THE CONSERVATION OF NATURAL FORESTS AND THEIR INDIGENOUS WILDLIFE IN THE HILL DISTRICTS OF HIMACHAL PRADESH

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ABSTRACT

Predictions now abound to suggest that India's remaining stocks of forest are threated with almost complete destruction by the end of this century. Great hardship for the human population and widespread extinctions among the indigenous wild flora and fauna are inevitable consequences of these predictions being realized. This paper focuses on Himachal Pradesh, and on Kulu District in particular, to explore issues related to the conservation of surviving natural ecosystems.

We review both historical and contemporary data on the status of forests and wildlife in Himachal Pradesh and describe the process of evaluation used in the selection of Inner Seraj as a potential Biosphere Reserve and National Park. We outline a management regime for this area that would allow the maintenance of existing natural ecosystems without excessive disruption of the local economy. Local education and the active involvement of the National Park's residents in conservation schemes are seen as two vital constituents of any long-term plan for the preservation of the remarkable biota still to be found in this area..

The recipe we suggest is of precisely the kind envisaged by the UNESCO 'Man and Biosphere (MAB)' Programme, embodying the idea that man should harvest natural resources for maximum sustainable yield and ecosystem stability.

INTRODUCTION

Human influences on the biosphere have advanced to the stage at which there is practically no part of the globe where biological communities continue to exist without direct or indirect interference from man. The highest mountains, clad in acid snow, are often adorned with the refuse deposited by intrepid climbers: the abyssal depths are the receptacle for our most deadly toxic wastes. For good or ill, our activities are collectively the major influence on the biosphere.

Until recently the world's renewable resources appeared to be inexhaustible. It is only in this century that the accelerating attrition of natural ecosystems and the extinction of plant and animal species has reached a level sufficient to elicit widespread concern (Myers 1979; Allen 1980; Eckholm 1982). The resulting conservation movement seeks, in part, to protect remaining natural areas and to reduce the rate of species extinction. Conservation is sometimes considered a narrow-minded viewpoint, standing in the way of the aims of 'development', but we, in contrast, see it as a hybrid philosophy drawing support from a variety of sources. In the developed world conservation causes tend to be associated with human health and amenity (e.g. clean up the river; save the oak tree), and draw support largely from urban elites. In these relatively affluent countries good economic arguments can be advanced for conservation based on the recreational value of wildlife: Canadians, for instance, spend about $200 per year per head on activities related to wildlife (Filion et al. 1983).

In the third world the same issues are forced into an uneasy alliance with movements dedicated to the preservation of rural lifestyles. In India these include the entire hunting and gathering tradition of many tribal peoples throughout the sub-continent. In addition, the universal rural demands for fuel-wood, animal fodder and construction timber have placed local agricultural communities at odds with commercial timber interests. But only recently has the resulting conflict assumed a conservation dimension: some agriculturalists now understand their own dependence on the stability of adjacent natural ecosystems (Ashish 1979,1980).

The ultimate aim of development in India, and elsewhere in the third world, seems to be to raise material standards towards those of Europe and North America. Thus, if development proceeds as expected, the same level of interest in wildlife, and other aspects of natural ecosystems, that we see now in the west should emerge eventually in India. The problem for India lies in maintaining sufficient natural reserves of the native flora and fauna during the present period of environmental crisis caused by her burgeoning human population.

Prior to the advent of agriculture most of India was probably forested (Puri 1965; Whyte 1968). Hence most remaining areas of natural vegetation consist of forest. Estimates of the rate of felling in these reserves over the past decade in India suggest that, if harvesting continues unchecked, there will be virtually no primary forest remaining by the end of the present century (Eckholm 1979; Baig 1980; Centre for Science & Environment 1982). Simply to supply the immediate fodder and fuel-wood requirements

of India's population necessitates reafforestation on a scale that may make it incompatible with both arable farming and stock-grazing in the Himalayan front-ranges (Ashish 1979). Fast-growing trees, not necessarily those characteristic of the natural climax, and often of species alien to India, may well have to predominant (Engineer 1982).

