

SPATIAL STRUCTURE OF RURAL POPULATION IN CHAMOLI DISTRICT (UTTRAKHAND HIMALAYA)

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ABSTRACT

The Himalaya mountainous regions under low density of population is considered as thinly populated areas. On the contrary three dimensional surface of mountains with highly variable geological structure and lithology has resulted into highly variable surface configuration leading to uneven distribution of land resources. Variability of altitude, slope and slope aspect have created heterogeneous environmental conditions giving way to highly diversified spatial structure of population. There is need to understand different aspects of mountain demography as a component of the geographical knowledge of the Himalaya. Present paper deals with different dimensions of population in Chamoli district of Uttarakhand State. Study is based on 1981 and 2001 censuses utilizing village level data. Average arithmetic density is 37.7 person per square km but at Nyaya Panchayat level 18.7 percent rural population of district maintains density above 300 person. Similarly, physiological density is two fold of Indian average. Distribution of population show variability in horizontal and vertical dimensions both. The main valley of Alaknanda river observes 30 percent fall in density at 400 m interval upto 2000 m and above which the rate of decrease doubles. During last two consecutive censuses, decennial population growth has dropped to 13.5 percent per decade in 1991-2001 from 21.97 percent in 1981-91. Average female sex ratio of Chamoli district in 2001 was 1017 females per thousand males and it has experienced negative and positive changes during 1981-2001. Census 2001 registered 18.5 percent rural population among scheduled castes which has increased by 1.5 percent from 1961 level. On account of its situation in the interior of Himalaya. Chamoli district experienced delayed development and the impact of recent development is reflected on the various component of population and their changing direction.

Key words: *Density of population, Growth, Sex-Ratio, Settlement, Distribution.*

The ecosystem of the Himalaya is largely governed by the natural vegetation and population (Human & Animal). Although, the physical grandeur of the Himalayan landscape is popularly visualized through towering snow clad peaks, glaciers, deep gorges and forests but population factor makes it living, transforming and graceful. It is the population factor that makes the Himalaya distinguishable from other mountains of the world. The mountainous area of Japan carries population density below one person/m² against 104.5 person/m² of the Himalaya (Kumar, et.al, 2007). Such high density in itself becomes vulnerable factor in the ecosystem stability of this unique landscape of the

earth. Manifestations of high density of population are noticed in almost every aspect of physical, floral, demographic and social facets of the Himalaya.

In macro view, the Himalaya is a fragile and thinly populated forest dominated region of South Asia but it carries pockets/belts of swarming humanity exceeding the carrying capacity of local resource base. With the expanding knowledge of the less known areas of India, it becomes imperative to analyze various geographical dimensions of the Himalaya including demographic structure and its changing direction. Present paper seeks to undertake the analysis of the different components of population in the regional background of Chamoli District of Uttarakhand state based on 1981-2001 census data.

Study Area- Chamoli district occupying upper catchment of the Alaknanda river spreads over 8476 km² area extending between 29°55'-31°05' N and 79°05'-80°06' E. Chamoli district represents high altitude environment of Great Himalaya and Inner Lesser Himalaya region of the Himalaya. Altitudinally, Chamoli district negotiate, vertical fall of more than 7000 m (7817-600m) with 59.6 percent of geographical area situated above 3000 m (Bist and Gandhi 2006) and in the remaining area forests account for 65.0 percent area leaving just 14.1 percent of geographical area for direct population related activities. Availability of land for human settlement and agrarian economy is highly perched over gentle slopes below 3000 m Terrain is highly dissected and landscape organized into catchments of streams of different orders (Alaknanda, 8th order) joining the master stream on the right and left bank.

Methodology- Census 2001 enumerated 370359 person in 1166 villages and six towns. Only 13.7 percent population is urban. Study is based on organization of census village data of the district into Nyaya Panchayats (village council) which numbers 39 (Fig. 1). Population size of Nyaya Panchayats (NPs) vary between 2103 persons (Malari) and 18918 persons (Tharali) but most of them confine to 8-10000 persons. Most of the analysis is based on 2001 census and the components of population dynamics have been inferred on the basis of 1971-81 and 2001 census. Analysis is based on arithmetic averages and percentages.

