

NANDA DEVI JUGGERNAUT

HARISH KAPADIA

After the first joys in victory came a feeling of sadness that the mountain had succumbed, that the proud head of the goddess was bowed. With these simple words of veneration, H.W. Tilman and Noel Odell completed the saga of finding a route to the summit of this charismatic mountain. They were standing then on the highest point in the British Empire, 'where the sun never sets' (The independent Kingdom of Nepal and Kashmir contained all the other high peaks known then, including Everest and K2). It was not without reason that Nanda Devi was held in such awe, for since in 1883, it had humbled at least eight attempts to reach its base.

The twin peaks of Nanda Devi (7816 m) and Nanda East (7434 m) stand majestically in the centre of a ring of peaks. Looked at from any angle, the Nanda Devi peaks stand out distinct and beautiful, particularly as the first and last rays of sunshine always caress their summits. Hugh Ruttledge who had made an attempt to reach the foot of the peaks described the Nanda Devi Sanctuary in a letter to the *London Times* in 1932 as: *A seventy-mile barrier ring on which stand twelve measured peaks of over 21,000 ft which has no depression lower than 17,000 ft except in the west where the Rishi Ganga rising at the foot of Nanda Devi draining the area of some 250 square miles (800 square kilometres) of snow and ice has earned for itself what must be one of the most terrific gorges in the world.* The Sanctuary of Nanda Devi is remarkable for its unique wild grandeur. Even more remarkable is the veneration that this peak holds in Hinduism, the folklore behind it and the tributes it has received from some of the finest pens in mountaineering literature. The Sanctuary and the high peaks of Nanda Devi are the major barriers between the cold Tibetan winds and the Gangetic plains of India. Without the Sanctuary to absorb the main thrust of the icy winds, Tibetan winds would have stripped the Gangetic plains, the granary of India, barren. No wonder the peaks are worshipped as a Goddess with some impressive folklore built around them. The name, Nanda Devi itself means; 'the Bliss Giving Goddess'.

The humility and veneration of the first climbers was perhaps missing with later visitors to the Sanctuary. The inner sanctums were opened for unrestricted flow of visitors in 1974. Within 8 years there was so much pollution, cutting of trees and damage that the Sanctuary had to be totally closed now till 2002. (During these years five expeditions visited the Sanctuary, two of them from the defence forces, which climbed the main peak¹). It was therefore imperative that the effect of this closure should be observed, especially as the new state of Uttaranchal was interested in knowing the state of the Sanctuary.

Being the abode of goddess Nanda the peaks and the sanctuary is venerated by people and poets for centuries. Environmentalists, scientists (even nuclear scientists), historians, politicians, poachers, medicinal plant gatherers, forest contractors, local residents, activists, government, forest officials, trekkers, agents, and international climbing community – everyone has an interest and views on the affairs of the goddess and its Sanctuary. With her benevolent smile this 'bliss giving' goddess blesses all as the juggernaut moves on.

The Indian Mountaineering Foundation decided to send a multi-disciplinary expedition to the Nanda Devi Sanctuary in May-June 2001. Finally, our expedition consisted of 3 trekkers and mountaineers and 4 scientists to trek into the inner Sanctuary. We were asked to study specifically the following points:

¹ The first team was from the Indian Army engineers in 1991, followed by the team from the Indo-Tibet Border Police (ITBP) in 2000. Both these teams climbed the main summit and the Police team lost one climber on the mountain. Immediately following the ITBP team was a British trekking group (see article in the present HJ) and our team sponsored by the IMF. Following us, in October 2001 was a large Indian Army team from Garhwal Rifles which climbed the main peak and Dunagiri apart from clearing much old garbage.

- Whether any further destruction have taken place since closure of the Sanctuary
- Whether the total closure has been beneficial to the growth of natural resources
- Whether the closure has been total or there have been several encroachments or
- Whether the Sanctuary's fragile environment is now strong enough to allow some trekking and climbing activity.

Based on the report of our team, a 'Management Plan' could be formulated by the IMF and the Uttaranchal Government.

We travelled by train with Gurdial Singh who was one of the earliest climbers to have visited the Sanctuary. He was forthright in his advice and finally ended with a little twinkle in his eyes; 'I envy you all. Have fun and try to save Goddess from further destruction.'

The day we reached Joshimath, one of the screws in my specs was loose and I could not find any optical shop to fix it. Finally I located a small shop selling watches with a friendly looking owner at the desk chewing *paan* (beetle-nut). I showed him the problem. Listening to a radio, he looked around for a tool and repaired it in no time. I offered to pay for the services. He simply extended his hand and murmured. 'just shake hands'. I was back in the friendly land of Garhwal!

Diwan Singh Butola

We travelled to Lata village where we had discussions with local *Pradhan* (village headman) who bargained for a better rate for porters. While negotiations were on I visited the village and looked for the legendary Diwan Singh Butola.

Diwan Singh has a place in the history of exploration of the Nanda Devi Sanctuary. Today he is possibly one of the few persons alive who were with the first team of Shipton and Tilman in 1934 which explored the route to the Nanda Devi Sanctuary. He may be old, 95 years of age, but was certainly alert and energetic.

With a sense of humour, he narrated several experiences. He had carried load for the 'two Angrez(as he called Shipton and Tilman team) and stayed at various camps en route when Shipton and Tilman explored routes. He reached Sarso Patal and returned with them when the monsoon arrived.

When they returned to the Sanctuary after the rains, they did not take any locals with them, as the plan was to descend across the Sunderdhunga Khal to the south. Amongst his companions with the 1934 team Diwan Singh remembers Ang Tharkey and his ponytail well. For his efforts, in 1934 he was given a Re.1 Victoria Silver coin and a 'metered' Pressure Cooker. He sold both these for Rs. 500 and used the money for his own marriage, he added with a laugh.

He continued going with other teams later to the Nanda Devi Sanctuary and other areas. He was with the French team (1951), which attempted to traverse the two peaks of Nanda Devi. The French killed too many bharals and birds en route to the base camp, which according to Diwan Singh was *chhejan*, a bad omen. The two summiteers perished on the mountains. He remembers the various American expeditions (in mid-sixties) too. 'Many Americans came looking for gold in the Sanctuary. They went in with huge boxes.'² (He had carried one of the boxes). He felt that the death of Nanda Devi Unsoeld on the Nanda Devi peak was ordained. The goddess was displeased.

I asked him whether he required any medicine. With a laugh he said, 'can you give any water to dry wood? At this age no medicine will work on me'.

² He was referring to few hush-hush American teams to the Sanctuary in mid-sixties which were reported to be planning to plant a nuclear-listening device on the summit. Local were told that they were looking for gold in the Sanctuary.

'Do you require anything, have any wish?', I asked.

'Only thing remains is death, dying in the warmth of the great Himalaya where I have lived whole my life'. He had never been beyond Chamoli in the hills and had not seen the plains. The Himalaya and goddess Nanda Devi had given him everything he needed.

The Problems

The negotiations for rates were over but as the expedition was ready to move, awaiting porters, the *Pradhan* of Lata village came with a 'resolution' on paper and a printed receipt book. He wanted us to obtain a 'permit' from him and wanted us to pay Rs. 5/- per day per person as fee to enter the Sanctuary. We refused to do so as only the Uttaranchal Government or its representatives are authorised to issue any permit and collect money. After long arguments, the porters went on strike and refused to carry luggage for the expedition. This seems to be a new and threatening development in the Himalaya (somewhat like the Maoist rebels in nearby Nepal). The villagers were not wrong in their demands too for they were promised a lot when the sanctuary was closed first, but nothing was done. They feared that when the sanctuary opens to trekkers and climbers again the main benefits would go to outsiders and they would be left in lurch again.

