European Honey Bee - Worker Caste Development Stages

Robt Burns Handout 3/02/2017

	Day	Stage			
Egg is laid	1	egg	1	FERTILIZED EGG TYPE	
	2	egg	2		
	3	egg	3	hatching	
	4	1st larval	1	1st instar (moult)	Food: Royal jelly - glandular secretion / 2 copies of working protein (2nd protein *feminizer* - ovipositor/venom)
	5	2nd larval	2	2nd instar (moult)	Food: Royal jelly - glandular secretion / 2 copies of working protein (2nd protein *feminizer* - ovipositor/venom)
	6	3rd larval	3	3rd instar (moult)	Food: Royal jelly and pollen (Bee bread)
	7	4th larval	4	4th instar (moult)	Food: Nectar and/or honey and pollen (Bee bread)
	8	larva	5	gorging	Food: Nectar and/or honey and pollen (Bee bread)
Cell is capped	9	larva	5.5	gorging	Capped; gorging on remaining food in cell
	10	pre-pupa	1		Cacoon spinning begins
	11	pre-pupa	2	5th moult	Pupal form develops
	12	pupa	3		
	13	pupa	4		
	14	pupa	5		
	15	pupa	6		
	16	pupa	7		
Red eye	17	pupa	8		Color develops in the eye
Yellowing of thorax	18	pupa	9		Color begins to develop in the thorax
Yellowing of abdomen	19	pupa	10		Color begins to develop in the abdomen
Pupa moult	20	pupa	11	6th moult	The wings, legs, & mouth parts are freed; pupa becomes adult and is able to chew thru the cell. The worker emerges
Emergence	21	adult	12	(emerging)	
			21	Day's Cycle	

Adult Life -Worker In-House	22-23	adult	1-2	Clean cells and warm brood nest. Skeleton hardens.
Adult Life -Worker In-House	24-26	adult	3-5	Feeds older larvae with honey and pollen
Adult Life -Worker In-House	27-31	adult	6-10	Feeds young larvae with royal jelly
Adult Life -Worker In-House	32-38	adult	11-18	Ripens necar, produces wax, & constructs comb
Adult Life -Worker ventures outside	39-42	adult	19-21	Takes flight to exercise orientate, guards & ventilates
Adult Life -Worker Outdoor Forager	43+	adult	22+	Forages for nectar, pollen, water, and/or propolis…
Life Span	Winter	Summer	Adult Worker	
	5+ mnths	7 - 8 wks		
Body Length	12 - 15 mm		Adult Worker	
Hatching Body Weight	nearly 100 mg		Adult Worker	
Sex	Female (incomplete)		Adult Worker	
Worker Cell Position	Horizontal		Worker	
Standard E. Cell Size	5.1 - 5.5 mm		Worker	

Kingdom: Animalia

Phylum: Arthropda

Class: Insecta

Order: Hymenoptera

Family: Apiidae

Genus: Apis

Species: Apis mellifera

Kingdom: Animalia	Order: Hymenoptera
Phylum: Arthropda	Family: Apiidae
Class: Insecta	Genus: Apis

Species: Apis mellifera (common western honey bee)
Apis mellifera carnica Apis mellifera caucasia Apis mellifera ligustica
Apis mellifera mellifera Apis melliefera scutellata

Apis mellifera

carnica	*Slovenia, eastern Alps, Balkans
caucasia	*Central Caucaus (Georgia, Turkey, Armenia, Black Sea area)
ligustica	*Italian (dark banded, light banded, & golden)
mellifera	*dark bee of northern Europe
scutellata	*Africa (central, west) S.&C. America Southern USA
*Russian	*neither Italian nor Carniolian but most charactistics of Caucasian…originates from Primorsky Krai (provence of far south-eastern Russia -borders China, N. Korea)

BASIC GENETICS

Haploid - unpaired, single set chromosomes
Diploid - 2 complete sets of chromosomes, 1 from each parent

*Haplo-diploidy is a sex-determination system. Each worker is 50% of the queen's and 100% of the drone's genetics

Bees, most ants, and wasps work like this sytem.

Sister is the relationship between female siblings of the same father and mother. Males are the combination clone of their mothers.

;0% +100% =150 / 2 = 75%	RELATIVE TO MOTHER QUEEN & SAME DRONE	Super-sister - Workers: 75% genetically related resulting from the same sub-family members. (75% average relations). Workers are more related to each other than even to their mother queen. These are workers in a colony from the same drone father. They inherit exactly the same genes from their father drone.
50% +50% =100 / 2 = 50%	RELATIVE TO QUEEN & BROTHER DRONES MATED TO QUEEN	Full-sister - Workers: 50% genetically related resulting from the same queen mother and brother (related) drone fathers (same mother related fathers). (50% average relations). 1/2 genes in common from each parent. Brother drones have mated with the same queen.
50% + 0% = 50 / 2 = 25%	RELATION OF WOKERS FROM THE SAME MOTHER-QUEEN	Maternal Half-sister - Workers Avg Relatedness: 25% genetically related resulting from the same queen mother. (25% average relations). One of two sets of chromosomes make up 1/2 the worker's genes, resulting in a 50% chance that 50% of a worker's genes will be the same as her sister's. Workers with the same queen but un-related drone (different) fathers.
		Drones: 100% related to the queen of the hive. Father-less but have a grand-father. Drones are full brothers to each-other. Queen is only 50% related to each drone and 50% related to each worker.