With the exhaustion of India's primary forests evidently so close at hand, any scheme to preserve natural ecosystems intact needs to implimented quickly. Because only small areas can be maintained justifiably without any form of commercial exploitation, we also need to select extremely carefully those that are to be secured. How ever this is done, some variant of the Delphic method, involving the sacrifice of certain areas for the salvation of others, seems inevitable.

The Government of India, through its Man and Biosphere (MAB; UNESCO 1977) Committee, has already begun the process by which prime areas collectively representing all the main ecosystem types of the subcontinent are to be set aside (Gadgil in press). One of those already chosen is the area comprising the headwaters of the Sainj and Tirthan valleys in the Kulu District of Himachal Pradesh in the Western Himalayas. We were joint editors of a report (Gaston et al. 1981b), submitted to the Government of India, recommending that this area be given maximum protection forthwith. Our decision was taken after analysis of data on wildlife and forest habitat distribution carried out at more than a dozen different localities under the Himachal Wildlife Project in 1978-80 (Gaston et al. 1981a, 1983a). Here we summarise some of the arguments employed in reaching that decision. We also suggest some practical steps that might be taken to safeguard this and other similar areas in the hills, whilst simultaneously bringing certain immediate benefits to local people, and longer-term ones to others.

AN HISTORICAL PERSPECTIVE

It is generally assumed that the natural climax vegetation of the Western Himalayas, up to the limit for tree growth at about 3,600m, is forest (Puri 1965; Champion & Seth 1968). Now, however, mature forests cover only a small proportion of the total land area. In Himachal Pradesh 56% of land below the tree-line is classified as forest, but at present only about one-third of this area supports continuous tree-cover (Bakshish Singh 1979). The rest consists of scrub communities, grasslands or bare ground.

Clearly a huge area of forest has disappeared from much of the Himalayan front ranges, but when did this take place? Historical records of forest boundaries go back only as far as the mid-nineteenth century, when they were first demarcated by the British administration as part of an overall scheme for land classification. By that time the distribution of major forest blocks was substantially as we see it today (Gaston in press), and hence considerable deforestation must have taken place already. Previous felling was probably associated with increasing agricultural land-use, and particularly with the maintenance of permanent grasslands for grazing though regular deliberate burning.

A comparison of the major river catchments within Himachal Pradesh (i.e. Ravi *, Beas & Sutlej feeding the Indus; Pabar & Giri feeding the Jamuna) suggests that the Ravi was the least forested at the inception of British rule (Cleghorn 1864). The headwaters of the Ravi and its tributary the Budhil Nalla form the homelands of the Gaddis, a nomadic sheep- and goat-herding people centred around their ancient capital at Brahmaur (Phillimore 1984, this vol.). The antiquity of this site extends back to at least the sixth century AD (Goetz 1955). Assuming that the grazing of sheep and goats in this area has been intensive ever since, it is not surprising that the Ravi has a more denuded aspect than other catchments further east. The Gaddis and other transhumant sheperding peoples of the Western Himalayas (e.g. Kanets & Kinnauris) undertake long journeys from winter grazing grounds in the Siwalik foothill areas to summer pastures at high altitudes further north. The latter are mostly located north of the Pir Panjal or Great Himalayan ranges in Lahaul, Spiti and Kinnaur, beyond the reach of the monsoon. However some flocks remain in the Bara Bangahal area in the upper Ravi and in the Parbati valley of the upper Beas, both of which receive only moderate summer rainfall owing to rain-shadow effects (Gaston et al. 1981b)

East of the Sutlej, access to high altitude pastures buffered from the monsoon's influence is more difficult. There the seasonal migrations of sheep and goats are less well developed and these animals constitute a smaller fraction of total livestock populations. The husbandry of sheep and goats requires rather different ecological conditions from those suitable for cattle: rainfall, which generally decreases from east to west along the Himalayas, may be a crucial factor. The agility of sheep and goats enables them to use the steepest of available pastures, and their catholic taste in food-plants causes them to be blamed for more damage to their grazing range than cattle. However buffalo-herders do great damage to forest trees such as oaks, by lopping branches for fodder. Although the precise effects of sheep, goats and cattle may differ, heavy grazing by all domestic stock undoubtedly has had a considerable impact on natural ground vegetation (see below).

