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201

CULICIDAE (pp. 417-454)

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Introduction

The Culicidae are one of the most readily recognized families of nematocerous Diptera. Adults are distinguished from those of the closely related Dixidae and Chaoboridae by the prolongation of the mouthparts into a proboscis and presence of scales on the veins of the wings. The pupae have the respiratory trumpet open at the tip and the spiracular opening at its base. In the larva, the 3 segments of the thorax are fused, and the antennae are not prehensile.

Immature stages occur in a wide variety of aquatic habitats ranging from fresh to brackish water, still to running water, permanent to temporary bodies of water, specialized habitats (crab holes, rock holes) and container habitats (leaf axils, treeholes, tin cans, tires, etc.). Most adult females require one or more blood meals to complete the ovarian cycle.

The Neotropical region is known for the highest level of endemicity among both mosquito genera and subgenera (Table 1). Of the 37 recognized genera, 10 or 27% are restricted to the neotropics [*Chagasia, Galindomyia, Haemagogus* (the presence of *Hg. equinus* Theobald in Texas, U.S.A. is apparently due to a recent introduction), *Johnbelkinia, Limatus, Phoniomyia, Runchomyia, Sabethes, Shannoniana* and *Trichoprosopon*]. The same percentage of 135 subgenera (27.4%) are confined to the Neotropical region.

Belkin et al. (1965, 1967) furnish information on the collection, rearing and preservation of mosquitoes for systematic studies. Gerberg (1970) gives general procedures for laboratory colonization of many species. Specialized techniques for *Deinocerites* are in Galindo (1967).

The National Museum of Natural History (NMNH), Smithsonian Institution, Washington, D.C., contains the most important material for systematic study of the subject area. In addition to the older material cited by Howard, Dyar and Knab (1913-17) and Dyar (1928), the Smithsonian Institution now contains the John N. Belkin collection. This collectionwas assembled during 1963-80 at the University of California, Los Angeles, with grant and contract support from U.S. federal agencies and the collaboration of many cooperating scientists.

The Belkin collection contains more than 400,000 specimens from all areas of Middle America and many portions of South America. An important feature of this collection is that it contains more than 100,000 slides of larval and/or pupal exuviae, half of which have associated adults. Tentative identifications of this material are contained in the published collection records for the project "Mosquitoes of Middle America" which appeared in *Mosquito Systematics* from 1973-78 in the following papers: Belkin and Heinemann 1973 - Dominican Republic; 1975a - Puerto Rico, Virgin Islands; 1975b - Bahamas, Caymans, Cuba, Haiti, Lesser Antilles; 1976a - Leeward Islands; 1976b - French West Indies; 1976c - Southern Lesser Antilles: Heinemann and Belkin 1977a - Costa Rica; 1977b - Belize, Guatemala, El Salvador, Honduras, Nicaragua; 1977c - Mexico; 1978 - Panama.

Many of the specimens collected by L.E. Rozeboom, H.W. Kumm and other investigators at Johns Hopkins University are housed in the School of Hygiene and Public Health, Johns Hopkins University, Baltimore, Maryland. In other portions of the Americas, important collection are at the Instituto de Salubridad y Enfermedades Tropicales, Mexico, D.F., the Universidad de Mexico, the Universidad del Valle de Guatemala, Guatemala City and the Gorgas Memorial Laboratory, Panama City. The location of type-material in European museums is discussed by Belkin (1968). Belkin, Schick and Heinemann (1965) give an annotated list of species originally described from Middle America and mention the institutions where their types are deposited.

General references in bionomics, morphology and medical importance include Forattini (1962, 1965a, 1965b), Harbach and Knight (1980) and Horsfall (1955). Bibliographic information may be found in Breeland (1980), Bright and Hogue (1972) and Travis and Labadan (1967). Older reviews on zoogeograhy are by Lane (1949a) and Ross (1964). The world mosquito catalog (Knight and Stone 1977) with its supplement (Knight 1978) are indispensable references for any worker in this area.

The most comprehensive keys to the genera are included in the illustrated world keys by Mattingly (1971 or 1973) that include adults, pupae and 4th stage larvae. These keys should be used in conjunction with Zavortink (1979) which has similar keys for the recently segregated trichoprosopon genera. Brief keys to adult females and 4th stage larvae were prepared by Vargas (1972, 1974). Certain first stage larvae may be identified in keys prepared by Dodge (1966).

Keys for the identification of anophelines occur in several older papers: Forattini (1961) - adults, male genitalia, larvae; Stojanovich, Gorham and Scott (1966) - adult females and larvae of Central America; Vargas (1959) - adult males, (1963) - adult females and larvae.

