REPORT AND RECOMMENDATIONS OF THE NANDA DEVI SANCTUARY EXPEDITION 2001

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Letter of Transmittal

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1st August 2001

Shri N. N. Vohra,
President,
Indian Mountaineering Foundation,
New Delhi 110 021

Dear Shri Vohra,

I am pleased to send you the Report and Recommendations of the Nanda Devi Sanctuary Expedition, 2001, sponsored by the IMF.

This is a comprehensive work to which all members have contributed in one way or other. The individual reports of the scientists are clearly indicated and reflect their special knowledge and skill. Shri Suman Dubey did the drafting of the report, but it is essentially a collective effort, and I am grateful to all members for the contribution that they have made.

In forwarding this to you, I cannot emphasis sufficiently that a lot more work needs to be done, especially by ecologists, to create a scientific base line for the Nanda Devi area, particularly the Sanctuaries, both outer and inner. Nor can I emphasise the need for caution in proceeding with any opening up to visitors, however limited. We as a nation face problems of efficient implementation, and it is far too easy to give in to popular and strident demands. Nanda Devi is a national treasure, and deserves to be venerated as such. Strict access control, strict implementation of policies and above all a respect for the needs of Nature in conjunction with, if not over, the needs of Man may enable us to respect and enjoy this treasure in our lifetimes and bequeath it, protected and pristine, to future generations.

All of us on the team are grateful for the opportunity that we were given to participate in this expedition. We are indebted for your support, interest and initiative that made all this possible.

I hope that we have fulfilled your expectations, and if there are shortcomings, I hope you will view them against the complexity and magnitude of the task of making a thorough and appropriate assessment of the Nanda Devi region within the limitations of time and resources.

With regards,

Yours sincerely,

(Harish Kapadia)

2. Executive Summary

- The IMF organized the Nanda Devi Sanctuary Expedition to assess the effects of almost two decades of closure and see if visitors should once again be permitted to go into the Nanda Devi National Park to climb or trek.
- The Expedition between 27th May and 29th June visited the Inner Sanctuary, reached the Sundardhunga Col and the ridge between the Dakhini Sanctuary and the Trisul Nala. Scientific observations were made.
- The Nanda Devi National Park was created in 1982 following reports of environmental degradation on a large scale. This resulted from the sudden opening of the Rishi Ganga gorge and Sanctuary to large numbers of expeditions after the Inner Line restrictions were removed.
- The creation of the Park led to a ban on visitors, though there is some evidence of illegal entry since then.
- The route to the Sanctuary appears to be well used and is in good condition.
- The natural habitat is in good condition, with all round evidence of regeneration.
- A base-line scientific survey of flora and fauna should be conducted cutting across the seasons and over the entire National Park area to the extent possible to provide basis for periodic assessments in the future.
- The core area of the National Park be redefined to permit access to the Nanda Devi main and east summits, the Trisul Nala and select peaks in the Northern Sanctuary , as well as the traditional route along the Rishi Ganga.
- A strict limit be placed on the number of expeditions, their constitution (defined to include both climbers/trekkers and porters), the duration of their visits, the phasing of their visits and their destinations.
- All visitors to the area now comprising the National Park should be charged a fee over and above the IMF's mountain fees sufficient to help keep numbers down to pre-determined levels. A share of this fee should be earmarked for development activities in villages adversely affected by the closure 20 years ago.
- This programme should be introduced in a phased manner, starting next year, after the necessary amendments to laws and regulations. It should be reviewed periodically to ensure that expeditions are causing no harm.
- The strictest regulations governing conservation, including all regulations pertaining to National Parks, be applied to all visitors and local populations.
- The involvement of local populations be considered vital to the success of this venture, and their participation be upgraded as far as possible from simply providing porterage to becoming organizers and perhaps even guides and liaison officers if they meet the requirements.

3. Introduction

The Indian Mountaineering Foundation organised a multi-disciplinary expedition to the Nanda Devi Sanctuary in the summer of 2001, from 27th May to 30th June. The team, consisting of three trekkers and mountaineers and three scientists, visited the Sanctuary for over a week. A medical doctor and a senior forest officer of the Uttaranchal Government accompanied the team. The expedition trekked from Lata village by the traditional route over the Dharanshi pass through the Rishi Ganga gorge into the inner Sanctuary, and visited three separate points. Various aspects of the Sanctuary, which has been closed to visitors (with some notable exceptions) for almost for 20 years, were studied.

Origins:

Shri N. N. Vohra, President, the Indian Mountaineering Foundation, was instrumental in conceptualizing the expedition. It was brought to the notice of the IMF that two parties had visited the Nanda Devi Sanctuary in the year 2000, and there were sundry reports of illegal entry and poaching. Moreover the newly formed state of Uttaranchal has expressed its keenness to study the possibility of opening the area to mountain and adventure tourism.

Shri Vohra organised a meeting with the Chief Secretary and senior officials from the Uttaranchal Government and the Ministry of Environment and Forests, Government of India, along with independent experts on 7th April where his proposal to send the expedition this summer was approved by the relevant authorities and the necessary permissions obtained.

The expedition was required to study the following aspects:

(a) Whether any further destruction has taken place since closure of the Sanctuary.
(b) Whether the total closure has been beneficial to the natural endowment of the area.
(c) Whether the closure has been total or there is evidence of violation and encroachment.
(d) Whether the Sanctuary's fragile environment is now strong enough to allow limited trekking and climbing activity.
(e) In the event of a recommendation to permit entry into Sanctuary, prepare the outlines of a comprehensive Management Plan along with recommendations.

1. Report on Expedition Activities

The expedition gathered in Delhi on 27th May 2001 and was flagged off at IMF Headquarters by Shri Matbar Singh Kandari, the Forest Minister, Uttaranchal State Government. The team traveled to Rishikesh where the Chief Minister of Uttaranchal, Shri Nityanand Swami, gave his good wishes and, again, ceremonially flagged it off.

We reached Auli, the ski resort on the slopes above Joshimath, on 30th May and spent three days on acclimatisation. Porters were arranged after long negotiations with three village pradhans. Finally a rate of Rs. 175 per day per head plus food was agreed upon, working out to around Rs. 200 per day in all. We reached the village of Lata[1] on 2nd June, about 25 kms. upstream on the Dhauli Ganga.

Problems:

As the expedition was ready to move awaiting porters, the pradhan of Lata village came with a paper resolution and a printed receipt book and said that members going into the Nanda Devi Sanctuary had to obtain a "permit" from the pradhan of the Lata Village and pay Rs. 5 per day per person as entry fee. This was not agreed to by the expedition since it was entirely arbitrary and not sanctioned by any laws or regulations. After long arguments, the porters went on strike and refused to carry for the expedition. They appeared to be guided by one NGO and its representative who was present nearby. After some time, the pradhan and porters returned, possibly aware that we were not going to yield, and lured by the money they were to earn. All future expeditions and trekking teams should be advised that no such permits and payment are necessary to visit Nanda Devi Sanctuary or any other region, for that matter[2]. The State Government may also like to take remedial action to prevent harrassment of authorised visitors.

Trek:

Delayed by this episode, we began our trek on the afternoon of 3rd June and climbed up to Belta Kharak. A steep climb led to Lata Kharak on the 4th and we camped on a beautiful ridge close to a grove of Rhododendron *Campanulatum*. On 5th June we continued the steep ascent and finally crossed the Dharanshi Pass (4252m), the entrance to the Nanda Devi National Park. There were spectacular views of Devistan, Bethartoli Himal, Trisul, Ronti, Nanda Ghunti and Hathi Parvat obtained en route. Crossing the notorious *Satkula* gullies, we camped at Ranikhola at 4250m, which is above the Dharanshi pastures on the old route.

On 6th June the second pass, Malathuni (4250m) also known as the 'Curtain Ridge', was crossed and we descended steeply to Dibrugheta (3475m). The campsite, in a small forest cleaning, is well established and the trees are scarred by carved graffiti announcing the presence of past expeditions. The next day started with a climb of almost 400m to reach the top of a heavily forested ridge. A very delicate and difficult traverse followed high above the river and led to a nala descending steeply to the Rishi Ganga where a large rock in the middle of the river made it possible to cross over to the far bank. Some fine work by Motup Chewang and our two Sherpas, Samgyal and Dhukpu, resulted, after a couple of hours in the construction of a fragile but usable bridge made up of three aluminum ladders with rope support. Two persons had been asked to reach the opposite bank from village of Reni, traversing steep rock and forest

[1] Please see Appendix B for place names and route, and Appendix F for Explanation of Place Names
[2] Please see Appendix E for details

slopes. They helped tie the ropes on the other side. The whole operation took the better part of the whole day, and on 8th June we took rest day at Deodi (3354m).

On the 9th the trek began again with steep climb of about 300 m and after a long traverse we descended into the Trisul nala. A natural rock bridge allowed us to cross to the other side and after a long walk in dense forest we reached the Ramani camp site (3520m). Ramani is at the start of difficult part of the Rishi Ganga gorge. At one time, route finding ahead of Ramani was a major challenge. By now the trail is well established but no less difficult and, at times, dangerous, especially for laden men. On the 10th we climbed up steeply and reached a set of prominent cairns from where we had our first close view of Nanda Devi. Ahead lay the well-known " Slabs" , so-called because the layered rock slopes outward and can be difficult in wet weather. Several meters of rope were fixed here. In the past, expeditions used less fixed rope than they do at present, and we were obliged to fix rope in almost a dozen stretches all told as the porters were reluctant to proceed anywhere without protection.

That night was spent at Bhujgara (4050m). On the 11th the difficulties continued and following long sections of fixed rope and exposed terrain we reached one of the main difficulties on the route, a narrow rocky staircase named "Vaikunth Gully, overlooking the Rishi Gorge. This led to a long, steep climb followed by a stretch over exposed rock where in the past a fatal accident had occurred. Beyond this lay another steep climb and then the final rocky ramparts, christened the “Pisgah Buttress” by Shipton and Tilman, effectively the end of the gorge. A small temple greets visitors at the top and nearby is Patalkhan camp (4200m) where water and a few caves are available. On 12 June we went 5 km ahead to the vast open meadows which mark the start of the Inner Sanctuary. This camp, which we christened Chaubata (4500m) - the meeting point of four routes -became our base camp for the next seven days.

Activities at Base Camp:

(i) Two scientists, Dr Sarfaraz and Anand Pendhedkar, with a support team, made a camp ahead of Sarson Patal near the confluence of two glaciers; the Dakhini Nanda Devi Glacier and the Dakhini Rishi Glacier. They spent four days collecting water samples, rock samples, observing bharals, birds and other fauna in the Sanctuary.
(ii) 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 departing for Lata on 16th June.
(iii) Vineet Pangtey and two forest guards accompanying him had studied forests on the way in, and the Sanctuary. He left the base camp on 14th June.
(iv) Suman Dubey developed high blood pressure during the trek and a helicopter was arranged to evacuate him to Joshimath on 13th June.
(v) Harish Kapadia stayed at Chaubata and organised the erection of a bridge across the Dakhini Rishi glacier to reach the Northern Sanctuary. The water was very high, and a bridge was put in place after great difficulty. But by the time the team was ready

to cross over to visit Rishi Tal, a large lake in the Northern Sanctuary, the monsoon had arrived and the plan was given up.

(vi) Motup Chewang, Samgyal Sherpa, Dupku Sherpa left Chaubata on 14 June and reached the Sunderdhunga Col (5550 m). This was possibly the first climb to it in the 67 years after Shipton and Tilman in 1934. Full details of visit to the Sunderdhunga Col are given separately in this report.

(vii) Motup Chewang, Kalyan Singh and Samgyal Sherpa climbed to the ridge above Chaubata and camped on the Devistan ridge separating the Inner Sanctuary from the Trisul glacier basin, a point we christened "Nanda Dekhni Dhar". This was a new crossing into the Inner pioneered by Ummed Singh of Reni village in the late seventies[3]. There were cairns erected by the shepherds who had brought goats inside in 1978-82. Our party tried to follow the shepherd route into the Trisul Nala, but beyond a point, rock fall has obliterated the narrow ledges it followed and the route is no longer passable, by goats or trekkers. No easy route was available and they had to climb back and finally descend down a nala to meet the regular trail at Bhujgara.

On 19th June a monsoon arrived in the area, a week or fortnight earlier than usual. It started with heavy rains. We decided to call off the expedition and return to Lata Village. In the rain, conditions were tricky, and very carefully the entire party was escorted across the difficult sections and we reached Lata village was reached on 26th June, arriving safely back at Joshimath on the same day.

Sunderdhunga Khal (5550 m)

14th June: Motup Chewang, Samgyal Sherpa and Dukpu Sherpa left Chaubata at 9.40 a.m. and made camp on the Dakhini Rishi Glacier at 4800m. On 15th 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 5000m.

16th June: Started early and climbed under the feature known as "Cream Roll", east of Sunderdhunga Col. The western slopes of Sunderdhunga Col are broken and avalanched regularly. Having started at 5.00 a.m. they reached a little above Sunderdhunga Col on the east and descended to it at 8.00 a.m. They came across a small rocky campsite with a cairn and signs of past visitation, possibly Shipton and Tilman's camp of 1934. Another cairn was sighted to the south of the pass, probably marking the extremely difficult route they took to exit the Sanctuary that autumn.

They turned back at 9.00 a.m. and retraced their route to return to base camp at 6.30.pm. They opined that return via the right hand moraine of the Dakhini Rishi glacier would provide a better route.

