The Honey Bee Family

In order to understand and study animals the zoologist has classified them by placing them in groups showing similar characteristics.

Group	***Name***	***English equivalent***
Kingdom	Animalia	Animal (with)
Phyllum	Arthropoda	jointed legs,
Subphylum	Hexapoda	six in number,
Class	Insecta (Insects)	
Order	Hymenoptera	4 membrane-like wings,
Sub-order	Apocrita	
Section	Aculeata	possessing a sting.
Super family	Apoidea	Bees.
Family	Apidae	Social bees.
Sub-family	Apinae	
Genera	Apis	Honey bees.
Species (main)	cerana	Eastern honey bee.
	dorsata	Giant honey bee.
	florea	Little honey bee.
	mellifera	Western honey bee.

A more detailed table showing the place of the honey bee in the hymenoptera can be found in *The Illustrated Encyclopedia of Beekeeping* edited by Roger Morse and Ted Hooper.

There are 20.000 species of bees in the world. Bees differ from other insects by having bodies covered with plumose hairs and by living on a diet of pollen and nectar. The hairs aid the bee in pollen collection and the pollination of flowers.

There are two main groups of bees: *solitary* and *social*.

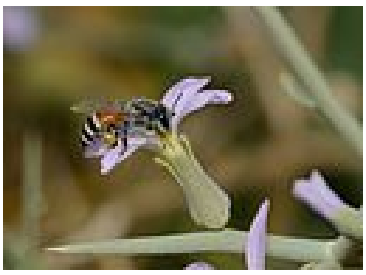
Solitary bees, as the name suggests, do not live together in a colony. A typical example is the mason bee *Osmia rufa.* The female is attracted to old buildings with soft brickwork or mortar, where she can drill a hole in which to lay an egg. Suitable conditions may attract many solitary bees – some are gregarious if not social. But scare stories of houses falling down because of the attentions of mason bees are nonsense - the house needs repointing![7]

Honey bees are the only bees that live together in a complex well-organised society and store food to enable the colony to survive the winter, when forage is no longer available. Wasps and bumble bees do not accumulate surplus stores of food and do not survive the cold of the winter. In the autumn, queens are reared and, after mating with males, leave to find suitable sites where they hibernate until the following spring, when they emerge and the colony cycle begins again.

The four species of honey bees (*Apis*) are, obviously, closely related, their anatomy and behaviour being very similar. The true mark of a species is that no member of one species

can mate with a member of another species. However, recent research has shown that if there are no other males to mate with *A mellifera* queens, queens will mate with *A. cerana* drones.[9] The eggs do not hatch or are removed.

A florea (the little or red dwarf honey bee - commonly known as *Kathori mauri*.) and *A dorsata* (the giant honey bee) are both indigenous to south and south-eastern Asia. *Apis dorsata laboriosa* (the Himalayan honey bee) is the world's largest honey bee and can measure up to 3.0 cm (1.2 in) in length. They both build a single comb in the open. The difference is in the size – the former is very small and the latter very large. *A florea* tends to abscond when disturbed. Although attempts have been made to keep *A florea* in hives, its *flight instead of fight* strategy is the main factor which has prevent success, since quite minor interference, readily tolerated by *A mellifera*, can induce it to desert. *A florea* builds the comb on the branch of a tree or shrub. Unlike *A mellifera,* the returning foragers do not recruit foragers by the waggle dance on the vertical face of the comb. Instead, they perform the dance on the horizontal upper surface where the comb wraps around the supporting branch. The dance is a straight run pointing directly to the source of pollen or nectar. In all other *Apis* species, the comb on which foragers dance is vertical, and the dance is not actually directed towards the food source.



Apis florea
Photo: Gideon Pisanty.[1]

A breviligula & *A binghami* are both thought to be sub-species of *A dorsata.*

A andreniformis is 'the black dwarf honey bee'.

Honey is harvested from both *A florea* and *A dorsata.* In Nepal, for example, the method used to collect the huge combs (up to 3' wide) of *A dorsata* involves hanging from ropes over cliff faces where the combs are built. In a television documentary, Jimmy Doherty, from *Jimmy's Farm,* was seen descending down a cliff face on a rope and cutting away honey comb, which he dropped into a basket held on a stick.

