

HIGH-ALTITUDE TIBETAN POPULATIONS IN THE REMOTE HIMALAYA: SOCIAL TRANSFORMATION AND ITS DEMOGRAPHIC, ECONOMIC, AND ECOLOGICAL CONSEQUENCES

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ABSTRACT The fragility of high mountain systems, their sensitivity to even small disturbances, and the tendency of such disturbances to be irreversible, have focused scientific and developmental attention onto the deteriorating physical environment in mountain areas such as the Himalaya. While this focus is obviously important, it has tended to obscure an equally critical dimension of the problem namely, the social environment.

Despite the remoteness and apparent traditionalism of Tibetan populations inhabiting the high mountain areas of the Himalaya, in reality, these groups have either undergone or are now undergoing a major transformation of their social structure. This paper examines the manner in which this transformation has occurred. It argues that the traditional social adaptation was as fragile as the mountain environment itself and discusses the manner in which fraternal polyandry (two or more brothers sharing a wife), the traditional Tibetan marriage and family system, was an adaptation to an encapsulated environment. It then demonstrates the manner in which a variety of different exogenous influences have unintentionally de-encapsulated this environment and undermined the traditional system. Ladakh in India and Limi in northwestern Nepal are used to illustrate different stages of this process of social transformation and some of its demographic, ecological, and economic consequences.

RÉSUMÉ *Populations tibétaines de grande altitude dans les parties reculées de l'Himalaya: transformation sociale et ses conséquences démographiques, économiques et écologiques.* La fragilité des systèmes de haute montagne et leur sensibilité aux moindres perturbations, dont les conséquences sont souvent irréversibles, concentrent aujourd'hui l'attention des milieux scientifiques et des organismes d'aménagement sur la détérioration physique en cours dans les milieux naturels montagnards tels que l'Himalaya. Cet intérêt est certes important, mais il a pour résultat de reléguer au second plan un autre aspect, pourtant tout aussi décisif, du problème: le milieu social.

Malgré l'isolement et le traditionalisme apparent des communautés tibétaines qui habitent les régions himalayennes de haute montagne, une transformation profonde vient en fait d'avoir lieu, ou est en train de se dérouler, dans la structure sociale de ces groupes. Cet article examine les modalités de cette transformation. Il démontre que l'adaptation sociale traditionnelle était tout aussi fragile que le milieu montagnard naturel, et discute la polyandrie fraternelle (où plusieurs frères se partagent une seule femme), qui représente le système matrimonial et familial tibétain traditionnel, en tant qu'adaptation à un milieu naturel "capsulé," à potentiel de production fini. Il décrit ensuite comment de nombreuses influences exogènes diverses ont involontairement décapsulé ce milieu et sapé le système traditionnel. Le district indien de Ladakh, et Limi, dans la partie nord-ouest du Népal, ont été choisies pour illustrer les divers stades de ce processus de transformation sociale et quelques-unes de ses conséquences démographiques, écologiques et économiques.

ZUSAMMENFASSUNG *Tibetische Hochgebirgsvölker in abgelegenen Teilen des Himalaya: Umschichtung der sozialen Struktur und daraus folgende Konsequenzen für Bevölkerung, Umwelt und Wirtschaft.* Die Anfälligkeit des Hochgebirges, seine Empfindlichkeit selbst gegen kleine Störungen, und die Tendenz, daß solche Störungen meistens nicht rückgängig zu machen sind, haben die wissenschaftliche und entwicklungsgeschichtliche Aufmerksamkeit auf die schlechter werdenden Umweltbedingungen solcher Gebirgsgegenden wie z.B. den Himalaya, gelenkt.

Zweifelloos ist diese Beachtung wichtig, aber sie kann einen ebenso kritischen Aspekt, nämlich den der sozialen Struktur, verschleiern. Tatsächlich hat eine beträchtliche Veränderung der gesellschaftlichen Ordnung der tibetischen Bevölkerung, die im Himalaya wohnt, bereits stattgefunden, trotz der Abgeschiedenheit und des offensichtlich traditionellen Lebensstils dieser Gruppen. Die vorliegende Veröffentlichung untersucht in welcher Form diese Umgestaltung vorgegangen ist. Sie erörtert, daß die überlieferte, soziale Anpassung ebenso zerbrechlich war wie die gebirgige Umwelt selber. Die Ursache der Polyandrie (bei der mehrere Brüder eine Frau teilen), die das traditionelle Ehe- und Familiensystem ist, wird als Anpassung an den abgekapselten Lebensraum erklärt. In der Folge werden verschiedene, äußere Einflüsse aufgezeigt, die unbeabsichtigt diese Abkapselung sprengten, und damit das überlieferte System untergruben.

Ladakh in Indien und Limi im Nordwesten Nepals werden als Beispiele angeführt, um verschiedene Stufen im Prozess der sozialen Umschichtung und die daraus folgenden Konsequenzen für die Bevölkerung, Umwelt und Wirtschaft aufzuzeigen.

INTRODUCTION

The emergence and sustenance of a sophisticated civilization for 1,500 years in the harsh and frigid high-altitude region of the Himalaya and Tibet represents one of the great victories of human adaptation to an extreme environment. This successful human-environment relationship is all the more impressive when we consider the extreme sensitivity of mountain systems to even small disturbances and the tendency for such disturbances to be irreversible (Unesco, 1974; MAB Series 14). Unfortunately, however, the ecosystem homeostasis that traditionally characterized the Tibeto-Himalayan area is breaking down as a result of a variety of exogenic changes. The spectre of ever-increasing environmental deterioration looms large.

The attention raised by this situation, not surprisingly, has focused on the physical environment and on such problems as soil erosion, the elimination of forest cover, and the overuse of pasture areas. While this focus is important and necessary, a different, and perhaps more

basic, dimension of the problem—the social dislocation deriving from the indirect impact of modernization in these areas—has not received adequate attention. This paper suggests that the traditional Tibetan social adaptation was no less fragile than the physical environment and that the impact of modernization in areas adjacent to the Tibeto-Himalayan region has dramatically transformed the social structure of the high-altitude inhabitants, altering irreversibly the traditional homeostasis and fostering many of the present-day problems.

The adaptation of Tibetans to the high-altitude environment of the Himalaya and Tibet has involved the cultivation of cereal grains and the husbandry of bovines and ovines. Although it is extremely difficult to generalize for the entire geographic area, it is possible to delineate a high-altitude arid zone and to characterize the traditional socio-economic organization found there as an adaptation to what is here termed environmental encapsulation.

AN ENCAPSULATED ENVIRONMENT

Encapsulation refers to a situation in which the potential for increased production of energy by agricultural exploitation of new areas and by internal intensification of production is virtually nil. Unlike most of the monsoonal parts of the Himalaya, cultivation in the high-altitude arid zone is extremely limited, typically between 3,600 m and 4,200 m but usually extending only a few hundred metres in any single area. Early frost and late thaw combine to restrict severely the amount of land suitable for agriculture. Furthermore, within the narrow arable zone, extreme aridity and the subsequent need for irrigation render a sizable portion unsuitable for cultivation due to the absence of a secure source of water. Poor soil composition and steep slopes in the river valleys further reduce this potential. It is not surprising, then, to find that only 0.48 percent of the total area of the Tibetan plateau is under cultivation (Li, 1980).

Intensification of cultivation is also limited. Tibetan agricultural technology traditionally used fertilizers, irrigation, crop rotation, and weeding and in most areas arable land was carefully husbanded on well-kept terraces. It is difficult to imagine how Tibetans could have farmed more intensively than they did. Despite their agricultural skill, however, yields were low and throughout the Tibetan arid zone yields of only ten times the seed sown were considered excellent.