I had a job to do so I spread the word with other porters, some of whom I knew from my previous two visits, about the large amount of cash I was carrying for them to earn as portage on the current expedition and I threatened to return home with the goodies. Temptation was name of the game and the 'principles' could not last against such a large one. After few hours, *Pradhan* and porters returned, lured by the money they were to earn.³

Chhino – Jhpto

A movement in the name of 'Chhino - Jhpto' literally meaning, 'Grab and Take Away' was started in July-August 1998 by the villagers of Lata. This was a protest against the closer of the Sanctuary since 1982. The idea was to take over the grazing land and forcibly enter the reserved forest for grazing/cultivation and collection of medicinal herbs. According to them when the Sanctuary was closed in 1982, the villagers were promised alternative grazing rights in the forest division of Badrinath section. Unfortunately, even after almost 20 years their plight was not attended to.

During the protest, many villagers gathered at the Lata village and climbed up to Lata kharak, Dharashi and crossed into the core area of the Sanctuary at Dibrugeta. Their plan was to camp in the forest reserve for months in a relay and break rules of the National Park. Later while trekking in to the area we could read the slogans written by them on the rock walls and trees. The Government in response had sent the District Magistrate for negotiations. When these failed, a contingent of Police Armed Constabulary (PAC) was sent but the villagers could not be stopped. However, after about a month, the protest fizzled out and villagers returned back from the prohibited area.⁴

³ All future expeditions and trekking teams are advised that no such permits and payment is required to be made to any villages in this area for visiting Nanda Devi Sanctuary.

⁴ Chipko

This area has a history of protests related to forestry rights. In the past the well-known *Chipko Movement* originated from the area. The Chipko movement (literally 'hug the trees') was started from the village Reni which is situated at the entrance to the Sanctuary, by Ms Gaura Devi in 1976. The village women embraced trees to prevent the forest contractors from cutting it. This became a well-known idea and received much coverage the world over. She was given a medal and some money. Later Sunderlal Bahuguna (Tehri Garhwal) and Chander Prasad Bhatt of Gopeshwar entered the movement and took charge of it. Ms Gaura died in 1996 and today Chipko movement is not active.

The Trail

With the problems now behind us we started on the famous trail to the inner Sanctuary of the Nanda Devi. We climbed from the roadhead to Lata village (2 km) on a well-cemented track. The famous Nanda Devi temple was situated above the village. After offering prayers, we followed a broad foot track to Belta Kharak and next day, to Lata Kharak. The trail zigzags up the steep slopes through beautiful forest. On top of the ridge, we came across a forest hut that had been built in 1995.

The footpath ends at Doni Dhar. A narrow trail led us to the Dharanshi pass, a name given by Shipton and Tilman. The map calls it *Barf kina dhar* (ridge of snow). Across the pass, one has to descend and traverse across the Satkulas (seven nalas). From the last nala one can descend to the lower Dharanshi camping ground. However, the present route climbs steeply up the last nala and traverses for 3 km to a higher plateau called Rani khola. Our third day's camp was established on this ground. Ahead, we had to cross the second famous pass, Malatoni⁵ (garland ridge). We reached the pass, which is under the Malatoni peak, after traversing a distance of 2 km. This was what the explorers had named 'the Curtain Ridge'. We saw Nanda Devi briefly from here. The trail descended more than 1000 m to an open green ground of Dibrugheta, named after god 'Dibru'.

By this time we had established camaraderie with the porters who were a friendly lot. I chatted with Dinesh, a local lad who was carrying a heavy load.

'I have appeared for my final school exams and am awaiting results. I thought I must see the Sanctuary about which elders have told me many stories'.

Ultimately, he wanted to be employed in the plains and undertake a government service. Most of the younger lot was educated and were carrying loads out of curiosity. When we paid wages, unlike in the past, all of them could sign their names, some of them in English. If involved in environment protection of the Sanctuary, this educated generation can surely bring a new life to the area. They appreciated the need for protection but pleaded helplessness to do anything in face of stronger forces.

From Dibrugheta, a steep climb through forest led to an open ground followed by a delicate traverse for 3 km. At the end of it, we descended a broad nala to the Rishi ganga river. There was no bridge so we constructed one with three aluminium ladders. Across the river we continued, after a camp at Deodi, on the trail with a steep climb through forest and an easy traverse of about 3 km to Shikari Udiar. This is a large cave where Shikaris used to stay. 'Used to stay' is perhaps the wrong word to use as we could observe that the trail and caves are well used in recent times. There were signs of poaching, cutting of trees and the area was far from 'closed' for so many years. Our porters also had many stories to tell.

The trail descended steeply to the Trisul nala, which we crossed by a natural rock bridge. Soon we were at Ramani, at the foot of the historic Rishi gorge. This gorge was the key to the exploration of the route to the inner sanctuary of Nanda Devi and it took many years for this riddle to be solved by early explorers.⁶

The Rishi Gorge

⁵ In early literature the pass is mentioned as 'Malathuni'. Malatoni is the correct spelling as on the present maps and used by the local villagers.

⁶ The history of exploration of the route to the Nanda Devi Sanctuary are covered in several books and articles. For a brief coverage see 'Story of the Nanda Devi Sanctuary' in *Meeting the Mountains* (by Harish Kapadia, Indus, New Delhi, 1998).

The trail climbed steeply, first through rhododendron bushes and then on rocky terrain. From some points, there were good views of the main peak. As the trail turned after a long traverse, suddenly we were at the foot of 'The Slab'. This is a slope of downward sloping rocks where we had to fix ropes. After negotiating it carefully we were at the traditional camping site of Bhujgara midway through the gorge.

The trail was now what locals called the '*Tel-mel bat*' (crooked trail). This ended in a pinnacle like feature, which was highly exposed. After a steep climb with fixed ropes, we were again at another famous point, 'Vaikunth Sidi' (Staircase to Heaven) which was dangerous and exposed. No wonder it is so named, for if you climb this you reach the heaven of Nanda Devi, if you fall you reach heaven anyway! Climbing the huge slopes over rocks and juniper we finally reached the top of the ridge; 'The Pisgah' (The Promised Land) and we were inside the famed Sanctuary. The campsite, Pataalkhan (Mine of slabs) was nearby.

In the Sanctuary

From Pataalkhan we had to cross an exposed slope, where we fixed a last piece of rope, for one slip can take you to the Rishi ganga. After a large rock fall area, we reached the vast plains of the Southern Sanctuary with excellent views of Nanda Devi. We decided to make our base here, next to a spring, from where different parties would visit various areas of the Sanctuary. This place was christened Chaubata (four paths) and a small temple was constructed and consecrated to mark our camp.⁷

From this base camp we had wonderful views of Nanda Devi but unfortunately the famed 'Golden Sunset', only for one evening. Soon everyone was busy in different activities in smaller sub-groups.

One of the first move was that Suman Dubey had to unfortunately leave next morning by helicopter as he developed high blood pressure. Two scientists, Dr. Sarfaraz and Anand Pendharkar, with a support team, made a camp ahead of Sarso Patal near the confluence of two glaciers; the Dakhini Nanda Devi glacier and the Dakhini Rishi glacier. They spent days collecting water samples, rock samples, observing bharals, birds and other fauna in the Sanctuary. Rupin Dang and his support team had filmed the entire route and the expedition on video and had undertaken many studies on the flora and fauna of the route. From Chaubata, they visited the Southern Sanctuary and higher slopes towards Nanda Dekhni Dhar before returning early on 16 June.

