Wool producer knowledge of flystrike control

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Summary
In the century since flystrike became a major problem in the Australian wool industry, a significant amount of extension effort has concentrated on educating sheep managers about basic fly biology, and the protection and treatment of sheep. This study of professional Tasmanian wool producers indicates an extensive knowledge of fly control issues. However, flystrike is still perceived to be a problem, especially as most wish to reduce reliance on chemical treatments. There are a wide variety of fly management strategies in use, and further research on some of these minor issues might provide some useful adjuncts to an integrated fly control system.

Keywords
Flystrike management, extension issues.

Introduction

Australian wool producers have been the focus of a significant extension effort with respect to flystrike control over the past century. This began almost as soon as flystrike became a major problem, with the work of the NSW Government Entomologist (Froggatt, 1904) through the Sheep Maggot Fly Experiment Station in NSW (Froggatt, 1915) and the output of the Joint Blowfly Committee in the 1930's (Joint Blowfly Committee, 1933) and 1940's (Joint Blowfly Committee, 1943). Since the 1950's there has been a continuous extension effort through the various state Departments of Agriculture, with current knowledge summarised through a national symposium on the subject in 1979 (NSW Dept Ag, 1979) and another four years later (NSW Dept Ag, 1983).

A survey in Victoria and the Riverina in the early 1980's (Lottkowitz *et al*., 1984) concluded that a major extension effort was required to improve uptake of the many measures which were known to reduce flystrike problems. This paper reports findings from a project designed to investigate the current knowledge and awareness of flystrike control measures amongst Tasmanian woolgrowers.

Method

The properties involved in this study are described in these proceedings (Horton and Champion, 2001a). Participants were interviewed (Horton and Champion, 2001b) about their farm practices as they related to flystrike and general sheep management. The interviews with the original 24 participants in 1997/98 were fully transcribed using Microsoft Word 97®. All comments relating to flystrike management were manually collected from each transcript and inserted into a single Microsoft Word 97® table, without any indication as to their source. These quotes were then sorted by category to form a review of all flystrike management strategies mentioned in the interviews. The categories were generated by the topics found and not from a preconceived list as the aim was to understand the producers' knowledge of flystrike, not what they knew of what the investigators had considered to be the key issues.

The categories ultimately used were; weather, environment, flies, people issues, paddock management, scouring management, stock management, fleece management, surgical alterations, selection, flystrike treatments, sheep health issues, and chemical use. Each subset was then titled as to whether it was being discussed in relation to increased or decreased flystrike risk. Under this heading, a summary of all positive

comments relating to that particular issue were arranged first, and then those with a negative focus. These were then edited into a coherent suggested strategy.

Eg. Under Stock management: Lamb/Hoggets
Provide mentor wethers for weaners: decreased risk of flystrike
Lead them to water and show how to drink
Lead them during mustering and through yards unstressed
Lead them to shelter in bad weather
Encourage them to eat feed available
But
May transmit lice if wethers run in bush at other times
Need to have wethers handy at the right time

All topic subsets were then arranged into a 37 page booklet which was posted back to the 24 participants in that year, along with three coloured hi-lighter pens and a reply-paid envelope. Recipients were asked to use the pens to indicate their opinions of the suggested strategies, with red for 'Ridiculous, stupid, or downright wrong', green for 'Good, the right idea, correct thinking', and blue for 'Well, that is interesting. Don't know if it is right, but worth thinking about'. Blank was to indicate 'No comment'.

Of the 24 booklets sent out, 14 were returned and used as the data set for this report. No quantitative assessment was made of individual returns, as interviewees chose different ways of expressing themselves. Some wrote extensively, adding new points to the summaries, and others simply marked the main headings. There was strong agreement on the relative importance of the topic headings, but often a marked difference of opinion on the relative importance of the minor headings.

Using the returned booklets, the topic headings were then assessed individually to determine the level of participant agreement on each, with a rating of 'well known', 'quite well known', 'not well known', or 'difference of opinion'. This information was then used to develop the revised interview schedule used with subsequent interviews with new participants in this project over the following two years (Horton and Champion, 2001b).

A summary of the farmer-knowledge topics relating to flystrike management which were included in the 'flystrike booklet' is included as Appendix 1.

Results

The information in this section is a compilation of the data from the booklet returns (14 participants) and also 26 subsequent interviewees, as they were asked the same questions.

