REVIEW OF NEW NEARCTIC MOSQUITO DISTRIBUTIONAL RECORDS NORTH OF MEXICO, WITH NOTES ON ADDITIONS AND TAXONOMIC CHANGES OF THE FAUNA, 1982–89[1]

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ABSTRACT. During the past 7 years, 24 species of Nearctic mosquitoes have had extensions to their known distribution in the form of 32 new state and province records in the United States and Canada. They are included in this report along with relevant references. Additionally, 3 new United States country records have been established, 3 species have had name changes, a new species of *Anopheles* and sibling species of another anopheline have been described. Details of these occurrences are covered.

INTRODUCTION

The publication of Darsie and Ward (1981) included distributional records for the 166 species of mosquitoes known at that time to occur in the Nearctic Region, north of Mexico. It also reflected the taxonomic changes in the specific and supraspecific categories which had been delineated since the publication of Carpenter and LaCasse (1955). Ward and Darsie (1982) also accounted for other distributional changes up to and including 1982.

Since many new state and province records in the United States and Canada have been published over the last 7 years, it seemed appropriate to summarize them as well as enumerate new country records and pertinent taxonomic changes for the convenience of those interested in the field.

State- and province-wide mosquito records have been published by Belton (1983), Breeland and Loyless (1982), Darsie and Anderson (1985), Harrison et al. (1981), Means (1987) and Quickenden and Jamison (1979).

Other distributional records, identification information and limited bibliographies on a mosquito genus or geographical area are as follows: Andreadis (1988), Bennett (1983), Berry (1985), Berry and Craig (1984), Berry et al. (1986), Bosworth et al. (1983), Breeland (1982), Clark et al. (1986), Copps et al. (1984), Davis et al. (1984), Easton (1987), Easton et al. (1986), Haeger and O'Meara (1983), Hribar and Gerhardt (1985), Helson et al. (1980), Jakob et al. (1985), Jewell and Grodhaus (1984), Kaster (1981), LePrince (1982), Manning et al. (1982), Nasci et al. (1983), Nawrocki and Craig (1989), Pappas and Pappas (1983), Pratt (1952), Reiter (1986), Reiter and Darsie (1984), Schoelfield and McIntosh (1984), Schoelfield et al. (1981), Steffan et al. (1980), Taylor (1983), Welch and Long (1984) and White and White (1980).

NEW STATE AND PROVINCE RECORDS

There have been extensions of the known distribution of 25 species in 16 of the political subdivisions of United States, Canada and Bermuda. They are listed in Table 1 along with the species and the reference first reporting the finding.

Two geographical areas which have heretofore been excluded by us in considering the indigenous mosquito fauna, but which are clearly colonized by Nearctic species, are here being added. They are Greenland and Bermuda, insular territories in the Atlantic Ocean.

NEW COUNTRY RECORDS

Aedes (Stegomyia) albopictus *(Skuse)*: This species was apparently introduced into Harris County, TX, prior to 1985 in used tires shipped from Asia. It was first reported by Sprenger and Wuithiranyagool (1986) and Bartnett and Davis (1986). It has since spread to many other states. Its known distribution now includes Alabama, Delaware, Georgia, Indiana, Kentucky, Mississippi, Missouri, North Carolina and Tennessee (Craven et al. 1988, Moore et al. 1988). Other states reporting its presence are Florida (Peacock et al. 1988) Illinois (Rightor et al. 1987), Louisiana (Darsie 1986), Maryland (Sweeney et al. 1988) and Ohio (Berry et al. 1988). It is also know from South Carolina (R. F. Darsie and S. Ferguson, unpublished data).

The discovery by Foster (1989) that *Ae. albopictus* has colonized tree holes is most significant because that is the natural habitat in its indigenous Oriental region. Also, Nawrocki and Hawley (1987) discussed its eventual distribution in North America.

Aedes (Howardina) bahamensis *Berlin*: This species was recognized as new (1969) by Berlin. The immature stages occur in the containers in

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Table 1. List of new state (USA), province (Canada) and Bermuda records which have occurred between 1980 and 1989.

Species	Location	Reference
Ae. aegypti	Rhode Island	Cookman and LeBrun (1986)
Ae. albopictus	Eastern USA, Texas	Sprenger and Wuithiranyagool (1986), Moore et al. (1988)
Ae. bahamensis	Florida	Pafume et al. (1988)
Ae. communis	Connecticut	Andreadis (1986)
Ae. diantaeus	New Brunswick	Maltais and Daigle (1984)
Ae. dupreei	Michigan	Cassani and Newson (1980)
Ae. hendersoni	Rhode Island	LeBrun et al. (1983)
	Manitoba	Brust (1979)
Ae. infirmatus	New Jersey	McNelly (1989)
Ae. leucomelas (=*implicatus*)	New Jersey	Maltais and Daigle (1984)
Ae. melanimon	North Dakota	Darsie and Anderson (1985)
Ae. mitchellae	Indiana	Copeland (1984)
Ae. punctor	Connecticut	Andreadis (1986)
Ae. purpureipes	California	Meyer et al. (1987)
Ae. sollicitans	Michigan	Cassani and Newson (1980)
Ae. s. spencerii	New Jersey	Ehrenberg (1983)
Ae. sticticus	Rhode Island	LeBrun et al. (1983)
Ae. thelcter	Arizona	Maloney and Reid (1989)
	California	Meyer et al. (1988)
Ae. thibaulti	New Jersey	McNelly (1984)
	Rhode Island	Cookman et al. (1985)
Ae. triseriatus	Manitoba	Gallaway and Brust (1982)
An. barberi	Massachusetts	Walker (1983)
An. crucians	Michigan	Cassani and Newson (1980)
An. hermsi	California	Barr and Guptavanij (1989)
An. perplexens	Michigan	Wilmot et al. (1987)
	Louisiana	Chapman and Johnson (1986)
Cx. tarsalis	Rhode Island	Jakob et al. (1986)
	Quebec	Gebara and de Oliviera (1986)
Cs. impatiens	Rhode Island	LeBrun et al. (1983)
Cs. inornata	Rhode Island	LeBrun et al. (1983)
	Bermuda	Darsie and Ward (present work)
Cs. minnesotae	Newfoundland	Mokry (1984)
	North Dakota	Darsie and Anderson (1985)
Ps. ferox	Rhode Island	LeBrun et al. (1983)
Ps. howardii	New Jersey	McNelly and Crans (1983)
	Iowa	Berry et al. (1986)

