

***Additional forage to sustain
pollinators and bee populations: to
maximize pollination***

By: Inge Lotter

CONTEXT:

- In many regions of South Africa, especially areas with mono-crops such as macadamia orchards, good bee forage is scarce to absent during the dry season.
- As the macadamia sector expands to meet market demands (both national and global), it is progressively demanding more from managed bee services.

- Within the next 10 years, it has been estimated that double the current number of beehives will be required to successfully pollinate crops in South Africa.
- This demand is unsustainable with the current floral resources available to the bees and the lack of space for hive placements.
- It is therefore critical to engage the support of all stakeholders to secure adequate bee forage to ensure healthy swarms to satisfy the current and future pollination demands.

- While it is essential for government to support this cause, it is critical for growers to realise their role in securing their current and future pollination demands.
- Growers can invest into the future of the honeybee by keeping as many beehives as possible year round on their property – normally around 1 hive : 2 ha

- Responsible planting of non-invasive bee forage plants will enable bee populations to persist throughout the year. Without this measure there will not be enough bees to effectively pollinate the crop.
- As most growers utilise pesticides, there are a few precautions that need to be addressed should farmers wish to keep hives year round, namely the application of pesticides and the location of the hives.

Macadamia orchards as bee forage

- **Nectar** is primarily an energy source, but in addition to sugars contains various minor ingredients that have nutritional significance.
- **Pollen** provides bees with the protein, lipids, vitamins and minerals that are essential for larval rearing.
- The quality of macadamia pollen and nectar may vary. The bee value (out of 4), according to Beeplants of South Africa, ranges as follows: N1-3; P0-2. Pollen ranges from 16% to 22% crude protein. Bees need protein of at least 20% crude protein that includes 10 amino acids.

