



E-ISSN: 2320-7078

P-ISSN: 2349-6800

JEZS 2017; 5(6): 728-731

© 2017 JEZS

Received: 25-09-2017

Accepted: 29-10-2017

Agni Chandra

Sociobiology and Behavioural
Ecology Research Laboratory
Department of Biosciences,
H.P. University, Shimla,
Himachal Pradesh, India

VK Mattu

Sociobiology and Behavioural
Ecology Research Laboratory
Department of Biosciences,
H.P. University, Shimla,
Himachal Pradesh, India

Studies on major pests and predators of *Apis cerana* F. and *Apis mellifera* L. in the Chamba valley of Himachal Pradesh

Agni Chandra and VK Mattu

Abstract

The occurrence and distribution of pests and predators of honeybees (*Apis cerana* F. and *Apis mellifera* L.) in the chamba valley of Himachal Pradesh were surveyed during the agricultural seasons of 2016. A total of 15 apiaries was chosen from the chamba and adjoining areas that support beekeeping in rural areas. Honeybee colonies are attacked by 36 species pests and predators in different areas of the chamba valley. The most serious pests and predators which cause considerable damage are *Varroa destructor*, *Vespa auraria*, *Vespa orientalis*, *Galleria mellonella*, *Dicrurus* and *Ursus* species however other pests of minor importance to beekeeping were also recorded in chamba and bharmour valley of Himachal Pradesh.

Keywords: *Apis cerana*, *Apis mellifera*, Acarina, Chamba, Himachal Pradesh

1. Introduction

The diversity of flora is very vast in India due to its different agro climatic and ecological conditions which makes beekeeping and management very diverse. It is an agriculture and horticulture based industry which increases economy without affecting environmental balance [1, 2]. Pollinators play a major role in global crop production through their pollination services however in recent years increase in the urbanization, deforestation and excessive hunting pressure, putting too much stress on pollinators ecology and natural habitats [3]. 85% of the world's plant populations depend upon animals, mostly on insects for pollination [4]. Pests of *A. cerana* and *A. mellifera* range from species that may cause diseases to almost innocuous insects like flies which may hinder the movement of the queen, many insects, spiders, pseudoscorpions and mites may act both as pests as well as predators [5, 6]. Dragonflies, certain spiders and wasps act as the predators. Wasps are not only fatal to bees, but also rob their eggs, brood and honey stores [7]. Large mammals such as skunks and bears are classified as the pests because they do a little damage to the colony, generally thought as predators [8, 9]. Studies revealed 36 species of pests and predators infesting/attacking *A. cerana* and *A. mellifera* colonies in the chamba valley. Among invertebrate insects pests and predators, 8 belonged to order Hymenoptera, 3 to Diptera, 2 to Lepidoptera and 1 each to Coleoptera, Orthoptera, Dictyoptera and Odonata respectively. Of arachnids, 13 species belonged to Acarina and 1 to Pseudoscorpionida. The honeybee colonies were also invaded by some vertebrate pests and predators which included 1 species each of amphibian, reptiles, aves and 2 to mammals respectively.

2. Materials and Methods**2.1 Experimental Apiaries**

A survey of different pests and predators infesting/attacking colonies of Indian hive bee, *Apis cerana* F. and European bee, *Apis mellifera* L, was made in 15 apiaries of the chamba valley having different altitudes, latitudes and climatic conditions. Chamba is a hilly place of Himachal Pradesh that is located between the latitude 32° 10' to 33° 13' North and the longitudes 75° 45' to 77° 33' East with an estimated area of 6,528sq.km. It is bounded by Jammu and Kashmir on the Northwest and West, Ladakh area of Jammu and Kashmir, Lahul and Bara Banghal on the Northeast and East, Kangra on the Southeast and Gurdaspur district of Punjab on South. The territory is wholly mountainous with altitudes ranging from 610 m to about 6,400 m above the mean sea level.