A cerana (the Asiatic, Eastern or Himalayan honey bee) is found in southern and south eastern Asia up to Russia in the north and as far west as Afghanistan. Its distribution includes China, Pakistan, India, Korea, Japan, Malaysia, Nepal, Bangladesh, Papua New Guinea and Solomon Islands. It is a cavity dweller, like *Amm,* and can be kept in hives, but being smaller than *A mellifera* the hives are a smaller version of the Langstroth hive. Similar to *A mellifera,* there are several subspecies adapted to different environments:

Apis cerana
Photo: Charles Lam.[2]

A cerana cerana (syn. *A c sinensis*)
A c heimifeng
A c indica
A c johni
A c nuluensis
A c skorikovi (syn. *A c himalaya*)
A c javana[21]
A c japonica

The species is found in habitats ranging from lowland forests and scrub to high mountain passes in the Himalayas and can tolerate a wide range of temperatures from cold, temperate, to tropical ecosystems.

Behaviourally, *A cerana* is almost indistinguishable from *A mellifera.* There can be large differences in their defensiveness depending on the season and region. They are described as 'very docile, gentle, and even somewhat timid'[22] and 'very aggressive'.[23]

A cerana colonies frequently swarms and easily absconds. *A cerana* usually swarms between March and May and November and December. When fanning to circulate air at the entrance, *A cerana* workers face the opposite direction that *A mellifera* workers face when performing the same task. *A mellifera* workers face the hive entrance, whereas *A cerana* workers face away from the entrance. *A cerana* has several unique responses to disturbances such as the workers' fast and sudden lateral body shaking, making a hissing sound and heat balling. The latter is used by *A cerana japonica,* the Japanese honey bee, when attacked by the Japanese giant hornet, *Vespa mandarinia.* Japanese beekeepers attempted to introduce the more productive *A mellifera* colonies, but they had no defence against Japanese giant hornets, which can rapidly destroy colonies. When a hive of *A cerana japonica* bees is invaded by the Japanese giant hornet, about 500 bees surround the hornet and vibrate their flight muscles until the temperature is raised to 47°C (117°F), heating the hornet to death, but keeping the temperature still under their own lethal limit (48–50°C.

Apis cerana is the natural host to the parasitic mite *Varroa destructor* and the microsporidium *Nosema ceranae,* both serious pests of the Western honey bee. Having co-evolved with varroa, *A. cerana* exhibits more careful grooming than *A mellifera*, which prevents the mite from devastating colonies. It is reported they remove infested worker brood and trap mites in drone brood. They are known to renew the wax of brood comb on a continuous basis thus keeping pathogen levels low.[17] *A cerana* does not use propolis.

A nigrocincta is closely related to *A cerana,* found on several islands in Indonesia and the Philippines.

Apis koschevnikovi, the red bee, is a species of honey bee which inhabits Malaysian and Indonesian Borneo, where it lives with other honey bee species such as *Apis cerana* (specifically *A c nuluensis*). *A. koschevnikovi* hosts a unique species of *Varroa*, named *Varroa rindereri* (Guzmán et *al.*, 1996). It has only been reported in colonies of *A. koschevnikovi* in Borneo and seems to be specific to that species, as it has yet to be observed crossing over to colonies of *A. cerana*, even when they live in the same apiary.

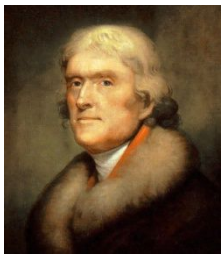
Apis mellifera (the Western honey bee) probably originated as a successful species in the central part of North Africa. From there it spread to the south to colonise the Middle East and South East Europe and to the west. However, a recent world-wide survey of the genome sequence variation in honey bees suggests that they are derived from an ancient lineage of cavity-nesting bees that arrived from Asia around 300,000 years ago and rapidly spread across Europe and Africa.[10]

A mellifera was named by Linnaeus & means 'the honey bearing bee'. He tried, unsuccessfully, to change the name to *A mellifica,* 'the honey making bee'. The latter name is seen in old beekeeping books.