Knowledge of weather factors

The participants well understood the weather conditions for flystrike, and in particular the risks of warm humid weather. In Tasmania, the fine and misty easterly rain which thoroughly wets sheep for some days was also nominated as a particularly high risk event during the fly season. Producers were aware of the advantages of a long, hot and dry spell, a cold snap, or high winds in reducing fly activity. They did not agree on the advantages of a protracted wet spell, although this probably depends on whether it is followed by cold weather while the sheep dry out.

Knowledge of the environment

All interviewees were well aware of the areas on the properties that were less conducive to flystrike, and in particular the advantages of bush run. They described the 'low fly' areas as open paddocks with hard ground, short native pasture, non-fertilised, and without hawthorns or pine trees. Those with marshy or salty ground also tended to see these as risky sites, although the problem may be restricted to a particular area of the state as others felt they were no problem.

There was some agreement on the desirability of watering from troughs, both because of preventing the water becoming contaminated and attracting flies, and the sheep not getting so wet as when they drink from a dam or natural water source. However in practice, there were many properties where there was seen to be no alternative to the waterhole at that time, and this was generally seen to be a low priority issue until a more economical way could be used to provide clean water to stock.

Irrigation was seen as being a high risk activity for those who grazed irrigated pasture, but not those who used the irrigation for cropping. However, the time required for irrigation management was cited by many as a major reason chemical protection was applied to sheep which were to be left unsupervised for long periods due to the time demands of irrigation.

The relative merits of trees versus their perceived problems was a matter of disagreement. Many producers had strong views on the subject, but there were conflicting views on issues such as trees' conflicting roles in decreasing wind speed, providing shelter in wet weather, the shelter provided stopping the sheep drying out and the innate attractiveness (or repellent effect) of trees to flies.

Knowledge of direct control of flies and maggots

The majority of the participants were interested in flytraps, but not convinced of their usefulness. The concept of fly survival from clipped maggotty wool left on the paddock or shed was of interest to many although few had thought about it. All interviewees said they made an effort to dispose of carcases but many relied on a high scavenger population (Tasmanian Devils, crows, etc.) where they could. Tasmanian law requires burning or burying of carcases for hydatid control, so this was rather a 'loaded' issue, possibly influencing the response of some interviewees. Many were aware of the current recommendation that carcase disposal is of no importance for *Lucilia cuprina* survival, but there was a strong feeling that they could still be a source of flies. The rapidly increasing population of Tasmanian Devil on many properties was often mentioned as a positive fly control tool, with farmers taking steps to foster the scavengers.

There was a good general knowledge of the fly danger period on each property, and this was in agreement with the known pattern of emergence and survival according to weather pattern. The flies were expected in early spring in the north of Tasmania, and progressively later further south and in the highlands In general, this was some time in September or early October, with the main risk period seen to be about a month later. There was then expected to be a lull over the height of summer in late January and February, with another peak in March and April. Again, the expectation was for the fly season to end earlier in the south and highlands, and later in the north.

People Issues

There was an almost total lack of discussion with neighbours on flystrike incidence, but many did agree it might be useful. However, producers were generally aware of the neighbourhood lice situation, so the flystrike issue could not be seen to be due to a lack of general communication around the local area.

The issue of lack of time or manpower for many fly management options was one on which there was general agreement. The participants were also well aware that whatever they did to control flystrike, there would always be a risk of an outbreak. However, there was a wide variety of opinion on the level of risk that was acceptable, and how risk management could be applied to the issue.

Paddock management

There was little consensus on the flystrike risk factors involved in the various types of grazing management. Most opinion on high risk strategies related to systems not actually used on that particular property, such as the strong feeling that cell grazing increased flystrike risk which was very common amongst the non-cell grazers. There was strong agreement however on the importance of not working sheep in humid conditions, or using management techniques which might be likely to cause stress. As mentioned by several respondents

though, this was a very good reason for not working in difficult conditions, and one on which they are happy to follow "father's advice". There were no first hand accounts of outbreaks from this cause.

Scouring management

The dangers of scouring were universally acknowledged as a major source of flystrike. Apart from the 'attractiveness' of the scour wet wool and skin, it was commonly felt that the unwell, stressed sheep was less able to withstand a strike, and that the sheep that was unwell and sitting about was an easier target for flystrike than one that was actively grazing.

The participants mentioned a wide range of feeds which they felt, under particular circumstances, increased scouring. Apart from a universal awareness of the dangers of lush pastures, they were particularly conscious of forage rape and other forage brassicas, cocksfoot, a variety of weeds, and frost damaged pastures out of season. There were also many mentions of plants which were seen to be useful in reducing scouring, including pennyroyal, pea straw, and native pasture generally.

