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Large assemblages of flakes and cores found on dated young terraces of River Satluj and its tributaries

Till recently, prehistoric investigations in the Indian Siwaliks appeared to have followed the approach of De-Terra and Paterson¹ to the Soanian Palaeolithic finds from the Potwar region of Pakistan. Several technological phases were believed^{1,2} to have existed within the Soanians, which were thought to be the result of (now questioned)^{3,4} glacial and interglacial periods in the Himalayas. In the northwest sub-Himalayas or Siwaliks of India, most of the investigations during the last century took place around the rivers Ravi (H. M. Saroj, unpublished; Mohapatra⁵), Beas–Banganga^{6,7}, Satluj^{8–10}, Sirsa^{7,9}, Markanda^{11–14}, and their tributaries (Figure 1). The technological descriptions of the Indian Soanian Palaeolithic industries were also known by the names Early, Middle, Late and Evolved/Final Soan, etc.^{1,2,15}, which were several times based on meagre^{6,9} and selective¹⁰ surface collections. The Soanian industries were supposed¹⁵ to have flourished from the middle to the end of Pleistocene, but no information was available in any datable context. Though the number of flakes was known to increase in the later industries, stone-knapping was not taken as flake-intended^{9,10} and flakes were generally considered to be the necessary accompaniments of pebble-tool fabrication^{7,9}. It was also invariably claimed (H. M. Saroj, unpublished)^{1,2,15} that in the Late/Upper or Evolved Soan industries

found on younger terraces, the artefacts went on diminishing in size. The traditional Mesolithic has always been considered as absent from sub-Himalayan findings with a plea that the fine-grained raw material needed for the fabrication of microliths was not available in this region⁹. A straight transition from Palaeolithic to Neolithic has been supposed in the context of the Siwaliks of northwest India, but an argument is being forwarded that the few sub-Himalayan Neolithic sites discovered so far have now become out of bounds for future field investigations because of dam constructions or civil and military occupations¹⁵. Recently, a large assemblage of artefacts has been discovered¹⁴ in the region of River Markanda, Himachal Pradesh (HP) still expressing the need for finding the Soanian in a datable context. Apart from giving a new typo-technological interpretation to the Soanian, the flakes in the Toka assemblage¹⁴ are satisfactorily described according to the Toth classification¹⁶ based on the presence or partial/total absence of cortex on the platform or on the dorsal surface of the flake.

In light of the above-mentioned earlier investigations and interpretations of the Soanian finds, the results of field investigations made by us are presented here. These are likely to throw new light on the subject. Most of the sites found by us exist away from the sources of raw mate-

rials, and many are on the young terraces of the streams which join the River Satluj or its tributaries after cutting through the Miocene and Upper Siwalik rocks. Among about three dozen odd sites recently discovered¹⁷, many rich assemblage flake-dominant sites were found existing on the lowest depositional–erosional-type terraces of the streams. Many artefacts found from these undated terraces, though fabricated on the coarse-grained quartzite cobbles, had smoothly ground edges¹⁷. Some flake-dominant Palaeolithic sites were also reported by us¹⁸, which existed on the recently dated¹⁹ Pinjaur Dun Luhund-Khad alluvial fan surfaces, dated to 15 ka BP or so. In addition to many small-sized pebble and flake tools, this flake-dominant assemblage¹⁸ was found to possess some large-sized pebble/flake tools also. An intensive exploration was carried out further up to the point where the River Satluj emerges from the Siwalik Hills. It was found that still younger terraces of many quasi-perennial rivulets joining the Satluj on its left bank and similar terraces of Satluj itself, also possess large assemblages of flakes and cores with tools shaped on them. Absolute dates of deposition for two such implement-bearing terraces were obtained using the OSL method (N. Suresh, pers. commun.) from the luminescence dating laboratory of the Wadia Institute of Himalayan Geo-

logy, Dehradun. The quartz OSL ages were determined for samples taken from the sites in darkness. Their uranium, thorium and potassium contents were determined at the required dose rates for 90–125 μm grain size of quartz using the SAR protocol^{20,21}. These dates (Table 1) are 6.254 ka BP for the lowest terrace of River Satluj just on its left bank (site Bm/Ng-2), and 11.209 ka BP for a similar terrace of Charnganga Nala (CgN), a tributary of the Satluj, and thus provided a new lower age limit to the artefacts collected from these terrace surfaces. The artefacts collected from these dated surface sites were mostly fresh and unrolled, and were present only in the upper thin layer of the soil. Use of plough in the agricultural fields was deeper than the existence of the artefacts and their intensity was non-uniform throughout the ploughed fields as the artefacts were more concentrated at certain spots only. These spots, which also contained some weathered potsherds, could be the places of activity of prehistoric hominids, since the present day agricultural activity could not have greatly displaced the artefacts from their original positions.

