

# REVISION OF DARSIE AND WARD (1981) TO INCLUDE *OCHLEROTATUS JAPONICUS* THEOBALD AND A CHECKLIST OF SPECIES REFERRED TO THE GENUS *OCHLEROTATUS* IN THE NEARCTIC REGION

RICHARD F. DARSIE, JR.

Florida Medical Entomology Laboratory, 200 9th Street, SE, Vero Beach, FL 32962

**ABSTRACT.** Breeding populations of *Ochlerotatus japonicus japonicus*, 1st detected in 1998, are now found in several states in the United States. To be able to identify this mosquito with the keys to the mosquitoes of North America north of Mexico, changes are proposed, especially dealing with the new genus *Ochlerotatus*. Also, a checklist of the genera *Ochlerotatus* and *Aedes* in the Nearctic Region is given.

**KEY WORDS** *Ochlerotatus japonicus*, North America, identification

## INTRODUCTION

Recent articles by Peyton et al. (1999), Harrison (1999), Romanowski et al. (1999), Fonseca et al. (2001), Scott et al. (1999), Andreadis et al. (2001), and Crans (1999) have reported the presence of breeding populations of *Ochlerotatus (Finlaya) japonicus japonicus* (Theobald) in New Jersey, New York, Connecticut, Pennsylvania, Ohio, and Maryland. This introduces the problem of the identification of this mosquito and separation from the previously recorded Nearctic fauna, the subject of this note.

Darsie and Ward (1981) published revised keys to the adult females and 4th-stage larvae of mosquitoes of the Nearctic Region north of Mexico. With the information that follows, *Oc. j. japonicus* can be identified with the same keys by adding suggested inserts. Descriptions of *Oc. j. japonicus* (as *Aedes j. japonicus*) by Tanaka et al. (1979) and

adult females and 4th-stage larvae collected in Connecticut by T. Andreadis were studied.

The recent work of Reinert (2000) that elevated the subgenus *Ochlerotatus* to generic rank complicates the identification process. To understand the nomenclatorial changes resulting from his action, a new checklist of the species of *Aedes* and *Ochlerotatus* of the Nearctic Region (Table 1) is included here. Although many species in the keys of Darsie and Ward will be in different genera, the actual keys to species are unchanged, except for the addition of the 5 species new to the Nearctic fauna since 1981, as follows.

*Aedes albopictus* (Skuse), 1st reported by Sprenger and Wuithiranyagool (1986), was added to the keys by Darsie (1986, 1992). *Ochlerotatus bahamensis* (Berlin), reported by Pafume et al. (1988), was treated in the same manner by Darsie (1992). *Ochlerotatus tahoensis* Dyar (Brust and Munstermann 1992) is distinguishable from *Ochlerotatus communis* (DeGeer) only by the use of biochemical markers, and *Ochlerotatus clivis* Lanzaro and Eldridge and *Ochlerotatus washinoi* Lanzaro and Eldridge (Lanzaro and Eldridge 1992) cannot be separated from *Ochlerotatus increpitus* Dyar in the adult female and 4th larval stages. These latter 3 species then can essentially be disregarded in formulating key changes to accommodate *Oc. j. japonicus*.

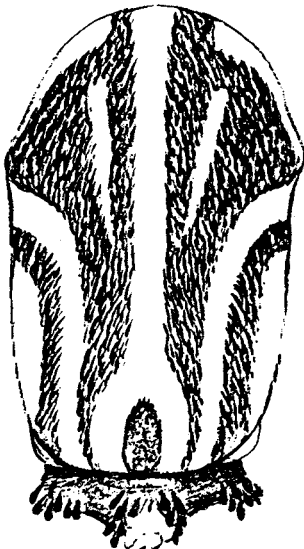


Fig. 1. Scutum of *Ochlerotatus japonicus japonicus*.

## IDENTIFICATION OF *OCHLEROTATUS* *J. JAPONICUS*

*Adult female:* In the generic key, *Oc. j. japonicus* will easily key to couplet 7, where *Ochlerotatus* can

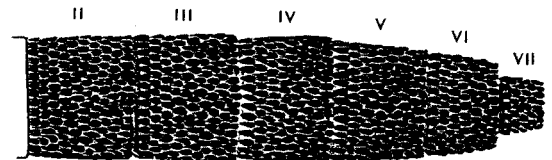


Fig. 2. Terga of abdominal segments of *Ochlerotatus japonicus japonicus*.

Table 1. Checklist of genera *Ochlerotatus* and *Aedes* in the Nearctic Region (Reinert 2000).