There were no indigenous honey bees in any part of the New World[3] – the Americas and Australasia. Honey bees were introduced by colonists, probably in the 17th C. Eva Crane (*A Book of Honey*) quotes the earliest likely record, a letter dated 5th December, 1621, from the Council of the Virginia Company in London to the Governor and Council in Virginia:

We have by this ship and the Discovery sent you divers sorts of seed, and fruit trees, as also Pidgeons, Connies, Peacocke maistives, and Beehives.

The 18th C statesman Thomas Jefferson (3rd U.S. President) mentioned in his *Notes on Virginia* that the Native Americans referred to the bees as *white man's flies* because they were always seen in advance of the settlers. White clover, which spread similarly, was known as the *white man's foot.*



Thomas Jefferson by Rembrandt Peale 1805

Whereso'er they move, before them
Swarms the stinging fly, the Ahmo,
Swarms the Bee, the honey-maker;
Whereso'er they tread, beneath them
Springs a flower unknown among us,
Springs the White Man's Foot in blossom.

Hiawatha – H. W. Longfellow (1855)

In the beginning, honey bees were rare and costly. In 1660, a stock of bees in Massachusetts was valued at £5, a considerable sum at that time. Honey bees quickly became an essential part of the local fauna living in the forests of New England and Virginia in large numbers.

Honey bees from Europe reached Australia in 1822 on the convict ship *Isabella.*[4] The Master of the *Isabella,* Captain John Wallis, was also Master of the *Three Bees!* In 1840, £4 was paid for a hive of bees in Jervis Bay, New South Wales, by a settler who hired an aborigine to carry it 40 miles to his home. The first Italian bees to arrive in Australia were sent out by Thomas Woodbury of Exeter, England, in 1862.

Until lately bees were unknown in Australia. A gentleman who had noticed this fact, when he visited England, obtained a well-filled hive, and took it with him on his return to the colony. It was placed on deck during the voyage, the bees having perfect liberty; and however far they sometimes flew over the waters, they were sure to return to the ship.[5] *In this way they were carried sixteen thousand miles to Hobart Town. When safely arrived, the hive of bees was presented to the governor, who placed it in his garden. The bees there found a rich supply of food, and so thrived that twenty swarms were the produce of this one hive in the first year. The governor kindly presented the increase to his friends and, in a few seasons, most gardens in the colony were furnished with a hive of bees.*

Extract from *The Hive and its Wonders* published by *The Religious Tract Society* (undated).

In 1986, a sample of dark bees from an isolated apiary in Tasmania was examined and identified as *A mellifera mellifera* (q.v.), probably descendents of colonies taken out by the early settlers. The area around the apiary is now an exclusion zone and it is forbidden to take bees into or through the area.[6]

In New Zealand, Mary Anne Bumby, the sister of a missionary, arrived on 20th March, 1838 bringing two straw skeps of bees from Thirsk, Yorkshire. In 1844, the Reverend William

Cotton left England for New Zealand. He took with him beehives packed inside ventilated barrels resting on racks above blocks of ice with cinders filling the space in the upper half. Unfortunately, the sailors thought the bad weather they encountered was caused by the bees and threw them overboard.

Sub- species of Apis mellifera

Many sub-species evolved in response to environmental conditions, the most well-known being the Italian, Carniolan, Caucasian and the Dark European honey bees. It has been introduced into almost every country in the world. The following information comes from different sources & details can vary depending, for example, on where the bees are kept and introgression.

Ssp originating in Europe

- The indigenous bee of this country was the British black bee *Apis mellifera mellifera,* also known as the British brown! Included in this group are the Dutch, German and French dark bees. A better term is the *Dark European* bee. The original home was Europe, north and west of the Alps, and central Russia to the Urals. It was a bee that had evolved over millions of years to survive in cool climates and was well suited to our fickle climate and scanty nectar flows.