Nanda Dekhni Dhar

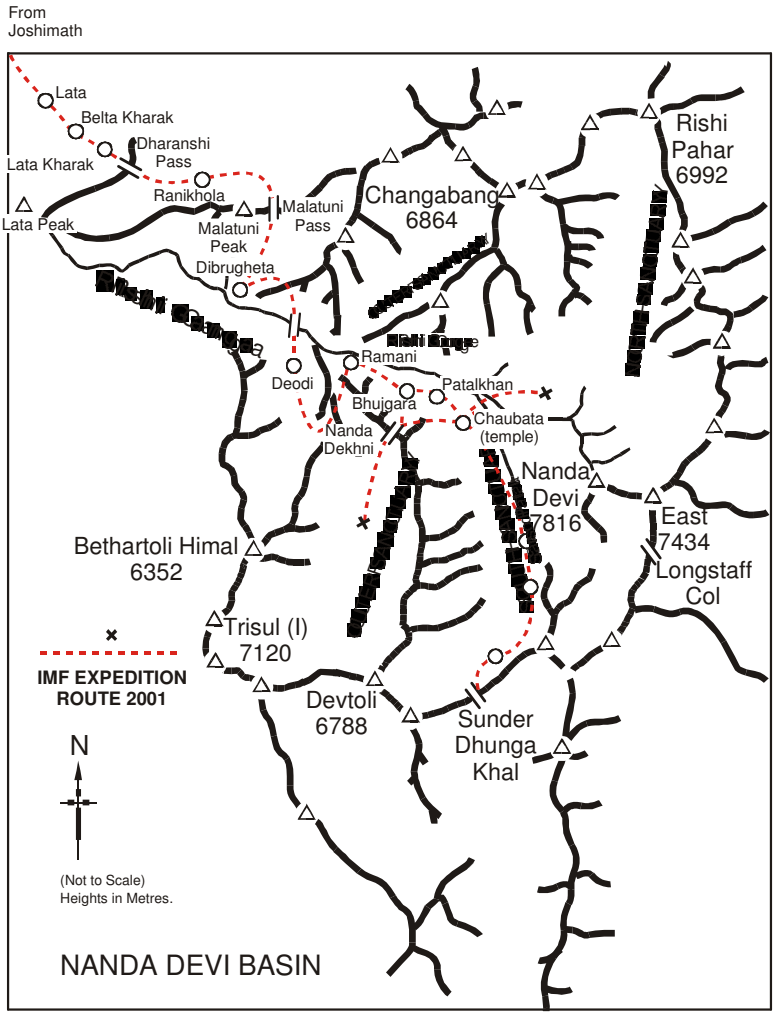
[3] See Section *Closure of the Sanctuary* below

19th June: Motup Chewang, Kalyan Singh and Samgyal Sherpa left Chaubata at 7.30 a.m. in uncertain weather. At first they traversed across 3-4 steep gullies to reach a small nala draining to Patalkhan. They climbed up this nala and camped at 2 p.m. at 5000m. This camp was a little below the ridge, but in the evening and the next morning they obtained wonderful clear views of the peaks of the North Sanctuary, peaks of the Trisul nala, Dunagiri and the Chaukhamba group in the distance to the West.

20th June: They left in brilliant weather at 7.00 a.m. First they had to descend cross the slope of the upper Bhujgara Nala and reached a Col at 9.00 a.m. They crossed over into Trisul valley and descended steeply along natural ledges and across gullies going south towards Tridang, the base camp for Trisul. They descended down to 4400m. The lower ledges and gullies were grassy but the route was otherwise entirely on rock. Cairns were found all along the way indicating that this was indeed the route used by the shepherds in the past. But they were stopped by a large section of the route having been destroyed by rock fall. For almost four hours they attempted to get around this break from different directions to descend to Tridang. But no route was possible, and they retraced their steps all the way to the ridge to camp high above Bhujgara at 7 p.m. A long day of 12 hours.

21st June: Leaving camp at 7 a.m. they reached Bhujgara at 9.00 a.m., joining the traditional route. Two hours later, they reached Ramani and joined the main party at Deodi in the evening.

Route Map of the Expedition



2. The Closure of the Sanctuary

The Inner Nanda Devi Sanctuary, protected by the Rishi Ganga gorge[4], received its first human visitors in 1934. Traditionally, the villages around the confluence of the Rishi Ganga and the Dhauli Ganga had exercised forest rights in the lower reaches of the Rishi Ganga valley, and were familiar with the grazing grounds one to three days from the last village, Lata. And, mountaineers had explored the lower reaches of the Rishi Ganga[5] in the 19th Century. Trisul, for example, was first climbed in 1907. But till Shipton and Tilman found a way in 1934, the gorge beyond Ramani had proved impossible to penetrate. Soon after, in 1939, the area was declared a wildlife sanctuary.

[4] Please see Appendix B for route details and place names.
[5] See Appendix D, Climbing History of Nanda Devi

Even after this pioneering exploration, mountaineering expeditions remained few and far between in the 1930s, non-existent during the war-dominated 1940s, and resumed but as a trickle in the 1950s and 1960s. A dramatic change occurred in the 1970s, after the Government pushed the restrictive Inner Line further towards the border with China, and opened the Nanda Devi region to foreign visitors and climbers. The trickle quickly became a deluge. Mountaineering activity also increased by leaps and bounds in the Outer Sanctuary areas.

The movement of expeditions, each accompanied by scores of porters, caused enormous environmental damage to the frail ecology of the Rishi Ganga gorge and the upper reaches of the Inner and Outer Sanctuaries. Prior to the 1970s, the impact on the environment, even with limited hunting that was in vogue then, was comparatively superficial. True, trees were felled to make bridges and for firewood, but the numbers were small and visitors limited. With exploding numbers, even with a ban on hunting, came a brutal impact on the forests and the habitat of wild life. The increase in expedition numbers, both climbing and trekking, led to a scarcity of porters which obliged expeditions to rely on goats. To be sure, goats from Lata and some other villages had long been grazing in the Dharanshi and Dibrugheta pastures. But the pressure began to mount in the 1970s. Here is a contemporary account, written in 1981 by William McKay Aitken, a long-time resident of India with great familiarity with Garhwal and Kumaon:

" I read of a successful Czech expedition whose achievements were splashed in the national dailies. It so happened that I had followed in their footsteps and had marked how all the birch trees around Dibrugheta had been slashed to provide fodder for their pack goats. They were in a hurry and there was no time to unload their saddlebags to let the goats graze naturally. The Japanese who scored the ultimate climbing feat by performing the traverse linking the two peaks of Nanda were notoriously beneficent in paying porters to hasten their supply trains by felling trees to make bridges over side streams."[6]

Shri Aitken estimated that the number of human entries into the Rishi Ganga gorge was approaching 4,000 in 1982. Shortly before, in 1979, an enterprising resident of Paing village, Ummed Singh, discovered a route into the Inner Sanctuary from the Trisul Nala that enabled him to take goats into a hitherto inaccessible area. Shri Aitken writes[7] that after his first visit, Ummed took one *toli* of 500 animals into the Inner Sanctuary in 1981 and Pratap Singh and two companions took in nearly 1,500 animals. "In 1982, I learned that 4,000 had forced illegal entry," Shri Aitken writes.

In 1977, noted ecologist Lavkumar Kacher accompanied a British expedition into the Inner Sanctuary and was alarmed at what he observed. His comprehensive observations[8] proved to be vital to the future of the Sanctuary. He reported on the overgrazing of Dharanshi (Malathuni) and Dibrugheta by goats, some coming from Malari and further afield, particularly after the closure in the early 1960s of grazing

[6] The Nanda Devi Affair by Bill Aitken
[7] Himalayan Journal, Volume 39
[8] Himalayan Journal, Volume 35

grounds in or bordering Tibet. Plant collection, he reported, was on the rise due to higher prices and increased demand. In the past, this was restricted to shepherds; now even poorer landholders and the landless were resorting to foraging in the forests. Moreover, in search of such plants, the gatherers were penetrating further afield. Their increasingly frequent encounters with wild life and ability to pioneer difficult routes also enabled them to act as guides for poachers and hunters, he reported. During this visit, Shri Khacher encountered half a dozen skulls of bharals in the Inner Sanctuary.

His descriptions is worth noting: "All along the single, often dangerous narrow trail, there were massive signs of degradation, cut trees, overgrazed meadows, burnt forests, charred grass slopes and the supreme visual affront to the divine presence was a massive, ugly scar diagonally cutting across the east face of the Malathuni (Curtain) Ridge caused by the passage of thousands of goats and sheep carrying expedition supplies." He was appalled to learn of a plan to construct a bridal path to Deodi.

Shri Kacher argued forcefully for the need to convert the Nanda Devi basin into a wild life preserve. He recommended that entry be regulated, restricted and be charged for. He suggested an entry only by the Dharanshi route and the stationing of armed and well-equipped forest officials. These comprehensive findings and recommendations rang alarm bells in the right quarters. Shri Nalini Dhar Jayal, who was at the time a senior official in the Union Environment Department and had in the 1950s been into the Sanctuary, was able to prevail upon the Uttar Pradesh Government to gazette the Nanda Devi basis a National Park, thus legally forbidding outsider entry except as may be provided by a sanctioned management plan. In a recent[9] letter to the Secretary, Department of Environment, Shri Jayal wrote about the Nanda Devi Sanctuary: " To save such a priceless heritage area from destruction, the only solution lay, at least in the core area, of total…protection from human and domestic animal intrusion to facilitate the slow process of restoration of its biological and natural assets." As a result of these efforts, on 6th November 1982, the entire Nanda Devi basin was declared the core area of a national park[10], and access was effectively shut off. In 1988, it was declared a Biosphere Reserve. In 1992, it was denominated a World Heritage Site.

In 1993, an army expedition climbed the mountain. It was accompanied by a number of scientists and forest officials. On its return, the expedition prepared a report describing their ecological findings and cataloging flora and fauna encountered[11]. On August 26th 1993, the Secretary of the Department of Environment and Forests chaired the first meeting of the Scientific Advisory Committee on Biosphere Reserves where it was decided that no disturbance should be allowed in the core area of the Nanda Devi Biosphere Reserve, that expeditions involving mountaineering and the scaling of peaks, etc., should not be permitted, and there should be scientific monitoring of the area every five years to get the latest status of the flora and fauna.

[9] 5th April 2001
[10] See Appendix C, the IUCN's report which also has references to existing literature & reports
[11] The expedition report is available with the Indian Mountaineering Foundation

Some Observations

We were acutely aware of the background and the strength of arguments which had led to the creation of the Nanda Devi National Park and Biosphere Reserve. At the same time, we were required by the brief given to us by the IMF to exercise our judgement and look afresh at the situation as it exists today.

Alienation of local populations:

As already reported above[12], our expedition encountered a certain amount of hostility from the local population almost as soon as we arrived. This was a manifestation of one major consequence of the closure, namely, the alienation of the people of several villages, notably Lata, Reni and Paing, who were more dependant for their livelihood than others on the area now shut off to them. The loss of income from porterage was one consequence[13]. Another was the loss of access to forest produce and grazing grounds. The village of Paing also lost some panchayat forests to the new park.

In essence, our experience with the pradhan of Lata village, who is acknowledged there and among NGO circles to be an activist and politically well-connected, and others is a manifestation of a feeling of deprivation and exclusion resulting from the Nanda Devi National Park and the intrinsic conflict that exists between their interests and the interests of conservation. Their experience is representative of the experience of villages elsewhere in Uttaranchal where the creation of parks and reserves has deprived local residents of income and traditional rights in areas newly closed off[14].

The villagers speak not only of economic deprivation and unfulfilled official promises of compensation; they resent the implication that their interaction with these areas is harmful to the environment. They have, after all, lived in harmony with nature for generations, they argue, and by shutting them out they are being cut off from their *matribhoomi* and the cultural and religious relationship they have with Nanda Devi. While admitting to the existence of smuggling and poaching, the villagers argue that it is closure and the absence of legitimate traffic that enables the poachers and smugglers to operate without fear of being found out. It is widely believed in this area that the

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[12] Section 4 above, under the subhead *Problems*

[13] *Ecotourism in Nanda Devi Reserve* by K. G. Saxena, *et al*, published in the *International Journal of Sustainable Development & World Ecology*, Vol. 7, 2000, estimates that annual earnings per porter hired by expeditions rose from an average of Rs. 5,652 in the years 1962-71 to Rs. 11,808 during 1972-82. Porters earned approximately Rs. 5,000 to Rs. 11,000 from our 5-week expedition in June 2001, depending on how long they carried loads.

[14] *Ecotourism in Nanda Devi Reserve* notes that in 1998 India had more than 521 protected areas covering 12% of the forest land (4.5% of the total land area), while in the Himalayan region there were three biosphere reserves, 18 national parks and 71 wildlife sanctuaries occupying 9.2% of the Indian Himalaya. The paper says: "Legal notification of protected area status follows enforcement which, by and large, curtail resource use and tourism and also affect the socio-cultural value system of the local communities leading to people-reserve conflicts. These conflicts are major threats to biodiversity conservation…and call for changes in conventional strategies of conservation planning and management." A privately circulated "background note" dated 18th December 1999 says that in Uttaranchal only about 12% of the land is under human settlement and, "The declaration of protected areas and establishment of large river-valley projects are taking away…traditional rights and (causing) displacement."

Government's policies on protected areas do not take into account the interests of the people thus affected. Several Non-Governmental Organizations (NGOs) and voluntary bodies have taken up these causes, and meetings are regularly[15] held to discuss such issues.

This alienation reached a flashpoint in 1998 in the Nanda Devi National Park when over 500 inhabitants[16] of nearby villages, supported by NGOs, launched an extended *Cheeno-Jhapto* movement and forced entry into the restricted zone of the Biosphere Reserve as far as Dibrugheta to draw attention to their plight and their demands. The police had to be called in to control the situation.

These issues lie beyond our brief and are, thus, outside the scope of our report. They need to be addressed by the State Government, for they are strongly political, NGOs and others who work in these areas. However, there are implications for the environment and for regulation which we take note of in our recommendations.

Illegal entry:

For a route that is said to have been closed off for almost 20 years, the trail into the Sanctuary is far too well defined for this to be so, almost as if much of it is being maintained[17]. It was clear to us that there has been continuous traffic along it. Officially, only the 1993 army expedition was permitted into the core zone. We also know that the ITBP sent an expedition to Nanda Devi last year (2000) and that a group of about a dozen foreign trekkers were able to obtain permission to make the journey in the wake of the ITBP expedition. Allowing for the fact that both these expeditions were massive in the number of porters that accompanied them, it seemed to us from the condition of the trail that there had been traffic along the route since the winter snowmelt. The undergrowth, while abundant, had not obliterated the trail even in thickly wooded areas. In the open, on grass slopes and the cliffs that make up the route, the trail was also in good condition, all the way into the Sanctuary, though clearly the trail was far better up to Ramani. The natural stone bridge across the Trisul nala that we encountered had a tree trunk affixed to one side for easy crossing; we had not placed it there.

Further evidence of recent traffic came from the existence of stones set up as *choolas* and remnants of cooking fires. At Dibrugheta, we came across a dump of expedition refuse, including plastic, which was clearly left by one of the two teams that came in 2000. At the small cave that is a traditional shelter (en route to the Trisul base camp) above the junction of the Trisul nala and the Rishi Ganga a patch of juniper had recently been burnt.

