Guide to Recognising Insect Pollinator Groups

13 November 2005

It is unrealistic to expect pollination field staff to be able to recognise all the families of insects that visit flowers, especially when some are seen only momentarily. Neither is it important in the context of this study to distinguish between insects such as bristle flies and blow flies, which are morphologically very similar and are likely to be functionally similar in terms of mode of pollination. More detailed analysis of pollinators for particular plant species, including their relative importance, is an area for future research.

Recognising the various types of flies (Diptera) may be particularly difficult until you become familiar with the families and species that occur commonly on flowers in your study area. For this reason, we have decided to have two levels of data recording: a basic level and a user-specific detailed level. We expect that most observers will be able to recognise some families or species of insects at a greater level of detail than given in the basic level, but that this ability will differ between observers. The detailed level of data recording allows you to add additional columns to your data sheet to capture that information. For example, if you recognise crane flies you can add a "crane" column to your data sheet.

Some of the groups you might recognise could be relatively rare in your counts, so you do not need to add a specific column in your data sheets, but can record this in a note column. If subsequent counts suggest this is going to be one of the common things you encounter, then add a column for it. A key component of your data recording is that you make sure you are always consistent in your nick-names for a particular insect you recognise so we don't run the risk of interpreting them as different things. For the purposes of this guide, we have standardised the common names used to be consistent with your reference book: "Which New Zealand Insect?" by Andrew Crowe.

We realise and accept that a division such as "big flies" versus "small flies" is rather arbitrary and subjective and will introduce some anomalies (particularly with highly variable families such as the hover flies), but the concept behind it is more to do with the mechanics of pollination rather than the taxonomy of insects. Thus "big flies" is to be interpreted as those big-bodied flies that appear relatively bulky and are often quite hairy or bristly, such as blow flies, bristle flies, gad flies, and the large-bodied hover flies. Any measurable limit to what is a "big fly" or a "small fly" will be artificial and end up with people attempting to measure flies on flowers, which is certainly not what we want. For the purposes of this study we want you to imagine a domestic house fly (*Musca domestica*) as being a "big fly" whereas anything smaller can be classified as a "small fly". Thus, "small flies" might include some of the small-bodied hover flies. Some flies, such as crane flies, can appear large due to their long legs, but their skinny bodies indicate they are perhaps better interpreted as "small flies" in the basic data. There are some very large crane flies, but these are unlikely to feed on flowers during your daylight counts.

Strive for internal consistency in your data, but don't be too concerned about getting your divisions of big and small flies right. We will still be able to determine the relative importance of flies versus the various bees for the flowers you are observing. Your voucher collection of insects and photographs will give us a great insight into the species visiting.

The following table shows the "basic" groupings of insects and some "detailed" groupings that you might be able to get data on. You'll see that hover flies and soldier flies can be equivalent to both "big" and "small" flies, but if you can recognise them, you only need one "hover" or "soldier" column in your detailed data.

ORDER	**BASIC**	**DETAILED**
Hymenoptera	Honey bees	Honey bees
	Bumble bees	Bumble bees
	Native bees	Native bees
	Wasps	Social wasps
		Other wasps
	Ants	Ants
Diptera	March flies	March flies (Bibionids)
	Drone flies	Drone flies (*Eristalis tenax*)
	Big flies	Hover flies (large-bodied)
		Gad flies
		Soldier flies (large)
		Blow flies and bristle flies
	Small flies	Crane flies
		Hover flies (small)
		Soldier flies (small)
		Other small flies
Lepidoptera	Moths	Moths
	Butterflies	Butterflies[1]
Coleoptera	Beetles	Beetles[1]
Other Orders	"Other"	Anything you recognise e.g. shield bugs, cockroaches, mantids, cockroaches, thrips[#], weta, spiders, etc.

1. If you recognise a more detailed level of butterflies (e.g. monarch) or beetles (e.g. Zorion), by all means note this in your data.

[#] Do not waste time attempting to count tiny, extremely abundant "other" things such as thrips, just indicate you noticed "many thrips".