the Bahama Islands. Pafume et al. (1988) reported that it has been present in Florida since 1986 from eggs deposited in ovitraps; now it has been collected in tires with water from 37 locations in Dade and Broward counties (O'Meara et al. 1989). It is notable because it is the first species belonging to the subgenus *Howardina* to be reported from the United States.

Anopheles (Anopheles) hermsi *Barr and Guptavanij 1989*: This new anopheline was described from the coastal region of southern California by Barr and Guptavanij (1989). It is closely related to *An. freeborni* Aitken. Only larvae and pupae of *An. hermsi* can be separated from the latter. The authors point out that this species was apparently responsible for the transmission of malaria in San Diego County, CA, in 1986. Some details of its biology and distribution had been previously given by Barr et al. (1988).

MOSQUITO FAUNA OF GREENLAND AND BERMUDA

Greenland: The first report of mosquitoes on this arctic island was made by Henricksen and Lundbeck (1917). They recorded the presence of *Ae. nigripes* (Zetterstedt) as *Culex nigripes* Zett. Some 50 years later Nielsen and Nielsen (1966) added *Ae. impiger* (Walker) as *Ae. nearcticus* Dyar and stated that it is locally more abundant than *Ae. nigripes*. A third species, *Ae. triseriatus* (Say) was collected by Messersmith (1971).

Bermuda: The following species have been collected in the islands of Bermuda: *Ae. aegypti* (Linn.) (Mayers 1983), *Ae. sollicitans* (Walker), *Ae. taeniorhynchus* (Wiedemann), *Cx. salinarius* Coq., *Cx. quinquefasciatus* Say (Williams 1956) and *Culiseta inornata* (Williston). One female of the last named species was identified by one of us (R.A.W.) and is here being reported from Bermuda for the first time. The specimen was collected from a house on Middle Road, Devonshire Parish, March 8, 1966, and has been deposited in the collection of the Bermuda Department of Agriculture, Hamilton.

TAXONOMIC CHANGES

Aedes (Ochlerotatus) leucomelas *(Meigen)*: This species was formerly known as *Ae. (Ochlerotatus) implicatus* Vockeroth, until it was synonymized by Mezenev (1980) under *leucomelas.*

Anopheles (Anopheles) quadrimaculatus Say: This species is the traditional malaria vector in the eastern United States. Recently it was found to consist of at least 4 sibling species. They have been characterized both genetically and cytogenetically by Kaiser and Seawright (1987), Kaiser et al. (1988a, 1988b, 1988c), Lanzaro et al. (1988), Narang and Seawright (1988) and Narang et al. (1989a, l989b). They are now designated as species A, B, C and D.

Culex (Melanoconion) cedecei *Stone and Hair*: This species was described by Stone and Hair (1968). It was subsequently synonymized with *Cx. opisthopus* Komp by Belkin (1969a, 1969b). Then Sirivanakarn and Belkin (1980) determined that *Cx. opisthopus* was conspecific with *Cx. taeniopus* Dyar and Knab so that its synonym, *Cx. cedecei,* was automatically transferred to synonymy under *Cx. taeniopus.* Recently, Weaver et al. (1986), as the result of isoenzyme and cross-mating experiments, have concluded that *Cx. cedecei* is indeed a distinct, incipient species.

Culex (Culex) stigmatosoma *Dyar*: This species had been called *Cx. peus* Speiser before Strickman (1988a) discovered that the holotype of *Cx. peus* is conspecific with *Cx. thriambus* Dyar. With the realization that *Cx. peus* was not a valid name for this species, the next available name was *Cx. stigmatosoma,* by which it was known in older literature (e.g., Dyar 1928).

Culex (Culex) peus *Speiser*: This is now the valid name for the species which was formerly known as *Cx. thriambus* Dyar, because Strickman (loc. cit.) found that the holotype of *Cx. peus* is identical to that of *Cx. thriambus.* He has described the holotype in detail. In order to assist in the use of the keys in Darsie and Ward (1981), Strickman (l988b) has provided a necessary couplet and name changes, as well as an illustration of the salient adult female character, to distinguish *Cx. peus* from *Cx. stigmatosoma.*

The name *Cx. thriambus* has been used in the literature related to mosquitoes of the western United States for 67 years (1921–88). Eldridge and Harbach (1989) believe that there is good reason to preserve the name *thriambus.* They are proposing to suppress the name *peus* under the plenary powers of the International Commission of Zoological Nomenclature.

Culex (Culex) pipiens *Linnaeus*: Important studies on *Cx. pipiens* by Harbach et al. (1984, 1985) have resulted in neotype designations for *Cx. pipiens* and *Cx. molestus* Forskål. A thorough investigation of the latter, a physiological and behaviorial variant, concluded that the name *molestus* has no taxonomic validity. It has been applied to populations which exhibit autogeny, stenogamy and anthropophily. Brodgon (1984) has determined that characters of the siphon can be used to distinguish larvae of the 2 taxa, *Cx. pipiens* and *Cx. quinquefasciatus* Say.

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