CHAPTER I

INTRODUCTION
The area investigated is part of western sub-Himalaya. Its environment, physical setting and morphological configurations, therefore, are apparently distinct from those of the peninsular India where extensive prehistoric investigations have been carried out. Viewed in this context, the prehistoric researches carried out previously on Early Man and his environment in the sub-Himalayan region as a whole, have a close relevance to the work which is being presented here.

The terrain morphology of the western sub-Himalaya is characterised by the river terraces and hills of Upper Sivalik sediments, which in the area investigated, are exposed along the course of the Sutlej and its tributaries.
Also, the whole area is known to have yielded rich mammalian fossil fauna and occasional Stone Age remains.

The study area (long. 30° 48' : 31° 48' and lat. 76° 00' : 76° 55') is located between the Śivalik Hills (maximum height 621 meters above mean sea level) in the south and the Lower Himalaya (maximum height 2133 meters above mean sea level at Kasauli) in the north (Fig. I). Within this the most outstanding morphological features are the two duns (longitudinal, flat bottom, structural valleys located between the Śivaliks and the Himalaya), namely the Pinjore-Nalagarh dun and the Soan dun. Most of the lithic sites are located in these two valleys. The first one is the valley of the stream Sirsa (long. 30° 48' : 31° 04' and lat. 76° 33': 76° 55') which rises from the Kasauli Himalaya at Thadugarh Dhar and flows for a course of 50 km before joining the Sutlej above Ropar at Chakdehra. The second dun (Soan dun) (long. 31° 15' : 31° 48' and lat. 76° 00': 76° 24') extends from Sahora to Daulatpur i.e., 75 km from the meeting point of the Soan river with the Sutlej (Sahora) till the place of origin of the Soan (Daulatpur). The Soan is the northerly or rather north-westerly stream discharging to the south and the Sirsa is the southerly or south-easterly discharging to the north. The distance between the meeting points of the two rivers with the Sutlej is 30 km. While the Soan meets the main river from the right i.e. from the Śivalik flank, the Sirsa comes down from the Himalayan front on the left.
Quaternary investigations have been conducted for over nearly a century now in the region of sub-Himalaya. Such researches pertaining to the geological and environmental events have revealed very intimate relationship between the sub-Himalaya and the Himalayan regions. In the Himalayan zone the Cenozoic Epoch is characterised by a number of significant crustal disturbances. The phase of the Himalayan orogeny which took place about the middle of Miocene period resulted in spectacular changes in the Himalayan region (Saxena, 1971). The powerful upheaval of the Himalaya converted the vast 'Tethys' into a narrow depression (foredeep) towards the south which continued to get gradually filled up throughout the subsequent geological eras by brackish and fresh-water sediments of great thickness borne down from the north. The sediments constitute the well known Sivaliks of the Indian Stratigraphy and they nearly run along the entire length of the Himalaya from northwest to southwest. The width of the Sivalik Ranges varies from 20 to 25 kilometers, and vertical thickness varies from 1800 to 2700 meters (Wadia, 1964). The Sivaliks rise abruptly from the plains, but rarely reach more than 1215 meters of elevation above mean sea level. The Sivaliks have been subjected to severe earth movements probably more than once which led to the formation of structures like folds and faults. The Sivalik hills enclose remains of a very rich mammalian fauna. Many of these fossils, especially those of hominoids, have been of crucial importance for consideration of the origin and evolution of man in this part of the Old World. Ramapithecus, who lived about 12
4 million years ago (Mio-Pliocene) in the Sivalik region, is considered so far to be the earliest member of the hominid family.

