Detection of the exotic mosquito *Culex gelidus* in the Northern Territory

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The Medical Entomology Branch (MEB) of Territory Health Services (THS) has confirmed the presence of established breeding populations of the exotic mosquito *Culex gelidus* in the towns of Katherine, Batchelor and Darwin in the Northern Territory (NT) of Australia. It is also probably present in Alice Springs. While there are no immediate public health risks, it adds to the number of pest and potential disease vector mosquitoes in the Northern Territory.

The detection follows the first detection of this species in Australia at Brisbane in June 1999.[1] Subsequent collections have been made in Makay, Cairns and possibly Daintree in Queensland (Scott Ritchie, personal communication).

The first indication of the existence of *Cx. gelidus* in the Northern Territory was from a single adult mosquito collected on 16 February 2000 in Alice Springs in the weekly carbon dioxide baited traps, as part of the NT wide adult mosquito monitoring program. MEB staff initially identified the specimen as *Cx. vicinus*. However a review of the results indicated that there were no previous records of this species south of Tennant Creek, approximately 450 kilometres to the north. The specimen from Alice Springs was examined and found to be different from typical *Cx. vicinus*. *Culex vicinus* adults are very similar to *Cx. gelidus* in appearance with a cover of frosty white scales over the front two-thirds of the top of the thorax, and a number of other characteristics. Increased vigilance was placed on the identification of *Cx. vicinus* from Alice Springs and other collections.

MEB adult trap collections detected 89 *Cx. vicinus* adults from Katherine on 9 March 2000 during MEB aerial operations to combat widespread mosquito breeding following the February flooding. A review of these results indicated this number was outside the expected relative numbers of this species in this area. A detailed examination of these specimens indicated they were similar to the Alice Springs *Cx. vicinus* specimen. They conformed to the published descriptions of *Cx. gelidus.* There was however, uncertainty over a discriminating character in published taxonomy keys; the apicolateral pale patches on the tergites of the abdomen. It was decided that the resolution of the uncertainty required link bred specimens of adults from larvae from the Katherine area. Live larvae were collected from the Katherine Dairy area on 20 March. The larvae were examined on 20 March and conformed to the published descriptions of *Cx. gelidus*. The identification of adults was indicated on 21 March with *Cx. gelidus* reared from a pupa collected with the larvae. Link bred specimens reared on 23 March confirmed the presence of *Cx. gelidus* in the Northern Territory.

Discussions with Prof Richard Russell on 21 March confirmed there was a potential problem in the identification of adult specimens of *Cx. gelidus* using the standard taxonomic key and particularly with specimens that were partially rubbed. Samples of larvae and adults of *Cx. gelidus* have been sent to Prof Russell for verification.

The larvae collections from Katherine on 20 March indicated prolific breeding in the dairy wastewater effluent, the meatworks wastewater ponds and the sewerage overflow area. All these areas had been aerially treated with Bti insecticide approximately a week earlier.

A survey of wastewater ponds in the Darwin area was started on 22 March and detected large numbers of *Cx. gelidus* larvae in a piggery waste water pond in the rural area on 22 March. Prolific breeding was also found in a primary sewerage pond in Batchelor, approximately 70 kilometres south of Darwin on 23 March. The survey of wastewater ponds in the Darwin area is continuing and further surveys will be made in other towns in the NT.

An examination of records of weekly adult trap collections of *Cx. vicinus* in Katherine indicated an increase in this species starting 29 January 1999 from 9 to 29, and 81 over a three week period in the vicinity of the meatworks and the dairy. This may indicate a recent colonisation of the area by *Cx. gelidus*, but could also be related to seasonal conditions. The MEB will be examining all *Cx. vicinus* records in the NT and reviewing all larval and adult reference specimens of *Cx. vicinus* and *Cx. quinquefasciatus* to determine the earliest records of *Cx. gelidus* in the NT.