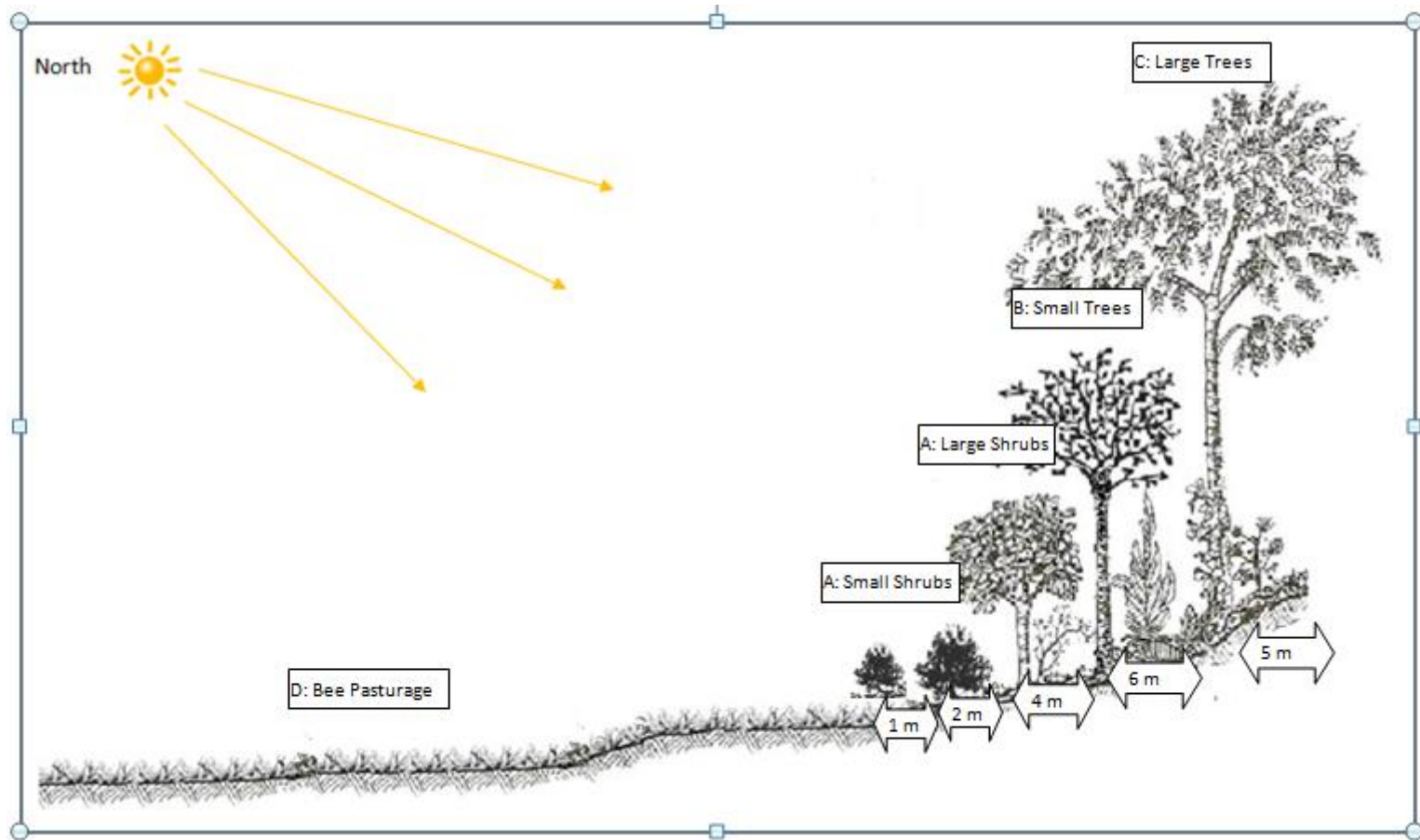


How to prevent swarms from leaving once the flowering season is over:

The Scutellata bee is by nature a migratory species. This means that when forage becomes limited, the swarm is likely to move off. This is problematic for both beekeepers and farmers that own their own bees.

- What can be done to limit this?
 - Planting additional forage
 - Artificial feeding in times of dearth

Planting of bee forage plants



Tip: Using areas such as rocky outcrops and road verges, a lot of bee forage can be planted. Ideally plants in all the natural forms: pasture, shrubs and trees should be planted to ensure good varied bee nutrition.

What can be planted on Macadamia farms to maintain swarms in the off season?

- It is recommended that some trees such as litchi or citrus are also planted on the farm to supplement the bees nectar requirement in the macadamia season. Macadamia flowers are not that nectar rich.
- Planting of plants such as African Blue Basil, Lavender, Sage, Bottle brush (non invasive), Aloes, none listed Eucalyptus and leaving flowering blackjacks will all sustain honey bee colonies.

