BITING MIDGES

Non-pest species are numerous and cover many genera. These breed in a great variety of fresh and saltwater situations. The adults feed on nectar, pollen, other large or small insects (or their larvae) or upon vertebrates other than humans according to species.

The species which are pests of humans are opportunistic feeders on a wide range of warm-blooded vertebrates, though some will exhibit preferences for birds or groups of mammals, if these are available.

The pests known to exist in the Gladstone area fall into three genera;

(a) Lasiohelia, represented by one species, biting by day and breeding in rain-forest like situations.

(b) Leptoconops, represented by two species in the subgenus Styloconops, biting by day and breeding on certain sandy beaches.

(c) Culicoides, represented by seven species, biting mostly around dusk and dawn and breeding in a variety of air-soil-water interface situations, each rather highly specific. Biting by the species may extend into the day and night under calm, warm, humid conditions. Strong wind impedes their activity

EFFECTS OF BITING MIDGE

Biting midges produce their effects on people, due to the injection of saliva by the female, while taking blood.

The reaction of a person to this saliva is individual and allergic in nature, so that the lesion produced depends upon that person's sensitivity or immunity to the species biting; not on the species itself. How one will react depends upon the history of exposure to a species, and, upon a constitutional ability to develop immunity.

People reared and bitten from infancy in an infested area will usually develop a fairly complete immunity to the local species. It seems probable that the immunity developed to one species may confer little or no immunity to the bite of other species.

The person who has never been exposed has no immune response and does not feel the bite. A small number of bites may be sensitising, so that, when bitten again, the reaction is generalised and out of all proportion to the attack. If the reaction is a delayed one, exposure to bites may continue for hours or days; so that when reaction does happen, it is all the more severe, and, may threaten life.

Between the extremes of complete immunity and sensitivity, lies a large range of degree of reaction; from the annoyance of a large number of bites producing transient local reaction lasting less than an hour, through reaction which irritates for days, to lesions which blister and may become infected. Unsightly

The species most likely to be troublesome in order of importance are:

(1) Culicoides ornatus:
It is as much due to its long pest range of 1.6 km as to its abundance both in actual numbers, and, in the number of breeding places available to it.

(2) Culicoides subimmaculatus:
It has more numerous breeding areas available which are often large, and generally closer to human habitation.
(3) **Leptoconops australiensis:**
Although limited to beaches, it is there when people use them for recreation by day.

(4) **Culicoides molesius:**
It can be rather localised, but is a severe pest within ranges of its breeding places. Alternation of its emergence with that of C. subimmaculatus leads to a continuous high level of infestation where both are breeding close together.

(5) **Leptoconops townsvillensis:**
Its part is difficult to predict, with much depending upon gardening practices adopted, and, possibly on longer term weather cycles which may permit its population to build up in bushland. Even relatively small numbers, however, by persistent daytime attack, can be a severe domestic nuisance.

The first two of these could be classed as major pests of BITS on the grounds of their abundance and their ability to enter houses through fly screening. Indeed, screening may increase the incidence of indoor attack by reducing air flow through a building.

Most of these pest species have a more or less defined 'pest range'; which is the distance from a breeding place within which the species can be expected to be a fairly constant pest. This range may be modified by the size and productivity of the breeding area, by transient or permanent climatic factors, or, by physical and biological features of the surrounding area. Scars may result even without infection. The psychological effect of continued midge attack can be quite devastating.

**COASTAL VINE SCRUB/MIXED SWAMP COMMUNITY**

Behind the strand communities is a low, seasonally inundated area dominated by Melaleuca decAbata, Paperbark Teatree (*Melaleuca quinquenervia*), Blue gum, MoretonBay ash (*Corymbia tesselaris*) and Cheese tree. River she-oak (*Casuarina cunninghamiae*) is another common species in this area.

The canopy created by these trees is, with the exception of Paper-barked Teatree, 20 to 30 metres high. The canopy cover is patchy, but often over 70%, and the resultant micro-climate is moist and protected.

Small changes in elevation result in quite different species abundance; however, species composition does not vary greatly.

Often species from the littoral vine forest and the wet scrub forest overlap. Here palms (*Livistonia*), Paperbark Teatree, Casuarina, Blue gun, Burdekin Plum (*Plieogyniwn timorense*). Ribbon wood (*Eurochinthus aicata*) and Celery wood (*Potysclias elegons*) are found with a diverse variety of mid, lower and ground species.

There is a rich species diversity in, but rarity of, coastal vine forests in the Gladstone area. Locally, this type of habitat is preserved in the reserve at Canoe Point, however, there are many species not common to both sides of the Boyne River.