The site complex found on the left bank of the stream Charnganga Nala consisted of four terraces. Terrace T_1 of this stream is about 7 m above its present bed and its topmost terrace T_4 is an interfluvial surface. Terrace T_3 (centred at $31^{\circ}17'0''\text{N}$; $76^{\circ}30'0''\text{E}$) is about 9 m below the topmost one and is nearly 250 m long, having an average width of 20 m. All these terraces (including the lowest terrace T_1 , dated by OSL method to have been laid down a little after 11 ka BP), yielded quite a good number of artefacts, with T_3 providing most of them. The quartzite raw material used for these artefacts is not locally available and could have been transported to the working places from a distance of 2–3 km. The presence of unrolled hammer-stones, fresh angular fragments, fine points, flakes with sharp edges, and tools in mint condition found without any sign of abrasion due to pluvial/fluvial actions, indicates that the artefacts were not re-deposited. This implies that certain pockets showing surface concentrations of artefacts on these terraces could have been the activity spots of hominids during prehistoric times. The site complex yielded 1207 artefacts for our collection, which contains nearly 50% flakes/flake-tools, 44% utilized/flaked specimens, the rest being the debitage. Some

hammer tools, cobble-tools with eye-like pits, semi-discoids and chopper/chopping tools were present in the utilized/flaked pieces. Stone-punches (Figure 2j), prismatic blades, a non-cortical haft-able stone-axe, and a ring-stone (Figure 2a) were also present in the assemblage. Nearly 22% of the flakes have been shaped into different tool types like blade-flakes, points, arrowheads, borers, burins, chisels and tools with lateral tangs (Figure 2m).

The second major site complex (of which the lowest tool-yielding terrace T_1 is dated to 6.25 ka BP or so) is a set of two wide terraces situated on the left bank of River Satluj, where it emerges out of the Siwaliks near Nangal-Bhakra Dam. The depositional-erosional-type terrace T_1 is about 8 m above the present bed of the Satluj. It extends from Barmla village (HP) to Nangal with a wide gap between, created by a rivulet Samteni-Khad joining the Satluj on its left bank. The upstream portion of terrace T_2 (Barmla site) is backed by Siwalik sandstone rocks and this terrace, along with T_1 , supports agricultural activity. Downstream portion of the T_1 of Satluj (site Ng-2) is spread into about 2 sq. km area and is backed by a scarp ending onto the upper terrace T_2 . Terrace T_2 bearing the site Ng-1 is 8 m

higher than the first terrace and its southern portion is now inhabited as a part of Nangal-township, with about 2 sq. km area of the terrace being under cultivation. All these terrace portions have large spreads of flakes and cores littered on them in the ploughed fields, and the artefacts (almost all fresh and unrolled) are mostly similar to those found from the site CgN mentioned above. The upper terrace (site Nangal-1) has a much greater surface density of artefacts in its southeast corner. During a one time exploration of its nearly 1200 sq. m area (centred at $30^{\circ}23'45''\text{N}$; $76^{\circ}23'31''\text{E}$), 324 artefacts visible at certain spots were collected by us. The expected number of artefacts on this terrace surface is so large that it was not worthwhile collecting all of them during more field sessions. A representative number of specimens collected from this selected surface area of ploughed fields may be deemed to give a fairly good idea about the industry. Some 108 artefacts were procured from the site Ng-2 around the position ($31^{\circ}24'01''\text{N}$; $76^{\circ}23'21.8''\text{E}$) near the northmost point of the lowest Satluj terrace, while 174 artefacts as a one-time collection, were obtained from the upstream terrace T_2 of Barmla (centred at $31^{\circ}24'17''\text{N}$;