The commonest trees at middle and high altitudes in the Western Himalayas are the Deodar Cedrus deodara, Spruce Picea smithiana, Silver Fir Abies pindrow, Blue Pine (or Kail) Pinus wallichiana, Chir Pine P. roxburghii, and three oaks Quercus incana, Q. dilatata and Q. semicarpifolia. Commercially the most important species is Deodar, as it provides excellent construction timber. However Chir Pine is now very extensively grown and tapped for its resin, which is used principally for turpentine manufacture. The oaks, all being evergreen, are lopped heavily throughout the year to provide forage for domestic animals. Both pines yield low grade construction timber (e.g. for

Footnote: All proper names mentioned in the text are featured in Figs. 1 or 2.

use as pit-props), whilst fir is used to make apple crates. Because of its superior timber-quality Deodar has always been subject to heavy felling, but it has also been most diligently replanted since the start of forest management in the hills. Consequently present stocks, taken over the whole of Himachal, are probably similar to those observed by Cleghorn (1864) during a tour of the Western Himalayas in the mid-nineteenth century.

During the period of British rule two episodes of particularly rapid deforestation occurred (Tucker 1982,1983; Gaston in press). The first, during the period 1850-80, resulted from a massive expansion of the railway network in the northern plains following annexation of the Punjab. To give two dramatic examples: in just two years (1861-2) 32,000 Deodars were floated down the Ravi, a harvest possibly represented half the standing crop in that catchment. Reports suggesting that no commercial timber at all remained there were filed in both 1874 and 1896. Then in the period 1853-63, 74,000 trees (again mainly Deodar) were felled in Pangi on the upper Chenab in north-west Himachal. Cleghorn (1864) commented: "It is obvious that no forest in the world can bear such excessive cutting."

The second period of rapid deforestation took place in 1921 when agitations associated with Mahatma Gandhi's civil disobedience campaign, combined with an exceptionally dry summer, resulted in the firing of huge forested tracts from the U.P. hill districts right through to Mandi and Kangra in Himichal (Tucker 1982). Mandi lost 30% of its total forest and 65,000 acres were destroyed in Kulu. There was much damage done besides in Kotkai, Kotgarh, Chopal and Nahan (Gaston in press).

[Figure 1]

A striking feature of current forest distribution in Himachal is that most areas of surviving primary forest are on north-facing slopes. This is presumably because the moist conditions typical of this aspect inhibit the spread of fires, be they natural or deliberate. The greater insolation of southerly-facing slopes makes them more susceptible to both fires and erosion, thus creating a steep, dry habitat in which open oak (Q. dilatata & incana) forest probably forms the natural climax. Grasslands are currently to be seen over large expanses of such mountainsides, and they are evidently maintained by regular spring burning and grazing. Such habitat is well represented in landscape paintings of this area from the early nineteenth century (cf Frazer 1820), when it was presumably maintained in the same way. Such grazing management, the suitability of southerly aspects for fruit cultivation, and heavy tree-lopping for animal fodder has made middle-altitude oak forest one of the rarest ecosystem types in the Western Himalayas, although it may have been one of the commonest originally.

A perusal of management plans written since the start of systematic forestry in the mid-nineteenth century suggests that, in contrast to forest cover, the species composition of forests has probably changed considerably since. Specifically there appears to have been a relative decline in lower altitude hardwoods accompanied by an increase in conifers (especially Chir). Spruce and fir comprise much of the upper-altitude (2,500-3,600m) Reserve Forest originally designated to protect catchment

headwaters from catastrophic erosion, a phenomenon already familiar to foresters at the time (cf Gaston in press). At lower altitudes most Reserve Forest consists of Deodar, much of it secondary. The majority of oak forests fell within village-land boundaries, which has allowed the Revenue Department to preside over their slow destruction ever since. Recently the overall trend away from broad-leaved forest has been exaggerated even further in Himachal by the widespread reafforestation of open middle-altitude hillsides with pines, both exotic and indigenous (AJG, pers. obs.).

