

Bara Shigri Glacier

"We stay silent but there is in us a slight trepidation. Tents are up, the winds blow a last little gust, and then tranquil sets everywhere..."

It's a once-in-a-lifetime experience of the drive through Trans-Himalayan Kinnaur and Spiti. The world-famous adventure trail proceeds from Shimla along the Sutlej river, through Kinnaur to the famous Sangla valley, across the Great Himalayan Range. It lingers on along the Spiti river through tribal and Buddhist belts, over the Kunzum La Pass. A side trek/drive to Chandra Tal or what is popularly called moon lake takes almost a day to the boulders-covered Bara Shigri glacier terminus across the wind-swept Rohtang Pass to Manali, over the Jalori pass through Himalaya's zenith conifer forests, via Narkanda back to Shimla.

Location and Geology

Bara Shigri literally means "Great Glacier", (where Bara = "big" and Shigri = "boulder-covered ice") is a glacier located in Chandra Valley of Lahaul & Spiti, in the state of Himachal Pradesh, India. It currently stretches to 27.7 kilometers (17 miles) which makes it the second longest glacier in Himalaya after Gangotri and covers over 126.45 square kilometers (51 square miles). It is, as the name already suggests, the largest glacier in Himachal Pradesh.

Bara Shigri supplies the Chandra River which after its conjugation at Tandi with the Bhaga River is known as Chandrabhaga or Chenab.

Lahaul Spiti is, undoubtedly, one of the less-explored travel destinations in India. But in recent times, it is gaining recognition steadily due to its stark terrain, crystal clear

lakes, high mountains, wild rivers, and astonishing local cultures. It is sparsely populated and the 4th least populated district in India.

To the further side of the Bara Shigri, is another glacier known as Chhota Shigri (Chhota= small + Shigri= boulder covered in ice). It is, as we break down its name, a comparatively smaller glacier.

Bara Shigri glacier is located on the northern slopes of the main Pir Panjal Range of the Inner Himalayas. It is supplied by various tributary glaciers with the main ones congregating at about 4,900 m (16,100 ft). The glacier ensues into the Chandra River through the Shigri stream which rather than joining the river directly from the south, hurdles to the west shortly after it leaves the ice cave and proceeds almost parallel to the course of the Chandra River up to Phuti Runi.

The glacierized area of Bara Shigri snakes from 3,984 m (13,071 ft) at the terminus to about 6,363 m (20,876 ft) at the headwall. The glacier presents heterogeneous surface characteristics, ranging from crystal clear ice in the accumulation zone to extensive debris-covered areas in the lower ablation zone.

There is a small deposit of antimony ore known to exist near the Bara Shigri glacier. This makes it one of the few reported occurrences of the strategic mineral in the country.

Bara Shigri, as a greater part continues to form the Nun Bara Shigri Glacier belt which scales from Ladakh to Himachal Pradesh.

The inner sanctum of the Nun Bara Shigri Glacier Region initiates from the area around the Nun Kun Peaks and proceeds southwards lingering along the main spine of the Great Himalayan Range. The Nun Kun Peak stands between the Suru Valley in Ladakh and the Warwan Valley of Kishtwar. The Chenab is the chief river into which most of the rivers of this inner

sanctum drain though some rivers fed into the Indus as well. Also, it is very interesting to note that the Indus and the Chandrabhaga or Chenab run a parallel course on either side of the Great Himalayan Range. The Chenab dwells between the Pir Panjal and the Great Himalayas and the Indus between the Zaskar and the Ladakh Range.

Though the Himalayan Region receives a lot of tourists, few ever venture anywhere near the inner sanctum which is probably due to the fact that few people are aware of the existence of this vast Glacial belt. There are over 1000 Glaciers that pour mostly into the Chenab. The wild tributaries that join the Chandrabhaga/Chenab are just a keepsake of the wilderness they inhabit.

