Applied Management for Fly Control

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In Florida, cattle have numerous arthropod pests. Most of these pests are considered external parasites, as their attack on cattle is principally on the skin, as opposed to internal parasites such as "worms" or nematodes and bot flies. The common external parasites include filth flies such as non-biting house flies and biting stable flies and horn flies, as well as the numerous other blood-feeding flies, such as mosquitoes, biting midges, black flies, horse flies, and deer flies.

To successfully combat these pests and potential threats to cattle health, producers must understand the biology, ecology and principles of pest management. To attempt control of these pests otherwise, often will result in failure of the treatment and perhaps additional undesirable impacts including those on animal health and the environment. The most common pests on pastured cattle are the horn fly, *Haematobia irritans*, and the stable fly, *Stomoxys calcitrans* (Figure 1). These two pests share several features and many of the insecticide-based techniques used to manage one, often assist in the management of the other. However, there are important differences in their biology that make management challenging. Of particular concern is in understanding where the immature stage develops and what you can do to reduce them. For pests in confinement operations, the house fly is the most important pests and has been successfully managed in many livestock, poultry, and equine facilities using the principles of integrated pest management (IPM). This system has several components that are adaptable to a wide variety of on-farm situations and a program can be customized to an individual farm. The use of IPM with horn flies and stable flies is particularly important in that insecticide resistance has been observed with both flies, making the simple use of ear tags or pour-on's less reliable than in the past.

Figure 1. Horn fly (top), stable fly (bottom). Not angled wings of horn fly and biting mouthpart of both flies.

The basics of setting up an IPM program involves the utilization of a multi-step system, which cycles among seven steps: preparation, pest identification, pest sampling, situation analysis, determination of management actions, implementation of these actions and re-evaluation. The first step of a fly pest management program is to realize that if you have cattle, you will have flies. To have a goal of and to attempt to eliminate all flies on the animals is unrealistic, will result in failure and will promote insecticide resistance on the farm. Therefore, preparation for the fly season is paramount. These flies will be on the farm, and taking the time to consider your options for their management before they arrive will help you in managing them when they do arrive.

Identification and Monitoring

Horn flies are the most commonly observed fly on pastured cattle, spend their entire adult lives on the cattle and rest on the backs, sides and belly of the animals. While stable flies are associated with both buildings and pastures and are only on animals when they are feeding. In general, stable flies will be observed on the lower legs of animals and cause animals to bunch and stamp their feet. Learning to recognize these flies will help one choose the appropriate monitoring and management tactics. Both flies are similar in color and general appearance, with each having a non-retractable biting mouthpart projecting forward. However, a couple of features can be used to help to easily distinguish them. Horn flies are much smaller than stable flies and often cattle will "glisten" due to the fly holding its wings at an angle, reflecting the sunlight. Stable flies are about the size of the common house fly and hold their wings flat over their backs. Stable flies also appear to have a "checker-board" abdomen (area of body covered by the wings).

When viewing flies on animals, both fly location on the animal and the animal's reaction to the fly can assist with identification. Horn flies are always resting on the cattle, and will be present in up to three areas: the back, side and belly. Animals will toss their tails and swing their heads to their sides and back to dislodge flies, but never stamp their feet. When disturbed, horn flies fly up in one group, and typically return to the animal they left, such as when animals flick their tails. Horn flies may feed anywhere from 4 to 30 times per day, but their bite is not as painful as the stable fly. Levels of between 200 to 10,000 flies have been reported on individual animals. Bulls are much more likely to carry heavy horn fly loads than other animals in the herd.

Stable flies, most often are observed on the legs of animals and when feeding, cause foot stamping and use of the head to dislodge flies from legs and, although ineffective, tail flicking. The bite from stable flies is quite painful and cattle exhibit an aggressive defensive behavior. When not feeding, stable flies rest on structures, fences or vegetation.

Although the immature stages (larvae and pupae) of both flies superficially appear to be in similar habitats, there are important differences. Horn flies only develop in fresh, undisturbed cattle manure. If manure is disrupted early in the fly's development, most larvae will die. Stable fly immatures develop in rotting organic matter, particularly if it is formed from hay or straw and contains manure or urine that is in contact with soil. However, stable flies are quite capable of developing in rotting piles of grass clippings, without the presence of manure. Winter hay feeding rings and other areas where manure, urine and grass mix and stay moist promote stable fly development and are thought to be a major source of on-farm, stable fly sources.