I stayed at Chaubata and organised the construction of a bridge across the Dakhini Rishi glacier so that we could visit the Northern Sanctuary. After great difficulties the bridge was made and team was about to cross over to visit Rishi Tal, a lovely lake in the Northern Sanctuary. However, due to the early arrival of monsoon, this plan had to be given up. The grand finale of our activities was two treks accomplished by Motup Chewang.

Sunderdhunga Khal (5550 m)

On 14 June, Motup with 2 Sherpas, Samgyal and Dukpu, left Chaubata and reached the Dakhini Rishi glacier where they camped at 4800 m. The next day, they traversed the upper slope, keeping above the glacier moraine and finally descending to cross the moraine. They climbed on the right of the glacier and camped on a small snow plateau at 5000 m. June 16 was partly cloudy and they started early, around 5.00 a.m. First they traversed under the slopes of peak 'Cream Roll', which is to the east of Sunderdhunga Col. The western

⁷ Chaubata (four paths): Four routes meet here: a. The route from the Rishi Gorge, b. route (via Sarso Patal) to the Nanda Devi Base Camp, Devtoli and Maiktoli base camp, Sunderdhunga khal in the Southern Sanctuary. c. Route to the North Sanctuary, across the Rishi Ganga river to Rishi Tal and all the peaks in the Northern Sanctuary and d. Route for climbing to the Nanda Dekhni Dhar which crosses into the Trisul nala. This trail was used by shepherds to cross into the Sanctuary.

slopes of Sunderdhunga Col⁸ are broken and avalanched regularly. They emerged a little above Sunderdhunga Col on the east and descended to the Col at 8.00 a.m. They saw a small clearing for camping on the south of the pass as well as an old cairn, possibly made in 1934.

After half an hour they returned and the descent was quick and they returned to Chaubata the same evening, tired but satisfied. This had been a strenuous outing but they had the satisfaction of clear views and being the first party in 67 years to reach the Sunderdhunga Col, after Shipton-Tilman in 1934.

We were poised to enter the Northern Sanctuary when persistent bad weather turned in to heavy rain. On 19 June, monsoon arrived in the area, a couple of weeks earlier than usual. The radio was issuing warnings. As we had to descend the dreaded Rishi gorge on return, it seemed wiser to call off the expedition and return to the Lata village. Very carefully, we re-crossed the difficult sections of the Rishi gorge and we crossed some of the high passes amidst heavy rain, which was a harrowing experience.

Nanda Dekhni Dhar

The rain did not stop our last exploration. Motup, Samgyal and our guide, Kalyan Singh, decided to return across the high col above Chaubata. This pass connects the inner Sanctuary with Trisul nala and was used by enterprising shepherds to bring the flock into the inner Sanctuary. They discovered several cairns erected by them during 1978 – 1982.⁹ By using this route shepherds could bring the herds into the inner sanctuary, which was one of the reasons why the area had to be closed.

They started from Chaubata on 19 June in rather uncertain weather. At first they traversed across 3-4 steep gullies to reach a small nala to Pataalkhan. They climbed up this nala and camped at 5000 m, having walked almost 7 hours that day. This camp was a little below the Nanda Dekhni Dhar. Views from this camp were vast and exquisite. Peaks of the North Sanctuary, Trisul nala, Dunagiri and distant peaks of Chaukhamba group were visible though Nanda Devi remained under cloud.

20 June was a brilliant day. First they descended a little to cross the slopes of the upper Bhujgara nala and finally reached the col and crossed over into the Trisul valley. The descent was steep, across gullies going south and traversing towards Tridang, the base camp of Trisul. They descended to 4400 m over a few grassy slopes but mostly rocky gullies. They found several cairns up to the lowest point they reached in the Trisul nala, indicating that this was the route used by the shepherds in the past. However on the lower slopes a large section had broken off and they tried traversing on a small ridge for almost four hours, trying to locate a route across the ridge. This would have allowed them to descend to the Trisul nala. However, finding no route, they had to climb back to the col and camp above the Bhujgara nala completing a long day of 12 hours. Next day they started to descend the Bhujgara nala and joined the traditional route through the Rishi gorge.

Their exertions were not in waste. With more time and clear weather, it will be possible to complete this route, from Tridang to Chaubata, by traversing diagonally across from Tridang which is traditional base camp for climbing Trisul. It offers the lower and probably, a less

⁸ In his book *Nanda Devi* Eric Shipton gives vivid details of reaching the Sunderdhunga Col. From the col they descended in the Sunderdhunga valley in the south, a most dangerous descent, which has not been repeated. I could not locate any photos of their route (in the above book or elsewhere) and no reference to any other party having reached this col after them.

⁹ The route was discovered by Umed Singh of Reni village. Unfortunately he passed away in 1999 and we could not talk to him about this pioneering effort.

difficult access to the Inner Sanctuary.¹⁰ A team can climb to the Nanda Dekhni Dhar to obtain excellent views of the Inner Sanctuary, without suffering the difficulties of the Rishi gorge or disturbing the Inner Sanctuary. This could be one of the environment friendly solutions for the future of the sanctuary.

The objective of our expedition was to study and make recommendations on the environment and ecology of the Sanctuary. All along the trail we discussed these issues as well as measures necessary to protect the fragile environment. These have been compiled in a detailed report and submitted to the Indian Mountaineering Foundation.¹¹

On one of the last evenings in the Sanctuary, we camped at Ramani, on the banks of the Rishi river. Alone in my tent, I could observe the Rishi ganga in spate. The river was rushing faster than the Rajdhani Express (the fastest train in India), roaring louder than any industrial unit and was powerful enough to generate many units of electricity. That sight itself was a *coupe de grace*. The power and divinity of even one river was enough to fight for and preserve it.

This power, I realised, was directly pitted against the power of the human mind. Is this where the conflict was? On the one hand the human mind wants to borrow beauty, peace and power from the Rishi and on the other, the same mind has led to the destruction of the mighty rivers and their environs. But then, an uncontrolled Rishi can also destroy everything in its wake. Maybe the power of the river and the power of the human mind are incomplete without each other. Where do we find the balance, that 'Golden Mean' to preserve this mighty river and the Nanda Devi Sanctuary, as well as feed the human desire to borrow from it by visiting such environs? Like in Fritjof Capra's philosophy, how do we achieve the 'Tao of Rishi'?

SUMMARY

A visit to the Nanda Devi Sanctuary in May-June 2001 by the team from the Indian Mountaineering Foundation to study the state of environment.

Members: Harish Kapadia (leader), Suman Dubey (deputy leader), Motup Chewang, Anand Pendharkar, Rupin Dang, Dr Sarfaraz Ahmad and Dr M. N. Sharama. Vinit Pangtey, a senior Forest officer accompanied the team.

¹⁰ Bill Aitken had crossed a direct route from Tridang to the base camp of Nanda Devi on the same ridge. According to him this was called 'Nanda Kharak Pass' and was also used by shepherds. See his book *The Nanda Devi Affair*.

¹¹ Almost 100 page report edited by Suman Dubey was prepared. It is available with the Indian Mountaineering Foundation, offering suggestions 'towards a management plan' for the Sanctuary. It is up to the authorities to decide finally about implementation of these ideas. One hopes they have the desire, will and resources to protect the Sanctuary.

