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ORIGINAL ARTICLE

Status of *Apis laboriosa* populations in Kaski district, western Nepal

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SUMMARY

The present study was conducted in Kaski district, western Nepal during the months of February, March, April and May in year 2001 and 2003 with the objective to identify the status of *Apis laboriosa* populations. Information was gathered from a total of 148 cliff sites. Of these, 54 cliff sites were visited to record longitude and latitude, cliff aspect, distance of the cliff from major bodies of water, distance from the ground, number of bee nests per cliff, and nearest settlement area. Information was also gathered from local people and honey hunters using participatory tools such as transect walks, semi-structured interviews and informal meetings. Survey results indicate a sharp decline in the bee population during recent decades. The decline observed both in the number of cliffs having bees and the number of nests per cliff. Information gathered from honey hunters and our observations indicate explanations for this decline, which are discussed.

Keywords: honey bees, *Apis laboriosa*, nesting sites, bee cliffs, population status, Kaski, Nepal

INTRODUCTION

Apis laboriosa, the largest honey bee species of the world, lives in the Himalayas on inaccessible cliff faces. This bee species is reported to be distributed from Nepal to Vietnam and Laos (Otis, 1996; Trung *et al.*, 1996). It is one of the least researched bee species, as it was identified as a separate species only in 1980 (Sakagami *et al.*, 1980). After the clarification of its taxonomic status, Roubik *et al.* (1985) and Underwood (1986, 1990) carried out field studies in the Himalayan region of Nepal and reported on certain behavioural characteristics of *A. laboriosa*. Specifically, they reported that this species constructs a large single comb under rock ledges, in deep, vertical river valleys. It lives at high altitudes ranging from 1200 m to 3600 m, forages at up to 4100 m, makes a seasonal migration depending upon the availability of the bee forage, and tends to colonize one site in a reproductive season. These authors also reported that the distribution of *A. laboriosa* does not overlap with the giant honey bee of the tropics, *A. dorsata*. However, we found nests of *A. dorsata* during the months of April–May at the same altitude where *A. laboriosa* were nesting during December–January. But when *A. laboriosa* return to that area, *A. dorsata* move down to the low altitude areas, indicating that both species can be found at the same altitude but not at the same time or during the same season. Strickland (1982) and Oppitz (1991) have described the tools and methods of honey hunting used by Gurungs and Magars in different areas of Nepal. Based on anecdotal evidence, Valli & Summers (1988) and Underwood (1992) have reported that the number of colonies of *A. laboriosa* has been declining rapidly in Nepal. These studies, however, did not attempt to estimate number of colonies, locate bee cliffs or identify population trends/dynamics. Hence, to estimate the number of colonies and develop a locational database of nesting on cliffs by *A. laboriosa* as well as its exploitation by Himalayan communities, ICIMOD's 'Indigenous Honeybee Project' has been carrying out in-depth field studies in Kaski, western Nepal (Ahmad *et al.*, 2003). As a continuation of the project's field research activities, the present study was carried out with the objective of updating existing information, locate bee cliffs and estimate the number of *A. laboriosa* nesting sites in all the river valleys of Kaski district. The information presented here is the result of the field surveys undertaken in Kaski during the months of February, March, April and May in the years 2001 and 2003.

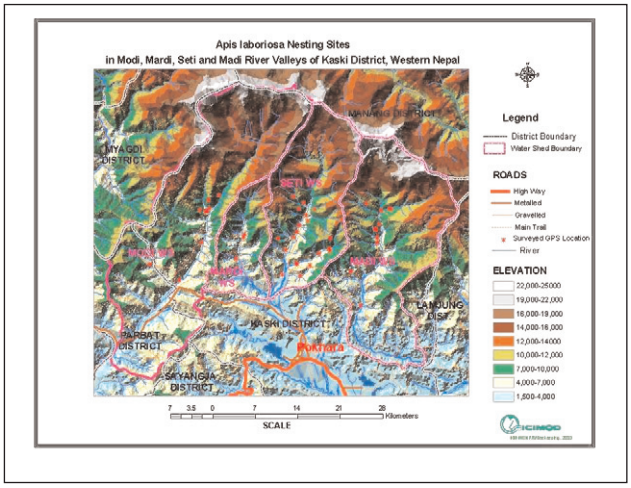

FIG. 1. GPS location of *Apis laboriosa* nesting sites in Kaski District, West Nepal.