For trekkers, eager reconnaissance on the Bara Shigri glacier represents that a considerable number of issues would have to be overcome in order to conquer the peak. The glacier itself is protected by a comprehensive arrangement of ice cliffs supporting teetering boulders that from time to time crashed down to join masses of other boulders which had undergone a similar fate. It seems that there were two routes that would avoid the hindrance of the ice cliffs, namely to traverse to the extreme ends of the cliffs on either side of the glacial river. The surface of the glacier consists of unstable mounds, ridges, and furrows of unstable rock debris which successfully conceals the true ice surface of the boulder. This has the combined effect of making both navigation and movement across the glacier (especially when carrying full sacks) extremely slow, hard, and hazardous.

History

The Bara Shigri glacier was first surveyed by E.H. Pascoe and H. Walker of the Geological Survey of India in 1906. The Geological Survey of India organized an expedition to this glacier in 1955 as part of the Indian program for the

International Geophysical Year 1956–57, this was when a number of Himalayan glaciers were explored and their snout position was derived.

In 1924, Hugh Whistler, an English ornithologist, wrote about the transcendence of Bara Shigri. He quoted, Shigri applied par-excellence to one specific glacier that finds its way out from the mountains on the left bank of the Chenab. It is considered to be several miles long, and the snout reaches right down to the river, laying the customary road from Kullu to Spiti. This glacier had dammed the Chenab River in 1836, causing the formation of a large lake, which eventually broke loose and caused havoc down the valley.

Biodiversity

Human beings have been using medicinal plants as a major source of therapeutic agents since the Vedic periods. Himalayas are exclusive and largest mountain chains that cover roughly 10% of the total land surface of India. The unique environmental and varied climatic conditions support a diverse and unique flora. These areas are home and important habitat of more than 9,000 plant species, mainly angiosperms, out of which about 3,471 are considered exclusively endemic to this region, and hence it is regarded as the major hotspot of biodiversity.

The Lahaul valley is rich in local medicinal herbs of immense potential and practitioners of Tibetan or Buddhist communities. These biodiversity hot spots are a treasure of medicinally important flora. Overall 31 medicinal plants were recorded from forested and moist shady habitats, and these populations were established under threatened categories. Most species are not commercially viable but since they present a niche in balancing the ecosystem, it has to be ensured that ex-situ conservation and large-scale cultivation strategies of the medicinal plants are undertaken in ecologically rich

areas. Despite the harshness of the climate in this region, it harbors diversity in flora that showed richness valued as medicinal plants.

The meadows, mountain slopes, and alpine pasturelands give an excellent display of flowers from cold desert barren mountains. The vegetation pattern within Lahaul valley is specific in different locations like Keylong, Koksar, Rohtang pass, and Piyukar which lie along the major river Bhaga. The total geographical area under cold deserts in Lahaul Spiti is about 11,000 square km, out of which 3,400 sq. km lies in Lahaul itself. The mountain slopes, alpine meadows, and alpine pasturelands give a breathtaking display of flowers to the cold desert barren mountains. The maximum number of plant species recorded during the survey are of economic use in these regions belonging to families Rosaceae, Apiaceae, Asteraceae, Scrophulariaceae, Gentianaceae, and Polygonaceae (Figure 1). The common species grown in these regions are *Rosa webbiana*, *Jurinea*, *Picrorhiza kurroa*, *Verbascum thapsas*, *Mentha longifolia*, *Sedum ewersii*, *Carum carvi*, *Ephedra gerardiana*, *Rhododendron campanulatum*, *Bistorta vivipara*. The plant species are important source of various chemicals such as Tropane, Emodin, Aloe-emodin, Physcion and Rhein, Cuscutalin and Vitexin, Cuscutin, Podophyllin, Aquilegiolide, Plantagin, Verbascoside, Piperazine, Sedamine and sedinine, Aquilegiolide, Avicularin, Aucubin, Malvillin, Organol, Potifulgene, and Thymol. Many threatened plant species (*Podophyllum hexandrum*, *Aconitum heterophyllum*, *Rhododendron campanulatum*, *Ephedra gerardiana*, *Thymus linearis* and *Potentilla atosanguinea*) were also recorded during exploration. More than 17 types of disease ailments are carried out by medics in the Keylong region. It was understood from the survey that the monk communities residing in regions of Lahaul valley have inherited a diverse and concentrated resource of medicinal plants. They still depend upon the diversity of local medicinal plants and are aware of their depletion in native habitats. The documentation on these rich