Thus, the ecosystem is encapsulated in the sense that there is a limited potential for energy extraction and the population must adjust to this reality. This situation is

very different from that found in the lower Himalaya where expansion of agriculture into forests and onto steeper slopes has continued up to the present.

The inelasticity of the environment, however, has another dimension. For centuries, Tibetan populations have not only had to extract their own subsistence from the delicate and inelastic physical environment, but have had to generate substantial surpluses in order to maintain in luxury the religious and political elites that dominated their society. These surpluses comprised not only foodstuffs and products but also labour (corvée tax obligations). Tibetan peasants, for example, had to cultivate their lord's lands, and provide animals and humans to transport his goods, and it is clear that such labour obligations were among the most onerous. Traditional Tibetan social structure was as much an adaptation to serfdom as it was to the climatic and geomorphological limitations of the high-altitude environment.

Despite the encapsulated environment, Tibet has flourished as a major political entity since the seventh century A.D. and virtually all areas currently inhabited by Tibetans were occupied by A.D. 1,500. This raises the fundamental question of how this has been possible without impoverishing the population and producing chronic starvation; without reducing the level of consumption of the elites; without destroying the productive capacity of the environment; and without producing large-scale migration to other ecological zones. Central to this question is the nature of fertility in Tibetan populations.

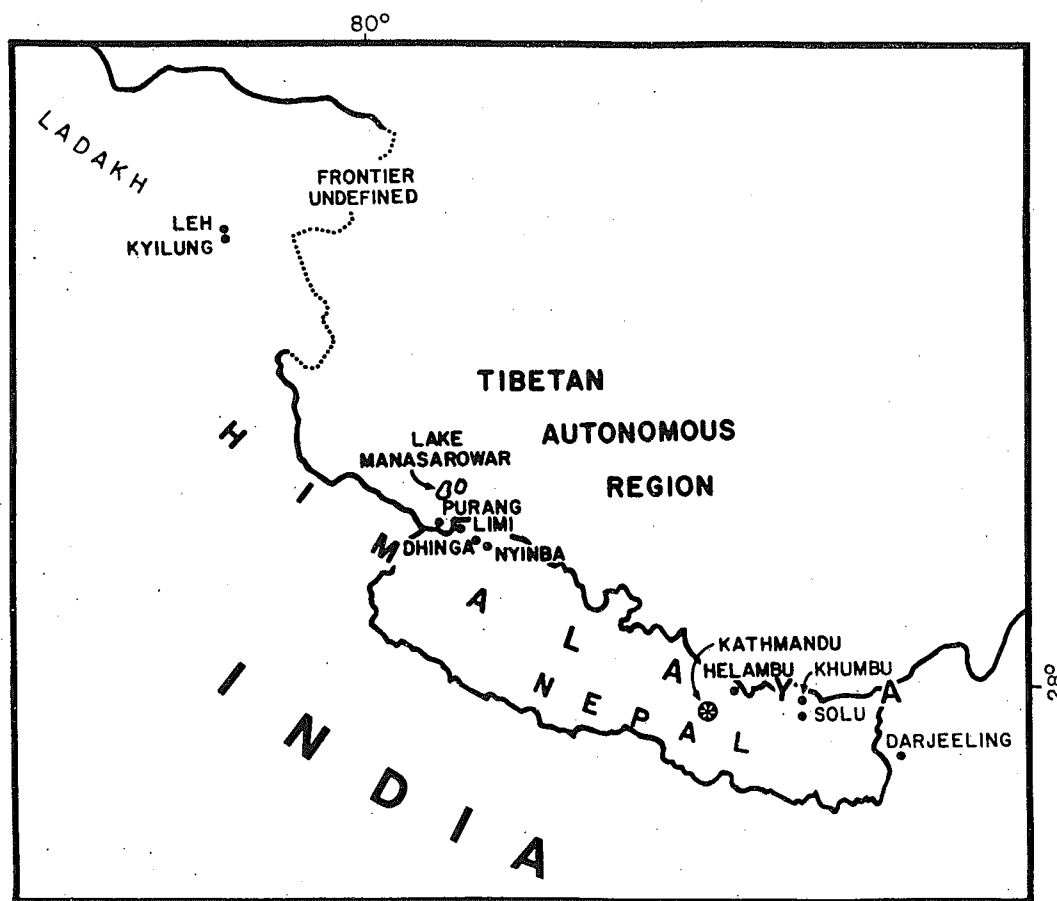


FIGURE 1: Location map of research sites.

TIBETAN DEMOGRAPHY

It has been claimed that Tibet is anomalous among peasant societies for not only has it maintained population homeostasis, but it has actually undergone substantial population decline since the seventh century A.D. (Ekvall, 1972). Ekvall argues, moreover, that the cause of this decline is not high mortality but rather low fertility. MacFarlane (1976, p. 297) has utilized Ekvall's argument to refute the Malthusian contention that it is mortality that has balanced population throughout man's evolution.

"Even in the absence of 'vice, misery and moral restraint' population does not necessarily grow. A good example of this negative finding seems to be Tibet, whose population appears to have been declining since it reached its peak between 600 A.D. and 800 A.D."

Ekvall's analysis, however, while suggestive, is based on anecdotal evidence—on his impressions as a missionary in Tibetan areas of Chinese Qinghai Province thirty years ago. It does not present data on the number of females at-risk, on birth rates, or on completed fertility.

Recent studies of indigenous (non-refugee) Tibetan-speaking groups in northern Nepal and Ladakh (Bangham, 1977; Goldstein, 1976; Goldstein, in press; Gupta,

1978; Lang and Lang, 1971; Levine, 1977; Ross, ms; and Weitz *et al.*, 1978) provide valuable new data on fertility that reject the Ekvall argument for Tibetan society. These populations fall into three groups (see Figure 1):

- (1) Sherpas of eastern Nepal and Kalimpong, India
- (2) Tibetans from the Humla District of Karnali Zone in northwest Nepal
- (3) Ladakhis from northwest India

The three populations of Humla (Limi, Dhinga, and Nyinba) are representative of Western Tibetan culture. Of these three, the Tibetans of the Limi Valley (studied extensively by Goldstein) are clearly the most typical of traditional Tibetan society and will be examined in most detail.

Limi is an area of about 500 km² and 800 persons located in the northwest corner of Nepal abutting the Tibet-Nepal border (Goldstein, 1977). Two types of detailed demographic data were obtained for the Limi village of Tsang (3,930 m). Vital statistics (births, deaths, migration) covering the period from winter 1973 to late autumn 1977 were collected by the author during the course of three field trips undertaken in spring and sum-

mer 1974, summer 1976, and autumn 1977. These data were retrieved from village household composition records (in Tibetan), key informant interviewing, conversations with household members, and direct observation. Detailed reproductive histories were also collected for Tsang females.

Table 1 presents the number of births over the four-year period 1973-77 when vital statistics were collected for Tsang village of Limi. There were 73 females of reproductive age (15-44) in that population, 41 (56 percent) of whom were married. No females of reproductive age died during this period and 37 (51 percent) had at least one birth. A total of 51 births occurred, 88 percent to married females. The average size of Tsang village during this four-year interval was 299 persons and this yields a high Crude Birth Rate of 42.6 $[(51 \div 299) \times (100 \div 4)]$ per annum.