Diwan Singh Padam Singh Butola

(95 years)

We met Diwan Singh Butola at Lata Village on 28 June 2001. He may be old, 95 years in age, but he was certainly alert and energetic. Diwan Singh has a place in the history of exploration of the Nanda Devi Sanctuary. Today he is possibly only person alive who was with the first exploratory team of Shipton and Tilman in 1934. With sense of humour, he narrated to us several experiences. He carried load for the 'two Britishers' (as he called Shipton and Tilman team) and stayed at various camps en route when Shipton and Tilman looked around for the routes. He reached Sarso Patal and returned with them as the monsoon arrived.

During the rainy period that indomitable pair of Shipton and Tilman explored another legendary route; from Badrinath to Kedarnath. They returned to Lata village to go back to the Sanctuary, where they had deposited food, to complete the exploration of the Sanctuary.

When they went into the Sanctuary again they did not take any locals as the plan was to descend across the Sunderdhunga Khal to the south. Amongst his companions with the 1934 team Diwan Singh remembers Ang Tharkey and his pony tail well. For his efforts in 1934 he was given Re. 1 Victoria Silver coin and a 'metered' Pressure Cooker. He sold both of these for Rs 500 and used the money for his own marriage, he added with a laughter. He has 3 daughters one is married in Lata, second in Kosa and last is in Fukti village. The first daughter is alive and looks after him.

He continued going with later teams to the Nanda Devi Sanctuary and other areas. In 1951 he went, possibly with Heinrich Harrar to Panch Chuli. He remembers the year, the area and two 'white sahibs'. They could not find a route across the main icefall and turned back. Same year later, 1951, he was with the French team which wanted to traverse the two peaks of Nanda Devi. The French killed too many bharals and birds en route to the base camp, which according to Diwan Singh was *Chhejan* a bad omen. The two summiters perished on the mountains. He remembers the various American expeditions too. 'Many Americans came looking for gold in the Sanctuary. They went in with huge boxes.' One of the boxes he carried. The death of Nanda Devi Unsoeld on the Nanda Devi mountain was attributed by him to be ordained. The Goddess was displeased.

The India-China war in 1962 had no effect in this area. He regularly travelled to Niti, Lapthal, Bara Hoti and Kungri Bingri la passes. He remembers meeting Tensing Norgay and his nephew, Nawang Gombu and many others.

We asked him whether he required any medicine. With a laughter he said, 'Can you give any water to dry wood? At this age no medicine will work on me'.

"Do you require anything, have any wish?" we asked again.

"Only thing remains is death, dying in the warmth of the great Himalaya where I have lived for full life". Yes had never been beyond Chamoli in the hills and have not seen the plains. The Himalaya and goddess Nanda Devi had given him everything he needed

EXPLANATION OF PLACES NAMES THE NANDA DEVI AREA

Betaru :A special fragrance comes from the plant of Betaru, when it is burnt as offering. This special plant is available near the base camp of Bethartoli Himal peaks. These peaks are named after this plant of Betaru.

Bhujgara: 'Bhuj'-birch, 'gara'-rock. The place between birch and rocks.

Changbang: 'Chang' – steep. 'Bang'- shining. A steep shining peak.

Chaubata: Chau-four, bata-routes. Meeting place of four routes.

Deo Damia: 'Deo'-god, damia- strength. God's Strength.

Deodi: Stony place.

Dharashi: called Barf kini Dhar – ridge of snow.

Dibrugheta : 'Dibru'- local god. 'Gheta'- maidan. Maidan of God Dibru.

Doni dhar: 'Doni' is a round rock by which the wheat is grounded into flour. Many such flat stones are available here.

Ghori Parvat: 'Ghori' - horse. Peak looks like a horse.

Hathi Parvat: 'Hathi' – elephant. The peak looks like an elephant.

Kalanka: Head of a cock.

Lata Kharak : 'kharak' - grazing ground. Grazing ground of Lata.

Lata: 'A kick': Based on a legend. Goddess Bhagwati wanted to get rid of a demon named Belu, who had terrorised the villagers in this area. If the demon was slain with a sword, his blood would have produced many other demons. So she killed the devil Belu by a kick, hence the name 'Lata' which means 'kicking'. The blood of the devil was collected by goddess Nanda Devi and hence a temple of Nanda Devi came into existence in Lata.

Maiktoli: 'Mai'-goddess, 'toli'- place. Place of Nanda Devi.

Malatoni: A garland of nalas around the valley.

Mrigthuni: 'Mrig' – a deer. The place of deer.

Nanda Ghunti: 'Ghunti'- veil. The veil of Nanda.

Patalkhan: Patal-slates, khan- mine. Named after slates available at this place.

Ramani: Ramani-noise made by cows when they are satisfied. Here river makes a noise like an animal, as it reaches out of the Rishi gorge.

Ranikhui : ‘The valley of Rani (queen)’, A stone gate is made near the camping ground of Rani Khola. During the Nana Jat pilgrimage, a goat had to pass through this gate and was let loose to reach Homkund. It is said that one part of Nanda Jat yatra passed from here in the older days. The goat went across the Ronti saddle to reach Rupkund and Homkund. The tradition is not followed in present days.

Rishi Tal: Lake of Rishi.

Ronti: ‘a circle’ . Peak is named because of its round walls.

Sarso Patal: One explanation is : ‘Sarso’-small insect. Patal- vast plains. A man appears like a small insect on this vast plain in the Southern Sanctuary. Or sarsar- noise of wind. ‘APlain where wind makes noise.’

Satkula : ‘seven nala’, which are to be crossed after the Dharashi pass.

Tilchunani: ‘Tilchu’- slate. A place of slates.

Quotation: As long as the rope is not removed from the load, body does not relax.
“Judu Kholike Thaki kum Lagine”

Chhino-Jhpto

A movement in the above name, literally meaning "Grab and Take away" was started in July-August 1998 by villagers of Lata.. This was a protest against the closer of the Sanctuary since 1982. The idea was to take over the grazing land and forcibly enter the reserve forest for grazing/cultivation and collection of medicinal herbs. When the Sanctuary was closed in 1992 the villagers were promised alternative grazing rights in the forest division of Badrinath section. Unfortunately, even after almost 20 years this was not done. Under the guidance of some NGOs from Dehra Dun and the local pradhan, (village headman) Dhan Singh Rana (who is a member of Communist Party of India - CPI) this movement was launched.

Many villagers gathered at Lata village and climbed up to Lata kharak, Dharashi and crossed into the core area at Dibrugehta wanting to camp in the forest reserve and the National park.. Villages of Lata, Tolma, Reni, Paing and Bhallagaon all gather at Dharansi camp via different routes and crossed into Dibrugheta which is the part of the core area of the Nanda Devi Sanctuary.

Many slogans were written on the rock walls and trees which are still visible. The intention was for 25 persons to stay at Dibrugheta in rotation. The Government in response sent the District Magistrate and when negotiations failed a contingent of Police Armed Constabulary (PAC) was sent. However, villagers could not be stopped. After about a month the protest fizzled out and villagers returned back from the prohibited area.

As we approached Lata for the present The Nanda Devi Sanctuary Expedition 2001, we faced trouble in light of the above. We were asked to pay Rs 5 as tax and obtain permit from the Pradhan of Lata Village. He had a printed book and receipt ready which stated that "this was payment receipt and Permit" to visit the Sanctuary. We refused to comply with his demand and were ready to turn back. The Pradhan was guided by a NGO representative, Sunil Kenthola who was present in the village and was seen guiding the Pradhan. Finally in view of earning portorage and payments from us Pradhan dropped his demands and porters agreed to work for us.

