The only other sheep treated were the rams.

Groups
Most of the producers in both groups were aware that the weather conditions were expected to increase flystrike, but they reported that their fly problem was generally no worse than normal. They were confident that the fly-traps had a major effect by preventing the increase in fly numbers reported elsewhere. One property in each group did have problems but these were due in one case to lack of normal preventive treatment and in the other to problems with daggy sheep throughout the fly season.

1999/2000
Although flies were active earlier in the fly season due to a mild winter and early spring, the weather was generally dry and unsuitable for flies during summer so their numbers did not increase. Flystrike was not a major problem in any areas of Tasmania. Some of the monitor traps were in areas of severe drought.

Bruny Island
The manager decided to change the shearing time from early December to May for the ewes, with the aim of improving wool quality. He was aware that this would increase the risk of flystrike but believed that it was sufficiently under control. The change in shearing time was achieved gradually, so adult sheep were shorn as usual in December, while weaner ewes were shorn in July.

Approximately 5 sheep were struck and the only group of sheep given protective treatment were the rams.

Groups
The groups reported a low incidence of flystrike.

2000/2001
The fly season was mild with little rain early in summer. There was increased rain in late March, followed by warm weather suitable for flystrike but almost all producers agreed that flystrike was low.

Bruny Island
Two adult sheep were struck in late spring and two weaners were struck in autumn.

Table 1. Geometric mean of flies per trap

Trapped area	Number of traps	1997/98	1998/99	1999/00	2000/01
Monitor traps	136 - 160	914±16%	1483±15%	3156±10%	
Low trap rate trials	13-28	145±46%			
Bruny Island main farm	102	5.2±16%	9±11%	14.3±9%	19.1±8%
Bruny Island other farms	27		7±26%	52±30%	
Longford	245		1222±8.4%	863±7.8%	
Royal George	242		499±11%	192±9.0%	

Monitor traps were 2 to 4 per property with new traps for each new property.
Low trap rate trials used 1 trap per 300 to 800 sheep. All traps were about 5 years old.
All other trials used 1 trap per 100 sheep with new traps when the study started.

Groups
Most producers in the groups reported a low incidence of flystrike although a few said it was average.

For the Royal George group, reviewing the whole period, one producer said the traps made no difference, three said they made some improvement, while four were unsure whether the traps made a difference to flystrike. Three had decided not to use traps next year when the study was finished, one would definitely use them while 3 were unsure and would only use them if their neighbours continued to use them.

Monitor traps
The average number of flies trapped per year in the monitor traps on each farm ranged from 66 to 32,000 green flies (Figure 1). Random sampling showed that 70-80% of the green flies trapped were *Lucilia cuprina*. There were differences in the number of flies trapped between different regions of Tasmania that related to the severity of flystrike in those regions. However, every region had some properties with very few flies and some properties with large number of flies. The highest fly catches filled the trap and may have underestimated the number that would be trapped per day over a shorter time period in those areas.

Properties with few flies (less than 100 per month) reported little flystrike. However, treatment ranged from no protective treatment to treatment of all sheep. In a few cases properties with few flies did have flystrike problems but these were usually in areas at least 1 km from the monitor traps.

Properties where more than 1,000 flies were captured per month usually reported serious flystrike problems.