The computation of the General Fertility Rate (no. of births to females 15-44/no. of females 15-44 \times 1000 \div 4 = GFR) and the Marital Fertility Rate (no. of births to married females 15-44/no. of females 15-44 who are married \times 1000 \div 4 = MFR) takes into account the proportion of females in the population and number of married females and corroborates the high level of Limi fertility. During the four-year interval in question, the GFR in Limi was 175 and the MFR was 274. Thus, the four-year vital statistics indicate high fertility despite late first birth. Only one female under twenty gave birth and only 18 percent of the births occurred to females under twenty-five years of age.

Demographic data based on direct observation and intensive interviewing such as that presented above, while highly accurate, may not be the best indicator of population dynamics because of the small size of the population and the relatively short period of time the data reflect. Counting the number of children born to a group of

women who have completed their childbearing period is probably a more useful measure of fertility for such small populations since it reflects the reproductive history of a cohort of females during their childbearing years. Table 2 presents these data for Tsang females age 40-44 and 45 plus. This measure has been called various names such as the Total Maternity Ratio and the Completed Fertility Rate (CFR). The latter term will be used in this paper.

Table 2 demonstrates that married females 45 years and over averaged 7.4 live births per female, slightly more than married females 40-44 who averaged 7.1 births. However, when all females 45 and over are considered, the CFR drops to 6.3 births per female because 19 percent of the females over 45 are unmarried (cf. Goldstein, 1976 for a detailed discussion of this).

Among populations in which there is no conscious behaviour to affect fertility no matter how many children a woman has borne, maximal fertility is represented by the Hutterites of the United States and Canada who average 10.4 births per woman. At the lower end are the !Kung bushmen where women 45 and over in 1968 reported an average of 4.69 births per woman (Howell, 1976). CFR can be divided into three categories: high (5.51 and above), low (3.01-5.50) and very low (below 3.0) (Nag, 1968). According to these data, the Limi CFR for married women is very high while the CFR for all females lies near the bottom of the "high" category and represents moderately high fertility.

Table 3 compares Limi with other Tibetan, Sherpa, and Ladakhi groups in Nepal and India. Dhinga (2,800 m-3,500 m) and Nyinba (2,900 m-3,500 m) are located in the Humla-Karnali River area near Simikot, the capital of Humla. They are situated about three or four days walk southeast of Limi over a high mountain range and differ from Limi in altitude and climate, being a part of the Nepal monsoonal mountain zone. Nonethe-

TABLE 1
Number of births to married and unmarried females 15-44 years old in Tsang, Limi during 1973-1977

Age	No. Females ¹	No. Females Married	% Females Married	No. Females Married & Reproducing During Interval	No. Births to Married Females During Interval	No. Females Unmarried & Reproducing During Interval	No. Births to Unmarried Females During Interval	Total No. Females Reproducing During Interval	Total Births to Females Married & Unmarried During Interval
15-19	14	4	29	1	1	0	0	1	1
20-24	9	2	22	2	4	3	4	5	8
25-29	15	11	75	10	14	1	2	11	16
30-34	12	7	58	7	11	0	0	7	11
35-39	12	8	67	6	6	0	0	6	6
40-44	11	9	82	7	9 ²	0	0	7	9
Total	73	41	56	33	45	4	6	37	51

¹On the basis of field studies in 1976 and 1977, ages for females have been revised and do not exactly correspond to those cited in Goldstein (1976).

²Includes one late miscarriage.

TABLE 2
Number of live births and surviving offspring per married and unmarried females of age 40-44, and 45 + in Tsang, Limi

Age	Marital Status	No. Females	No. Live Births	\bar{X} Births per Female	No. of Surviving Offspring	\bar{X} Surviving Offspring
40-44	Married	9	64	7.1	36	4.0
	Unmarried	2	6	3	4	2.0
	Both	11	70	6.36	40	3.63
45 +	Married	17	126	7.4	72	4.2
	Unmarried	4	7	1.8	4	1.0
	Both	21	133	6.33	76	3.61

less, they are clearly ethnically Tibetan in language, religion, dress, marriage, and family organization. Table 3 demonstrates a striking equivalence in both CFR and number of surviving children. Limi and Nyinba have the same CFR (for all females) and differ by only 0.3 in surviving children. This remarkable similarity is reinforced by the Ladakh data.

Data on Ladakh were collected by the author during the summer of 1980 in the village of Kyilung (pseudonym) situated at 3,600 m near Leh, the capital of Ladakh. Household census and fertility data were collected as part of a larger project but extreme reticence on the part of Kyilung females to list offspring who died in infancy and childhood prevented accurate direct assessment of completed fertility. On the other hand, data on the number and sex of living children were readily provided and cross-checked for accuracy. These data indicate that for all 92 females aged 45 and over the average number of living children was 3.3. Ladakhis also uniformly asserted that,

on the average, mortality claimed about 50 percent of a woman's offspring. The Ladakh data, therefore, parallel the Humla data and do not support the argument that Tibetan society was characterized by very low fertility.

The demographic data for Sherpas are more problematic as there are several varying accounts of Sherpa fertility. The most detailed discussion of this is the article of Weitz *et al.* (1978). Based on research conducted in 1971, they calculate the CFR of females, married and unmarried, over 50 to be 4.77, a figure far lower than that of Limi and the other Humla communities. However, the 4.77 CFR figure includes recent Tibetan refugees to Khumbu (Weitz's "socioeconomic category number two") who fled from the Chinese regime in Tibet in the early 1960's. Recent research with Tibetan refugees in Nepal (Pokhara and Kathmandu) indicates that Tibetan refugees such as these include a disproportionate number of nulliparous and low-fertility females (Beall and Goldstein, ms). On questioning, the Tibetans corroborated the

TABLE 3
Completed Fertility Rate and number of surviving children for seven Tibetan populations

Group	Age	Completed Fertility Rate (all females)	\bar{X} Surviving Children (all females)	Completed Fertility Rate (married females only)
HUMLA TIBETANS	1. Limi	45 + 6.3 (21) ¹	3.6	7.4 (17) ¹
	2. Dhinga (Ross, n.d.)	45 + 6.7 (16)	3.7	7.4 (14)
	3. Nyinba (Levine 1978)	45 + 6.3 (19)	3.3 ²	—
SHERPAS	4A. Khumbu ³ (Weitz <i>et al.</i> 1978) including Tibetan refugees	50 + 4.77 (104)	3.0	—
	4B. Khumbu (Weitz 1980) excluding Tibetan refugees	50 + 5.2 (81)	3.3	6.2
	4C. Khumbu (Lang and Lang 1971)	45 + 6.0 ⁴ (103)	—	—
	4D. Khumbu (Gupta 1978)	45 + —	—	4.5 (23)
	5. Kalimpong (Gupta 1978)	45 + —	—	7.4 (94)
	6. Helambu (Beall and Goldstein ms)	45 + 6.8 (21)	3.5	7.2 (20)
LADAKHIS	7. Kyilung (Goldstein)	45 + 6.6 ⁵	3.3 (92)	—

¹Figures in parentheses represent the number of individuals included.

²Children surviving past age 5.

³The 4 Khumbu samples all refer to the same population.

⁴Refers to pregnancies rather than live births.

⁵This is an estimate based on the average mortality of the groups 1,2,3,6 times the number of surviving children in Kyilung.

hypothesis that families with many children, particularly small ones, decided to remain behind in Tibet. The difficulties of the flight to exile and the belief that their exile would be short, as it had been earlier in this century, kept many females with large families in Tibet. Thus, the Tibetan refugees represent a skewed sample. Their CFR is not representative and should be excluded from the "pure" Sherpa data; therefore the Khumbu Sherpa CFR increases to 5.2 and is about one birth less per woman than that of Limi (Weitz, personal communication).