Recent reviews of the Neotropical fauna have largely been published in the "Contributions of the American Entomological Institute." These monographs are essential for any serious study of the mosquitoes of this area as species are described from type and topotypic specimens whenever possible, life stages are described in detail and are illustrated on full page plates. The systematic and biological literature is analyzed and distributions are tabulated and shown on outline maps. The published revisions are listed in Table 2.

Table 1. Degree of endemicity of Culicidae genera and subgenera in zoogeographic regions.

Region	No. restricted genera/ Total no. genera	Percent	No. restricted genera/ Total no. subgenera	Percent
Australian	3/37	8.1	18/135	13.3
Ethiopian	1/37	2.7	7/135	5.2
Nearctic	0/37	0	1/135	0.7
Oriental	2/37	5.4	16/135	11.9
Palaearctic	0/37	0	1/135	0.7
Neotropical	10/37	27.0	37/135	27.4

Table 2. List of modern taxonomic revisions of Neotropical culicid taxa.

Anopheles (Anopheles) treehole species - Zavortink 1970
Anopheles (Anopheles) crucians subgroup - Floore, Harrison and Eldridge 1976
Anopheles (Nyssorhynchus) albimanus section - Faran 1980
Anopheles (Kerteszia) - Zavortink 1973
Aedes (Howardina) - Berlin 1969a
Aedes (Ochlerotatus) scapularis group - Arnell 1976
Aedes (Ochlerotatus) varipalpus group - Arnell and Nielsen 1972
Aedes (Finlaya) terrens group (now in subgenus *Protomacleaya*) - Schick 1970
Aedes (Aztecaedes and *Protomacleaya)* - Zavortink 1972
Culex (Aedinus, Tinolestes and *Anoedioporpa)* - Berlin and Belkin - 1980
Culex (Carrollia) - Valencia 1973
Culex (Micraedes) - Berlin 1969b
Deinocerites - Adames 1971, Belkin and Hogue 1959
Haemagogus - Arnell 1973
Orthopodomyia - Zavortink 1968
Psorophora pupae - Barr and Barr 1969
Trichoprosopon s.l. reclassification - Zavortink 1979

There are many older publications which are still useful for this area. However, the descriptions are incomplete by modern standards and the nomenclature should be verified in the Knight and Stone (1977) catalog and its supplement (Knight 1978).

The earlier general works attempted to cover the entire fauna (Howard, Dyar and Knabb 1913-17, Dyar 1928, Lane 1953). Anophelines are reviewed by Aitken (1945), Aragão (1964), Komp (1941a, 1942), Lane (1949b) and Senior White (1950). Vargas (1952) discussed the synonymy of *Culex* species. Other useful references for *Culex* are: Bram 1967 (subgenus *Culex*), Foote 1954 (immatures of subgenus *Melanoconion*), Rozeboom and Komp 1950 (male genitalia of *Melanoconion*). *Mansonia* s.l. was briefly treated by Pratt (1953) and Ronderos and Bachmann (1963). Lane and Cerqueira (1942) reviewed the sabethines (*Trichoprosopon* s.l., *Wyeomyia, Phoniomyia, Limatus* and *Sabethes*). The genus *Uranotaenia* was last treated by Galindo, Blanton and Peyton (1954). Vargas (1953a) furnished brief descriptions and keys for *Toxorhynchites*.

Several recent papers of more limited geographic coverage include: Galindo (1957), Galindo and Trapido (1956) - *Haemagogus;* Galindo (1958) - *Sabethes;* Aitken and Galindo (1966), Belkin (1969, 1970b), Sirivanakarn (1978), Sirivanakarn and Belkin (1980) - subgenus *Melanoconion* of *Culex*.

The remaining portion of this review mentions more limited taxonomic references on a country-by-country basis.

Mexico. Papers that enumerate or briefly describe mosquitoes of states or geographic areas include: Aitken (1942), Brookman and Reeves (1953), Cheng and Hogue (1974) - Baja California; de Buen de Biagi (1953) - Puebla; Díaz Nájera (1963) - Veracruz; Díaz Nájera (1966a) -Chiapas, Oaxaca and Veracruz; Díaz Nájera and Vargas (1973), Eads (1963), Vargas (1956b) - general culicine distribution; Eads and Campos (1963) - Tamaulipas and San Luis Potosi; García-Aldrete and Pletsch (1976) - Guerrero; Pletsch (1977) - Quintana Roo; Vargas (1960) - Sonora (includes keys to all species except *Culex*).

Handbooks containing keys or annotated checklists of Mexican anophelines include: Vargas (1958, 1976), Vargas and Martínez Palacios (1956). Shorter papers on *Anopheles* include: Downes (1950), Martínez Palacios and Vargas (1952), Pletsch (1979), Vargas (1953b, 1979a, 1979b), Vargas and Martínez Palacios (1953c, 1955).