This troubles were brought to the notice of Honourable Minister of Tourism of Uttaranchal Government, Shri K S Fonia during our meeting with him.

Chipko

The original Chipko movement (literally 'hug the trees") was started from the village Reni which is at the entrance to the Sanctuary. Ms Gaura Devi of Reni started movement in 1976 . The villagers women embraced trees to prevent the forest

contractors from cutting it. This became a world famous idea. She was given a medal and some money. Later Sunderlal Bahuguna (Tehri Garhwal) and Chander Prasad Bhatt of Gopeshwar entered the movement and took charge of it. Ms Gaura died in 1996 and today Chipko movement is not active and forests are again being exploited.

Local Traditions

We could gathered much information about the local traditions in this part of Garhwal. People here are not traders and never traded with Tibet. They have been visiting the areas till Malari Village. They celebrate Baisakhi Mela when Goddess Nanda Devi is brought down to "Maika Room" (Mother's room) from the temple which is at top of the village. The celebrations lasts for 15 days. Ladoos (sweets) of phaphar are offered. Peacock made of wood is introduced a joker and paraded in the village. There are several dances like 'Gopichand' dance, 'Raja-Rani' dance that are performed. The villages believe in Nanda Devi, the female Goddess and not in Lord Badrinath a form of Vishnu. They celebrate Diwali, Dushera and Nanda Ashtami.

ROUTE DETAILS

<u>Date (2001)</u>	<u>Place/Height</u>	<u>+ m</u>	<u>- m</u>	<u>± m</u>	<u>K m</u>	<u>Hr s</u>	
28 May	Delhi	Flag Off	I	-	-	-	-
29 May	Rishikesh	Flag Off	II	-	-	-	--
30 May	Auli (acclimatisation)						
31	Auli						
June 1	Auli						
June 2	Lata (1950 m)						
June 3	Belta Kharak (2630 m)	680	-	680	6	4	
June 4	Lata Kharak (3720 m)	1090	-	1090	5	5	
June 5	Ranikhola (4320 m)	665	65	730	5	8	Crossed Dharashi pass (4385 m).
June 6	Dibrugheta (3250 m)	280	1200+15 0=1350	1630	6	5	Crossed Malatoni Pass (4400 m)
June 7	Deodi (3280 m)	1000	970	1970	5	6	
June 8	Rest	-	-	-	-	-	-
June 9	Ramani (3450 m)	600	430	1030	6	6	-
June 10	Bhujgara (4000 m)	550	-	550	5	4	-
June 11	Patakhana (4200 m)	200		-	20 0	4	5
June 12	Chaubata (4320 m)	120	-	120	4	3	
Totals For Approach		<u>5185</u>	<u>2815</u>	<u>8000</u>	<u>46</u>	<u>46</u>	
		RETURN					
June 19	Bhujgara (4000 m)	-	320	320	8	8	
June 20	Ramani (3450 m)	-	550	550	5	4	
June 21	Deodi (3280 m)	430	600	1030	6	5	
June 22	Deodi (3280 m)	100	100	200	2	2	
June 23	Dibrugehta (3400 m)	1120	1000	2120	6	5}	Crossed Malatoni pass (4400 m)
June 24	Ranikhola (4320 m)	1200	280	1480	5	5}	
June 25	Lata Kharak (3720 m)	65	665	730	5	6	crossed Dharashi pass (4385 m)
June 26	Lata Roadhead (1950 m)	-	1770	1770	11	5	
Totals for Return		<u>2915</u>	<u>5285</u>	<u>8200</u>	<u>48</u>	<u>40</u>	

ROUTE DETAILS OF THE NANDA DEVI SANCTUARY TRAIL

From Joshimath, Lata road head is 25 km away via Tapovan. The trek begins from this road head.

Day 1: Climb from the road to Lata village -2km on a cemented track. It was made in 1994. Famous Nanda Devi temple is at the top of the village. A broad, proper foot track leads to Belta Kharak. The first camp can be made here subject to availability of the water.

Day 2: The same proper foot track continues climbing to Lata Kharak in 6 km -a zig-zag up the steep slopes - through a beautiful forest. Here on top of the ridge, a forest hut has been built in 1995. It contains 4 simple rooms. About 100 m ahead here is a lovely camping site on a vast open ridge and water is available nearer to this site.

From Lata Kharak, a foot trek leads to the south to an open ground known as Saini Kharak. The trail ahead descends to Paing village, 5km. Reni is further 3 km away of the Rishi Ganga. Saini Kharak can be used for camping to reach the Lata peak, 4 km with many ups and downs. On top of the Lata peak there is a huge cairn ("binayki"). Lata peak offers exclusive views of Rishi Gorge, Nanda Devi Peak and southern area. Lata peak was first visited by Shipton and Tilman and it was from here that they observed the riddle of the Rishi Gorge.

Day 3 : The main trail ends at Doni Dhar. From here on a small foot trail is available. First it crosses Falanga (rocky place). On *Nanda Ashatami* many Brahma kamals are collected from Falanga. Ahead is "Jhandi dhar" from where a route leads down to Tolma village - 5 km, with a camp at Himtoli (3 km above village Tolma). The trail continues to Ghimgain Gair (water noise), and climbs Chancha and Barf kina dhar. This is what is known as Dharanshi pass, which was reached by Shipton and Tilman. From the pass one has to descend and climb seven nalas called Satkulas. From the last nala one can descend to lower Dharanshi camping ground. However, the present route climbs steeply up the last nala and traverse for 3 km to a higher plateau called Ranikhola. A camp is established at this higher ground..

Day 4: A trail continues to Jogi Udiyar (a place of jogi- a hermit). It passes through narrow rocky gate which as per the legend is called with Ranikhui. (See Explanation of names) In 2

km Donidhar is reached which is under the Malatoni peak (from here you can bifurcate from the main trail and climb up to , Daka Kharak, 'a place of rocks'). The main trail descends more than 1000 m to an open green ground called Dibruggheta. You can camp in the side nala.

Day 5: From Dibruggheta a steep climb through forest ('langhur' meaning long) leads to an open ground. A delicate traverse for 3 km continues till a vast dry nala is reached. Descend this nala steeply to the Rishi river which is to be crossed on a bridge. A camp is made immediately after the crossing in forest of Deodi.

Day 6: Again a steep climb through forest leads half way up the slopes. An easy traverse of about 3 km leads to Shikari udiair. Shikaris used to stay in this cave. Trail descends steeply to reach Trisul nala which is crossed on a natural rock bridge. (A trail bifurcates from Shikari udiair towards Tridang, base camp of Trisul). A brief climb and steep descent leads to Ramani which is at foot of the Rishi gorge. A camp is made next to the river where only few tents can be accommodated.

RISHI GORGE

Day 7: Trail climbs above a rocky feature seen from Ramani. Trail is through rhododendrons. Cross a nala and again climb steeply over vegetation to Tali, where 3-4 cairns are made. Excellent view of the Nanda Devi is obtained from here. Continue traversing with many ups and downs of rocks towards a major nala. Descend under a huge rock to traverse ahead. As you turn suddenly you are at the foot of 'The Slab'. These are downward-sloping rocks where ropes are to be fixed for safety. After the slabs you cross several small nalas with a rocky terrain. There are several places where rope is to be fixed. Finally at the end of a juniper slope is a major nala flowing from Nanda Dakhni dhar. This is the traditional camping site of Bhujgara where a small camp site is available here.