Condition of the natural habitat

[15] For instance, at Pithoragarh, Lachhiwala and Mussoorie in 1999 and 2000

[16] *Ecotourism in Nanda Devi Reserve*

[17] From Lata and Tolma villages, there is a well-constructed route up to Dharanshi pass which was built some years ago using funds from the Forest Department. Beyond this is a well-defined trail all the way into the Inner Sanctuary.

What good had to come out of closure in terms of improvement in the forest cover seems to have climaxed. The forests appear to be in as good health as one can expect of the region. Regeneration has peaked and bald patches of previous campsites have been covered in many places, with fresh and mature vegetation.

The heaviest *in situ* human-related impact and that of domestic livestock, within the outer sanctuary of Nanda Devi, was before closure felt in the meadows and supposed grazing grounds. This includes the fecund grasslands above Lata Kharak and stretching much of the way to the base of Dharanshi pass. It also includes the upper grazing grounds of the Tolma route, which joins up with the traditional Lata Kharak route, just around the base of Dharanshi pass. It also includes the excellent grazing grounds below the new Dharanshi camp (the lower meadows through which one originally passed to gain access to the Malathuni curtain ridge) as well as the grassy slopes around Malathuni. Some of the best meadows after Malathuni centered around Dibrugheta. Further up the valley, the Trisul nala offered excellent grazing during the peak of summer, right up to the snout of the Trisul glacier, above which the Trisul base camp is situated. Within the sanctuary, once a route had been discovered, the finest grazing to be had was right along the Sarson Patal meadow and just beyond the Dakhni Nanda Devi Glacier.

There is good evidence to show that the condition of the former grazing grounds and permanent alpine meadows has improved. While grazing still takes place above Lata Kharak, there is no direct evidence of recent or current grazing beyond Dharanshi. Although grazers' camps with the droppings of goats and sheep still exist at Dharanshi and Dibrugheta, it is difficult to date these precisely. While these incursions may not be as old as five years, they do not appear to be less than one year old either.

All the typical species of Nanda Devi Sanctuary alpine meadow flora were present in their expected abundance in the meadows, indicating that there does not seem to have been any long-term species loss in meadow flora, as a direct result of the past impact of grazing. Apart from minor and occasional incursions by villagers, to collect alpine herb plants and other produce that the villagers consumer locally, the overall impact of thirty years of intense expeditions seems to have been repaired to a very great extent. The forests themselves have seem tremendous fresh regeneration, both in the form of young saplings (less than one year old) as well as five and ten year old young trees that have taken root, and contributed to a layered canopy. The two decades of protection seem to show amply in the forest cover. In many places, the path to the inner sanctuary has been overgrown, though not obliterated, by Silver Birch and Rhododendron saplings and shrubs. Older signs of felling have long since been overgrown by fresh and young saplings, and evidence of this from the past appears to be few and far between.

Poaching

The same positive note cannot be struck in the case of the ungulate populations, however, especially that of the Musk Deer. We came across direct signs of Musk Deer poaching, and the villagers spoke extensively of poaching being carried out by outsiders. With the financial stakes being high (some Rs. 20-25, 000 per musk deer pod, plus meat), and the risks low (inadequate surveillance or monitoring within the core

area), it is evident that poachers have been frequenting the sanctuary and making off with the spoils of their depredations. While the poaching of Bharal cannot possibly be anywhere near as rewarding as that of Musk Deer, there is no doubt that Bharal are also poached, if for no other reason than to sustain the weekly food requirements of the poachers.

Villagers say that there has been virtually no Forest Department monitoring within the park area, and argue correctlly that closure has also deprived the area of random monitoring by climbers, trekkers and villagers. In the past, the presence of villagers and itinerant visitors was a discouragement to poachers seeking the freedom to roam the sanctuary freely.

Absence of base-line information

It is noteworthy that though the Scientific Advisory Committee on Biosphere Reserves in November 1993 recommended regular monitoring expeditions to the area, this has not been done. In fact, the survey done by the 1993 expedition and other descriptions of flora and fauna in the area are basically a listing of what was seen. A biosphere reserve requires a base-line survey with which to compare changes and developments; no such base-line survey exists for the Nanda Devi Biosphere Reserve and monitoring flora and fauna remains a walk-through and subjective exercise, and of limited value.

Species counts tend to vary in a rather wide spectrum between seasons and time of the year. It is essential to estimate the population dynamics and approximate species count of certain key ungulates and predators, to be able to study the overall change in actual populations. Variations can be extreme, and this can lead to extrapolations that are based on inadequate data and insufficient evidence. For example, during the IMF Nanda Devi Expedition 2001, our visual observations of Bharal number less than forty individuals during the course of the entire expedition. Previous expeditions have seen nearly one thousand bharal. Here, one cannot safely extrapolate that the Bharal population has come down, but seasonal factors need to be studied. In the case of the current expedition, a winter of low snowfall followed by an early spring and thus plentiful grass at a time of year when the ground would normally have been covered with snow, led the Bharal to exhaust the lower grazing grounds earlier in the year and head to unusually high altitudes in the summer months, to seek out fresh grass. This led to lower Bharal observations around the Sarson Patal grazing grounds, and the only ones seen were those at the higher altitudes, mostly over 5,000 meters (17,000 feet.)

To overcome the limitations of such seasonal variations, and various other scientific aberrations, one needs to conduct a baseline survey, to get a real and near-accurate population and species count. Such a scientific survey must be completed prior to any changes in the status quo of the sanctuary, and updated on a regular basis every five years or so, so that we may monitor the changes that are taking place in the sanctuary.

Recommendations

A fine balance needs to be crafted between the essential and indisputable requirement of conservation and the equally inalienable needs of human populations, for livelihood and for recreation. We are in no doubt that where a conflict exists, the resolution must not be at the cost of flora and fauna who, far more than human populations, lack the ability to regenerate and face the danger of destruction and even extinction. That is our starting point. Yet, we believe that where there is a political will, where regulation is strictly carried out, and where local populations are able to share in this responsibility and benefit for it, we can sensibly combine human and natural requirements.

Until the changes brought about in the 1970s, there was an equitable balance between the needs of nature and the needs of both dependent populations and visitors to the area that now comprises the Park. In the absence of a base-line survey, it is impossible to say whether or not the closure of two decades has benefited the Park and if so by how much. Our observations certainly suggest that the Park forests, trails, grasslands and general ecology have regenerated markedly. Those of us who have been to the Sanctuary some decades earlier were impressed by the absence today of degradation, the instances of burnt juniper and poached musk deer notwithstanding. We believe, therefore, that even though the effect of the closure cannot be quantified or demonstrated scientifically, it can be asserted on the basis of our observations.

Our recommendations, ***which are spelt out in detail in Section 8, Towards A New Management Plan***, are as follows:

1. Scientists at the earliest opportunity undertake a base-line survey of the Nanda Devi National Park. This should involve agencies such as the Botanical Survey of India, Zoological Survey of India, Wildlife Institute of India, G B Pant Institute of Himalayan Environment & Development, and any other institutions who may be able to contribute. Such a survey should be made across the seasons and should be exhaustive so that all species, their spread and populations are adequately identified within the limits of science and topography.
2. The core area of the National Park should be redefined to permit access to the Nanda Devi main and east summits, the Trisul Nala and select peaks in the Northern Sanctuary , as well as the traditional route along the Rishi Ganga. Details of this are contained in Section 8.
3. The involvement of local populations must be considered important and vital to the success of this venture. They must feel they have a stake in its success. This will enable them to visit traditionally revered areas, benefit economically from the visitors and help in maintaining the area free from smuggling and poaching. In addition, their participation should be upgraded from that of providing porterage to becoming organisers, and perhaps even guides and liaison officers if they meet the requirements.
4. A bridge should be built and left in place over the Rishi Ganga at Deodi so that there is no compulsion on visitors to look for trees to bridge the river. No other construction of any kind will be permitted in the Nanda Devi National Park area, though cave shelters can be improved through the building of low walls where possible and beneficial from stone available locally.

5. A strict limit must be placed on the number of expeditions, their membership (defined to include both climbers/trekkers and porters), the duration of their visits, the phasing of their visits and their destinations. To make environmental sense, these restrictions have to apply to military and para-military expeditions as well, which need to be counted among the overall limit of visitors.
6. Visitors to the area now comprising the National Park, whether Indian or foreign, whether official or unofficial, whether climbers or trekkers, should be charged a fee over and above the IMF's mountain fees sufficient to help keep numbers down to pre-determined levels. Of the share of the fees accruing to the state authority, a pre-determined percentage, say 25%, should be earmarked for the villages that fall in the area affected by the closure of the National Park 20 years ago for development and beneficial activity and projects.
7. This programme should be introduced in a phased manner, starting next year, 2002, which has been designated The Year of the Mountains, with an expedition to Nanda Devi.
8. The strictest regulations governing conservation, including all regulations pertaining to National Parks, must be applied to all visitors, including local populations and outsiders. This will include total prohibition on the use of wood, the cutting or defacing of trees, shrubs and plants, the collection of plants of any kind, on any form of interaction with wild life, including trapping, hunting or any form of pursuit, the entry of any domestic animals, including goats for any purpose including the carriage of goods, the removal of garbage and refuse following the principle of taking out whatever is taken in. Current prohibitions on grazing and gathering forest produce are not sought to be changed.
9. A New Management Plan should be drawn up urgently to implement these recommendations. The involvement of agencies like the The World Conservation Union, IUCN, and the US National Park Service, in drafting this would be invaluable in making available a wide range of international expertise and experience in managing wilderness areas.
10. The impact of visitors should be reviewed annually to ensure that expeditions cause no harm; if the ecology is damaged, the Plan should be flexible enough to impose curbs and reduce the numbers of visitors and expeditions. Periodic closure for natural rejuvenation should be a part of the Management Plan.

3. Towards a New Management Plan

8.1 *Introduction*

Nanda Devi is a mountain jewel set in a unique natural and cultural setting that exemplifies the unsurpassed majesty of the Himalaya. It is like an icon of the new state of Uttaranchal, symbolising the close relationship of the people of this land with their *dev bhoomi*, a microcosm of the bond between the people of India and the Himalaya, celebrated in religion, tradition, literature and legend. The Goddess Nanda, consort of Lord Shiva and a manifestation of Parvati, has been revered through the centuries. For many villages on its periphery she is the presiding deity. Every 12 years, the Nanda Raj Jat yatra, starting from Nauti village in the Nandakini valley, makes the difficult journey to Hom Kund, close the high mountain wall protecting and enclosing the Devi, for ritual obsequience and prayer.

Nanda Devi's importance, indeed the importance of the Himalaya and its *maths* and shrines to our ethos and belief, enjoins on us not to fail in the preservation and safekeeping of its ramparts, its valleys and ridges, its attendant summits, its forests and rivers, its wild life and rich biodiversity. A collective responsibility binds us in this endeavour, the people, the authorities, visitors and travelers who would find recreation or solace in the mountains, and all those who are concerned with the welfare of both people and wilderness. We must as a community recognize and act upon the belief that the dictates of human development cannot be permitted to damage the beauty and bounty that nature bequeaths to us. In managing its ecology, we must set an example for the rest of the country, for nothing else comes close to Nanda Devi's religious centrality, its cultural importance and its ecological vitality. If we are not able to succeed in this, then where else is it worth succeeding?

8.2 *Natural Endowment*

The Nanda Devi National Park is located in Chamoli district of Uttaranchal State. It has a unique topography, the main peak being located at the end of the middle stroke of an inverted "E", the two other strokes enclosing the North and South Rishi Glaciers and various feeder glaciers. This forms the Inner Sanctuary, beyond which lie other glaciers flowing south (Ramini Glacier) and north (Trisul Glacier), forming the Outer Sanctuary. Owing to the relative inaccessibility, of the Rishi Ganga, which drains the basin, access to its gorge lies over a high pass (Dharanshi, 4,350m) on the outer ridges of the Park.

The Nanda Devi basin lies mostly above 3,500m except in the west where the Rishi Ganga descends to 2,100m to join the Dhauli Ganga. Nanda Devi, at 7,817m is its highest summit. There are three principal summits above 7,000m, Nanda Devi East, Trisul and Dunagiri, and scores of summits above 6,000m, many of them still unexplored and unclimbed. The Rishi Ganga gorge, a spectacular defile slicing through this high mountain country, leads at the base of the central mountain to pastures of unexpected gentleness.

Owing to its structure and location, the Nanda Devi basin enjoys a distinctive microclimate. Conditions are generally dry with low annual precipitation, but there is heavy rainfall during the monsoon, from late June to August, and it is mostly snowbound for six months in the year. Prevailing mist and low cloud during the monsoon keeps the soil moist. Consequently, the vegetation in the lower reaches is lusher than is usually characteristic of drier inner Himalayan valleys. Forests are restricted largely to the Rishi Gorge but are thick where they occur, dominated by fir, rhododendron and birch up to about 3,350m. Forming a broad belt between these and the alpine meadows is birch forest, with an understorey of rhododendron. Beyond Ramani, the vegetation switches from forest to dry alpine communities, with scrub juniper becoming the dominant cover within the 'Inner Sanctuary'. Juniper gives way to grasses, prone mosses and lichens, and on riverine soils to annual herbs and dwarf willow.

The basin is renowned for the abundance of its ungulate populations, notably bharal, musk deer, serow and tahr. Snow leopard roams the higher reaches of the basin. There is rich bird life and high altitude flowers, are abundant.

a. *Approach to Park Management*

The purpose of a Management Plan is to provide clear goals and objectives, along with a framework for their implementation. It needs to combine and resolve the varied and sometimes conflicting demands of sustainable tourism, the welfare of inhabitants and the protection of the environment. In this draft, only the beginnings of such a plan are attempted. Detailed work needs to be done on a working Management Plan for the Nanda Devi National Park.

