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New evidence of pseudo scorpion *Ellingsenius indicus* Chamberlin as predator of Indian honey bee *Apis cerana* F.

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ABSTRACT: Traditional wall hives in the two villages of Kullu district, Himachal Pradesh namely Bhindi and Daula, recorded a heavy mortality of Indian honey bees (*Apis cerana*) due to the attack of an arachnid predator identified as a pseudo scorpion *Ellingsenius indicus*. It was observed that the pseudo scorpions did not venture the comb full of bees but attacked only those bees which were either moving in isolation or in groups of 1-3 or those coming and going to the hive entrance for foraging. There was a complete loss of bees in three conies whereas in other two colonies more than 70% of worker mortality was noticed. The observations recorded from the wall hives as well as from the laboratory experiments, revealed that generally 1-3 pseudo scorpions (*E. indicus*) caught hold of the single bee preferably from its legs and sometimes from its wings and did not leave the bee from their grip so long it was not dead.

KEY WORDS: Indian honey bee, wall hives, *Apis cerana,* pseudo scorpion, predator, *Ellingsenius indicus*

The presence of honey, beeswax and salubrious environmental milieu inside a bee hive/nest, invite and entice number of insects, mites and other visitors. Some feed on honey, others on wax, some simply refuse inside the hive to enjoy warmth and still others feed on bees. The pseudo scorpion *Ellingsenius indicus* Chamberlin associated with honey bees has been observed by many beekeepers and researchers and it was reported that these individuals were melittophilic and it was believed that they did not cause harm to bees but use them phoretically for dispersal (Murthy and Venkataraman, 1985). Donovon and Paul (2006) have reported *E. indicus* eating arthropods enemies of honey bees including varroa mite (*Varroa jacobsoni*) in the colonies of Indian honey bees (*Apis cerana*) and reported that honey bees were not attacked by *E. indicus*. Later on Thapa *et al*. (2013) reported that pseudo scorpions did not prey on mites and lesser wax moth larvae but on the dead honey bees, bee larvae and live psocids. Investigations were carried out on the basis of the information provided by the local beekeepers of Kullu district of Himachal Pradesh regarding the mass scale mortality of bees and perishing of their traditional wall hive colonies of Indian honey bee (*A. cerana*).

During April-May, 2014 farmers from Bhindi (from 31^0 50'-53" north latitude and 77^0 08'- 55" east longitude, situated at an elevation of 1362 metres above mean sea level) and Daula (from 31^0 50'-

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71'' north latitude and 77^0 08'-95'' east longitude situated at an elevation of 1324 metres above mean sea level) villages in Kullu district of Himachal Pradesh reported heavy mortality of Indian honey bees, *Apis cerana* in their traditional wall hives due to the attack of an arachnid. The villages were visited and the photographs of the arachnid attacking and killing the bees were taken and the thorough observations on the mode of predation of *A. cerana* bees by the arachnids were recorded. The live as well as dead specimens of the arachnid were brought to the laboratory.

The specimens were identified as pseudo scopions belonging to the order, Chelonethi; superfamily, Pseudoscorpionidea; family, Cheliferidae; species *Ellingsenius indicus*. The full grown pseudo scorpions were 7.9 ± 0.03 cm long with dark brown colour whereas the nymphs were pale white in colour. Both adults and nymphs were found roaming freely in the cells of the combs where bee activity was quite less or sometimes negligible and were also found in the cracks and crevices near the base of the wall hives (Photo 1).

The live specimens of E. *indicus* were brought to the laboratory and five live *A. cerana* bees along with five healthy full grown larvae (for keeping the pseudo scorpions alive after they killed the living bees) were put in each of the three cages covered with muslin cloth and four pseudo scorpions were released in each of the three cages and the observations were recorded on the predation of the bees by the pseudo scorpions for a period of 1 hour daily for 7 days. After taking observations each day, the dead bees were removed along with the larvae and fresh live bees and bee larvae were put in the cages. The dead pseudo scorpions were also replaced by the live ones from time to time to maintain their number 4 everyday in each cage.

In the wall hives of Bhindi and Daula villages of of Kullu district, it was observed that pseudo scorpion did not venture the comb having flurry of bee activity but attacked only combs where activity was less and at those places on the comb (particularly on the lower sides of the combs) where bees were either moving in isolation or in groups of 2-3 or those coming and going to the hive entrance for foraging. The attack of pseudo scorpions was noticed in five colonies in wall hives in two villages (Bhindi = 2, and Daula = 3) and there was a complete loss of bees in three conies whereas in other two colonies more than 70% of worker mortality due to pseudo scorpions was noticed and these two colonies got absconded. The observations recorded from the wall hives and from the laboratory experiments revealed that generally 1-3 pseudo scorpions (*E. indicus*) caught hold of the single bee preferably from its head or legs and sometimes from its wings and did not leave the bee from their grip so long it was not dead (Photos 2-3) After injecting saliva into the victim, they feed on liquefied contents. Having sucked the haemolymph of its prey, the pseudo scorpions shift their focus to the other bee.

