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CASE REPORT

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PROBLEMS FOR BEEKEEPING IN BAHRAIN (ARABIAN GULF)

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Introduction

Beekeeping is the practice of keeping and/or manipulating honeybees for the production of honey, wax, propolis, pollen, royal jelly and beevener. Besides this, honeybees are highly efficient pollinators. Before developing an infrastructure for beekeeping in a particular vicinity, it is important to recognize the problems to be faced during and after establishment of beekeeping industry. The present work deals with such problems identified in Bahrain for developing its beekeeping industry.

Study Area

The present work was carried out on Bahrain Island and neighbouring islands such as Muharraq, Sitrah, Nabih Salih, Umm Na'san and Zallaq.

The state of Bahrain is situated at a latitude of circa. 26°N and a longitude of 50°30'E, in the Arabian (Persian) Gulf between the north eastern coast of Saudi Arabia and the Qatar Peninsula. Bahrain has a total land area of 690.86 sq.km. (Doorankamp *et al.*, 1980; CSO 1986; Phillips, 1986). Bahrain Island, from which the country takes its name, represents 85 per cent of the total land area. The Bahrain Island is about 48 km. long and 16 km. wide at its widest point. The other islands surrounding Bahrain

are now connected by causeways.

Methods

With the help of map obtained from CSO, 1997 detailed surveys have been made in the study area to collect information on honeybee habitat structure, crop patterns, floral characteristics, resource partitioning, etc. Questionnaires were prepared and data was collected during the surveys according to the methods adopted by Rao and Agrawal, 1998. Information on crop patterns, area under cultivation and agricultural practices were collected from the Ministry of Agriculture and Works, The Central Statistics Organisation, Bahrain, and meteorological data was obtained from the Meteorological Laboratory, Bahrain Defence Force (BDF).

Results and Discussion

Adverse climatic conditions

Owing to the proximity of Bahrain to the tropics, the temperature range is very wide. The temperatures reported from Muharraq varies from a daily mean maximum of 40°C in August to a daily mean minimum of 14°C in January (CSO, 1997). This high range of temperature acts as a limiting factor for the foraging activity of the bees. During higher temperature periods the bees have to expend a major part of their energies to cool the nest by collecting more water rather than in gathering nectar and pollen.

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Bahrain experiences about 86 per cent humidity through out the year. The cumulative influence of high temperature and humidity exerts suffocation stress on the bees. However, almost the entire bee population come outside the hives and settle in the form of a cluster near hive entrance to minimize the suffocation stress. During clustering, the bees were not seen to perform any field duties.

Rainfall in Bahrain is irregular, occasional and varies from year to year, and occurs during the months of November and April. Very low amount of rainfall has been reported during the months of June and August. Average rainfall over the Bahrain Island is 72.5mm (Lauw & Marry, 1982; Phillips, 1986; CSO, 1997).

Three major winds blow in Bahrain, namely Samal, Qwas and Bara. These winds blow from Northeast, Southeast and North respectively. Average speed of these winds are 12 knots/hr. Higher wind speeds may lead to cessation/disturbance in the foraging activity of the bees.

Floral scarcity

Only 127 plant species are reported from the Bahrain Islands belonging to 37 different families, comprising of only five trees, 44 shrubs, 72 herbs and the rest are grasses. Phenologically only 25 shrubs and 22 herbs flower during summer and almost similar number of plant species flower during winter. However, during the monsoon season only nine shrubs and nine herbs bloom. The majority of existing plant species of Bahrain are holophytic and succulent (Good 1954; Phillips, 1979; Batanouny, 1981; Corral, 1983; Cornes, 1985; Alder, 1986). The most important aspects which adversely influence the growth, development, flowering periods, nectar secretion and the longevity of plants are higher range of temperatures, low rainfall and increasing salinity in the soils and groundwater (Peterson & Margaret, 1968; Migahid, 1978; Hill & Paul, 1984; Phillips, 1986). Almost all plant species in Bahrain have very small flowers, short nectar secretion periods, small amounts of pollen and pale coloured flowers which make it hard for introduced bees to seek them for nectar and pollen.