MATERIALS AND METHODS

Honey hunters, honey traders, local NGOs and government officials were consulted in order to locate possible nesting areas of *A. laboriosa* in Kaski. Based on these consultations and the findings of an earlier case study (Ahmad *et al.*, 2003), we learned that in Kaski district almost all nesting sites are in the four major river valleys (Modi, Mardi, Seti and Madi). Hence, all were chosen for the purpose of the population studies. As the distribution of *A. laboriosa* nests in these river valleys is uneven and the valleys differ considerably, the study method was aimed at counting total nests in all cliff sites, rather than using an indirect estimate based on statistical methods.

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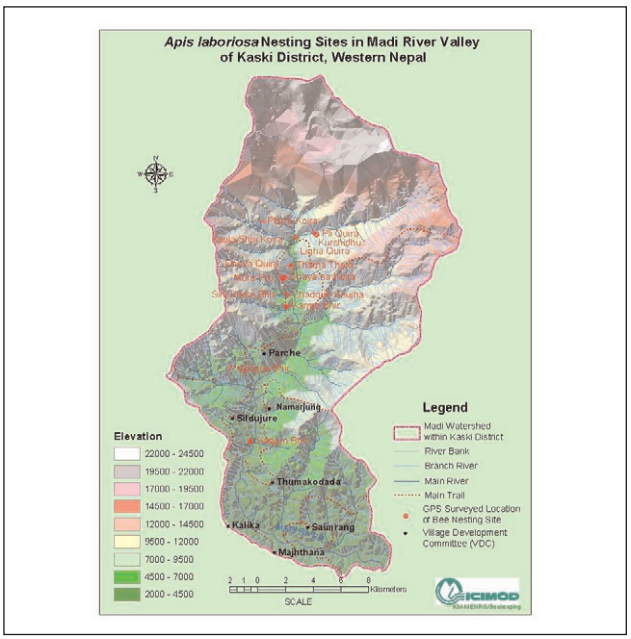

FIG. 2. GPS locations of *Apis laboriosa* nesting sites in Madi Valley of Kaski District, West Nepal.

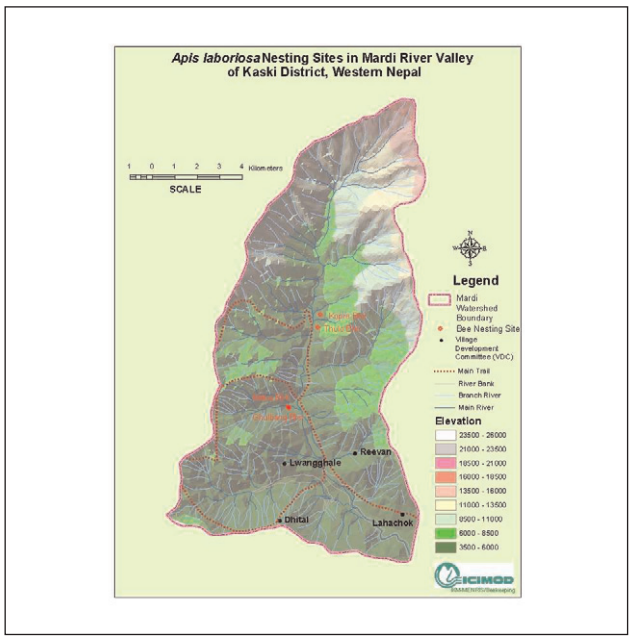

FIG. 3. GPS locations of *Apis laboriosa* nesting sites in Mardi Valley of Kaski District, West Nepal.

