Density and Distribution of Nesting Sites of Honeybees in the Dinder Biosphere Reserve, Sudan

Lubna M. Abdalla 1, Ibrahim M. Hashim 2 and Siham K. Nagi 3

(1)* Lubna M. Abdallah. Wildlife Research Centre, Shambat, Sudan, Corresponding author. (lobnamoh2010@yahoo.com)

(2)* Ibrahim M. Hashim. Sudanese Wildlife Society, Sudan. (ibrahama35@hotmail.com)

(3)* Siham K. Nagi. The National Centre for Research, Apiculture Research Department, e-mail: (sihamnahal@yahoo.com)

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Abstract:
This study was conducted in the Dinder Biosphere Reserve (DBR) during the dry season 2009 and 2010. Colonies of honeybees were counted and the density was determined in the three ecosystems of the DBR: the Maya, the Riverine and the Dehra. Line transects each with a maximum length of 500 m were selected randomly in each ecosystem. Sixty-four line transects were sampled. All colonies in cavities and feral swarms, along the line transects, were counted in 200-m wide and 500-m long plots. The density was calculated as the total bee colonies counted in each transect divided by the area of the plots. Three tree species had high preference by the bees for nesting: "Habil" (Combretum sp.); "Cuke" (Acacia siebriana) and "Higlieg" (Balanites aegyptiaca). Larger number of honeybee colonies was encountered in 2009 than in 2010. In 2009, however, about 70% of the colonies well established and 30% absconded. In 2010, the numbers of established and absconded colonies were about equal (52% and 48%, respectively). The natural colonies were more common in tree cavities than in the form of feral swarms.

Index Terms- Honeybees; Nesting site; feral swarms; "Habil"; "Cuke"; "Higlieg"

I. Introduction:

This study was conducted in the Dinder Biosphere Reserve (DBR), which lies at the southeastern portion of Sudan, approximately 400 kilometers from Khartoum. It was established in 1935, and was designated biosphere reserve in 1979. Sennar, Gedarif and Blue Nile states, borders it. It lies in the clayish floodplain of the Nahr Ad-dinder and Nahr Arrahad at an elevation of 700 – 800 m, and covers an area of 10,000 km2. The boundary continues again up to Lat. 12˚ 32" N and Long. 34˚ 32' E along Khor Kennama. Finally the boundary slightly diverts to the southeast to Lat. 11˚ 55" N and Long. 34˚ 44 E and then gets to the Sudan Ethiopia border [1].

The general climate of the DBR is characterized by two seasons: the hot humid rainy season (May — November) and cool dry season (December — March). DBR lies in the zone of northeasterly winds in which rainfall decreases towards the northeast in the order of 30 mm every 20 km. This decrease is responsible for the marked zonation of the DBR vegetation. The northeastern part has the least rainfall (600 - 800 mm) which gradually increases (800 – 1000 mm) with distance towards the southeast. The effective rains start in May in the southeast and June in northeast. The normal rainy season is from May to November, peaking in August [2].

The vegetation of DBR was classified into four categories: flooded grassland, open grassland, woodland and riverine forest [3]. However, three types of ecosystems were recognized: Acacia seyal and Balanites aegyptiaca, Riverine and Mayas [4]. Fauna and flora have been described in detail [5, 6, 7 and 8].

To the best of our knowledge, no studies were conducted on honeybees in DNP. Therefore, this research was undertaken to study the density and distribution of nesting sites of honeybees (Apis mellifera) colonies in DBR.
II. MATERIALS AND METHODS

This study was conducted in Dinder Biosphere Reserve during the dry season in 2009 and 2010. A longer time was spent in the selection and the sampling of the line transects in 2009 than in 2010 when only the sampling was done. Colonies of honeybees were counted and their density was determined in the three ecosystems of the Dinder Biosphere Reserve; the Maya, the Riverine and the Dehra. Line transects each with a maximum length of 500 m were selected randomly in each ecosystem. Sometimes, the length of the line transect would be limited by the boundary of the adjacent ecosystem so the line would be shorter than the normal length (500 m). Sixty-four line transects were sampled, of which 16 were in Riverine, twenty-four in Dehra and twenty-four in the Maya ecosystem. For the Riverine ecosystem, the line started at the edge of the river and extended until the edge of the ecosystem, where it was demarcated by tree indicators such as “Sider” (Ziziphus spinachristi) and “Dom palmi” (Hyphaene thebaica). In selecting line transects in the Dehra ecosystem, the length of the road was measured by GPS (Global Position System), and positions of the lines were located at 2 km intervals along the road. The total number of lines sampled was calculated by dividing the length of the road by 2 km. Only 30% of these line transects were selected randomly and sampled. In the Riverine ecosystem, however, the line transects started at the bank of the river and ran towards the Dehra ecosystem. Selection of the line transects along the river bank was similar to the selection of the road’s line transects. For Maya ecosystem, however, line transects started at the edge of the Maya and their directions were selected randomly from north, south, east and west. Because of the small size of Maya ecosystem, only one line transect was selected randomly from the four directions (north, south, east or west), and run right through the centre of the Maya. For determining the density of honeybee colonies, all colonies in cavities and feral swarms, along the line transects were counted in 200-m wide and 500-m long plots. Honeybee's corresponding features (such as bee-eater birds, waxes, and swarms) were also recorded. The occurrence of colonies and the signs outside the plots were also recorded. The density was calculated as the total number of bee colonies counted in each transect divided by the area of the plots, whereas the corresponding features were expressed as percentage of occurrence.