Correspondence**Agni Chandra**

Sociobiology and Behavioural
Ecology Research Laboratory
Department of Biosciences,
H.P. University, Shimla,
Himachal Pradesh, India

The main natural divisions are the Ravi valley, which means the Chamba valley including Bharmour, Churah area and the part of Bhattiyat, the Chenab valley, which comprises Pangi, Lahaul and the Beas valley which takes in rest of Bhattiyat^[10]. Bees were collected during March to November, 2016. Experimental apiaries were located at:

Mehala (1086 m), Kalsuin (1102 m), Bakani (1125 m), Luna (1362 m), Judera (1480 m), Durgethi (1590 m), Sirlagharat (1485 m), Lahal (1738 m), Dakhog (1600 m), Bharmour (2186 m), Rehel (2200 m), Khani (2200 m), Lujh (2283 m), Phindru (2583 m) and Killar (2625 m).



Fig 1: Different apiaries at the Chamba valley of Himachal Pradesh considered during the present study.

2.2 Collection of insect pests

Different insect pests and predators attacking the honeybee colonies (*Apis* spp.) were sampled by Hand Picking Method, Sweeping Method, Aerial Netting Method and Aspirator Method. From each apiary, six honeybee colonies were randomly selected, these were first inspected visually for the infestation by honeybee pests. Thereafter, analysis of brood mites was done by examining 50-100 capped drone (*A. cerana* and *A. mellifera*) and worker (*A. mellifera*) brood cells in each colony, as well as 80-100 adult bees were sampled at random from each inspected colony and were examined later in the laboratory under a research binocular for infestation with any arthropodal parasites. 50 bees were selected at random from 100 sampled adult bees per colony to diagnose the infestation with tracheal mites. Laboratory examination for tracheal mites was conducted by slicing the mesothorax of the bees, macerated in 10% KOH, and examined under a microscope^[11].

2.3 Identification of pests and predators

Identification of mite pests of honeybees was done with the help of earlier records of Acarology Research Laboratory, Department of Biosciences, Himachal Pradesh University, Shimla. All the insect pests and predators specimens collected were killed, stretched and pinned for proper identification. Identification was done with the help of earlier records of Sociobiology and Behavioural Ecology Research Laboratory, Department of Biosciences, Himachal Pradesh University, Shimla. These were later on confirmed by the various insect taxonomists of Zoological Survey of India (ZSI), New Delhi, Forest Research Institute (FRI), Dehradun and Central Bee Research and Training Institute (CBRTI), Pune.

3. Result and Discussion

Among insects belonging to genera *Vespa* and *Polistes* were the most serious threat to both *A. mellifera* and *A. cerana* in the Chamba valley. Honeybee pests and predators species that were recorded during this survey are illustrated in Table (1). Present studies revealed 6 species of wasps viz., *Vespa auraria* Smith, *Vespa mandarina* Smith, *Vespa tropica* (Leefmans) Vecht, *Vespa orientalis*, *Vespa basalis* Smith and *Polistes hebraeus*. Of all wasps, *V. basalis* and *V. tropica* were the most predominant at elevations <1000 metres amsl i.e. Sub-tropical (low lying hills and valleys), whereas, attack of *V. auraria* was very low in this agro-climatic zone. In sub-

temperate zone i.e. mid-hills (between 1000-1550 metres), *V. auraria*, *V. basalis*, *V. tropica* and *V. mandarina* were the most abundant predators. Present studies further revealed that attack of *Vespa* spp. was more frequent on European *A. mellifera* than native *A. cerana* colonies in this agroclimatic zone.

