

## SCIENTIFIC NOTES

EPIDEMIOLOGICAL NOTES: INCIDENCE OF *Culicoides variipennis* IN AN OUTBREAK OF BLUETONGUE DISEASE

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This is a report of some entomological observations made in connection with an outbreak of bluetongue disease which occurred in the late fall of 1963, in an area of irrigated farmland and pasture in the South Platte River valley near Hudson, Colo. Hudson is about 30 miles northeast of Denver. The principal crop in the Hudson area is sugarbeets, and sheep are commonly imported in the fall to feed on the residues in the beet fields after harvest. The outbreak occurred in a flock of about 2,000 feeder sheep recently brought from Wyoming; and personnel of the Animal Disease and Parasite Research Division's Bluetongue Laboratory, with which the author is associated, met with local, State, and other Federal authorities to observe and analyze the occurrence of the disease. A description of the outbreak itself and of the incidence of bluetongue throughout the area will subsequently be published by ADP (Bowne *et al.*, in manuscript).

Major water areas in the vicinity of the outbreak were sampled on October 24, to determine breeding of biting flies. Only one site of major proportions was found—a massive breeding area of *Culicoides variipennis* (Coquillett), where numerous pockets containing extremely heavy concentrations of larvae were found in a stream bed (Weld Co., T1N R64W S18). This breeding area occupied most of a gentle S-shaped curve in Box Elder Creek, and was composed of a broad mud flat about 250 meters long and 10 meters wide. A narrow, clear stream flowed through the mud flat, whose surface was lightly crusted and was spotted with pools of water. The material of the flat, which filled the stream bed to a depth of over a foot, was a very homogeneous, black, viscous, sewage-like muck. Pockets in which breeding occurred were easily discernible as open areas in the crust. Larvae were so concentrated in these pockets that thousands could be collected with a few dips of a teaspoon.

Apparently the water in this small stream was supplied only by seepage from the base of a large earthen dam at Horse Creek Reservoir about 5 kilometers to the south. Available information indicates that water in the stream could not have come from a source containing sewage effluent. Furthermore, although the South Platte River is heavily polluted by the Denver metropolitan sewerage system and is extensively used for irrigation in the region, drainage from fields irrigated with

sewage effluent did not flow into this particular stream. Therefore, even though the flies were of a species known to prefer highly polluted habitats (Jones, 1961a), and the area was surrounded by polluted sites, the large amount of colloidal-like silt in the breeding area was apparently not a direct result of sewage effluent, but of sedimentation of effluent and its gradual transportation by seepage through the base of the earthen dam and downstream to the breeding area.

To determine the incidence of flies biting sheep in the area of the bluetongue outbreak, an animal-baited trap was operated about 1 kilometer from the breeding area by methods previously described (Jones, 1961b). The late-season records obtained of biting flies attacking sheep follow: *Aedes dorsalis* (Meigen), *Culex salinarius* (Coquillett), and *Leptoconops torrens* (Townsend), 1 ♀ each, November 6; *Leptoconops kerteszi* Kieffer and *Simulium vittatum* Zetterstedt, 1 ♂ each, November 28; <sup>1</sup>*Culicoides hieroglyphicus* Malloch, 1 ♀ (collected while biting inside ear), November 28; and *Culicoides variipennis* (Coquillett), 22 ♀♀ (2 collected while biting inside ear) and 46 ♂♂, November 6, and 5 ♀♀ and 13 ♂♂, November 28. In addition, on October 28 at a nearby site several stable flies (*Stomoxys calcitrans* (Linnaeus)) were collected from a tethered sheep.

The trap was operated almost every fair day from October 24 until the end of November when permanent cold weather set in, but even on warm days fly activity was often prevented by high winds. In spite of the short time during a satisfactory day that weather conditions permitted fly activity, quite large numbers of *C. variipennis* were collected. The data indicate that in Colorado many biting flies are not active late in the season unless the shade temperature reaches about 21° C., but that once activity begins, *C. variipennis*, at least, will continue to bite at temperatures as low as 13° C.

The biting records obtained, together with the presence of a massive breeding area, indicate that the "gnats" reported by local people as having been annoying that fall were very likely *C. variipennis*. It is easy to suppose that this species was the primary vector in the Hudson bluetongue outbreak, especially since we know that it is capable of biological transmission of bluetongue (Foster *et al.*, 1963).

