Notes on daytime biting catches of mosquitoes (Diptera: Culicidae) in native forest sites in the Auckland region

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Although New Zealand has a relatively poor Culicidae fauna (Laird 1990, 1995) consisting of 12 native species and four exotic mosquito species (Derraik 2004), little information is available on their bionomics, especially of the indigenous species. New Zealand is under a serious risk of a mosquito-borne disease outbreak (Derraik & Calisher 2004), and more research is urgently needed to fill the extensive knowledge gap regarding the ecology of culicids in this country.

The feeding habits of New Zealand's endemic mosquitoes are largely unknown (Holder *et al.* 1999), although some hosts have been described for a few species (Belkin 1968; Pillai 1966). The four established exotic species, *Culex (Culex) quinquefasciatus* Say, *Ochlerotatus (Finlaya) notoscriptus* (Skuse), *Ochlerotatus (Halaedes) australis* (Erichson) and *Ochlerotatus (Ochlerotatus) camptorhynchus* (Thomson), are known to bite humans and are vectors of disease (Derraik 2004). Although some indigenous species are also known to bite humans, including *Coquillettidia (Coquillettidia) iracunda* (Walker), *Culex (Culex) pervigilans* Bergroth, *Culiseta* (*Climacura*) *tonnoiri* (Edwards), and *Ochlerotatus (Ochlerotatus) antipodeus* (Edwards) (Belkin 1968; Holder *et al.* 1999), the host preferences of the majority are still unknown. However, they are probably adapted to feeding on birds as a result of New Zealand's evolutionary history.

During extensive field work in native forest sites in the Auckland region (Derraik, unpublished data), a human biting catch was conducted in February/March 2003 to identify the mosquito species actively feeding in the daytime. Collection was carried out by JGBD during one day of field work at each of eight sites (Table 1), with biting mosquitoes being aspirated and placed into a plastic container. Collections of biting mosquitoes at two of the sites were also made from a large Huntaway dog that accompanied one of the authors. All specimens were taken to the laboratory and identified to species by AES using a key to the adult female mosquitoes of New Zealand (Snell, unpublished data).

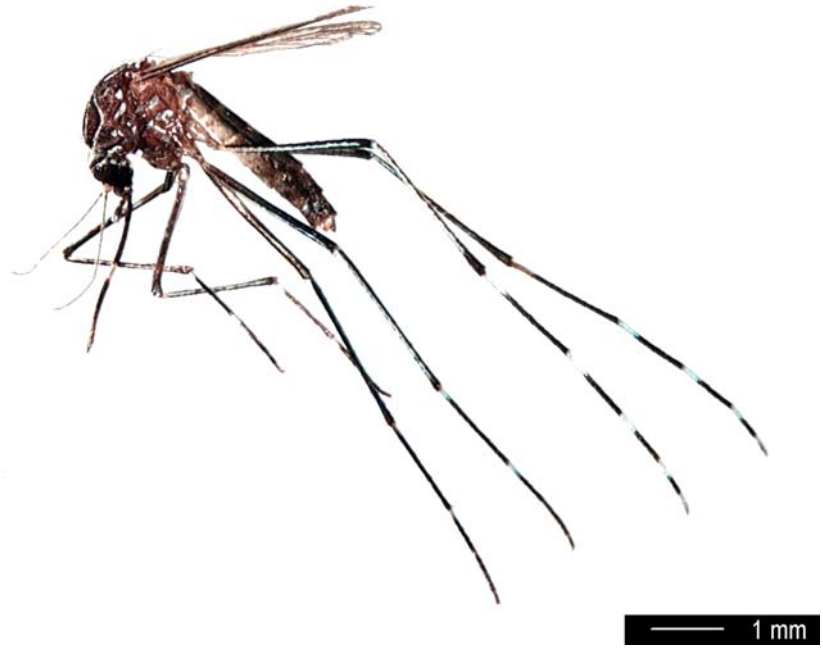

Figure 1. *Ochlerotatus (Finlaya) notoscriptus* (Skuse), the most abundant and widespread exotic mosquito in the North Island. Photo by Richard Toft.