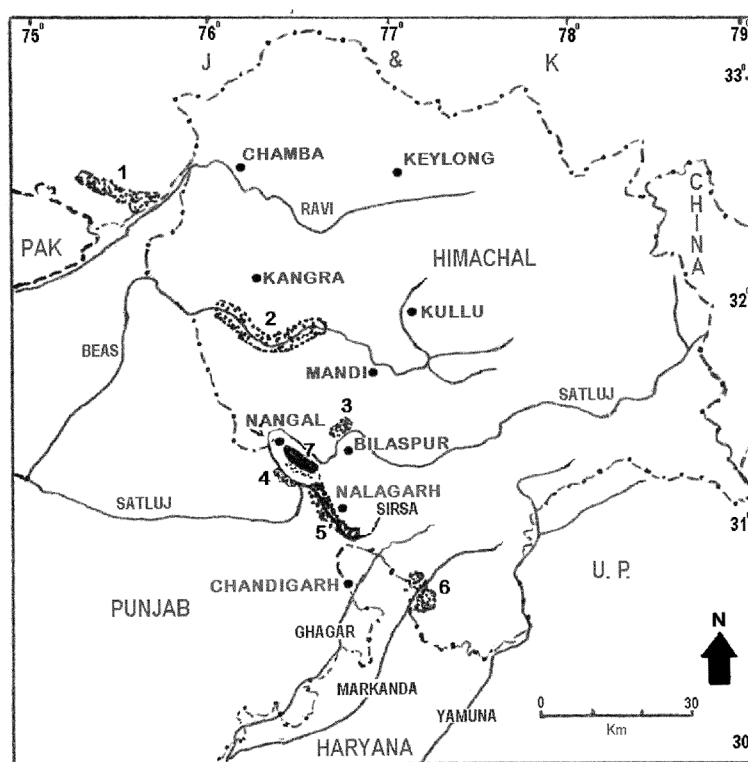


Figure 1. Map of palaeolithic sites in Indian NW sub-Himalayas. 1–6, Earlier explored regions; 7, Region explored by the present authors.

Table 1. OSL dating of sample AS-2 from site CgN and of sample AS-4 from site Bm/Ng-2. Quartz OSL ages

Sample no.	U (ppm)	Th (ppm)	K (%)	Water content (%)	Equivalent dose (Gy)	Dose rate (Gy/Ka)	Age (Ka BP)
AS-2	1.1 ± 0.1	8.5 ± 0.85	1.46 ± 0.15	0.44	28.27 ± 4.99	2.522 ± 0.163	11.209 ± 2.107
AS-4	2.3 ± 0.23	18.6 ± 1.86	1.75 ± 0.17	0.90	23.98 ± 2.89	3.834 ± 0.231	6.254 ± 0.842

Material used, Quartz with grain-size: 90–125 µm. Method, SAR protocol²¹.

76°23'36"E). A total of 606 artefacts recovered from the Nangal/Barmala site complex contain many casual cores and core-fragments, but a large number of partly flaked, utilized and battered cobbles including sub-globular cores are also found here in good numbers. The total Ng/Bm assemblage contains about 32% flaked/utilized pieces and 62% constitutes detached pieces. Among the detached specimens, about 92% constitutes flakes and flake-tools, while the rest is debitage. There are cobble-tools with eye-like pits (Figure 2d), stone-punches, sling balls (Figure 2h), pointed unifacial cores (Figure 2f), utilized cores and many flake-tools shaped on different Toth-type flakes¹⁶.

Most of the core forms found from both the site complexes probably are the simple by-products of flake manufacture rather than representations of stylistic norms. It is also worth noting that the representation of chopper/chopping tools on these young terraces is quite small (3.1% in CgN and 3.6% in Ng/Bm assemblage). This indicates that the flakes here were not just the necessary accompaniments of the chopper/chopping tool manufacture as was maintained by some earlier workers^{7,9}. Most of the flakes in this industry were meant for utilization or for making flake-tools, and the slightly flaked and battered/utilized cobbles appear to have been used for pounding actions. The discovery of large-sized core and flake-tools (Figure 2b, c, e and f) from these young dated terraces shows that there was no diminution of tool types in the younger Soanian Stone Age industries as was considered earlier¹⁵.