Horn fly and stable fly monitoring is conducted in a similar fashion. The numbers of horn flies and stable flies should be counted from up to 10 mature cows. These numbers should be averaged and recorded. If 10 animals are not available, either conduct repeated counts over a specific period of time (perhaps 15 minutes) or use fewer animals. Only flies that can be seen from a stationary position should be counted. All horn flies that can be observed from one side (top, side and belly) should be counted. An alternative method to estimate horn fly numbers is shown in Figure 2. Observations of stable flies is also done from one side of the animal,

but in this case only flies that are observed on the viewable portion of all four legs are counted. Research in California suggests that 10 tail flicks per minute is equivalent to a count of 5 stable flies per leg. It has been determined that economic losses to stable flies occur on beef cattle (Nebraska) when a farm average of greater than 100 horn flies per side of animals or 2.5 stable flies per leg (10 per animal). Again, record these numbers, and compare animal comfort (also recorded). Develop your own farm thresholds.

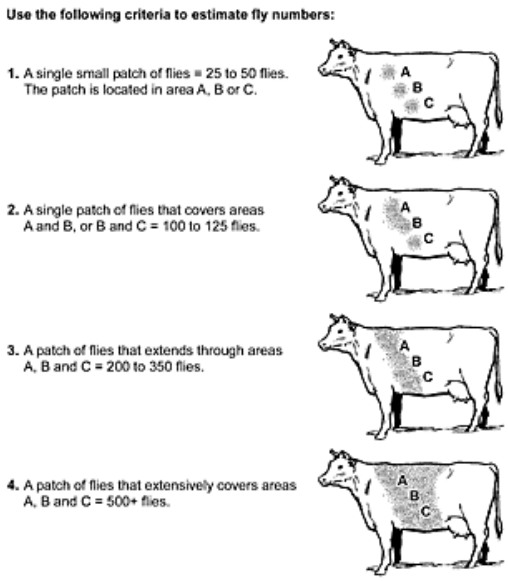

Figure 2. A method of estimating horn fly numbers in the field.

Fly Management:

The management options for an IPM program can be grouped into 5 areas: Cultural, Mechanical, Physical, Biological and Chemical. Cultural control consists of changing the environment to make conditions less favorable to fly development. Mechanical control includes the use of active devices to kill exiting flies, such as cultivation or disruption of development sites to aid in drying. Physical controls include passive devices to eliminate or exclude existing flies, such as traps. Biological control is the use of living organisms to kill pests at any life stage. These can include predators that consume fly eggs or larvae, parastioids (mistakenly called "fly predators" by some), which are tiny wasps that kill developing fly pupae, and pathogens or pest diseases that typically target adult flies. Chemical control includes the use of pesticides, pheromones, food attractants and repellants. There is no single pest management program that will work for all farms and producers need to determine which types work for them. Additionally, no single tactic will provide long-term fly management.

Cultural and mechanical control techniques are sometimes linked and serve as the foundation of a successful confined animal pest management program. However, the use of cultural controls in pastured systems is much more difficult and largely unproven. One approach that is often considered, but typically does not work, is the use of pasture drags to disrupt the dung pats and kill the immature horn flies. This approach would only be possible in intensively grazed rotation systems in which animals trample their own manure and the constant movement of animals between smaller pastures allows for the dragging of these pastures when vacated. One major problem with this approach is pasture-fouling, wherein the manure pats that are dragged, smear across a wider area of grass that cattle reject when offered access at later grazing periods. A cultural control technique that will lower stable fly populations on cattle includes the removal and dispersal of winter hay feeding site debris. If this material is dispersed using a manure spreader, stable flies will have limited local development sites. It is likely that flies will immigrate from other areas; however, local production will be decreased.

Physical control holds potential, but must fit the system. In this approach, items such as traps are used to reduce pest pressure. Several options are available, but only a few have been thoroughly evaluated. Walk-through horn fly traps utilize the horn flies avoidance behavior of dark places, and as such, animals are walked through a darkened structure wherein the horn flies leave the host and fly toward the "windows," where they are captured and eliminated. No commercial products remain on the market; however, design plans exist for individual construction of a device shown to remove 40-50% of the horn flies

(http://extension.missouri.edu/publications/DisplayPub.aspx?P=G1195). Traps exist for stable flies. However, most of these are sticky-based and would not last long given Florida's sandy soils or are too small for use on large acreages. Louisiana State University is in development of a producer-made, highly attractive stable fly trap that is constructed from blue and black fabric and is treated with an insecticide. Flies are attracted to the contrasting colors and when they land on the fabric, the stable flies acquire a toxic dose of the insecticide. These treated-target traps have been shown effective in preliminary tests, but are highly dependent on the pasture size and trap and animal densities. It is hoped that designs will be made available within a year or two. Unfortunately, horn flies have such an attraction to their cattle hosts, that this type of trap holds no interest for them.

