BITING MIDGE INFORMATION SHEET – FEBRUARY 2016

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Biting midges (often referred to as "sandflies") are small biting flies about the size of a pin-head belonging to the Ceratopogonidae family. They are especially prolific in coastal areas of tropical and subtropical Australia where some species can cause significant pest problems. They make up for their small size with the large numbers in which they can occur and their painful bite.

In Australia most pest species breed in the intertidal zone (*i.e.* between the low and high tide levels) of estuarine creek systems. There is one well known exception to this which breeds in the mulch and leaf litter of parks, gardens and bushland which is sometimes referred to as the Bushland Midge or *Lasiohelea*.

The intertidal midge *Culicoides ornatus*

The Bushland Midge *Forcipomyia (Lasiohelea) townsvillensis*

There are five main species of biting midge that cause localised pest problems near intertidal areas in southeast Queensland. These species are all part of the natural insect fauna of southeast Queensland's subtropical environment. These species are:

Culicoides longior – breeds in mangrove mud and has a pest range of about 800 m. It has rarely been studied even though it can be a severe localised pest. See Reye (1992) for a brief summary.

Culicoides marmoratus – breeds in mud and sand associated with mangroves. Has been studied by Kay (1973) in Deception Bay just north of Brisbane. Can be carried for kilometres from breeding sites by wind.

Culicoides ornatus – breeds in fine silt mud of mangroves and can travel for kilometres without wind assistance. Usually a serious pest in residential areas near where it breeds but not currently known to occur south of the Brisbane River. Has been studied extensively by Reye along the Queensland coast and by Shivas in Darwin and Brisbane.

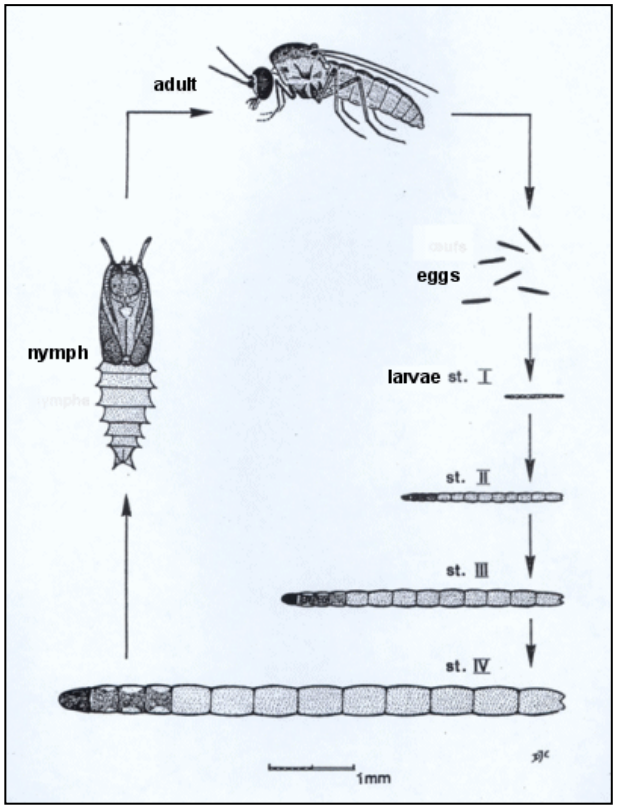
Culicoides molestus – breeds in clean sandy beaches of sheltered tidal waterways. It is a well known pest in constructed canal estate beaches. Has been studied by Kettle, Reye & Edwards (1979) and Chitra (2002). Pest range over 400 m.

Culicoides subimmaculatus group species – a complex of species that breed in sandy mud associated with mangroves. This group is currently being reviewed using DNA technology and initial results indicate that three species occur in southeast Queensland and northern New South Wales (G. Bellis, unpublished data). One of these species has been erroneously called *C. subimmaculatus* in the past (*e.g.* Kay & Lennon 1982; Edwards 1989) but the true *C. subimmaculatus* occurs much further south. Little is known about the differences in behaviour and biology of these species. Species in this group have a pest range of about 400 m.

Typical *C. longior* and *C. ornatus* breeding site in a small mangrove creek.

BIOLOGY

Life-cycle. Like many flies the life-cycle of biting midges consists of an egg, four worm like larval stages or instars, a pupa and finally the adult male and females. Only the females take a blood meal, using the protein to develop a batch of eggs. A few species such as *C. ornatus* can develop their first batch of eggs without the need for a blood meal. In southeast Queensland the egg to adult period probably takes two to three months with most breeding occurring between spring and autumn. Studies have indicated that there are three or four generations per year for most species in southeast Queensland. There is little midge activity in winter as it is too cold for development. Adult midges live for one to two weeks.



Tidal synchrony. Intertidal midges typically emerge as adults from their larval habitats in synchrony with the 15 day neap-spring tide cycle. This means that biting activity is usually at its greatest around the same time in every 15 day neap-spring tide cycle. For some species this might be around the spring tide (*e.g. C. molestus*) while for others in might be during the neap tide period (*e.g. C. ornatus*). Close to breeding sites biting can occur for most of the neap-spring tide cycle. Due to regional variability and species differences, local knowledge of these patterns is necessary to attempt to predict when biting activity will occur in an area.

Daily and seasonal biting patterns. Intertidal biting midges are crepuscular *i.e.* they are most active at dawn and dusk. Close to breeding sites they will bite throughout the day. In southeast Queensland biting midge activity is often greatest in spring and autumn although substantial activity will also occur throughout summer. Winter does provide a reprieve.