This typical 'flake and core' industry has yielded stone artefacts of the Palaeolithic and post-Palaeolithic typologies that prevailed here up to some time after 6 ka BP, according to the age now determined (Table 1) of one lowest implement-bearing terrace. The flakes, cores and tools manufactured on them bearing similarities with Palaeolithic to Meso/Neolithic stages, were probably parts of a 'single industry' then flourishing in the sub-Himalayas, whose absolute time-span may be deter-

mined by future research. Although till now the Mesolithic and Neolithic industries of the Holocene era, like those of Baluchistan, western Rajasthan, the Ganga Plain, north-central India, Kashmir, and Nepal, all having some regional characters have been discovered all around^{22,23}, this 'flake and core' industry may also be considered to possess its own regional

character as is manifest by the typotechnology of the artefacts and age of the sites revealed in this study. Till recently, studies^{4,22} about population dispersal during Meso/Neolithic times remained confined only to regions barring the NW sub-Himalayas. This newly identified flake-dominant Stone Age industry after mid-Holocene will provide a new ethno-

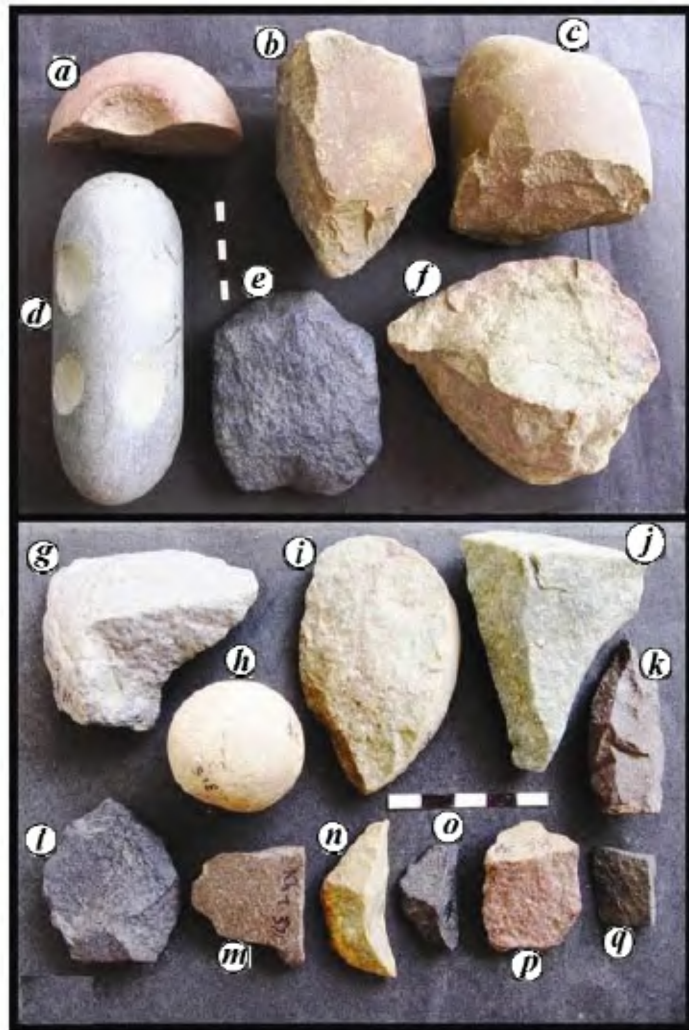


Figure 2. Some artefacts from CgN and Ng/Bm sites. **a**, Ring stone; **b**, Battered nosed core; **c**, Battered unifacial end-chopper; **d**, Cobble-tool with several eye-like pits all around; **e**, Toth type-4 flake retouched to side and end scraper; **f**, Unifacial core shaped to point; **g**, Lateral tang on a point; **h**, Partly ground sling ball; **i**, Point on type-2 flake; **j**, Stone-punch with cortical head; **k**, Arrow head on type-3 flake; **l**, Levallois-like point on type-3 flake; **m**, Fan-like flake with tang; **n**, Unifacial lunate; **o**, Non-cortical lunate; **p**, Broad blade on type-3 flake; **q**, Unifacial prismatic bladelet.

SCIENTIFIC CORRESPONDENCE

graphic understanding regarding the study of the prehistory of this region from Palaeolithic to Chalcolithic times.

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