Day 8: The trail crosses the nala next to the camp over fixed ropes and passes under a huge cave. Climbing up and up all the time it traverses sometimes steep and exposed ground. This is called 'Tel-mel bat' which ends in a pinnacle like feature, which is highly exposed. After the climb of this pinnacle trail climbs rather steeply for 300 m to reach foot of huge rock cliff. A traverse is made across a narrow ledge till nala is met. Before entering the nala a rocky staircase, which is highly exposed, leads you up into this vast nala. This is called 'Vaikunth Sidi' ('Staircase to heaven') which is dangerous and exposed. Much rope is

fixed from here onwards trail crosses the nala and climbs steeply on the slopes in the east. Climbing up the huge slopes over rocks and juniper you reach the top of the ridge which is named as 'The Pisgah' ('the Promised Land'). The camping site of Pataalkhan is nearby.

Day 9: From Pataalkhan a slope of slate rocks is to be crossed, which is exposed. One slip can take you to the Rishi Ganga. A rope is to be fixed here. Then several slopes are crossed with debris of rocks. There are many ups and downs. No sooner the rock fall area is over the vast slopes of Southern Sanctuary are reached. One has excellent closer views of the main Nanda Devi peak. This place was christened as Chaubata ('four paths') and a small temple was constructed our IMF team in 2001. Four routes meet here:

- (a) The route from the Rishi Gorge.
- (b) Route (via Sarso Patal) to the Nanda Devi Base Camp, Devtoli and Maiktoli base camp, Sunderdhunga khal etc. in the Southern Sanctuary.
- (c) Route to the North Sanctuary, across the Rishi Ganga river to Rishi Tal and all the peaks in the Northern Sanctuary.
- (d) Route climbing to the Nanda Dekhni Dhar which crosses into the Trisul nala. This trail was used by shepherds to cross into the Sanctuary.

Day 10: Sarso Patal is 4 km ahead and is a simple flat walk. A helipad is constructed here.

Day 11: From Sarso Patal the Nanda Devi base camp is on South of Nanda Devi Glacier about 5 km ahead and the base camp for Devtoli and Maiktoli is on the South Rishi Glacier also 5 km.

SUNDERDHUNGA KHAL (5550 m)

(Members Motup Chewang, Samgyal Sherpa, Dukpu Sherpa)

On 14 June they left Chaubata 9.40 a.m. and reached a camp site on the Dakhini Rishi Glacier at 4800 m. On 15 June they traversed the upper slope keeping above the glacier moraine and finally descended to cross the moraine. They climbed on the right side of the glacier and camped on a small snow plateau at 5000 m.

16 June: They started early. They climbed under the peak 'Cream Roll', east of the Sunderdhunga Col. The western slope of Sunderdhunga Col are broken and avalanched regularly. Having started at 5.00 a.m they reached little above Sunderdhunga Col on the east and descended to the col at 8.00 a.m. A small clearing for camping was seen on the south of the pass and a old cairn was visible too -- possibly made in 1934. They started the decent at 9.00 a.m. and followed the same route. Camp was reached at 10.45 a.m. Starting from this camp at 12.30 p.m. they reached the base camp at 6.30.p.m. They opined that return via the right hand moraine of the Dakhini Rishi glacier was a better route.

NANDA DEKHNI DHAR

(Members Motup Chewang, Kalyan Singh and Samgyal Sherpa) .

19th June: The party left Chaubata at 7.30 a.m. in uncertain weather. At first they traversed across 3-4 steep gullies to reach a small nala which was draining to Patalkhan. They climbed up this nala and camped at 2 p.m. at 5000 m. This camp was little below the Nanda Dekhini Dhar. From this camp in the evening and the next morning they could obtain wonderful clear views of the peaks of the North Sanctuary, peaks of the Trisul nala, Dunagiri and distant peaks of Chaukhamba group..

20th June: They left in a brilliant weather at 7.00 a.m. First they had to descend cross the slope of the upper Bhujgara Nala and climb to a Col at 9.00 a.m. They crossed over into Trisul valley and descended steeply across gullies going south towards Tridang. They descended till 4400 m. Last 2 gullies were had some grass slopes while the rest were rocky. Cairns were found till the lowest point they reached indicating that this was the route used by the shepherds in the past. However ahead a large section of slope had broken off. They tried traversing on a small ridge for almost 4 hours, trying to locate a route across the ridge. This would have allowed them to descend to the Trisul Nala. However as no route was found they had to climb back to the Col and camp above Bhujgara Nala at 7 p.m. A long day of 12 hours.

21st June: They started to descend the Bhujgara Nala at 7 a.m. and reached Bhujgara at 9.00 a.m, joining the traditional route through the Rishi Gorge. They reached Ramani on at 11.00 and joined the main party at Deodi in the evening.

With some more time it is possible to complete this route, from Tridang to Chaubata. It offers the lowest and possible less difficult access to the Inner Sanctuary. A party can climb to the Nanda Dekhni Dhar to obtain excellent views of the Inner sanctuary, without suffering the difficulties of the Rishi Gorge or disturbing the Inner sanctuary.

This route across the Nanda Dekhni Dhar was pioneered by Umed Singh of Paing village. He carried goats from Trisul Nala to Chaubata between 1978-82, till the Sanctuary was closed. Shri Umed Singh died on February 2001. There is possibility of other high passes on this ridge: between Tridang to Sarso patal. One known pass is called Nanda Kharak pass. It was crossed by Bill Aitken as described in his book *The Nanda Devi Affair*.

AVERAGES / TOTALS

Km walked per day	5.25 km		Total days	30
+ m per day (Meters climbed)	485 m	1590 ft	Rest days	1
-m per day (meters descended)	450 m	1475 ft	Travel days	5
+_ per day (meters up and down)	900 m	2950 ft	Mountain days	10 to BC, 8 return : Total 18 days
<u>Average Hours Walked per day</u>	5 hours		Approach Days	10
			Return Days	8
			BC Days	6
+ m per km	92	302 ft	Total kms walked	94
- m per km	85	280 ft	Total +m	8730=28,6 40 ft
+_ m per km	171	561 ft	Total -m	8100=26,5 75 ft
Hours per km	1.10 hours		Total +-m	16,200=53 ,150 ft
			Total Hours walked	86 hours
			Total passes crossed	Two X twice
			Highest camp	4320 m (Dharashi + Chaubata)
			Highest point	4320 m

reached

Highest + m in day 1200 to Ranikhola from Dibrugheta

Highest -m in day 1770 m to Lata from Lata Kharak

Highest +__in day 2120 m Deodi to Dibrugheta

Highest kms in day 11 km from Lata Kharak to Lata

Highest hours in day 8 hrs to Ranikhola & Bhujgara on return.

Subject: Nanda Devi affair
Date: 28 Jul 2001 09:54:19 -0000
From: "Dhan Singh Rana" <tharwa@rediffmail.com>
To: harish.kapadia@gems.vsnl.net.in <harish.kapadia@gems.vsnl.net.in>
CC: indmount@vsnl.com <indmount@vsnl.com>

Mr. Harsih Kapadia,
Team Leader,
Nanda Devi Study Expedition 2001,
C/O Indian Mountaineering Foundation
New Delhi

Dear Kapadia Ji,

Nameshkar!!

Greetings from the Land of Chipko!

Hope everything is fine there. We are trying to publish a book on our struggles. We request you to send a copy of your report to Gram Sabha Lata also.

