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Environmental Studies in Indian Anthropology: Perspectives, Premises and Strategy

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ABSTRACT

India is a vast country of 3,274,000 sq. km. and 547 million people as shown by the Census of India, 1971. A wide range of variations occur among the different communities with respect to various physical, biological and cultural environmental factors. This presentation has the following basic premise: environmental studies in Indian anthropology should be directed towards the understanding of the relationships of human biological traits with the various components of the environment, so that this understanding can be used for human development.

In the context of this premise, it is proposed that the strategy of environmental studies in biological anthropology in India should be: (1) to identify and measure the relative impacts of specific environmental factors of human biological traits; (2) to compare the relative impacts of physical, biological and environmental factors, and (3) to enquire whether a feedback system operates between environmental and human biological traits. A few studies already attempted in India, and also those which should be taken up, on the above themes have been mentioned.

1. Perspective

India is a vast country of 3,274,000 sq. km. with a total population of 5,470,000 (Census of India 1971), and a wide range of physical, biological and cultural environmental variations.

For instance, the physiography varies from the Indo-Gangetic lowlands to the extra-peninsular Himalayan range with the highest elevation of above 6,000 m; rainfall varies from 10—15 cm. per year in a part of Rajasthan to above 1,000 cm in Chirapunji; temperature from —45 °C in Leh to 51 °C in a part of Rajasthan; and soil type from the highly fertile black soil in west-central India to the relatively poor lateritic soil in coastal areas.

Rice is the staple crop in the Indo-Gangetic lowlands and the eastern and peninsular areas; wheat is grown principally in the northern and western regions; grams and pulses, the major sources of protein for a large section of the population, is grown in Uttar Pradesh, Panjab and Madhya Pradesh; milk yield varies from 30 kg per cow in Madhya Pradesh to 660 kg in Panjab; and fish is plentiful in many coastal areas but scarce in the hinterland. Tuberculosis is highly prevalent in Kerala and Tamil Nadu; venereal diseases along the eastern coast, the tip of the peninsula and Gujarat; leprosy in the hot and humid eastern coast and the southern part of the penin-

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sula; and hookworm in the coastal parts of the peninsula and the eastern sub-Himalayan area.

The economy varies from the hunting-gathering/pastoral tribal economy to large-scale organised farming and industry; diet varies from high calories, protein and fat intakes in Panjab and Madhya Pradesh to low intakes in Tamil Nadu; nutritional deficiency diseases show a relatively higher prevalence of goitre (due to iodine deficiency) in the entire Himalayan/sub-Himalayan area and of the various deficiency diseases taken together in the north-eastern, eastern and eastern peninsular areas than in the rest of the country; and per capita expenditure on public health is lower than the national average in the Himalayan/sub-Himalayan area, Indo-Gangetic lowlands and one part of the eastern peninsula, but higher in the rest of the country.

Detailed descriptions of the environmental variations mentioned above are given by Kuriyan[1], Misra[2], Simmon[3] et al., Spate and Learmonth[4] and many others. This presentation is intended not to make an exhaustive review of the existing studies on the wide array of environmental factors and their impacts on human biological traits, but to propose a rational strategy for future studies, within the framework of a given basic premise, and citing some relevant illustrations.

2. Premise

The basic premise is as follows: environmental studies in biological anthropology should be directed towards the understanding of the relationships of human biological traits with the various components of the environment, so that this understanding can be used for human development. In another presentation Basu[5] suggested that human development should be defined in terms of the major problems of a society at a given point in time and space and their resolutions, and that although the major problem of the contemporary Indian society is constituted by large-scale socio-economic disparities, the resolution of which depends on large-scale socio-political movements for which anthropologists are not professionally trained, they could still contribute, by (a) evaluating the causes and consequences of socio-economic disparities, and (b) providing interim relief against some of these consequences, to pending final resolution of the problem. Evaluation and promotion of community health status, especially of the underprivileged sections of the society, may be considered as one of the possible interim actions, health being defined »as a state of complete physical, mental and social well-being and not merely the absence of disease and infirmity«.[6]

3. Strategy

Following from the above premise the strategy of environmental anthropology in India should be (a) to identify and measure the relative impacts of specific environmental factors on human biological traits, especially those related to health and disease; (b) to compare the relative impacts of physical, biological and cultural environmental factors; and (c) to enquire whether a feedback system operates between environmental and human biological traits, to give rise to a vicious circle.

A few examples of the types of relationships proposed to be studied are cited below.