Opinions of the British black bee vary, especially regarding their temper – probably due to the effect of imports on the purity of the sub-species. It is generally agreed that the chief characteristic was their ability to produce surplus honey under adverse conditions. The queens were not prolific and the bees were long-lived. They were good comb builders and they sealed their honey with a smooth white capping which was of great value in the production of comb honey. They wintered well on the minimum of stores. They placed a supply of honey round the brood and rarely failed to keep this intact – in fact, the queen would cease laying if the supply of food was running short. They were never eager to swarm.[11]

"The climate of the British Isles is such as to stimulate the desire to swarm, with the result that foreign races of the bee when imported tend to swarm more here than they do in their native country … the native black bee of the British Isles, up to the great epidemic of bee disease about 25 years ago, swarmed less than any bee we now possess."

The British Bee Journal 1930.

During the *Little Ice Age* (c 1200-1850 AD), canals & rivers in this country frequently froze deeply enough to support skating & *Frost Fairs* were held on the River Thames. It is not surprising, therefore, that native bees survive severe winters better than foreign bees and their crosses.

The *Dark European Bee* (*Apis mellifera mellifera)* is physiologically different to other subspecies (e.g. the Italian bee *Apis mellifera ligustica).*[24] In Darwinian terms, *adaptation* and *survival of the fittest* have produced bees suited to their environment.

Amm is a dark coloured bee (hence *Dark European*) whereas, for example, the Italian bee is predominantly yellow or tan coloured - black absorbs heat. *Amm* is able to fly at lower temperatures. It winters well on the minimum of stores. It is the largest of the whole species and is able to produce greater metabolic heat, thus reducing the amount of food required to maintain warmth during periods of cold. It has the longest abdominal hairs and the outside bees of the winter cluster tuck their heads inwards & the hairs interlock, insulating the cluster like a mammal's fur. There is an increase in the amount the enzyme catalase, unlike other subspecies, that breaks down the hydrogen peroxide generated during digestion of glucose, so decreasing the need for cleansing flights – if confined for long periods & unable to take cleansing flights, *Amm* bees are less likely to develop dysentery. Colonies are broodless for a longer period during the winter & consequently consume less food, reducing the amount of waste products. In late summer the enzyme biopterin is formed (not present at other times) and proteins & fats accumulate in their bodies. These 'winter bees' are physiologically young in the spring and can act as nurse bees. Unlike the Italian bee, they do not need to produce brood in the winter to have nurse bees in the spring. There is greater resistance to nosema. It is also suggested that the native bee has evolved to thrive on heather and ivy honey as winter stores, unlike non-native bees which suffer from dysentery.[25]

The British black bee remained pure until 1859, when Thomas Woodbury procured queens from Liguria in Italy. The Italian bees were (and still are by some beekeepers) favoured because of their reputed docility. However, Italian bees are better suited to Mediterranean countries, where they evolved to live. The Italian queen continues laying in poor weather, colonies often need feeding as a result and they do not winter well when conditions are harsh. More importantly, matings with local bees (over which there can be no control) often produce bad tempered crosses. But from 1859 until the present day, queens of various sub-species have been introduced into this country from all parts of the world with the mistaken intention of improving the bees of this country.

The largest influx of foreign bees occurred following the spread of the Isle of Wight disease to the mainland in the first quarter of the 20th C. causing the loss of many colonies of the native bee. At the time, the country was at war with Germany, sugar was scarce and honey was in great demand. Bees were also needed for pollination. The Dutch had great numbers of skeps of bees for sale and these were purchased as part of a government restocking programme. Since the Dutch bees were known to be given to swarming, it was the practice to requeen colonies with Italian queens, which at the time were cheap and easily obtainable.[14]

The I.O.W. disease raged from 1904 until the 1920s. It was several years before the causative agent was identified as a parasitic mite, *Acarapis woodi* (*Acarine*), and several more years before Richard Frow developed a treatment.[12] Before the *Frow mixture* was available, various 'treatments' were suggested including *Izal* disinfectant – similar to today's quack remedies for another parasitic mite, *Varroa* destructor. It is now doubted that acarine was responsible or wholly responsible. The symptoms described – dislocated wings, crawling bees, etc. – are more likely those of paralysis. It is now thought that acarine exhibits no symptoms. It was a period when skep beekeeping was giving way to movable-frame hives. Skep beekeeping relied on swarms building new combs, which probably prevented the build-up of disease. It may be that the Italian bee, used to restock, was more susceptible to acarine – in recent years America has experience problems with stocks of Italian bees and the *tracheal mite*, as they call acarine. The data suggests that acarine originally existed only in Britain from where it spread to the European continent.[13] Overcrowded apiaries have also

been suggested as a cause of the losses. The Great War resulted in colonies being neglected & a loss of beekeeping experience.