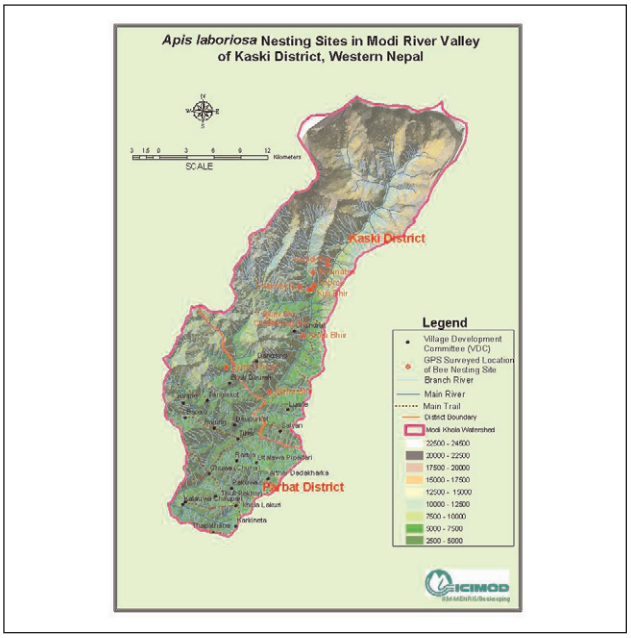

FIG. 4. GPS locations of *Apis laboriosa* nesting sites in Modi Valley of Kaski District, West Nepal.

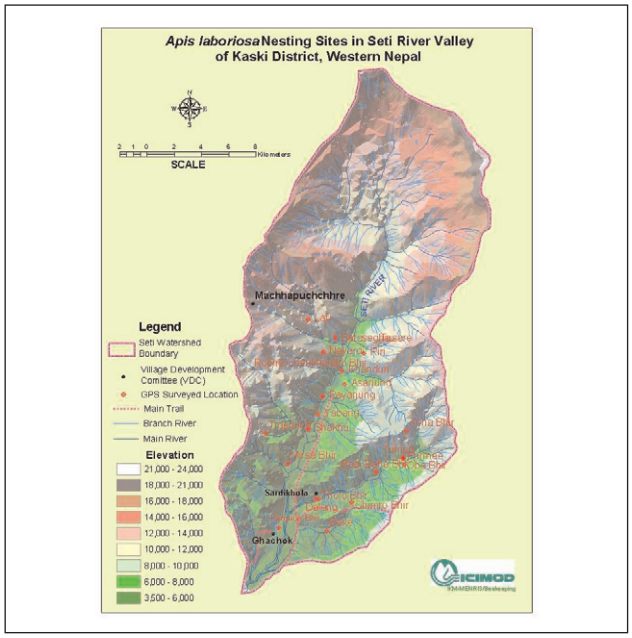

FIG. 5. GPS locations of *Apis laboriosa* nesting sites in Seti Valley, Kaski District of West Nepal.

We visited all accessible cliff sites located in the river valleys (figs 1–5). A global positioning system (GPS) tool was used to record the location of cliff sites. Mr Chandra Gurung, Field Coordinator of BEENPRO and honey hunters from each river valley joined us in the fieldwork. Apart from this, a special meeting of honey hunters was organized to determine the trend in *A. laboriosa* populations: was it decreasing, increasing, or the same, compared to 20–30 years ago. A total of 11 honey hunters from each of the four river valleys who currently harvest honey or used to harvest honey in the past, participated in the meeting.

RESULTS

Included in the study were all cliffs in the Kaski district identified by the honey hunters as having colonies at any time during the past 30 years. This was a total of 148 cliffs. Of these, 54 cliff sites were visited and geographic information system (GIS) maps generated to enable us to permanently locate them (figs 1–5). Details of the 54 cliffs are summarized in table 1, including location, altitude, distance from bodies of water, height, number of nests per cliff, cliff ownership, and nearest settlement area.

