

perience in Haiti, and reports of persistent transmission in other countries despite the repeated application of residual insecticides, reconfirm needs for continuous evaluation of attack measures. Complexities of factors contributing to persistent transmission requires the utilization of multi-professional disciplines for investigation of causes of persistent transmission and evaluation of attack measures. It is suggested that the extent of reported problems throughout the world warrants a reappraisal of the role of entomology by eradication programs.

Prior to the development of the residual insecticides, the effectiveness of "classical"

methods of source reduction and anti-mosquito measures for control of malaria had been widely demonstrated in many areas of the world. Because of their effectiveness, it is concluded that increased attention should be given by malaria eradication programs to their use as supplementary or alternative attack measures in areas of persistent transmission.

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NEW DISTRIBUTION RECORDS FOR SNOWPOOL *Aedes* MOSQUITOES IN THE MOUNTAINS OF ARIZONA AND NEW MEXICO

LEWIS T. NIELSEN,¹ THEODORE A. WOLFF¹ AND JAY H. LINAM²

For several years we have been investigating the distribution of the snowpool *Aedes* mosquitoes in the mountains of western North America. These species with the exception of *Aedes* (*Aedes*) *cinereus* Meigen belong to the subgenus *Ochlerotatus* and are single brooded species found at higher elevations in the mountains and mountain valleys of the western United States. Due to their univoltine habits and over-wintering in an egg stage with an obligatory diapause they are believed to have evolved in arctic or cold temperate regions. They were apparently pushed southward into the western United States during Pleistocene glaciation and were left restricted to the colder mountainous regions when tem-

peratures warmed after the glaciers receded northward. Certain species, such as *Aedes cataphylla* Dyar, *Aedes fitchii* (Felt and Young) and *Aedes increpitus* Dyar which often occur at lower elevations in mountain valleys may still be in the process of extending their ranges.

Although there are over twenty snowpool *Aedes* species known to occur in western North America, only four of these species have been reported as occurring in Arizona and New Mexico. *Aedes cataphylla* and *Aedes fitchii* were reported from northern Arizona by Richards, Nielsen and Rees (1956). *Aedes fitchii* also has been reported from New Mexico (Wolff, 1970). *Aedes increpitus* was reported from New Mexico by Theobald (1903) who described it as a new species *Grabhamia vittata*. *Aedes pullatus* (Coq.) was recorded for New Mexico by Miller, Doll and Wheeler (1964).

¹Department of Biology, University of Utah, Salt Lake City, Utah 84112.

²Department of Biology, Southern Colorado State College, Pueblo, Colorado 81001.

Although Arizona and New Mexico are at the southernmost points in the western United States, both states have high mountainous areas with habitats which we believed were suitable to support relict populations of snowpool *Aedes* species. Our collections during the past five years in these areas have revealed that several of these species did reach these southern mountainous areas and are well established. Snowpool *Aedes* mosquitoes now known to occur in Arizona and New Mexico are as follows:

ARIZONA

Aedes cataphylla Dyar
Aedes fitchii (Felt and Young)
Aedes implicatus Vockeroth
Aedes pullatus (Coq.)

NEW MEXICO

Aedes cataphylla Dyar
Aedes cinereus Meigen
Aedes communis (De Geer)
Aedes excrucians (Walker)
Aedes fitchii (Felt and Young)
Aedes hexodontus Dyar
Aedes implicatus Vockeroth
Aedes increpitus Dyar
Aedes pullatus (Coq.)
Aedes schizopinax Dyar

For Arizona, *implicatus* and *pullatus* are new state records. Both were larval collections made in Greenlee County in southeastern Arizona in the vicinity of Hannagan Meadows on March 23, 1967, at an elevation of 9,200 feet. The larvae of *implicatus* were associated with *cataphylla*.

The records for New Mexico are new except for *fitchii*, *increpitus* and *pullatus*. Most of the collections were made in Rio Arriba and Sandoval Counties in the northcentral region of the state. The mountains here are southern extensions of the Rocky Mountain system.