3.1. Impacts of specific environmental factors on human biological traits.

Physical environmental factors. (a) Altitude is one of the important physical environmental factors the effects of which has been studied in animal and human populations. In general, high altitude seems to be associated with high red cell number, haemoglobin and haematocrit values, low fertility, high infant mortality, slow growth rate and small adult body size. In humans, such trends occur mainly in the Andean populations,[7] but exceptions occur in Ethiopian[8] and even some Andean studies.[9, 10, 11] The limited studies done in the Indian region so far show that highland groups have higher haematological values and lower fertility than lowlanders, as expected, but similar

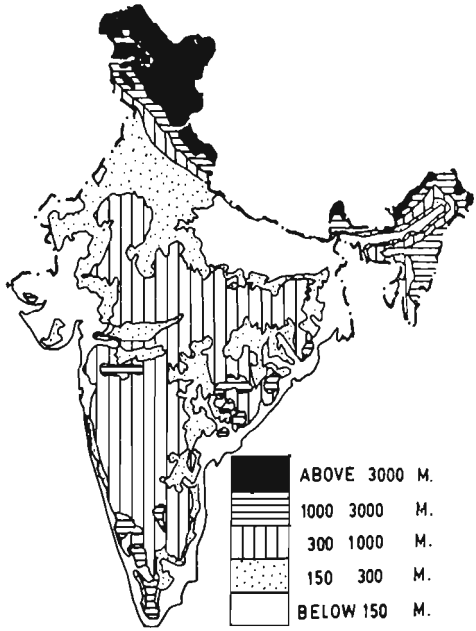

Fig. 1. Physiography

infant mortality and child growth rates and bigger adult body dimensions, contrary to expectation.[12, 13, 14] That altitude effects on human biological traits in the Himalayan populations are unlike that in the Andean ones has also been noted by Baker.[15] The possible effects of altitude on body dimensions has also been shown by Malik[16, 17] on Indian data. (b) Temperature (low) is generally associated with rounder heads. In the Indian region, in the extrapeninsular mountain regions of Nepal, Bhutan and Sikkim rounder heads are found to occur with a higher frequency than in the peninsula and Indo-Gangetic lowlands.[18] (c) The hypothesis of a possible advantage of the cool climate and light, sandy soil to the survival and propagation of hookworm ova/larvae as suggested by Beaver[19] and May[20] seems to be compatible with our recent finding of a heavy hookworm infestation in the sub-Himalayan areas of Kalimpong subdivision, but the corollary of a disadvantage of the hot climate and heavy, alluvial soil to their survival and propagation is not borne out by the finding of a similarly high hookworm infestation in the coastal area.[21, 22]

Biological environmental factors. Flora and fauna provide raw materials for the dietary intakes of calories, protein, carbo-

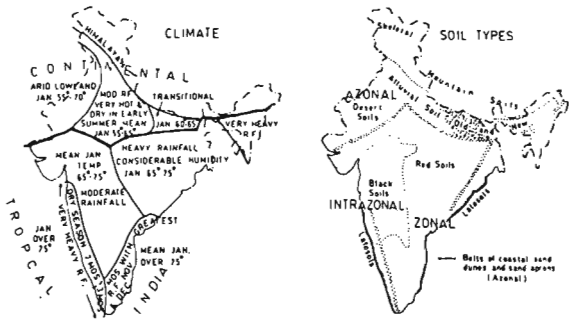

Fig. 2. Climate and soil type

hydrate, fat, vitamins and minerals which affected child growth and adult body size.[23] In India, the effects of dietary intakes of, especially, calories and protein on child growth, adult body size and seasonal fluctuation in body measurements has been demonstrated in many micro-level studies,[24, 25, 26, 27, 28, 29, 30, 31, 32, 33, 34] and more recently in a macro-level[18] study.

