although it is known to prefer cattle to man, this species has been reported biting man in large numbers on many occasions.

SUMMARY. Six species of *Anopheles* from four different localities in Thailand were tested for their susceptibility to DDT and/or dieldrin. Larvae and/or adults of all species tested were susceptible to those insecticides with the exception of *Anopheles vagus,* adults of which were resistant to dieldrin. Three phenotypes for dieldrin resistance in *An. vagus* larvae were distinguished. The appearance of resistance in *An. vagus* from the Kasetsart University experimental farm may be attributed to the widespread use of a variety of insecticides for experimental purposes.

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SEASONAL DISTRIBUTION OF TABANIDAE (DIPTERA) AT TEXAS HOLLOW, NEW YORK IN 1968

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During 1968, studies were carried out to test various collecting and trapping methods for Tabanidae. In the course of this work, a rather complete picture of the seasonal distribution of the Tabanidae of a limited area was secured. This information is given in Figure 1.

Texas Hollow is a north-south valley in Schuyler County, New York. Our studies were confined to approximately 100 acres in the Town of Hector about 1.3 miles southeast of the hamlet of Bennettsburg. The valley at this point is 0.4 of a mile wide. The altitude of the valley floor averages about 1,140 feet and the dirt road giving access to the area is at an elevation of 1,230 feet. The hills defining the valley range from 1,600 to 1,700 feet. No collections were made above the level of the road.

The valley is drained by Cranberry Creek which flows north to Hector Falls Creek which flows westerly to Seneca Lake. The main physical features of the area studied consist of three ponds. One pond is formed by a small dam across Cranberry Creek which has flooded portions of a swamp. A second pond has

WEEK BEGINNING	JUNE 2	9	16	23	30	JULY 7	14	21	28	AUG. 4	11	18	25	SEPT. 1	8
C. cuclux Whtn.	X	X													
C. ater Macq.	X	X	X												
H. illota (O.S.)	X	X		X	X	X	X		X						
C. indus O.S.	X	X	X	X	X	X	X	X	X	X					
H. difficilis (Wd.)		X		X											
C. cincticornis Walk.		X	X	X	X	X									
H. lasiophthalma (Macq.)		X		X	X	X									
C. niger Macq.		X	X	X	X	X	X	X	X						
H. epistates (O.S.)		X			X	X	X	X	X	X	X				
C. calvus P&T			X		X	X	X								
C. sackeni Hine			X	X	X	X	X								
T. marginalis Fabr.				X	X	X	X	X	X						
C. frigidus O.S.				X	X	X	X		X						
C. callidus O.S.				X	X	X	X	X	X	X					
H. typhus (Whitn.)				X		X	X	X	X	X	X				
T. similis Macq.				X		X	X	X	X				X		
C. macquarti Philip				X	X	X	X	X	X	X	X	X	X	X	
C. vittatus Wd.				X	X	X	X	X	X	X	X	X	X	X	X
C. carbonarius Walk.					X				X						
C. lateralis Wd.					X		X		X						
C. shermani Hine					X	X	X	X	X	X	X	X	X		
T. nigripes Wd.						X									
T. pumilus Macq.						X	X								
H. trepida (McD.)						X	X								
A. ohioensis (Hine)						X			X						
H. sodalis (Will.)						X	X	X	X	X	X	X			
T. sparus milleri Whitn.						X	X	X	X	X	X		X		
C. geminatus Wd.						X	X	X	X	X	X	X		X	
C. univittatus Macq.						X	X	X	X	X	X	X		X	
T. reinwardtii Wd.							X	X							
H. aurilimba (Stone)							X	X	X						
A. bicolor (Wd.)							X			X					
T. superjumentarius Whitn.							X	X	X	X					
C. moechus O.S.							X		X	X	X				
T. quinquevittatus Wd.							X	X	X	X	X	X			
C. aberrans Philip							X				X		X		
T. lineola Fabr.								X	X	X				X	
T. sulcifrons Macq.								X	X	X	X	X	X	X	
T. sagax O.S.									X						
T. catenatus Walk.									X						
T. sackeni Fairch.									X	X	X	X	X		
H. microcephala (O.S.)									X	X	X	X	X	X	
C. dacne Philip											X				
G. chrysocoma (O.S.)											X				
T. novaescotiae Macq.												X			
T. calens L.													X		