A few years after Weitz and his colleagues had worked in Khumbu, another fertility study was made there by Gupta (1978). As Table 3 indicates, he reports the CFR for married women living in wedlock as a very low 4.5 and my calculation of his raw data yields a CFR of 4.26. Both of these figures are lower than the !Kung Bushmen even though they exclude unmarried women. Gupta also conducted a study among Sherpa migrants from Khumbu living in Kalimpong, West Bengal, India, and reports that the CFR for married women is 7.4. It is suggested here that his Khumbu data appear questionable and show a serious under-reporting of births. In Table 5 of his article he lists the number of live births by the age of married women. For women 45-49 in Khumbu he cites a CFR of 5.7, for those 50-54 a CFR of 4, and for those 55 and over a CFR of only 3.3. It seems apparent that the fewer number of births claimed by older females is a reflection of faulty memory or outright informant misinformation rather than a demographic pattern. If it does reflect some idiosyncratic historical event or process, Gupta does not discuss it.

Problems with Sherpa fertility are confused even more by studies conducted in Helambu, Solu, and the Arun Valley. A bio-cultural study on aging conducted in 1979 by Beall and Goldstein among Sherpas of Helambu retrieved data on fertility and mortality for 21 females over the age of 45. As can be seen in Table 3, these data indicate fertility levels comparable to Humla (CFR = 6.8) and higher than those cited for the Khumbu Sherpas. Another report of Sherpa fertility (including one of the villages studied by Beall and Goldstein) gives a CFR of 7.8 for Helambu (Bangham, 1977). This article, however, presents no raw data and mentions only a number for completed reproduction. It is not clear whether the data include both married and unmarried females. The article also cites high CFR figures of the Sherpas in Solu (8.5) and the Arun Valley in Eastern Nepal (9.0) but does not present any supporting data.

The Sherpa data suggest that with the exception of Khumbu, fertility was equivalent to, or higher than, that of Humla Tibetans. Fetal loss, however, may account for the lower fertility reported in Khumbu. Lang and Lang (1971) report a CFR (for pregnancies) of 6.0 per woman 45 and over and Weitz's survey (based in part on Lang and Lang's survey) indicates an average of 5.9 pregnancies per female 50 and over (Weitz, personal communication). Both studies demonstrate that about one birth per woman is lost by ante-natal mortality. Weitz (personal communication) suggests that a high incidence of goitre

may be the cause. A recent study, unpublished and undated, by Fisher asserts that contraception is widespread in Khumbu and varies according to the degree of involvement in the outside cash economy. For example, in Kunde, "all fertile women—with only 7 exceptions—who had living husbands and 2 or more living children, were practicing some form of birth control." This corroborates information collected among the Sherpas of Helambu (Goldstein and Beall, 1981b) and suggests that low fertility in Khumbu may result from the use of contraception. In any case, the high rate of fetal wastage approximately equals the difference in CFR between Limi and Khumbu.

The data presented clearly contradict the contention that Tibetans traditionally maintained population homeostasis and/or decline due to very low fertility. Not only do the vital statistics for Limi indicate moderately high fertility, but this is also indicated by the reproductive histories of females born 45 years or more ago in seven Tibetan societies.

This, however, does not mean that Tibetan society has experienced sustained and/or substantial population growth during the past millennium. The declining population may be the result of high mortality balancing or outstripping fertility. Table 4 presents the mortality data for the four-year interval during which vital statistics were collected in Limi. There were 25 deaths during this interval with infant mortality accounting for the largest proportion (40 percent) of the deaths. Pre- and post-reproductive mortality (under 15 and over 45) accounted for 96 percent. However, only 20 percent of the children born during that period died in infancy. On the basis of these data, the Crude Death Rate for this population computes to 20.9 per annum and the Crude Rate of Natural Increase to 2.2 percent per annum. At that rate of increase,

TABLE 4
Mortality in Limi during 1973-1977 by age of deceased

Age	No. Died	% of All Deaths
0-1	10	40
2-4	2	8
5-9	2	8
10-14	0	0
15-19	0	0
20-24	1	4
25-29	0	0
30-34	0	0
35-39	0	0
40-44	0	0
45-49	1	4
50-54	1	4
55-59	1	4
60-64	1	4
65-69	0	0
70 +	6	24
	25	100

the Tsang population will double in 31 years. Interestingly, these figures almost exactly parallel those for Nepal as a whole (CBR = 44, CDR = 21, CRNI = 2.3) (World Population Data Sheet, 1979).

Table 3 presents an indirect measure of mortality: that is, the number of children surviving to females who have completed their childbearing. It shows a congruence concerning the average number of surviving children for the Tibetan (Sherpa) groups regardless of their CFR. While the percentage of surviving children varies between 51 and 57 percent, the actual number surviving remains similar. For the six populations for which data exist (Limi, Dhinga, Nyinba, Khumbu, Helambu, Ladakh), the average number of surviving children is 3.5 and no population varies more than 0.2 from that figure. This number of surviving children indicates that these six populations are increasing rather than declining.

Since usually more males than females are born at high altitude, if we assume that the sex ratio at birth is 110/100, using the Limi 3.61 average number of surviving children, the number of daughters surviving to replace each woman over 44 would be 1.74, a figure capable of producing more than a 50 percent increase each generation (Polgar, 1972). Thus, while mortality is high in these populations and 46 percent of the births of Limi married women now past menopause did not survive, this level of mortality is not sufficiently high to balance the fertility levels encountered.

Long-term growth patterns can be examined by comparing the different rates of mortality and fertility needed to produce zero population growth. If a given population has mortality rates wherein 50 percent of the females born survive to mean childbearing age, each woman would have to produce an average of two children ($1 \div 0.5$) for that population to remain constant in size (Coale, 1974). Using the sex ratio of 110/100, the total number of children each female must bear to achieve zero population growth is 4.2 (2.10×2.0) and the number of daughters per woman is 1.99 (4.2×0.476). However, the actual number of children born to women 45 and over (the CRR) in Limi is 6.3, a number substantially higher than the 4.2 necessary for zero population growth. Even assuming that 33 percent of the females over 44 had never married (the actual figure is 19 percent) and that mortality levels indicate 50 percent of the females born do not survive to the mean age of childbearing, these populations would have been increasing by over one percent per annum. Growth rates such as these, however, could not have been sustained over long periods of time due to the force of exponential growth.

While it is not possible to determine the population of Tibet in A.D. 650 (the reign of the first of the great Kings of Tibet), the evidence for Ekvall's (1972) contention that Tibet's population was twice as large as in 1950 (i.e., about six million) is unconvincing. There is, however, very good demographic data for Tibet in the thirteenth century A.D., the period during which the Mongols established suzerainty over Tibet. According to a Mongol census undertaken for tax purposes in 1268, a total of

36,031 households was estimated to consist of six persons so that this computes to a total population of about 215,000 persons. This census, however, did not include monks and is limited to Central Tibet. It excluded very large and populous areas such as Eastern Tibet (*Khams* and *a mdo*) and Western Tibet (*mga' ris*) and probably missed scattered households and possibly also landless units. Consequently, one might contend that the population of Tibet in the thirteenth century was three or four times higher than the census implied, that is to say, about one million persons.