African Blue Basil – Sterile and prolific year round flowering







Lavender



Aloes

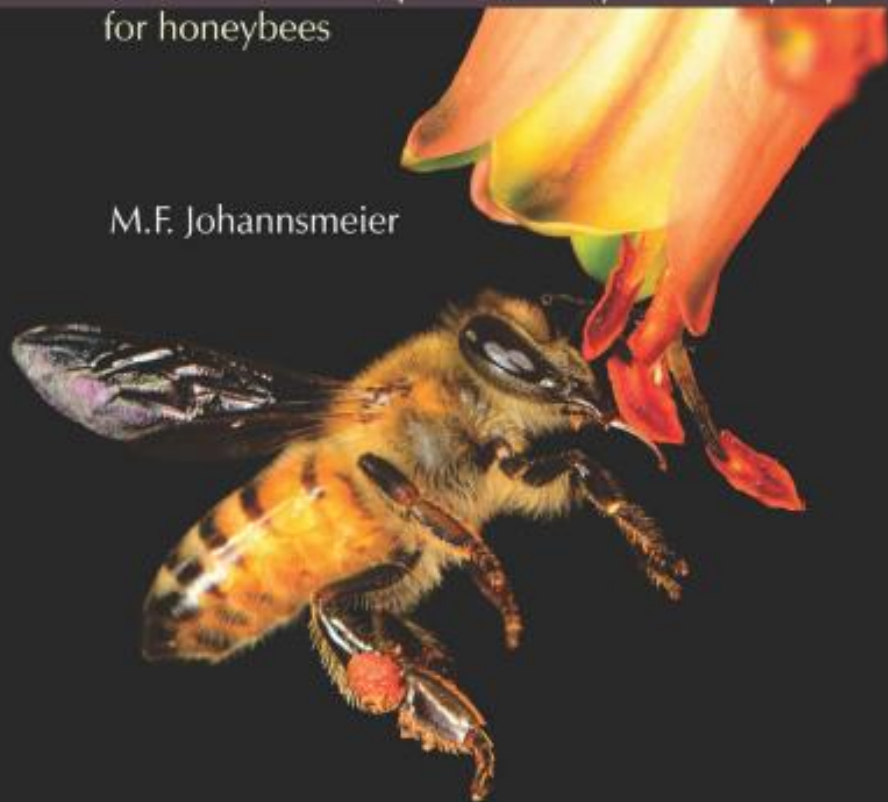




Beeplants of South Africa

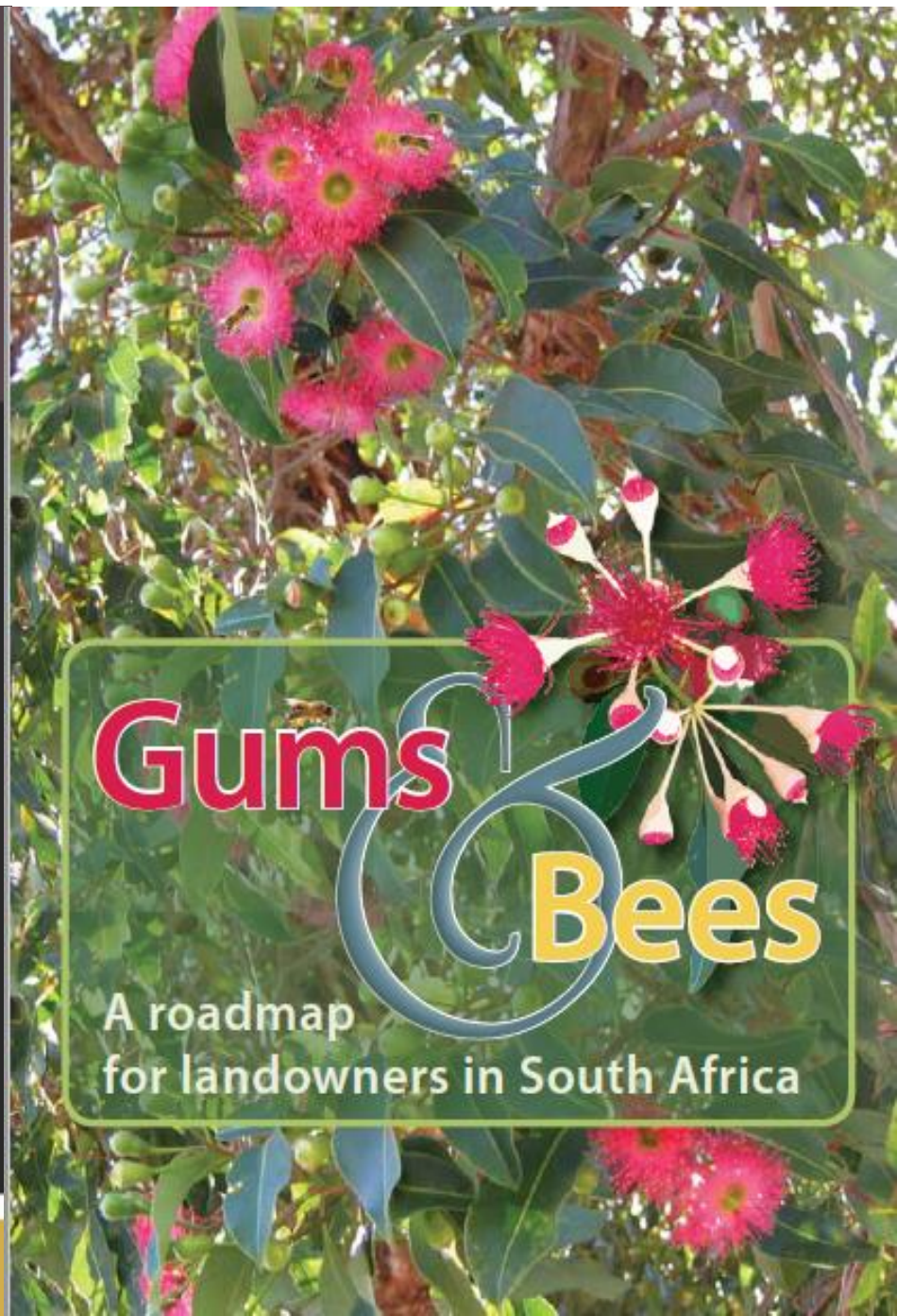
Sources of nectar, pollen, honeydew and propolis
for honeybees