FIG. 1.—1968 Seasonal Distribution of Tabanidae, Texas Hollow, Schuyler County, N.Y. C.=*Chrysops*, H=*Hybomitra*, T=*Tabanus*, A=*Atylotus*, G=*Goniops*.

swampy margins which in spots are boglike in character with considerable quantities of *Sphagnum* but lacking most of the lower growing bog plants except cranberry (*Vaccinium macrocarpon*) and cotton grass (*Eriophorum* sp.). Poison sumach (*Rhus vernix*) and highbush blueberries (*Vaccinium* spp.) grow in quantity where *Sphagnum* is present whereas alder (*Alnus* sp.) and winterberry (*Ilex verticillata*) predominate along other portions of the pond margin. The third pond is a steep sided "pot hole" without inlet or outlet.

At the dam end of the artificial pond is an open field of about six acres which is mowed at irregular intervals. At the north end of the field is a spring and seepage areas about 5 feet by 60 feet which usually has an inch or two of standing water and a scattering growth of cattail (*Typha latifolia*). The cattails were used as oviposition sites by several species of Tabanidae.

Part of the area was under cultivation at one time and the most recently abandoned portion has an extensive growth of staghorn sumach (*Rhus typhina*), dogwoods (*Cornus* spp.) and trembling aspen (*Populus tremuloides*). Other sections, judging by the size of the trees now growing there, must have been out of cultivation for over 50 years. Other portions apparently were never under cultivation and support a growth of large trees of hemlock (*Tsuga canadensis*), white pine (*Pinus strobus*), beech (*Fagus grandifolia*), white oak (*Quercus alba*), red oak (*Quercus rubra*), chestnut oak (*Quercus prinus*) and red maple (*Acer rubrum*). There are large stumps of chestnut (*Castanea dentata*) but the only living trees are four inches or less in diameter.

Most of the collecting was done in the road, on a path from the road to the open field, in the vicinity of the dam and along a trail which circled the second pond.

Collection methods used included two types of Malaise traps, used with and without dry ice as an attractant, and an insect net used to collect specimens attacking the collector. Vegetation along trails an pond margins was swept and numerou specimens were collected as they fle about or rested on the dam. Other spec mens were taken as they rested on th road.

Dry ice placed under Malaise trap greatly increased collections of most specie of *Hybomitra* and *Tabanus* but did nc noticeably increase the collection of *Chr sops*. When dry ice was used, the colle tion of face fly, *Musca autumnalis* De Gee was so increased that it became a nuisanc nearly filling a quart collecting jar i 2 or 3 hours. This was surprising in tha the nearest herd of cattle was at least on mile away.

That Malaise traps are efficient tabani collectors may be illustrated by one exan ple. On August 3, a trap with 12 pounc of dry ice was set up at noon. At 4 p.m 506 females and 20 male Tabanidae wer removed from the collecting apparatu These specimens represented 8 species c *Chrysops*, 6 species of *Hybomitra* and species of *Tabanus*. That such traps ar selective, however, is shown by the catc of three species which other collectin methods demonstrated to be very abundar that day. *Chrysops vittatus* was very ar noying and aggressive and obviously pre ent in large numbers. However, only specimens of *C. vittatus* were found in th trap. The catch of *Tabanus sparus mille* and *T. sulcifrons* was 127 and 198 ind viduals respectively.

Collections were made once each weel The actual day was selected on a basis c weather conditions regarded as favorab for tabanid activity. Usually this was th first warm sunny day of the week. Co lection activity began on May 28 but n tabanids were found until June 5, an the final collection was made on Septembe 14 when a single *Chrysops vittatus* wa secured.

It is assumed that each species wa present in the area through the perio indicated by first and last collection date although the species may not have bee collected each week. Exceptions to th

may be *Tabanus similis* and *T. lineola* where 26 and 28 days respectively intervened between the last collection and the previous collection. Both were fairly common in the area and the wide separation in dates may indicate a partial second brood, although a life cycle of less than one year has never been demonstrated for any northern tabanid. It is more likely they were abnormally late emerging individuals.

Some species were collected in such small numbers that their flight period could have a wider range than shown on Figure 1. These include *Goniops chrysocoma, Chrysops carbonarius, C. lateralis, C. aberrans, C. dacne, Atylotus ohioensis, A. bicolor, Tabanus nigripes, T. sagax, T. catenatus, T. novaescotiae,* and *T. calens.*

The collection of 46 species in 5 genera indicates that a majority of the species found in the area were collected. These 46 species represent 45 percent of the species known from New York (Pechuman, 1957). When species with precinctive habitats, such as salt marshes, are deleted, along with northern species, restricted in New York to the Adirondacks, and southern species approaching the northern limit of their range in southeastern New York, the 46 species collected represent about 75 percent of the total which could be found in the area.