Besides wasps, 2 species of ants (*Formica fusca* L. and *Camponotus compressus* F.), 2 species of wax-moths (*Galleria mellonella* L. and *Achroia grisella* F.), 3 species of flies (*Lucilia* sp., *Calliphora* sp. and *Promochus* sp.), 1 species each of beetles (*Platylabus alvearium*), mantids (*Mantis* sp.), cockroach (*Blatta* sp.), and damselfly (*Coenagrion puella*) were also seen invading the colonies of honeybees in the Chamba valley. One species of pseudoscorpion (*Chelifer* sp.) belonging to arachnids also attacked *Apis mellifera* colonies in this agroclimatic zone. Various mite pests inhabiting hives/nests of *Apis cerana* F. and *Apis mellifera* L. in 15 localities of Chamba valley revealed a total of 13 species belonging to 8 families of subclass Acari. Of these, 5 mite species infested *A. cerana* and 5 on *A. mellifera* colonies. Mite pests of honeybees comprised 3 species of astigmatic mites such as *Tyrophagus longior* Gervais, *Caloglyphus berlesii* Michael, *Rhizoglyphus robini* Claparede, 1 species of prostigmatic mites: *Acarapis woodi* Rennie and 9 species of mesostigmatic mites like *Varroa jacobsoni* Oudemans (Ectoparasitic), *Tropilaelaps clareae* Delfinado & Baker (Ectoparasitic), *Parasitellus* sp. (Predatory), *Macrocheles muscaedomesticae* Scopoli (Predatory), *Neocypholaelaps indica* Evans (Phoretic).

According to Percentage composition, pests and predators belonged to class insecta (47%) was the most dominant followed by Arachnida (39%) and mammals (5%) (Fig.2) The most diversely distributed species of pests and predators are related to order Misostigmata (25%) followed by order Hymenoptera (22%), Astigmata, Diptera (8% each), Lepidoptera (6%), order Pseudoscorpiones, Prostigmata, Coleoptera, Orthoptera, Dictyoptera, Odonata, Anura, Squamata, Passeriformes, Rhodentia and Carnivora include only one pest or predator (i.e. 3% each), These studies are in conformity with the observations of some earlier investigators,^[12] on the diversity and seasonal variations of predatory wasps in 41 apiaries of Himachal Pradesh, It revealed the occurrence of 8 species of wasps i.e. *Vespa auraria* Smith, *Vespa mandarina* Smith, *Vespa tropica* (Leefmans) Vecht, *Vespa orientalis* Linnaeus, *Vespa basalis*

Smith, *Vespa flaviceps* Smith, *Polistes schach* and *Polistes hebraeus* ^[13] also reported that September to October was the period of high incidence of *Tropilaelaps clareae* in A.

mellifera at Bajaura in Kullu valley and ^[14] revealed the prevalence of several species of mites which included ectoparasitic mites, phoretic mites and stored product mites.

Table 1: Pests and predators attacking/ infesting *Apis cerana* F. and *Apis mellifera* L. colonies in different agroclimatic zones of the Chamba valley of Himachal Pradesh

Invertebrates			Vertebrates		
Arthropoda			Chordata		
	Insecta		Arachnida		Amphibia
I	Order Hymenoptera	viii	Order Pseudoscorpiones	Xii	Order Anura
	Family Vespididae		Family Cheliferidae		Family Bufonidae
1	<i>Vespa auraria</i> S.	18	<i>Chelifer</i> sp.	32	<i>Bufo</i> sp.
2	<i>Vespa mandarina</i> S.		Order Astigmata		
3	<i>Vespa tropica</i> Vecht		Family Acaridae		Reptilia
4	<i>Vespa orientalis</i> L.	19	<i>Tyrophagus longior</i>	xiii	Order Squamata
5	<i>Vespa basalis</i> S.	20	<i>Caloglyphus berlesii</i> Michael		Suborder Lacertila
6	<i>Polistes hebraeus</i> F.	21	<i>Rhizoglyphus robini</i> Claparede	33	<i>Hemidactylus</i> sp.
	Family Formicidae		Order Prostigmata		
	Sub familyFormicinae		Family Tarsonemidae		Aves
7	<i>Formica fusca</i> L.	22	<i>Acarapis woodi</i>	xiv	Order Passeriformes
8	<i>Camponotus compressus</i> F.		Order Mesostigmata		Family Dicrudidae
ii	Order Lepidoptera		Family Varroidae	34	<i>Dicrurus</i> sp.
9	<i>Galleria mellonella</i> L.	23	<i>Varroa jacobsoni</i> Oudemans		
		24	<i>Varora destructor</i>		
10	<i>Achroia grisella</i> F.		Family Laelapidae		Mammals
iii	Order Diptera	25	<i>Tropilaelaps clareae</i> Delfinado & Baker	Xv	Order Rhodentia
	Family Calliphoridae		Family Parasitidae	35	<i>Rattus rattus</i>
11	<i>Lucilia</i> sp.	26	<i>Parasitellus</i> sp.	xvi	Order Carnivora
12	<i>Calliphora</i> sp.		Family Macrochelidae sp.	36	<i>Ursus</i> sp.
13	<i>Promochus</i> sp.	27	<i>Macrocheles muscaedomesticae</i> Scopoli		
iv	Order Coleoptera	28	<i>Macrocheles</i> species (i)		
	Family Tenebrionidae	29	<i>Macrocheles</i> species (ii)		
14	<i>Platylolium alvearium</i>	30	<i>Macrocheles</i> species (iii)		
v	Order Orthoptera		Family Ameroseiidae		
	Family Mantidae	31	<i>Neocypholaelaps indica</i> Evans		
15	<i>Mantis</i> sp.				
vi	Order Dictyoptera				
	Family Blattidae				
16	<i>Blatta</i> sp.				
vii	Order Odonata				
17	<i>Coengrion puella</i> (Damsel Fly)				

