

## A NOTE ON SWARMS OF SO-CALLED "WOODS" MOSQUITOES IN MCKINLEY PARK, ALASKA

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"Woods" mosquitoes are supposed to breed in cool, shaded waters and their adult activities, including swarming, are said to take place in the forest. This concept does not always apply, however, because certain "woods" species abound north of the trees in the Arctic and above timber line in mountains. Martini (Nativig, 1948), noted in the far north a change of preferred larval breeding places of these species to open, unshaded pools, and called this switch of habitat, *geographischen Brutplatzwechsel*. For example, *Aedes communis* (DeG.) and *impiger* (Wlk.) are recognized American temperate zone "woods" species (Matheson, 1944; Rempel, 1953), but they also occur in virtually treeless Arctic parts of Alaska and Canada. Knight (1951), who leavens his taxonomic studies with ecology, has described "tundra" varieties of *Aedes punctor* (Kby.) and *hexodontus* Dyar. A stupendous, diffuse swarm of presumably tundra *A. punctor* and *communis* over the Hudson Bay Railway tracks near Churchill, reported by Hocking *et al.* (1950) for a single evening, is the only recent reference found to Arctic swarms. Swarming of *impiger* apparently has not been reported, but the typical swarms of *communis*, first described by Wesenberg-Lund (1920-21) from Denmark, are now well known from North America. *Communis* males swarm in the deep shade of secluded alcoves of the forest. In this paper a change of swarming site to the open, which is comparable to the change of larval habitat reported by Martini, is noted for *A. communis* of alpine Alaska. The swarms of *communis* and *impiger* to be described were observed near timber line in Mount McKinley National Park, Alaska. About 70 percent of the Park is said to be above timber line which ranges 2500-3000 feet elevation.

**METHODS, AREAS, SWARMING SITES.** Approximately five acres of jumbled sand-gravel-boulder wash dotted with barren pools, scrubby willows, stands of fireweed and purple vetch located conveniently near camp were selected for a swarm study area. Two evenings of reconnaissance in mid-June had uncovered large swarms of *Rhamphomyia*, a dance fly, and one mosquito swarm in the dissected triangle where Riley Creek receives Hines Creek and enters the Nenana valley at about 1700 feet elevation. The swarming site of the mosquito, which proved to be *A. communis*, was an exposed area above two huge half-buried boulders, one white, one grey. The boulders lie in a flood channel in a dry section interposed between long, barren pools teeming, however, with *Aedes pullatus* larvae. The pools were favored flight lanes of male mosquitoes approaching or leaving the swarming site. On ten evenings during the period June 16-July 9, small swarms of *communis* were observed here. Three swarms of *impiger* were found at three different locations outside the swarm study area.

Swarming behavior was studied by direct observation. Samples of the swarmers were collected periodically for later identification from genitalia mounts, inspection for orchid pollinia, and experiments. On each evening when the swarming site was visited, whether a swarm occurred or not, minimal weather records of temperature, wind, cloudiness, and rain for that evening and the preceding 24-hour period were made. The most representative "swarming" temperature seemed to be taken at 20:30 (Alaska Standard Time) near the ground.

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**SWARMS.** *Aedes communis* (DeG.). Swarms of this species were observed at the Riley Creek site over the two boulders on the evenings of June 16, 17, 18, 19, 23, 25, 28, July 2, 7, 9. Swarming ordinarily started between 19:15 and 19:45 and was terminated between 20:15 and 20:45 when the deep valley became almost dark. The air was calm on swarming nights. Either there was no wind or an intermittent breeze of less than 4 mph. Seven evenings, the exceptions being June 17, 18, 19, were clear following rain. No swarm appeared at the site June 14, 15, 20, 21, 22, 24, 26, 27, 30, July 1, 4, 5. Seven of these twelve negative evenings were rainy, one was smoky from a distant forest fire, and two were very windy. The remaining negative evenings, July 4 and 5, came near the close of swarming there. The latter day was, nevertheless, an exceptional one for anticipated swarming did not occur despite clearing after rain. Temperatures seemed to play no great role. The ground-level air temperature at 20:30 ranged 49-60 F. on swarming evenings and 48-62 F. on the stated non-swarmering ones.