Only two species were recorded in this study, biting both human and dog: the exotic *Oc. notoscriptus* (Fig. 1) and the endemic *Cq. iracunda* (Fig. 2). They were recorded together at only one site, with the remaining seven sites yielding either of these two species but not both (Table 1). Overall, few specimens were collected, but at two particular sites, Cascade-Kauri Park and Wenderholm Regional Park, *Cq. iracunda* and *Oc. notoscriptus*, respectively, were found to be a considerable nuisance and large numbers of biting specimens were collected (Table 1).

Mosquitoes were collected mostly from JGBD's arms and legs (areas exposed and not covered by clothing), and showed preference for the dog's head, nose and legs. This study provides the first record of *Cq. iracunda* feeding on a dog. *Ochlerotatus notoscriptus* has been previously recorded from this host, and it is an important vector of dog heartworm *Dirofilaria immitis* (Russell & Geary 1996). Both *Oc. notoscriptus* and *Cq. iracunda* were vicious biters and a considerable nuisance to man and dog alike.

Figure 2. The native *Coquillettidia (Coquillettidia) iracunda* (Walker). Photo by Mark Disbury.

The results showed that within native forest sites *Oc. notoscriptus* and *Cq. iracunda* were active during the daytime. The time of biting activity can vary between habitats, as microclimate has a significant impact on the behaviour of mosquitoes (Haddow 1945, 1947), and it seems that the time of biting activity of the above species may vary between habitats (Derraik *et al.*, unpublished data). In this study *Oc. notoscriptus* and *Cq. iracunda* within native forest sites readily fed on their hosts during the daytime, possibly because of microclimatic conditions that would not otherwise occur in open habitats during daylight hours.

The scope of this study was limited and the results have to be considered with some caution. Nonetheless, no other indigenous species were recorded biting humans at the studied sites. *Ochlerotatus antipodeus* was very abundant in adult traps at Cascade-Kauri Park (Derraik *et al.* in press) where *Cq. iracunda* was a particular nuisance, but it was not recorded biting man or dog. *Coquillettidia iracunda* seems to be an exception amongst indigenous mosquitoes, as it was found to aggressively bite humans and it could potentially play a role as an arbovirus vector if it is capable of virus transmission. The exotic *Oc. notoscriptus*, which appears to be well established in many native forests sites, is already known to be a disease vector, and could play an important role in the event of an outbreak of mosquito-borne disease in New Zealand (Derraik & Calisher 2004).

The identification of host preferences of individual mosquito species is an aspect of particular relevance to the understanding of the public health threats posed by mosquito-borne diseases. Considerably more research is needed to address the extensive gaps in current knowledge regarding the host preferences of mosquitoes in New Zealand. Based on the records from this study and those of other authors who described *Cq. iracunda* as a persistent biter (e.g. Graham 1939), we believe that laboratory tests should be carried out to assess the species' ability to act as a vector of the most likely arboviruses to enter New Zealand, such as dengue, Ross River and Barmah Forest viruses.

Table 1. The eight native forest sites in the Auckland region and their locations where mosquito biting catches were carried out, and respective species recorded. Biting catches refer to man, and an asterisk (*) indicates the species that were also recorded biting a dog.

Field Site	Approximate Coordinates	Collection Date	Biting Catch
Cascade-Kauri Park	36° 53' 35'' S 174° 30' 30'' E	06.02.2003	39 *Cq. iracunda**
Goldies Bush Reserve	36° 51' 15'' S 174° 27' 30'' E	24.02.2003	6 *Oc. notoscriptus*
Logues Bush Reserve	36° 15' 45'' S 174° 35' 10'' E	18.03.2003	3 *Oc. notoscriptus*
McElroy Reserve	36° 27' 30'' S 174° 41' 30'' E	01.03.2003	3 *Cq. iracunda* 3 *Oc. notoscriptus**
Pohuehue Reserve	36° 27' 30'' S 174° 39' 00'' E	02.03.2003	2 *Oc. notoscriptus*
Tapu Bush Rd (private property)	36° 15' 30'' S 174° 38' 00'' E	15.03.2003	2 *Cq. iracunda*
Wainui Farm (private property)	36° 36' 00'' S 174° 36' 30'' E	19.03.2003	6 *Oc. notoscriptus*
Wenderholm Regional Park	36° 32' 30'' S 174° 42' 35'' E	25.03.2003	31 *Oc. notoscriptus*

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