Honey Bees (*Apis mellifera*)

Honey bees are likely to be one of the most common pollinators you observe. Just be aware that there are various "strains" of honey bees, ranging from very light-coloured forms to darker feral strains. There has been a suggestion that feral honey bees have been eliminated in the North Island by Varroa mite, but the empirical evidence for this is lacking.

The only thing you are likely to confuse with a honey bee is a European drone fly, (*Eristalis tenax*) which is a bee mimic. Drone flies have bigger eyes, tend to work slower than honey bees, and often move their abdomens up and down with a distinctive bobbing motion.

There is no need to collect honey bees for your insect voucher collection unless you are uncertain of their identity.

See also: Page 69 of "*Which New Zealand Insect?*"
Page 179 of "*An Illustrated Guide to some NZ Insect Families*"

Bumble Bees (*Bombus* spp.)

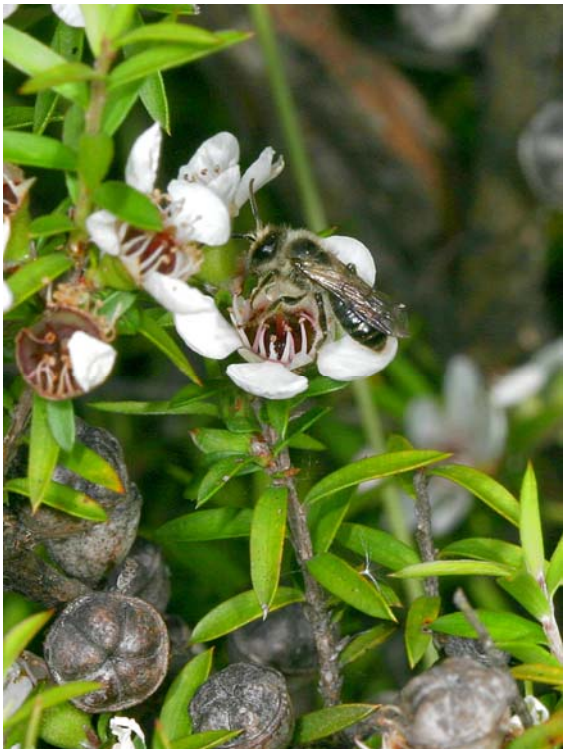
There are four species of bumble bee present in New Zealand (all imported), but only 2 (*B. terrestris* and *B. ruderatus*) are widespread. There is no need for you to distinguish the species at this stage of the study.

The only thing you are possibly going to mistake for a bumble bee is a narcissus bulb fly (*Merodon equestris*), which is also fluffy with variable colour patterns of black and orange. It is, however, closer in size to a honey bee than a bumble bee and has relatively larger eyes. The narcissus bulb fly belongs to the Syrphidae, so if seen would be recorded under hover flies in a more detailed assessment (you can also note down the species if you're sure).

There is no need to collect bumble bees for your insect voucher collection unless you are uncertain they are bumble bees. If need be, we can usually distinguish the species of bumble bees from full-body photographs.

See also: Page 69 of "*Which New Zealand Insect?*"
Page 179 of "*An Illustrated Guide to some NZ Insect Families*"

Native Bees
(Colletidae and Halictidae)



Native bees resemble dark honey bees but are noticeably smaller (some are very small). One of the common species (*Leioproctus fulvescens*) has a thin covering of golden hair, whereas others are very sparsely haired and black. Many of the native bees will be seen carrying pollen sacs on their widened hind legs (like other bees), so that is often a good way of determining that they are bees rather than wasps.

There are numerous species of native bees, but they are difficult to tell apart and we do not expect you to identify between them. Please make sure your reference collection of insect specimens contains several samples of native bees from each of the plant species they visit.

See also: Page 69 of "*Which New Zealand Insect?*"
Page 181 of "*An Illustrated Guide to some NZ Insect Families*"

Social Wasps (*Vespula* and *Polistes*)

There are only four species of social wasps established in New Zealand, and you may not find any of them to be particularly prevalent as flower visitors, but we would like to record their presence if you do see them.