Distribution of Population- Heterogeneity of the Himalayan environment and terrain in particular has given way to highly uneven distribution of population in Chamoli district. Mountain landscape is organized into river basins, catchments and watershed of the

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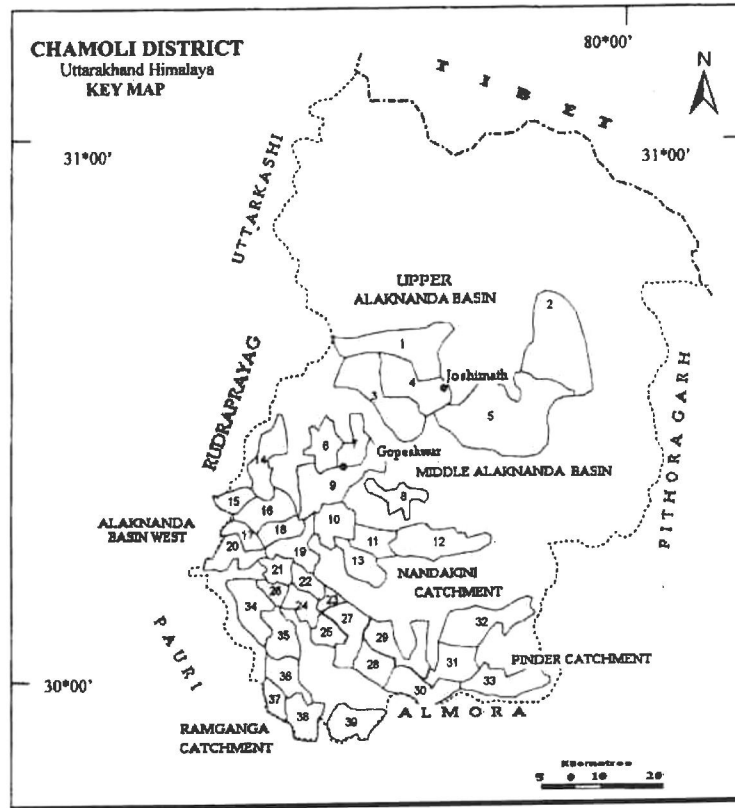


Fig. 1: NYAYA PANCHYATS OF CHAMOLI DISTRICT

Upper Alaknanda Basin-1-Pandukeshwar,2-Helang,3-Degatpol,4-Tapovan,5-Malari Middle Alaknanda Basin- 6-Boirangana,7-Chhinka,8-Gadora,9-Maithana Nandakini Catchment- 10-Chal, 11-Farkhet,12-Bura,13-Ghat, Alaknanda Basin West- 14-Kimotha,15-Thailbair,16-Pokhri,17-Bamnoth,18-Girsa,19-Sonla Pinder Catchment- 20- Gaucher,21-Simli,22-Kandara-23-Jakh-Patsu,24-Thapli,25-Bhagoli,26-Nauti, 27-Nrayanbagar,28-Harmani,29-Tharali,30-Bainoli,31-Dewal, 32-Mundoli,33-Andar Ramganga Catchment-34-Dewalkot,35-Adibadri,36-Gairsain,37-Rohira, 38-Mehalchauri,39-Maithan.

Table- 1. Arithmetic density of rural population, 2001(Nyaya panchayat unit)

Person per Sq. km	Percentage of Rural Population	
	2001	1981
Below 25	6.4	4.2
25-75	9.5	6.5
75-150	17.4	55.0
150-225	40.8	22.8
225-300	13.2	6.6
Above 300	18.7	4.9

Source: Anita (1989), Geographical Study of Population in Chamoli District, Unpublished D.Phil. Thesis, H.N.B.G.U., Srinagar Garhwal and Census 2001, CD

streams of different order. Clustering of population is superimposed on the pockets favourable slopes below Crop (agriculture) Line (2400 m). Population appears to cling with river like beads to a rosary (Nand & Kumar, 1989). In the upper valley of the Alaknanda, population distribution is sparse but in large size of Bhotia settlements. On the other hand main tributary Pindar river shows relatively closer distribution but in smaller size of settlements. The glaciated terrain of the main (Dhaul) valley permitted siting of large settlements but tributaries favoured patchy and sparse distribution. Although, average size of rural settlement in 2001 has been 274 persons but it varied between 170 in the NPs of lower valley region, 502 in Pandukeshwar NP in Vishnuganga valley, 438 in Tapovan and 409 in Bainoli. Change in the size of settlement is not gradual but fluctuates in response to the habitability factor of terrain. Below Vishnuprayag, there is a sudden drop in the population size of settlement to 172 in Helang NP from 438 in Tapowan.