THE PRESENT STATE OF HIMACHAL'S FORESTS

Thanks to past management policies in Himachal the extent of forests of Reserve or Protected status, and therefore under the control of the Forest Department, probably remains much as it was some 150 years ago. However, rates of regeneration within natural forest has been negligable in most places, resulting in large blocks of over-mature trees without younger successors in their midst. This situation was foreseen by Trevor (1921) who pointed out that intense grazing pressure throughout Kulu District had prevented any significant natural regeneration for several decades even in his day. This situation does not seem to have altered since.

The Forest Department has the power to close areas under their jurisdiction to grazing and other types of harvesting, for up to ten years on a rotational basis (Chief Conservator of Forests [Simla]; pers. comm. to AJG, 1980). In practice, however, this control is very rarely exercised effectively. For instance, during September of 1980 we were told by Forest Officers in Kulu that no grazing was currently permitted in Solang Nalla, just north of Manali and only about 50 km away, at a time when our surveys indicated the presence of not less than 10,000 sheep and goats in the area. Effectively erected stock-proof fences are a rare sight; most are found to be slack or lying on the ground.

The free grazing of domestic stock in these forests not only prevents regeneration of naturally dominant tree species, it also leads to dramatic changes in the structure and botanical composition of the shrub and herb communities on the forest floor. Numbers of shrub species found during systematic vegetation surveys at 7 localities at middle-altitude in Kulu ranged from 13-15 at sites least subject to human disturbance, compared to only 2-7 species at much disrupted sites. Shrubs covered 19-28% of the ground at the undisturbed sites and only 2-3% at the others (Babu et al. 1984). Forest understorey subject to moderate grazing pressure can look similar to that in undisturbed localities, whilst actually exhibiting very considerable differences in species composition. In the Western Himalayas the iris Iris kumaonensis tends to become dominant in such heavily grazed areas. Thus, while such changes may do little to alter the attractiveness of the forest floor to our eyes, they may have very profound consequences on the diversity and abundance of wildlife (e.g. MacArthur & MacArthur 1961). Practically nothing is known of such effects in Himachal Pradesh because information on the habitat and dietary preferences of the indigenous wildlife species is so scanty.

Recent information on timber harvesting in Kulu and elsewhere

in Himachal suggests that the rate of felling is increasing steeply. The production figures speak for themselves: 8,984m in 1966, 26,346m in 1970 and 89,058m in 1975 (de Roy 1983). Currently 85% of Himachal's timber harvest is sold outside the state (Centre for Science & Environment 1982). Much of the remainder is used for the production of apple-crates, a market that has only recently developed: the annual apple harvest has increased about 100-fold in 20 years to reach 11,000 tonnes in 1982. In 1982-3 20,000 trees were harvested for this reason alone in Kulu (P.N. Tikku, Conservator [Kulu]; pers. comm. to PJG, 1983).

Another factor contributing to uncontrolled timber harvesting in Himachal, and probably in large parts of the rest of India, is the right of local people, enshrined in the Final Settlements (dated 1910 for Kulu), to obtain construction timber at nominal rates from the Forest Department. A single deodar worth up to Rs 2,500 to a contractor can be obtained for Rs 4-10 by such right-holders. The resale of this timber therefore constitutes a substantial element in typical family budgets, and a massive loss of potential revenue for the Forest Department. Even leaving this practice aside, local timber use would still be on the increase now in Kulu, simply to cope with the genuine construction and fuel-wood requirements of a prosperous and rapidly expanding population.

THE STATUS OF WILDLIFE

As the Western Himalayas were originally clothed almost entirely with forest, it is not surprising to discover that the majority of indigenous wildlife species depend on forest as their exclusive or preferred habitat. No systematic survey of even the larger species present in Himachal was available prior to the work of the Himachal Wildlife Project (1978-80). Although local *shikaris* have always had a shrewd insight into the ways and whereabouts of their local wildlife, only a few of the trophy-hunters that accompanied them in the past recorded their anecdotal observations in detail (e.g. Burrard 1925; Wilson [in Hume & Marshall 1889]; Winter Blyth 1951). The most reliable information available comes from local check-lists of birds compiled for Dharamsala and Kulu by Whistler (1926a & b), and for Simla by Jones (1946 - unfortunately never completed).