Also I wish to inform you that all the Gram Sabhas of Nanda Devi Buffer Zone are planing to organize a workshop on community based eco-tourism in the Niti Valley, we may need your inputs in this process.

After your departure it was brought to our notice that one of your team member Mr. Rupin Daang, took the skull and horns of Bharal from Sarchu Patal. He also collected the rare medicinal plants like Thuneer from Dubbal Gahti. As you know that Thuneer is an endangered species as it is used to produce anti-cancer medicines. We consider this a criminal act.

Kindly take appropriate action and inform the concerned authorities about this offence. Since you were the team leader and the offence was committed inside the core zone it is basically your responsibility to lodge the FIR.
Hope you will understand the problems of local communities who are fighting against the anti people conservation policies and cooperate accordingly.

This comes from the Land of Chipko Movement.

Humbly yours

Dhan Singh Rana
Pradhan,
Gram Sabha Lata,
Joshimath, District Chamoli
Uttaraakhand.

Subject: Nanda Devi, Community participation vs vested interests.Kind Attn: Mr. Kapadia!
 Date: Mon, 30 Jul 2001 18:42:43 +0000
 From: "Dhan Singh Rana" <nanda_putra@hotmail.com>
 To: indmount@vsnl.com

Respected Kapadia Ji and Suman Dubey Ji,

Nameste!

This is in continuation to my earlier email regarding activities of Mr. Rupin Daang, one of your team member. Attached herewith is my voice message in reference to the slide show program of Messers Wilderness Films at India Habitat Center.

As an elected representative of the panchayati raj institution, it is my duty to safe guard the interests of my people. (Ref: Powers of Panchayati Raj Institutions under 73rd and 74th constitutional amendment of INDIA).

This comes from the land of CHIPKO !

Humbly

Dhan Singh Rana
 Gram Pradhan
 Village LATA
 Dist. Chamoli, Uttaraakhand

Proof Below:

Wilderness Films India Ltd is organizing a special screening of our two new releases, "A Shivalik Monsoon" and "Heli-Skiing in the Himalaya". The screenings will be held in collaboration with the India Habitat Center, New Delhi, at 7 pm, on the 31st of July, 2001, in the main auditorium.

In addition to the two films, Rupin Dang will be making the first public presentation of his slides from a recent expedition to the Nanda Devi Sanctuary, as part of an Indian Mountaineering Foundation ecological expedition in May-June 2001. The much-sought-after Nanda Devi area is a Sanctuary, National Park, Biosphere Reserve and a World Heritage Site. It has been closed off to tourism and human activity since 1982. This expedition was an attempt to scientifically quantify

the extent of ecological and other changes that have taken place in the sanctuary since its closure, with a view to possibly allowing limited access to certain types of visitors, in the future. These slides are a unique record from a greatly inaccessible region, where no scientists or other visitors have been allowed for nearly two decades, and show the region in all its pre-monsoon splendour. Be a part of this unique experience!

We would like to invite you for the screenings and the slide presentation, and hope to see you there.

Please do contact us for any further details.

With good wishes,
Sincerely,

Kadambari Mainkar
Operations, Wilderness Films India Ltd.
6163766, 6198954, 6198255

Get your FREE download of MSN Explorer at <http://explorer.msn.com/intl.asp>

Part 1.2

Name:

Nanda_Putra.zip

Type:

Zip Compressed Data (application/x-zip-compressed)

GEOLOGICAL REPORT

Using the Geomorphological evidence and Remote Sensing technique for determining the Retreat rate of Glaciers in The Nanda Devi Biosphere Reserve, Garhwal Himalaya, Uttarakhand, India

Sarfraz Ahmad and Syed Iqbal Hasnain

Glacier Research Group
School of Environmental Sciences
Jawaharlal Nehru University
New Delhi 1967



Introduction

Nanda Devi Biosphere Reserve is one of the major glacier field in Garhwal Himalaya, which feed to river Rishi Ganga (a major tributary of the River Dhaul Ganga). Dhaul Ganga furthers confluence with Alaknanda at Vishnu Prayag in the vicinity of Joshimath. The catchment of the snow fed river like Alaknanda, Dhaul, and Bhagirathi river forms the major part of Ganga headwater and supplies the water in river Ganga and controls hydrology of the North India. The 70-80 % of water in the rivers like Upland tributaries of Ganga, Brahmaputra Sutlej supplied by these snow and ice melting in higher Himalayan, which make these big rivers perennial in nature. But in present scenario of global warming and increased pollution level in the environment has threatened the sustainability of the high altitude Mountain and lowland across the world. The impact of global warming is already evident in the form of glacier retreat, sea level rise in various part of the world. Recent trend of increasing green house gases in the atmosphere raised the atmospheric temperature exponentially since last fifty years, the increase in ambient temperature has resulted in glacier retreat and wasting of snow and ice field in the higher altitude of Himalayas. Retreat of the Himalayan glaciers linked to decrease in precipitation since 1940 (Dahe, 2000) and rise in summer air temperature on these summer accumulation type glaciers has negative effect on mass balance

(Ageta and Katoda, 1992). The proportion increased in rain by the temperature rises and snows accumulation decrease surface albedo decreased by the snowfall and ablation increase. Meltwater runoff from glacier's basin in Garhwal Himalaya is a valuable water resource for the countries sharing Himalayan Mountain system. Hence it is important to understand the effect of climate change on variability of change in the glaciers morphology and area in future. The aim of the present research to identify the change in glaciers geomorphology and retreat rate since last forty years in one of the pristine catchment of the world.

Area of study

Nanda Devi Biosphere Reserve ($30^{\circ} 17' - 30^{\circ} 41' N$ and $79^{\circ} 40' - 80^{\circ} 5'$), located in the state of Uttaranchal, India consist of core zone (625 km^2 area) surrounded by buffer zone 1612 km^2 Fig. 1. Nanda Devi Basin enjoys a distinctive climatic condition. Climate is generally dry with low annual precipitation. Prevailing mist and low cloud during the monsoon keeps the soil moist, hence the vegetation than is usually characteristic of drier inner Himalayan valleys. The upper parts of the basin experience the alpine type climate alongwith monsoonal influence in June- September. Snow being deeper at lower altitudes on the southern side than the northern (Lavkumar, 1979; Lamba, 1987). At 2300m altitude village



Reni average annual rainfall (1994-96) data is about 900mm. Mean monthly minimum and maximum temperature area $3-7^{\circ} C$ and $14-24^{\circ} C$ respectively.

The catchment area of the Rishi Ganga, an eastern tributary of Dhaulti Ganga which flows into the Alaknanda River at Joshimath. The area is a vast glacial basin, divided by a series of parallel, north-south oriented ridges. This area is occupied by numerous glaciers, viz. North Rishi glacier, North Nanda Devi glacier (7434m), South rishi glacier, South Nanda Devi glacier, Dunagiri glacier, Ramni glacier, Trisul (7045m), Bhathartoli (6352m), Raunt, Nanda Gungti, Changbang (6864m) and Hanuman bank (6070m). This is one of the represented area show various kind of Glico-fluvial type of geomorphological features. The Glico-fluvial system covers a wide spectrum of features

in combinations with valley and hanging glaciers on different rock types. The area falls within the Central Crystalline of Tertiary age and higher northern part in Tibetan-Tethys sediments of Precambrian age. Rock types are mainly consisting of sediments of sandstone, micaceous quartzite, limestone and shales (Kumar and Sah, 1986; Maruo, 1979). The Tethys sediments form Nanda Devi itself and many of the surrounding



peaks, and display spectacular folding and thrusting, while mountains like Changbang are granite. Large part of the area at lower altitude is covered by the mountain type of soil with loam to sandy loam and very from well drained to excessively drained.