Vespula wasps are the common wasp (*V. vulgaris*) and the German wasp (*V. germanica*). These are your typical yellow and black wasps (called "yellow jackets" in the USA). The common and German wasps can be tricky to distinguish in the field and we do not expect you to do so.

The *Polistes* wasps are the paper wasps. They fly slower than *Vespula* wasps and have their long dangly legs hanging beneath them as they go. The Chinese paper wasp (*P. chinensis*) is yellow and black, but appears skinnier than the *Vespula* wasps. The Australian paper wasp (*P. humilis*) is reddish and brown with some narrow yellow trim. It is likely to be seen only at our Auckland and Whangarei sites.

The only wasp you are likely to confuse with the social wasps is the European tube wasp (*Ancistrocerus gazella*). The European tube wasp is much smaller than *Vespula* wasps and has a distinctive wide black band across the fatter part of the abdomen as well as standard yellow and black bands (see next page)

See also: Page 70 of "*Which New Zealand Insect?*"
Page 174 of "*An Illustrated Guide to some NZ Insect Families*"

Vespula wasp

Chinese paper wasp

Australian paper wasp

Other Wasps

There are a large number of other hymenopterans that will on occasion visit flowers. These include things like *Gasteruption* (a native bee parasite), spider hunters, and European tube wasps. Most of you will be able to distinguish a wasp from a fly just from the body shape. Wasps have 2 pairs of wings (flies have 1 pair), but the hind wings are often small and linked to, or folded under, the fore-wings, so this is usually not obvious on living specimens. Many of the flies you will find on flowers have short stubby antennae, whereas wasps tend to have long antennae. One group of flies that you may mistake for hunting wasps are the larger species of soldier flies discussed below.

See also: Pages 71-72 of "*Which New Zealand Insect?*"
Pages 166-173 of "*An Illustrated Guide to some NZ Insect Families*"

European tube wasp

Golden spider hunter

White spotted Ichneumon

Ants (Formicidae)

Ants can sometimes be found in association with flowers, attracted by the nectar. They may also defend the flower from other insects that may choose to visit it and could therefore affect pollination success. We would therefore like you to note the presence of ants if they occur. If you are regularly seeing ants in your observations it might be easiest to add an ant column to your datasheet.

Ants are rarely likely to be mistaken for other insects due to their combination of narrow waist, absence of wings, and angled antennae.

See also: Page 183 of "*An Illustrated Guide to some NZ Insect Families*"

March Flies (Bibionidae)

These peculiar little flies may be surprisingly important pollinators for some flowers and we are especially keen that you learn to distinguish them. They are small flies with elongate bodies. Their heads seem small for their thorax, and they have bulging eyes and protruding mouthparts. The most commonly encountered species, *Dilophus nigrostigma*, is sometimes referred to as a blossom fly. The female has a distinctly reddish thorax and swollen abdomen. The males are entirely black and can often be seen flying in display groups above heavily flowering shrubs with their abdomens bent strangely upwards. Both males and females will be found visiting flowers.

Female march flies on manuka blossoms

A male march fly rests on a thistle

See also: Page 64 of "*Which New Zealand Insect?*"
Page 120 of "*An Illustrated Guide to some NZ Insect Families*"

Drone Flies (*Eristalis tenax*)

European drone flies are actually in the same family as hoverflies (Syrphidae), but we would like you to count them separately because they are a particularly ubiquitous on some types of flowers and easily recognised once you become familiar with them.

Drone flies are honey bee mimics, but are distinguished by their larger eyes and their habit of moving their abdomens up and down in a distinctive bobbing motion when resting on flowers. They also have a more darting flight than honey bees, and generally appear less "busy" when working flowers. The pattern on the abdomen is also very consistent, although it varies in intensity. Drone flies seem particularly attracted to daisy-like flowers with a strong yellow component.