The pheasants of the region have generally been an abundant and popular quarry for both local *shikaris* and foreign visitors. The only previous attempt at a survey was conducted by Major Ian Grimwood in the winter of 1952-3 around Manali in the upper Beas. He located a population of at least 18 calling Western Tragopans *Tragopan melanocephalus*, and this was the only substantive evidence of a viable population of this species in the world when it was classified as endangered in the *Red Data Book* (I.U.C.N. 1979). Grimwood remembers regularly seeing up to 50 Monal pheasants *Lophophorus impejanus* in the air at once, and recalls having no difficulty in seeing several tragopans in a morning's stroll (*in litt.* to PJG, 1982). Whistler (1926a) recorded the other endangered pheasant species of this area, the Cheer *Catreus wallichii*, as uncommon in the Dhaula Dhar near Daramsala, and sparsely and locally distributed in Kulu.

In the absence of precise contemporary information on the

distribution and abundance of eitner the major forest ecosystems or their component large wildlife species, the Himachal Wildlife Project necessarily consisted of extensive surveys aimed at establishing the status quo. After discussions with the Government of India, Himachal Pradesh Forest Department (Wildlife Wing), and World Wildlife Fund - India, we decided to concentrate our efforts in Kulu District, an area encompassing the Beas headwaters and its principal eastern tributaries: the rivers Parbati, Sainj and Tirthan (Fig. 2). The latter two valleys, collectively referred to as Inner Seraj, had been proposed as the site for Himachal's first National Park in 1977. More than a decade beforehand the area north of Manali and south of the Rotang Pass had also been proposed. Thus one of our objectives was to compare these and other areas as potential sites for a National Park in Himachal's middle-altitude forest belt.

[Table 1 & Figure 2]

Analyses of our survey data showed clearly that wildlife is both more diverse and more abundant at Inner Seraj than at Manali. For instance, the number of resident bird species recorded in Inner Seraj far exceeds the totals for the other areas (Table 1), a result due principally to differences in the songbird (passerine) fauna rather than that of other groups such as the raptors (owls, hawks, etc.) The numbers of summer migrant species visiting each area appear rather similar, but this comparison may be suspect because our overall survey effort and the seasonal timing of short visits varied between sites. A faunal similarity index which controls for these effects (Odum 1971) has been calculated for all possible pairs of sites (Table 2). The figures indicate that the present avian species complement of Chamba on the Ravi, Simla and Inner Seraj are comparable with each other now and with that of Dharamsala previously (Whistler 1926b). The Manali and Parbati avifaunas are relatively distinct from these, and from each other.

[Table 2]

An analysis of the relative frequency of records for 8 of the commonest large mammal species reveals Inner Seraj to have the highest scores for 5, and Manali the lowest for 5, whilst Parbati is intermediate for 5 (Gaston et al. 1983a, Table 4). The apparent absence of both Tahr Hemitragus jemlahicus and Goral Nemorhaedus goral from the Beas headwaters was consistent with local reports, and those of earlier hunters, that neither has ever occurred north of Manali.

Data based on both sightings and dawn-chorus counts of pheasants shows them to be most abundant in Inner Seraj, sparsest in the Manali area, and of intermediate status in the Parbati valley (Gaston et al. 1981b, 1983a). The Monal is certainly commoner in Inner Seraj than elsewhere. The Koklas Pucrasia macrolopha is evidently absent from the uppermost forests of the Beas, in Solang Nalla, whilst its density in the upper Jiwa Nalla of Inner Seraj is only rivalled by that in Simla Water Catchment Reserve, a near sacrosanct area (Gaston et al. 1981a). A large commitment of manpower and time to the Manali area in 1980 produced fewer records of Western Tragopan than more modest efforts by a smaller team in Inner Seraj during March and April 1983.

The main conclusion from our wildlife surveys is incontestable : there is a greater abundance of both species and individuals in Inner Seraj than anywhere else we visited. It was primarily on these grounds that we recommended that this area should be given maximum protection from human disturbance forthwith,and recommended for international recognition as a Biosphere Reserve under the 'Man and Biosphere (MAB)' Scheme(UNESCO 1977).

An initial notification of the ' Great Himalayan National Park', to be sited in Inner Seraj, was approved and publicized by the Himachal State Legislature on 1st March 1984.