To the north, the Sivaliks abut upon the Lesser Himalayan range composed of pre-Tertiary rocks, the peaks of which often reach an elevation of 3700 to 4650 meters above mean sea level. Further inward, these are bordered by the Great Himalayan Range, the peaks of which, on an average, rise over 4860 meters. The last upheaval of the Himalaya, which is considered to have been of quite severe nature, occurred at the close of Middle Pleistocene uplifting most of the Upper Sivaliks (Wadia, 1964). From the deposits belonging to this period although no fossils of Early Man have been discovered, large quantities of stone tools recovered from the dun terraces, piedmonts and slope surfaces attest to his presence in this region. 'In a way', in the opinion of Walter A. Fairservice J., 'the lack of knowledge about the physical character of the hominids who lived in the sub-continent during the Pleistocene is not handicapping to the research (prehistoric) as one might think. The tool types that are found in abundance in the sub-continent are known elsewhere and often in association with one or another fossil form' (Fairservice, 1971).
The northwestern region of the Indian sub-continent, constituting the Himalayan mountain ranges, the sub-Himalaya (Śivaliks) and the adjoining plains, contain extensive terraces and alluvial deposits of Quaternary period. Borne down from the northern mountains, these deposits are the sediments of the major Himalayan rivers and their tributaries. Although the greater Sutlej Valley is part and parcel of this region, the area dealt with in this work lies entirely within the sub-Himalayan zone. The objective of author's investigation was to study the pre-historic complex of this sub-Himalayan valley of the Sutlej against the relevant environmental set up.

The first truly comprehensive Quaternary study of the Himalaya and the adjoining foot hills and plateaus in association with artefactual evidence was carried out by De Terra and Paterson in the Kashmir, Potwar and Jammu areas under the aegis of Yale-Cambridge Expedition of 1935 (De Terra and de Chardin, 1936; De Terra and Paterson, 1939). This study is remarkable both in its interdisciplinary
collaborative aspects as well as in the substantial results, which since then has become a standard work of reference against which all subsequent pre-historic researches in the sub-continent have been measured. Even De Terra himself used this study as a standard reference for elaborating his observations regarding the lithic culture complex in the valley of the Narmada and the Kortalayar (South India) during the course of the same expedition. Considerably later, a detailed analysis of the lithic evidences alone that were collected by this expedition from the Soan Valley was brought out by T.T. Paterson and H.J.H. Drummond (1962).

Before the work of Yale-Cambridge Expedition the first evidence of the presence of Early Man in western sub-Himalaya was recorded by Wadia (1928) and subsequently by Todd (1930). Although these evidences were in the form of cursory discoveries of occasional stone tools, they, combined with the Quaternary glaciological studies in the Himalaya carried out by Dianelli (1922), were in fact the primary stimulus for the detailed investigations planned and carried out by Chardin, De Terra and Paterson. In continuation to the work carried out in the Himalaya by Yale-Cambridge Expedition, the Italian National Council led an expedition to Karakorum in 1954. Under the aegis of this expedition P. Graziosi (1964) discovered and analysed quite a number of lithic artefacts and sites in Northwestern Punjab (Pakistan) which is another milestone in the research on Early Man in the western sub-Himalayan region and adjoining areas.
Following De Terra and Patersons' work, a number of lithic localities have been brought to light in the Indian part of the sub-Himalaya after the partition of India in 1947. The first in this direction is the investigation carried out by Olaf Prufer (1956) who accidentally discovered a number of Stone Age sites in the valley of Sirsa within Pinjore-Nalagarh dun while in search of extensions of Harappan civilization in the valley of Sutlej. D.Sen (1955) published a detailed account of his observations in the field regarding Prufer's sites, and analysed the lithic artefacts from this area, namely, around Nalagarh. Y.D.Sharma (I.A.R.*, 1954-55) of the Archaeological Survey of India picked up a few pebble tools from Daulatpur area which incidentally happens to be the first conclusive proof of the presence of Early Man in the Soan dun towards Beas river. Almost simultaneously, B.B.Lal of the Archaeological Survey of India led an expedition to the Valley of the Beas and the Banganga in Kangra (Himachal Pradesh). In his report (Lal, 1956) he had made a study of the terraces of the Banganga around Guler and tried to fix the horizons of implement-bearing deposits to some of them. Besides, he also noted the occurrence of palaeoliths at Kangra, Dehra and Dhaliara situated upstream, to the north and west of Guler. Others who have since then worked in this area include Khatri (1960), Krishnaswami(I.A.R.*, 1964), officers of the Archaeological Survey of India (I.A.R.*, *I.A.R. Indian Archaeology - a Review.
Mohapatra (1966; 1974; 1976), Mohapatra and Saroj (1968), Joshi (1970), Sankalia (1971) and Joshi et al. (1974). Hari Mohan Saroj (1974) has investigated the Jammu region between the Chenab and the Ravi which is in fact an extension of De Terra and Paterson's work in Potwar in the west and Lal's and Mohapatra's work in Kangra, in the east. He discovered sixteen sites and named various lithic industries as Jammu A, B, C and D which correspond to all the Soanian industries. In addition, he also recorded some neoliths from this area (Saroj, 1974). Joshi et al. (1975) noted the occurrence of a suspected Acheulian bifacially worked sub-triangular point on quartzite flake along with small choppers on pebbles from the Saketi area of Markanda Valley (Himachal Pradesh).