While this does not preclude the possibility that Tibet's population declined between the seventh and thirteenth century, it suggests that from the thirteenth to the twentieth century there was actually a slight increase in population size. Taking the 1950 population of Tibet as 3 million, Tibet experienced a threefold increase in this 700-year period. In order to achieve such an increase, however, only very meagre growth rates would have been needed (about 0.21 percent per annum). On the other hand, at the one percent growth rate discussed above, Tibet's population would have increased to about one billion by 1950. Thus, while it appears that Tibet's population has not declined since the thirteenth or even the seventh century A.D., if there was an actual increase the rate of increase was lower than that in most contemporary industrial nations.

This was achieved traditionally by means of high mortality combining with the only moderately high fertility described above. As was shown, there is a substantial difference in Tibetan populations between the CFR of married women (in Limi 7.4) and that of all women (in Limi 6.3), the latter being considerably lower than the former. The key to this reduction and to the Tibetans' very successful traditional adaptation to an encapsulated environment was the presence in these societies of fraternal polyandry, the rare form of marriage and family in which two or more brothers jointly share a wife in a single family. This form of marriage and family performed three critical functions: (1) it precluded the division of family fields between male heirs each generation; (2) it concentrated labour in the household, therein facilitating utilization of multiple ecological niches (e.g. pastoralism, farming, trading) in the presence of heavy corvée taxes, and (3) it unintentionally reduced aggregate fertility. By joining multiple males to a single female mate, fraternal polyandry generates a surplus of females who do not marry and either remain celibate or have at most one or two illegitimate children. Thus, the greater the number of polyandrous marriages, the larger will be the category of unmarried females (there is virtually no polygamy, i.e. one male with multiple wives), and the lower the aggregate fertility for all females. In Limi, for example, 19 percent of the women 45 and over were unmarried and fertility for all women was 15 percent lower than that of married women. Moreover, it appears that in the past fraternal polyandry was more prevalent than when the current studies were made (Goldstein, in press).

The data presented above show that while the reduction

of fertility caused by polyandry was not sufficient to produce population homeostasis and while it is certain that very high levels of mortality were integral parts of the traditional adaptation, fraternal polyandry was an indis-

pensable part of the system. The Tibetan system of marriage and family organization was the key factor in the successful traditional adaptation to the high-altitude encapsulated environment.

MODERNIZATION AND DE-ENCAPSULATION IN THE HIGH-ALTITUDE HIMALAYA

Despite the isolation, the lack of development, and the unchanging utilization of traditional agricultural and pastoral technologies, the Tibetan populations scattered throughout the high-altitude area extending from Ladakh to Sikkim have undergone substantial and fundamental changes. Although the causes vary area by area, their impact has produced analogous changes that have de-encapsulated the environment by offering new economic opportunities that do not require significant initial reserves of capital and by eliminating the exploitive serf system with its heavy labour obligations. As is discussed below, these new forces reduced the importance of concentrating labour in the family while providing younger brothers new opportunities for obtaining income outside the traditional system. The result has been the disintegration of the traditional polyandrous family and marriage system. Thus, while these areas appear traditional and undeveloped at first glance, the superficial appearance is very deceiving for, in reality, their key social and economic structures have been, or are in the process of becoming, fundamentally transformed. This paper suggests that this transformation of the traditional social milieu is a very important component of the current social and ecological situation. Ecological degradation may be the most immediate concern, but it cannot be understood or halted without knowledge of the major isomorphic social transformations that have occurred. The remainder of this paper will illustrate the nature of these transformations by examining populations at two different stages of the process of change: Ladakh, in India, and Limi, in northwestern Nepal (Figure 1).

LADAKH

Ladakh is the northeasternmost district of Jammu and Kashmir State. It is divided into three Teshil (sub-district units), two of which, Leh and Zaskar, are overwhelmingly Buddhist, while the third, Kargil, is predominantly Muslim. In Ladakh as a whole, 52 percent of the population is Buddhist, 46 percent Muslim, and 2 percent Hindu and others (Census of India, 1973).

Research in Ladakh was undertaken by the author in the village of Kyilung (pseudonym) in the summer of 1980 as a part of a larger study on monasticism. Kyilung is a predominantly agricultural village located at an altitude of about 3,597 m near Leh, the capital of Ladakh. According to the 1971 Census of India, it has a population of 1,056. Research indicates that roughly 75 percent of the people are Buddhists (who are the original inhabitants) and 25 percent Muslims, most of whom are of the Shia sect. Although the Kyilung Buddhists are clearly

part of the mainstream of Tibetan culture, they refer to themselves as Ladakhis rather than Tibetans and this usage will be followed here.

A basic structural unit in traditional Tibetan and Ladakhi society was the corporate stem family. As alluded to earlier and discussed in detail in previous papers (Goldstein, 1971, 1976, 1977, 1978), because of the nature of the feudal corvee (labour) tax system, the inelasticity of the environment, and the need for male labour to fulfil tax obligations and utilize the disparate economic niches traditionally exploited, the basic adaptive strategy of such corporate families was to preclude land fragmentation and to maintain a core of males in the family. Fraternal polyandrous marriages and stem families were the main vehicles by which this was achieved.

Traditionally, all males in Tibet had demand rights to their family's land. This produced a fundamental structural contradiction in that prevention of land fragmentation was considered essential, yet the legal system permitted any male to fission from his family and to take a share of the land on demand. Fraternal polyandry, the sharing of one wife by two or more brothers, was the main mechanism by which this structural contradiction was overcome. It provided for gratification of the sexual and emotional needs of all the brothers without forcing them to marry monogamously and produce separate sets of heirs. Land stayed within the family unit and the most effective cost-benefit equation ensued. Fraternal polyandry, however, is not without problems and many younger brothers clearly preferred to marry monogamously and establish independent households. They generally did not do so because there were a series of legal, economic, and labour constraints that traditionally reduced their ability to achieve a satisfactory style of life if they split from their natal family.

In Ladakh, however, the conservation of land principle was carried to its logical, and most rigid, extreme in that inheritance went according to the principle of primogeniture, i.e. only the eldest son inherited land. Younger sons could not legally demand nor did they obtain any portion of the family patrimony. Unlike in Europe, however, in Ladakh, primogeniture was linked to fraternal polyandry. Consequently, when younger brothers reached maturity they were not sent from their natal household to seek their livelihood elsewhere but rather were brought into the polyandrous marriage of their elder brother(s). Ladakhi social structure, therefore, eliminated the underlying contradictions of Tibetan social structure by linking primogeniture to fraternal polyandry. By this strategy, land fragmentation was precluded and labour concentration