The distribution and ecology of *Aedes aegypti* (Linnaeus) are discussed by Díaz Nájera (1967) and World Health Organization (1970). Other studies on *Aedes* are: Berlin (1975), Díaz Nájera (1966b), McDonald (1957a, 1957b), O'Meara and Craig (1970), Vargas and Downes (1950). *Culex* papers include: Berlin (1974), Martínez Palacios (1950, 1952a, 1952b), Vargas and Martínez Palacios (1954). *Haemagogus* is treated in Díaz Nájera (1960, 1971), Vargas and Díaz Nájera (1959b), Vargas and Martínez Palacios (1953a).

Other genera are treated as follows: *Mansonia* - Díaz Nájera (1965); *Orthopodomyia* - de Buen (1953a); *Psorophora* - Díaz Nájera (1965), Lassmann (1951), Vargas (1956a); *Sabethes* - Vargas and Díaz Nájera (1959a, 1961); *Shannoniana* - Díaz Nájera (1961); *Wyeomyia* - de Buen (1953b), Vargas and Martínez Palacios (1953b).

The books of Carpenter and LaCasse (1955) and Darsie and Ward (1981) are useful for identifying material collected adjacent to the border of the U.S.A.

Guatemala. De Rodaniche and Galindo (1956) and Sudia et al. (1971) listed the mosquitoes collected during studies on yellow fever and Venezuelan equine encephalitis, respectively. The distribution of several *Anopheles* species are discussed by Brennan (1951) and Komp (1940, 1941b). Belkin and Heinemann (1971) give a first country record for *Aedes vexans* (Meigen).

Belize. Notes on 65 species are given by Bertram (1971). Papers mentioning or describing other species include: Belkin (1977b) - *Aedes;* Galindo and Trapido (1967) - *Haemagogus;* Komp (1940, 1941b) - *Anopheles*.

Honduras. Trapido and Galindo (1955) and de Rodaniche (1956) cite 33 species collected in the forest canopy during yellow fever investigations. A new *Culex* was described by Galindo and Blanton (1954), and Komp (1941b) noted the presence of *Anopheles darlingi* Root, a potential vector of malaria.

El Salvador. Kumm and Zuñiga (1942) recorded 52 species from this country. The results of small light trap collections were presented by Wilton (1975). Other recent publications are: Darsie, Merino and Wilton (1977) - *Anopheles;* Duret (1971a) - *Psorophora;* O'Meara and Craig (1970) - *Aedes*.

Nicaragua. Lists of species have been compiled by Galindo and Trapido (1957) and Woke (1947). Duret (1971b) described a new *Haemagogus* which was later synonomyzed by Arnell (1973).

Costa Rica. Kumm, Komp and Ruiz (1940) listed 93 species and presented adult keys to identify all species except *Culex*. V.M. Vargas (1956) listed 18 species of *Anopheles* and later (1975) published keys to the adult females of this genus. Additional papers on Costa Rican mosquitoes include: Adames and Hogue (1969) - *Deinocerites;* Duret (1971a) - *Wyeomyia;* Galindo, Carpenter and Trapido (1951c) - *Haemagogus;* Galindo and Trapido (1955) - list of forest canopy species; Hogue (1975) - *Culex;* Kumm and Komp (1941), O'Meara and Craig (1970), World Health Organization (1971) - *Aedes*.

Panama. The mosquitoes of Panama are better known than those of any other Central American nation due to the disease vector problems associated with the construction of the Panama Canal and the continuous program of entomological activities of the Gorgas Memorial Laboratory for more than 50 years.

General publications on Panamanian mosquitoes include: Arnett (1947-50), Carpenter, Galindo and Trapido (1952), Carpenter and Peyton (1952), Fairchild (1943), Galindo, Carpenter and Trapido (1949, 1951a, 1955), Galindo, Trapido and Carpenter (1950),

Peyton, Galindo and Blanton (1955), Trapido and Galindo (1957), Trapido, Galindo and Carpenter (1955). Most of the above papers are ecological in nature as they were prepared in conjunction with studies on the ecology of yellow fever virus.

