Over the course of two days we visited four of the beekeepers with whom Liz and Shree have worked, who live in small settlements about an hour's hike on either side of the ridge upon which the district capital of Terhathum sits. Liz had arranged for a short-course in beekeeping technologies for the beekeepers in her area. The course had been held near Kathmandu. The training was conducted by Ms. Soni Basnet of the Himalayan Bee Concern-- a private, for-profit consortium that produces honey and promotes beekeeping in the region. Training emphasized movable frame technology using hive bodies constructed either of wood (a scaled-down version of a Newton hive) or of compressed straw. Most of the beekeepers we visited had several types of hive: log, house, straw and wood. Liz and Shree hope that, with the continuing support of incoming Peace Corps volunteer Michael Spinnelli, that the beekeepers will be able to select or modify a system that will be most appropriate for the conditions in the area.

Log hive, straw hive, Newton hive on ledge and wall hive with Shree and Liz

The wall hive entrance has been festooned with thorns for protection against raids by the pine marten. The hives have been placed on this balcony-platform to afford some protection from theft, ants and the pine marten. A wall hive can be discerned on the right by a festoon of thorns provided as further protection against raids by the pine marten

The first of the beekeepers we visited, Janak Nirola was busy constructing a new dwelling for his growing family when we arrived early in the morning following our hour-long hike from Terathum. He had left voids in the walls in a couple of locations of the new building that would not be packed with the thick daub with which the rest of the walls would be filled. The wall voids would serve as shelters for *Apis cerana* which are referred to as *ghar mauri,* house bees, because of this traditional method of keeping them. The thick walls enclosing most of the cavity would provide considerable insulation from the extreme temperatures common in the mountainous region.

Land of milk and honey: dairy products from sturdy buffalo such as these and honey traditionally produced from log hives such as that hung at the top left of the photo are common agricultural products of Nepal.

After chatting for an hour or so, de rigueur for most extension work in the country, we began to inspect Janak's beehives. Originally, all of Janak's hives were fixed comb hives-- either wall hives or log hives. Sometimes the latter are obtaining by cutting whole nests out of hollow trees where they are discovered in the forest. Alternatively, a log hive may be made "from scratch"-- either by chopping a log hollowed out by natural factors into appropriate lengths or by coring a log section which is solid but rotten in the center. Hives produced by such means are usually about three feet in length. In contrast to the tradition of "gums" in North America, log hives are hung horizontally rather than as vertical cylinders. (Some of Naomi's research at ICIMOD indicated that local lore in the Jumla area holds that the side of the tree that had faced the predominent direction of the sun's rays should be used as the top of the hive-- since *Apis cerana* prefers to depend combs from the more resinous wood [and thus more impervious to weather and rot?] on that side). Round stoppers of wood or basketry are used to close both ends and are sealed in place with daub. A hole is bored through one of the stoppers to form an entrance for the bees. The log hives are then usually placed on platforms or roofs affording them some protection from theft, ants and the *malsapro*-- the pine marten (a weasel-like animal with an appetite for bees and honeycomb exceeding that of North American skunks).

House hives, such as the ones Janak was working into his construction, are an integral part of new domiciles. The outside surface of the compartment is plastered over except for a small entrance hole. The inside is sealed in the same manner as log hives. Before they are sealed, however, empty log and house hives may be baited using *gosard*, a mixture of beeswax, honey, herbs and other substances thought to be attractive to bees. The components are dried, sometimes by "frying" over low heat and then combined into fragrant balls that are rubbed vigorously over the inside surfaces of the hives. There is scientific evidence that *Apis mellifera* swarms are attracted to boxes that have been treated in similar ways with the odors of comb or with herbs that contain analogs of the Nasonov pheromone which bees use to mark nest entrances-- so it is very likely that the Nepali practice does have objective merit. The beekeepers I spoke to mentioned using leaves from walnut trees for the purpose; Naomi's extensive research also indicated that, in addition to walnut leaves, mustard oil, roasted rice, rose flowers, juniper foliage,and even ghee (clarified butterfat) are added as attractive aromatics. Some of these substances may have more cultural, as opposed to apicultural, significance since some foods and herbs are considered propitious for the gods worshipped in the Hindu and Buddhist religions; the five holiest offerings, the *paanch amrit*, are honey, black pepper, yoghurt, milk and ghee. Many of the routine tasks of beekeeping, as in many aspects of Nepali life, are scheduled according to auspicious astrological dates and other religious considerations.