The measure of the swarm used—average count or estimate of males at the core—was little to begin with and less and less for successive swarms. On the first four evenings the figure ranged from 10-50 males. By July it was 5-10, and for the last two swarms, only 2-5 and 1-3. Swarming behavior is characteristic so that a single male at a known swarming site may constitute a recognizable swarm, a point made by Nielsen and Greve (1950). It is thought likely there were larger swarms before observations began June 16, especially since the peak emergence of *communis* adults occurred about May 21 and it is assumed that mating was largely completed long before the middle of June. No instance of mating at any mosquito swarm was observed in this study.

Swarming male mosquitoes were in-

variably interfered with by aggressive male dance flies of *Rhamphomyia* sp., usually outnumbering the mosquitoes and swarming diffusely around them or where the mosquitoes were wont to swarm (negative nights) for a radius of 10-15 feet. Pursuit and grappling were frequent but only two instances of actual capture of *Aedes* males were seen at this site.

Individual mosquito males probably remained a very few minutes at the core as a rule. Sometimes at intervals of low count at the core one was seen merely to tarry there for less than half a minute as if in passing. They flew away on a beeline to the northeast or southwest, the directions of the pools between which the swarm site was located. Swarming was commonly below eye level and the observer had to sit to see swarmer well. It is reasonable to suppose most of the males were resting most of the time. The only proven resting place, however, was flowers of the orchid, *Habenaria obtusata* (Pursh) where some of them acquired tell-tale pollinia on their eyes. One evening in three successful instances among many failures at following a male mosquito's flight away from the swarm, each mosquito turned about and reentered the core without resting. As usual the swarm (core) was reconstituted within a few minutes after annihilation with the insect net; numerous recruits were obviously resting or flying close by. Captured males on release did not return (directly) to the swarm.

*Aedes impiger* (Wlk.) Two unstable swarms of *impiger* males were seen on a bright afternoon, 16:30-1700, June 24, near Sanctuary River at elevation 3100 feet approximately. The moving cores consisted of about 50 males each. They became diffuse and recondensed again at intervals in a manner suggestive of *A. excrucians* swarms. Both swarms averaged about five feet above the water of different intermittent pools teeming with *A. pullatus* larvae and pupae. A third evidently induced swarm of *impiger* took place at dusk August 7 in camp near Riley Creek over a bright-yellow gasoline drum. Unique

observations of swarms, i.e., those which are not repeated several nights, are of uncertain normalcy and specificity. This is especially true of large recently hatched mosquito populations; such *new* mosquitoes are sometimes easily induced to swarm, as over the observer, his net, etc. For whatever unique swarming observations may be worth these of *impiger* were probably composed of *old* males. All three swarms were in the open without apparent reference to vegetation.

DISCUSSION. If swarming is courtship, why then was no mating seen? The explanation may be: Mosquitoes mate a few days after emergence. For many species male swarms provide the female a "re-leaser" stimulus. The bulk of mating for a one-brooded species occurs within a week following peak emergence. The swarms of this study occurred several weeks to two months later.

Shortly after peak emergence the swarms are very large and frenzied—the *period of early (mating) swarms*. The longevity of males may exceed six weeks. With proper stimuli males swarm throughout adult life. The period of early (mating) swarms is followed by a much longer *period of late (nonfunctional) swarms*. It is reasonable to assume that the late swarms are equally if not more characteristic of the species than the early ones.

Current data are adequate for description of the typical swarms of very few mosquitoes, but it is likely that when details are well known, prominent among the specific differences will be the type of swarming site chosen.

SUMMARY. Ten small swarms of *Aedes communis* (DeG.) and three of *A. impiger* (Wlk.) were observed near timber line in Mount McKinley National Park, Alaska. Swarming occurred in the open. (Most swarms of *A. communis* described in the literature have occurred in deep shade of the forest.) No mating was seen. Swarming of *A. communis* generally took place on calm, clear evenings following rain ending during the morning or afternoon.

Some of the male *A. communis* carried pollinia of the orchid *Habenaria obtusata* (Pursh).

Male *Rhaphomyia* sp. (Diptera: Empididae) swarmed about the swarms of *A. communis* and harried the mosquitoes.

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