All collections reported were larvae taken from snowpools.

Aedes cataphylla and *implicatus* were collected in several localities in Rio Arriba County. These were: 16 miles NE of Chama, III-18-67, 8,100 ft.; Chama, III-24-67, 7,900 ft.; Canjilon Lakes area, IV-30-72, V-21-72, 9,300-10,000 ft.; Hopewell Lake, VI-5-72, 9,800 ft. Also collected on the same dates in the Canjilon Lakes area were *excrucians*, *fitchii*, *hexodontus*, *increpitus* and *pullatus*. *Aedes fitchii*, *hexodontus* and *pullatus* were collected at Hopewell Lake with *cataphylla* and *implicatus*. Three other localities in Rio Arriba County produced snowpool *Aedes* species. At San Gregario Lake, VI-9-72, 9,200 ft., *hexodontus*, *implicatus* and *pullatus*, at Trout Lakes, V-21-72, 9,240 ft., *communis*, *excrucians*, *fitchii*, *increpitus* and *schizopinax* and at Dulce Lake, III-24-67, 7,200 ft., *pullatus*.

In Sandoval County, Rancho de Chaparral Girl Scout Camp, Canyon of Rio de Las Vacas, V-19-70, 7,800 ft., *implicatus*, *increpitus*, *fitchii* and *pullatus* were collected.

Aedes increpitus has been noted in a number of publications as occurring in New Mexico (see Sublette and Sublette, 1970). These are mainly checklist references based on Theobald's (1903) report of the species from Pecos Canyon in San Miguel County and from McNeel and Ferguson (1954) and Ferguson and McNeel (1954), who reported *increpitus* as a new state record for New Mexico. Although they gave no precise locality, they reported it as "abundant and locally or seasonally distributed" in the Arkansas-White-Red River Basins. In addition to our collections noted above, we have taken *increpitus* in four additional localities in Rio Arriba County: Canjilon, VI-12-67, 7,900 ft. with *pullatus*; Chama, III-16-68, V-24-72, 7,860 ft.; Espanola, III-17-68, III-7-72, 5,600 ft. *Aedes increpitus* has not been reported for Arizona, but based on its currently known distribution, it seems likely that it will be found there.

Aedes pullatus appears to be very widespread in the mountains of northern

New Mexico. In addition to the localities noted above in Rio Arriba and Sandoval Counties, it has been reported from Colfax County (Miller *et al.*, 1964). We also have collected *pullatus* in Santa Fe County, Aspen Ranch area, V-5-72, 9,160 ft. and the Santa Fe Ski Basin, V-5-72, 10,564 ft. and in Taos County, Taos Ski Valley, VI-31-67, V-28-72, 9,300-9,900 ft.

Aedes cinereus is widely distributed in North America. It is sometimes multivoltine and although not restricted to snowpools occurs with great frequency in this habitat in the mountainous areas of western North America. Although an authenticated record for this species is not known for New Mexico, we did collect *cinereus* larvae 10 miles north of Chama in Conejos County, Colorado, V-27-72, 9,500 ft. The species was associated with *cataphylla*, *excrucians*, *fitchii* and *pullatus*. This site is within three miles of the Colorado-New Mexico border and we have no doubt that the species also occurs

in New Mexico and should be added to the state list.

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ERRATUM

In *Mosquito News*, 33(2): Front Cover Contents: The title of the fifth article which reads: "Polymer Formulations of Mosquito Larvicides. IV. Larvicidal Effectiveness of Polyethylene of Chlorpyrifos on Non-Target Populations Naturally Infesting Artificial Field Pools," should read "Polymer Formulations of Mosquito Larvicides, III. Effects of a Polyethylene Formulation of Chlorpyrifos on Non-Target Populations Naturally Infesting Artificial Pools," to correspond to the correct title as it appears in the fifth article on page 165 of that issue.