Janak had several moveable frame hives into which he had transferred comb from log hives. He'd received training in this regard and other aspects of hive management at the short course arranged by Liz and Shree. Shree had helped in constructing frames from locally available wood using hand-tools; brain-storming with Nepali beekeepers also led to the innovation of an appropriate-technology frame constructed from slats of bamboo. The hives themselves were constructed of either wood or compressed straw. In some areas of Nepal wood is scarce and straw is abundantly available-- in other areas the situation is reversed, straw being unavailable as a building material because it is required to feed animals. According to ICIMOD research, the straw hives provide better insulation than wood; however straw hives offer less protection against attacks by pine martens-- which have, in fact, been known to gnaw their way even into wooden hives on occasion. Some of the beekeepers in the Therathum area reported that keeping a dog on the premises mimimized problems with pine martens.

Inside the hives, one of the first things that struck my eye were the inhabitants other than the bees. The odd silverfish or two, which we observed scurrying out of the light when lifting off the hive lids probably subsisted on scraps of pollen, honey and hive debris. Several small beetles, although in the same size range as the dreaded African hive beetle, were confined to the daub used as sealing material and were probably feeding on organic debris therein. Most interesting however, were a couple of small creatures which appeared to be a cross between a spider and a scorpion-- which, as arachnids, they are indeed related. I explained to my companions that the arachnids were called pseudoscorpions. The animals are too small to prey on the bees themselves and too large to act as ectoparasites so they are probably no threat to the principal apine inhabitants of the hives-- although there has been speculation that they may feed on the body fluids of larvae. It is more likely that they feed on small insects and other arthropods that invade the hive. Liz noted that the local beekeepers referred to the creatures as "the beekeepers' friends" but she was not sure why, nor were the several beekeepers to whom we subsequently spoke. The tantalizing possibility exists, also raised by those few researchers who have published information on the subject, that, through grooming of the bees whose living space they share, these arachnids assist in keeping down the population of varroa mites, which I observed to be present in very low numbers. (Of course, there are aspects of the biology of *Apis cerana*-- such as relatively shorter larval stages, the bees own grooming behaviour, tendency to abscond, etc.-- which imbues them with a relative resistance to varroa mites compared to *Apis mellifera*.)

The dozen or so colonies of *Apis cerana* that we had the opportunity to inspect were exceptionally docile. This was perhaps due in part to the fact that the area we were visiting was suffering from a seasonal dearth that was compounded by drought-- since the light rains normal in December and January, which supplement the monsoons of June through September, failed to materialize. Thus the stores in the colonies were very light. Under such conditions *Apis cerana* colonies are apt to abscond. Liz was encouraging the beekeepers in her area, if necessary, to feed their bees when they could. Sugar is relatively expensive and many beekeepers chose not to feed their bees because they could readily catch swarms that would migrate back into the area when forage improved. Naomi, on the other hand, has found that beekeepers in the Jumla area attempt to feed their bees with a variety of substitutes for pollen and honey. There, to sustain their bees through hard times, beekeepers may use a variety of sweet plant concoctions (from pumpkin, sweet turnip, apples, raw sugar cane, inner rice husks, or dried flower heads) or a candy made of honey mixed with roasted buckwheat.

I had the opportunity to re-emphasize this point with another beekeeper we visited the day after Janak. Daal Bahadur Limbu had a large number of house and log hives at his farm on "the other side of the mountain". He had been having some trouble with absconding. He had confronted this problem by constructing queen excluders for the entrances of all his hives. He'd used a queen excluder which he'd obtained at the training course in Kathmandu as a template and cut similar devises out of plastic which he then sealed into the entrances of all his hives. If a colony attempted to abscond only the workers could leave. Without an attendant queen such an absconding swarm would return within a day or two to their original hive. I suggested to Daal that adequate feeding could serve as an additional tactic in minimizing one of the stimuli for absconding-- namely, nectar dearth.

The author, beekeeper Dal Bahadur Limbu and Shreehari Thapaliya, showing transferred comb. The frame held by the author shows hammock-style cradle which results in greater support of the comb against the top-bar which will facilitate repair by the bees.

