

arcticum in abundance and for the first time outbreaks of economic proportions originated repeatedly from that river. Since then, outbreaks have continued to severely affect people and livestock in some 18,000 km² of farmlands and recreational areas in east central Saskatchewan.

Even though *S. luggeri* does not poison animals as severely as does *S. arcticum*, the habit of swarming densely around heads of cattle causes stampeding. Grazing and breeding are repeatedly interrupted throughout the summer and fences are broken down. Young animals suffer broken bones and increased incidence of stress-related diseases such as pneumonia and diarrhoea. Summer-long outbreaks reached a peak in 1978, causing losses including unrealized weight gains that were estimated to have exceeded \$1,400,000.00 Fredeen (in preparation). Relatively intensive larviciding prevented re-occurrences of these outbreaks in 1979.

S. luggeri is capable of about five generations per summer in this region. Like *S. arcticum* it overwinters as eggs in submerged sand. Hatching commences about two weeks after ice break-up in the spring and adults emerge in late May or early June. Attacks on people and livestock continue during warm days until late in the fall. Egg masses are attached to emergent vegetation and also, single eggs, similar to those of *S. arcticum* may be dropped onto the water surface.

12. *Simulium (sensu stricto) decorum* Walker (Figs. 22, and 43).

This species is distributed sparsely throughout the province. Larvae occur most frequently in the outfalls from small stream impoundments. Single larvae sometimes collected from the North Saskatchewan River presumably originated in small streams. Not enough is known about *S. decorum* to predict whether it could commence breeding in fast flowing sections of the Saskatchewan River. It overwinters as eggs in wet river sand and apparently is capable of several generations per summer. The females attack a wide variety of animals. In northern Saskatchewan adults are sometimes abundant enough to create severe local problems for humans and other animals.

13. *Simulium (sensu stricto) tuberosum* (Lundstroem) (Figs. 18 and 41).

Landau (1962) showed that *S. tuberosum* (Lundstroem) in southern Ontario consists of a complex of at least four cytogenetically distinct species. Several morphological forms occur in Saskatchewan indicating a complex here, also.

Larvae occur sparsely but regularly in the North Saskatchewan River, especially downstream from tributaries that are normal habitats. Larvae were reliably reported from South Saskatchewan River for the first time in 1979 and again in 1980, when a few were collected from three sites, 20, 40 and 120 km upstream from the confluence with the north branch. This widespread distribution and lack of stream tributaries which might have contributed larvae, suggests that the species is now breeding in that river.

S. tuberosum (Lundstroem) may be multivoltine and adults have been collected along with those of *S. venustum* Say from swarms attacking humans and other animals. However, nowhere in the southern half of the province has it been abundant enough to create problems by itself.

14. *Simulium (sensu stricto) venustum* Say (Figs. 19, and 44).

S. venustum Say is one of the most widely distributed black flies in Saskatchewan and breeds in a wide variety of relatively unpolluted streams and rivers. Occasionally faster flowing sections of small rivers such as the Assiniboine, Big and Beaver have produced brief outbreaks

that have created problems for humans and other animals. In the early 1970's *S. venustum* Say commenced breeding sparsely in the last 50 km or more of both branches of the Saskatchewan River. Although still uncommon there it should be watched because of the large productive capacity of the Saskatchewan River.

S. venustum Say overwinters as eggs and is multivoltine, attaining greatest abundance in June. Rothfels (1975) considers this to be a species complex.

15. *Simulium (sensu stricto) verecundum* Stone and Jamnback (Figs. 20, and 45).

Larvae and pupae of this species occasionally have been collected from the last 50 km or so of each branch of the Saskatchewan River. Although it may become more abundant it probably will not become economically important because it is not known to attack for blood.

PRACTICAL CONSIDERATIONS

The black fly fauna of the Saskatchewan River in Saskatchewan has changed considerably during the past 15 years coinciding with changes in river conditions. Originally *S. arcticum* was the dominant species. Sporadic outbreaks that killed livestock belonging to the earliest settlers in 1885 were attributed to this species. As recently as 1972 an outbreak of *S. arcticum* originating from an untreated portion of the North Saskatchewan River killed 18 farm animals near Wingard. Since then, however, *S. luggeri* has gradually replaced *S. arcticum* as the dominant species and the conversion is believed due to changes in river conditions that allowed growth of large beds of aquatic plants on previously barren river beds. Losses estimated to have exceeded \$1,400,000.00 resulted from summer-long outbreaks of *S. luggeri* in 1978 (Fredeen, in preparation).

Tendencies towards continuing changes in black fly populations were indicated by appearances of larvae of *S. tuberosum* (Lundstroem) and *S. venustum* Say in several sites in 1979 and 1980. Troublesome outbreaks of those two blood sucking species have been reported from several small prairie rivers. Thus their populations should be monitored annually along with those of blood sucking species in the relatively large Saskatchewan River.

At present, chemical larviciding offers the only means of preventing outbreaks (Fredeen, 1977). Continued research may eventually provide other methods. Residents in areas recently affected by outbreaks of *S. arcticum* Malloch and *S. luggeri* Nicholson and Mickel require assurance that protection will be provided when required. It is hoped that this key to species inhabiting the Saskatchewan River will prove useful for monitoring and research.

ACKNOWLEDGEMENTS

I am indebted to Dr. L. Burgess, Canada Agriculture Research Station, Saskatoon, Saskatchewan, for reviewing this paper and Ralph Underwood for advice during preparation of the figures.

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