Stock Management

There was considerable comment on the need for good general sheep husbandry to limit flystrike risk. For most, this meant avoiding any cases of flystrike at all, if possible. However, there was a strong minority view that young sheep should be left untreated in a high risk area in order to cull the most susceptible sheep, and only then to take steps to prevent the remainder being struck.

It was an accepted fact among all participants that horned rams were at very high risk of poll strike, to the extent that they did not count poll strike in general flystrike statistics. They also generally accepted that rams will fight, and that this was natural so that constant attention was required to avoid losses in these valuable stock. They were well aware of the dangers of physical combat when introducing newly purchased rams into a mob of resident males, but the majority saw fighting as a sign of virility and therefore a positive factor despite the dangers of flystrike.

Wethers were well understood to be relatively resistant to flystrike, especially as adults. Some respondents considered that the risk of poll strike from broken scurs justified dehorning, but mostly where this operation was carried out it was for ease of handling and prevention of injury to staff and other sheep.

Ewes were also seen to become more resistant to strike as they matured, with no particular risk associated with the breeding cycle. However, in Tasmanian conditions, lambing occurs in the very cold late winter and early spring when flies are not prevalent.

Most lambing was planned early enough in the season so that the lambs could be mulesed and recovered well before flies became active. There was thus no expectation of strike in un-weaned lambs except in the most fly-prone areas in the north of the state.

There was no consensus on the relative susceptibility of weaners or 2-tooths to flystrike, but this was related to the shearing regime on each property. Where lambs were shorn at weaning, or prior to weaning, they were generally seen to be more at risk the following summer. Where the lambs were left unshorn, these were mostly seen to be at greater risk in the summer/autumn as weaners. However, there was strong support for keeping weaners under the best possible care and minimising stress to help them withstand any fly challenge.

Fleece management

All participants were aware that off-shears sheep were virtually immune to strike on their properties, and that risk increased with fleece length. They also had very strong opinions on the importance of good shearers in keeping sheep injury free, and of the dangers of damage to the vulva in causing poor urine flow and thus increased staining.

However, many sheep are not spring shorn in Tasmania and, there were many reasons given to justify shearing at these other times. In particular, pre-lamb shearing of the ewes was seen as absolutely vital for ewe survival on many properties, with the full knowledge that this would leave them in long wool for the autumn fly season, when chemical treatment would be difficult if it became necessary.

Premature shearing as a means of dealing with a fly wave was mentioned by a number of the participants as something they had either considered or carried out. They were all well aware of the economic losses involved with moving shearing time out of the twelve month cycle, and of getting back into the desired cycle afterwards.

Crutching once a year was taken for granted by most participants, and those who belonged to a wool quality assurance scheme were well informed of their requirement to present clean sheep at shearing time. However, there was not a great deal of interest in the subject as a tool for fly control. It was more commonly noted as a means of keeping the wool clean, for the purposes of improved wool quality. However, a number of participants did cite extra crutchings or individual dagging in preference to jetting during outbreaks of breech strike.

Surgical alterations

All participants docked all lambs, although many did not specifically mention it as a form of fly control. However, they had generally considered the method of docking used in relation to future fly risk, and justified their current method in relation to past experience with alternatives. Thus those who used rings considered the cut more dangerous, and those who used a hot or cold knife (the majority) were generally of the opinion that rings resulted in greater risk of strike. Length of tail was considered of little importance, but most used the locally recommended 'to the tip of the vulva' length without particular thought.

Method of castration was mostly based on past experience with alternatives. Those who used a knife generally felt that a ring risked flystrike before the scrotum fell off, but the majority, using the rings, cited the lifetime flystrike risk in the empty scrotum as greater than the short term risk of the rings.

Mulesing was generally accepted as reducing flystrike, although not all practiced it, for a variety of reasons. Where it was carried out, it was always as part of the marking procedure. There was some difference on the preferred style, with the larger mules being considered to offer the best control but to decrease the wool cut. Where contractors were used, it was usually the contractor who decided the style.

Most participants considered that, based on experience, they had little risk of strike after marking and mulesing. Dressings were felt by many to increase the risk of strike if flies were active due to slowing the drying of the wound, and they were seldom used.

There was unanimous agreement on the need to carry out marking for minimum stress and in fine weather, and to allow time for mothering-up before dark. Most properties joined the ewes in a mob size such that the ensuing lambs would be able to be marked in a single morning by the number of people available on that property for the operation. Thus the lambing mob size varied from about 50 up to 4000 ewes on different properties.