In 1945, Joseph Tinsley wrote[14] 'In all epidemics, whether in man or livestock, some survive. Nature does not destroy all. Those that live through a prolonged attack of disease invariably show resistance … and often become more or less immune' – in Darwinian terms, *the survival of the fittest.* It is not true as many authors have stated (including Brother Adam) that the native bee was completely wiped out. Many colonies survived, especially further north of the country - although Willie Hamilton, in *The Art of Beekeeping,* states that 'even in some of the Highlands of Scotland … foreign queens had been imported as far back as the (1860s)'. Joseph Tinsley continued 'If, instead of importing foreign bees, we had used the remaining native stocks, and carefully bred them by selection, we should probably have gone a long way in the improvement of our bees. As it was, Dutch, Italian and the remaining native bees were allowed to mix freely and breed, with the result that mongrel races were produced'.

"For some years I have been crossing drones of an English-bred strain of Italians to the successive daughters of a cross-bred hybrid queen which came to me in a swarm. The queen … was extremely prolific – too much so in fact. They … could be really bad tempered at times and nothing would stop them swarming."

The British Bee Journal March 1930.

There has been a resulting deterioration in the temper of bees. Any beekeeper collecting swarms will have encountered vicious bees. The use of a mixture containing ether & chloroform was once recommended for anaesthetising vicious bees! Compare pictures of beekeepers working skeps & hives in the past, without protective clothing and the minimum of smoke, with the excessive protective clothing of recent years, which makes careful handling difficult. Such bad tempered bees are a source of nuisance and annoyance to neighbours. They can cause much bad feeling and sometimes provoke litigation. Not only have imports of foreign bees produced a mishmash of bad tempered mongrels, but there is always the risk of bringing in exotic diseases and pests.

Germany faced the same problems as we do today. Their bees were bad-tempered, swarmy and non-productive mongrels. They decided to restock using the Carniolan bee (*A m carnica*) (qv), since this was available in a pure form. As a result, more honey was produced in West Germany than in the whole of Germany before the last war, even though the number of hives had decreased and there was less forage. However, increased production and docility have been achieved only after many years of careful selection. It must be emphasised that all the four sub-species – Carniolan, Caucasian, Italian and Dark European (qv) – are gentle when pure and crosses become aggressive, often in the first generation. Some now think that the native bee should have been selected for improvement.

A recent *Defra* study (2014) into the genetic diversity of honey bee populations in England & Wales shows that despite decades of importations & claims that the native bee was wiped out by *the I.O.W.* disease, the honey bee population in England & Wales contains almost 50% *Apis mellifera mellifera* genes.[15] The distribution of *A m mellifera* genes is reasonably even.

I have ascertained beyond doubt that the good old British bee still exists, absolutely pure, in Scilly. Mr A Mumford, of Holy Vale, St Mary's of Scilly writes me:- "In answer to your letter about the old English black bee, I myself can honestly say that my bees are the native black. They have existed here for years, and no bees are allowed to be landed from mainland." I am confident that this good old race will again supply the tables of British people with honey gathered by the bees known to Shakespeare and our forefathers.

WJ Farmer, *BBJ* Feb. 20th 1930.

"Can you," I asked him, as we parted, "after all these years of experience, lay down for beginners in beemanship one royal maxim of success above any other?" "Well, they might take some warning from … King Solomon," he said, "and beware the foreign feminine element. Let British bee-keepers cease to import queen bees from Italy and elsewhere, and stick to the good old English Black. The English black bee is a more generous honey-maker in indifferent seasons; she does not swarm so determinedly, under proper treatment, as the Ligurians or Carniolans; and, above all, though she is not so handsome as some of her Continental rivals, she comes of a hardy northern race, and stands the ups and downs of the British winter better than any of the fantastic yellow-girdled crew from overseas."