Discussion with local people concerned with this species revealed the presence of 50 more cliffs where observers had recently noted nests of *A. laboriosa*. We were unable to record GPS data from those cliff sites. In addition, honey hunters mentioned the name and location of 44 cliffs in which they have seen bees at some time but are now devoid of any sign of combs or bees. The information collected from each river valley on the total number of cliffs, nesting sites and number of nests is given in table 2.

DISCUSSION

We found that most nests of *A. laboriosa* were located on steep inaccessible cliffs close to major rivers. A few bee cliffs were

TABLE 1. The *Apis laboriosa* nesting sites observed in Kaski district.

SN	Cliff name	Longitude/ latitude	Cliff aspect	Distance above ground	Distance from water body	No. of nests	
						2001	2003
1	Sodque Bhir	84°04'.359E 28°20'.161N	SE	200m	200m	37 (O) 10 (E)	32
2	Kamro Bhir	84°06'.912E 28°22'.776N	SE	150m	200m	27 (O) 11 (E)	29
3	Chadque Keujha	84°06'.928E 28°23'.227N	SW	150m	300m	13 (O) 3 (E)	2
4	Sini Khemai Bhir/ Cenethama quira	84°06'.928E 28°23'.227N	SW	150m	300m	4 (O) 2 (E)	NR
5	Mura Pro, Biura Pro Keira	84°06'.687E 28°23'.927N	E	90m	150m	17 (O) 1 (E)	12
6	Thama Thera	84°07'.102E 28°24'.462N	SW	70m	650m	2 (O) 6 (E)	1
7	Dhoya Quincha	84°07'.102E 28°24'.462N	SW	60m	100m	4 (O) 3 (E)	2
8	Ligha Quira	84°07'.258E 28°25'.656N	SE	30m	60m	6 (E)	2
9	Pli Quira	84°08'.251E 28°25'.800N	E	60m	120m	8 (O) 32 (E)	3
10	Kurshidhu	84°08'.082E 28°25'.880N	NE	30m	200m	5 (E)	4
11	Pil Quira	84°08'.082E 28°25'.880N	S	60m	120m	11 (E)	NR
12	Kaula Shoi Koira	84°08'.087E 28°25'.877N	E	200m	500m	10 (E)	2
13	Pla-ra Koira	84°05'.699E 28°26'.280N	E	50m	500m	NR	2
14	Ghaya na Koira	84°06'.787E 28°23'.985N	E	50m	1000m	1 (O) 6 (E)	4
15	Kangro Bhir,	84°05'.371E 28°17'.134N	SE	10m	200m	8 (O) 6 (E)	21
16	Maha Bhir	83°47'.477E 28°18'.948N	NW	30m	500m	NN	NN
17	Sobrok	83°49'.879E 28°25'.433N	SW	30m	30 m	NN	NN
18	Obio	83°49'.879E 28°25'.433N	SE	200m	200m	NN	2
19	Kuli Bhir	83°49'.721E 28°25'.207N	SE	30m	30m	16 (E)	19
20	Silasi Bhir, Chhomrong Bhir	83°49'.513E 28°25'.155N	SW	50m	120m	8 (O) 2 (E)	17
21	Chaknevra, Chanedhar	83°48'.884E 28°25'.300N	SE	50m	200m	NN	NN
22	Khuldi Bhir	83°50'.780E 28°26'.681N	SE	30m	300m	NN	9
23	Ruhinabei	83°49'.771E 28°26'.209N	W	25m	150m	3 (O) 1 (E)	3
24	Kroja Bhir	83°49'.221E 28°22'.405N	W	20m	20m	20	3
25	Tamu Khark	83°44'.026E 28°20'.362N	S	30m	30m	12	ND
26	Chimro Bhir	84°00'.160E 28°20'.648N	SW	25m	150m	7 (O) 2 (E)	19
27	Dalang	83°58'.801E 28°20'.729N	SW	150m	200m	5	13
28	Mirsa Bhir	83°57'.717E 28°21'.894N	S	40m	100m	ND	2 (O) 2 (E)
29	Pargaun Bhir	83°57'.427E 28°19'.756N	E	25m	150m	ND	3 (O) 1 (E)
30	Tuinsu	84°02'.059E 28°22'.184N	E	100m	100m	ND	11
31	Tona Bhir	84°02'.199E 28°23'.107N	W	30	30	ND	2
32	Oba Bhir	84°02'.101E 28°22'.169N	W	100	100	ND	NR
33	Purmee	84°02'.129E 28°21'.973N	S	50	150	ND	NR
34	Bake	83°59'.247E 28°19'.688N	W	50	500	ND	1 3
5	Neyardi	83°58'.946E 28°25'.674N	S	50	200	ND	26
36	Asarjung	83°59'.805E 28°24'.622N	S	50	300	ND	7
37	Riri	84°00'.494E 28°25'.654N	S	25	150	ND	5
38	Bataseghar	83°59'.148E 28°26'.202N	S	100	200	ND	8
39	Tusare	83°59'.382E 28°26'.167N	S	30	50	ND	5
40	Lari	83°59'.382E 28°26'.167N	S	80	80	ND	2
41	Kopre	83°58'.357E 28°26'.742N	S	50	50	ND	12 (E)
42	Payarjung	84°58'.047E 28°27'.013N	S	20	60	ND	6
43	Thulo Bhir	83°58'.977E 28°24'.180N	W	50	1000	ND	10
44	Yabang	83°58'.924E 28°20'.729N	W	60	1500	ND	1
45	Shakhu	83°58'.801E 28°23'.575N	W	30	100	ND	1
46	Tiderjung	83°58'.450E 28°23'.064N	S	100	1500	ND	2
47	Cheuri	83°56'.851E 28°22'.902N	S	50	1500	ND	4
48	Hadi Daha Bhir	83°56'.575E 28°17'.621N	S	100	150	ND	9
49	khnduri	84°01'.059E 28°21'.679N	W	50	50	ND	1
50	Roche Cheukholako Bhir	83°59'.691E 28°25'.052N	W	50	100	ND	1
51	Thulo Bhir	83°53'.398E 28°23'.022N	SW	400	400	ND	8 (O) 3 (E)
52	Kopre Bhir	83°53'.478E 28°23'.324N	SW	50	150	ND	4 (O) 4 (E)
53	Maha Bhir	83°52'.669E 28°21'.115N	SW	60	80	ND	NN
54	Ghulbang Bhir	83°52'.689E 28°21'.088N	SW	50	100	ND	NN
Mean number of nests per cliff						6.77	6.15
Standard deviation						9.425	7.833