At the same time, it is imperative that a base-line survey of the flora and fauna of the National Park be undertaken at the earliest. Species counts tend to vary in a rather wide spectrum between seasons and time of the year. It is essential to estimate the population dynamics and approximate species count of certain key ungulates and predators, to be able to study the overall change in actual populations. To overcome the limitations of such seasonal variations, and various other scientific aberrations, one needs to conduct a baseline survey, to get a real and near-accurate population and species count. Such a scientific survey must be completed prior to any changes in the status quo of the sanctuary, and updated on a regular basis every five years or so, so that we may monitor the changes that are taking place in the sanctuary.

b. *Current Status*

The Nanda Devi National Park has been officially closed to visitors since 1982. There are many reasons, however, why a second look is being taken at this almost two-decade old prohibition. Among them are the following:

8.4.1 Two decades of closure have revived the natural habitat of the National Park sufficiently to permit limited access for relatively small groups of climbing and trekking parties accompanied by guides and porters under strictly controlled conditions. What good had to come out of closure in terms of improvement in the forest cover seems by

now to have been achieved. The forests appear to be in as good health as one can expect of the region. Regeneration has peaked and bald patches of previous campsites have been covered in many places, with fresh and mature vegetation.

8.4.2 There is evidence of illegal entry into the prohibited areas. The trail into the Inner Sanctuary is in good condition, better than total abandonment would suggest. There is evidence of Musk Deer poaching and at campsites of recent visitation. In the absence of any sort of forest department monitoring within the park area, there has been a sort of free-for-all on the poaching front. Opening up of the sanctuary in a phased and very controlled fashion will ensure the presence of a small number of outside visitors within the sanctuary at certain times of the year, thus discouraging poachers from roaming the sanctuary freely. Also, responsible mountaineers and trekkers can act as policing conservationists, reporting any untoward incidents to the park authorities. A bridge across the Rishi Ganga will be constructed at Deodi to pre-empt felling of trees annually.

8.4.3 Closure brought the people of the area into conflict with the Government's conservation policies. The inhabitants of the affected villages been deprived of forest rights and have lost income from porterage and other travel related activities. The villagers speak not only of economic deprivation and unfulfilled official promises of compensation, they resent the implication that their interaction with these areas is harmful to the environment. They have, after all, lived in harmony with nature for generations, they argue, and by shutting them out they are being cut off from their *matribhoomi* and the cultural and religious relationship they have with Nanda Devi. One result has been a rising tension between inhabitants and officials, culminating in a popular move to defy restrictions in 1998 when around 500 forced entry into the prohibited zone.

8.4.4 It is clear that unless local inhabitants are involved in the management of the National Park, such conflicts will continue, and if the wishes of the inhabitants are ignored, the effectiveness of National Park management will be undermined. There is a strong need to involve the inhabitants of villages around the National Park, to give them a reason to be participate, to provide them a role in whatever is being implemented, to educate and enable them, and to solicit their contribution and support for the goals of the National Park. Training and employment will enable them to participate in National Park management to the maximum extent that is possible without compromising the integrity of the Management Plans.

8.4.5 The new state of Uttaranchal is under considerable fiscal pressure to encourage tourism and to find new sources of revenue. Properly drawn up plans and regulations faithfully implemented will enable the National Park to accept revenue-generating visitors without altering the ecological balance or causing damage to the natural endowment.

8.5 *Park Management Principles*

- The Nanda Devi National Park will be opened for limited and controlled tourism (climbing and trekking) access under strict conditions outlined in Sections 8.7.1 and 8.7.2 below.
- The involvement of local communities will be ensured to the maximum extent possible, consistent with the broader aims of Park Management and conservation.
- Where conflicts occur, resource conservation will take precedence over human use.
- Education of both visitors and local inhabitants will be an integral part of National Park management.
- Strict regulations will prohibit the use of any natural resources for consumption; no wood will be used for fire or energy, no felling of trees or collecting of species will be permitted, no interference with wild life or its habitat will be allowed, all material taken in will be brought out, no foraging or grazing or domestic animal access will be permitted, no fire will be permitted and all fuel will have to be brought from outside.
- A strengthened Nanda Devi National Park authority will be established by the Uttaranchal Government consisting of Forest and Environment officials, headed by a senior and dedicated official who will have the necessary staff to enforce the regulations governing the Park. Such staff will include Rangers who will be appropriately equipped and lightly armed suitable for their task and the conditions in which they operate.

8.6 *Core Area of the National Park*

At present, the entire Nanda Devi Basin is the Core Area. This effectively cuts it off for visitors. A new basis of core area[18] is proposed which will consist of:

- The northeastern portion of the Northern Sanctuary (about 1/3rd of the Northern Sanctuary)
- Catchment of the Dakhini Rishi Glacier, traditionally the Southern Sanctuary (also about 1.3rd of the Southern Sanctuary area)
- Dasholi Reserved Forest, with large temperate and subalpine forest, except 50 meters on either side of the riverine track along the gorge to allow access.
- Not in the core area will be the Catchment of the Ramani glacier, the Trisul Nala and the Dunagiri Reserved Forest.

8.7 *Expeditions to the Nanda Devi basin*

8.7.1 Principles:

- Ecological integrity is at the core of management plans.
- The size of visiting teams, including porters, will be limited.
- They will come for limited duration and to limited destinations.
- Small, lightweight expeditions will be encouraged and, if possible be given preference.

[18] See attached map p. 27A

- There will be no overlap at camping sites or on any mountains of expeditions and teams, whether climbers or trekkers.
- Local people will be employed as porters and scouts, and efforts will be made to upgrade their abilities to cooks, guides and Liaison Officers if they meet the requirements.
- A proportion, say 25%, of the revenues generated from levies and fees charged by the local authorities will be ploughed back into the villages associated with the National Park for their development.
- The Indian Mountaineering Foundation will continue to coordinate the sanction of foreign expeditions on its established principle of first-come first-served. The IMF will also regulate Indian expeditions who will not be allowed unless appropriate permissions have been obtained.
- The Uttaranchal Government/National Park Authority will be represented at the IMF's sanctioning meetings of both Indian and foreign expeditions.
- The IMF will charge its stipulated fees but the Uttaranchal authorities will levy an additional fee for mountain climbing in the Nanda Devi National Park, a share of which will be earmarked for local development.
- Trekkers will also be required to register with the National Park Authority and will be asked to pay an appropriate fee, whether they are Indian or foreign.
- The Armed Forces and Para-Military Forces will be required to conform to all regulations, including access, permissions, numbers and destinations governing the Nanda Devi National Park.
- *If ingress by expeditions is found to be harmful to the National Park or if visitors do not abide by regulations, the Plan should be flexible enough to restrict numbers at short notice or even cancel visits and close the National Park if such steps are warranted. Periodic closure, partial or total, for natural rejuvenation as well as rotation of peaks available for climbing should be part of the Management Plan.*

i. Expeditions to the Nanda Devi National Park

- Only the Lata-Lata Kharak-Dharanshi route will be open (this strictly excludes access from Paing, along the Rishi Ganga river) for access.
- There will be two climbing/trekking seasons, pre-monsoon (May 7-July 7) and post-monsoon (September 1-October 31) and a maximum of eight expeditions (four climbing and four trekking) in the National Park in a year.
- A maximum of one climbing expedition to the North Sanctuary and one to the South Sanctuary (to Nanda Devi main and East summits, Kalanka, Changabang from the Changabang Glacier) will be allowed in each season.
- A maximum of two climbing expeditions to the Outer Sanctuary areas, one to the Ramani Glacier and one to the Trisul Nala (to the peaks of Trisul, Mrigthuni, Hanuman, Dunagiri and Changabang) will be allowed in each season.
- Similarly, two trekking parties will be permitted per zone (Outer and Inner Sanctuaries) per year, one in each season.
- No campsite will be occupied by more than one expedition, climbing or trekking, at a time.
- Each climbing expedition will have a maximum duration ex-Lata of 45 days, each trekking expedition a maximum duration ex-Lata of 21 days.

- Climbing parties will have an absolute maximum of six (6) members and 75 porters, including Haps, doing multiple ferries if necessary.
- Trekking parties will have a maximum of 12 members and 50 porters, though smaller parties will be preferred.
- Dates of departure for climbing expeditions will be slotted one to two weeks apart: on of May 7, 12, 17, 22 & September 1, 6, 11, 16 subject to the ceiling of four in a year.
- Dates of departure for trekking expeditions will be 27 May, 2 June, 21 & 26 September.
- A vacancy in mountaineering will be transferable to a trekking party, not vice versa.
- Bookings will have to be made six (6) months in advance.
- All expeditions will be required to meet with the National Park Authorities for briefings and orientation on regulations, appropriate conduct within the National Park, including National Park Regulations.
- All expeditions will have to satisfy National Park Authorities that they have met all Park Regulations, including the treatment of refuse and garbage[19].

8.8 *Threats to the Park Ecosystem*

The following threats will have to be dealt with:

- Garbage and pollution
- Poaching
- Domestic livestock and grazing
- Foraging for forest products
- Felling of timber and deforestation
- Fuel requirements
- Collection of samples, flora and fauna
- Interference with wild life and its habitat

8.9 *Next Steps*

- The drafting of a Nanda Devi National Park Management Plan[20]. This will be a document with global implications and therefore should meet international standards. It should be a trendsetter document unveiling a trend-setting program. It should be our endeavour to bring the widest possible skills and experience to bear, and for this purpose, as well as to finance such a document and raise finances for this project, collaboration should be sought from the Geneva-based The World

[19] It is worth recalling here the sentiments expressed in the regulations concerning the handling of garbage and refuse contained in literature produced by the Park Rangers of Denali National Park in the US which surrounds the highest mountain in North America: *Leave nothing in the mountains. Expeditions have climbed Denali and have carried out everything brought in, including their human waste. Use sledges, haul bags, temporary caches under large snow blocks at minimum depth of 3 feet (1 meter). Mark caches with large wands, 1.5 to 2.0 meters above ground. Bears destroy caches, so secure them in three layers of garbage bags so that no scent is emitted. Line toilet hole with biodegradable sack, tie up when full and throw into deep crevasse; if no crevasse carry till you find one. Bring back if you can. Crevasse only human waste; all other trash must be carried off.*

[20] Several details, such as mechanisms, actual fees to be levied, and other micro-details will need to be worked in consultation with several concerned authorities.

Conservation Union, IUCN, which has among other projects drawn up a Draft Management Plan for the Central Karakoram National Park[21] in Pakistan, which has similar problems to the Nanda Devi National Park. Collaboration should also be sought with the United States National Park Service, which has many decades of experience in managing the Denali National Park and can be associated through agreements that already exist under the auspices of the Indo-US Joint Commission.

- Appropriate action needs to be taken to initiate a Base-line survey of the National Park involving institutions such as the Wild Life Institute, the G. B. Pant Institute of Himalayan Environment & Development, the Zoological Survey of India, the Botanical Survey of India, the Salim Ali Centre for Ornithology & Natural History, and any other institutions who may be able to contribute.
- After this, appropriate action will need to be taken to delimit new Core areas, to amend the Nanda Devi National Park legislation.
- A strengthened Nanda Devi National Park Authority will have to be instituted to help the Forest Department implement the Plan, associating experts/officials from relevant departments or disciplines, with appropriate local participation where possible. The head of this Authority will need to be a dedicated person committed to conservation and the protection and preservation of the Nanda Devi National Park.
- The year 2002 is internationally designated the Year of the Mountains. It would be appropriate if an international expedition were to be organized in the post-monsoon season, a year from now, to inaugurate the new Management Plan of the Nanda Devi National Park.

[21] See Attachment at the end of this Report.

APPENDICES

A: Members of the IMF Expedition, 2001

(i) Shri Harish Kapadia (Leader): A mountaineer from Bombay; has been climbing for the last 40 years and has visited the Sanctuary twice. He has written several books, lectured widely and is an authority on the Himalaya; Editor of the *Himalayan Journal* published by the Himalayan Club, Bombay.

(ii) Shri Suman Dubey: A well-known journalist from New Delhi, who also lives in Kausani, Uttaranchal State. He attempted Nanda Devi peak in 1961 and has climbed extensively in the Himalaya and the Alps. Currently editor of the *Indian Mountaineer*, which is a main publication of the Indian Mountaineering Foundation.

(iii) Shri Rupin Dang: An expert on flowers of the Himalaya has published books on the subject. Also an expert photographer and filmmaker.

(iv) Shri Sarfaraz Ahmad: A research scholar who has done his Ph.D. in Glaciology. He has published several papers in collaboration with Dr Syed Hasnain. He has also visited the Dhauli Ganga basin near the Nada Devi Sanctuary; has made detailed study of water resources of this particular area.

(v) Shri Motup Chewang Goba: A mountaineer from Ladakh who lives in Delhi, he is in the travel business and an active organiser of expeditions. He has climbed several peaks, including in the Siachen Glacier area. He was the leader of the IMF expedition which successfully climbed peak Gya in 1998.

(vi) Shri Anand Pendharkar: Working in the field of environment studies for a long time. He has made studies about mammals, birds and other bio-diversity of several areas including places surrounding the Nanda Devi Sanctuary. He has published several papers; is working a for website company.

(vii) Wing Commander M. N. Sharma: Chief medical officer of IAF in Mumbai. He was medical doctor to the Expedition.

(viii) Shri Vineet Pangtey: An experienced forest officer with first hand knowledge of the National Park, presently Joint Secretary and Staff officer to the Principal Secretary, Forest and Rural Development Board, Government of Uttaranchal. The Government of Uttaranchal deputed him to join the Expedition to discuss and study the forest management plans while on the Expedition. Two Forest Guards accompanied him.

B: Route Details

From Joshimath, Lata village, the start of the trek, is 25 km away via Tapovan. The trek begins from the road about 200m below the village, and after climbing over a high protective ridge and two passes, descends to the Rishi Ganga gorge that leads into the Inner Sanctuary.

Day 1: Climb from the road to Lata village, 2 km on a cemented track made *pucca* in 1994. The old and renowned Nanda Devi temple is at the top of the village. A broad, proper footpath or trail leads to Belta Kharak. The first camp can be made here subject to the availability of the water.

Day 2: The trail continues steeply uphill to Lata Kharak, 6 km, going zigzag through a beautiful forest. Here on top of the ridge, a forest hut was built in 1995 (it can be seen from the road-head and Lata village.) The hut has four simple rooms, and about 100m ahead there is a lovely camping site on a vast open ridge with water available in a nearby rhododendron forest.