The Bee-master of Warrilow by Rev. Tickner Edwardes, 1920

- *A m lehzeni* is the heathland bee, found in Germany & Norway. The heather bee begins brood rearing early in the year and continues late into the autumn. The bees swarm two to five times a year and a first swarm usually swarms again and may swarm again. They liberally build drone comb. They build up to 50 queen cells.[20]

- *A m nigra,* the black bee, is found in the Alps (Alps Black, Pomeranian Brown, Black Scandinavian).

- The Italian bee, *A m ligustica,* has been mentioned. In addition to their qualities cited above, they are favoured for their colony build up, strong foraging abilities, low swarming, and building comb quickly with clean white cappings. However, they readily rob other hives and drift between hives. Unlike *Amm*, they do not fly at low temperatures. The bee is recognized by yellow or tan bands on the abdomen. In spite of many excellent qualities, it has never become properly naturalised north of the Alps and does not take kindly to northerly winters. It is interesting to note that after so many years of importing yellow Italian bees, our bees tend to be dark rather than yellow – black absorbs heat, an essential quality for survival in a cold climate. Beowulf Cooper has written *'If all bees were wiped out and replaced by imports, the new bees could turn themselves within a few generations into something resembling the extinct native'* (*The Honeybees of the British Isles).*

- The Carniolan bee, *A m carnica* (the grey or Slovenian bee), has broad grey bands on the abdomen and is native to the south-eastern Alps, the north Balkan region and the Danube (Austria, Hungary, Bulgaria down to Bosnia and Serbia). It has a gentle temperament, winters with a small colony size (hence consumes less stores) and withstands the hardest winters. It builds up rapidly in the spring but, as a result of this rapid expansion, swarms excessively.

- The Caucasian bee, *A m caucasia (*often misspelled *caucasica*), is also grey in appearance and originates from the Caucasus. It is widespread in Russia and central Europe. It has the longest tongue of all the four sub-species and is able to reach the nectaries of red clover – hence, its popular name of *the red clover bee.* It is well-tempered & quite prolific, but is slow to build up and does not do well in cool, damp, climates. Some strains are excessive propolizers.

<u>*Lesser known sub-species*</u>

- *A m remipes* (syn. *armeniaca*) *is* also found in the Caucasus region, Iran & the Caspian Sea.

- The Greek bee, *A m cecropia,* of southern Greece is favoured for its gentleness, large colony size, non-swarming & foraging ability. It is a heavy producer of propolis making hive inspections difficult. It has been offered for sale in the U.K.

- The Iberian or Gibraltar bee, *A m Iberiensis* (often misspelled *Iberica*), is found throughout much of the Iberian peninsula (Spain & Portugal). The drones are believed to preferentially mate with *A m Iberiensis* queens, which results in a fairly pure population. Although not particularly aggressive, after any disturbance (e.g. opening the hive) 'sentry bees' patrol the area around the colony for up to 24 hours. Consequently, colonies are often destroyed.

- The Maltese bee, *A m ruttneri,* is noted for its drought tolerance and its rapid response to the seasons & forage availability – hard-working & copes with the hot Maltese summers.

- The Sicilian bee, *A m siciliana* (syn. *A m sicula*) a dark bee from the Trapani province and the island of Ustica of western Sicily.

- The Cretian bee, *A m adami,* from Crete.

- The Cypriot bee, *A m cypria*, was exported in the 1900s to Europe and the U.S.A and, although it wintered well even north of the Alps, it had little effect. It has the reputation of being very fierce.

> *These bees were introduced into England a few years ago. They are rather smaller than Italians, but much brighter in colour. As far as appearance goes, they are certainly the most handsome bees cultivated. They are extremely prolific, excellent honey-gatherers, and our own experience of them was that colonies vary in temperament, some being gentle and others very vicious.*
>
> T.W. Cowan - *The British Bee-keeper's Guide Book* (1924)

<u>*Ssp originating in Africa*</u>

Africa has several sub-species adapted to the extreme conditions. The sub-species of tropical Africa are easily provoked to attack, have a high tendency to swarm & abscond when food stores are low, and have a small body size.