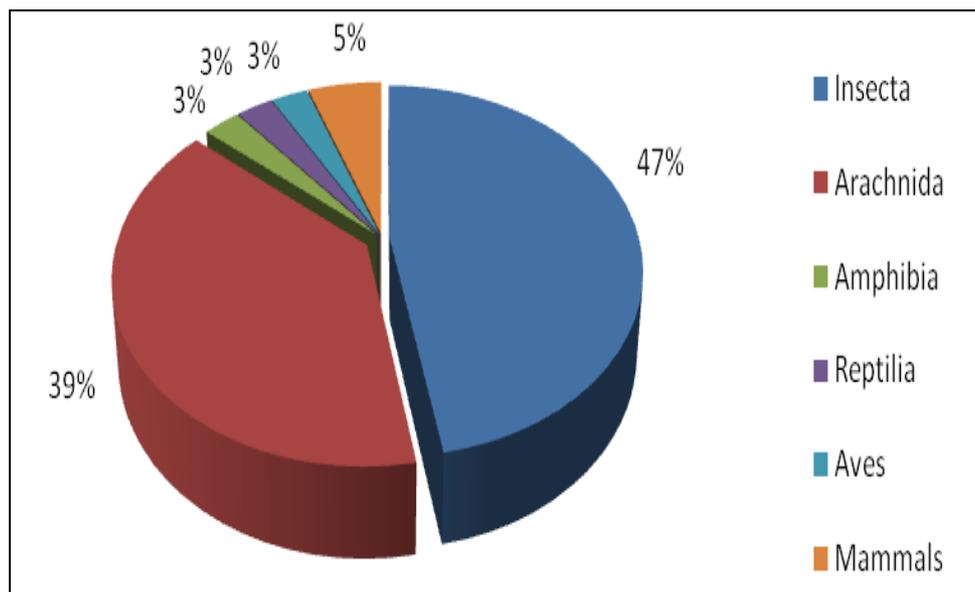


Fig 2: Percentage composition according to different classes of pests and predators.