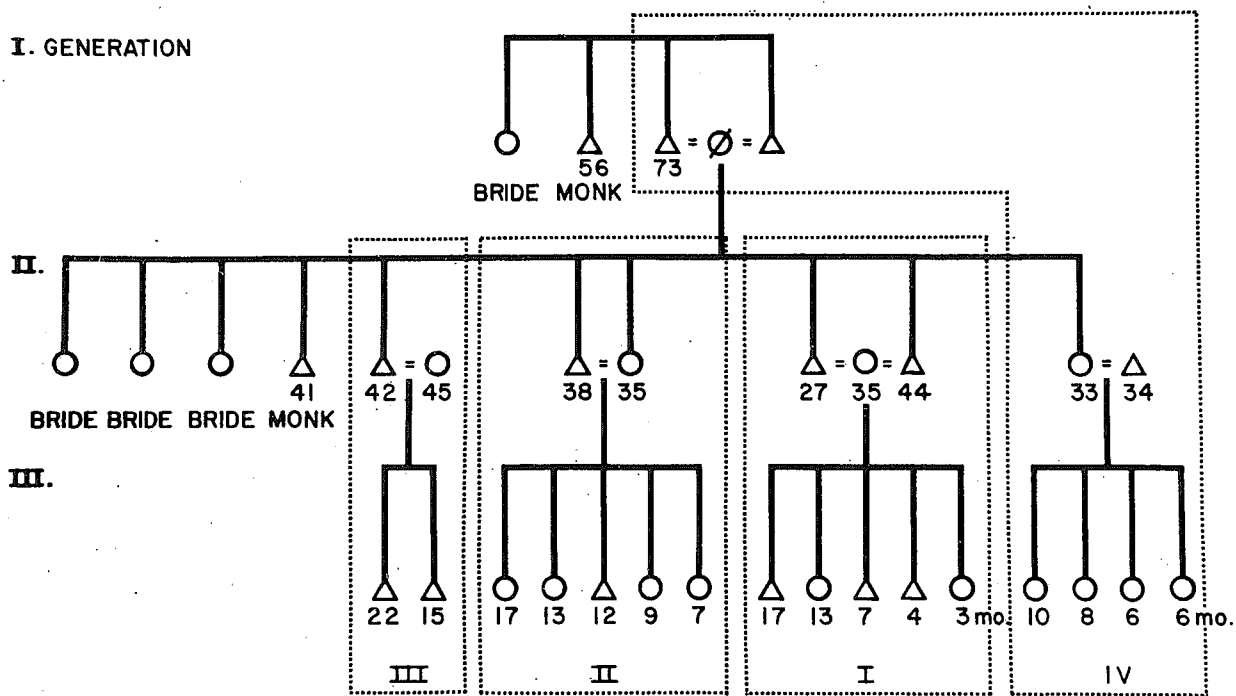


FIGURE 2: The Phichu Family through three generations.

was assured.

The manner in which fraternal polyandry acts to reduce aggregate fertility has been discussed briefly above and in detail in Goldstein (1976). Suffice it to say that because of the prevalence of fraternal polyandry, substantial numbers of Ladakhi Buddhist females of reproductive age remained unmarried unless they could find husbands outside the Buddhist community, i.e. among Muslims, in which case their offspring were not heirs to the land of their mother's family. While this movement of Buddhist females to Muslim husbands was common until recently, in 1980 13 percent of Kyilung's Buddhist females 45 and over were unmarried and had not reproduced. Traditionally, therefore, Ladakh social structure was very well adapted to the limiting features of an encapsulated environment.

The end of World War II marks the onset of a series of different and often unrelated events that affected different parts of the Himalaya in similar ways. In India, independence was attained in 1947 and after a brief conflagration in Kashmir, Ladakh joined with Kashmir to become part of the new Indian nation. As such it was subject to the new constitution of India including laws concerning corvee taxation, inheritance, and land tenure. According to Indian law, primogeniture was not legal and corvee and other "serf" taxes were not allowed. Although no special effort has been made to eradicate primogeniture in Ladakh, gradual realization of its illegality has totally transformed the nature of family organization in the Buddhist sector of Ladakh, since younger brothers who

grudgingly remained together with their older brother(s) began to demand a share of the family patrimony. As their demands were sustained in government courts, the integrity of the corporate family dissolved and land and family fragmentation began to prevail. The resultant population explosion has irreversibly altered the nature of the human adaptation.

The case of the Pichu family illustrates this transformation. Figure 2 sets out geneologically the last three generations of this family. Until about 1957 the Pichu family had maintained its land intact and was well-to-do, holding about 150 *khal** of land. In generation I there were three brothers, two of whom married polyandrously while the third became a monk. The marriage resulted in nine surviving children, five of whom were males and four females. The two eldest (aged 44 and 42 in 1980) males were initially married polyandrously but this did not work out and the younger brother demanded a share of the land to set up an independent household. He was given about 20 *khal* of land and is Family III in the figure. The third son was made a monk and got no land but the son who is now 38 separated taking with him another 20 *khal* of land.

*Tibetans (and Ladakhis) traditionally measure land by the amount of seed a field takes, i.e. they use a volume measurement. A rough estimate is that approximately 7.5 *khal* equal one acre, but since the amount of seed used varies tremendously in accordance with the quality of soil, that is only a very crude equivalence.

Finally, about ten years ago, the two fathers decided to split from their eldest son (aged 44) because they could not get along with his wife. They took their daughter with them and received 30 *khal* of land. She then took an "adoptive" bridegroom and this is Family IV in the figure. This left the main family (in Ladakhi, the *khang chen*) with 60 *khal* of land and a polyandrous marriage linking the eldest and youngest brothers.

Thus, from one large and wealthy family, there are today four families comprising 28 persons (9 parents, 2 grandparents, and 17 children). Assuming, however, that the traditional system was still intact and that fraternal polyandry would have been the form of marriage for all four of the brothers (one male would still be a monk), and if their wife had five surviving offspring (i.e. the most children surviving to any of the actual females), the total number of persons in the one polyandrous stem family would have been only eleven (5 parents, 2 grandparents, and 5 children). The per capita land size would have been 11.8 *khal* per person versus the actual average which is 4.6 *khal* per person; that is to say, it would have been 157 percent greater than the actual per capita amount. Not only is the total number of persons more than twice what it would have been with the polyandrous stem family, but the actual number of offspring produced is over 3.4 times greater (17 versus 5) than it would have been if polyandry had been retained.

This type of family and land fragmentation has become extremely common and today fission is the expectation and fraternal polyandry the exception. Because Ladakhi corporate families have names and because fissiparous families are known as the *khang bu* ("little house") of the main family (*khang chen*), it is easy to determine the degree to which fission has occurred in the village. About one hundred years ago there were 64 main families (*khang chen*) who held virtually all the land and were the basic taxpayers. Today there are 143 households, including the 64 original main houses. The additional 79 families are all "little houses" (*khang bu*) that have come into existence in the period since Indian independence. This represents an increase of 123 percent in the number of families in the course of roughly three decades. Modernization in India, therefore, has had a devastating impact on the traditional Ladakhi social structure despite the fact that no special effort was made in this direction. The current situation is an indirect consequence of events taking place far away that are oriented to Indians not Ladakhis.

The transformation of the traditional social organization in Ladakh has another element that must be mentioned. Even though primogeniture could be legally circumvented in modern India, younger brothers still had to weigh the costs of fission versus polyandry in the sense that they had to determine whether they could survive economically if they split off. In essence, the elimination of primogeniture placed the Ladakhis in a situation similar to that obtaining in Tibet. Although before Indian independence there normally were no "extra" resources, a series of events occurred after 1947 that made fission

feasible by providing new and alternative sources of income for village Ladakhis while eliminating corvee labour obligations.

Indian independence also ended the feudal-like corvee transportation tax that had been imposed on all families (i.e. all taxpayers). In Kyilung, this tax obligated each family to send one adult male with food and animals for four months of the year (one month every three months) to a nearby Transport Station where authorized travellers and goods were assembled for transportation to the next station either toward Leh or Shrinagar. This was a very costly and difficult obligation and those who were negligent or inefficient were often punished physically, when, for example, animals or people were not ready to leave on time. Several old Ladakhi men told me that the night or two before their turn came to move to the station they could not sleep because of their apprehension. This requirement, even without primogeniture, would have made it extremely difficult for a young man to marry monogamously and to succeed on his own. The elimination of the corvee transportation tax was another factor, therefore, underlying the structural transformation in Kyilung.