M.F. Johannismeier



Gums & Bees

A roadmap
for landowners in South Africa



Determining what plants are needed to ensure good year round forage for bees

Flowering periods - Pollination

Plant	July	Aug	Sept	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	June	Nectar	Pollen
Macadamia														
Aloe greatheadii var. greatheadii - Spotted aloe													N3	P3
Lavandula x intermedia - Margaret Roberts Lavender													N3	p1
Salvia officinalis - Common Sage													N3	p1
Ocimum basilicum - Sweet Basil													N3	p1
Origanum spp.- Marjoram, Oregano													N3	p 2
Thymus spp.- Thyme													N4	p1
Brassica juncea variety - Leaf Mustard, Indian Mustard													N3	P3
Eruca vesicaria - Salad Rocket, Rocket Cress													N3	P3
Foeniculum vulgare - Fennel													N4	p 2
Mentha pulegium - Pennyroyal, Groundcover													N3	p1
Nepeta cataria & N. racemosa - Catnip & Catmint													N3	p1
Rosmarinus officinalis - Rosemary													N3	p 2
Helianthus debilis - Cucumber-leaf Sunflower													N3	P3
Coriandrum sativum - Coriander													N3	p 2
Corymbia ficifolia - Red flowering gum													N3	p 2
Bauhinia tomentosa - Yellow bauhinia (indigenous)													N3	p1
Aloe arborescens - Krantz Aloe													n1	P3
Aloe marlothii - Mountain Aloe													n2	P4
Callistemon viminalis - Weeping Bottle Brush													N3	P3
Acacia sieberiana - Paperbark Thorn													N3	p 2
Buddleja saligna - False Olive													N3	p 2
Schotia afra - Karoo Boerboon													N3	P3
Eucalyptus cinerea - Florist's Gum													N3	P3
Eucalyptus sideroxylon - Mugga / Black Ironbark													N3	p0
Corymbia citriodora - Lemon-scented gum													N3	p 2
Eucalyptus camaldulensis - River red gum													N3	P3
Eucalyptus grandis - Rose Gum													N3	P3
Trifolium repens - White clover													N4	p2
Phacelia tanacetifolia - Lacy phacelia													N3	p 2
Borago officinalis L. - Borage													N3	P3
Fagopyrum esculentum - Buckwheat													N3	p 2
Centaurea cyanus - Cornflower													N3	p 2

COVER AND INTER CROPPING

Planting cover crops to:

- Provide a **natural means of suppressing soil diseases and pests**
- Improve yields by enhancing soil health including Nitrogen fixing
- Retain and conserve soil moisture through mulching
- To provide high-quality material for grazing livestock or haying
- To provide food and habitat for wildlife, beneficial insects, and pollinators.
- Have an additional product to market

White clover

Trifolium repens

Dutch clover

FLOWERING SEQUENCE

J F M a m j j A S O N D

Features

Herbaceous annual or perennial legume

H 7.5 – 50 cm



Fast growth rate. A prostrate, spreading, soft herbaceous legume. With a stoloniferous growth habit, the creeping stems bear rich green compound leaves with 'heart'-shaped, finely serrated leaflets to 20 x 20 mm. Leaflets may be marked with a white crescent. Leaves and roots develop at nodes along the stolon. The rounded flower heads consist of 40–100 pea-shaped white to pinkish florets each to 9 mm long. White clover requires good rain and soil moisture to bloom prolifically.