While human-assisted biological control is important and effective in confined systems, its use has never proven viable in pastured systems. Recent research on Ocala, FL equine farms suggest that the naturally-occurring *Spalangia* parastioids are the most commonly encountered species attacking both house flies and stable flies. As these parasitoids are the most often encountered, augmenting these wasps with additional *Spalangia* from a commercial insectary may improve fly management, but only if on-farm production of stable flies is confirmed and cannot be eliminated using cultural controls, such as cleaning up winter-feeding areas. Releasing parasitoids for control of horn flies has been shown over and over to be ineffective. However, tremendous natural enemy populations exist in your pastures already. These include predators, parastioids and fungi. Some common predators are beetles and mites; however, the red imported fire ant probably has the greatest impact on reducing horn fly populations by consuming immature flies. Other naturally-occurring insects that reduce horn fly populations include the large variety of dung beetles. These beneficial beetles consume or bury and disrupt dung pats, preventing horn fly development. Certain insecticide applications may have detrimental effects on the dung beetles; thereby inadvertently increasing horn fly numbers.

Chemical control is an important component of an IPM program, but should be the option of last-resort. When used, chemical control first should be attempted with lower impact techniques, such as forced-use backrubbers and dust bags. For this technique to be effective, animals should be directed into contact with these devices in order to reach mineral supplement or water by placing the backrubber or dust bag in a restricted walking area, such as a gate. In fact, these dispensing devices, provided they are recharged, along with the other techniques outlined herein will provide season-long horn fly management. The widespread use of insecticide-containing ear tags has lead to widespread insecticide resistance in horn flies, especially with many of the pyrethroid-based products. Recently, the use of insecticide pour-on products has rapidly increased across the US, however, if horn flies are resistant to the products in the ear tags, they will also be resistant to those same products in pour-on products. Due to their reduced on-animal activity, stable flies have not had many of the resistance issues that have plagued horn fly management; however, recent studies performed in our laboratory have shown resistance to permethrin in Florida stable fly populations. To prolong the use of ear tags and pour-on techniques, producers should rotate among active ingredients (a.i.), not just products – read the label and choose products that have different a.i.'s. Ear tags should be removed from cattle when horn fly populations begin to increase. Leaving them in until animals are worked in the fall only accelerates horn fly resistance development and subsequent failure of the products in the future. Because of rapid losses in product registrations, producers should consult the "External Parasites on Beef Cattle" EDIS publication or contact their local Cooperative Extension Office for a detailed list of currently registered products.

Other Important Fly Pests:

Horse flies and deer flies are commonly called tabanids. These are large, strong-flying, aggressive, blood-feeding flies that inflict

painful bites (Figure 3). There are dozens of important species in Florida and these flies emerge at various times thought the year, often overlapping with one another. These flies also develop in aquatic and semi-aquatic environments, making immature control challenging. The adults will readily fly miles for a blood meal and are difficult to discourage with repellents or whole-animal insecticide sprays, although short-term relief can be obtained. Moving animals away from low-lying areas during a particular species outbreak may provide some relief. There are many traps available for purchase. Most of these traps rely on the excellent visual abilities of the flies and operate through the use of contrasts of black and white or black and yellow. Traps have not been shown to provide sufficient relief to animals, but they can, in some cases, remove large quantities of these flies.

Figure 3. Horse fly adult.

Sources of further information include:
UF/IFAS EDIS System – Tremendous amount of free information: http://edis.ifas.ufl.edu
Pet and Livestock Pests: http://edis.ifas.ufl.edu/topic_in_pet_and_livestock_pests
External Parasites on Beef Cattle: http://edis.ifas.ufl.edu/ig130
Horn Flies: http://edis.ifas.ufl.edu/ig137
Stable Fly (Dog Fly) Control: http://edis.ifas.ufl.edu/ig133
Management of External Parasites with Forced-Use Dust Bags: http://edis.ifas.ufl.edu/ig135
Pesticide Safety Around Animals: http://edis.ifas.ufl.edu/ig128
Entomology Dept. Publications: http://entnemdept.ifas.ufl.edu/publicat.html
Pest Alert: http://entnemdept.ifas.ufl.edu/pestalert/

County Extension Offices: Fantastic resources for many needs – 1st stop.