Selection

All interviewees had a strong opinion on the type of sheep that were especially at risk of flystrike and that should be culled. These included adults that scour, those with poor anatomical conformation which allowed portions of the fleece to stay particularly damp, and any form of wool which could act as a fly attractant. More controversial was the most risky form of fleece, although nearly all producers had a strong opinion on the subject. Some felt that more open fleeces were more susceptible, and others a tighter fleece, with many individual preferences.

There was strong support for the idea of culling flystruck sheep, but not all actually practised this because of the belief that many of the factors that predispose to flystrike are related to improved wool quality and yield. Generally, specific selection against flystrike was seen as a luxury that could not be incorporated into the current system. However, there were a few respondents who had been practising various forms of selection for many years with considerable success reducing flystrike susceptibility.

Flystrike treatment

There was a strong general dislike of treating struck sheep, and none of the respondents would have knowingly left a sheep 'to suffer'. However, there was an acceptance that strike might happen when it could not be seen, and that this was economically necessary with the impossibility of checking every sheep, every day during the fly season. However, there was a general awareness that untreated strike could soon develop into a flywave if the conditions were suitable.

Most treatment of individual sheep seemed to be based on personal preference. They also often had sound justifications for preferring to either remove the wool (to let the wound dry out and remove the maggots) or leaving it in place (for sun protection and for speed of application). There were a minority who were aware that cyromazine would kill the maggots in due course, and much more safely for the operator. Those who did use diazinon for fly treatment were in some cases unaware of the need to mix it freshly for regular use, and when they did, often admitted to not being particularly careful in measurement.

Many had not considered the fate of clipped-off maggots on flystruck wool, and the general procedure was to leave it where it fell in the paddock, or to drop it into a struck bale in the shed. A few felt this was an issue, and either doused the clippings with chemical, or gathered them up for burning or disposal in the offal pit.

Sheep health management

There was a high level of awareness of the flystrike risks associated with pizzle rot, footrot and fleece rot. Most were aware of the conditions conducive to pizzle rot and managed accordingly, with treatment used when wethers were likely to be grazing a clover-rich pasture. In Tasmania, this was not a considered a frequent occurrence, so few treated regularly.

Many areas were believed to be footrot-free, and most would like to achieve this status but considered it with varying degrees of possibility. Fleecerot was not seen as a problem as affected animals were normally culled out.

Dermatophilosis was a more contentious issue, and there was an opinion that it did not increase flystrike risk. Although many culled, others felt strongly that shearing as lambs would solve the problem and that older sheep would grow out of it. Cancers were generally seen as needing to be culled, though they were usually left until a convenient time.

Chemical use

A number of the participants did treat all sheep on a regular basis as a fly preventative, but the majority either did not treat at all, or only treated the most vulnerable sheep. However, here was a general acceptance of chemical treatment as a necessary method of last resort in a fly wave, and producers saw the need for suitable chemicals always to be available. Many did intend to treat if they saw a problem developing, but not otherwise.

They were mostly aware of issues of occupational health and safety, and of wool residues, as well as the economics of regular treatment, and were in many cases were experimenting with various regimes designed to limit chemical use.

Knowledge of recommended application regimes was good, but many did not practise these due to lack of equipment or the wish to work at a faster rate. There was also a very poor knowledge of the chemicals used, and they were commonly described by colour of the container or even the smell rather than the product name.

There was very little knowledge of the chemical group (insect growth regulators, synthetic pyrethroids or organophosphates), nor what the between-group differences might mean in practice.

Discussion

Unlike Lottkowitz's findings in Victoria and New South Wales in the early 1980s (Lottkowitz *et al*., 1984), these Tasmanian participants did perceive flystrike as a problem, as they were well aware of the issue of chemical residues and the need to limit chemical use. However, this survey specifically excluded producers where the tested wool had a high level of chemical residues while the mainland survey was more general.

The benefits of a 3-joint tail length and mulesing, seen by Lottkowitz as in need of a major extension effort, were well understood by this group of wool growers.

As with those in the earlier study, Tasmanian farmers interviewed for this project had an extensive theoretical knowledge of possible fly control strategies. However, they also did not always practice all of these strategies due to conflicting management requirements. Extension is not likely to influence uptake of strategies unless the underlying decision-making is understood.