Origin: Mediterranean, now widely spread and naturalised.

A field of white clover Photo: Laitr
Keiow/shutterstock.com

Conditions

Climate	Cool, temperate, warm/humid
Rainfall	750 mm, requires good summer rain or irrigation
Aspect	Full sun
Soil	Well-drained heavier, moisture-retaining, pH >4.5

or hay, suggestive of spicy cinnamon and plums. Its taste is clean, mild and very sweet and lingers in the mouth. The honey crystallises quickly into a fine-grained solid white mass. For this reason it is often creamed (www.honeytraveler.com 2011).

Honey	Yield	Colour	Density	Crystal	Frequency
	37 kg/hive	Extra light	Weak	Rapid to fine	1–2 year
Pollen	Yield	Colour	Quality	Quantity	Frequency
	Moderate to high		Average 22.1 to 25.9% cp	Moderate to high	1–2 year



White clover's classic ball of little flowers Photo: Martin Fowler/shutterstock.com

HERB

White sweet clover

Melilotus alba

Bokhara

FLOWERING SEQUENCE

J f m a m j j a s o n D

Features

Herbaceous biennial legume

H 0.3–2.6 m



White sweet clover Photo: Estormiz

Fast growth rate. An erect herbaceous legume. Leaves are dull green, glabrous alternate trifoliate, with the upper leaves oblong to 1.5 to 5 cm. Flowers are white to 6 mm in long racemes of 20–80 flowers, 8–28 cm long. Propagate by seed.

Origin: Asia.

Conditions

Climate	Cool, temperate, warm/humid
Rainfall	400 mm, drought tolerant
Aspect	Full sun
Soil	Well-drained deep medium-to-heavy textured soils, natural to a wide range from sands to heavier clays, pH 6.5–8.5, intolerant of high acidity

HERB

Lucerne

Medicago sativa

FLOWERING SEQUENCE

J F m a m j j a s o n D

Features

Herbaceous perennial

H 1.5 m W 1.0 m



Pea-like flower of lucerne Photo: Victor Selvas

Lucerne has erect soft stems and a deeply penetrating taproot. The stems, arising from a woody base, are 30–120 cm long. Leaves are trifoliate; leaflets are narrow, oblong to ovate or obovate, to 28 x 15 mm, dentate near apex, glabrous on the upper surface and slightly pubescent on the lower surface. Purple, blue or, rarely, white pea-like flowers to 13 mm are borne in a small spike at the upper end of the plant.

Origin: Asia Minor.

Conditions

Climate	Cool, temperate, warm/humid
Rainfall	350 mm, moderately drought tolerant
Aspect	Full sun
Soil	Sandy to clay, pH >5.5

Uses

A widely planted pasture species grown for green feed, hay and silage. It is very productive in the right environment, producing a number of harvests each year.

HERB

Buckwheat

Fagopyrum esculentum

FLOWERING SEQUENCE

j F M A m j j a s o n d

Features

Annual crop

H 100 cm



Bees visit buckwheat early in the day
Photo: Danis Derics/Shutterstock.com

A fast-growing annual crop that is widely planted in the northern hemisphere. It does well on low-fertility, acid soils. It is neither a cereal nor a grass but instead the seed of a fruit. Flowering starts 4–6 weeks after sowing and can continue for 4–15 weeks.

Origin: Siberia, Central Asia.

Conditions

Climate	Cool, frost tender
Rainfall	700 mm
Aspect	Full sun
Soil	Light to medium textured well-drained soils; sandy loams, loams and silt loams

Uses

Buckwheat has become a prized grain: it is gluten free and known as the 'meat of the fields' for its high protein content. It is a significant crop in Russia and China. It provides good green manure, breaking down rapidly once ploughed in.