It was with Daal that Liz, Shree and I assisted in transferring combs from a log hive to a wooden frame hive. Having conducted this operation on numerous occasions I made a couple of suggestions that I had also passed along to Janak:

- When transferring combs, if the queen can be located she should be placed into a match box. The box should be left open slightly, enough that workers can feed the queen but not so large that she can escape. The box should then be placed in the new hive where the queen will be protected from the commotion inherent in any hive transfer and from any tendency that the workers may have to ball up on her in the hubbub .
- Janak had tied transferred comb to top-bars using thread that wrapped around the faces of the comb. This did not offer sufficient support in many cases and the comb would slump away from the top-bars. Since bees will only build comb from top-down the bees did not repair comb in the manner that they did when combs were tight against their upper supports. I recommended the use of cloth "hammocks" torn from cotton rags. Each end of the strip is split for a length of two inches or thereabouts so that these can be tied around a top-bar. The rag strips should be about as wide as the combs themselves and of sufficient length that they can be slung completely along the bottom edge of the comb with enough length to spare for tying off. Thread or string can be wrapped around the faces and the hammock to keep the comb from wobbling out of the sling. When combs are secured in this manner the bees will quickly secure them to the top-bars and will often remove the cotton rags and strings themselves.
- Feeding, aside from contributing to the survival of colonies during dearth is useful after a transfer to stimulate the bees to exude wax, thus facilitating repair of transferred comb.

After all comb has been transferred into a frame hive the new hive is placed in the same location as that previously occupied by the fixed comb hive to assist bees in orienting to their new abode. Bees remaining in the log hive are dumped on a mat in front of the hive to transfer young bees not yet skilled in flying. The old hive will be removed so as not to mislead colony members and will later most likely be used as a trap hive in the upcoming swarming season.

Although Daal used a minimal amount of smoke to pacify his bees before starting the transfer he also used a considerable amount of water. He dipped a crude brush made from a bunch of twigs bundled together to into a bucket of water and sprinkled the water onto the bees. The water cooled and weighed the bees down so that they were not as able to fly and sting us during the procedure. (I have used a similar method myself, using a spray bottle of the kind for misting plants, when managing bees in areas with an extreme fire danger.) Naomi, when I related the episode to her, pointed out that water used in this manner is often not potable-- neither may be the water used to clean out collection vessels. Thus, for harvesting, Naomi suggests that water not be used as a pacifying agent and that, whenever possible, only boiled or treated water be used to clean any surfaces (extractors, knives, receptacles, etc.) that will come into contact with the honey to prevent it from being contaminated by disease organisms. This is of particular importance in the cultural context of Nepal because honey is more often used in Nepal medicinally-- as a wound dressing, eye ointment or general tonic-- rather than simply as a food.

Peace Corps volunteer Elizabeth Hobson and her husband Shreehari Thapaliya chat with beekeeper Dal Bahadur Limbu and his family. The prospective young beekeeper sports a locally made bee veil while his father displays home-made frames constructed from slats of bamboo. Such bamboo frames may be used in place of wooden frames where milled wood or carpentry tools are difficult to procure.

Our time in Nepal seems all too brief in hindsight but was long enough to develop an appreciation for Nepalese beekeeping traditions and for the development organizations such as ICIMOD and Peace Corps which are working to preserve and improve beekeeping using the native honeybees. The aid being offered to *Apis cerana* beekeepers, I believe, is worthwhile for its intrinsic value as an ecologically and culturally appropriate means of supplementing the income of rural Nepalis. However, the biological resources (genetic traits, symbionts) that are thus preserved may ultimately prove of value in the control of pests and diseases of honeybees for beekeepers all over the world.

For more information on Nepal, ICIMOD or the Peace Corps visit the following websites:

http://http0542.hosting.connect.com.au/dest/ind/nep.htm

http://www.icimod.org.sg/ann_reports/arep97/widen.htm#2

http://www.peacecorps.gov

For more information about the Peace Corps' Beekeeping program write to:

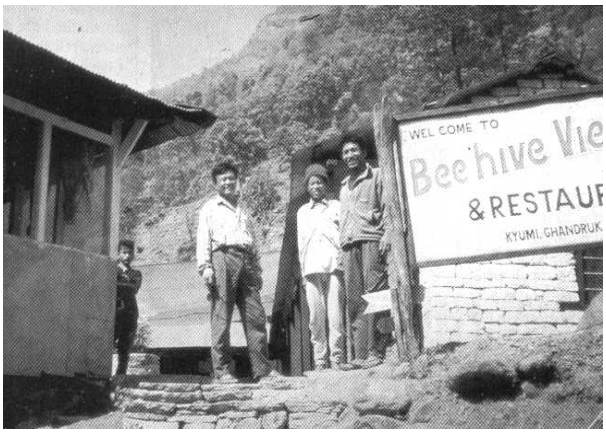
PEACE CORPS
806 Connecticut Avenue N.W.
Washington, D.C. 20526

or call (toll-free): 800-484-8580 or look up the local recruiting office under the government listings in your telephone directory.

