Binoculars were used to count the number of stable flies blood-feeding on front legs of cows—a favored site. At peak seasonal activity, observers often counted 50 to 100 flies per leg. Below: Flies were also monitored with fiberglass panel traps covered with plastic bags coated with a sticky material.

Stable fly activity on California dairies

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Stable flies are blood-sucking pests of cattle, horses, and other warm-blooded animals in many parts of the world. The pain associated with stable fly bites upsets livestock feeding patterns, reducing weight gains, feed efficiency, and milk production. Although few studies have been done on such losses, reductions of up to a half pound a day in weight gain and 30 to 40 percent in milk yield have been observed.

Both male and female stable flies, *Stomoxys calcitrans* (L.), feed on blood, generally once a day per fly. Stable flies can develop from egg to adult in 15 to 20 days in warm weather; development is much slower in cool weather. The female must feed for several days before the first batch of eggs is mature, but subsequent egg batches may be developed from a single blood meal per batch.

A female may lay several hundred eggs during her lifetime, depositing them in small batches in spilled feed, silage, soiled bedding in calf pens, or other sources of moist, decaying plant material. Although these flies do not often use fresh manure for egg-laying, the larvae develop well in old manure that accumulates along feed aprons, fencelines, or watering troughs. Stable flies can be particularly severe on confinement dairies and feedlots where developmental sites and hosts are readily available.

In temperate regions, stable flies are warm-weather pests, with one to three peaks of activity per year. Our previous observations had suggested that biting stable flies occur in high numbers at times on California dairies, particularly in late spring. We conducted studies to document how numerous these flies are and when they are most active.

Monitoring studies

We chose two of the major dairy regions in California: the Chino Basin in western Riverside and San Bernardino counties, and Tulare County in the San Joaquin Valley. Six dairies in each area were selected at random from producer lists compiled by UC Cooperative Extension dairy farm advisors. Dairy size ranged from 180 to 1,500 milking cows.

Monitoring began in late April 1985 in both areas, and continued every two weeks until mid-July 1985 in Tulare County and every week through early July 1986 in the Chino Basin. Stable flies are readily attracted to and land on Alsynite fiberglass panel traps. Three of these traps were placed on each dairy, usually near the perimeter where they would not be in the way of normal opera-