traditional knowledge has offered novel reports from the area. The degradation of these wild plants is also a matter of concern for medicinal practitioners as well as ecologists. Keeping this viewpoint in mind, the present study on documentation of tribal knowledge from the region where novel information was conserved in the form of sacred mythologies related to plants. It also helps in its conservation, leading the cushion of new pharmacological values for the betterment of mankind. An approach was made to explore the indigenous flora restricted to mention name localities and its conservation status for future generations. The conservation of rare and endangered species of cold desert by research institutions and state departments through the establishment of the medicinal park, herbal gardens, and ex-situ and in-situ conservation, will be beneficial for the overall development of the region and sustainable utilization of these wild resources for the future. The Himalayan region is well known for its valuable herbal wealth since ancient times. Similarly, the Himalayan region which seems barren and devoid of vegetation at the first sight is very rich in herbal resources. The present exploration study will help to reveal the potential of local plants in the support of notable traditional knowledge. Wild food plants have already been represented as the milestone of the traditional food systems and are still proved as a pillar of local food sovereignty. Medicinal plants play a vital role in ancient as well as present-time scenarios and need to be carefully reevaluated and reconsidered by pharmacologists and medicinal practitioners.

Lahaul Spiti is the habitat for various extremely rare animals and plants, some of which are endemic. Some of the crucial animal species are Tibetan antelope, snow leopards, argali, musk deer, Himalayan wolf, brown bear, ibex, and kiangs. Local communities also farm wheat, onion, cabbage, potatoes, and a few other crops in lower reaches.

The Pin Valley National Park is a lush hilly landscape in the state of Himachal Pradesh situated within Lahaul and Spiti District, The park was established on 9 January 1987 is under Cold Desert Biosphere Reserve of the Himalayan Region and is at an elevation ranging from approximately 3,500 meters (11,500 ft) to about 6,000 meters (20,000 ft) at its highest feet . Various endangered species including the Siberian ibex and snow leopard find their natural habitat in the higher altitudes within the area. The higher altitudes also limit the growth of vegetation yielding only to the Himalayan Cedar groves and Alpine trees including 22 reported endangered plants with medicinal value.

Approximately 27 km away from the glacier is the **Inderkilla National Park** established in the year 2010 in Kullu, Himachal Pradesh. It sprawls over a vast area of 104 km square. The awe-inspiring national park is home to several species of domestic, endemic and foreign flora and fauna and boasts of flourishing rich wildlife. The rare animals that inhabit here are wild goat, mountain deer, leopards, black and brown bear. Over 250 species of birds have been known to grace the park . Similar to the fate of Bara Shigri , it is considered to be one of the less often explored national parks in India.

Environmental issues

Glacial retreat

Glaciers and the current rate of degradation of Glaciers is a million-dollar topic of Debate in the World. And of course, here in the Himalayas, we have a great concentration of Glaciers (remember them from the Giant Glaciers of the Karakorams). We have Glaciers in the Western Himalayas as well as the Kumaon Himalayas with the Gangotri, Pindari, Milam, etc being the well-known ones. But unknown to most the largest concentration of Glaciers in the Indian Himalayas exists in

the region of the Nun Bara Shigri glacier belt.