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Location of Urban population is influenced by the river confluences (Vishnuprayag, Karanprayag, Nandprayag) while district headquarter. Gopeshwar is situated on spur. Badarinath and Gauchar are valley towns. Process of urbanization is very weak and towns grows in response to the developmental needs under patronage of the government. As the result administrative – educational impact is overwhelming.

Density of Population- In absence of refined measure of population pressure, the density of population continues to be workable measure of the variability of land-man relationship. The mountain areas are confronted with the problem of density controversy as sizeable proportion of land does not contribute to the subsistence of man directly or indirectly. The absolute of Land –Man relationship gives a rural density of 37.7 Person/m² for the district but density on NPs based revenue area comes to 136.2 Person/m². There is a marginal utility of forest fringe land for fuel and fodder but density on revenue area has more meaningful expressions about the state of population pressure in Chamoli district. Table 1 displays wide range of rural population density ranging from below 25 Person/m² to above 300 Person/m². Distribution population density appears to follow the availability to gentle slopes as per sequence of fluvial landforms in the high altitude environment.

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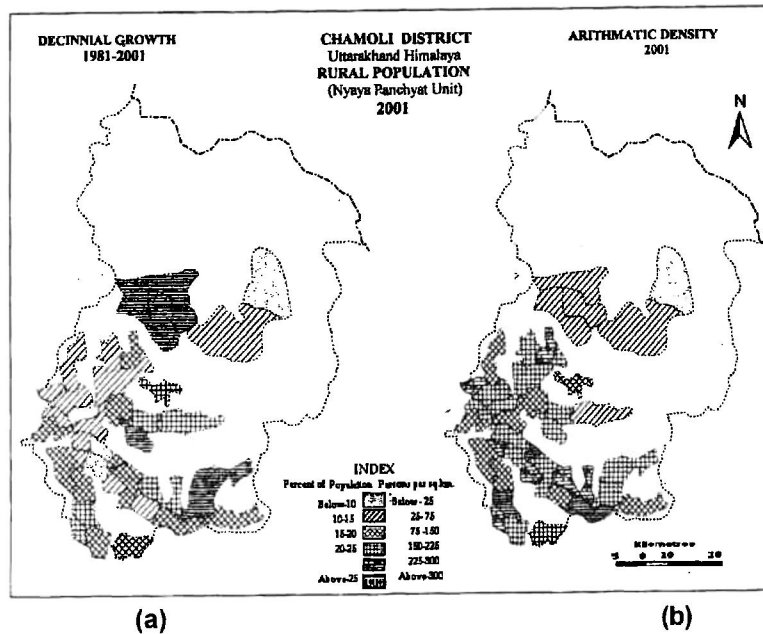


Fig- 2 Rural Population & Chamoli District

Table- 2. Hypsometric Distribution Of Population, 1981

River Basin	Below 1200 m	1200-1600 m	1600-2000 m	2000-2400 m	2400-2800 m
Alaknanda	362	245	178	46.7	26.1
Nandakini	162	110	119	47.6	21.6
Pinder	76	173	108	20.1	5.6
Dhaulī	-	-	20.	39.5	21.5
Birahi	74	176	59.	21.1	7.5

Source: Anita (1989), Geographical Study of Population in Chamoli District, Unpublished D.Phil. Thesis, H.N.B.G.U., Srinagar Garhwal and Census CD, 2001

Table- 3. Spatial Aspect of Rural Population Growth (1981-2001)

Growth Category	Percent Population, 2001
Below 10%	6.37
10-15	25.76
15-20	30.91
20-25	23.23
Above 25	13.57
Growth of Urban Population	
Below 30%	Joshimath, Nandprayag
30-40%	Karanprayag
Above 40%	Gopeshwar, Gauchar

Source: Anita (1989), Geographical Study of Population in Chamoli District, Unpublished D.Phil. Thesis, H.N.B.G.U., Srinagar Garhwal and Census CD, 2001

High density above 300 Person/m² is quite unusual at the current resource availability status of the area under study. All the NPs in high density category inflate their density under weight of unclassified urban centers. Deval, Tharali and Gairsain (proposed capital of Uttarakhand) are noteworthy market centers of southern Chamoli district and have shoot up the rural density of their respective NPs and also the adjoining ones (Fig.2). After classification of such market centers town the rural density falls as illustrated by Gauchar (170 Person/m²) NP. Rural density of population in Himalaya lacks comparability with other parts of the country because revenue area in the Himalayan villages carry large unproductive area under steep slopes, barren wastes, degraded forests-scrub land and landslip etc. Average physiological density of Chamoli district (1013) is just double of India (559). These differences need to be visualized in view of irrigability (Chamoli 4.8, India 40 percent), mechanization, Crop diversification as well as relative impact of Green, White revolutions and industrialization in the two areas. Considering the impact of all these factors the population pressure as represented by physiological density in the region is more than three fold of national average (Nand & Kumar, 1989).

