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SCIENTIFIC NOTE

FIRST RECORDS OF *CULEX GELIDUS* FROM AUSTRALIA

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ABSTRACT. *Culex gelidus* Theobald was recorded for the 1st time in Australia in May 1999 from 2 locations (Brisbane and Mackay, Queensland) approximately 820 km apart. Larval samples were collected from a semipermanent freshwater swamp and an open drain and reared to adults in laboratories. Implications for Australia are discussed.

KEY WORDS Mosquitoes, *Culex gelidus,* new record, Australia

Culex gelidus Theobald is distributed from India and southern China throughout southeast Asia to Irian Jaya (Sirivanakarn 1976). The predominant breeding sites are freshwater ground pools, although this species has also been recorded in artificial containers and polluted water. *Culex gelidus* will bite birds and mammals. Bram (1967) reported this species as a vicious biter of humans in the absence of other domestic hosts. *Culex gelidus* is a confirmed vector of Japanese encephalitis (JE) virus (Burke and Leake 1988). Other viruses isolated from *Cx. gelidus* include Tembusu, Getah, Sindbis, and dengue type 1 (Lee et al. 1989).

Culex gelidus was detected by local council mosquito control agencies in Mackay and Brisbane (Queensland) on May 20, 1999, and May 31, 1999, respectively. Brisbane (27°27′S, 153°01′E; population 1 million) is the capital city of Queensland and lies on the central eastern coast of Australia. Mackay is a coastal regional center (21°07′S, 149°11′E; population 72,000) located approximately 820 km NNW of Brisbane.

Culex gelidus was detected in Brisbane from larvae sampled on May 31, 1999, during routine *Bacillus thuringiensis* var. *israelensis* (*Bti*) larvicide bioassays. Brisbane City Council Mosquito and Pest Services (BCC) staff collected a combination of *Culex annulirostris* Skuse, *Cx. australicus* Dobrotworsky and Drummond, and *Cx. quinquefasciatus* Say larvae from a small semipermanent grassland swamp in the suburb of Banyo. The collection site was 2.7 km west of the Brisbane International Airport Terminal. A small number of larvae that were initially thought to be *Cx. quinquefasciatus* were put aside because of their pale antennae. Adults that emerged were clearly not this species. Further similar larvae were separated from the same bulk collection and reared in an insectary, including 7 link-reared specimens.

The tentative identification of *Cx. gelidus* was proposed on June 9, 1999. Australian Quarantine and Inspection Service (AQIS) and Queensland Health authorities were notified within 24 h. Larval surveys on June 10, 1999, collected additional larvae from the same site and the swamp was thoroughly sprayed with *Bti.* Surveys of nearby freshwater breeding sites (within a 4-km radius) on June 11, 1999, collected 5 *Cx. gelidus* larvae from a ground pool on a golf course located 2.5 km to the north. This site was treated with *Bti* on June 12, 1999.

Identification was confirmed from the 7 link-reared specimens and preservation of other larval and pupal skins. Approximately 30 adult *Cx. gelidus* were pinned as reference specimens and are retained at BCC. Light trapping (encephalitic vector surveillance [EVS]-type traps baited with carbon dioxide and octenol) and larval sampling in the airport area by AQIS and BCC have not detected any further *Cx. gelidus* to date.

Culex gelidus was detected in Mackay from larvae sampled on May 20, 1999, by Mackay City Council (MCC) staff during routine larval surveillance and control operations. Adult mosquitoes with light-colored heads were noted by staff while collecting larvae. A combination of *Cx. annulirostris* and *Cx. gelidus* larvae were collected from an open drain 1.7 km from the domestic airport in the suburb of South Mackay. The collection site contains freshwater after rain but is also subject to tidal influence. At the time of sampling the water was fresh and contained green filamentous algae. The MCC regularly monitors and treats all open drains in the city area, as dictated by prevailing weather conditions and tidal movement. The drains are treated with either *Bti* or Altosid (*S*-methoprene) Pellets® (Pacific Biologics, Brisbane, Queensland, Australia).

Larvae were reared to adults in the MCC laboratory. Five females were pinned and tentatively identified by MCC staff as *Cx. gelidus,* following the detection of this species in Brisbane (Muller

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1999). On August 18, 1999, 1 of the adult mosquitoes was submitted to the Tropical Public Health Unit (TPHU) of Queensland Health to confirm the identification. Medical entomology staff of TPHU, Richard Russell (medical entomologist, University of Sydney, Westmead Hospital, New South Wales), and the BCC medical entomologist (Mike Muller) have subsequently confirmed this identification. Richard Russell also noted that the specimen exhibited atypical pale scales at the base of the costa.

Two additional adult specimens reared from the larvae collected on May 20, 1999, were subsequently sent to TPHU. These adults were also identified as *Cx. gelidus* by TPHU staff and the BCC medical entomologist on November 8, 1999. No additional *Cx. gelidus* have been detected to date.

The detection of *Cx. gelidus* in Brisbane and Mackay within a short period may indicate a recent introduction of an exotic species into Australia, arriving in Brisbane; an increase in previously undetected, localized, and endemic populations of *Cx. gelidus*; an expansion of the range of a previously undetected population in northern Queensland; or some combination of these 3 factors.

Muller (1999) speculated that the occurrence of *Cx. gelidus* in Brisbane may be recent because of its absence from previous surveys and the proximity of the collection site to the Brisbane International Airport. Russell et al. (1984) reported finding specimens of *Cx. gelidus* in disinsected international aircraft arriving in Darwin and Sydney in the late 1970s. The importation of *Anopheles* spp. adult mosquitoes aboard international aircraft has been used previously to explain cases of airport malaria in Australia (Jenkin et al. 1997, Merritt et al. 1998) and overseas (Isaäcson 1989). The absence of an international terminal at Mackay would require an initial importation of *Cx. gelidus* into Brisbane and a subsequent importation from Brisbane to Mackay aboard domestic aircraft. The introduction of *Cx. gelidus* into Mackay by international sea traffic is considered less likely because the sea port is located approximately 10 km east of the city.

Any future establishment of *Cx. gelidus* in urban Brisbane is not considered to present a risk for the transmission of JE because of the absence of amplifier hosts (pigs). However, JE has spread to the islands of the Torres Strait in north Queensland (Hanna et al. 1996) and has recently reached the Australian mainland (Hanna et al. 1999). The establishment of *Cx. gelidus* in north Queensland may provide an additional vector other than *Cx. annulirostris* for JE transmission in Australia.

The potential role of *Cx. gelidus* in the transmission of Australian arboviruses is unknown. Sampling will continue in Brisbane and Mackay and other areas of northern Queensland to determine the continued presence and distribution of this species.

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