Cultural environmental factors. (a) The relationship between the low economic conditions and high fertility and mortality in the developing countries of Asia, Africa and Latin America, as contrasted to the low fertility and mortality in the affluent West, is generally recognised, and explicitly demonstrated by the thematic maps produced by the US Department of Commerce.[35] A similar negative relationship of crude birth rate and crude death rate with per capita income has been recently shown by Basu et al.[36] and of economic conditions with family size by Gopalan et al.[36] and Rao,[37] using Indian data. The effect of economic condi-

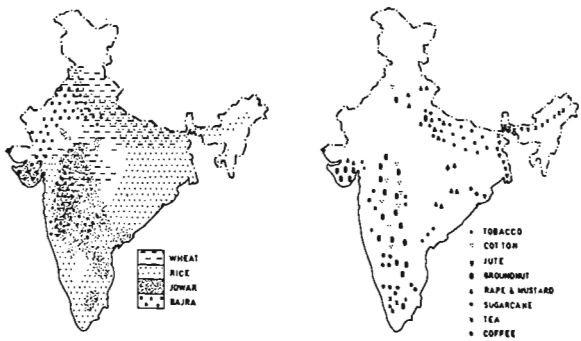

Fig. 3. Food and cash crops

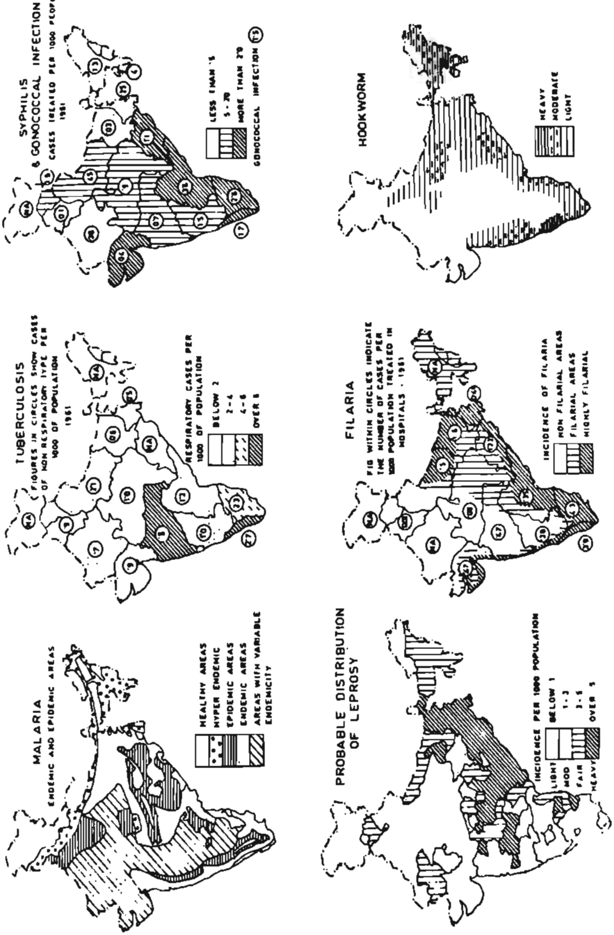

Fig. 4. Pathogenic microorganisms

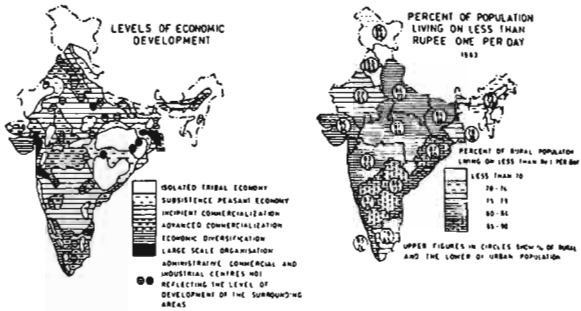

Fig. 5. Economic status

tion generating the need for child labour and consequently large family size, has recently been shown by Neg et al.,[38] and the differential effects of cultural factors on the food-gathering Birhor and the agricultural Santal by Verma.[39] Our own studies on the Sherpas of Kalimpong subdivision show a consistent relationship of low fertility with agricultural occupation and/or nearness to the urban centre, and of high fertility with forest-based occupation and/or greater distance from the town, with the plantation labourers lying in between.[14] (b) The relationship of economic condition, occupation, etc. with child growth and adult body size, presumably via nutrition, is generally known. In India it was shown as early as 1927 by Mahalanobis[40] and 1939 by Dutta,[41] and subsequently by others.[42, 43, 44]

The studies cited above as illustrations succeed, perhaps, only in emphasizing the large gaps in our knowledge of human biology in India in relation to its total environment. It is suggested, therefore, that comprehensive studies be taken up to detect and measure the effects of specific physical, biological and cultural environmental factors on individual demographic, anthropometric, morphological,