Tagasaste

Chamaecytisus palmensis

Tree lucerne

Features

Shrub to small tree

H 1.5–7 m

Fast growth rate. A tall perennial legume with long drooping, softly hairy, leafy branches. Bark is rough, yellowish-grey. Leaves are greyish-green trifoliate; leaflets narrow, 5–30 mm, slightly paler beneath with velvety, hairy young growth. Flowers are scented, white and like pea flowers, in clusters in leaf axils. Established by direct seeding or planting.

Origin: Canary Islands.

Conditions

Climate	Temperate, hot/arid, warm/humid, frost tender
Rainfall	350 mm, drought tolerant
Aspect	Full sun
Soil	Well-drained deep sands, pH 4.0–7.5

Uses

An attractive specimen tree if allowed to grow, with profuse flowers. Widely planted fodder species for cattle and sheep in semi-arid Australia; at least 100 000 ha planted in Western Australia (www.agric.wa.gov.au 2011). With appropriate management it can provide much needed fodder in drought. It is widely used to improve the productivity of infertile sands and has been able to significantly increase carrying capacity. Its foliage has a crude protein content varying seasonally between 15 and 25%, equivalent to pasture grasses (www.agric.wa.gov.au 2011). It is often called a green haystack. It provides improved environmental outcomes by using soil water, mitigating dryland salinity and preventing erosion. It can also provide on-farm shade and shelter. It may offer carbon sequestration benefits.

FLOWERING SEQUENCE

j f m a m j j A S O n d



Prolific flowering of tagasaste. Photo: Rob Manning

WE CAN USE EXAMPLES OF OTHER COUNTRIES PLANTING BEE FORAGE

In Israel:

- A countrywide plan to help pollination has also increased Israel's honey production dramatically
- They mainly used a mixture of eucalyptus species that flower different times of the year
- Planting more around 100,000 trees per year for more than 12 years!

Eucalyptus species are not always large trees but can still be significant bee forage providers and still remain some of the best bee forage available in South Africa

Remember of the more than 400 species, there are only 8 listed invasive species of Eucalyptus and then only in riparian zones.

Artificial feeding

- In times of dearth feeding bees artificially, might be needed in order to prevent them from migrating.
- Nectar substitutes such as sugar water can be fed for limited periods.
- Don't forget to feed a pollen substitute as well. Bees need both to survive.

SO: WHY ARE YOU FEEDING?

ARTIFICIAL FEEDING FOR POLLINATION

OR

ARTIFICIAL FEEDING FOR HONEY PRODUCTION

LIFE CYCLE OF THE HONEY BEE

Egg – House Bee	18.5 Days
House Bee	22 Days
Forager Bee	10-24 Days

SO: WHEN SHOULD YOU FEED?

ARTIFICIAL FEEDING FOR POLLINATION

OR

ARTIFICIAL FEEDING FOR HONEY PRODUCTION

SO: WHEN SHOULD YOU FEED?

ARTIFICIAL FEEDING FOR POLLINATION:

**JUST BEFORE POLLINATION STARTS FOR HIVE TO BE POLLEN
HUNGRY WITH A LOT OF BROOD**

VS

ARTIFICIAL FEEDING FOR HONEY PRODUCTION

**40 DAYS BEFORE THE HONEY FLOW FOR MAXIMUM FORAGER
BEE NUMBERS**

WHAT SHOULD YOU FEED?

- Pollen substitute with at least 20% protein value and good mix of 10 essential amino acids
- Nectar substitute 1:1 sugar syrup
- Added Pro Biotics is advantageous when bees have been exposed to stress and pesticides
- Added amino acids helps to ensure complete nutrition.



HOW?

Efficient pollen feeder that both protects the pollen from getting wet as well as stopping the bees from kicking it out while they collect it



Easy Nectar feeders



Remember: Bees need both water and shade for optimal health and productivity



**If shade isn't available, it is advised
that shade be provided**



Why is water and shade important?

- Bees need to keep their hive temperature at around 36 °C.
- Many areas in South Africa is hot. So how do they reduce internal hive temperature?
- They have to fetch water and place droplets all over the frames inside the hive.
- Young hive bees then have to fan the droplets to cool the air inside the hive down.
- If they can't manage field bees will help as constant brood temperature is crucial.