CAUSES OF VARIATION IN THE DISTRIBUTION AND ABUNDANCE OF WILDLIFE

The differences that most strike an observant contemporary visitor to Manali, Parbati and Inner Seraj all relate to human impact. The resident population density is far higher in the Manali/Kulu strip than in the lower Parbati and, by comparison, settlements in Inner Seraj are both sparse and small. Most residents in these areas work some local terracing to produce cereals and pulses. Thus the main Beas valley is largely denuded of its trees from south of Kulu to the original northern limit of the forests on the approach to the Rotang Pass. Massive timber extraction operations ensued here after the construction of the metalled road up to the pass in the late 1960's. What forest remains is largely bereft of an understorey, a sure symptom of heavy grazing by domestic stock. In contrast, there are extensive tracts of forest remaining in Inner Seraj, and their typically diverse and luxuriant understorey vegetation is a certain indicator of much less disturbance (Babu et al. 1984).

Analyses of the local habitat requirements of larger wildlife species indicate that the shrub component of the forest understorey is important either as cover, as a provider of food in the form of buds, shoots and fruits, or both. Other analyses show that several species, of which Monal and Koklas Pheasants are the most notable, execute large (1000 m +) altitudinal migrations in response to winter snowfall. During winter and early spring these and other large wildlife species frequently descend below 2,000 m, bringing them into close contact with permanent human settlements, which occur up to 2,500m. Poaching of ungulates and pheasants is widespread in these circumstances (PJG pers. obs., 1983).

Considerable hunting effort, involving the erection of brush barricades to channel the quarry to traps, and the setting of lines of snares, as well as shooting, is expended to procure male Musk Deer Moschus moschiferus. Musk (kasturi) from the abdominal gland (pod) of a single male was worth about Rs 8000 on the international market in 1980 (M.J.B. Green, pers comm.). It has been suggested that about four females and juveniles, carrying no musk, die for every mature male captured (Jackson 1979). In addition, Tahr, Goral, Barking Deer Muntiacus muntjak and the rare and elusive Serow Capricornis sumatraensis all fall foul of the Musk Deer hunter's indiscriminate methods.

The other important poachers' quarry is the male Monal, primarily because its green head crest feathers are a fashionable

nat adornment in Kulu. Indiscriminate "snap" shooting in dense forest is certain to result in the more or less accidental demise of many other birds, including tragopans. Although there has been no significant trophy-hunting of Ibex Capra ibex sibirica or Brown Bear Ursus arctos recently, present-day populations of these species are much smaller than those decribed by early hunters (see Schaller 1977). Poaching, and in the case of Brown Bear continued legal shooting by shepherds protecting their flocks, presumably account for this situation.

The effects of heavy grazing by domestic stock on wildlife probably operate in several ways. A decline in forest and shrub cover reduces the amount of suitable habitat available to pheasants and ungulates, making them more vulnerable to both predation and poaching. Changes in the type of vegetation may also reduce the availability of nutritious plants for wild herbivores. Destruction of the shrub layer will denigh a supply of fruits to the many bird species relying on this for food in autumn and winter.

Most of the blame for the 'over-grazing problem' in forests is assigned, somewhat arbitrarily by local Forest Department officials, to the Gaddis and other transhumant sheperds. There is also a general assumption that the size of the migrant stock animals' population is increasing, and hence grazing pressure also. However, Phillimore (1984, this vol.) has produced some first-hand evidence specific to the Gaddis of Kangra, that contradicts these widely-held beliefs. Whatever the source of the grazing animals, it is indisputable that their attentions are responsible for the absence of forest understorey both near settlements and along heavily used trails. Severe degradation of open forest glades (thach) is also evident in most places, judging by the dominance of thistles (Cirsium), docks (Rumex) and other nitriphilous and graze-resistant plants in the sward.

One important geographical feature of Inner Seraj is that, unlike either the Manali or Parbati areas, it sports no passes leading to high altitude grazing grounds in the north or east. Few migrant sheep and goat flocks are therefore taken to graze the upper Sainj and Tirthan valleys. In addition, the area is not heavily used by the buffalo-herding Gujjars, who occupy the high altitude oak forests during summer in many areas further to the south and west (especially Chamba & Mandi). Given that local stocks of domestic animals are also relatively small in Inner Seraj, there can be little doubt that a prolonged lack of grazing accounts in large measure for the exceptional qualities of the habitat there, compared to anything seen elsewhere.