Publications relating to the various genera include:

Anopheles - Baerg and Boreham (1974a), Blanton and Peyton (1956), Boreham and Baerg (1974), Galindo (1946).
Chagasia - Baerg and Boreham (1974b), Blanton and Peyton (1956).
Aedomyia - Blanton and Peyton (1957).
Aedes - Blanton and Peyton (1958).
Culex - Galindo and Blanton (1955) provide an annotated list of 88 species. The majority of the remaining papers concern species of the subgenus *Melanoconion* due to their role as vectors of arboviruses. These include: Duret (1968), Galindo (1969), Galindo and Blanton (1954), Galindo and Mendez (1961), Komp and Rozeboom (1951), Sirivanakarn and Belkin (1980), Sirivanakarn and Galindo (1980), Sirivanakarn and Heinemann (1980), Tempelis and Galindo (1975).
Deinocerites - Tempelis and Galindo (1970).
Haemagogus - Díaz Nájera (1971), Galindo, Carpenter and Trapido (1952).
Mansonia - Boreham (1970), Carpenter (1952).
Sabethes - Duret (1971a), Galindo, Carpenter and Trapido (1951b).
Uranotaenia - Galindo, Blanton and Peyton (1954).

The literature on the mosquitoes of the **West Indies** is rather scattered and many papers have had a very limited distribution. Consequently, they may only be encountered in the files of larger museums.

The monograph on mosquitoes of Jamaica by Belkin, Heinemann and Page (1970) is the most useful publication for the West Indies. Although it is limited to a single country, many of the keys, descriptions and illustrations can be used to identify species occurring on other islands. With the exception of the previously cited collection records of the Mosquitoes of Middle America project (Belkin and Heinemann 1973-76) and papers by Porter (1957), Charles and Senevet (1953) and Van der Kuyp (1953b, 1954), the publications mentioned below all pertain to a single island.

Cuba. Recent publications from this island include: de la Torre y Callejas et al. (1961) - keys to 45 species; Duret (1967) - a new species of *Culex;* García Avila (1977) - review of 58 species; Gutsevich and García Avila (1969) - new species records; Montchadsky and García Avila (1966) - larval keys to 52 species; Perez Vigueras (1948) - new country records, (1956) - natural history and medical importance of Culicidae.

Bahamas. Branch and Seabrook (1959) described a new *Culex*, while further information on *Aedes albonatatus* (Coquillett) was presented by Spilman and Weyer (1965).

Jamaica. The excellent monograph of Belkin, Heinemann and Page (1970), covering 66 species in great detail, has been previously mentioned. Page (1967) discussed the biology of 18 man-biting species and Thompson (1956) described a new *Aedes*.

Dominican Republic and Haiti. Belkin and Heinemann (1972) listed 53 species for the island of Hispaniola. Information on the type-locality of *Wyeomyia* species was prepared by Belkin (1970a).

Puerto Rico. Species lists are found in Capriles and Navarro (1967), Fox (1958) and Fox and Capriles (1953). Mosquitoes of Mona Island are cited in Maldonado-Capriles et al. (1958). *Culex* species are briefly discussed by Fox (1953) and Pratt and Seabrook (1952).

Virgin Islands. Checklists have been prepared by Flemings and Walsh (1966) and Miskimen and Bond (1970).

Antigua. Edwards and Box (1940) listed 15 species from the islands.

Guadeloupe. Distribution records are cited by Fauran (1963, 1964) and Fauran and Courmes (1966, 1967). Floch and Abonnenc (1945a) discussed the genus *Anopheles* and the culicine genera (1945b).

Dominica. Stone (1969) gave an annotated listing of 22 species.

Martinique. Notes on 22 species and a larval key are in Fize (1976).

Barbados. Rozeboom (1953) recorded the presence of *Anopheles albimanus*.

Grenada. Belkin (1977a) described a new *Toxorhynchites*, and Komp and Rozeboom (1951) found a new species of *Culex (Melanoconion)*.

Netherlands Antilles. Van der Kuyp (1949a, 1949b, 1953a, 1953b, 1954) discussed the biology, identification and medical importance of mosquitoes from the islands of Curaçao, Aruba, Bonaire, St. Maarten, Saba and St. Eustatius.

This literature review was facilitated through the use of libraries at the Walter Reed Army Institute of Research and the Smithsonian Institution in conjunction with the extensive mosquito literature files at the Medical Entomology Project of the latter organization and the Systematic Entomology Laboratory, U.S. Department of Agriculture. Additional references were kindly provided by Richard F. Darsie, Jr., Public Health Service; Jeffrey K. Brown, Defense Pest Management Information Analysis Center and Lcdo. M.V. De Las Casas, Director of the Biomedical Library, Gorgas Memorial Laboratory. The manuscript was kindly typed by Gale Munro of the Medical Entomology Project.

Los Culicidae es una de las familias de los dípteros nematóceros de identificación más fácil. Los adultos se distinguen de sus parientes más cercanos, los Dixidae y Chaoboridae, por la prolongación de sus partes bucales en una proboscis, y por la presencia de escamas sobre las venas de las alas. Las pupas tienen la trompeta respiratoria abierta en el extremo y en su base está la abertura espiracular. En la larva los 3 segmentos del torax son fusionados y las antenas no son prénsiles.