Three dimensional surface of the Himalyan territory demand analysis of population distribution with reference to the variability of altitude. Formerly Niti was the largest and highest settlement of Uttarakhand and Chamoli district as well but after the termination of Tibetans trade this village began deserted (98 Person, 2001) and Malari (3020 m) with seasonal population of 434 gained status of largest and highest settlement. Village level distribution of rural population at 40 m interval of altitude carried out for D. Phil. (Anita, 1989) work based on 1981 census. Table 2 shows clear impact of altitude on the distribution of population. Although, there is general decrease in density with the increase of altitude but the main stream and the tributaries show contrasting pattern due to relative location of workable slopes for agriculture with reference to altitude. In Alaknanda basin population density falls by 30-35 percent with each increase of 400 m in altitude upto 2000 m. Drop is maximum (75 percent) in 2000- 2400 m zone as this zone mark transition between permanent and seasonal settlements. On the other hand Pindar and Birahi Rivers depict lower densities in the zone below 1200 m due to gradually narrowing of valley towards outlet. At the same time density in 1200-2000 m zone falls by 30-40 percent with the successive lower stream order of the catchments.

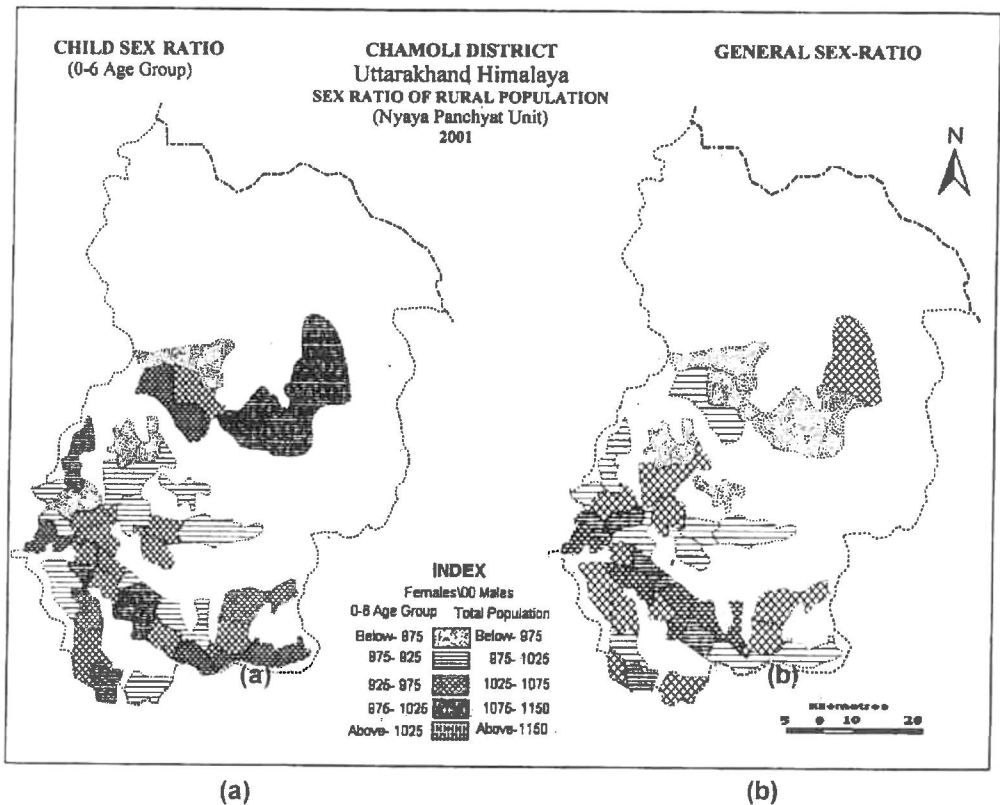


Fig.- 3 : Chamoli District: Sex ratio of Rural population (2001)

Table 4 Changing Pattern of Sex Ratios (1981-2001)

Females per thousand Males

Increase in Sex Ratio

Percent of Rural Population

Below 25	4.55
25-50	22.23
Above 50	3.77
No Change	12.23

Decrease in Sex Ratio

Percent of Rural Population

Below 25	15.15
25-50	18.72
50-125	19.62
Above 125	3.73

Source: Anita (1989), Geographical Study of Population in Chamoli District, Unpublished D.Phil. Thesis, H.N.B.G.U., Srinagar Garhwal and Census 2001, CD.