At about the same time that India obtained her independence from Britain, Tibet came under the direct administration of the People's Republic of China. The two new Asian nations were unable to agree on a joint border and after much acrimony and many border incidents, the Chinese armies, in 1962, attacked India in Ladakh and in the areas adjacent to Bhutan. Although troops were withdrawn from the tentative borders within a short time, this conflagration highlighted the strategic importance of Ladakh to the Indian government and resulted in a major strengthening of the Indian military capability there. The Ladakh Scouts, a completely Ladakhi unit in the Indian Army, were expanded dramatically and military bases and airfields were constructed. The result of this was an economic boom. Ladakhi villagers obtained jobs in road building, construction, in the army, and in the complex infrastructure that was necessary to maintain a bureaucracy and a sophisticated modern army in a backward, extraordinarily harsh environment. For Ladakhis, the Indians' awareness of the strategic importance of Ladakh has provided a golden opportunity and they have not been slow to take advantage of it. Not surprisingly, the overwhelming majority of families which split off (*khang bu*) have one or more individuals working for wages, either for the government or for the military establishment. It is these new economic opportunities that have afforded younger brothers and sisters the economic viability to be independent of the traditional family structure.

One further aspect of modernization should be mentioned, namely, the influence of politics on fertility. As indicated earlier, the traditional Tibetan/Ladakhi social structure was oriented to land conservation which had the consequence of reducing population growth. This, however, was not the case for the Muslims of Ladakh. The majority of the Muslims in Kyilung are Baltis, that is,

Shia Muslims originally from Baltistan who speak Ladakhi as their native language. The Baltis never utilized polyandry and instead followed patterns wherein each son married and stayed in a joint family. Sometimes before, and almost always after, the father died, these families typically split with each brother taking a share of the land. Theoretically females also had rights to own land and appear to have sometimes inherited it. From the beginning, therefore, Muslims followed a system wherein land was continually fragmented and also one which resulted in maximal reproduction since females were not systematically removed from the breeding pool. Moreover, because there was always a pool of unmarried Buddhist females, each Muslim male invariably married and reproduced. Thus, whereas the number of Buddhist families has increased 1.3 times in the past thirty years, the number of Muslim families has increased seven or eight times.

Since these Muslims were immigrants, they had traditionally only small landholdings, most of which they held on permanent lease from the larger Buddhist families. Consequently, they depended to a great extent on outside wages; in particular, on employment in the government which has been Muslim controlled since the mid-nineteenth century. The breakdown of fraternal polyandry among Buddhists has placed them in a situation analogous to that of the Muslims since they also have come to depend on outside income to maintain their quality of life. Because most of the more lucrative economic opportunities are in government, or at least controlled by the government, political organization has become an economic issue. The composition of the Kashmir government, the control of the seat of the Member of Parliament for Ladakh, the amount of political influence in Shrinagar and Delhi—these have become critical issues in Ladakh. Since each group's candidates are elected by vote and since voting is almost entirely communal, the number of Buddhists versus the number of Muslims in Ladakh is a central factor. Not surprisingly then, Buddhist leaders have launched a major pro-natalist campaign arguing that Buddhist females should not be permitted to marry Muslims and that all good Buddhists should marry monogamously and reproduce maximally. This has given broad-based sanction to anti-polyandrous ideas that were already present in India and among the younger Ladakhi who were more influenced by Indian ways. Thus, within the last decade, fraternal polyandry has been actively attacked within the Buddhist community for political reasons and passively attacked by Indian law. Its total demise seems inevitable by the next generation.

The result of these factors has been a rapid transformation of the traditional encapsulated socio-economic system into one dependent on the world economic and political system for its subsistence. No longer are Ladakhis part of a more or less homeostatic system in which population, technology, and environment are roughly balanced. The traditional environmental encapsulation has been destroyed by the explosion of new ideas and influences gen-

erated from outside. The Ladakhis now have high population growth rates (estimates of current population growth are over 2 percent per annum), and decreasing per capita land holdings. Their future well-being is inexorably linked to events and processes beyond their control. Traditional norms and values concerning conservation of the environment are no longer efficacious in this new situation and western-type notions that the environment is something to be used and manipulated rather than conserved is becoming the dominant idea. Education and governmental employment are the new long-term strategic values. The future of Ladakh, therefore, appears somewhat less than sanguine since large inputs of capital and technology will be necessary to maintain the present quality of life there. As long as opportunities for outside employment are maintained, the local economy can cope with the ecosystem disequilibrium, but should there be a decline to uncontrollable political events, such as peace between China and India, the local situation could deteriorate rapidly.

The social matrix of Ladakhis has been irreversibly transformed as an indirect consequence of modernizing influences in India; and Ladakhis are now locked in a struggle which they are unlikely to win without substantial outside assistance. That assistance, however, must not only examine the arid physical environment, but also the explosive social environment to which it is inexorably linked.

LIMI

Limi is an ethnic Tibetan area located in the northwest-most part of Nepal on the Tibetan border. It is a remote and still relatively traditional high-altitude arid area that is one of the most representative examples of traditional Tibetan social, cultural, and economic patterns. Research was conducted by the author in Tsang Village (3,932 m) and surrounding areas in 1974, 1976, and 1977.

Exogenous forces began to take effect in Limi about the same time as in Ladakh, and change, while not as far-reaching as in Kyilung, is following an analogous course.

Despite differences in subsistence economy between Limi and Kyilung, each was coping with an encapsulated environment and both utilized fraternal polyandry as the dominant form of marriage. Fraternal polyandry in Limi, as in Ladakh, functioned to conserve land and to concentrate labour in the family and, by virtue of this, produced a pool of unmarried females which reduced aggregate fertility. Nineteen percent of females 45 and over were unmarried in Tsang village. However, traditional inheritance laws in Limi (and in most of Tibet) were very different from those in Kyilung. In Limi, each male had demand rights to a portion of his family's land. There was no rule of primogeniture. Consequently, why younger brothers opted for fraternal polyandry when they could have obtained land and married monogamously, is an important question.

Since this issue has been discussed in detail in previous

papers (Goldstein, 1971, 1977, 1978), it need only be indicated here that the decision results from younger brothers examining the relative prospects of independent existence versus marrying polyandrously. A variety of social forces operated to preclude younger brothers from receiving equal shares of land and to force them to evaluate alternative sources of income before fissioning the family. The key to the maintenance of polyandry in Limi, then, was the availability of economic resources that could be used by a younger brother to supplement income from the arable fields he would obtain if he broke away. Traditionally, because of the inelasticity of the physical environment and the exploitation of the social environment (i.e. the serf system) these resources were very few and consequently fission was infrequent. In the post World War II period, however, this situation changed dramatically. For Limi, the most important contributing factor was the introduction of communism into Tibet and the subsequent flight of the Dalai Lama and about 80,000 Tibetans to India in 1959-60. Nevertheless it should be noted that while events relating to the communization of Tibet were the most significant of the exogenous influences affecting Limi, change was already in progress (paper in preparation by the author).

In 1960-61, a group of Tibetan nomads from areas across the border just north of Limi decided to seek refuge in India and crossed over into Limi together with their herds. Since Limi is the last Tibetan-type area before the monsoonal alpine zone is reached, the yak and sheep of these nomads could not be taken further south and the nomads were forced to sell their animals at almost giveaway prices. In fact, many simply abandoned those animals not sold. A new economic resource, therefore, suddenly appeared in Limi that was available to all and did not require large capital. Some younger brothers took this opportunity to create herds of viable size and to separate from their brothers. Not only did this lead to land fragmentation but it set the stage for increased population growth.