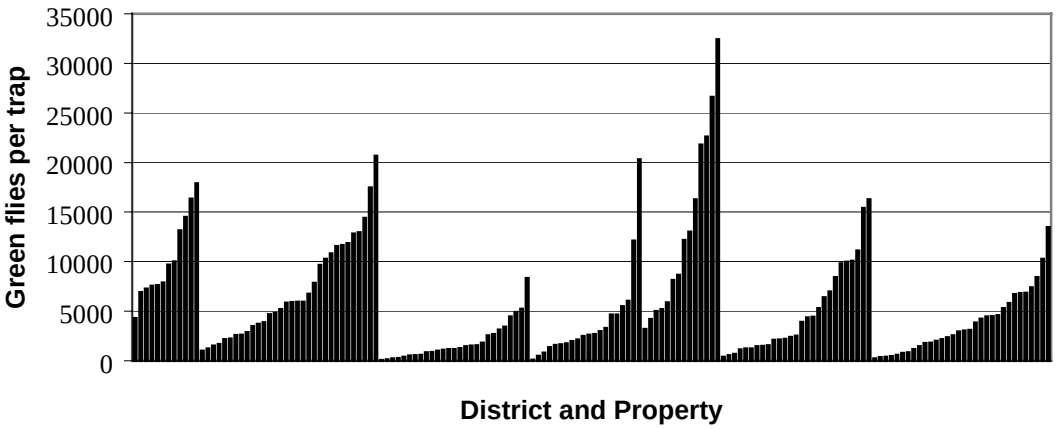

Figure 1. Number of green flies per trap per year on each monitor property in 1999/2000 sorted by district and within each district by number of flies. Districts are NE midlands, Central Midlands, East Coast, Highlands, North East, Northern Midlands, Southern Midlands (left to right along the x-axis).

Figure 2 shows the average number of flies per month in the monitor traps. The number trapped was always lowest in the first collection in November/December and declined again if a collection was made after March. The increase in February/March 2000 occurred in the first collection after the old traps were replaced with clean traps and may not represent a true increase in fly numbers at this time (Horton *et al*.,

2001). Fly numbers in traps sometimes changed dramatically during the fly season if paddocks had sheep for only part of that season. Flies were rarely found in paddocks while there were no sheep present.

For the mass trapped groups there was a high correlation (0.8) between the average number of flies per trap on the property in one year compared with the next (Table 2). The correlation for the monitor trap properties which only have 2 to 4 traps each was not as high (0.66). Catches between seasons for the pairs of traps on each property were generally consistent (correlation = 0.63 - 0.72).

For the monitor traps (Table 3) there were significant correlations between numbers trapped in one season compared with the following period (0.35 - 0.66), but only a weak correlation between the first and last results of the fly season (0.06 - 0.24).

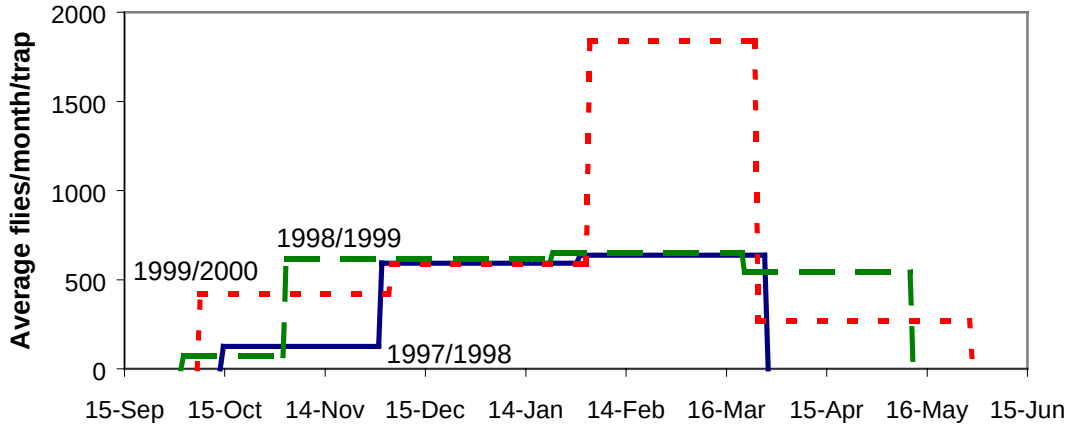

Figure 2. Average number of flies per month for each monitor trap for 1997/98 (solid line), 1998/99 (dashed line) and 1999/2000 (dotted line).

Table 2. Correlations between trap catches.

Group properties, 1998/99 vs 1999/2000	0.81
Monitor properties 1998/99 vs 1999/2000	0.66
Pairs of monitor traps on the same property 1998/99 (64 pairs)	0.72
Pairs of monitor traps on the same property 1999/2000 (68 pairs)	0.63

All trap catch values are log transformed.

Table 3. Correlations between trap catches at different seasons of the year.

	Spring vs early summer	Early vs late summer	Late summer vs autumn	Spring vs Autumn
1998/98		0.56	0.42	0.06
1998/99	0.51	0.37	0.66	0.24
1999/2000	0.35	0.49	0.66	0.22

Mass trapping

All managers report that sheep in some parts of their property are more likely to have flystrike than sheep in other areas. The fly trapping studies confirmed that those areas where flystrike is not common have a low population of flies.