Reviewing the various investigations carried out in the sub-Himalayan region of north-western India, Joshi et al. (1978) have recommended evaluation of the Palaeolithic industries and their stratigraphy independently without tagging them with the successions as worked out by De Terra and Paterson (1939) in the Soan Valley. The reported discovery of handaxe and chopper industry from Pahalgam in the Kashmir basin in association with the derived glacial boulder clay deposit (Mindal) has evinced considerable interest in that region (Sankalia, 1971; Joshi et al. 1974).

The primary in situ position of the Palaeoliths recovered from Kangra Valley terraces is yet uncertain,
although large collections have been made during an excavation conducted on the third terrace of the Beas at Dehra Gopipur (Mohapatra, 1966). However, the collections of palaeoliths made by different scholars at different times and places in the Beas-Banganga basin show choppers as the most dominant tool-type, in which the unifacials occur in greater strength than the bifacials. The presence of unifacial choppers in large number is rather unique in the sub-Himalaya because in the Acheulian industries of India the choppers generally accompanying handaxes and cleavers are usually bifacially worked. The domination of unifacial choppers in Kangra industry, according to Joshi et al. (1978), "is either characteristic of high altitude sites or most of them are naturally flaked pebbles". In view of the fact that most of the collections made at Guler on the Banganga came from the gulleys in the steeper slopes of the terraces, Joshi et al. (1978) further suggest that the Banganga chopper group should be distinguished as a separate entity and designated as Guler industry.

However, since the tools have been collected from the terrace surface sometime developed on the Šivalik Boulder Conglomerate datable to the Mindal period, the Guler industry cannot be earlier than the later Mid-Pleistocene. Corroboration to this assessment comes from Kretzoi and Vertes (1965) who, while estimating the relative position of the Guler choppers vis-a-vis those from the Soan culture and from certain central Asian sites, have assigned the
Guler material to a stage later than the Early Soan and of the Vertesszöllős industries of Hungary (Joshi et al. 1978).

Although Sen (1955) equated the Nalagarh lithic industry with the Early Soan of West Pakistan, Mohapatra (1966, 1974a, 1976) has argued in favour of the Late Soan because of its developed characteristics both chronologically and typo-technologically. Mohapatra (1974a) in a critical survey of the entire mass of prehistoric cultural evidences from Himachal Pradesh, distinguishes this (Nalagarh) industry from that of the Beas-Banganga Valley primarily on the basis of many advanced features in technique and typology of the tools. Mohapatra (op. cit.) is inclined to consider Beas-Banganga and Sirsa Valley industries as the two industries of one and the same culture, namely the Soan, or the pebble-tool culture of the Indian Early Stone Age. The Sirsa valley industry according to him is a developed manifestation of the Beas-Banganga industry which is undoubtedly earlier in age. Therefore, he equates the Kangra valley industry with the Early Soan and that of the Pinjore-Nalagarh dun with the Late Soan. The lithic complex of the Chikni valley, adjacent to the Pinjore-Nalagarh dun, is exactly similar to that of the Sirsa valley and in view of their contiguity Mohapatra and Singh (1979) consider the former as part and parcel of the latter.

The Middle Palaeolithic (Middle Stone Age) cultural level in the sub-Himalayan region is not yet well-defined because the artefacts have been recovered from the surface to which no definite age can be assigned. While Sankalia
(1974) tends to equate the industry called Final Soan/Evolved Soan (De Terra and Paterson, 1939; Paterson and Drummond, 1962; Mohapatra, 1974a, 1976, 1979) with the Indian Middle Stone Age or Middle Palaeolithic, the persistence of the chopper elements in the sub-Himalayan region, which is rarely seen in any of the peninsular industries of the Final Pleistocene, is noteworthy.