Note the large eyes that easily distinguish drone flies from honey bees

See also: Page 63 of "*Which New Zealand Insect?*"

Hover Flies (Syrphidae)

Hover flies are an extremely variable family of flies that range from the large, bulky and hairy to the small, slender, and shiny. There are more than 40 species in New Zealand. Common features of the family are large eyes (often wider than the front of the thorax) and a distinctive wing venation in which veins run parallel to the hind edge of the wing giving the appearance of a false margin. Although this venation is recognisable in pinned specimens, it will be very difficult or impossible to pick up while doing flower observations, so it is better to familiarise yourself with the appearance of some of the common hover flies beforehand. There are two basic forms of hover flies: the small-bodied types from which the common name is derived, and the large-bodied varieties that rarely hover.

The small bodied ones tend to be quite recognisable. These are the ones that have a distinctive hovering flight, in which they appear to hang still in the air (like a tiny hummingbird), and then dart off rapidly to a new location or settle on a flower. They often have banded abdomens and may have a black or metallic thorax.

The large-bodied varieties include some of the bee mimics like the drone fly (which are discussed separately above), and the narcissus bulb fly, which is a bumble bee mimic. Other large-bodied hover flies include the native *Helophilus* varieties which have a series of pale yellow and black stripes running lengthwise down the thorax and a variable number of yellow or orange patches on the sides of the abdomen. There is also a metallic blue variety that is likely to be confused with a blue-bottle blow fly. Don't be too concerned if you can't figure out the various large-bodied hover flies, as they will still be picked up in the basic "big flies" category and will hopefully be represented in your voucher collection.

See also: Page 63 of "*Which New Zealand Insect?*"
Page 126 of "*An Illustrated Guide to some NZ Insect Families*"

Narcisus bulb flies mimic bumble bees.

A small type of hover fly

Gad Flies (Tabanidae)

Gad flies (also called horse flies) generally resemble large, somewhat flattened, big-eyed blow flies. With their long wings held out at a slight angle from their body they have a somewhat deltoid shape and have been described as resembling "stealth bombers". Another key feature is the elongate beak-like mouthparts (some overseas species feed on blood and can give very painful bites). They also have a distinctive wing venation in which two apical veins are splayed out either side of the wing tip. There are about 20 species in New Zealand, usually in shades of black, grey and brown.

When busy foraging for nectar, gad flies walk slowly between flowers and tend to allow you to observe them very closely. Blow flies, on the other hand, have a tendency to move rapidly between flowers and are easily scared to flight.

See also: Page 65 of "*Which New Zealand Insect?*"
Page 128 of "*An Illustrated Guide to some NZ Insect Families*"

Soldier flies (Stratiomydae)

The soldier flies are a variable family with over 30 New Zealand species. Many of the native ones are relatively small and can be comfortably bundled into the "small flies" category without need to identify them further. However, those with sites in the north of the North Island may encounter a particularly large and distinctive variety called an American soldier fly (*Hermetia illucens*). These are long, black, quite flattened flies with dark-tinted wings. Their feet are distinctly pale and contrast with the black legs. If the wings are spread, this species is immediately recognised by two clear "windows" at the front of the abdomen (pictured on page 64 of "*Which New Zealand Insect?*").

Another large immigrant species that could be encountered on flowers (particularly in the North Island) is the Garden soldier fly (*Exaireta spinigera*). On this species only the apical half of the wings are tinted dark. The hind legs are noticeably larger than the others, giving this fly a distinctive gait to its walk. The "knees" and "ankles" are pale and contrasting with the rest of the black legs (pictured on page 64 of "*Which New Zealand Insect?*").

See also: Page 64 of "*Which New Zealand Insect?*"
Page 122 of "*An Illustrated Guide to some NZ Insect Families*"

Blow flies (Calliphoridae)
Bristle flies (Tachinidae), etc

These are the "calyptrate" flies. They tend to be fast-flying, fat-bodied species that are often tricky to get close to in a field situation. Blow flies are well known for breeding in decaying organic material such as carrion, whereas the bristle flies are obligate parasites. There are about 50 species of blow fly and well over a 100 species of bristle fly in New Zealand. Other common calyptrate families are the Muscidae (e.g. house flies) with over 200 NZ species, and Sarcophagidae (flesh flies) with 4 species. We do not expect you to distinguish between these families in the field. Some of the bristle flies are distinctive, and you may wish to note these down in your data sheets. Others, however, are very similar to bluebottles or muscids. For simplicity sake, it is easier to treat flies you see of this type simply as "big flies". Naturally, Murphy's law prevails and some calyptrate flies are diminutive and are likely to be included in "small flies". As stated earlier, such anomalies are expected and at this stage we are more interested in the mechanism of pollination rather than the taxonomy of flies.