BITING MIDGES AND PUBLIC HEALTH

Biting midges are not known to transmit any human diseases in Australia. However they are a significant nuisance and close to breeding sites they can make life unbearable. Midge bites can cause persistent itching and may develop into blisters that weep a few days after the bite. Midges inject an anticoagulant in their saliva when they bite and itching is due to an immune response to chemicals in the saliva. Scratching can result in secondary infection. People do develop a degree of immunity to bites with repeated exposure. This is probably why the severest reactions to bites are often seen in children, tourists and new residents to midge prone areas. With increasing urban expansion into coastal areas near midge breeding habitats this is an on-going problem.

Blood fed female biting midge

MANAGEMENT OF BITING MIDGE PROBLEMS

Treatment of the larval habitat

If it is possible, the best option for the control of pest insects such as mosquitoes and biting midges is "source reduction" *i.e.* control of larvae in their breeding habitat before they disperse in search of a blood meal. This approach is widely used for the control of mosquitoes because mosquito-specific insecticides are available but with one exception this approach cannot be used for biting midges. This is because there are no midge-specific insecticides available and even if there were it would be difficult if not impossible to treat larvae that are living in mud, unlike mosquitoes which breed in water.

Intertidal habitats, especially those associated with mangroves, are protected under state government fisheries legislation and general insecticides cannot be used in these areas. This is because most of these insecticides are highly toxic to fish and crustaceans and their use could easily lead to fish kills. The one exception to this is the treatment of sandy beaches for *C. molestus* larvae in canal estates. This is allowed under permit because these areas are regarded as "artificial". Treatment of "natural" habitats is definitely not allowed. **There are no products registered in Australia for the control of intertidal biting midges in natural habitats such as mangroves.**

Interception barriers

Once the adults move from the larval habitat the pest population can quickly disperse over great distances and it then becomes very difficult exert any kind of effective control at a population level. One promising possibility that might be effective in some situations are "interception barriers". The idea of an interception barrier is to intercept the midges on their flight path from their breeding sites to residential areas. The two types that have been used are insecticide treated vegetation barriers and insecticide treated constructed barriers made from timber panelling (similar to the sound barriers that line highways) or shade cloth.

The effectiveness of treated barriers depends on the midges landing on the barrier which can't be guaranteed. Vegetation barriers are likely to be more effective than constructed barriers as the midges might rest in the vegetation during the day. Anecdotal reports suggest that these treated barriers might help with biting midge management but there have been no scientific studies to verify this. In many situations it would not be possible plant or construct a barrier between breeding sites and residential areas. The insecticide most commonly used for treated barriers is bifenthrin which should be effective for about six weeks in outdoor situations and will then need retreatment. The use of barriers does entail on-going maintenance costs.

Thermal fogging and ULV misting

Insecticidal fogs and mists have been used for short term management of biting midges. The insecticides used in thermal fogs and ultralow volume (ULV) mists are not residual and consequently only kill what is flying at the time of application. Reinvasion of an area by midges shortly after treatment is likely, especially if close to a breeding site. The fog is only effective while it is in the air which might be for only a few minutes. If reinvasion occurs there is little point in daily retreatments. The insecticides used will kill all insects and as such are not environmentally friendly and cannot be used near waterways or mangroves.

Household protection

Treated flyscreens: Biting midges are small enough to be able to get through normal flyscreens. Anecdotal reports suggest that treating flyscreens with a water based, UV stable insecticide such as bifenthrin does make them effective as a barrier to midges. They would need retreating about every six weeks.

Fine-meshed screens: There are a number of fine-meshed screens available designed to keep midges out. They will decrease air flow and possibly light entry compared to a normal flyscreen but would be effective and not need on-going insecticide treatments.

Spatial repellents: Mosquito coils, lanterns and space sprays are all effective provided that there is little air movement. They can be very effective indoors, less so on verandahs and rarely effective outdoors unless it is very still. Most use synthetic pyrethrins as the active chemical which have very low mammalian toxicity. Some of the recent products containing actives such as metofluthrin do not require heat to vaporise and will last for about three weeks. This is far more convenient than older products such as mosquito coils which require heat to vaporise the active and only last for about eight hours.

Fans: Midges like still air and consequently air movement from ceiling or pedestal fans can be very effective for protection both indoors and on verandahs.

Barrier treatments: Barrier treatment is the application of a residual insecticide such as bifenthrin to external surfaces such as house walls, solid fences and garden vegetation – anywhere a midge might rest. There is some evidence that this method can reduce midge numbers for up to six weeks (Standfast *et al.* 2003) but as with interception barriers its success depends on whether the midges

will rest on the treated surfaces and this will vary from house to house. Treatments should be undertaken by a licensed and experienced pest controller for best results.

Barrier treatment is indiscriminate and can potentially kill many non-target insects which is not environmentally desirable. It is also impossible to know in advance whether or not a barrier treatment will be effective in any particular situation. On-going retreatment costs will be the home owner's responsibility as Council does not conduct pest treatments on private land.

Personal protection

Long trousers and sleeves: Midges cannot bite through clothing. Consequently long sleeves and trousers are a simple, effective protection against midge attack especially if used with a personal insect repellent on exposed skin. Thin cotton gloves can be used to protect hands and fine meshed netting can be used in conjunction with a broad brimmed hat to protect the head and face.

Personal insect repellents: Personal insect repellents applied to exposed skin are very effective at protecting from midge bites. The most effective active ingredients are DEET (diethyl toluamide) and picaradin. They should always be used according to label directions.

Avoidance: It might sound trite to suggest avoidance as a strategy but a little local knowledge of the times that midges bite and the places where they occur can save a lot of discomfort.

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