Discussion

Flystrike reduction

This study was not intended to measure the reduction of flystrike caused by flytrapping. We believe that in Tasmania it is not possible to find pairs of properties with similar climate, similar sheep and similar management to allow controlled experiments. Comparison with previous years is not accurate due to the wide variation in flystrike from one year to another. Therefore the conclusions here on flystrike reduction depend on reports from producers and observations by scientific staff and stock officers.

Most of the property owners believed that the fly-traps had been of some assistance in reducing flystrike or keeping it at manageable levels when weather conditions were suitable for flies. However, many were unsure about the value of fly-traps because any reduction in flystrike was relatively small. They were generally uncertain whether the work required to maintain the traps was worth the reduction in flystrike that might occur.

The manager of the Bruny Island property was the only one in the study who substantially reduced fly control treatment while the fly-traps were in use and this was a change which had been considered previously. In view of the very low number of flies trapped on Bruny Island compared with other locations it is likely that the high level of protection used previously was not necessary. Nevertheless, the low fly-trap results did increase confidence in the change and make it easier to monitor.

We conclude that there may be some reduction of flystrike but no more than 50% reduction and this is not sufficient on its own to reduce chemical usage. Nevertheless, fly-traps could be combined with other management changes as part of an overall fly management program.

Before the study commenced it had been suggested that fly-traps could gradually reduce the fly population to the extent that *L. cuprina* could be completely removed from the area after several years. Our studies on trap efficacy (Horton *et al*, 2001) show that the traps would have become less effective each year because they were not cleaned until the final year. This would explain why the fly numbers trapped in the Longford and Royal George groups declined in the second year. The number of flies trapped on Bruny Island did not decrease, showing that trapping alone, without use of other protective treatment cannot reduce the fly population even when the number of flies is already extremely low. On Bruny Island in each year some traps were successively moved from areas where flies were not caught to areas that appeared to be of (relatively) greater risk. This explains why the number of flies caught increased each year. However, this explanation assumes that the initial rate of 1 trap per 100 sheep was not adequate for the higher risk areas.

Where the fly population is low it is possible that thorough treatment of all sheep on the property combined with trapping could reduce the population of flies to levels where further reproduction would depend on flies migrating in from outside the area. However, this hypothesis has not been tested in this study, as the only properties with very low fly populations in our studies did not routinely treat their sheep.

Comparison between different areas

The monitor fly-traps showed that although all parts of the state have areas with low fly numbers and areas with high fly numbers, there are nevertheless differences between some regions that remain consistent over several years. The north-east corner of the state has higher numbers of flies trapped, while the southern regions have lower numbers of flies trapped than the north. These differences are consistent with a previous survey (Horton and Best, 1995) showing a greater length and severity of the fly season in northern Tasmania compared with southern grazing areas.

These differences could be used to target specific information to certain regions that may suffer a greater severity of flystrike.

The monitor trap fly numbers were related to the incidence of flystrike on these properties and differences in fly numbers per trap in the mass trapped groups were also strongly associated with the reported flystrike problems on those properties.

Within any one property there may be a wide variation in the distribution of flies. In some cases this may be a result of short-term effects related to the presence of sheep. Other effects are due to the topography and will apply at all times. This was seen in the grid trapping results reported by Horton *et al*. (2001) where the fly numbers varied throughout the season, but the same traps were consistently high or low. This information allows wool producers to plan stock movements to take advantage of areas of low fly risk at certain times when flystrike is most likely. Some producers already know the high and low risk areas (Horton and Champion, 2001), while others involved in our studies have used the information to make changes to stock management.

Change in fly numbers over time

The number of flies trapped varies during the fly season. However, the change in fly numbers depends on many factors, particularly shearing time and seasonal weather patterns. Fly numbers are usually low for 1 to 2 months immediately after shearing so the seasonal pattern may vary for each property according to the shearing time (Denwood, 1998).