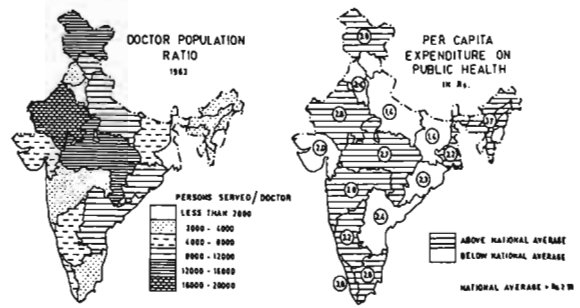

Fig. 6. Deficiency diseases

clinical and other health-oriented traits, using clearly-formulated hypotheses/questions and appropriate statistical designs so as to eliminate the effects of uncontrolled variables which may confound the real relationships. Ganguly's[43] excellent study is a case in point. Using a sophisticated statistical design he showed that most body dimensions were correlated with economic conditions, rather than with urban/rural status; without the rigourous design used in this study the effects of economic condition and urban/rural status might well have been confounded. Further, as part of these studies attempts should be made to find easily observable indicators, and devise simple methods of detection and measurement, of environmental stresses. For instance, biochemical assay of the iodine contents of the food items generally consumed by a community is a technically specialized and laborious job, but counting the incidence of goitre is much simpler and may give an indication of iodine deficiency in the community, rough but sufficient to recommend distribution of iodised salt. A more general health problem pervading India and many other Third World countries is indeed malnutrition. Various methods of estimation of the degree of malnutrition exist, e. g., qualitative and quantitative diet survey, biochemical assay of cooked food minus the left-overs, estimation of serum protein level, etc., but it would be worthwhile to devise methods of determining the nutritional status using simple and quickly obtainable measurements, e. g., height, weight, circumferences and skinfold thickness, as has been attempted by Jelliffe[46], and in India by Gowrinath Sastry and Srikantia[47], Visweswara Rao et al.[48] and others. Examples can be multiplied of the types of relation-

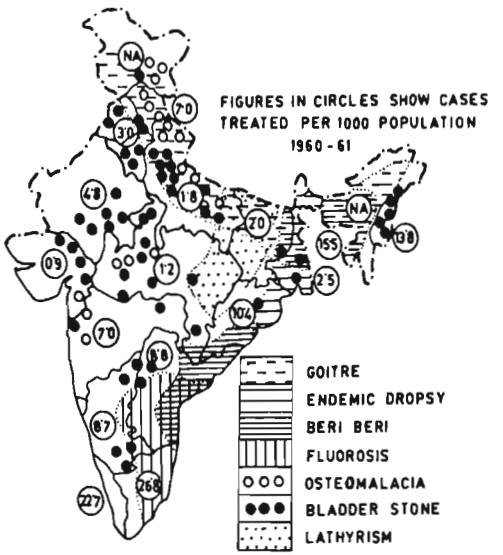

Fig. 7. Doctor population ratio and expenditure on public health

ships that should be explored but such is not the purpose of this report, and the above examples should suffice to illustrate our point.

3.2. Relative impacts of physical, biological and cultural environmental factors on human biology.

The relatively few studies done on this problem suggest that while infant growth in the Andes may be related to altitude irrespective of nutrition, health-care and socio-cultural factors[48], altitude effects on fertility may be overridden by cultural norms favouring high fertility[49], and those on body size by nutrition[8]. In India, hardly any studies have been done on this problem. Our studies on the Sherpas suggest that inadequate nutrition of comparable magnitudes due to poor dietary intakes may have reduced the altitude-related human biological variations between highland and lowland Sherpas, i.e., a socioeconomic factor may have overridden the effects of the physical environment[12].

Now that we have observations to suspect the overriding role of socio-economic over physical environmental factors, it would be profitable to use suitable statistical methods to quantify the relative effects of the various factors. For instance, it is possible that the high cereal diet of the highland Sherpas and the high animal protein diet of the lowland Sherpas may affect the health parameters of the two subgroups differentially; alternatively, the high round worm infestation in the highland and high hookworm infestation in the lowland Sherpas[31, 61] may cause differential rates of reduction of nutrient absorption, and/or of red cell destruction, in the two subgroups and thereby affect some more health parameters, but the differential effects must be carefully quantified. Another important area of study may be defined: general debility is widely prevalent in many Indian populations and it is generally ascribed to protein-calory malnutrition which is quite pervasive[36]. Intestinal helminthic infestations are also widely prevalent[62, 63], and are known to cause general debility. Studies on the relative roles of malnutrition vis-a-vis malabsorption due to parasitic load would help formulate medical welfare programmes for different areas with differential emphases on nutritional supplementation and anti-helminthic medication plus anti-contagion public health measures.