The review of specimens collected before the aerial spraying in Katherine revealed *Cx. gelidus* larvae in a tyre at the Katherine dairy. The dairy and meatworks have commercial road transport links to Queensland and this could indicate a mode of transport of larvae between the two areas. Adults and larvae could feasibly be moved in spare tyres or cabins with the road transport of cattle or people between Queensland and the Northern Territory, and within the NT.

The low numbers of adult *Cx. gelidus* in traps at the locations of the wastewater ponds in both Katherine and Darwin, at times of prolific larval numbers, indicate that carbon dioxide baited traps are not accurate indicators of high larval populations. These traps probably do not detect moderate numbers of adults unless they are immediately adjacent to the breeding site. This has implications for quarantine surveillance and other collections of this and similar species. The current NT experience suggests that the most practical method to establish the distribution of this species is to conduct larval surveys of wastewater ponds and to base the presence on identification of larvae.

The taxonomic keys to differentiate between adult *Cx. gelidus* and *Cx. vicinus* in the Australasian region need revision. The differentiation between adult females of these species and *Cx. vicinus* can be made on the erect scales on

the vertex of the head, which are cream in *Cx. vicinus* and white in *Cx. gelidus*. *Culex vicinus* is also generally bigger and darker, with darker integument on the pleura, a shorter proboscis, narrower basal pale bands on the tergites and not produced markedly in the midline, and mostly dark scaling on the sternal segments of the abdomen.

The larvae are distinct from *Cx. quinquefasciatus*, with *Cx. gelidus* having no lateral tuft on the siphon, a more barrel shaped siphon, and unequal anal papillae.[1] The *Cx. gelidus* also have stout head hair compared with *Cx. quinquefasciatus*, which is more filamentous. The best differential identifications between all species can be made on larvae.

Culex gelidus is found in India, China, Thailand, Indonesia, Timor and Irian Jaya.[2] Larvae have been found in freshwater ground pools, rivers, marshes and containers, sometimes in dirty water, and sometimes with considerable organic matter. It has been reported as a voracious biter of humans and to enter houses,[3] while others have reported it as having a preference for larger domestic animals with little preference for humans.[4]

Japanese encephalitis (JE) virus has been isolated from *Cx. gelidus* in several countries. It is considered important in maintaining JE in pig mosquito cycles in Sarawak and has been suggested as one of the most important vectors of JE in South East Asia.[5] It is at least a potential vector of JE.[6]

Culex gelidus is now a potentially very important mosquito in the NT for THS, Department of Primary Industries and Fisheries, primary producers, and local governments. It has been found breeding prolifically in wastewater ponds in dairies, sewerage treatment facilities, abattoirs, piggeries and ponding in ground pools contaminated with organic pollution, often in close proximity to urban areas. Its presence associated with piggeries is of particular concern as it could play a very important role in the amplification of JE if and when it occurs in the NT. Known breeding sites should be controlled. The distribution of the larvae in wastewater ponds in the NT indicates that the design and maintenance of wastewater ponds in a weed free condition is critical in the control of larval populations. The presence of this species in habitats of both *Cx annulirostris* and *Cx. quinquefasciatus*, and the possible replacement in habitats of the latter, indicates a new landscape for mosquito pest and disease potentials in northern Australia.

The present distribution of *Cx. gelidus* in the NT indicates that eradication may not be practical or possible. No attempt at eradication should be considered until the distribution and range of breeding sites is known. It could be much more widely distributed in Queensland and could even be present in Western Australia. The most pressing need is to conduct larval surveys in northern States and the NT to determine the current distribution. It is important to try to establish where and when this species entered Australia. The determination of the introduction and spread in the NT may be possible from weekly adult monitoring from all major towns and other regular collections, and the maintenance of a reference collection of larval and adult mosquito specimens. There should then be a national consensus on the status of this species, and a review of the detection and surveillance methods in Australia to detect further importations and subsequent spread of other species of mosquitoes.

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