Los estados inmaduros ocurren en una amplia variedad de habitats que van desde el agua dulce hasta las aguas salobres. Habitan en las aguas corrientes, en los cuerpos de agua tanto permanentes como temporales, en los habitats especializados (agujeros de cangrejo, cavidades en las rocas) y habitats de pequeños depósitos de agua (axilas de las hojas, huecos de los árboles, latas vacías, llantas viejas, etc.). La mayoría de las hembras adultas, necesitan una comida de sangre o más para completar su ciclo ovárico.

La Región Neotropical se conoce como el área de más alto nivel de endemismo de los géneros y subgéneros de mosquitos (Table 1). De los 37 géneros reconocidos, 10 (ó 27%) están restringidos a los neotrópicos [*Chagasia, Galindomyia, Haemagogus* (la presencia de *H. equinus* Theobald, en Texas, USA, aparentemente se debe a una introducción reciente), *Johnbelkinia, Limatus, Phoniomyia, Runchomyia, Sabethes, Shannoniana* y *Trichoprosopon*]. El mismo porcentaje de los 135 subgéneros (27.4%) está confinado a la Región Neotropical.

Belkin et al. (1965, 1967) proporcionó información sobre la colecta, cultivo y preservación de mosquitos para estudios taxonómicos. Gerberg (1970) dá técnicas generales para cultivo en el laboratorio, de muchas especies. Las técnicas especializadas para *Deinocerites* se encuentran en Galindo (1967).

El National Museum of Natural History (NMNH), Smithsonian Institution, Washington, D.C., contiene el material más importante para el estudio sistemático de mosquitos en el área que nos ocupa. Además del material más antiguo citado por Howard, Dyar y Knab (1913-17) y Dyar (1928), la Smithsonian Institution contiene ahora la colección de John N. Belkin. Esta colección fue reunida durante 1963-1980, en la Universidad de California, Los Angeles, con el apoyo de agencias federales de los Estados Unidos y la colaboración de muchos científicos que cooperaron en esta tarea.

La colección Belkin contiene más de 400,000 ejemplares de todas las áreas de Mesoamérica y muchas porciones de Sudamérica. Un aspecto importante de esta coleción es que contiene más de 100,000 preparaciones microscópicas de las cuales la mitad esta asociada con sus adultos correspondientes. Las identificaciones tentativas de este material están contenidas en los registros de colecta publicados para el proyecto "Mosquitoes of Middle America" que aparecieron en *Mosquito Systematics* desde 1973-78 en los siguientes trabajos: Belkin y Heinemann 1973 - República Dominicana; 1975a - Puerto Rico, Virgin Islands; 1975b - Bahamas, Islas Caimán, Cuba, Haití, Pequeñas Antillas; 1976a - Islas de Sotavento; 1976b - Antillas Francesas; 1976c - Pequeñas Antillas Sur: Heinemann y Belkin 1977a - Costa Rica; 1977b - Belize, Guatemala, El Salvador, Honduras, Nicaragua; 1977c - México; 1978 - Panamá.

Muchos de los ejemplares colectados por L.E. Rozeboom, H.W. Kumm y otros investigadores en la Universidad de Johns Hopkins están depósitados en la Escuela de Higiene y Salud Pública, de la Universidad de Johns Hopkins, Baltimore, Maryland. En otras partes de las Américas, las colecciones importantes están en el Instituto de Salubridad y Enfermedades Tropicales, México, D.F., en la Universidad Nacional Autónoma de México; en la Universidad del Valle de Guatemala, Ciudad de Guatemala y en el Gorgas Memorial Laboratory, cuidad de Panamá. La ubicación del material-tipo en los museos europeos es discutida por Belkin (1968). Belkin, Schick y Heinemann (1965) dieron una lista comentada de especies descritas originalmente de Mesoamérica y mencionan las instituciones donde quedaron depositados los tipos.

Las referencias generales sobre bionomía, morfología e importancia médica incluyen Forattini (1962, 1965a, 1965b), Harbach y Knight (1980) y Horsfall (1955). La información bibliográfica se puede encontrar en Breeland (1980), Bright y Hogue (1972) y Travis y Labadan (1967). Las revisiones antiguas sobre zoogeografía corresponden a Lane (1949a) y Ross (1964). El catálogo mundial de mosquitos (Knight y Stone 1977) con su suplemento (Knight 1978) son referencias indispensables para cualquier investigador en esta área.