Note: O = occupied; E = recently empty (migrated bees); NR = only old nest remnants; NN = no sign of old nest (bees are not nesting since few years); ND = data is not available; SE = southeast; E = east; SW = southwest; S = south; NW = northwest; W = west

TABLE 2. Number of cliffs, nesting sites and number of nests in each river valley.

River valleys	Total number of nesting sites*[1]	Number of nesting sites with GPS data	Number of nesting sites with bee nests[2]	Number of additional nesting sites reported by local people*[2]	Number of former nesting sites*	Total number of bees' nests	
						2003[3]	20-30 years ago*
Modi	34	10	6 (53)	10 (20)	14	73	160-300
Mardi	6	4	2 (17)	0	2	17	150-175
Seti	59	25	23 (155)	10 (25)	24	180	581-713
Madi	49	15	13 (116)	30 (93)	4	209	477-597
Total	**148**	**54**	**44 (341)**	**50 (138)**	**44**	**479**	**1368-1785**

Note: * = figures based on the information provided by local people, 1= sum of the figures given in 3rd, fifth and sixth column, 2 = Figures in the bracket indicates the number of nests, 3= sum of the figures given in fourth and fifth column

located in the banks of rivulets and streams which also lead to these major rivers. There is no report (verbal or published) of bee nests on cliffs occurring more than 2 km from major bodies of water. As reported in an earlier case study (Ahmad *et al.*, 2003), the majority of bee cliffs faced between south-east and south-west, although some faced east and some faced west. None of the cliffs faced north (table 1).