III. RESULTS and DISCUSSIONS

The distribution of honeybee colonies at the nesting sites in 2009 and 2010 are shown in Figures 1and 2. Three tree species had high preference by the bees for nesting; namely, “Habil”, (Combretum sp.); “cuke” (Acacia siebriana) and “Higlieg” (Balanites egyptiaca); “Talih” (Acacia seyal var seyal); “Sunt” (Acacia nilotica); “Sider” (Ziziphus–spinachristi) and “Khashkhash” (Stereospermum kunthianum) were preferred to lesser extent Table (1). Preference of nesting trees varied in the different years. In 2009, Cuke was highly preferred, followed by Habil and Higleig. In 2010 however, Habil was highly preferred followed by Higleig Figure 3. The selection of the remaining tree species was as follows: “Talih” relatively high in 2010, negligible in 2009; “Sunt” and “Sider” equally selected in 2009 but relatively with low selection in 2010 and “Khashkhhash” with low selection in 2009, had almost no selection in 2010.

Larger number of honeybee colonies was encountered in 2009 than in 2010 Figure 4. In 2009, however, about 70% of these colonies well established, and 30% absconded. The situation was quite different in 2010; the number of the well established and the absconded colonies were about equal (52% and 48%, respectively). The established colonies were more abundant in tree cavities than in the form of feral swarms Figure 5. However, more feral swarms occurred in 2010, but the reverse was true in 2009.

The consensus is that honeybees nest in trees close to water sources in the Riverine and Maya ecosystems. Accordingly, it is expected that honeybee colonies are scarce in the Dehra ecosystem. Among the highly preferred nesting trees, “Cuke” always occurred in the Maya ecosystem and Habil in the Dehra ecosystem [9]. “Higlieg” however, was distributed in both the Maya and Dehra ecosystems. The preference of “Cuke” by honeybees in 2009 could be attributed to its close proximity to Maya ecosystem where water prevails.

The drought season affects bee colonies in two ways: It considerably reduces the swarming activity of bee colonies as well as the percentage of the established colonies. It is
likely that in normal years, honeybees set their colonies close to the sources of water and spend fewer efforts in foraging water, food and propolis collection. The reverse is true in drought years where colonies may prevail in Dehra ecosystem that lies to some extent at a longer distance from water found in few locations. The high number of established honeybee colonies in normal years indicates that honeybees do not abscond their nests, thereby producing more honey. The choice of bee colonies to be established in tree cavities or in feral swarms needs further investigation. There are, however, more feral swarms in drought years. This could be explained by the fact that the colonies migrate more frequently during the drought years and so they nest as migratory swarms rather than being well established colonies nesting in tree cavities. It could be concluded that honeybee swarms prefer establishment in "cuke", "habil", and "higlieg" for unknown reasons. Further research is needed to verify this.

IV. CONCLUSION AND RECOMMENDATIONS

V. In conclusion, Density of bee colonies increases in vicinity of water sources where they nest in Cuke, Habil, and Higlieg.

VI. REFERENCES

Figure (1): Distribution of honeybee colonies in Dinder Biosphere Reserve (2009)
Figure (2): Distribution of honeybee colonies in Dinder Biosphere Reserve (2010).
Figure (3): Occurrence of bee colonies in tree species in Dinder Biosphere Reserve (2009 and 2010)

Figure (4): Performance of honeybee colonies in Dinder Biosphere Reserve (2009 and 2010)

Figure (5): Nature of nesting sites of honeybees in Dinder Biosphere Reserve (2009 and 2010)
Table (1): Occurrence of bee colonies in tree species in Dinder Biosphere Reserve (2009 and 2010)

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<thead>
<tr>
<th>Tree species</th>
<th>% of bee colonies in</th>
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<tr>
<td></td>
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<tr>
<td>Habil</td>
<td>28</td>
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<tr>
<td>Higlieg</td>
<td>18</td>
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<tr>
<td>Cuke</td>
<td>39</td>
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<tr>
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<td>Khashkhash</td>
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