On deep sand in the Tannum Sands and Wild Cattle Creek area, Eucalyptus species are found mixed with *Banksia iniegrifoli* and often Melaleuca low lying areas. *Pandanus pedunculatus* is found in areas seaward.
FRINGING CORAL REEF

The Port Curtis area has relatively few areas of hard coral, their distribution being limited by turbidity, elevated nutrients and fluctuating salinity.

Fringing reefs supporting hard and soft corals and macroalgae occur near the North Entrance and Rat Island. Reefs at Pancake Creek, Jenny Link Banks, Sable Chief Rocks and Rundle Island offer the greatest diversity, whilst those at Colosseum Inlet, Farmer's Point and Manning Reef show signs of degradation.

Reefs tend to be characterised by extensive colonies of the soft coral Sinularia and Sarcophyton both above and below the low tide level. A diverse community of branching, massive and encrusting hard corals: Pocillopora damicornis, Montipora digitata, Acropora acutmnata, A. clathrata, Porites latea, Leptastrea, Turbinaria mesenterina and T. reniformis are scattered across the lower intertidal, extending into the shallow subtidal. Colonies are generally small, with few exceeding 500mm in diameter. The small size of most of the hard coral colonies are indicative of frequent disturbance and high levels of mortality.

MANGROVES

Mangroves play an important role in supporting a wide range of marine and estuarine fauna, as well as commercial and recreational fisheries. Many commercial fish and Crustacean species use these habitats for spawning and/or nurseries.

Eleven species of mangrove have been identified in the Gladstone area; with one associated species of mistletoe, and sixteen species of lichen. In the areas exposed to the full tidal range and a wide intertidal zone, the mangrove communities have a diversity of species. Of the eleven species present, Acanthes illicifolius is the least common whereas Rhizophora stylosa followed by Avicennia marina var. australasia are the most common.

The mangroves community in the BITS area, is rather sparse and poor in species composition. It contains mainly Avicennia marina as low open shrubland to occasional open scrub along the river banks, mixed with occasional patches of Rhizophora stylosa and Aegiceras comicumatum.

Vegetation in the Canoe Point area is relatively well developed, forming a woodland of Avicennia mixed with Rhizophora and occasional Ceriops tagal. Signs of modification can be seen in the vegetation in the area receiving effluents from the nearby sewage plant.

The southern section of South Trees Inlet has a number of small creeks draining into it. This section is dominated by Avicennia and Rhizophora forming scrub. Monospecific low shrublands of Ceriops tagal var. australis are found in the well drained creek flats. Rhizophora stylosa is widely distributed and the predominant seaward species of mangrove in the northern part of South Trees Inlet and Spillway and Sandy Creeks system and forms closed forest fringes backed by a mixed zones of Avicennia, Ceriops tagal var. australis with other species present as minor elements. These mangroves decrease in height away from the waterways and are backed by extensive saltmarsh and claypans forming low open shrubland composed of Avicennia and Ceriops tagal var.australis.

Avicennia marina is the main mangrove affected by Dieback in the area, particularly in the northern South Trees Inlet fringes.
The habitats commonly occupied by benthic/epiphytic algae in the mangroves vegetation along the banks of creek are the pneumatopores, trunks and leaves below the high-water mark.

**Algal communities** associated with the grey mangrove (*Avicennia*) pneumatophores includes:

The filamentous cyanobacteria *Microcoleus* and several species of *Schizothrix*.

The red algae *Bostrychia, Caloglossa* and *Catenella* are commonly associated with trunks as well as pneumatophores.

The green algae, *Cladophorella* and *Trentepohlia* are most common.

**MOSQUITOES**

Several species of mosquitoes in the Gladstone area are potential vectors of human disease (eg. malaria, Ross River and Dengue fever) but only if they have previously bitten an infected, vertebrate host.

Pest mosquitoes occurring in BITS may be grouped according to their favoured breeding places:

(a) Salt marsh mosquitoes  
- *Aedes vigilax*  
- *Aedes aiteahus*  
- *Culex sitiens*  
- *Anopheles Mil*  

(b) Fresh water mosquitoes  
- *Culex annulirostris*  
- *Anopheles annulipe*  
- Various other *Aedes* species  

(c) Domestic mosquitoes  
- *Culex Jatigans*  
- *Aedes aegypti*  
- *Aedes notoscriptus*  

Extensive tidal areas along South Trees Inlet include many saltmarsh mosquito breeding places from which mosquitoes could reach the Boyne Island/Tannum Sands locality when north-west winds prevail. Similarly, the extensive tidal areas associated with Wild Cattle Creek and Wild Cattle Island produce large populations of saltmarsh mosquitoes, which could reach to the townships during periods of south-east winds.