From Lata Kharak, a trail also leads southwards to an open ground known as Saini Kharak. This trail then 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. Lata peak and the ridge connecting it to Lata Kharak, offers exclusive views of Rishi Gorge, Nanda Devi and the mountains that ring the Sanctuary. 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: From Lata Kharak, the trail climbs steeply and traverses steeply to a junction, where a similar trail of 5 km ascends from Tolma village. Shortly above this junction is the highest point, the Dharanshi pass and where the National Park begins. The trail crosses the Satkula gullies and leads to the traditional camping ground of Dharanshi in open meadows that were once grazing grounds. 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: The trail continues to Jogi Udiyar (a place of *jogi* - a hermit). It passes though narrow rocky gate that as per the legend is called with Ranikhui. (See Explanation of names) In 2 km Donidhar in reached which is under the Malathuni peak. The main trail descends more than 1000m to an open green ground called Dibrugheta. On the near side is a cave used by shepherds, but the traditional camping ground is over the pasture to a stream on the far side.

Day 5: From Dibrugheta a steep climb through forest leads to a steep open hillsides. A delicate traverse for 3 km continues till a vast dry nala is reached. Descend this nala steeply to the Rishi River that is to be crossed. A bridge must first be built and camp is made immediately after the crossing in forest of Deodi.

Day 6: Again a steep climb through forests leads to easy traverse of about 3 km leads to *Shikari udiar*. At one time Shikaris, or hunters, used this cave, and the trail bifurcates, one leg going on towards the Trisul base camp, Tridang. The other descends into the Trisul valley to the nala that is crossed on a natural rock bridge. A brief climb and steep descent, both through dense forests, leads to Ramani where the Rishi Ganga is a mere 20m wide. There is another overhang cave and camp is made on the slowly eroding shelf between it and the river.

Day 7: The Trail climbs through a rhododendron forest, over a rocky feature seen from Ramani. It rises steeply through forest and then steep grassy slopes to Tali, marked by some prominent cairns, from where Nanda Devi is seen close up for the first time, in a magnificent view. The trail continues on its traverse with many ups and downs over rocky cliffs, grassy ledges and steep hillsides. This leads to a major nala and a slight

descent to a rock, turning which brings up 'The Slabs'. These are downward-sloping rocks over about 200 meters where fixed ropes are necessary for safety. After this the trail crosses several small nalas with a rocky stretches where fixed rope is advisable. Finally, at the end of a juniper slope is a major nala next to which, in a birch grove, is the traditional camping site of Bhujgara, probably the smallest on the whole route.

Day 8: The trail crosses the nala next to the camp and passes under a huge cave. Climbing up all the time, it often traverses steep and exposed ground, with a straight drop to the river, several hundred meters below. The local villagers call this 'Tel-mel bato' which ends in a highly exposed pinnacle like rock feature. After the climb of this pinnacle trail climbs rather steeply for 300m to reach the foot of huge rock cliff. A traverse is made across a long, exposed and narrow ledge that leads to the dramatic *Vaikunth Sidi* (Staircase to Heaven), a tricky rock chimney with step-like formations. Another steep climb upward leads to a nala and the final steep rocks that mark the end of the gorge. Shipton and Tilman called this 'The Pisgah Buttress'. Cairns and relatively gentle slopes lie atop this, as does a small shrine. The camping site of Patalkhan is nearby.

Day 9: From Patalkhan, an exposed slope of slate rock (fixed rope is advisable) leads to a long traverse in a deep re-entrant with the nala from where Patalkhan camp gets its water. Beyond this is a long rocky area with dwindling vegetation and uncomfortable rock and boulder hopping. But in 3 to 4 km the terrain changes abruptly: No sooner is the rock fall area over than the vast slopes of Southern Sanctuary begin. A complete change from the gorge and its vertical walls, the sight ahead is of gently sloping meadows and the massif of Nanda Devi towering above. We christened this Chaubata ('four paths') and built a small temple because four routes converge here. They are:

(a) From the Rishi Gorge.
(b) To Sarson Patal, the Nanda Devi Base Camp, Maiktoli base camp, Sunderdhunga khal, etc., in the Southern Sanctuary.
(c) To the North Sanctuary, across the Rishi Ganga River to Rishi Tal and all the peaks in the Northern Sanctuary.
(d) To the Devistan ridge over which shepherds crossed into the Sanctuary two decades ago coming from the Trisul nala. This trail is now broken.

Day 10: Sarson Patal is 4 km ahead and is a simple flat walk. A helped is constructed here. The route to Devistan turns directly uphill from this trail.

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

C: IUCN Report on the Nanda Devi National Park

NAME Nanda Devi National Park

IUCN MANAGEMENT CATEGORY

Ia (Strict Nature Reserve)

GEOGRAPHICAL LOCATION: Lies in Chamoli District, within the Garhwal Himalaya. The main entry point to the park is via Lata Village, some 25km from Joshimath township. The park is bounded by high mountain ridges and peaks on all sides except its western side, which features a deep and virtually inaccessible gorge. 30°16'-30°32'N, 79°44'-80°02'E

DATE AND HISTORY OF ESTABLISHMENT: Established as a national park with effect from 6 November 1982 as per Notification No. 3912/14-3-35-80 of 6 September 1982, the intention having been declared under Notification No. 2130/14-3-35-80 of 18 August 1980. Dang (1961) provides an historical account of the exploration of the Nanda Devi Basin. The first recorded attempt to enter the sacred basin was by W. W. Graham in 1883, but he was unable to proceed beyond the gorge of the lower Rishi Ganga. Subsequent attempts by Dr T. G. Longstaff in 1870 and Hugh Ruttledge in 1926, 1927 and 1932 also met with failure. Finally, in 1934, Eric Shipton and H. W. Tilman pioneered a route to the 'Inner Sanctuary' by forcing a passage up the gorge of the upper Rishi Ganga. Later, in 1936, Tilman and N. E. Odell made the first ascent of Nanda Devi, reputedly the most outstanding mountaineering success of the pre-Second World War era. It was their accounts of this natural sanctuary that first drew attention to the spectacular mountain wilderness (Tilman, 1935; Shipton, 1936), following which the area was established as a game sanctuary on 7 January 1939 (Government Order No. 1493/XIV-28). Commonly referred to as 'Nanda Devi Sanctuary', the name was changed to Sanjay Gandhi National Park at the time of notification. This met with local opposition and the site was gazetted as Nanda Devi National Park. The park was inscribed on the World Heritage List in 1988. The park constitutes the core zone of a much larger area (200,000ha), extending as far north as the Dhauli Ganga, that has been proposed as a biosphere reserve (Indian National MAB Committee, n.d.).

AREA: 63,033ha. This is the official and correct size. Lavkumar (1979) gives the area of the Nanda Devi Basin as 79,900ha, while Hajra (1983a), Tak and Lamba (1984, 1985) and Lamba (1987) cite a similar figure of c. 80,000ha for the park.

LAND TENURE: Provincial Government

ALTITUDE: The entire basin is above 3,500m, apart from the lower Rishi Gorge which descends to 2,100m. Nanda Devi West at 7,817m is the highest peak.

PHYSICAL FEATURES: Comprises the catchment area of the Rishi Ganga, an eastern tributary of Dhauli 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. These rise up to the encircling mountain rim along which are about a dozen peaks above 6,400m (21,000ft), the better known including Dunagiri (7,066m), Changbang (6,864m) and Nanda Devi East (7,434m). Nanda Devi West, India's second highest mountain, lies on a short ridge projecting into the basin and rises up from Nanda Devi East on the eastern rim. Trisul (7,120m), in the south-west, also lies inside the basin. The upper Rishi Valley, often referred to as the 'Inner Sanctuary', is fed by Changbang, North Rishi and North Nanda Devi glaciers to the north and by South Nanda Devi and South Rishi glaciers to the south of the Nanda Devi massif. There is an impressive gorge cutting through the Devistan-Rishikot ridge below the confluence of the North and South Rishi

rivers. The Trisuli and Ramani glaciers are features of the lower Rishi Valley or 'Outer Sanctuary', below which the Rishi Ganga enters the narrow, steep-sided lower gorge (Lavkumar, 1979). The basin presents a diverse array of glacial and periglacial forms. The glaciers cover a wide spectrum of growth phases. The combinations of normal and perched glaciers on different rock types add interest to the basin (T.M. Reed, pers. comm., 1988). The greater part of the park falls within the Central Crystallines, a zone of young granites and metamorphic rocks. Along the northern edge is exposed the Tibetan-Tethys, consisting of sediments of sandstones, micaceous quartzite, limestones and shales (Kumar and Sah, 1986). 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 (M. P. Searle, pers. comm., 1988). The crystalline rocks of the Vaikrita Group and lower part of the Tethys sediments have been tentatively subdivided into four formations, namely: Lata, Ramani, Kharapatal and Martoli (Maruo, 1979). Further geological details are given by Lamba (1987).

CLIMATE: Being an inner Himalayan valley, Nanda Devi Basin enjoys a distinctive microclimate. Conditions are generally dry with low annual precipitation, but there is heavy rainfall during the monsoon, from late June to August. Prevailing mist and low cloud during the monsoon keeps the soil moist, hence the lusher vegetation than is usually characteristic of drier inner Himalayan valleys. The basin is snow-bound for about six months of the year, snow being deeper and at lower altitudes on the southern side than the northern (Lavkumar, 1979; Lamba, 1987). Meteorological data are not available.

VEGETATION: 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 *Juniperus 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 alpines and lichens (Lavkumar, 1979; Reed, 1979; Hajra, 1983a). Balodi, n.d., gives a floristic analysis of the area based on the 1993 Nanda Devi Scientific and Ecological Expedition. A total of 312 species, distributed over 199 genera and 81 families, has been recorded and preserved in the herbarium of the Northern Circle, Botanical Survey of India. At least 17 of these are considered rare (Hajra, 1983a). Not included in this list is *Saussurea sudhanshui*, newly described from the area (Hajra, 1983b). A total of 773 plantshas been reported from the proposed biosphere reserve (Indian National MAB Committee, n.d.). Some 620 species from 344 genera and 116 families were recorded by the 1993 Nanda Devi Scientific and Ecological Expedition (Samant, n.d.). Nationally threatened species recorded include *Nardostachys grandiflora* (I), *Picroehiza kurrooa* (V), *Cypripedium elegans* (R), *C. himalaicum* (R), *Dioscorea deltoidea* (V) and *Allium stracheyi* (V). A species list is given in (Samant, n.d.). Local populations use a total of 97 species, 17 for medicine, 55 as food plants, 15 as fodder, 16 for fuel, 5 for tools, 8 for house building, 2 fibres, 6 miscellaneous, and 11 for religious purposes.

FAUNA: An account of the 14 known species of mammals is given by Tak and Lamba (1985) and Lamba (1987). The basin is renowned for the abundance of its ungulate populations, notably bharal *Pseudois nayaur* (LR) (Tilman, 1937) estimated to number 820 in 1977 (Lavkumar, 1979) 440 in 1981-84 (Tak and Lamba, 1985; Lamba, 1987) and 990 were sighted in 1993 (Sathyakumar, n.d.). Preliminary surveys suggest that Himalayan musk deer *Moschus chrysogaster* (LR), mainland serow *Capricornis sumatraensis* (VU) and Himalayan tahr *Hemitragus jemlahicus* (VU) are also fairly common (Lavkumar, 1979; Tak and Lamba, 1985; Lamba, 1987), but probably not as plentiful as previously due to hunting (Dang, 1961). However, numbers appear to be increasing due to the closure of the park to human activities (Sathyakumar, n.d.). The distribution of goral *Nemorhaedus goral* (LR) does not appear to extend to within the basin, although the species does occur in the vicinity of the national park (Tak and Lamba, 1985; Lamba, 1987). Snow leopard *Panthera uncia* (EN) is reported to have been "extraordinarily common" (Dang, 1961). This may reflect the relative ease with which the species is observed here and in the vicinity (Green, 1982), it being unlikely that the park supports a large snow leopard population because of its comparatively small size and the deep snow in winter (Green, 1988). Other large carnivores are common leopard *P. pardus*, Himalayan black bear *Selenarctos thibetanus* (VU) and brown bear *Ursus arctos*, the existance of which has yet to be confirmed. The only primate present is common langur *Presbytis entellus* (Tak and Lamba, 1985; Lamba, 1987) although Rhesus macaque *Macaca mullata* (LR) has been sighted outside the park boundaries (Sathyakumar, n.d.). Some 83 species are reported from the biosphere reserve (Indian National MAB Committee, n.d.).

Sankaran, n.d. recorded a total of 114 bird species belonging to 30 families during the 1993 Nanda Devi Scientific and Ecological Expedition. Some 67 of these species were not recorded during earlier surveys. Abundant species recorded during May-June include crested black tit *Parus melanolophus,* Yellow-bellied fantail flycatcher *Rhipidura hypoxantha*, Orange flanked bush robin *Erithacus cyanurus*, Bluefronted redstart *Phoenicurus frontalis*, Indian tree pipit *Anthus hodgsoni*, Vinaceous breasted pipit *A. roseatus*, Common rosefinch *Carpodacus erythrinus*, and nutcracker *Nucifraga caryocatactes*. Species richness was found to be highest in temperate forests, with a significant decline in richness as elevation increased.

Other expeditions for which bird lists are available include Reed (1979) and Tak and Kumar (1987). Lamba (1987) lists 80 species for the area but the distribution of some of these is restricted to lower altitudes in adjacent areas. Some 546 species are reported from the proposed biosphere reserve (Indian National MAB Committee, n.d.).

There is a lack of systematic surveys on invertebrate fauna. Baindur (n.d.) recorded 27 species of butterfly from 6 families during May-June 1993, including Common yellow swallowtail *Papilo machaon*, Common blue apollo *Parnassius hardwickei*, Dark cloudedyellow *Colias electo*, Queen of Spain *Issoria Iathonia*, and Indian tortoiseshell *Aglais cashmirensis*.

CULTURAL HERITAGE: Nanda Devi, after Devi (meaning goddess), consort of Shiva, is a manifestation of Parvati and has been revered as a natural monument since ancient times (Reinhard, 1987). Hindus have deified the entire basin and every 12th year devotees have approached the foot of Trisul to worship Nanda Devi, the 'Blessed

Goddess' (Kaur, 1982). The local people are Bhotias, those of Lata Village being Tolchas (Kandari, 1982).

LOCAL HUMAN POPULATION: The park is uninhabited but there are two small villages (Reni and Lata) on the north-western side. Local people used to bring more than 4,000 goats and sheep to Dharansi and Dibrugheta for grazing (Lavkumar, 1979) and derive an income from employment as porters and guides before the area was closed in 1983.