Redistribution of Densities (1981-2001)-Table 1 depicts the distribution of population in same density categories at the span of two decades. Impact of population growth (17.6) during last two decades is visible on the redistribution of population share. This growth could not make significant change in low density category but the 75-150 Person/m² density, which represented 55 percent population in 1981, reduced its share to one third. As a consequence of this change 150-225 Person/m² density has been the gainer of population share from 22.8 percent in 1981 to 40.8 percent in 2001. The higher density category carried 32.9 percent population in 2001 census against 11.5 percent in 1981.

Growth of Population- Change in population structure of a region are consequent on the pattern of decennial population growth. Total population of Chamoli district recorded average decennial growth of 17.6 percent during 1981-2001 with wide inter-decade variations. It dropped to 13.5 percent in 1991-2001 from 21.97 percent during 1981-91. Rural population growth accounted only 10.0 percent decennial growth against 22.3 percent growth in urban population. This fall in growth of rural population is a mixed response of falling birth rate and change in the mode of rural out-migration both. Distribution of the pattern of rural population growth (1991-2001) and female sex ratio may explain the spatial behaviour growth. Seasonal settlements of Malari NP in Upper Dhauri Valley have recorded a decrease of 38.5 percent in their population under influence of ongoing process of shifting population to lower altitude after termination of Tibetan trade. Low population growth in 10-15, 15-20 percent category is represented by 25.8 and 30.9 percent of rural population (2001) respectively. Main Alaknanda valley and lower Pindar-Ramganga valleys represent low population growth (Fig. 2b). Early settlements and developed means of communication and easy accessibility of these areas has initiated systematic rural out migration from these areas resulting low low population growth of 11.5 and 20.2 percent of during 1961-71 and 1971-81 respectively.

High growth above 20 percent is characteristic of NPs around Joshimath town in Alaknanda basin and the upper catchments of tributaries (Birahi, Nandakini and Pindar) where pace of out-migration is yet to gain momentum under impact of education and modernization. Besides developing market centers of semi-urban status have been helpful in boosting population growth of parent NPs in this category of growth.

On the contrary urban population is beneficiary of rural out-migration and maintaining a steady growth. District Hq. Gopeshwar has maintained average growth of 43.5 percent per decade and Gauchar following it closely. These towns have become

preferred destination of return migrants.

Sex Ratio- In the population structure of the Himalaya sex ratio is the most dynamic element of regional synthesis. The distribution of two sexes shows wide spacio-temporal variations. Change in the human resource factors (education, employment, opportunities) of the various localities during consecutive censuses resulted in variable mobility of male population. Density pattern in the middle of 20th century could find some relationship with present day growth and sex ratio patterns. If we may exclude the role of factors other than sex ratio (high) appears to be complimentary of rural population growth (low). Census 2001 gives 1017 females per thousand males as the average sex ratio of total population of Chamoli district while Child population (0-6 age group) registered corresponding figures of 935. On the other hand rural population registering sex ratio of 1073 becomes interesting and meaningful tool of regional analysis. At NP level Pandukeshwar represents lowest figures of 693 and Mehal Chauri highest sex ratio of 1267 females per thousand males. There is no definite spatial pattern of sex ratio distribution and it goes on changing with the level of development and modernization. Upper catchments of tributaries show a tendency towards average sex ratio of the district as represented by Bura (1042), Nauti (1087), Deval (1060), and Gairsain (1073) NPs. On the other hand high SR are characteristics of lower valleys (Fig. 3a), where population pressure on primary resources has exceeded the sustainable level of mountain environment and male population set on move. Gauchar (1224), Jakh-Patsu (1249) and Narayanbagar etc. NPs represent high sex ratios.

Changing Pattern of sex ratio- In response to the changing socio-economic opportunities (education, employment etc.) sex ratios oscillate from one census to the other. At the entry level of out-migrants sex ratios moves up and these sink by return out-migrants. Both negative and positive changes in sex ratios are observed simultaneously. Only 12.2 percent population of the district maintained status quo and 30.6 percent rural population registered positive change. Remaining 57.25 percent population portrayed tendency of decrease in sex ratio. During last five census, Chamoli district recorded quite high (1073-1108) sex ratio except 1991 (1029). Extreme sex ratio of 1961 (1108) remained nearly stable (1087-1090) during 1971-81. Maximum change in sex ratio is observed in Dhauli valley, where Pandukeshwar (137), Malari (140) experienced fall in sex ratios in accordance with the decreasing tendency of transhumance to Dummer settlements while Tapovan (1114) and Helang NPs have recorded same

level growth in their sex ratio. Nauti and Simili NPs have experienced steady fall in sex ratio.