There were a number of issues in this survey on which there was disagreement as to the relevance for flystrike management. These issues need to be resolved either by extension or new research, as appropriate. These included:

- Managing the water supply to limit attractiveness to flies and sheep susceptibility;
- Tree distribution and species for fly population and sheep shelter;
- Carcase disposal;
- Usefulness of flytrapping, and which type is best;
- Grazing systems and flystrike;
- Weeds and pastures and their effect on controlling and exacerbating scouring;
- Ram management to prevent flystrike, especially on horns;
- Selection parameters for reducing fly susceptibility;
- Culling systems for struck sheep;
- Best individual treatment method for struck sheep;
- The different chemical treatments and methods of application;
- Biological effects of off-label use of chemicals; and,
- The future effects of chemical use on wool sale value.

Some of these issues are relatively minor, and alone are unlikely to solve the problem of cheap, simple and effective flystrike control. However, they are essential to the creation of a successful integrated fly management system.

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Appendix 1

	Increases flystrike risk	Decreases flystrike risk
Weather	Good season	A long hot dry spell
	Warm humid weather	Spell of cold weather
	Easterly weather	Protracted wet spell
		High wind
Environment	Long wet grass	High open country
	Rushes	Native pasture
	Hawthorns and pines	Bush runs
	Gorse	Fence sheep from under trees
	Sycamore	Tree-free paddocks
	Fertilizer use	Shelter belts and hedges
	Salty areas	Exposed, hard ground
	Marshy areas	
	Watering stock from dams	
	Irrigation	
The flies	Maggots clipped & dropped	Flytraps
	Leaving carcases in paddock	Encouraging scavengers
People issues	Off-farm employment	Discussion with neighbours
	Lack of man-power	Low tolerance of strike
	Non-wool enterprises	Recognising fly risk period
	Accepting high strike level	Recognising high risk stock
	Accepting high risks	Recognising high risk areas
Paddock Management	Cell grazing	Low stocking rate
	Stubble grazing	High stocking rate
	Summer fodder crops	Set stocking
	Handling in muggy weather	Quiet sheep
	Movement of wet sheep	Contented sheep
Scour Management	Worms	Change feed slowly
	Non-worm scouring	Balance the feed
	Frost damage	Plenty of roughage
	Fodder crops, especially rape	Varied diet
	Cocksfoot, irrigated lucern	
	Weeds, long wet grass	
Sheep health	Pizzle rot	Eradicate footrot
	Dermatophilosis	Cull out fleece rot
	Cancer	
Chemical use	Limiting use of chemicals	Quick response
	Jetting when humid	Target risk areas
	Incorrect technique	Jetting race
	Incorrect application	Effective chemicals

	Increases flystrike risk	**Decreases flystrike risk**
Stock management	Shedding	Keep healthy
	Poor husbandry	Leave untreated, cull susceptible
	Not checking often enough	Protect from light rain
Rams	Belligerent rams	Control fighting in rams
	Ram odour	Introduce rams carefully
	Keeping flystruck rams	Manage aggro rams
	Poor head management	High value of rams
	Poor horn management	Shear twice a year
Wethers	Heads under bellies for shade	Dehorn
Ewes	Extended joining	Ewes with single lambs
Lambs/hoggets	Over-feeding	Early lambing
	Under-feeding	Late weaning
	High stress	Taught to drink from trough
	Fouled water supply	Provide mentor weathers
Fleece management	Summer shearing	Premature. Shearing in fly wave
	Long wool in summer	Sheep clean at all times
	Pre-lamb shearing	Paddock crutching as needed
	Shearing injuries	Frequent crutching
	Dirty pizzle wool	Reactive crutching when struck
	Long wet wool around eyes	
Surgical alteration	Late spring mulesing	Mulesing
	Poor mulesing style	Dressing used at mulesing
	Marking in risky weather	Pre-marking jetting
	Stress at marking	Ring castration
	Poor docking operator	Knife castration
	Docking with ring	Hot knife docking
		Short tail length
		Medium tail length
Selection	Struck ewes as crossbred dams	Culling vulnerable sheep
	Late culling	Culling struck sheep
	Keeping struck sheep	Two strikes and out
	Highly productive fleece	Run older sheep
	Forgiving flystruck rams	Keep only wethers
	Buying in sheep	Low fly susceptibility
	Using highly susceptible breeds	Don't have sheep at all
Flystrike treatment	Ignore isolated strikes	Treat individual strikes
		Cull struck sheep
		Jet whole mob
		Clip in paddock
		Put over board
		Non clipping to protect lesion
		Chemical treatment
		Leaving untreated
	Problem chemicals	Preferred chemicals