Another factor that indirectly worked to undermine the traditional social and environmental balance by providing new economic opportunities was the emergence of new markets in India. Limis traditionally traded with Tibet and the surrounding areas in Nepal and went to India mainly for pilgrimage. The creation of a modern communist state in Tibet altered this. First, the new regime limited access to Tibet. Nepalese Tibetans were required to trade only with the government at official Trade Marts in their local areas. No longer could Nepalese Tibetans go to collect trade items such as salt in the alkaline lakes of northern Tibet and no longer could they carry their products throughout Tibet. Their freedom to trade was severely circumscribed and, with regard to salt, the quantities obtained varied year by year according to factors incomprehensible to the Limis. Often there was not enough salt for sale at these Trade Marts to satisfy the needs of the Limi and other Humla traders.

These events, when coupled with the emergence of a large population of Tibetans in India, motivated the

Limis to take a closer look at India and Kathmandu as potential markets, particularly for the beautiful wooden eating bowls for which Limi is traditionally famous. They have become very successful in this and in 1976 the gross sales for these bowls in India and Nepal amounted to about 200,000 rupees (U.S. \$16,600).

This contact with Tibetan refugees in India and Nepal has led the Limis to discover that Tibetan culture was popular in the Western World and that there was a lucrative market for Tibetan statues, paintings, and jewelry. The Limis were in an excellent position to capitalize on this market since these items had become virtually worthless in Tibet and the Limis (but not the refugees) could go to Tibet and buy such items very cheaply on an individual basis. Procurement of one or two art objects could produce an enormous profit when sold in India and could set a young man up for life. Younger brothers, therefore, again were presented with an economic opportunity that required little capital. Although the illegality of trade in such items restrained many younger brothers, some were not deterred and decided to split from their families.

Events relating to the economic development of Tibet have had another indirect and unintended consequence for the Limis. Limis depend on Tibetan pasturelands for winter pasture and keep their yaks and sheep herds in Tibet for eight months of the year. Without this winter pastureland they cannot maintain the type and size of their herds (Goldstein and Messerschmidt, 1980). These herds, moreover, in recent years have come to play a role in the Limi economy more important than in the past. Although a complicated issue, this is largely a result of: (1) an increase in herd size due to the initial animal windfall and subsequent population growth due to mild winters (there were about 10,000 animals in 1977); (2) the increasing fragmentation of arable land; (3) the increasing population size due to less polyandry; and (4) the reduction of wool exports from Tibet to Humla and the increasing value of Limi wool (the Limi sheep are the only other source of Tibetan wool in Humla). In short, the increasing dependence of the Limis on animal yields has made them increasingly dependent on access to Tibetan pasture for which they have to pay a "pasture-fee" (*rtsa rin*). Their pasture agreement with China, moreover, must be renegotiated every two years.

The Chinese policy for all trade, including the payment of the pasture-fee, however, has been to accept *only* trade goods in return for their products. They do not accept Nepalese currency nor even their own currency. Which goods will be accepted, and what value will be placed on them, is entirely in the hands of the Chinese officials, and in the final analysis, Limi pastoralism depends on the Limis' ability to provide satisfactory barter items.

The Limi wood trade now plays a central role in this relationship; indeed, the Limis have traditionally traded with Tibet in wood products and lumber. Many Limi males are excellent carpenters and wood-lathe operators, and traditionally they produced a variety of craft articles such as eating bowls, horse saddles, yak saddles, tent pegs, tent poles, wood jars, as well as lumber items such

as beams, pillars, and planks. Until recently, the craft items comprised the bulk of the trade. Beginning in the mid 1970s, however, this began to change.

Economic development and modernization in the Tibetan areas just north of Limi have substantially increased the need for construction lumber since this part of Tibet possesses no indigenous wood. Traditionally, the materials needed for houses and monasteries in this part of Tibet came from Limi and particularly birch wood that can still be found in the Limi Valley itself. The recent surge of development in the area adjacent to Limi, however, has increased dramatically the demand for Limi lumber (which is used to pay the "pasture-fee" and to buy salt). It has also placed a premium on high quality lumber. While birch is adequate, it is said to warp and thus, as the Chinese have begun to construct more substantial and elaborate ("modern") buildings, they have indicated their need for a better grade of lumber made from fir. However, there are no fir trees in Limi.

The Limis' response has been to utilize the fir forests located on the southern edge of the mountain range separating Limi from the main valley of the Humla Karnali River. Beginning in 1976, the Limis moved hundreds of their yak, horses, and hybrid *dzo* (yak-cow or bull-yak cow crosses) over passes of 4,420 m and 5,100 m to reach a forest area (at about 3,000 m) located three days south of them. This is a six-day round trip to Tsang village, not counting, of course, the time spent felling the trees and cutting the logs. In 1976 the situation was rather comical since the Limis had not figured out how to tie the lumber onto the animals and the yaks would throw off their loads

leaving the Limis wildly trying to hold back their other animals while they chased and reloaded these yaks. By 1977, this transportation operation had been mastered and the animals moved smoothly.

Exogenic changes have again had an important impact in this most remote part of Nepal; and while it may be premature to discuss the consequences they will undoubtedly further weaken the traditional "conserving" adaptation. Current levels of exploitation of the forests do not appear to pose a short term threat but their fate in the future is obviously uncertain.

Developments in Limi, therefore, tend to parallel those in Ladakh, although for different reasons. While fraternal polyandry is still highly valued in Limi, it appears as doomed there as in Kyilung. The traditional family-marriage system is in the process of breaking down, and with it, a new set of social and economic problems has emerged. The initial result of the use of various "windfall" and new resources has been dependence, and there is no easy way to return to the old system because of concomitant population increase and land fragmentation. The instability that this has produced is characteristic of Himalayan high-altitude Tibetan groups. It is well illustrated by the new trade in fir lumber which is really a desperate attempt by the Limis to preserve their source of pastureland and salt. To do this they have developed a new economic strategy that requires a tremendous outlay of time, energy, and village organization and coordination. Though Limi appears to be one of the most traditional examples of Tibetan high-altitude life, in reality it is in the throes of a major transformation.

CONCLUSION

This paper suggests that the Tibetan populations inhabiting the high-altitude sections of the Himalayas have adapted to the inelasticity of the physical environment and the "encapsulation" of the total environment by developing social mechanisms that (1) prevented (or decreased) the fragmentation of arable land; (2) concentrated male labour in family units; and (3) decreased aggregate fertility (and thus overall population growth) by relegating substantial numbers of reproductive age females to a status of "unmarried." The main vehicle for accomplishing this has been the fraternal polyandrous stem family.

Despite their remoteness and inaccessibility, over the past thirty or so years a series of different, but structurally analogous, events have impacted on the life of these people and, in essence, have destroyed the traditional homeostatic adaptation. This transformation has produced a situation of instability and dependence that

emerges as one of the most salient characteristics of current high-altitude Tibetan populations in the Himalayas.

Two Tibetan areas were singled out to illustrate this process: Kyilung in Ladakh, India, and Limi in northwestern Nepal. In each, modernization and development in areas adjacent to them have produced a new situation in which rapid population growth and land fragmentation are the norm. Because of this, the future of life at high altitudes in the Himalaya is not sanguine and it may not be possible to sustain the current quality of life in the near future. A particularly distressing effect of this transformation is a shift in attitude toward the environment from one focused on long-term conservation and adaptation to one focused on short-term exploitation and manipulation. A parallel argument to the Limi and Kyilung situation has been developed for the Sherpas of Solu-Khumbu and Helambu (Goldstein and Beall, 1981a, 1981b).

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