References Cited

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<sup>1</sup> I am indebted to Alan Stone of this division, who corroborated my determinations of the Culicidae and determined the Simuliidae.

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A SIMPLE, PRACTICAL METHOD OF COLLECTING SAMPLES OF *Anopheles sergenti* MOSQUITOES IN A CAVE WITH THE AID OF A STANDARD MOSQUITO CAGE

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At Neot Kikar, a new settlement in the southernmost part of the Dead Sea area in Israel, large numbers of *A. sergenti* tended to penetrate during daytime into caves, crevices and fissures of limestone rocks, concentrating there on and between stones and pebbles. It is very hard to collect them from these places by means of the usual aspirator. Sucking by mouth is inconvenient and involves loss of time as well as the danger in inhalation of dust and small particles of the limestone walls.

These difficulties can be overcome by mechanical sucking (see *Mosquito News*, 23:4, 351) and by following the simplified method described below.

A mosquito cage with nylon or muslin netting and a wooden frame of 20 x 20 x 18 cms, was introduced in the afternoon, inside or close to the opening of a crevice of the cave, where many mosquitoes used to congregate, in a dim corner which was free of draft. The sleeve of the cage was left wide open. Mosquitoes entered the cage to hide, and then settled in it.

Early the following morning the sleeve was closed quickly, thus catching the mosquitoes inside. By this simple method we frequently succeeded in collecting more than 100 adults in one operation without any effort.

On November 10, 1962, when the temperature had dropped to 11° C. and a few drops of rain—so rare in this area—had fallen, we were able to catch 21 females, all with blood, inside the cage, while only a few mosquitoes were seen outside the cage.

Our observations showed that *A. sergenti* are very sensitive to meteorological conditions and change their resting places several times, even during daytime, under the influence of changes in temperature, humidity, lighting and draft conditions.

On May 28, 1964, between 2 and 5 p.m., we were able to collect with much difficulty 39 adults with the aid of an aspirator. Finally we put a cage of 30 x 30 x 30 cms. in a spot near the opening of the main crevice. After two hours only, at about 7 p.m., we closed the sleeve and

found that we had caught an additional 30 adults in this cage.

The method has proved to be simple and useful.

*Aedes* MOSQUITOES FEEDING ON TURTLES IN NATURE

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Considerable attention has been given in recent years to reptiles as possible overwintering hosts of arboviruses in nature. Gebhardt *et al.* (1964) demonstrated the maintenance of western equine encephalitis virus in wild snakes during the winter months. In New Jersey Goldfield and Sussman (1964) found turtles naturally infected with both eastern and western equine encephalitis viruses. They reported the isolation of EEE virus from the brain of a snapping turtle and the isolation of WEE virus from the blood of both northern diamond-back terrapin and box turtle. Hemagglutination-inhibition (HAI) antibodies to EEE virus (but not to WEE virus) were found in the blood of a box turtle in southern Maryland in 1964 (Yuill, 1965).

Since mosquitoes play a significant role in the dissemination of disease agents, observations on their feeding on reptiles or other hosts appear important. Investigations on mosquito-borne viruses are in progress in Pocomoke Cypress Swamp near Pocomoke City in Worcester County, Maryland. This brief note describes two observations made in early 1964 near Pocomoke Cypress Swamp on *Aedes canadensis* (Theobald) and *Aedes triseriatus* (Say) biting turtles.

On June 12 we saw a painted turtle, *Chrysemys picta* (Schneider), moving across the paved road from the fresh water swamp toward a cultivated field. At a distance the body of the turtle appeared to be entirely covered with mosquitoes, while others were flying about either in pursuit or departing towards the woods. As we approached the turtle, it stopped momentarily but soon continued on its course. When closely observed, mosquitoes were seen resting on the dorsum of the carapace, the head, neck and legs, undisturbed by the turtle's movement. Some mosquitoes were found probing through the skin, while two had their abdomens distended with apparently freshly ingested blood.

With a hand aspirator we followed the turtle in attempts to collect some if not all mosquitoes present. We collected 38 females, of which 37 were *Aedes canadensis* and one *Aedes triseriatus*. Four days later, a similar incident occurred in the general vicinity involving a box turtle, *Terrapene carolina* (Linnaeus). In this case six mosquitoes were collected from the turtle. These were identified as *Aedes canadensis*. It is interesting that