In addition to the excavated Neolithic site of Burzahom (Kashmir), reports have also been made from Kangra Valley (Mohapatra, 1966), Pinjore-Nalagarh dun (Mohapatra, 1974b), Jammu (Saroj, 1974) and Chikni Valley (Mohapatra and Singh, 1979) regarding the presence of this Holocene culture in the western sub-Himalaya.

The preceding brief review of the pre-historic investigations carried out in the entire region of western sub-Himalaya has been presented here in order to emphasize the state of our knowledge regarding this region previous to the investigations undertaken by the present author. Critical analysis of the various lacunae in researches carried out so far and how it is planned to deal with them and how far actually has the author succeeded in this regard are being given in detail in the succeeding chapters.
As an integral part of the study of culture of man during prehistory, environmental studies of the Quaternary period are now being carried out almost everywhere. Among many factors that operated in sub-Himalayan Zone during the tenure of prehistoric cultures, several geomorphological factors have played very significant roles. For nearly a hundred years or more various geomorphological aspects of this vast stretch of submontane terrain stretching from the basin of the Indus to that of Ganga and Jamuna have been investigated in parts by several workers (Godwin-Austen, 1859, 1864; Medlicott, 1864; The-bald, 1874; Lydekker, 1883; De Terra, 1935, 1936, 1939; De Terra and Hutchinson, 1936; Sahni, 1936; Heim and Gansser, 1939; De Terra and Paterson, 1939; Wadia, 1941, 1951, 1964; Pilgrim, 1944; Gill, 1951a & b; Sen, 1955; Lal, 1956; Bose, 1961; Sahni and Khan, 1964; Sahni and Mathur, 1964; Sahni and Mohapatra, 1964; Mittre, 1966; Mohapatra, 1966, 1967; Mohapatra and Saroj, 1968; Kharkwal, 1969, Bhatia and Mathur, 1970, 1971; Joshi, 1970, 1972, 1973; Nossin, 1971; Nakata, 1972; Chaudhari, 1972;
Sharma, 1973; Halstead and Nanda, 1973 and Joshi et al., 1974, 1975). A combined study of the geomorphological research in the sub-Himalaya and the glaciological study in the Himalaya reveal close link between the two regions, although there is no doubt that individually these two regions had completely two different types of climate and biotype during the Quaternary period. Probably most relevant factor responsible for this link between the two regions is the periodic orogenic and epeirogenic movements affecting the whole of the upland area (Himalaya and sub-Himalaya) bordering the Indo-Gangetic plain. Therefore, more than one type of climates were in operation in this region during the Quaternary; for instance, the glacial, peri-glacial and monsoonal. In addition the processes of uplifting, thrusting, folding of the various lithological structures, incision, rejuvenation, headward erosion and even extinctions of various chief fluvial regimes and, last but not least, great stretches of alluviation constitute the other factors that played vital role in the terrain morphology of the region during the Quaternary.

Past researches on the various aspects of physical geology, physical geography, and geomorphology etc had been carried out by several workers from the point of view of their own problems and requirements. Although none of them has viewed the Quaternary environments of sub-Himalaya from the point of view of the prehistorian, still these works have been of immense help for the archaeologists to understand
The Quaternary Period, extending over two million years, is comprised of the last two geological epochs, namely, Pleistocene and Holocene/Recent. Since this period is also known as the Era of Man it has a special significance for the prehistorians. Amongst the important Quaternary rock units of NW India are the Upper Sivaliks (semi-lacustrine and fluvial formations), the Karewas (lacustrine, fluvial and aeolian formations), the glacial, the glacio-fluvial and purely fluvial formations. The Quaternary System in north India covers about 648,000 sq. km. a major part of which were laid as river deposits in the Middle and Inner Himalayas. There are long contemporaneous ice deposits in high altitude areas and in pockets are seen lateritic, littoral, lacustrine and subaerial accumulations (Wadia, 1964) as well. During the Pleistocene considerable changes took place on the surface as can be seen in the glacially modified topography, various glacial deposits, changes in the drainage pattern and the plant and animal life. The entire sub-Himalayan region shows monsoonal periglacial features. The impact of monsoon is considerable in this zone because of the high relief resulting generally in the huge cones, scree cover slopes, and fan deposits. The higher elevation of some of the terraces is due to tectonic activity during this period. Fluvial processes have produced the highly rolled pebbles and boulders met with in cone deposits and gravels. Most
of these deposits belonging to the distant Himalayan region, were derived from the older geological formations and subjected to fluvial action, finally deposited in the sub-Himalayan region.