Las claves más completas para los géneros se encuentran en las claves ilustradas del mundo de Mattingly (1971 ó 1973) que tratan adultos, pupas y el 4° estado larvario. Estas claves deben ser usadas junto con las de Zavortink (1979) que dió claves similares para los géneros del grupo tricoprosopon recién separados. Unas claves breves para las hembras adultas y el 4° estado de larvas, fueron preparadas por Vargas (1972, 1974). Ciertas larvas en su primer estado pueden ser identificadas en las claves preparadas por Dodge (1966).

Las claves para la identificación de anofelinos se encuentran en varias publicaciones antiguas: Forattini (1961) - adultos, genitalia del macho, larvas; Stojanovich, Gorham y Scott (1966) - hembras adultas y larvas de Centroamérica; Vargas (1959) - machos adultos, (1963) - hembras adultas y larvas.

Las revisiones recientes de la fauna neotropical han sido principalmente publicadas en "Contributions of the American Entomological Institute." Estas monografías son imprescindibles para cualquier estudio serio de los mosquitos de esta área, ya que las especies están descritas a partir de los ejemplares tipos y topotipos hasta donde fue posible, los ciclos biológicos están descritos en detalle y quedaron ilustrados en planas completas. La literatura sistemática y biológica es analizada y la distribución quedó dispuesta en tablas sinópticas y en mapas. Las revisiones publicadas se enlistan en la Table 2.

Hay muchas publicaciones antiguas que todavía son útiles para esta área; sin embargo, las descripciones son incompletas dentro de las normas actuales y la nomenclatura tendría que ser verificada en el catálogo de Knight y Stone (1977) y su suplemento (Knight 1978).

Los antiguos trabajos generales intentaron cubrir la fauna completa (Howard, Dyar y Knab 1913-17, Dyar 1928, Lane 1953). Los anofelinos fueron revisados por Aitken (1945), Aragão (1964), Komp (1941a, 1942), Lane (1949b) y Senior White (1950). Vargas (1952) discutió la sinonimía de las especies de *Culex*. Otras referencias útiles para *Culex* son: Bram 1967 (subgénero *Culex*), Foote 1954 (inmaduros del subgénero *Melanoconion*), Rozeboom y Komp 1950 (genitalia del macho de *Melanoconion*). *Mansonia* s.l. fue tratado brevemente por Pratt (1953) y Ronderos y Bachmann (1963). Lane y Cerqueira (1942) revisaron los sabetinos (*Trichoprosopon* s.l., *Wyeomyia*, *Phoniomyia*, *Limatus* y *Sabethes*). El género *Uranotaenia* fue mas recientemente tratado por Galindo, Blanton y Peyton (1954). Vargas (1953a) ofreció descripciones breves y claves para *Toxorhynchites*.

Varios trabajos recientes de cobertura geográfica más limitada incluyen: Galindo (1957), Galindo y Trapido (1956) - *Haemagogus;* Galindo (1958) - *Sabethes;* Aitken y Galindo (1966), Belkin (1969, 1970b), Sirivanakarn (1978), Sirivanakarn y Belkin (1980) - subgénero *Melanoconion* de *Culex*.

En la parte final de esta reseña, se enlistan por país los trabajos de ámbito taxonómico más limitado.

Mexico. Trabajos que enumeran o describen brevemente los mosquitos de los estados o áreas geográficas incluyen: Aitken (1942), Brookman y Reeves (1953), Cheng y Hogue (1974) - Baja California; de Buen de Biagi (1953) - Puebla; Díaz Nájera (1963) - Veracruz; Díaz Nájera (1966a) -Chiapas, Oaxaca y Veracruz; Díaz Nájera y Vargas (1973), Eads (1963), Vargas (1956b) - distribución general de los Culicinae; Eads y Campos (1963) - Tamaulipas y San Luis Potosi; García-Aldrete y Pletsch (1976) - Guerrero; Pletsch (1977) - Quintana Roo; Vargas (1960) - Sonora (incluye claves para todas las especies, excepto de *Culex*).

Manuales conteniendo claves y listas comentadas de anofelinos mexicanos incluyen: Vargas (1958, 1976), Vargas y Martínez Palacios (1956). Entre los trabajos más cortos sobre *Anopheles* son: Downes (1950), Martínez Palacios y Vargas (1952), Pletsch (1979), Vargas (1953b, 1979a, 1979b), Vargas y Martínez Palacios (1953c, 1955).