Techniques used in surveys consisted of repeat terrestrial photographs, historical archives and reports, geomorphological evidence and maps, and high to medium spatial resolution satellite images (Corona, Hexagon, Landsat, and WorldView-2) were supplemented by extensive field validation. The results indicated that during the early part of the 19th century, the snout of Bara Shigri Glacier was at around 3900 meters above sea level. Following this, there was a continuous recession with a total retreat of 2898 ± 50 m, which corresponds to a frontal area loss of 4 ± 1 km² in the last 151 years (1863–2014). Compared to this, during the last half-century (1965–2014), the glacierised area was reduced by 1.1 ± 0.02 km² with a concomitant terminus retreat of 1100 ± 32 m. The early 19th-century development is attributed to a combination of cooling during this period that are glacier topographical factors and consequences from steep-fronted avalanching tributaries. The late 19th-century recession can be ascribed to a net increase in the temperature with a corresponding decrease in precipitation in the northwestern Himalayas.

The Bara Shigri glacier stores some of north India's largest freshwater reserves. The glacier is receding, impacted by global warming, and changing glacial streams.

Loss of natural resources

The fluctuations in the dynamics of glacial streams present a big challenge in the form of water shortage. As the glacier dries up, it will not only reduce the quantity of freshwater but will also increase the sea level and induce floods. As living organisms begin to experience the pressure of the ever changing environment of their habitats, some will evolve and adapt yet others will be lost. Furthermore, as glaciers become more prone to melting, it becomes extremely risky to organize expeditions in areas nearby. This hinders tourism and

hence dips the financial earnings of the region.

Loss of Cultural heritage

The local communities depend on the natural resources endowed by the glacier region. Their culture is a spectacular collaboration of Himachali Hindus, Tibetans, and Buddhist Ladakhis. If their habitat continues to present variations, some parts of their culture might get lost. Also, there are medicinal herbs from the glacial belt utilized by monks for various ailments. As several environmental issues damage biodiversity, and it wouldn't be long before their medicinal knowledge goes in vain.

Solutions

Creating database

To create solutions, one must dwell deeper into the issue, and keeping that in mind, scientists at the United States Geological Survey (USGS), in concert with the National Snow and Ice Data Center (NSIDC) and NASA, are developing a global inventory of all the world's glaciers to help researchers track each glacier's record. The inventory combines current information on size and movement with historical data, photos, and maps of each glacier. The purpose is to better enable scientists to connect changes in each glacier with any shifts in local climate, such as temperature or precipitation changes.

Judicious use of resources

Effectively, alternative energy sources can be introduced and popularised to slow down global warming. Solar panels trap the heat from the sun which can later be converted to electrical

energy. Wind turbines use the kinetic energy from the wind to generate power. Tidal and wave power utilize the humongous power of the ocean by harnessing the energy with generators placed on the ocean bed. Geothermal energy utilizes the heat from inside the earth. Biofuels such as ethanol can be produced by fermenting and mixing vegetables, grain waste, and fruit; ethanol has the remarkable potential of replacing diesel. Electric cars are battery-operated that do not rely on the highly polluting internal combustion engine; hydrogen fuel cells are being developed for these batteries. These are a few yet phenomenal ways to deal with global warming.

Individual Contribution

As an individual, you can contribute by using battery-operated vehicles or mass transportation services, reducing the waste generated from houses, fixing leaky taps, and switching off electrical devices when not required. Also when as a tourist, you visit sensitive areas, avoid littering the places. These seemingly little things make a large impact if they are done on a large scale, and they'll go a long way toward reducing your carbon footprint and saving the glaciers.

Conclusion

While statistics don't always reflect something tangible (particularly in remote regions), data along with the observations, vital words, and thoughts of local communities surely determine the extent of the damage done. The numbers are in themselves horrifying, suggesting a rapidly diminishing ice bulk. In the hollow ice cave, senses become active to the transition of ice to water.

This 'Great glacier 'that holds and supplies so much freshwater, and supports so much life and culture, needs recognition beyond an image. Bara Shigri is but one of many

such glaciers that are not increasingly talked about and fretted over. Hundreds like it are the vertical providers of freshwater that literally fuel millions of bodies but are given not even a fraction of the credit that they deserve.