Genus *Aedes* Meigen

Subg. *Aedes* Meigen

*cinereus* Meigen

Subg. *Aedimorphus* Theobald

*vexans* (Meigen)

Subg. *Stegomyia* Theobald

*aegypti* (Linnaeus)

*albopictus* (Skuse)

Genus *Ochlerotatus* Lynch Arribalzaga

Section I

Subg. *Finlaya* Theobald

*japonicus japonicus* (Theobald)

*togoi* (Theobald)

Subg. *Ochlerotatus* Lynch Arribalzaga

*aboriginis* (Dyar)

*abserratus* (Felt and Young)

*aloponotum* (Dyar)

*atlanticus* (Dyar and Knab)

*atropalpus* (Coquillett)

*aurifer* (Coquillett)

*bimaculatus* (Coquillett)

*campestris* (Dyar and Knab)

*c. canadensis* (Theobald)

*c. mathesoni* (Middlekauff)

*cantator* (Coquillett)

*cataphylla* (Dyar)

*churchillensis* (Ellis and Brust)

*clivis* (Lanzaro and Eldridge)

*communis* (DeGeer)

*decticus* (Howard, Dyar, and Knab)

*deserticola* (Zavortink)

*diantaeus* (Howard, Dyar, and Knab)

*dorsalis* (Meigen)

*dupreei* (Coquillett)

*epactius* (Dyar and Knab)

*euedes* (Howard, Dyar, and Knab)

*excrucians* (Walker)

*fitchii* (Felt and Young)

*flavescens* (Mueller)

*fulvus pallens* (Ross)

*grossbecki* (Dyar and Knab)

*hexodontus* (Dyar)

*impiger* (Walker)

*implicatus* (Vockeroth)

*increpitus* (Dyar)

*infirmatus* (Dyar and Knab)

*intrudens* (Dyar)

*melanimon* (Dyar)

*mercurator* (Dyar)

*mittchellae* (Dyar)

*monticola* (Belkin and McDonald)

*muelleri* (Dyar)

*nevadensis* (Chapman and Barr)

*nigripes* (Zellerstedt)

*nigromaculis* (Ludlow)

*niphadopsis* (Dyar and Knab)

*pionips* (Dyar)

*pullatus* (Coquillett)

*punctodes* (Dyar)

*punctor* (Kirby)

*rempeli* (Vockeroth)

*riparius* (Dyar and Knab)

*scapularis* (Rondani)

*schizopinax* (Dyar)

*sierrensis* (Ludlow)

Table 1. Continued.

*sollicitans* (Walker)

*s. idahoensis* (Theobald)

*s. spencerii* (Theobald)

*squamiger* (Coquillett)

*sticticus* (Meigen)

*stimulans* (Walker)

*taeniorhynchus* (Wiedemann)

*tahoensis* (Dyar)

*thelcter* (Dyar)

*thibaulti* (Dyar and Knab)

*tormentor* (Dyar and Knab)

*tortilis* (Theobald)

*trivittatus* (Coquillett)

*varipalpus* (Coquillett)

*ventrovittis* (Dyar)

*washinoi* (Lanzaro and Eldridge)

Subg. *Protomacleaya* Theobald

*brelaudi* (Zavortink)

*burgeri* (Zavortink)

*hendersoni* (Cockerell)

*triseriatus* (Say)

*zoosophus* (Dyar and Knab)

Subg. *Rusticoides* Shevchenko and Prudkina

*bicristatus* (Thurman and Winkler)

*provocans* (Walker)

Section II

Subg. *Abraedes* Zavortink

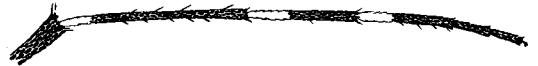
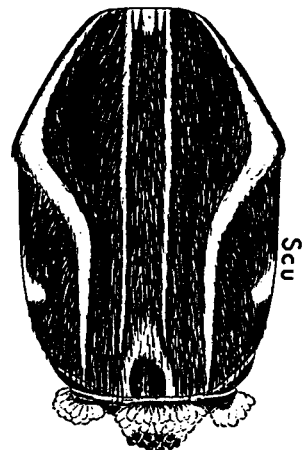
*papago* (Zavortink)

Subg. *Howardina* Theobald

*bahamensis* (Berlin)

Subg. *Kompia* Aitken

*purpureipes* (Aitken)

Fig. 3. Hindtarsomeres 1-5 of *Ochlerotatus japonicus japonicus*.Fig. 4. Scutum of *Aedes aegypti*.