Because of changes in collecting techniques used during the season, no truly quantitative study of the various species could be made. However, the following notes on nomenclature and relative abundance of certain species may be of interest.

Chrysops ater Macquart. We prefer to use this as the prior name for *C. carbonarius rubiapex* Philip and reasons for this will be given in a separate publication. This was a fairly common species but was abundant only on June 5. We have suspected, although its flight period is known to overlap that of related *C. carbonarius,* that it appeared earlier in the season. Our data support this but so few specimens of *carbonarius* were collected, that no definite conclusions can be drawn.

Chrysops geminatus Wiedemann was one of the species which was present for some weeks but had a limited time of real abundance. *C. geminatus* was fairly common on July 26, abundant on August 3 but in rather small numbers by August 7. On July 26, a male *geminatus* was noted slowly flying and occasionally hovering over a puddle in the road, and descending from time to time to briefly touch the water.

Hybomitra aurilimba (Stone). Males of this species were found hovering in spots of sunlight at intervals along about 50 feet of trail in a wooded area on July 18. No females were found on this date but females were found on July 26 and August 3. A reduced number of males were found hovering on July 26 but none were seen on August 3.

Hybomitra sodalis (Williston). Pechuman (1960) differentiated the previously synonomized *sodalis* from *trispila* (Wiedemann) at the subspecific level. Since that time, so few specimens have been seen which might be considered intermediate, that it seems better to regard them as two species.

Tabanus lineola Fabricius. All specimens were a melanistic form which probably is distinct from the *lineola* of the coast. The species was abundant only on August 3 and on this date a female was found ovipositing on a cattail in the seepage area mentioned above.

Tabanus sparus milleri Whitney. This form has only recently invaded south central New York and was abundant and pestiferous, attacking humans in the manner of a *Chrysops.* Although present in the area for almost two months, it was really common only on July 26 and August 3; by August 7, the population had declined considerably.

Tabanus sackeni Fairchild. We have seen many specimens collected at light and have assumed the species was crepuscular or nocturnal. At Texas Hollow, a few individuals were collected at various times during the day but most were taken rather late in the afternoon. No collecting was done after 5 p.m.

Tabanus sulcifrons Macquart. This large species was very abundant during much of its flight season. Only males were found when it first appeared on July 26. Both sexes were abundant between August 3 and 15. By August 21, the population had decreased but both sexes were still present on September 4.

Although on August 29, a number of species were still found in the area, they were represented by only a few individuals. *Chrysops vittatus* was still fairly common but the population was low in comparison with earlier in the season.

The species most annoying to humans varied as the season progressed. In order of appearance these were *Chrysops ater, C. indus, Hybomitra illota, C. niger, C. calvus, C. callidus, C. macquarti, C. vittatus* and *Tabanus sparus milleri.*

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HISTORY OF MOSQUITO OCCURRENCE IN MISSOURI

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Early newspaper accounts of insect plagues indicated that mosquitoes were perhaps a greater enemy of the pioneers than the Indians. Countless references to mosquitoes may be found in early journals and diaries. Bradbury (1819) who traveled in the western part of the United States from 1809–1811, recorded in his diary that he had to keep one hand free at all times to brush away the mosquitoes from his body while traveling in certain regions of the Missouri River. Prince Paul of Wurttemberg, some years later, fought mosquitoes throughout the entire length of his trip up the Missouri and was eventually forced to cancel his exploration of Kansas. On the Missouri River near Council Bluffs he recorded seeing a mosquito 1 inch long. He also noted that mosquitoes were so thick in certain places that one could scarcely see his companions at a distance of twenty paces.

In times of flood when the Mississippi and Missouri Rivers inundated large sections of the country, the mosquitoes spread from the river lowlands to the highlands. An interesting account of such an invasion was described in a letter by Gottfried Duden (1826). Duden stated . . .

> "Now I can tell you something about the plague of mosquitoes. About six weeks ago, I experienced something which, judging from all my former experiences, I should have regarded as something simply impossible. Everywhere in valleys and on highlands, there were such swarms of mosquitoes that in shady places, one could scarcely keep them from ones nose and mouth. . . . They are found over the whole earth but in such numbers I should have expected them only in swamps and never

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