La distribución y ecología de *Aedes aegypti* (Linnaeus) fueron discutidas por Díaz Nájera (1967) y la Organización Mundial para la Salud (W.H.O., 1970). Otras estudios sobre las especies de *Aedes* son: Berlin (1975), Díaz Nájera (1966b), McDonald (1957a, 1957b), O'Meara y Craig (1970), Vargas y Downes (1950). Los trabajos sobre *Culex* incluyen: Berlin (1974), Martínez Palacios (1950, 1952a, 1952b), Vargas y Martínez Palacios (1954). *Haemagogus* es tratado en Díaz Nájera (1960, 1971), Vargas y Díaz Nájera (1959b), Vargas y Martínez Palacios (1953a).

Otros géneros se tratan en: *Mansonia* - Díaz Nájera (1965); *Orthopodomyia* - de Buen (1953a); *Psorophora* - Díaz Nájera (1965), Lassmann (1951), Vargas (1956a); *Sabethes* - Vargas y Díaz Nájera (1959a, 1961); *Shannoniana* - Díaz Nájera (1961); *Wyeomyia* - de Buen (1953b), Vargas y Martínez Palacios (1953b).

Los libros de Carpenter y LaCasse (1955) y Darsie y Ward (1981) son útiles para la identificación del material colectado en las áreas adyacentes a la frontera con los Estados Unidos.

Guatemala. De Rodaniche y Galindo (1956) y Sudia et al. (1971) enlistaron los mosquitos colectados durante estudios sobre la fiebre amarilla y la encefalitis equina venezolana, respectivamente. La distribución de varias especies de *Anopheles* es discutida por Brennan (1951) y Komp (1940, 1941b). Belkin y Heinemann (1971) dan el primer registro de *Aedes vexans* (Meigen) en este país.

Belize. Bertram (1971) proporcionó apuntes sobre 65 especies. Los trabajos que mencionan o describen otras especies incluyen: Belkin (1977b) - *Aedes;* Galindo y Trapido (1967) - *Haemagogus;* Komp (1940, 1941b) - *Anopheles*.

Honduras. Trapido y Galindo (1955) y de Rodaniche (1956) citan 33 especies colectadas en el dosel de la selva durante las investigaciones sobre la fiebre amarilla. Galindo y Blanton (1954) describieron una nueva especie de *Culex*, y Komp (1941b) dió a conocer la presencia de *Anopheles darlingi* Root, un vector potencial de la malaria.

El Salvador. Kumm y Zuniga (1942) registraron 52 especies de este país. Los resultados de pequeñas colectas con la trampa-luz fueron presentados por Wilton (1975). Otras publicaciones recientes son: Darsie, Marino y Wilton (1977) - *Anopheles;* Duret (1971a) - *Psorophora;* O'Meara y Craig (1970) - *Aedes*.

Nicaragua. Listas de especies han sido compiladas por Galindo y Trapido (1957) y Woke (1947). Duret (1971b) describió una nueva *Haemagogus* que más tarde fue puesta en sinonimía por Arnell (1973).

Costa Rica. Kumm, Komp y Ruíz (1940) enlistaron 93 especies y presentaron claves para los adultos de todas las especies, excepto las de *Culex*. V.M. Vargas (1956) enlistó 18 especies de *Anopheles* y después (1975) publicó claves para las hembras adultas de este género. Unos trabajos adicionales sobre los mosquitos de Costa Rica incluyen: Adames y Hogue (1969) - *Deinocerites;* Duret (1971a) - *Wyeomyia;* Galindo, Carpenter y Trapido (1951c) - *Haemagogus;* Galindo y Trapido (1955) - lista de especies del dosel de la selva; Hogue (1975) - *Culex;* Kumm y Komp (1941), O'Meara y Craig (1970), Organización de la Salud Mundial (W.H.O. 1971) - *Aedes*.

Panama. Los mosquitos de Panamá son mejor conocidos que los de cualquier otro país centroamericano debido a los problemas sobre vectores de enfermedades asociadas con la construcción del canal de Panamá y al programa de actividades entomológicas del Gorgas Memorial Laboratory que ha continuado por más de 50 años.

Las publicaciones generales sobre los mosquitos panameños incluyen: Arnett (1947-50), Carpenter, Galindo y Trapido (1952), Carpenter y Peyton (1952), Fairchild (1943), Galindo, Carpenter y Trapido (1949, 1951a, 1955), Galindo, Trapido y Carpenter (1950), Peyton, Galindo y Blanton (1955), Trapido y Galindo (1957), Trapido, Galindo y Carpenter (1955). La mayoría de los trabajos antes mencionados son de naturaleza ecológica ya que fueron preparados en relación con estudios sobre la ecología del virus de la fiebre amarilla.