The third line of study will be to measure the relative roles of (a) organic or inorganic causative agents (b) the host factor, and (c) environmental factors in the etiology of particular health disorders, and further, to measure the relative roles of the following socio-cultural factors (in addition to the pervading poverty) which may be important in Indian rural communities[64]: housing conditions, water supply, lack of sanitation and improper disposal of nightsoil, lack of personal hygiene, habit of eating from common utensils, use of improper, indigenous drugs and witchcraft for treatment of diseases, etc. Again, the present report is not aimed at inventorising the problems that could be probed, and the above examples should suffice in making our point.

3.3. Human biology-culture feedback

Data are absolutely lacking on the possible impact(s) of human biological traits on culture, especially in India. However, it has been suggested from studies on plantation workers in Indonesia and tea pickers in Sri Lanka that »anaemic individuals had a decreased work output compared with that of non-anaemic colleagues«,[65] with its consequent impact on the plantation's production and earnings. Reduced earnings could lead to reduction of investment on the labourers' pay and other benefits, further deterioration of their health and work output, and further reduction of earnings. Such a vicious circle seems perfectly plausible but well-designed studies need to be undertaken to test this possibility in many a tea garden, especially, in eastern India.

Another, more speculative, example may be cited. The indigenous tribal inhabitants of the Andaman Islands must have lived in their isolated islands habitat undisturbed for millenia. With the influx of outsiders having a superior technology during the British reign the indigenes contracted »foreign« diseases to which

they had not hitherto developed any immunity, and also shrank to relatively inhospitable terrirories[36, 37], both resulting in a severe health breakdown and decline in numbers. The latter biological phenomena of epidemics and demographic decline must have caused an apathy in the native mind towards the outsiders, and consequently, further self-imposed isolation into more remote and inhospitable areas, away from the modern social, economic, medical, etc. facilities. Such an interplay of social, psychological and biological phenomena would be expected to lead to a vicious circle and result into an eventual extinction of the populations involved, as may have already happened in case of several Andaman tribes, e. g., Charier, Jeru, Puchikwar, Kede, Akar Bale, Okka Juwai, Aka Bea Da, Kol, and perhaps, presently happening to others, e. g., Jarwa, and Onge[37]. While the end result of such a feedback mechanism as postulated above may have been observed in the Andaman indigenes, the mechanism could still be studied in operation in order that the knowledge gained thereof could be utilised to save the remaining small communities in the Andaman and Nicobar Islands, as also many other in the mainland of India, from extinction.

Studies according to the strategies mentioned above may be relevant to human development in two ways: (a) in a limited perspective, knowledge of region/altitude/occupation/economic condition/etc. specific health impairment patterns would help make specific public health programmes; and (b) in a broader perspective, if socio-economic factors can be shown to override the effects of other environmental factors on health in general, then a basic problem of our society, i. e., population health and extinction of, especially, small, isolated communities, could be ascribed to socio-economic disparities rather than to superficial, intermediate variables, to which it is generally ascribed. Understanding of the real determinants of health and survival/extinction of populations as postulated above, could then demonstrate the need for large-scale social changes in order to ensure a lasting solution of some of the major maladies inherent in the structure of a Third World country.

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ISTRAŽIVANJA OKOLINE U INDIJSKOJ ANTROPOLOGIJI: PERSPEKTIVE, PREMISE I STRATEGIJA

SAŽETAK

Indija je velika zemlja s površinom od 3.274.000 km² i 547 milijuna stanovnika, prema popisu stanovnika iz 1971. godine. Među različitim zajednicama postoji veliki niz varijacija s obzirom na fizičke, biološke i kulturne faktore okoline. Osnovna pretpostavka ovog prikaza je da istraživanje okoline u indijskoj antropologiji valja usmjeriti prema razumijevanju odnosa između bioloških osobina čovjeka i različitih karakteristika okoline u cilju ljudskog razvoja i napretka.

U okviru ove pretpostavke predlaže se da strategija istraživanja okoline u biološkoj antropologiji u Indiji obuhvati: 1) određivanje i mjerenje relativnih utjecaja specifičnih faktora okoline na biološke osovine čovjeka, 2) usporedbu relativnih utjecaja fizičkih, bioloških faktora i faktora okoline i 3) utvrđivanje djelovanja povratnog sistema između faktora okoline i bioloških svojstava. U radu se navode brojne studije koje su izvršene u Indiji.