Agriculture, forest, alpine meadows, wasteland (areas extremely poor vegetation and soil) and permanent snow account for 0.7%, 22.2%, 4.5%, 6.6% and 6.6% respectively of reserve area (Sahai and Kimothi, 1996). About 600 plant species, 18 mammal and 200 bird species are reported from the Reserve (Rodger and Panwar, 1988; Mohan, 1993). Forests are restricted largely to the Rishi Gorge and are dominated by fir *Abies pindrow*, rhododendron *Rhododendron campanulatum* and birch *Betula utilis* up to about 3,350m. Forming a broad belt between these and the alpine meadows is birch forest, with an understorey of rhododendron. Conditions are drier within the 'Inner Sanctuary', becoming almost xeric up the main Nanda Devi glaciers. Beyond Ramani, the vegetation switches from forest to dry alpine communities, with scrub juniper *Junipers pseudosabina* becoming the dominant cover within the 'Inner Sanctuary'. Juniper gives way altitudinally to grasses, prone mosses and lichens, and on riverine soils to annual herbs and dwarf willow *Salix* spp. Woody vegetation extends along the sides of the main glaciers before changing gradually to squat alpine and lichens (Lavkumar, 1979; Reed, 1979; Hajra, 1983a).

Methods

For detecting the ariel coverage change, and the geomorphological changes for the glaciers in the study area the Topographic Map sheet (53N/15) surveyed in 1960 and Aster Image (Earth Observatory System, (EOS) a

NASA funded program were analyzed. Aster (Advance Spaceborne Thermal Emission Reflection Radiometer) Images of the area were obtained from the GLIMS Program (Global Land and Ice Mapping from Space) coordinated by USGS (United State Geological Survey). The IB level of remote sensing data obtained from Aster instrument was already radiometric and geometric corrected and visualized by using Webwind software. The ground truths were established on imagery and digitized the present boundary of the glaciers in the study area. During the field trip in the study area the position of present snout and other different glacial features has been marked on the Toposheet. A vector images of the glaciers boundaries according to Aster image and Topographic sheet surveyed in 1960 in the study area have been prepared using AutoCAD Map 2000. The change detection in the area and retreat for



the glaciers has been calculated by overlapping of the two vector images.

Results and Discussion

Most of the Himalayan glacier shows the general trend of retreating, but in case of few of them, advancing has also been observed. It is due coarse of consistent under global warming, the rate of Himalayan glaciers vary with location and aspect of valley and type of climate. The Himalayan glacier are surging type that are capable of causing floods, slides and avalanches, in the process their

recession may get accelerated. In present study area the glacier are summer accumulative type and sensitive to increase in ambient atmospheric temperature (Hasnain et al., 2001). The high mountain encircles the core zone of the catchment, so it enjoys the typical type of its own microclimatic condition and lesser affect of meso-scale climatology. Ablation zone of the glaciers in the study area

is covered by the thick debris cover. The surface debris is very uneven with mounded depression, which protect the melting processes by cutting the direct input of solar radiation and washing affect of monsoonal rainfall.

In Toposheet surveyed in 1960, snout of the South Nanda Devi and South Rishi Glacier are seeing as single snout for both glaciers at the altitude of 4450m.s.l, their lengths were about 10 and 15km respectively. The main glacial stream in South Sanctuary was emerged out from South Nanda Devi glacier. But in the present day there are two distinct glacier stream are emerging South Nanda Devi glacier and South Nanda Devi glacier respectively. Since, last forty years the snout of the South Nanda Devi has been retreat 1710 m and the recession rate is 42 meter per year (Fig.1). Near to South Nanda Devi The South Rishi glacier retreated about 1740 and the recession rate is about 44 m per year and snow line region has risen about 150-200 meter upword (Fig. 1). Another glacier in the basin is twin glacier form by the North Rishi glacier and North Nanda Devi Glacier, the snout of this glacier was at elevation of 4100 msl in 1960. However the snout of the present glacier is about 4230 msl and has been retreated about 1310 meter since in last 40 years, the rate of glacier recession is 32 meter per year (Fig.

2). One of the largest glacier in the region Trisul, the altitude range of the glacier is (4210 –6855m), it is one tongue type simple glacier. The snout of the glacier was at 4200msl in the 1960, while in the present field trip the new



location of the snout has been observed about at elevation of 4480msl along with retreat of the about 1160m and the rate of recession is about 28meter per year (Fig. 3). The change in Ariel coverage of the glaciers in the region is also calculated by remote sensing technique, the snow and ice field in the region has been reduce about 10-12% in last 40 years. In process of glacier retreat in the area the shape of the snout also has been changed from the tongue shape to half widen cusps. It show moderate glacier retreat in the region.

All the above observation related to change in the site of the glacier snout location and change in ariel coverage of snow and ice, it may be stated that the snow line in this area had been risen, when the snout began retreating. Recession of the snout is common to most of the glaciers in the Himalayan region, but such retreat is irregular in amount, rate and time of occurrence (Bhadur and Naithani, 1999). This may partly be attributed to the large annual fluctuation in the snowfall. As precipitation was dropped glacier and ice mass cover began to retreat, as the frozen ground began to absorb more solar radiation and directly effect to the thickness of the terminal ice cover in ablation area and retreating of the glacier in higher elevation. The comparative results with other glaciers in the region show that the glacier in

study area are retreating in same way as in other part of the Garhwal Himalaya (Table.1).

Table 1. Retreat of the some Himalayan Glaciers.

Glacier	Period	Retreat
Pindari	1845-1966	2840m
Milam	1849-1957	1350m



Gangotri	1935-1976	600m
Dokriani	1980-2000	4000m

Recommendation

The rate of the glaciers retreats in the region are comparable to other parts of the Himalayan rather less sensitive to global warming due to its own typical encircled physiography of the catchment, which protect it from the Meso-scale climatological activity. The glaciers are of medium size 15-20 km in length and having the capacity to regaining the any damages in the morphology because of heavy monsoonal rainfall and winter snowfall and nourishes to glacier quit well. The health of the glaciers in the region is governed by the amount of precipitation and atmospheric temperature not by the loacal trekking etc. because the size of the glacier is quit large.

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THE NANDA DEVI SANCTUARY EXPEDITION, 2001

SUMMARY OF ACCOUNTS

Expense	Amount	Total Amount
Transport		61,920
Travel Expenses:		
Food	6,178	
Stay	6,201	
Total travel expenses	12,379	12,379
Food		72,728
Equipment		12,012
Medical		3,259
Porterage:		
General (Local Porters)	2,87,239	
Permenat Staff (Kitchen etc)	33,000	
Sherpas	15,000	
Film Crew Porters	23,625	
Total Porterage	3,58,864	3,58,864
Miscellaneous		16,472
Postage		4,894
Photographs		3,385
Total Expedition Expenses		5,45,913

Financial Summary

Total Amount Sanctioned/Budgeted for the expedition by IMF	6,00,000
Total Expedition Expenses	5,45,913
Balance Saved from Budget	54,087

Amount retained by IMF during the initial payment to the expedition	50,000	
Net Balance payable to IMF	4,087	
Net Refunded by Bank Draft on 6th August 2001	4,087	Bank Draft (Rupees Four Thousand and eighty seven only) of S B I, Carmichael Rd. Branch, Mumbai, dated 6th August 2001 for the amount enclosed. No. 564661