Past engineering activities in the intertidal zone have created major mosquito problems in the Gladstone district. For example, in the problem areas at Gladstone, trees have been left standing within impoundments where normal drainage and tidal access are blocked, the subsequent rise in water level has resulted in the death of the trees; their presence, and continuing decomposition, have contributed largely to the development of mosquito problems.

Problems also may arise where normal tidal access to a mangrove swamp is blocked by an embankment. If the swamp is occasionally filled by spring tides entering by another route, the blocked drainage allows the development of large populations of salt water mosquitoes.
ROCKY FORESHORE

The rocky areas within the **upper intertidal** support a varied community of microalgal grazers such as gastropod snails e.g. *Bembicinum nanum* and *Nerita costata*. Scavengers include small *Grapsid* crabs and Hermit crabs. Dense populations of the filter feeding small Barnacle *Chthamalus* and the Tropical Rock Oyster, *Saccostrea omarasa* are found.

At **mid-tide** level there are often large pools amongst the rocks. The Giant Gem Chiton (*Acanthopleura gemmata*), Tropical Rock Oyster, and Barnacles, together with larger *Grapsid* crabs are the dominant fauna amongst the rocks. Turf algae is both denser and more luxuriant than higher on the shore.

**Within the pools** are small fishes (Blennies and juvenile Damselfishes), sponges and hard coral colonies. The hard corals are commonly Porites, and are usually less than 5cm in diameter.

At the **low tide level**, and extending into the shallow subtidal, both macroalgae and hard and soft corals are common. The brown algae *Sargassum crassifolium* occurs in dense clumps just below the low tide level, whilst *Padina, Zonaria, Halimeda opuntia, Neomeris*, and *Udotea* occur less abundantly within pools, and just below the low tide level.

Stinging hydroids (*Lytoparcus*), Sea Anemones (*Stichodactyla*), and Zoantharians are also moderately abundant. The Tropical Rock Oyster (*Saccostrea amasa*) and the Oyster Drill, (*Morula marginalba*) are also common. The Portunid crab, (*Thalamita*) is abundant within the pools and crevices of the lower intertidal, together with the Sea Cucumber (*Holothuria leucospilota*), and Sea Star, (*Echinaster luzonicus*).

SALTMARSH AND CLAYPANS

Associated with mangroves and coastal saltmarsh is a large variety of other plant and animal communities making an essential contribution towards these trophic systems.

The **area** covered by saltmarsh and claypans (salflats) is quite extensive around BITS (>5000 ha) and carries various algal and Samphireplant communities. These communities are found between the terrestrial vegetation and mangroves.

The **saltmarsh communities** associated with mangroves is largely comprised of *Sporobolus virginicus* (Sand Couch), *Suaedaaustralis* (Seablite) and *Sarcocoma quenquejlora*.

**Algae** found in these saltmarsh associations are represented by the cyanobacterial genera *Microcoleus, Schizothrix, Rhizoclonium, Lyngbya, Oscillatoria*, and the **green algae** *Enteromorpha*. Several benthic *Diatom* taxa are also recorded in this region.

The plant communities occur under hypersaline conditions; only occasionally being inundated with tidal water. *Sporobolus virginicus* forms open to close grasslands towards the periphery; whereas *Sarcocoma quenquejlora*, in association with *Suida australis* and *S. arbiculoides*, forms open herbland.

Extensive algal mats are found in the area with several Molluscs and Crustaceans associated with the saltmarsh community and *Avicennia* pneumatophores.

**Claypans**, with some saltmarsh plants, show an extensive distribution along both sides of the South Trees Inlet system. They carry ephemeral herbland composed of *Arthrocnemum, Salsola, Suaeda* and *Sarcocoma* with some *Sporobolus*. Claypans are usually **hypersaline**.
SAND FLATS

Sand flats support a range of burrowing Gastropods and include the Mud Creeper, *Terebraliasesulcata*, and Moon Snails, *Polineces*, Polychaete worms and many Soldier Crabs *Mictyris longicarpus* can also be found.

STRAND COMMUNITY

The sandy beach along the eastern margin of Boyne Island supports a variety of pioneering species. The width of this community is variable, but relatively narrow compared with other Queensland coastal areas. There is often little, if any, intermediate zonation (c.f. Canoe Point) with a distinct transition into the sand ridge communities. *Ipomea pes-caprae brasiliensis*. Beach Spinifex (*Spinifex hirsutus*) and Horsetail She-oak (*Cosuarina equisetifolia*) are common, with Acacia spp. and Beach Achnanota the presence of a variety of grasses including Red Natal Grass and Mossman River Burr in the wider, stable dune areas.

The transition zone into the swale and wetland communities is identifiable, but quite complex; with varying degrees of development, width and species composition.