Changes in fly numbers over time could be part of an early warning system for flystrike. However, in the studies reported here, where traps were only checked at intervals of 6 weeks or more, it appeared that the number of flies increased several weeks after an outbreak of flystrike had occurred. We believe that the increase in fly numbers trapped is a result of previous cases of flystrike, rather than an indication of an imminent increase. The increase might warn that a fly wave could occur if no other action is taken, but this does not warn of the initial strike and it also depends on the weather conditions at the time. If the weather is no longer suitable for strike then high fly numbers do not indicate an increased risk. If fly monitoring is combined with weather information then this could aid in decisions about when or if to provide protective fly treatment.

Short and long monitoring times

In some studies fly-traps have been used for very short monitoring periods, often over about 8 hours (Vogt and Woodburn, 1983). In our studies we used periods of weeks or months. Long periods are not suitable for early warning systems, where action is needed in days rather than weeks. The long periods also allow time for predators to remove flies from the traps. This clearly occurred in some cases, where spiders were found in the traps, and for traps attached to trees, where ants remove the fly carcasses (Denwood *et al*., 1999). In our studies our primary interest was in the ability of flytraps to trap flies over long periods under a range of conditions. In this case longer term measurement of fly numbers trapped is appropriate.

If traps are to be used for monitoring then much shorter periods may be more suitable. However, short monitoring periods are highly dependent on the weather conditions at the time (Vogt and Woodburn, 1983) and a correction is needed for the temperature and radiation (Vogt *et al*, 2001). This may make comparisons between properties very difficult if the comparison is highly dependent on the weather correction factor applied to the day's samples. In Tasmania weather conditions may change several times during the course of a day and will differ substantially between areas only a few kilometres apart. Trapping on different days would invariably require different weather corrections. Therefore we believe that short-term monitoring would not have been appropriate for the comparisons used here without extensive calibration of the weather correction factor for local conditions. We believe that both short term (daily) and long-term (weeks/months) trap monitoring is appropriate depending on the purpose of the trapping.

Fly-trap density

The trap density of 1 trap per 100 sheep is recommended by the manufacturer, but it is not clear how this figure was derived. It appears to match the trapping rate in the early bait bin studies (Mackeras *et al*., 1936) that showed a 50% reduction in flystrike. If the traps are to be effective there must be considerable overlap in the area covered by each trap. If this were not the case then flies in some areas would remain as a continual source for future flystrike. Therefore we would expect that where a single trap is used with no nearby traps (as in the monitor traps) the number of flies per trap should be considerably higher than where mass trapping is used.

The Bruny Island property with its low fly numbers is clearly a special case, whereas flystrike in the Royal George area is probably slightly lower than the Tasmanian average, while the Longford area may be slightly above. The results for 1999/00 are affected by the re-use of traps in the mass trapping groups. However, in 1998/99 clean traps were used for almost all of the mass trapping and for most of the monitor traps. In that year the Longford group had only slightly lower fly numbers than the Tasmanian average while the Royal George traps captured about 1/3 as many flies as the monitor traps. These figures suggest that any given fly may have choice of 2 or 3 traps when used at 1 trap per 100 sheep. Because the traps and flies are not evenly distributed, this degree of overlap between traps is probably inadequate to give complete coverage over an entire property.

If fly-traps are to be used to reduce flystrike by a significant amount it will be necessary to provide a more complete coverage of all the at-risk areas. It will also be necessary to make some allowance for stock movements. Traps in areas where there are no sheep are probably wasted, but if traps are spread according

to total numbers of sheep on the farm, and stock are moved regularly, then the areas where the sheep are currently grazing will have too few traps per head of stock. Moving traps every time stock are moved may not be cost effective. Preliminary studies with cell-grazing (sheep moved every 3 days) show that extra movable traps could be used, but this adds considerably to the time needed to move the stock plus the movable traps (McShane, *pers. comm*.).

Use of fly-traps to monitor fly numbers

Fly-traps can be used to monitor changes in fly numbers at any given location, either during the fly season or from one season to another. They can also be used for comparison between different areas, including different locations within a single paddock, different paddocks on a farm, different farms within a region or between regions.

Acknowledgments

We thank the many wool producers whose properties were used in this study, and technical assistance given by Warren Barr, Karen Pirlot, Calluna Denwood, Michael Lang, John Bushing and Jamie Nye. These studies were supported by Australian wool growers and the Australian Government through the Australian Wool Research and Promotion Organisation.

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