Although the vegetation, climate and physiographic conditions of the river valleys are similar, the distribution of *A. laboriosa* is uneven (fig. 1, table 2). It is interesting to report that the Mardi river valley lies between the Modi and Seti river valleys, but in Mardi we found only 17 nests, whereas in Modi and Seti we observed 73 and 180 nests, respectively. This suggests that bee colonies may not cross a ridge or migrate from one river valley to another.

The survey results suggest a sharp decline in the bee population during recent decades. This conclusion has two lines of support. First, the number of cliffs having bees has declined. Secondly, the number of nests per cliff has decreased. For example, in Seti valley, there used to be 59 bee cliffs until 1980, but in 2003 we found only 33 cliffs with bee nests (table 2). Similar information was obtained from the Modi, Mardi and Madi river valleys. All local people and honey hunters reported that 20–30 years ago there were two to three times more bee cliffs in the area than at present (table 2). Based on anecdotal evidence, Valli & Summers (1988) and Underwood (1992) also suggested that within the last 50 years the number of colonies of *A. laboriosa* has greatly declined throughout much of Nepal. Our figures are comparable with those of Underwood (1986). Underwood (1986) published a list of *A. laboriosa* cliffs that he had visited between 1 February and 26 May 1984. Between February and May 2001, we revisited eight of these sites and looked for signs of bee nests. Four of the eight sites had no nests at all and one had only two colonies, compared with 76 in 1986. One had 16 nests where there had been 26 and only two had a number of nests similar to that recorded earlier (table 3). Statistical analysis (Mann Whitney Wilcoxon test) shows that there is significant decrease (Asymp. Sig. = 0.017) in mean number of nests during the period between 1986 and 2001.

Information on nest aggression size reveals that the number of nests per cliff has decreased by at least 50% in the last 20–30 years. Underwood (1986) reported 1 to 76 (averaging 14.53 ± 17.52) *A. laboriosa* nests aggregated on a single cliff. He recorded a total of 247 colonies of *A. laboriosa* from 17 separate cliff sites. In 12 of the 17 cliffs (70.5%) he found more than 10 nests (Underwood, 1986). In the present study we observed 54 cliffs of which only 44 had bees at the time of survey, but the other 10 cliffs were habitually used by bees and unoccupied at the time of our survey (table 1). These 44 active bee cliffs had a total of 341 colonies of *A. laboriosa*, and the number ranged from 1–32 (averaging 6.1 ± 7.49) nests per cliff (table 1). Among these only 29.5% of the cliffs (13) had more than 10 nests per cliff, whereas the remaining cliffs had 1–9 nests. Thus if a cliff has nests, there are generally less than 10, whereas Underwood (1986) reported >10 nests in the majority of cliffs.

Information gathered from honey hunters and general observations around the cliffs indicate certain features that provide clues about reasons for bee population decline. These include destructive honey hunting, loss of forage and loss of nesting sites as a result of land use change and landslides (Ahmad *et al.*, 2003). Population pressure and lack of awareness of and knowledge about the importance of this bee species are responsible for the over exploitation of bees. Underwood (1992) has mentioned that overgrazing by livestock, destruction of forests and human depredation are likely the reasons responsible for the decline of *A. laboriosa* populations. Local people including honey hunters believe that introduction of modern technology, particularly improved crop varieties with the attendant application of pesticides has had a dramatic effect on population decline of indigenous bees in Nepal. In addition to these reasons, we are concerned about whether European foulbrood disease (caused by *Melissococcus plutonius*) and other pathogens of *A. mellifera* have

TABLE 3. Declining populations of *Apis laboriosa* on some cliff sites in Kaski, Nepal.