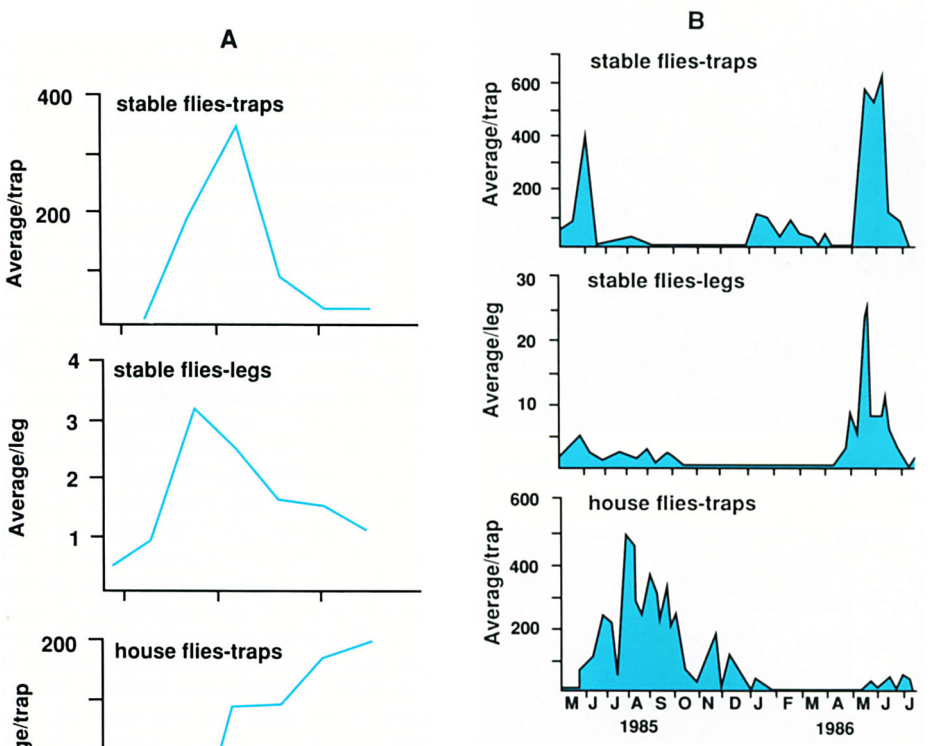

Fig. 1. Seasonal variations in stable fly and house fly populations on California dairies. Stable flies were most common in Tulare County (A) in early June. Data gathered over a longer period in the Chino Basin (B) showed a similar seasonal pattern, but adult stable flies were active to some extent year-round.

tions. The trap panels were covered with plastic bags and coated with a sticky material (Tack-trap and paint thinner).

On each visit, we counted the flies, covered the panels with fresh plastic bags, and re-coated them. The number of flies caught per unit of time gave us a good idea of relative seasonal activity.

We also observed the cows at each visit and counted stable flies on the front legs, a favored site for blood-feeding by these flies. Viewing the animals from the side and using binoculars when necessary, we counted the flies on the inside of one front leg and the outside of the other. We did leg counts on 15 animals per visit, observing several animals in each of several areas on each dairy.

Seasonal patterns

Stable flies are distinctly seasonal in California (fig. 1). In Tulare County, they were most common on the traps and were biting cattle in early June and were much less abundant by July. The more detailed, long-term data gathered in the Chino Basin in southern California indicated a similar pattern of seasonal occurrence, but adults were active to some extent year-round. Trap counts peaked at about 400 flies per trap in the Chino Basin, and counts on cows averaged almost 5 flies per leg in early June. When very hot weather began, stable fly activity declined markedly and the house fly, *Musca domestica* L., became common in both regions during the summer.

Stable flies showed another small peak of activity in the Chino Basin between January and March 1986, but did not become abundant again until early May. In May and June, stable flies were extremely numerous; average trap counts exceeded 600 flies per trap, and leg counts exceeded 8 to 10 flies per leg for six weeks from May through early June. At the peak of stable fly activity, it was not unusual to find individual cows with 50 to 100 flies per leg. Herd averages at this time occasionally exceeded 25 flies per leg.

During high biting activity, cattle obviously were very disturbed, and stamped almost continuously. Solitary animals, such as those confined in calving pens or sick pens, often were most severely attacked, with hundreds of flies feeding on the legs and lower body. Blood-engorged stable flies could be seen resting along fencelines, on hay bales, on milking parlor exterior walls, and other areas. Under heavy stable fly attack, cattle often bunched together, milling about in an effort to escape fly feeding; in such aggregations, cattle at the edges tended to be attacked, while those in the center did not.

Stable flies were most active at temperatures between 75° and 85°F, and could be numerous on cattle during much of the day, especially late morning. High winds tended to decrease biting activity.

The substantial difference in activity between 1985 and 1986 may have been due to rainfall patterns during the spring, when stable fly populations were developing. From January to April 1985, only 2.4 inches of rain fell at the University of California, Riverside, about 20 miles east of the Chino Basin dairies. During the same period in 1986, rainfall was more nearly normal (6.9 inches). In the dry California environments where much of the dairying occurs, adequate spring rainfall probably is needed to keep stable fly breeding sites moist for a long enough period to permit development. Even in a dry year, however, some dairies will have problems with stable flies.

Conclusion

Control options include cultural management (such as improving drainage, and cleaning up spilled feed and silage), biological control, and chemical control. Stable fly eggs, larvae, and pupae are subject to high mortality from predatory beetles and mites and parasitic wasps. The effectiveness of releasing natural enemies has not yet been well documented, but such releases may prove useful in some cases. Fly repellents or insecticides, such as pyrethrins or pyrethroids used on fly traps, applied to cattle, or applied to the premises, may offer significant relief when stable flies are most numerous.

Our monitoring studies showed that stable fly infestations have distinct seasonal patterns in southern San Joaquin Valley and southern California dairy regions, with peak numbers and intense biting activity occurring in May and June.

It is important now to establish the extent of potential losses to California dairies due to this pest. Pilot studies, funded through the UC Integrated Pest Management Project, are in progress.

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