VISITORS AND VISITOR FACILITIES: The trek to Nanda Devi basecamp is considered to be one of the toughest in the world and has attracted large numbers of mountaineers and trekkers from all over the world (Lamba, 1987). There were an estimated 4,000 visitors (mostly expedition members and porters) in 1982 (Aitken, 1981-1982), but the park has since been closed. There are no facilities.

SCIENTIFIC RESEARCH AND FACILITIES: A geological survey was conducted by Maruo (1979). Among the first published observations on the wildlife of Nanda Devi are those of Dang (1961), Lavkumar (1977, 1979) and, in the case of birds, Reed (1979). Surveys of the flora and mammalian fauna have been carried out by the Botanical Survey of India (Hajra, 1983a) and Zoological Survey of India (Tak and Lamba, 1984, 1985; Lamba, 1987), respectively. The 1993 Nanda Devi Scientific and Ecological Expedition conducted floral and faunal surveys and habitat assessments in 1993.

CONSERVATION VALUE: The area is reputedly one of the most spectacular wildernesses in the Himalaya. The basin is dominated by Nanda Devi, a natural monument and India's second highest peak, and drained by the Rishi Ganga which has cut for itself one of the finest gorges in the world (Shipton, 1936; Kaur, 1982). It supports a diverse flora, largely on account of the wide altitudinal range, and an interesting variety of large mammals, including a number of rare or threatened species. Unlike many other Himalayan areas, it is free from human settlement and has remained largely unspoilt due to its inaccessibility, particularly the forests of the lower Rishi Valley (IUCN Technical Evaluation).

CONSERVATION MANAGEMENT: Traditionally, the alpine pastures around Dharansi and Dibrugheta were grazed by livestock from Lata Village (and latterly from villages as far away as Malari) until the establishment of the park in 1982. The 'Inner Sanctuary' remained unexplored until 1934, when it was opened up to mountaineering. As a result, hunting, collection of medicinal plants and other forms of exploitation ensued. This part of the Himalaya was subsequently closed to foreign visitors from 1945 to 1974 (Lavkumar, 1979; Kaur, 1983). There followed a spate of mountaineering and trekking but, because of the considerable disturbance being caused to the environment (see Aitken, 1981, 1983), tourism was banned following a meeting held on 18 February 1983 under the chairmanship of the Chief Secretary of Uttar Pradesh.

A preliminary management plan has been prepared (Semwal and Asthana, 1986) but by 1988 this had not been sanctioned by the Chief Wildlife Warden. Included in the plan are recommendations concerning the present ban on tourism and ways in which to provide employment for local people. Nandi Devi was earmarked as one of several protected areas for inclusion under the Government of India's Project Snow Leopard (Ministry of Environment and Forests, 1987), but this project has not materialised to

date. It has been recommended that the Pindari and Sundadhunga valleys at the southern edge of the Nanda Devi massif be designated a sanctuary to protect their reportedly large and viable ungulate and pheasant populations (Rodgers and Panwar, 1988).

MANAGEMENT CONSTRAINTS: Litter, felling of trees and even cultural vandalism caused by expeditions, along with the introduction of sheep and goats to the 'Inner Sanctuary', reached serious proportions prior to the closure of the park (Clarke, 1979; Aitken, 1981,1983). The conclusion of the 1993 Nanda Devi Scientific and Ecological Expedition was that wildlife numbers are increasing and the ecosystem of the park shows signs of recovery since the park was closed. Poaching continues, with organised groups are thought to enter the park via Ronti Peak to Deodi and from Dewal via Roopkund to Bethartoli. However, poaching levels are not thought to present a serious risk to the park.

The two routes of access into the 'Inner Basin' used to be kept open by expeditions but have not been maintained by the park authorities since the ban on tourism. A few of the wildlife staff have been trained at the Nehru Institute of Mountaineering, Uttarkashi, but they lack the necessary mountaineering equipment to keep routes open.

STAFF: There is a total of 31 personnel, including four assistant wildlife wardens, and 22 wildlife guards, headed by a divisional forest officer (1987). Sathyakumar, n.d. reports however that in 1993 there were six wildlife guards patrolling the park.

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DATE: December 1987, updated July 1991 and May 1997.

D: Climbing History of Nanda Devi by 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 set' (The 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 the 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 kms.) 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'.

Peaks of the Nanda Devi Sanctuary

There are several famous peaks on the rim of the Nanda Devi Sanctuary. From the east the wall of the north Sanctuary has peaks like Latu Dhura (6392 m), Deo Damia (6620 m), Mangraon (6568 m) and Rishi Pahar (6992 m). The Sanctuary wall turns west from this junction and leads to Kalanka (6991 m) and Changabang (6864 m). It ends at Dunagiri (7066 m).

Towards south stand the small but difficult twin peaks of Bethartoli Himal (6352 m) and Bethartoli South (6318 m). Further south is Trisul (7120 m). The wall thence turns east and leads to Mrigthuni (6855 m), Devtoli (6788 m) and Maiktoli (6803 m). Then across the depression of Sunderdhunga khal stands Panwali Dwar (6663 m) and Nanda Khat (6611 m) to complete the circle. The Sanctuary wall is divided into the 'inner' and 'outer' Sanctuary and these peaks stand on these walls. In the central dividing ridge stand the Devistan peaks.

Nanda Devi Peaks

The twin peaks of Nanda Devi stand tall and aloof from other peaks of the Sanctuary. Rising steeply from the South Nanda Devi glacier they rise more than 3800 m. The south ridge falling from the main traverses above 'the Coxcomb' and has since been the main feature of this face (A feature of rock seen lower down was named 'the Coxcomb' and the normal route climbs over this.) The valleys surrounding the peaks contain four glaciers. The two at foot of the peaks on either side are called the Nanda Devi north and south glaciers, while the glaciers in the valleys further south and north are named the Rishi glaciers. Between them they drain about 380 square kms. of snow and ice.

The Main peak stands entirely inside the Sanctuary and is inaccessible because of current restrictions. The East peak stands on the eastern wall of the Sanctuary and its south ridge falls to the Longstaff Col.

Seen from the north the faces of both the peaks look even more formidable, offering no easy route. Due to the valleys being more open in the north the peaks are seen to rise like two towers, linked by a ridge, with one fore-summit. The most striking pose of the twin peaks is seen from eastern Kumaon where both peaks are seen in a joint profile, looking strikingly beautiful, especially at dawn and dusk

The ridge connecting the peaks is almost 2 km long, and nowhere less than 6700 m. It has a deep notch in the centre which is difficult to traverse.

Into the Sanctuary

The first attempt to explore the routes to the Sanctuary was by W.W. Graham (1883), who could not make much headway and his claims of having climbed several peaks, like Changabang, were repudiated. Dr Longstaff (1905 and 1907) was the next explorer. At first with A.L. Mumm and C.G. Bruce he tried to forge a route through the Rishi gorge but was beaten. He then approached from the east and reached a Col—he was thus the first person to look into the inner Sanctuary. This Col, on the shoulder of the East peak is named after him. Hugh Ruttledge was next, and of the several routes tried by him the most innovative was a possible approach from the Sunderdhunga Col in the south, which Shipton and Tilman used to descend from the Sanctuary in 1934.

Early Explorations and Climbs of Nanda Devi Main Peak

Spurred by the article by Hugh Ruttledge, Eric Shipton and Bill Tilman set their hearts on exploring the route to the inner Sanctuary. They reached India in 1934 and in one of the most brilliant explorations in the Himalaya forged a route along the Rishi Ganga, still the only accessible route. Two years later Tilman accepted and Shipton declined the Anglo-American invitation to climb Nanda Devi. Four Americans: W.F. Loomis, Charles Houston, Arthur Emmons and H. Adams Carter, and four Englishmen: Graham Brown, Noel Odell, H.W. Tilman and Peter Lloyd formed a strong party to take on the Goddess, their knowledge and tactics were based on the earlier explorations. Base camp was established on the Dakhini Nanda Devi glacier and the south side ('Coxcomb') was chosen for an attempt. As higher camps were established sickness and the difficulties of the route affected the Sherpas and members, and the party was depleted in strength. Sherpa Kitar Dorje died of dysentery at the base camp. Going up slowly, without crampons, Tilman and Odell reached the summit on 28 August 1936. In relief, on reaching the summit, and witnessing the beauty of the mountainscape surrounding them Tilman wrote: 'I believe we so far forgot ourselves as to shake hands on it'. The same evening, a cloudburst caused destruction in the lower Garhwal, attributed to humans violating the abode of the Goddess. Though Tilman did not believe it, it added a fresh chapter into the Nanda Devi folklore.

For the next 14 years this remained the highest peak climbed. Not content with their achievement two members of the party climbed out of the basin by the Col ('Longstaff Col') south of Nanda Devi East which Longstaff and two Brocherel brothers had

reached in 1905 to the Lawan gad. One more chapter in the Nanda Devi saga had ended, but a lot remained to be done.

Nanda Devi East

Nanda Devi East, which was reconnoitered by Longstaff in 1905, was climbed by the Poles in 1939. Their first attempt on 21 June had to be abandoned as Injung Sherpa fell through a cornice. He was saved by an alert belay by Dawa but it was half an hour before he could be pulled up to the ridge. The shock and the pressure caused by the incident made the party change their mind. Returning to the higher camps after a wait for good weather Bujak and Dawa Sherpa with Bernadzikiewicz and Klaner started for the summit on 2 July. At 7180 m (23,550 ft) Bernadzikiewicz had to give up and he descended with Dawa. The other two reached the summit at 5.20 p.m. and descended to the camp by the light of the moon and in intense frost.

The Traverse

The ridge between the twin peaks is almost 2 km long and nowhere is it lower than 6700 m (22,000 ft) The traverse of this ridge became the next objective for the mountaineers. In 1951 a French expedition led by Roger Duplat undertook this difficult project which ended in a tragedy. They established base camp in the Sanctuary as well as three more camps on the Coxcomb ridge following the route of the 1936 expedition. Another party set up camps till the Longstaff Col from the Lawan gad. On 29 June, Duplat and Gilbert Vignes were sighted a little below the summit of the main peak. They were never seen again. They had a long and difficult traverse ahead of them. The party waited for them for a while before a search was organised. The eastern party cut a route towards the summit, awaiting the climbers. L. Dubost and Sherpa Tenzing reached the summit of Nanda Devi East on 4 July, and on their return to the Longstaff Col learnt that two climbers undertaking the traverse had not returned. The base of the mountain was searched but no trace of them could be found. The French returned here in 1975 (with some Indians as a joint team) to traverse the peaks. They climbed by the Coxcomb ridge to the summit of the main peak and the East peak, but failed to complete the traverse.

The traverse succumbed to strong-arm tactics by the Indo-Japanese team in 1976, in a most organised assault. After initial difficulties loads were airlifted to base camp by helicopters and simultaneous efforts began on both peaks on 12 May. Both the summits were climbed by 3 June. A camp, 'East 4', was established on the ridge by climbing down the summit. On the main peak, despite the unstable snow and danger of avalanches the south face was traversed to reach the ridge and camp 'West 5' was established. On 11 June Y. Hasegawa and K. Takami climbed the east peak and descended to the camp (East 4) on the ridge. They continued the traverse. There were several overhanging sections on the 650 ft. high hump and a knife-edged ridge on the descent. It took them five hours. They reached the camp West 5 late in the afternoon where two climbers met them before leaving by the normal route. After waiting for a day due to a snowstorm the traverse was completed on 16 June and the main summit was climbed, where again two climbers greeted them on the summit.

In the same year the main peak was climbed by the north ridge, by the Americans. But they had to pay a heavy price for it. This was an expedition organised to celebrate the 40th year of the first ascent. The star of this nostalgic expedition was Willi Unsoeld's daughter, named after the Goddess, Nanda Devi Unsoeld. All that had to be done was for her to climb the summit to yield good copy for the press. But alas tragedy struck below the summit. She died at Camp IV, succumbing to an infection contracted earlier. The grief-stricken expedition members consoled themselves that the girl had merged with the myth ('the goddess has gone to her abode') but the hillmen's Hindu superstitions were further strengthened. A decade later, John Roskelley, a young successful climber of this expedition vented his disenchantment with sentimental motivation adding to the growing literature on the mountain.

During the mid-sixties Nanda Devi was also scene of many hush-hush joint expeditions. It was subsequently discovered that there were plans afoot to set up some nuclear device on the summit to detect nuclear activities on the Tibetan plateau. A device was left half-way on its slopes when the monsoon arrived. The party returned the next year to find it missing. Many years later there was a hue and cry that the device had fallen into the river and that the Rishi Ganga was polluted. Plenty of political mileage was sought from the 'Nanda Devi affair' by many Governments and the peak was in the public eye for all the wrong reasons.

In 1974 onwards the Sanctuary was thrown open to the western mountaineers. There were several noteworthy expeditions to Nanda Devi and the peaks on the Sanctuary wall. A Japanese expedition penetrated the northern Sanctuary, for the first time in 40 years, and climbed its northernmost peaks. The Czechs climbed via a brilliant new route on the north ridge. An Indian expedition in 1981 put the first women mountaineers on the summit while some large army expeditions climbed the peaks though some lives were lost on its slopes. All this put a pressure on the fragile ecology of the Sanctuary. Logs were cut to make bridges, junipers burnt to keep porters warm and there was talk of building a footpath to the inner Sanctuary for the tourists. Local shepherds forged an alternative route into the inner Sanctuary that allowed the herd to be taken into the main Sanctuary for the first time. This was a fine piece of exploration but led to much destruction of flora and the Sanctuary was closed to mountaineers and locals alike. It remains closed till today, depriving a generation of mountaineers from enjoying the bliss of the Goddess Nanda.

There is a lot to look forward to when the Sanctuary is again opened to mountaineers. The west face of Nanda Devi is perhaps the most stupendous rock face that awaits climbers, as are many other peaks and routes that are yet to be climbed. For whatever the reason, this abode of the Rishis will always be regarded as the most prized mountain wilderness in the world, one of the natural wonders of the world, as it is sometimes called. After five decades the words of Eric Shipton still ring true: ' . . . in the Sanctuary of the Blessed Goddess we had found the lasting peace which is the reward of those who seek to know high mountain places.'