See also: Pages 62 - 64 of "*Which New Zealand Insect?*"
Pages 128 -133 of "*An Illustrated Guide to some NZ Insect Families*"

Crane Flies (Tipulidae)

Crane flies (also called daddy longlegs) are a very recognisable group on account of their overly long, fragile legs. With over 550 NZ species, there is enormous variety, with some measuring just a few millimetres and others over 15 cm across the legs. Crane flies belong to the thin-bodied group of flies so should generally be classified as "small flies". Most crane fly activity on flowers occurs at dusk and the early hours of darkness, and this is the time you may be lucky enough to encounter some of the more spectacular varieties. Some crane flies, such as the aptly named *Elephantomyia*, have greatly elongated mouthparts that are presumed to be adapted for taking nectar from tubular flowers. If you are seeing crane flies regularly in your counts, you may wish to add a column for them.

Leptotarsus crane fly feeding on Carpodetus leaf flowers

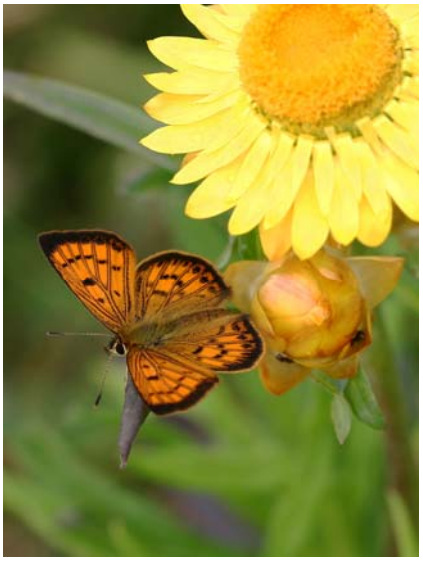
See also: Page 58 of "*Which New Zealand Insect?*"
Page 106 of "*An Illustrated Guide to some NZ Insect Families*"

Moths (Lepidoptera)

Moths are likely to be one of the most important pollinators at night time. The most active period for moths on flowers appears to be at dusk and the first few hours of darkness. Warm, still nights are the best. A few moths are active during the day.

See also: Pages 18 - 41 of "*Which NZ Insect?*"
Pages 144-163 of "*An Illustrated Guide to some NZ Insect Families*"

Butterflies (Lepidoptera)



Like moths, butterflies need no introduction. They can be readily separated from day-flying moths by their clubbed antennae and habit of resting their wings upright and together. New Zealand has few common butterflies, so you'll no doubt be able to identify a butterfly to a particular group (e.g. "blue" or "copper") if not to a species (e.g. "yellow admiral" or "cabbage white").

See also: Pages 9 - 16 of "*Which NZ Insect?*"
Pages 154-157 of "*An Illustrated Guide to some NZ Insect Families*"

Beeles (Coleoptera)

Beetles are often found in association with flowers. If you are able to recognise a particular type of beetle, note it down. Some of the more common and recognisable ones you may find on blossoms during the day include the flower longhorns (*Zorion* spp.), striped longhorns (*Navomorpha* spp.), two-spined weevils (*Nyxetes* spp.), four-spined weevils (*Scolopterus* spp.), and red-winged lycid beetles (*Porrostoma rufipenne*). A different suite of beetles may be found feeding on flowers during the night.

See also: Pages 43 - 55 of "*Which NZ Insect?*"
Pages 74 -103 of "*An Illustrated Guide to some NZ Insect Families*"