Name of the cliff	Location of the cliffs	Altitude	Number of colonies	
			1986#	2001
Maha Bhir[1]	Tomejung, Lumle VDC 2	1616*	11	NC
Kroja Bhir[2]	Landruk, Lumle VDC 9	1250	17	20
Kuli Bhir	Chhomrong, Ghandruk VDC 9	1708	26	16 (e)
Obio	Chhomrong, Ghandruk VDC 9	1647	14	NC
Khuldi	Chhomrong, Ghandruk VDC 5	2226	10	NC
Silasi Bhir[3]	Ghandruk VDC	1860	15	8 (o) & 2 (e)
Hadi Dahako Bhir[4]	Ghachowk Machhapuchre VDC	1220	76	2
Ghachowk Bhir[5]	Ghachowk Machhapuchre VDC	1400*	13	NC

Note: * = approximate; NC = no indication of colonies found; o = occupied nests; e = recently empty nests; # = cited from Underwood (1986); 1-5 = Underwood has given name of the village instead of the cliffs

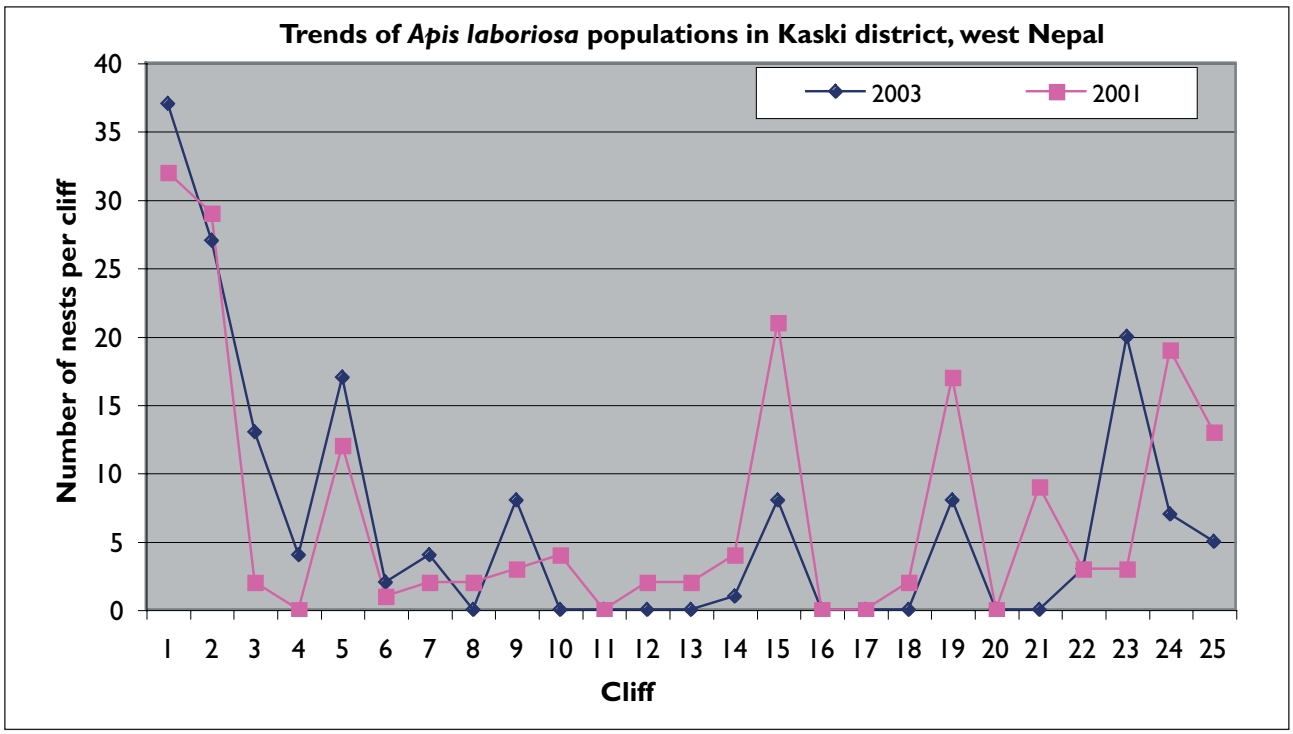

FIG. 6. Recent trend of *Apis laboriosa* populations in Kaski district, west Nepal

accelerated the decline. *M. plutonius* has been identified in *A. laboriosa* colonies (Allen *et al.*, 1990).