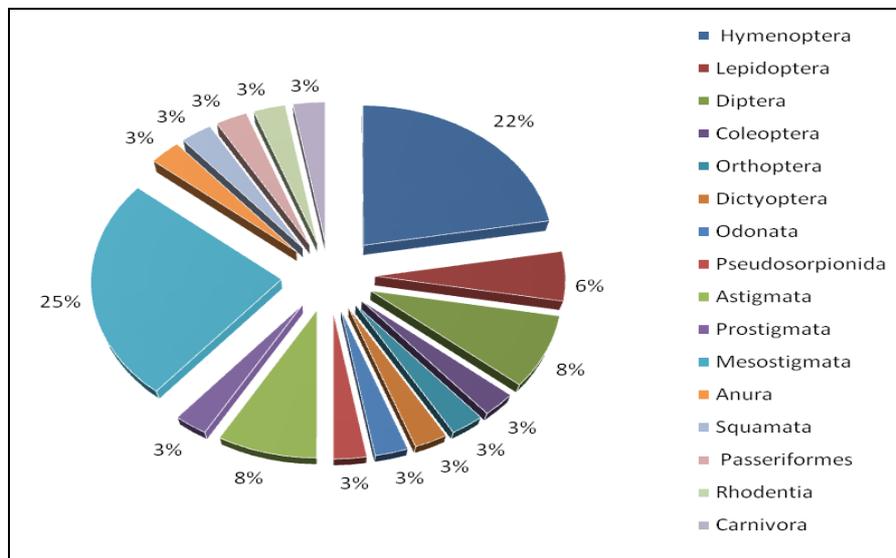


Fig 3: Percentage composition according to different orders of pests and predators.

4. Conclusion

Present findings revealed that mites are most diversely distributed and dominating pests of *A. cerana* F. and *A. mellifera* L. in chamba valley while *V. auraria*, *V. orientalis* and *V. mandarina* were the most abundant predators which pose a serious threat to beekeeping industry. The seasonal practices should be adopted like the special care of bees and proper management of hives to decrease chances of infestation and predation.

5. Acknowledgements

Authors are really grateful to the Chairperson, Department of Biosciences, Himachal Pradesh University, Shimla for providing necessary research facilities and encouragements.

6. References

1. Thakur CV. Practical aspects of bee management in India with *Apis cerana indica*. Proc. 1st Int. Conf. Apic. Trop. Climates, London, UK, 1976, 51-59.
2. Crane E. History of Honey. In: Honey, A comprehensive survey (Ed. Eva crane London: Heinemann. 1975, 439-488
3. Mattu VK, Mattu N. Mountain perspectives and modern Beekeeping Technology. Himalayan Studies Journal 4: 103-114. Crane, E. 1990. Bees and Beekeeping - Science Practice and World Resources. Hieneman Newners, Oxford, 2013, 614.
4. Ollerton J, Winfree R, Tarrant S. How many flowering plants are pollinated by animals? Oikos. 2011; 120:321-326.
5. Morse RA. Honey bee pests, predators and diseases. Cornell. Univ. Press, Ithaca, London, 1980.
6. Atwal AS. Essentials of Beekeeping and pollination. Kalyani Publishers, Ludhiana, New Delhi, 2000, 393.
7. Akre RD, Davis HG. Biology and pest status of venomous wasps. Annu. Rev. Entomol. 1978; 23:321-326.
8. Sharma OP, Raj D. Ecological studies on predatory wasps attacking Italian honeybee, *Apis mellifera* L. in Kangra Shiwaliks. Indian J. Ecology. 1988; 15:168-171.
9. Balokhra. Displaced Heritage: Responses to Disaster, Trauma, and Loss, 2012.
10. Morse RA. Honey bee pests, predators and diseases. Cornell. Univ. Press, Ithaca, London, 1980.
11. Kumar D. Bioecology of *Apis* and its mite pests in

relation to almond and peach pollination. Ph.D. thesis, Himachal Pradesh University. Shimla, 1995, 164.

12. Vishal Sharma, Mattu VK. Bioecological studies on *Vespa* species in honeybee colonies of Himachal Pradesh, India. American Multidisciplinary International Research Journal. 2014; 2(1):14-15.
13. Kumar J, Sharma SD. Seasonal incidence of ectoparasitic mite, *Tropilaelaps clareae* Delfinado and Bakar (Acarina :Laelafidae) in *Apis mellifera* L. colonies in Kullu valley of Himachal Pradesh. Pest Management and Economic Zoology. 2003; 11(9):15-19.
14. Sandeep Kotwal DP, Abrol. Mite pests of honeybee (*A. mellifera* L.) and their seasonal incidence in Jammu Division of Jammu and Kashmir, India. Bioscan International Journal. 2013; 8(2):529-531, 2013.