Las publicaciones con relación a los diversos géneros, incluyen:

Anopheles - Baerg y Boreham (1974a), Blanton y Peyton (1956), Boreham y Baerg (1974), Galindo (1946).
Chagasia - Baerg y Boreham (1974b), Blanton y Peyton (1956).
Aedomyia - Blanton y Peyton (1957).
Aedes - Blanton y Peyton (1958).
Culex - Galindo y Blanton (1955) dan una lista comentada de 88 especies. La mayoría de los trabajos se refiere a las especies del subgénero *Melanoconion* debido a su papel como vectores de los arbovirus. Estos incluyen: Duret (1968), Galindo (1969), Galindo y Blanton (1954), Galindo y Mendez (1961), Komp y Rozeboom (1951), Sirivanakarn y Belkin (1980), Sirivanakarn y Galindo (1980), Sirivanakarn y Heinemann (1980), Tempelis y Galindo (1975).
Deinocerites - Tempelis y Galindo (1970).
Haemagogus - Díaz Nájera (1971), Galindo, Carpenter y Trapido (1952).
Mansonia - Boreham (1970), Carpenter (1952).
Sabethes - Duret (1971a), Galindo, Carpenter y Trapido (1951b).
Uranotaenia - Galindo, Blanton y Peyton (1954).

La literatura sobre los moquitos de las **Indias Occidentales** es más bien dispersa y muchos trabajos han tenido una distribución muy limitada. Consecuentemente, ellos pueden ser hallados sólo en los ficheros de museos mas grandes.

La monografía sobre los mosquitos de Jamaica por Belkin, Heinemann y Page (1970) es la publicación más útil para las Antillas. Aunque está limitada a un solo país, muchas de sus claves, descripciones e ilustracions se pueden usar para identificar las especies que ocurren en otras islas. Con excepción de los registros de colecta previamente citados del proyecto sobre los Mosquitos de Mesoamérica (Belkin y Heinemann 1973-76) y los trabajos de Porter (1957), Charles y Senevet (1953) y Van der Kuyp (1953b, 1954), cada una de las publicaciones mencionadas abajo se refiere a una sola isla.

Cuba. Las publicaciones recientes con respecto a esta isla incluyen: de la Torre y Callejas et al. (1961) - claves para 45 especies; Duret (1967) - una nueva especie de *Culex;* García Avila (1977) - revisión de 58 especies; Gutsevich y García Avila (1969) - registros nuevos de especies; Montchadsky y García Avila (1966) - claves de larvas para 52 especies; Pérez Vigueras (1948) - nuevos registros para el país, (1956) historia natural e importancia médica de los Culicidae.

Bahamas. Branch y Seabrook (1959) describieron una nueva especie de *Culex*, en tanto que Spilman y Weyer (1965), presentaron una información adicional sobre *Aedes albonatatus* (Coquillett).

Jamaica. La excelente monografía de Belkin, Heinemann y Page (1970), que cubre 66 especies con gran detalle, ha sido mencionada previamente. Page (1967) discutió la biología de 18 especies que pican al hombre y Thompson (1956) describió una especie nueva de *Aedes*.

Republica Dominicana y Haiti. Belkin y Heinemann (1972) enlistaron 53 especies para la isla de Hispaniola. La información con respecto a la localidad tipo de las especies de *Wyeomyia* fue preparada por Belkin (1970a).

Puerto Rico. Las listas de especies se encuentran en Capriles y Navarro (1967), Fox (1958) y Fox y Capriles (1953). Los mosquitos de ls Isla de la Mona están citados en Maldonado-Capriles et al. (1958). Las especies de *Culex* son brevemente discutidas por Fox (1953) y Pratt y Seabrook (1952).

Islas Virgenes. Las listas de especies han sido preparadas por Flemings y Walsh (1966) y Miskimen y Bond (1970).

Antigua. Edwards y Box (1940) enlistaron unas 15 especies de la isla.

Guadalupe. Los registros de distribución están citados por Fauran (1963, 1964) y Fauran y Courmes (1966, 1967). Floch y Abonnenc (1945a) discutieron el género *Anopheles* y los géneros de los culicinos (1945b).

Dominica. Stone (1969) dió una lista comentada de 22 especies.

Martinique. Notas sobre 22 especies y una clave para larvas aparecen en Fize (1976).

Barbados. Rozeboom (1953) informó sobre la presencia de *Anopheles albimanus*.

Granada. Belkin (1977a) describió un nuevo *Toxorhynchites*, y Komp y Rozeboom (1951) encontraron una nueva especie de *Culex (Melanoconion)*.

Antillas Holandesas. Van der Kuyp (1949a, 1949b, 1953a, 1953b, 1954) discutió la biología, identificación e importancia médica de los mosquitos de las islas de Curaçao, Aruba, Bonaire, St. Maarten, Saba y St. Eustatius.

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