In recent years the population of *A. laboriosa* is again stabilizing despite the trend of recent decades. Statistical analysis of two sets of data presented in columns 7 and 8 of table 1 revealed that from February to May 2001, to February to May 2003 the number of cliffs having bee nests increased slightly. Of 25 bee cliffs surveyed both years, on 12 cliffs the number of nests increased; on eight cliffs the number of nests decreased, and on the remaining five cliffs the number of nests remained the same (fig. 6). The increase is especially noticable in the percentage of bee cliffs having 1–4 nests. Local people and honey hunters have also noted the increase in number. They believe this is due to the fact that sharp declines in bee populations during the early 1980s to late 1990s forced many honey hunters to abandon the practice of honey hunting (Ahmad *et al.*, 2003). On the other hand, the Annapurna Conservation Area Project (ACAP) made great efforts to increase the forest coverage and protect biodiversity. These two factors might have led to the stabilization, or even recovery, of *Apis laboriosa*. However, to make firm conclusions about population trends there is need for more data and regular monitoring of the nesting sites and colonies found there.

Acknowledgements

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REFERENCES

AHMAD, F; JOSHI, S R; GURUNG, M B (2003) *The Himalayan cliff be* Apis laboriosa *and the honey hunters of Kaski*. ICIMOD; Kathmandu, Nepal; 52 pp.

ALLEN, M F; BALL, B V; UNDERWOOD, B A (1990) An isolate of *Melissococcus pluton* from *Apis laboriosa*. *Journal of Invertebrate Pathology* 55: 439–440.

OPPTIZ, M (1991) Beekeeping and the hunt for wild honey among the Magars of Nepal. *Bee World* 72 (4): 165–169.

OTIS, G W (1997) Distribution of recently recognized species of honeybees (Hymenoptera: Apidae: *Apis*) in Asia. *Journal of the Kansas Entomological Society* 69(4) (1996, suppl.): 311–333.

ROUBIK, D W; SAKAGAMI, S F; KUDO, I (1985) A note on distribution and nesting of the Himalayan honeybee *Apis laboriosa* Smith (Hymenoptera: Apidae). *Journal of the Kansas Entomological Society* 58: 736–749

SAKAGAMI, S F; MATSUMURA, T; ITO, K (1980) *Apis laboriosa* in the Himalaya, the little known world's largest honeybee (Hymenoptera: Apidae). *Insecta Matsumurana New Series* 19: 47–77.

STRICKLAND, S S (1982) Honey hunting by the Gurungs of Nepal. *Bee World* 63(4): 153–161.

TRUNG, L Q; DUNG, P X; NGAN, T X (1996) A discovery of *Apis laboriosa* F. Smith in North-western Vietnam. *Proceedings of the 3rd Asian Apicultutal Association Conference on Bee Research and Development, Hanoi, Vietnam, October 6–10 1996*; pp. 7–14.

UNDERWOOD, B A (1986) *The natural history of* Apis laboriosa *Smith in Nepal.* Master's thesis; Cornell University, USA; 88 pp.

UNDERWOOD, B A (1990) *The behaviour and energetics of high-altitude survival by the Himalayan honeybee,* Apis laboriosa. PhD thesis; Cornell University, Ithaca, USA; 144 pp.

UNDERWOOD, B A (1992) Impact of human activities on the Himalayan honeybee, *Apis laboriosa*. *In* Verma, L R (ed) *Honeybees in Mountain Agriculture*. Oxford and IBH. Publishing Co. Pvt. Ltd., New Delhi, India; pp 51–57.

VALLI, E; SUMMERS, D (1988) *Honey hunters of Nepal*. Thames and Hudson Ltd.; London, UK.

VALLI, E; SUMMERS, D (1988) Honey hunters of Nepal. *National Geographic* 174(5): 660–671.