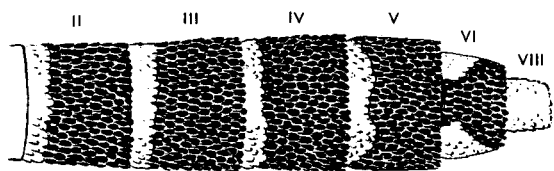


Fig. 5. Terga of abdominal segments of *Aedes aegypti*.

be added to *Aedes*. In the specific key to *Aedes* [now *Aedes* and *Ochlerotatus*], *Oc. japonicus* will key to couplet 8, which must be reworded and couplet 8A added as follows:

- 8(7). Scutum with lyre- or modified lyre-shaped marking of silvery or yellow scales on dark-scaled background . . . . . 8A
- Scutum with other scale markings . . . . . 9
- 8A(8). Scutum with median, longitudinal stripe of yellow scales (Fig. 1); abdominal terga III–VII without dorsal pale bands (Fig. 2); hind-tarsomere 5 dark-scaled (Fig. 3) *Oc. j. japonicus*
- Scutum without median, longitudinal stripe (Fig. 4); abdominal terga III–VII with basal, transverse, pale bands (Fig. 5); hind-tarsomere 5 pale-scaled (Fig. 6) . . . . *Ae. aegypti*

Following these couplets, 2 other inserted couplets, 11A and 12A, will separate *Oc. bahamensis* from *Ae. albopictus* (Darsie 1992).

*Fourth-stage larvae:* In the generic key, larvae of *Oc. j. japonicus* easily come out in the 2nd part of couplet 11, where the genus *Ochlerotatus* should be added to *Aedes*. A single siphon seta, 1-S, an incomplete saddle, apical pecten spines detached distally, and the seta 1-S placed within the pecten will lead in the *Aedes* [and *Ochlerotatus*] key to couplet 24. An inserted couplet, 24A, will identify *Oc. j. japonicus* larvae as follows:

- 24A. Setae 5,6-C with 3–6 branches, placed far forward on the head, anterior to seta 7-C (Fig. 7) . . . . . *Oc. j. japonicus*
- Seta 5,6-C single or double, at least seta 5-C placed posterior to seta 7-C (Fig. 8) . . . . . 25

According to Darsie (1992), *Ae. albopictus* can be identified by adding couplet 46A and *Oc. bahamensis* can be identified by adding couplet 51A.

The medical importance of *Oc. j. japonicus* was discussed by Fonseca et al. (2001). They reported that West Nile virus had been isolated from pools of *Oc. j. japonicus* in New York. Turell et al. (2001) found *Oc. j. japonicus* to be susceptible to infection by West Nile virus: “*Aedes albopictus* (Skuse), *Aedes atropalpus* (Coquillett) and *Aedes j. japonicus*



Fig. 6. Hindtarsomeres 1–5 of *Aedes aegypti*.

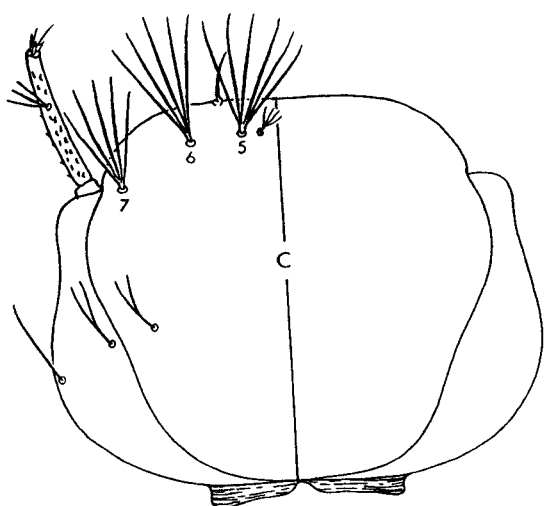


Fig. 7. Dorsal view of head of *Ochlerotatus japonicus japonicus*.

(Theobald) were highly susceptible to infection and nearly all individuals with a disseminated infection transmitted virus by bite.”

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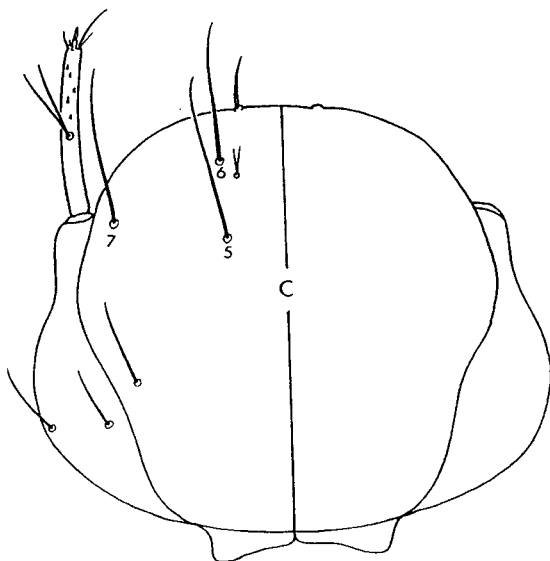


Fig. 8. Dorsal view of head of *Aedes aegypti*.

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