Important Events in the History of Nanda Peaks

1883

First explorations by W.W. Graham to find a route to the peaks. His claim about ascents of several peaks on the Nanda Devi Sanctuary wall was disbelieved.

1905-1907

Dr. Tom Longstaff explored several approaches to the inner Sanctuary. He climbed Trisul (7120 m) on the outer Sanctuary wall. Longstaff and two guides reached a high Col on the Nanda Devi East peak and were the first persons to look into the inner Sanctuary.

1927 and 1932

Hugh Ruttledge explored the approaches from the south and discovered the existence of the Sunderdhunga Col on the southern wall.

1934

The first attempt by Eric Shipton and H.W. Tilman to penetrate the Rishi gorge. They tried in the pre-monsoon period and finally succeeded in the post-monsoon period to reach the inner Sanctuary. They made an exit via the Sunderdhunga col.

1936

The Anglo-American expedition made the first ascent of the main peak of Nanda Devi. H.W. Tilman and Noel Odell reached the summit on 28 August 1936. Two members made an exit via the Longstaff Col to Lawan gad.

1939

Two Poles, J. Klaner and J. Bujak made the first ascent of Nanda Devi East on 2 July.

1951

A French expedition attempted to traverse from the Main peak to the East peak by the connecting high ridge. R. Duplat and G. Vignes were last seen below the main peak and presumed dead. Tenzing Norgay and L. Dubost climbed the East peak.

1964

An Indian expedition (Col. N. Kumar) climbed the Main peak.

1965-1968

Attempts to place a nuclear device on the summit of the Main peak.

1974

The Sanctuary was opened for western mountaineers. Changabang (6864 m) and Devtoli (6788 m), the northernmost and the southernmost peaks of the inner Sanctuary respectively, were climbed in June.

1975

A Japanese expedition penetrated the northern Sanctuary and climbed several peaks on the northern Sanctuary wall.

A French expedition (Y. Pollet-Villard) climbed both the peaks on 16 June but failed to complete the traverse between the two peaks as intended.

1976

An Indo-Japanese expedition traversed the ridge between the two peaks, from the East peak to the main. Y. Hasegawa and K. Takami traversed the ridge in three days, starting on 11 June.

A commemorative American expedition to celebrate 40 years of the first ascent in 1936 ended in tragedy with the death of Nanda Devi Unsoeld, though the Main peak was climbed by the north ridge, a new route.

1977

Serious eco-imbalances in the Sanctuary reported by environmentalists.

1981

A new route on the Main peak, north ridge to northeast buttress, climbed by a Czech (M. Martins) expedition on 19 September.

An Indian expedition (Col. Balwant Sandhu) climbed the Main peak. Three ladies reached the summit.

An expedition of the Indian Army Para-troopers (Maj. Kiran Kumar) climbed both the peaks but five climbers died during the expedition.

1983

The Sanctuary was closed for mountaineers and locals for environmental reasons.

1993

An Indian Army Engineers expedition climbed the Main peak and studied the condition of the ecology. They recommended continued closure of the Sanctuary.

2001

Following reports of fresh entries into the Sanctuary, the IMF sponsors expedition to make a fresh study and make recommendations on future policy.

E: Cheeno-Jhapto Movement

A movement with 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 forcibly enter the reserve forest and take over the grazing pastures for grazing and collection of medicinal herbs. When the Sanctuary was closed the villagers were promised alternative grazing rights in the forest division of the Badrinath section. Unfortunately, even after almost 20 years this has not been done. Under the guidance of some NGOs from Dehra Dun and the local pradhan, Dhan Singh Rana, a member of Communist Party of India, this movement was launched.

Many villagers gathered at Lata village and climbed up to Lata Kharak and crossed into the core area at Dharanshi all the way to Dibrugheta intending to camp in the forest reserve and the National Park. Villages of Lata, Tolma, Reni, Paing and Bhallagaon all gathered at Dharanshi camp coming by different routes and crossed to Dibrugheta.

Many slogans were written on the rock walls and trees that 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). However, the villagers would not relent. After about a month the protest fizzled out.

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 and were ready to turn back. Finally fearing the loss of earnings, the pradhan v dropped his demands and porters agreed to work with us.

This was brought to the notice of the Minister of Tourism of Uttaranchal Government, Shri K S Fonia, during our meeting with him in Dehra Dunat the end of the expedition.

Chipko

The original Chipko movement (literally 'hug the trees") started in the village Reni which is at the confluence of the Rishi Ganga and Dhauli Ganga. Ms. Gaura Devi of Reni launched the movement in 1976 when village women embraced trees to prevent forest contractors from cutting them down. This caught the imagination of activists and conservationists and gained international attention. She was given a medal and some money. Later Sunderlal Bahuguna of Tehri Garhwal and Chander Prasad Bhatt of Gopeshwar entered the movement and took charge of it. Ms. Gaura died in 1996. Today the Chipko movement has faded and the forests are again being exploited.

Some Local Traditions

We gathered much information about local traditions in this part of Garhwal. People here are not traders and never traded with Tibet. They have been visiting the areas as far as Malari Village. They celebrate Baisakhi Mela when Goddess Nanda Devi is brought down to "Maika Room" (Mother's room) from the temple at top of the village. The celebrations last for 15 days. *Ladoos* (sweets) of phaphar are offered. A wooden peacock image is paraded in the village. Several dances like 'Gopichand' dance, 'Raja-Rani' dance 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.

F: Explanation of Place Names in 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.

Dharanshi: called Barf kini Dhar – ridge of snow.

Dibrugheta: 'Dibru'- local god. 'Gheta'- maidaan. *Maidaan* 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 were 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'.

Goddess Nanda Devi collected the blood of the devil 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 Nanda Raj 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.

Sarson 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. 'Plain where wind makes noise.'

Satkula : 'seven nala', which are to be crossed after the Dharanshi 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*"

SCEINTIFIC REPORTS

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

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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 Dhauli Ganga). Dhauli Ganga furthers confluence with Alaknanda at Vishnu Pryag in the vicinity of Joshimath. The catchment of the snow fed river like Alaknanda, Dhauli, 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 tributries of Ganga, Brahamputra 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 Himalya 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 (30^0 17' –30^0 41'N and $79^0$40' – $80^0$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 0 c and 14-240 respectively.

The catchment area of the Rishi Ganga, an eastern tributary of Dhauli 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 bamk (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 attitudinally 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 GLlMS 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 upward (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 Himalya (Table.1).

Table 1. Retreat of some Himalayan Glaciers.

Glacier	Period	Retreat
Pindari	1845-1966	2840m
Milam	1849-1957	1350m
Gangotri	1935-1976	600m
Dokriani	1980-2000	4000m

Conclusions

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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B: Ecological Findings in the Nanda Devi National Park: May-June 2001

by Rupin Dang

The IMF Expedition made a conscious effort to leave behind no trace of its movement within the Nanda Devi Biosphere Reserve (NDBR) area. All expedition garbage that was biodegradable was suitably dug into pits, whereas non-biodegradable garbage was brought back for recycling or disposal, to the roadhead. We made no expedition markings or proclamations on the rocks (as is the wont of expeditions to Nanda Devi, it appears!) or on the trunks of the ancient Silver Birch trees at the campsites (once again a terrible tradition of expeditions to Nanda Devi).

All cooking was carried out on kerosene oil that we ferried into the sanctuary. No firewood was cut nor was available deadwood used.

We gathered data and observations from a variety of points within the inner and outer sanctuary, to be able to collate this report and present the true current ecological status of the NDBR. While our porters were strictly briefed (and requested) to follow in the spirit of the expedition, there were exceptions who believed that they deserve the ultimate rights to the NDBR region, and that no Governmental ordinance or law should affect their custodianship of the area. They claim that they would continue to make their own decisions in regard to use of firewood and other forest resources. It is clear that the concerns and rights of the villagers will have to be examined in the context of future plans for the NDBR. At the same time, ecological concerns cannot be compromised in the name of village rights, and national conservation laws must apply to the entire area. While members of a certain village community can be given employment preference in future operations centered around the Nanda Devi region, they cannot be allowed to claim rights of 'personal stewardship' or ownership of such a vast tract of land. In any case, there are actually many scores of villages situated or located around the access points to the sanctuary.

Signs of ecological disturbance within the NDBR

1) At Dibrugheta alone, we came across four partial skins of what were obviously poached Musk Deer. Each skin was located either next to a large rock or a campsite on or near the Dibrugheta meadow. This was obviously due to the fact that poachers had either killed these animals on or near the meadows and brought them to the campsites to extract the musk pod and meat, or else used the meadows as a night halt, having brought the Musk Deer down from greater heights. All the skins appeared to date to the spring and post-winter period of this current year, so it is evident that regular poaching activity takes place within the NDBR, especially in the spring months when non-poacher human (read:villager) presence is altogether devoid. With the financial stakes being high, clearly Musk Deer poaching appears to be the main draw for poachers to visit the Nanda Devi region.

   Whether the poachers hail from Lata, Reni, Surainthota or other local villages is not known. However, there is always the possibility that while some poachers are local residents, the rest might come from as far away as Nepal or parts of Kumaon.

2) Village women from Lata and other nearby villages regularly make summertime visits to Dibrugheta, having crossed Dharanshi and Malatuni, in order to collect Spring Onion leaves. They come in groups of five to ten, stay on the Dibrugheta meadows for up to five days at a stretch, collecting Spring Onion (Allium humile) leaves all day, battering them on the rocks on the meadows, drying them out, and then bringing them back in large sacks. These leaves are then sold in the local hill villages, for as much as Rs. 10 to 20 per 10-50 grams. Clearly, a five day human presence (accompanied by wood fires and camping) must be a source of disturbance to the Musk Deer and Monal Pheasant on the meadow. This is also the time that most species would be breeding.

3) A large trash heap was found at the Sarsopatal camp, at an altitude of almost 15,000 feet, close to the source of the Dakhni Nanda Devi Glacier. This included discarded lead acid batteries (obviously from communications equipment), gas stoves and refillable cylinders, some twenty-five Amul cheese tins (all dating to 1992 and 1993; in an Indian Army expediton, accompanied by several scientists, was in the Sanctuary), glass bottles of beer and apple juice, fruit juice and meat cans, ketchup tins, discarded splints and other medical supplies, old expedition ironmongery, and various forms of rusting tin and metal scraps. Despite the heavily-funded and helicopter-aided (unofficial reports claim as many as 90 helicopter sorties visited the sanctuary during this last expedition, for reasons varying from personal to delivery of letters and supplies) clean-up efforts of the 1993 Army Expedition, a lot of junk appears to remain within the inner sanctuary.

4) Further extensive garbage was found at the Dibrugheta campsite (some 40 kilos of waste) dating to the fall of 2000. All of this waste was foodstuff-related (with the exception of photographic film cartons and discarded items of personal hygiene) and was of foreign origin. This waste clearly originated from a foreign expedition in the autumn of 2000.

5) By the extensive use of certain campsites and meadows, over the course of the years, the original meadow vegetation has changed on certain campsites. Wild spinach, nettles and other (generally considered) undesirable plants have established themselves in the meadow camps.

6) The large number of porters required to stock up a mountaineering expedition in the Nanda Devi region (up to 200 porters are utilized per expedition) cause the maximum impact on the mountain tracks and campsites. They invariably burn wood and create campfires, as constant monitoring is not possible. Once an expedition has been reached to the Base Camp, the porters return to their villages unaccompanied, and frequently cut wood for the fires on the way back. Even if monitoring takes place on the way up, the return journey of the porters cannot be monitored.

7) Old climbing ropes and ironmongery (especially pitons) remain in place on the more tricky rock patches along the route. While these do not pose a considerable

environmental hazard, they can be a cause of concern for future mountaineering groups that might depend on such remaining equipment from past expeditions.

8) The Bharal population seems to have come down drastically or else the population seems to have reduced its overall range within the NDBR. This could be due to the fact that this year, the entire Himalaya experienced exceptionally-low snowfall, and as a result, grass growth came about early in the spring season. Having exhausted this spring grass early in the season, it is possible that the Bharal moved to higher altitudes earlier in the year. This theory could explain the low numbers of Bharal that we saw during our expedition.

   Few sightings of Bharal were made. Two were sighted on the Devisthan ridge above our Sarsopatal camp. Two were seen above the Dakhni Nanda Devi Glacier snout, and a group of some twenty were observed en route to the Sunderdhunga Col. The low numbers can only be explained by the above reasoning, for any normal expedition to Nanda Devi ought to have seen Bharal in the hundreds. This should have been more so in our case, since we were looking for them, and occasionally climbed to over 17, 000 feet in an attempt to trace the herds.

9) Collection of herb plants continues unabated. Evidence of this is everywhere to be seen. The villagers themselves claim to venture down to Dibrugheta on a regular basis, to collect Atish, Panja, Samal, Dadsa, Kuth, Ladu, etc. Uprooted patches could be observed within the meadows, leading to a clear sign of spring season herb collection activity, by local villagers.

10) Up to Lata Kharak, village disturbances are ample. The forest department log hut at Lata Kharak top is frequented by villagers, local buffalo herders and herb collectors. There are local buffalo 'deras' which see frequent human and livestock activity.

Signs of improved conditions and overall ecological well-being

1) The population of Silver Birch trees alongside the trails and trekking routes, as well as on the paths of the trails, seems to have regenerated very well, and the growth of new saplings is extensive. Likewise, Rhododendron lepidotum and anthopogon bushes have increased in number from the days of extensive disturbance dating back to the 1970's. Juniper has increased in number, and in many places grows right across the trails.

2) Several signs of Snow Leopard activity were recorded, including spoor marks dating back to the past winter and spring as well as evidence of one kill of a Musk Deer. No sightings were made.

3) Plantlife seems to be fairly undisturbed, apart from the much-targetted herb plants and roots/tubers. Certain species seemed to have proliferated beyond expectation, but this has more to do with a decade-wise change in local flora, as opposed to the reduced human interference over the past two decades. The distribution of certain species has also come down, but once again these changes are rather subjective.

Helicopter tourism in Nanda Devi

One of the best ways of promoting tourism to the Nanda Devi region, while keeping tourist arrivals to a minimum viable number and maximizing local and state-wise earnings, on a per-tourist basis, is to encourage helicopter-based tourism options. While such an operation would be expensive, the Government can consider offering certain incentives to one or two specialized operators who are capable of running such an operation, to give the idea an impetus.