Developing Market centers within NPs mark steep decline in early stage and later on remain stable under impact of local in-migration from adjoining NPs for business or permanent stay. Besides, general fall in sex-ratios is due to change in pattern of male dominated migration to family type migration which effects sex-ratios in early stage of migrations only.

Scheduled Caste Population- The impact of low population growth under influence of rural out- migration from Chamoli district is observed on the proportion of Scheduled caste population. Census 2001 registered 18.5 percent scheduled caste population. It was 17.3 in 1981 and 16.99 percent in 1961 census. The increasing proportion of scheduled caste population over general population carry the influence of higher fertility rates among scheduled castes on one hand and relatively higher rate of out-migration in general population. During 1971-91 scheduled castes population of the district registered at a growth of 27.5 percent per decade against the 24.1 percent growth of general population. Although, the relative influence of the fertility differential and out-migration is not established but fact remains the increasing share of scheduled castes in rural population of Chamoli district. The distributional characteristics show contrasting patterns.

A spatial characteristic of scheduled caste population has been depicted in Fig. 3b and Table 4. A glance at Fig. 3b explains the regional influence on the distributional and changes of scheduled caste population in Chamoli district. Three different pattern of spatial association emerged. Historians believe about the aboriginal elements among scheduled castes and their concentration is likely to occur in the interiors of tributary valleys. Gadora, Chal and Ander NPs in the interiors of the tributaries support this view where high incidence of scheduled castes is associated with their high population growth. Second pattern evolved out of the union of out-migration (high sex ratio) and high incidence of scheduled castes. NPs in the middle valley of the Pindar river (Thapli, Jakh-Patsu, Bhagoli, Narayanbagar) display moderate level concentration of scheduled castes. Continued out-migration of Brahmin and Rajputs from these areas resulted in relative concentration of scheduled castes population. On the other hand densely populated gently sloping main valleys (Lower Alaknanda and Upper Ramganga- Lobha

Table- 5. Distribution Of Scheduled Castes Population And Changing Pattern, 2001

Percentage of Scheduled Castes, 2001	Percentage of Rural Population, 2001
Below 10	4.09
10-15	23.14
15-20	35.19
20-25	27.23
Above 25	10.35

Changes in Scheduled Castes Population, 1981-2001 Percentage of Rural Population

Below 1 Percent	11.05
1-2	19.0
2-5	30.29
Above 5	3.79
Negative Changes	35.71

Source: Anita (1989), Geographical Study of Population in Chamoli District, Unpublished D.Phil. Thesis, H.N.B.G.U., Srinagar Garhwal and Census CD, 2001.

Valley) represent the third pattern where low percentage of scheduled castes co-exist with low growth of population. These appears to be the potential areas from where scheduled caste population migrated to interior valleys in the past but they equally participate in the livelihood oriented migration in correspondence to the general population of these areas.

Conclusion-Although Chamoli district represents just two percent areas and one percent population of the Himalaya but it portrays various dimensions of the spatial population structure of high mountain environment. Rivers are rightly called as lifeline of mountains because physical and cultural processes find integrated in the catchments of drainage basins. Different components of population distributions evolved by the inter-action of physical and cultural factors in the past are now under going transformation due to dominance of developmental and modernization processes in spatial patterning. The upper catchment of Alaknanda river (Dhaulti valley) is experiencing withdrawal of population due to termination of Tibetan trade and the Lower Alaknanda basin is also witnessing decreasing tendency of population growth under impact of out-migration. High sex ratios resulted from out-migration is characteristics features of mountains and other areas professing subsistence agricultural economy. Lower valleys under relatively

high concentration of population are responding to migration as measure of survival under precarious living conditions and sex ratios are inflated in census figures. Migration (high sex ratio) has become such an active agent of demographic metamorphism affecting the distribution and dominance of scheduled castes. The middle part of Alaknanda basin favoured clustering of population in the early period for favourable condition of accessibility and moderate relief, etc. On the same ground these areas took lead in transforming the demographic structure through out-migration.

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