…loves *laboriosa* last

One of my final and favorite experiences in Nepal was a visit to a nesting site of the giant honeybee, *Apis laboriosa*, which we had been told we could see along the course of a trek we made to Annapurna Base Camp. The nest site was located between the villages of Landruk and Gandruk to the north of the city of Pokara which is close to the geographic center of Nepal. An eight hour walk from the nearest road brought us to the village of Landruk. After making some inquiries I was able to locate an innkeeper, Chankar Gurung, who spoke English and was acquainted with the headman, Nakhaal Bahadur, who is in charge of supervising harvesting of the cliff nests. The next morning I met with Chankar and Nakhaal who gave me a tour of the nesting area about a half hour hike down to the Modi Khola river to a small settlement called Kumi, the centerpiece of which is an inn called the Beehive View Guest House.

Innkeeper Kumar Gurung, guide Chankar Gurung, headman Nakhaal Bahadur pose in front of the BeeHive Guest House located near the cliffs on which Apis laboriosa were nesting.



Innkeeper and guide, Chankar Gurung, headman, Nakhaal Bahadur and the author on the river bank opposite to the cliffs on which Apis laboriosa were nesting.

I counted ten nests of the *bhir mauri*, or cliff bees, across the river on a great face of rock that was nearly inaccessible except by repelling from the top. The nests are harvested twice a year, once in the spring and again in the fall. Making offerings (of red and white clothing, bread and fresh water) to Sheetabara, a nature god, is considered a requirement to prevent mishaps from occurring during the harvesting operation. Chankar and Nakhaal related to me that harvests have been called off because the gods had not been properly appeased and had sent snakes to block access to the cliffs.

At left: *Apis laboriosa* nest locations-- seven combs are shown in this photo.

Above: The single comb nests of *Apis laboriosa* can attain the size of an average door-- these are each about half that size.

A team of honey hunters is required to conduct a harvest. A rope ladder and baskets are lowered from the top of the cliff and one of the team of harvesters shimmies down the rope and, using long bamboo poles, maneuvers the baskets into position beneath the combs. He then cuts the comb to fall into the baskets. The climber is usually shielded by little in the way of protective equipment and counts on fires set at the base of the cliff to pacify the bees to some extent.

The author, in trekking garb, points to an Apis laboriosa comb displayed in an inn's dining area. This was an average sized comb-- large combs can exceed the size of a house door. (photo by Maura Walker)

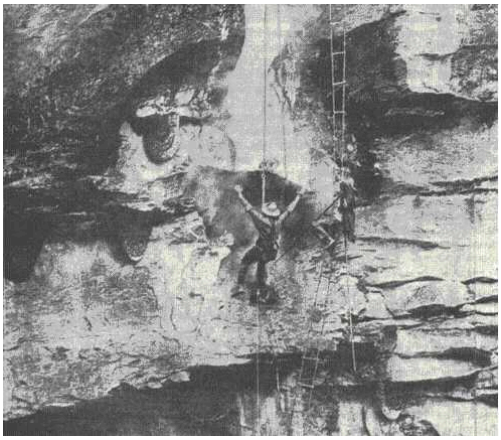
Although the honey is highly prized, the wax, which is used as a trade item in other areas of Nepal (since it can be used in metal-working or in the production of unguents and other valuable commodities) is not retained in the Landruk area. It is simply thrown away.

The criteria that the giant bees use for the selection of nest-sites is not at all intuitively apparent. I walked most of the length of the Modi Khola, from its headwaters near the Annapurna Base Camp to where it exits the canyons of the Himalayas into the valleys of the Pajar. The location in Kumi was the only site where we saw *Apis laboriosa*. The aspect with respect to sunlight, overhang, mineral compostion, etc. did not seem unique amongst locales along the river so I do not know why this was the only place where we saw the cliff bees. Perhaps some particular magnetic anomaly draws the bees to that specific location? Yet another of the exotic peculiarities of this elusive creature.

The numbers of bees on the comb here can be appreciated by noting the small whitish piece of comb that is free of bees between the two combs covered entirely by workers.

The Kyumi valley showing the cliffs on which Apis laboriosa nest-- the large size of the combs is exemplified by the fact that they can be barely discerned even from this distance. (photo by Maura Walker) .

I was told that a harvest was to take place within a week or so. I very much would have liked to witness this amazing display of athleticism and bee-hunting prowess. However, I had come to appreciate that schedules could easily be derailed by the vagaries of politics, weather and even astrological divination. I therefore bid farewell to my new-found Nepal bee pals and continued on our travels in order to stick to our itinerary. When we arrived back in Pokara we were informed that strikes in connection with the upcoming national elections were shutting down all transportation beginning the next day. Oh, well…



Honey harvesting of Apis laboriosa is as much an athletic endeavor as it is a bee-hunting skill.