Why is water and shade important?

Ok, so a few bees are busy regulating the hive temperature.....



Or is it just a few.....?

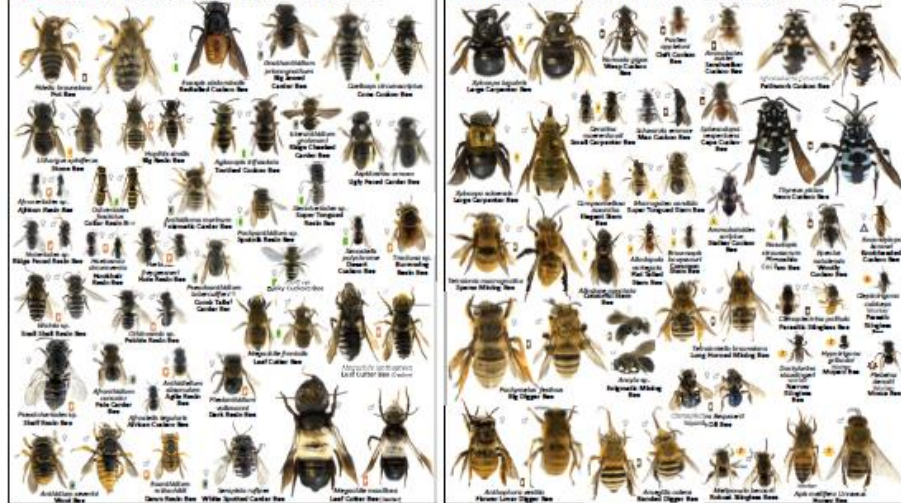


Bees of Sub-Saharan Africa

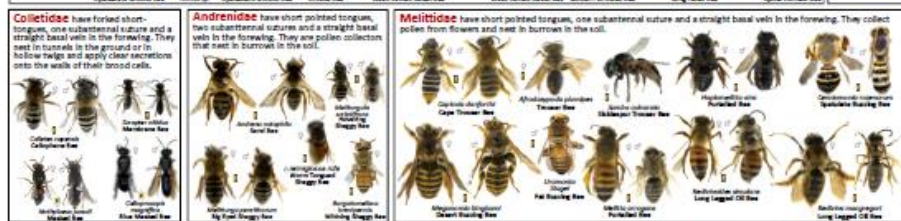
It is estimated that there are around 30 000 bee species worldwide of which about 20 500 have been described, 2755 occur in sub-Saharan Africa and about 1200 occur in South Africa. Bees, in many shapes and sizes, pollinate about 80% of all flowering plants and 75% of the vegetables, fruits and nuts we eat. The symbols next to each bee indicate their sociality, where they nest and where they get their food.

Megachilidae are long-tongued bees with two submarginal cells on their wings that collect pollen under their abdomens. The group comprises almost every type of nest building behaviour.

Apidae are long-tongued bees with two or three submarginal wing cells that collect pollen on their hind legs. Most are solitary but some are social. Parasitism includes social parasites, cleptoparasites and robbers.



Heliidae have short pointed tongues, one submarginal suture and a strongly curved basal vein in the forewing. They account for about one-third of all Afrotropical bee species, and are possibly the most abundant bees.