The data recorded for 7 days showed that the time taken for 12 pseudo scorpions to kill fifteen bees per day varied between 29.33 to 33.33 minutes and the average time taken for a single predator to kill its prey (bees) varied between 2.44 to 2.67 minutes. There was a huge reduction in the size of bee killed by the pseudo scorpions whereas the latter inflated in their size. The data on the longevity of the pseudo scorpions revealed that during second, third, fourth, fifth and sixth day, the mortality was found to be 41.66, 66.66, 83.33, 91.66 and 100 per cent respectively. The higher mortality of the predators (pseudo scorpions) was also recorded because of the counter attack of the honey bees to fend off themselves and ensuing melee between them.

The present investigations from the farmer's locality as well as from the laboratory clearly indicated that pseudo scorpions predated upon live *A. cerana* bees and preferred live to dead bee larvae. However in the absence of the live adult bee, they preyed on the live bee larvae. of Thapa *et al.* (2013) who reported that pseudo scorpions associated with *A. cerana* prey on dead honey bees, bee larvae and psocids. But in the present studies it was found that under laboratory conditions pseudo scorpions did not prefer to take dead bees as well as larvae

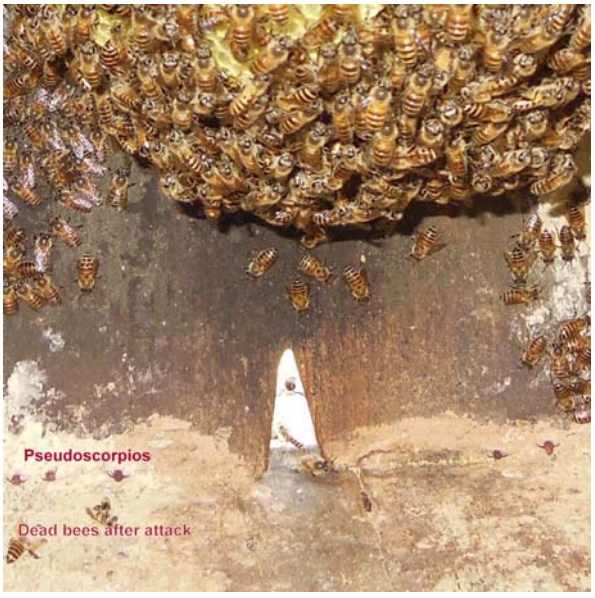

Fig 1

Fig 3

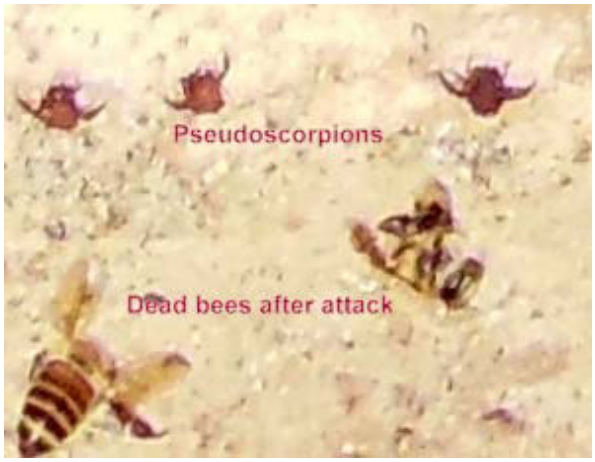

Fig 2

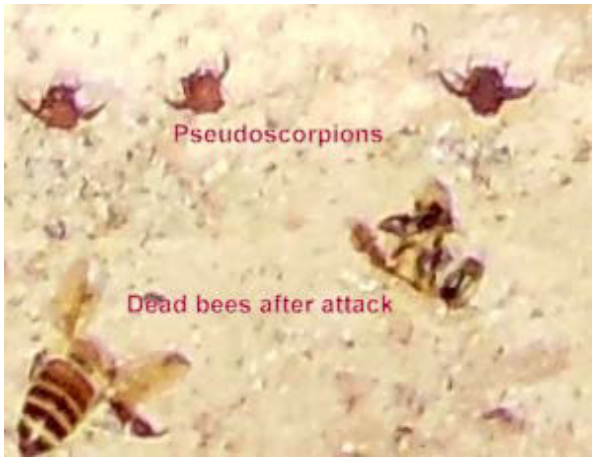

Fig 2-1

as their food so long they had access to live ones. Earlier Subbiah *et al*. (1957) had reported that the extent of harm done by *E. indicus* to bees was not exactly known but it was certainly a hindrance for the foraging activities of bees. Randy (2003) also reported that *E. indicus* sometimes feed on injured honey bees but was usually more interested in feeding on other insects like wax moth larvae and honey bee mites. However the present findings are contrary to the findings of Murthy and Venkataramanan (1985) and Semmer *et al*. (2014) who reported that *E. indicus* associated with *A. cerana* bees do not harm bees but use them phoretically for dispersal. Donovan and Paul (2006) have reported pseudo scorpions *E. indicus* eating arthropod enemies of honey bees including varroa mite (*Varroa destructor*) and it was also reported by them that the *E. indicus* did not attack the honey bees. However, Gonzalez *et al*. (2007) have reported that the role of pseudo scorpions within bee nests is still poorly known and the most records of pseudo scorpion-bee relationship are sporadic observations and are sparsely reported in the literature. Present observations clearly showed that *E. indicus* is a predator of Indian honey bees and is a potential danger for these indigenous honey bees in future.

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