Some of the benefits of heli-tourism would include:

1) No permanent or temporary tourist operation would exist within the confines of the inner sanctuary. Visitors would make helicopter-based day-time visits to pre-determined passes and open zones on the edge of the inner sanctuary or even within the inner sanctuary, without spending a single night in the sensitive zone. Camping and overnight stays could take place at Auli or at temporary camps near Lata or Lata Kharak.

2) The state could consider imposing a heli-tax on every helicopter-based visitor coming to the region. This could be in the region of $200 per visitor per week, which would add up to a considerable sum over the course of a season.

3) Local people could get involved in heli-tourism to a far greater extent than they would as simple porters on mountaineering expeditions. They could acquire skills in helicopter maintenance, high-end tourism operations, wildlife guiding, and related tourism opportunities. The local village economy would also benefit from direct sales of local handicrafts and produce to foreign visitors and outside clients. This has been the impact of heli-skiing on the local economy in Himachal Pradesh.

4) With a top-end tourism operation or two taking place around Nanda Devi, word would quickly spread around the world, and more such high-income-earning and low-impact tourism operations would get encouraged in the region.

With the presence of one or two helicopters in the region, visiting mountaineering expeditions could also take advantage of the possibility of low-cost helicopter-based expedition material drops into the inner sanctuary. As opposed to an expedition taking along 100 or more porters to ferry expedition loads into the sanctuary, a hired helicopter could carry the entire load in two or three ferries from Lata village. The flight time for a helicopter, from Lata to Sarsopatal and back, would be barely twenty minutes. The cost would, likewise, be in the region of Rs. 25, 000 per sortie, whereas the cost of taking over 100 porters inside the sanctuary, with their related food and tentage costs, would be nearly Rs. 3 lakhs per expedition. Thus, even a few sorties at Rs. 25, 000 each would work out to being less expensive than taking along a hundred of porters. Also, the impact on the trails and the general mountain environment would be far less in the case of helicopter sorties as opposed to the ingress of a large number of porters.

Another advantage of having helicopters in the vicinity would comprise quick rescue missions for visiting mountaineering expeditions. In the event that climbers need to be evacuated from the inner sanctuary, the local helicopters can be requisitioned quickly and inexpensively.

The possibility of conducting a limited amount of winter Heli-Skiing within the outer sanctuary can also be considered. However, this would have to be studied more closely, and the stringent rules and regulations that have been put in place in Himachal Pradesh would have to be adapted to local conditions in Uttaranchal.

Other suggestions for future visiting expeditions

1) Trekking groups and mountaineering expeditions should be encouraged to bring along solar panels for their power and battery charging requirements. Generators of any sort should be banned within the sanctuary as these produce an unacceptable amount of noise and the burning of fuel for the same would add an additional negative impact on the local environment.

2) All forms of tree-felling should be banned. Lopping of branches should also be prohibited. Additionally, damage to tree trunks should be strictly banned. Previous army and ITBP expeditions, including the recent ones, have all caused untold damage to the Birch trees at Lata Kharak, Dibrugheta, lower Deodi, Ramani and Bhujgara. Deep grooves have been made within the bark of the trees, and these grooves have further deeper slashes in the form of which people have written their names on the trees.

3) All forms of markings on rocks, trees and along trails should be banned. Far too many past expeditions have left behind banners, expedition year and date proclamations and personal self-aggrandisement markers.

4) No form of biotic material should be carried away from the sanctuary. Local porters report of an incident wherein two helicopter loads of the horns of dead Bharal were carried away by an ITBP expedition in 2000, from the inner sanctuary. Whether these Bharal were also poached by the same group is not known, although claims to that effect seem to be doing the rounds among the villagers.

5) Camping grounds throughout the inner and outer sanctuary should be marked at designated spots, and camping outside these camping spots should not be allowed. There are several sensitive meadows where rare Primulas, ground Orchids and Anemones have been found to grow in profusion. These are being crushed underfoot by porters and trekkers, and by the presence of campsites on the meadows. Large-impact expeditions such as from the Army and ITBP need to be particularly mindful of this aspect.

C: Wildlife Survey Report of the Expedition to Nanda Devi National Park and Biosphere Reserve, May-June, 2001

By Anand Pendhedkar

The Nanda Devi National Park was visited by a team of 8 members along with a logistics team of nearly 80 individuals, including local guides, cooks, HAPs and porters. The survey spread from June 2-26, 2001, beginning at Lata Village and back to Lata roadhead, staggering over a period of 25 days with the intention of studying the impacts of closure on the biodiversity and species richness of the National Park region.

Overview:

Located in the Kumaon and Garhwal region of the Western Himalaya, the Nanda Devi National Park and Biosphere Reserve form an important part of the Protected Area (Biodiversity conservation) Network of the country. Identified as one of the 18 Biodiversity hotspots of the world, under the Man and Biosphere Reserve (MAB) Programme of UNESCO, Nanda Devi and its surrounding areas protect some of the best representative wildlife of the Himalayan region. It falls under the Biogeographical Province - 2.38.12, or the Himalayan Highlands, according to Rodgers and Panwar (1988). The IUCN has conferred on the park a '**1a Management Category**', which translates to a '**Strict Nature Reserve**', or an inviolate zone, whether for tourism, extraction or any other anthropogenic interference.

The Study Area:

The study area, Nanda Devi National Park falls between 30°16'-30°32'N and 79°44'-80°02'E and covers an area of 624.62sq.km, is the core zone of the Nanda Devi Biosphere Reserve. The entire basin is above 3,500m, apart from the lower Rishi Gorge, which descends to 2,100m. Nanda Devi West at 7,817m is the highest peak. The entire altitudinal range from 2500m to nearly over 5000m was surveyed for plants, birds, mammals, and lepidopterans, and was an excellent source for comparison.

Methodolgy:

The team studied ecological parameters in and around the core area of the National Park, including glacial and wildlife studies, and made *ad libitum* observations of plants, birds, butterflies and mammals, as well as collected geological samples from glaciers for analysis in laboratories. The wildlife studies had a specific focus on the past and current impacts of mountaineering activity on the biodiversity and although no detailed census or quantification techniques were used, the observations are in comparison with past species' studies and listings.

Observations and Results:

1. The closure was not total in the real sense of the word, as 4 teams moved through the core region of the National Park during the said closed period (since 1988), viz: one local expedition (the Jhapto-Chino Andolan), one clean-up campaign of

the joint Army and Scientific & Ecological Expedition in 1993, followed by another climbing expedition by the ITBP in 2000, and a team of foreign trekkers lead by Col. Kumar in 2000. The impacts of all these teams were marked and several levels of damage to the ecology have been observed during these movements through the *Sanctum sanctorum*. Marked among these, is the defacement by the ITBP team, which has left severely vandalised trees and caves. There were also burnt patches of Juniper and Birch.

2. Another observation that came to the forefront through direct observations, discussions and analysis of past scenarios was the lack of proper infrastructure for the logistics (porters') teams, which led to the burning of firewood and plant parts for warmth and cooking too, in some cases. This could also be dangerous if such fires are not controlled before leaving campsites, as was seen from some large burnt patches of forest in the buffer and lower core zone. Some instances and evidences of active Musk Deer (*Moschus chrysogaster*) poaching were seen during the study, indicating the threat of hunters, not only to the endangered Musk Deer, but also to the elusive Snow Leopard (*Uncia uncia*), the gregarious and curious Blue Sheep or the Bharal (*Pseudois nayur*).
3. Rhesus Macaques, Hanuman Langurs, Musk deer, Bharal, Himalayan Thar, Himalayan Weasel and Pika were the main mammals sighted during the study. Two bats were seen flying at Dharansi and Patalkhan camps, but their identification was not possible although they were suspected to be the Serotine;
4. One more observation that stuck out prominently was that most of the sightings of Bharal were in the higher reaches (above 16000ft), maybe due to the high temperature that prevailed during the period of study. The stream outflow was also drastically higher than was encountered in past years. However, the low level of direct sightings of mammals may also be in response to the large size of the team (touching, at the start, nearly 90 individuals) and the generally noise habit of locals, in the initial part of the trek, which passes through excellent temperate forests.
5. However, on the plus side, regeneration of plants, especially Birch (*Betula alnoides* and *Betula utilis*), Yew (*Taxus baccata*), Juniper (*Juniperus indica)* and several species of Rhododendron (R. anthopogon, R. lepidotum, R. campanulatum), as well as Himalayan Silver Fir (*Abies pindrow*) and *Salix sps.* in the upper reaches, which form the bulk of the plant biomass in the temperate, subalpine and alpine zones, was found to be very good, compared to the lack of any solid system of patrolling or policing the entire region. Plant listing activity is being undertaken, after identification of herbaria specimens, the list is well over 200sps;
6. Birdlife although not exceptionally good was rich, comparing the short stay of the team. Almost all the birds, with the exception of the larger predatory birds, such as the Lammergeier, Griffons and Eagles, most others were confirmed to be breeding in the region. A checklist of the birds seen has been attached further on (Table 1).
7. The Lepidopterans seen during the study, namely the Red and Blue Apollos and the Yellow Swallowtails, are all endangered species and yet were found in great abundance, besides the Tortoiseshell and Fritillary butterflies, which are generally common in the high Himalayan regions, in India.
8. The area seems to have an excellent potential for wildlife studying and mountaineering, if strict norms are followed and proper infrastructure is in

place. But what was marked by its absence is the lack of any extensive and elaborate – baseline study on the region. All past studies have been walk through surveys, which have very little comparability and scientific weight, especially while planning management strategies, and a long term and detailed biodiversity study spanning over several consecutive seasons (year long), and encompassing all fractions of the wildlife gamut should be undertaken immediately, before any action towards opening the place (if at all) is recommended.

Recommendations:

1. As most of the past studies have been walk through surveys, the first and most important activity to undertake, so as to develop a management strategy plan of any protected area, is to undertake a detailed and all encompassing biodiversity study. This study should cover floral studies of angiosperms and gymnosperm along with detailed listing and abundance studies of lower plant species from mosses, ferns, lichens and mushroom groups, which form the bulk of the biodiversity in temperate forests.
2. Strict regulations and a yearlong post be established at the entry points to monitor and regulate movement within the National Park.
3. Anti-poaching equipment like walkie talkie sets, climbing gear, camping gear for patrolling in winter months and ammunition to tackle hardcore hunters would be essential if effective protection has to be brought in.
4. Conservation Education and Interpretation Centres to be established at entry points like Reni, Lata, Tolma and Suraithota, so that locals and Indian or foreign visitors can interpret the wildlife value of the place and can also lead to employment to educated youth of the local populace. The training, design and development of infrastructure could be handled by Wild Life Institute (Dehra Dun);
5. Captive breeding and regeneration Centres on the lines of:
    a. High-Altitude Plant Breeding Centres at Tungnath managed by the GB Pant Institute;
    b. The Musk Deer Breeding farm at Kanchula Kharak (Kedarnath WLS), managed by the CZA;
    c. Pheasant Breeding Centre at Darlaghat WLS, HP, sponsored by World Pheasant Association (WPA);
    d. Ecology Centre and Field Station as in Valley of Flowers NP (WII)
    e. Gene Pool Quantification Centre of ZSI, BSI
    f. Ethnobiological Studies Centre
1. Establish the office of the World Heritage Site with sale of products like cards, posters, gift articles, badges, t-shits, books (Mountaineering, wildlife, popular literature on Himalaya), so that foreign tourists are attracted to visit the buffer zone as day destination from Joshimath (25km);
2. Audio visual facility at starting points so that schools, colleges and trekking groups avail of them as educational supplements (developed by WII, GOI, past climbers in the region);
3. Develop books, brochures, films, audio-visual material and literature for the conservation of the National Park;
4. Public services:

g. STD/PCO
h. Petrol Pumps
i. Helipad
j. Medical Shops
k. General/ration stores
l. Rest houses

These ventures could be sponsored by the Govt. of Uttaranchal, GMVN. Tourism Dept. and other concerned agencies.

Table 1: Checklist of Birds seen during the Nanda Devi Expedition, 2001.

Serial Number	Handbook Number	Common Name
1	188	Bearded Vulture or Lammergeier
2	180	Griffon Vulture
3	181	Himalayan Griffon
4	1933	White Eye
5	222	Kestrel
6	1884	Grey Wagtail
7	1942	Tree Sparrow
8	1927	Yellowbacked Sunbird
9	1314	Streaked Laughing Thrush
10	1990	Yellowbreasted or Himalayan Greenfinch
11	2051	Rock Bunting
12	1148	Black Bulbul
13	1799	Greenbacked Tit
14	1006	Common Myna
15	1054	Jungle Crow
16		Indian Blue Robin
17		Ultramarine Flycatcher
18		Himalayan Whistling Thrush
19	192	Pied Harrier
20	170	Greater Spotted Eagle ?
21		Spotwinged Tit
22		Winter Wren
23		Orangeflanked Bush Robin
24		Whitebrowed Bush Robin
25		Yellowbellied Fantail
26		Large Cuckoo-Shrike
27		Perigrine Falcon
28	1605	Dull Green Leaf Warbler
29		Rufousbreasted Accentor
30		Brambling
31		Monal Pheasant
32		Spotwinged Grossbeak (female)
33		Redheaded Bullfinch
34		European Goldfinch
35		Upland Pipit
36		Chestnuttailed Minla
37		Greyhooded Warbler
38		Lemonrumped Warbler

39		Blyth's Leaf Warbler
40		Crag Martin
41		Velvetfronted Nuthatch
42	1716	White-capped Redstart
43	1675	Bluefronted Redstart
44	1671	Black Redstart
45		Golden Bush Robin
46		Rufousbellied Niltava
47		Mistle Thrush
48		Chestnutbellied Rock thrush
49		Brown Dipper
50		Yellowbilled Chough
51		Common Wood Pigeon
52		Snow Pigeon
53		Himalayan Swiftlet
54		Blackthroated Tit
55		Whitethroated Tit
56		Himalayan Snowcock
57		Snow Partridge
58		Redbilled Chough
59		Whitethroated Laughing Thrush
60		Variegated Laughing Thrush
61		Striated Laughing Thrush
62		Goldenheaded Babbler ???
63		Wall Creeper
64		Horned Lark
65		Nepal Tree Creeper
66		Grey Tit
67		Redbilled Blue Magpie
68		Nutcracker
69		Grey Drongo
70		Himalayan Pied Woodpecker
71		Woodcock
72		Mishmi Wren ???