- The Tellian bee, *A m intermissa* (syn. *A m major*), from the Maghreb area in North West Africa (Morocco, Libya, Tunisia). They are totally black and are extremely fierce, but do not attack without provocation. They are industrious & hardy, but have many negative qualities making them unsuitable for honey production or pollination.[19] Queenless workers start to lay eggs within a few days.[13]

- *A m sahariensis* is found in the oases of the Sahara in Morocco & Algeria in North West Africa. It has few predators and is consequently very gentle – however, when hives are opened they are very nervous. The lack of nectar producing plants around the oases they inhabit causes them to forage up to 5 miles. It is nearly as small as the bees south of the Sahara.

- The Egyptian or Lamarck's honey bee, *A m lamarckii* (syn. *A m fasciata*), found in the Nile valley of Egypt and the Sudan.

- *A m adonsonii,* West Africa (Nigeria, Burkina Faso).

- *A m scutellata,* Central and West Africa. This was introduced into Brazil (from Tanzania) and subsequently spread throughout south and central America crossing with local populations ('*Africanised* bees').[16] They direct more of their energy to defensive behaviour and less to honey storage.

- *A m litorea* is found in low elevations of East Africa, on the coast of the Indian Ocean from Kenya to Mozambique.

- *A m monticola* is found on the mountains of east Africa – Mt Elgon, Mt Kilimanjaro, Mt Kenya, Mt Meru - at altitudes between 1,500 and 3,100 m.

- *A m unicolour* from Madagascar.

- *A m yemenitica* (syn. *A m nubica*) from Oman and the Yemen (Somalia, Uganda, Sudan, Yemen) is the smallest of the *A mellifera* sub-species.

- *A m capensis*, the Cape bee, occurs in a restricted area on the Cape of Good Hope. In queenless colonies, the workers lay unfertilised eggs which develop into females rather than drones, from which queens can be produced.[16]

Ssp originating in the Middle East and Asia

- The Macedonian bee, *A m macedonica,* is found in an area extending into the Ukraine and around the Black Sea towards the Middle East, where it is thought to have originated (Republic of Macedonia, Northern Greece).

- *A m meda* found in Iraq.

- *A m anatoliaca* (misspelled *A m anatolica*) found in the central region of Anatolia in Turkey, Iraq and as far east as Armenia. It has many good characteristics but is unpleasant to deal with.

- The Syrian bee, *A m syriaca*, found on the east coast of the Mediterranean Near East and Israel), is said to have a fierce temperament.

- *A m pomonella* (classified 2003 by Sheppard & Meixner) is endemic of the Tien Shan Mountains in Central Asia – it has a range that is the farthest east.

Finally, mention must be made of the Buckfast bee. Brother Adam of Buckfast Abbey in Devon, spent his long life attempting to breed the 'perfect bee' by combining desirable qualities from several sub-species. Different opinions are given of its qualities and there appears to be variability in the queens supplied. However, it has its advocates worldwide and is favoured for its docility & honey production. But is difficult to understand how

suppliers can offer *Buckfast strain or British bred* Buckfast bees. However good the Buckfast queen and her progeny may be, later generations are likely to prove bad tempered – as with all such crosses. Since it is not a stable sub-species, it cannot breed true and the drones are free to fly and mate with local virgin queens, thereby influencing the colonies in a wide area. His assistant for many years was Peter Donovan. At a talk he gave, a member of the audience said that everything he had said about the Buckfast bee's qualities was true until they swarmed, when they became very aggressive. Peter Donovan's answer was to buy another Buckfast queen!

Photo: Eric Osterlund.[18]
Bro. Adam at a Dartmoor mating station.

I visited Colin Weightman in Northumberland and sat in the chair that Bro. Adam had sat in!

Eric Osterlund's *Elgon Blog* [http://www.elgon.es/diary/?page_id=2] contains an article entitled *Buckfast breeding* (go to *Home>Links>Categories)*, which includes an interesting account of a meeting with Brother Adam.