Soil constituents and plant survival

The desert soils of Bahrain are typically saline. The amount of water lost through evaporation is higher than the amount of rainfall. The uptake of organic matter in the soil by the plants is extremely low qualitatively and quantitatively because of the low moisture content in the soils. The low level of soil moisture also restricts the activity of microorganisms in the soil (Phillips, 1986). Mishra (1995) has suggested that low moisture content in the soil influence qualitatively the nectar production and secretion durations in certain plant species. The moisture supply in the soils is an important factor in determining the quality of arid soils which are relatively poor in nutrients. High salinity and very low nutrients in the soil affect the plant survival.

Scarcity of suitable natural habitat for bee species

Bahrain Island is almost a plain and is conspicuous for the absence of tall native trees as well as rocks. It seems that due to such structure of habitats, even a single nest of *Apis dorsata* was not sighted over Bahrain and surrounding islands. Similarly, for want of hiding places, cracks, holes etc., very few nests of *Apis cerana indica* (only 3) could be reported at west Riffa-a' only. *Apis florea* was the naturally predominant honeybee species over Bahrain because it preferred small trees and shrubs. It has also been suggested that the availability of natural colonies in abundance may be an indication of suitability of the area for native bees.

Resource partitioning

Almost all wild plant species of Bahrain have small-sized flowers which allow foraging by only small sized bees, such as, *Apis florea*, *Trigona* sp. and *Melipona* sp., etc. They do not allow foraging by bigger sized bees, such as *Apis dorsata* or *Apis mellifera*. This resource partitioning restricts the introduction, maintenance and survival of *Apis mellifera* (Mishra & Sihag, 1987) under Bahrain conditions.

Restricted agricultural practices

Limitation of cultivated land area, high salinity in the soil, high temperature, low rain fall, heavy wind gust, irrigation problems (highly saline sea water), lack of man power and want of adequate interest have contributed to very restricted agricultural activities in Bahrain. Beekeeping is an agro-forest based industry (Singh, 1955; Mishra, 1995); the very restricted cultivation existing in Bahrain is the major drawback for beekeeping activity.

Swarming problem

Swarming is a natural process for the propagation of honeybee species at new sites (Esch, 1967; Michener, 1974; Mishra, 1995). *Apis cerana indica* swarm when the worker bee population reached 18-20 thousand per colony and *Apis mellifera* has a higher limit for swarming, i.e. 70-80 thousand worker bees per colony (Goyal, 1978). It has been recently reported that excess gyne production also induces swarming in Bahrain conditions (Kushwah & Singh, 1998). It may therefore be stated that environmental extremes (higher temperature range and humidity), excess gyne production and pest and parasite incidence are the main causes for the swarming of bees in Bahrain.

Honeybee diseases, parasites and predators

All honeybee species in Bahrain are free from brood diseases. Bee louse, *Broula coeca* Nitzsch, a tiny red coloured dipteran fly, is very recently reported by Kushwah & Singh (1998) on the worker bees of *Apis cerana indica* in Bahrain. In Bahrain it attacks only the worker bees but elsewhere its attack on queen and drones are also reported (Shimanuki, 1980; Mainley 1985). The small Green Bee-eater bird, *Merops orientalis* Latham is a major predator for all bee species in Bahrain during the months

of April and August. During the remaining months of the year this bird migrates elsewhere (Kushwah & Singh, 1998).

Besides this, the Black Ant, *Achroia grisella*, roaches, lizards and spiders are also reported as predators of bees.

Recommendations

For helping in the establishment of beekeeping industry in Bahrain the following recommendations are made:

1. For reasons mentioned above, it is emphasised that the suitable honeybee for the establishment of the beekeeping industry in Bahrain is *Apis mellifera* (and not *A. cerana indica*).
2. Plant species producing nectar and pollen for longer periods and also possessing the ability to survive in desert conditions should be propagated.
3. Control measures should be taken against *Merops orientalis* and *Broula coeca* if these assume serious pest status.
4. To prevent frequent swarming, proper timely management manipulations have to be carried out.

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