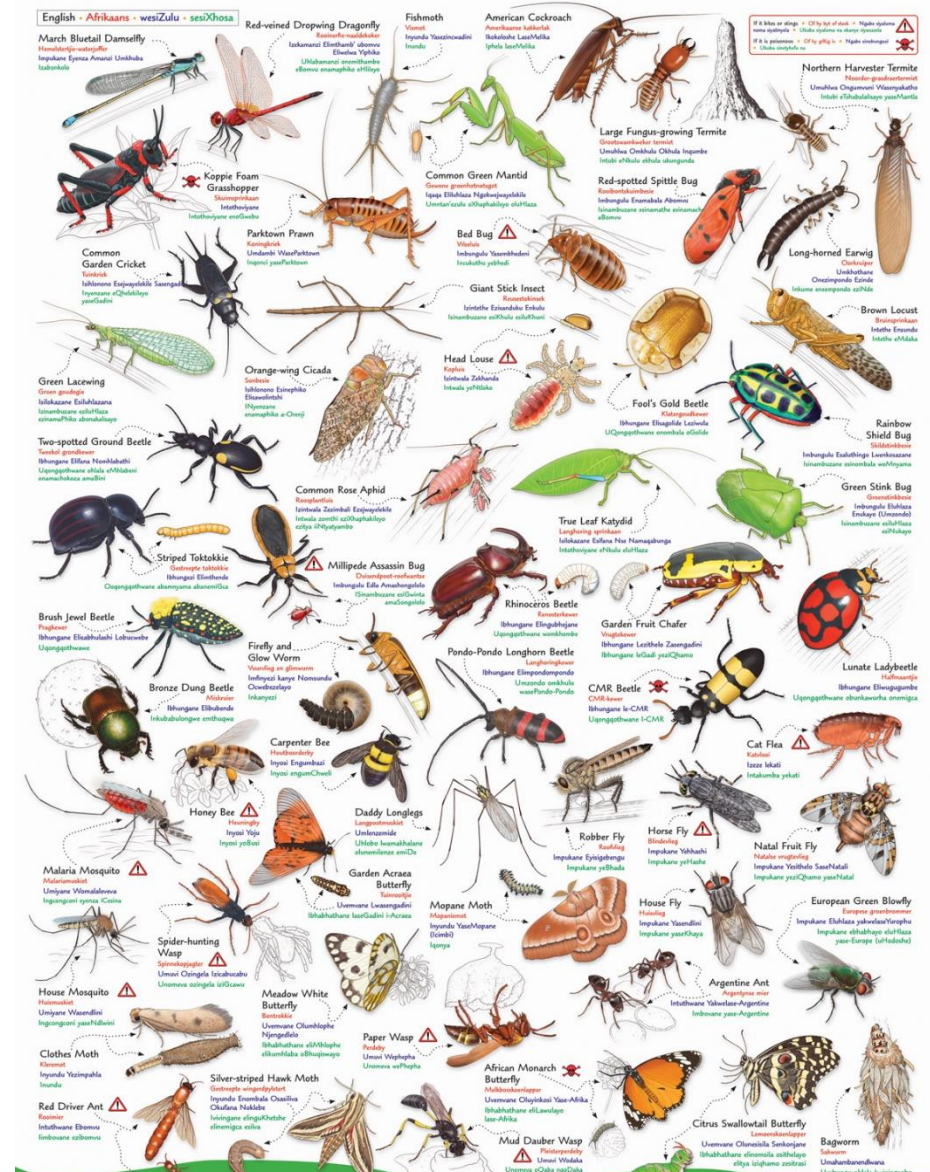


Scale: 5 mm, 10 mm

Nesting (Colour):
 ● Male asexual caste from plant material in existing burrows
 ● Secretes a cellulosic-like substance in existing wood burrows
 ● Carpenter, stem and stone bees bore tunnels in wood
 ● Ground nesting
 ● Digger and mason bees make cases of soil or mud
 ● Carriers make woolly balls around little cocoon-like structures

Feeding (Letter):
 F - Collect pollen from flowers and pollinate flowers in the process
 S - Social parasites replace or coexist with the queen and use the host workers to raise their progeny
 C - Cleptoparasites lay their eggs in the nests of other bees and the larvae feed on the food collected for the host's larvae
 R - Robbers steal pollen and honey from nests of other bees

Sociality (Shape):
 □ Solitary
 △ Social
 ◇ Parasitic



Insects of Southern Africa

SASOL Insekte van Suider-Afrika Izinambuzane zaseNingizimu ne-Afrika Izinambuzane zaseMzantsi Afrika

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REMEMBER:

Everything is connected

**It is about so much more
than the honey bee.....**

Thank you

Get:





Bee

Forage Plants

African Blue Basil Bags
African Blue Basil Cuttings

082 821 5011 | info@thebeegerpicture.co.za | www.thebeegerpicture.co.za