'In 1981, Hans Samland from Sweden visited Brother Adam. He asked Bro. Adam what he thought was the best way for him, as a hobby beekeeper with 15 colonies, to do his breeding work. His response was:

Every year you decide which half of your bees are the least good ones. In those colonies you remove the queens. You get the queens to put into those colonies by making a daughter queen from each and every one of the colonies in the best half of your colonies. Let the new queens mate in your apiary.' [Edited for clarity]

This is in line with *BIBBA's* approach: *cull the worst, breed from the best.*

References

1. Photo:Gideon Pisanty (Gidip) גדעון פיזנטי (Own work) [CC BY 3.0 (http://creativecommons.org/licenses/by/3.0)], via Wikimedia Commons

2. Charles Lam (Flickr) [CC BY-SA 2.0 (http://creativecommons.org/licenses/by-sa/2.0)], via Wikimedia Commons

3. Information regarding the introduction of honey bees into the New World obtained, in part, from *The Bee Book* by Daphne More, published by David & Charles.

4. The *Isabella* was built in London in 1818. She was owned by William Wiseman, Patrick Chalmers and James Wallace. The *Isabella* transported convicts to Australia in 1818 (NSW), 1822 (NSW), 1823 (NSW), 1832 (NSW), 1833 (VDL) and 1842 (VDL).

Captain John Wallis was formerly Master of a slave ship taking negroes from Africa to the West Indies. He was also Master of the *Three Bees* in 1814, the *Fanny* in 1816 and the *Isabella* in 1823.

The *Isabella* and *Southworth* were the next convict ships to leave Ireland for New South Wales after the departure of the *John Bull* in July 1821. The *Isabella* departed Cork on 4th November 1821 with 200 male prisoners and arrived off Port Jackson on 9th March 1822.

Source: http://www.jenwilletts.com/convict_ship_isabella_1822.htm

5. Recent research suggests that bees have difficulty navigating over water.

6. *Some Notes on Beekeeping in Tasmania* by Stan Millar – *The Bee Breeder* No 4 1988 [BIBBA].

7. Rather than drilling a hole, I have seen one enterprising bee using the key hole in a patio door!

8. No reference.

9. *Reproductive interference between honey bee species in Australia and China* (published [2014] in *Molecular Energy:* 23: 1096-1107).

10. Uppsala University (published in *Nature Genetics* 2014).

11. No reference.

12. *Acarapis woodi* was named in 1921 soon after it was discovered. Frow's treatment was published in the *British Bee Journal* in Nov. 1927. The *Frow mixture* is no longer allowed. Frow was a railwayman & made no money from his recipe. In recognition of his generosity, *Bee Craft* invited contributions to a fund which, sadly, was not well supported.

13. *The Illustrated Encyclopedia of Beekeeping* – Roger Morse & Ted Hooper.

14. *Beekeeping Up-To-Date*- Joseph Tinsley (1945).

15. Morphometry of a local swarm (Northamptonshire) collected in 2014 indicated it was 100% A m m.

16. v. my article *Moving Bees.* In an effort to increase honey production in Brazil, Warwick Kerr, a Brazilian entomologist, was asked by the Brazilian Federal & State authorities in 1956 to import several pure African queens from Tanzania to Piracicaba-Sao Paulo State in the south of Brazil.

17. v. http://barnsleybeekeepers.org.uk/species.html

18. http://www.elgon.es/diary/?page_id=2

19. en.wikipedia.org/wiki/List_**of**_Apis_mellifera_subspecies

20. Philip Baldensperger**,** *The Bee World 8, pg 4-5, June 1926.*

21. www.imkerpedia.nl/wiki/index.php/Apis_cerana

22. entnemdept.ufl.edu/creatures/misc/Apis_cerana.htm

23. http://apimondiafoundation.org/foundation/files/184.pdf

24. The physiological reasons for the survival of the Dark European Bee in severe winters are given by Prof. F. Ruttner in *Biogeography & Taxonomy of Honeybees* (1988), quoted in *Breeding Better Bees* by *John Dews & Eric Milner* (1991) – published by *BIBBA*.

25. http://irishdarknativehoneybees.com/index.html.

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