The lower horizons of the Quaternary Period (Pleistocene sediments) in parts of the northwestern India are represented by the Pinjor and Boulder Conglomerate Formations of Upper Sivaliks and the older river terraces.

The foot-hill region of the Himalaya is composed of multi-cycle river terraces and alluvial fans which have resulted from the superposition of climatic changes and crustal movements. These terraces have been worked out on the basis of geomorphological studies carried out by several workers as mentioned earlier.

The high level river terraces exposed 300 to 350 m. above the stream beds, subrecent alluvia and flood plain deposits constitute the youngest deposits in the Kashmir Himalaya. Following Dainelli's (1922) scheme of the Himalayan Pleistocene glaciation on the pattern noticed in the Alps, De Terra and Paterson (1939) recognised a four-fold glacial succession in the mountains surrounding the Kashmir basin. Recently, doubts have been expressed about the four-fold division of the Quaternary glaciation in the Himalayan region. According to Porter (1970), this four-fold glacial succession delineated in Kashmir is open to criticism and suggested serious re-evaluation of the
conditions in the light of present knowledge of Quaternary process, sediments and chronology. Porter himself (op. cit.) has traced only three glaciations in the Swat Valley (Pakistan). Joshi et al., (1974) recorded from the Lidder Valley in Kashmir the same number of glacial advances as were noticed by Porter in Swat Valley. Gupta et al., (1979) while supporting the views of Porter have expressed their doubts about the four-fold subdivision of glaciation worked out by De Terra and Paterson (1939). A point worth mentioning here is that no author of the above studies has given the age/period of glaciations.

Extensive work that has been carried out in recent years in the sub-temperate parts of the Kashmir Valley (Joshi et al., 1974) and in the sub-Himalaya of northwest India (Joshi, 1970; Joshi et al., 1975; Mohapatra, 1966, 1975; Mohapatra and Singh, 1979) throws light on the development of ideas about Quaternary chronology, environment and early man's culture in this area. The terraces in the Beas Valley are best exposed along the Banganga River near Guler-Haripur in Kangra District (Lal, 1956). According to Mohapatra (1966) a succession of seven such terraces (revised to five, considering the upper two terraces as Boulder Conglomerate, Mohapatra, 1973) is encountered from little above the Guler Railway Station to the point of convergence of Banganga with Beas. Joshi (1973) has also demarcated the presence of five terraces on the Banganga River on Guler side.
In the Sirsa valley, only three terraces have been worked out by D.Sen (1955) and G.C.Mohapatra (1973). Khan (1970) has recorded four terraces of Sirsa. However, in most places demarcation between the I and II terraces is difficult. Nakata (1972) also observed four river terraces of Ghaggar River just on the other side of Pinjore - a ridge between the Ghaggar River and Pinjore-Nalagarh dun. Chopra and Singh (1975) have also suggested the presence of four terraces in Pinjore-Nalagarh dun.

Recently, in the Markanda Valley near Saketi (Himachal Pradesh) five non-paired erosional terraces have been reported at heights of 50, 30, 18, 15 and 5 meters above the present river (Joshi et al., 1975).

There now exists an impressive inventory of Himalayan gravel terraces. These terraces of Ghaggar, Sutlej, Beas, Yamuna, Giri and Tawi, etc located near the water-gaps gorges, and re-entrants at the hill-foot and plain-hill junction sites need to be studied in detail for the additional wealth of information.

Against this background of work done on the Quaternary environment of the sub-Himalayan region of northwestern India, the author undertook to investigate into the geomorphological details of the river terraces and other deposits of Sutlej Valley. The present area constituting a single alluvial terrain unit is drained chiefly by the Sutlej and its tributaries, and the investigations in the valley intend to
supplement the previously conducted investigations in the adjoining Sirsa Valley (Mohapatra, 1966, 1967, 1974a, b) and the Chikni Valley (Mohapatra & Singh, 1979).