The annual burning of grassy areas each spring is probably another practice which has a considerable impact on wildlife. As noted above, such burning is almost certainly instrumental in maintaining many existing hill grasslands. This may actually augment the habitat available to species that prefer partially open country, such as Goral and Cheer. However, if burning is carried out late (i.e. April-May rather than February-March) it may terminate Cheer nesting attempts. In any case this practice, together with grass harvesting for hay, clearly has a strong influence on the ecology of this species at most of its localities in Himachal (Garson 1983), and also on other birds of open ground (e.g.pipits & wren-warblers).

In attempting to explain variations in the abundance and diversity of wildlife between different parts of the Beas valley we also need to consider the role of natural climatic trends. These vary somewhat in parallel with the impact of human disturbance, making it difficult to determine the relative importance of particular natural or human factors in bringing about the contemporary pattern.

The town of Manali lies beside the Beas at about 2,000m, and is hemmed in on three sides by ridges at 3,500-4,000m. To the north, beyond the Rotang pass, both climate and ecology abruptly become trans-Himalayan in character (i.e. cold but dry). In consequence winter weather conditions, particularly in terms of snowfall, are much more severe here than in Parbati or Inner Seraj. However, the greater proximity of these more southerly areas to the plains gives them a wetter monsoon. The complete absence of snow-free but forested winter refuge areas north of Manali may well explain the lack of historical or contemporary records for Tahr and Goral in the area and for the near-absence of Koklas pheasants from Solang Nalla. Conversely the moister, milder conditions at equivalent altitudes in Inner Seraj should favour the establishment of a richer flora, as documented by Babu et al. (1984). These effects may be powerful causes of the greater diversity of wildlife and the pattern of avifaunal similarity indices shown in Table 2. The latter indicates strong affinities between front-range localities (Chamba, Dharamsala, Inner Seraj, Simla) and weaker ones with the more "interior" sites (Parbati, Manali) A comprehensive study of the avifauna around Dharamsala might now prove to be very revealing, as the Dhaula Dhar appears to have been subject to human impacts as powerful as those simultaneously affecting the Kulu/Manali strip in the recent past.

LOCAL RESOURCE USE AND CONSERVATION

In advocating protection for the natural ecosystems of Inner Seraj, in preference to other areas we surveyed, three types of criteria were taken into consideration (Gaston et al. 1981b). These were concerned with (i) the state of the natural flora, (ii) the status of wildlife, and (iii) features of human and physical geography relevant to the practicalities of maintaining a large area of natural habitat in its primary state.

In Inner Seraj, large blocks of continuous forest extend from 1,600m up to the local tree-line at 3,650m. All the common types of Western Himalayan forest are represented, including extensive south-facing slopes (in the Tirthan valley) clothed in a mixed stand of Deodar, Blue Pine and oaks, a habitat that is now hard to find elsewhere. There is no good evidence of extensive fellings, as took place in most other localities during the British period, in Inner Seraj. Thus much of this habitat can be regarded as primary. The forest understorey is both luxuriant and rich in species, and medicinal herb collecting is an important source of local revenue, suggesting an abundant supply of such plants in the area. Elsewhere in Kulu there is widespread evidence of excessive grazing on both pastures and forest understorey.

The analysis of our wildlife survey data suggests that all

the large mammals and birds typical of West Himalayan front-range forests, and the alpine areas above them, are present in Inner Seraj. The bird-life of this locality also exceeds that found elsewhere, both in terms of abundance and diversity. The fauna includes populations of a number of rare or endangered animals including Cheer Pheasant, Musk Deer, Himalayan Tahr, Serow, Brown Bear, Leopard Panthera pardus, Lynx Felis lynx and Bharal Pseudois nayaur. It is one of only two areas in the world where anything more than a remnant population of Western Tragopan is known to survive (Gaston et al. 1983b). Himalayan Ibex Capra ibex sibirica and Snow Leopard Panthera uncia also occur nearby.

A low resident human population density and the virtual absence of migrant herds of stock animals during summer in Inner Seraj should minimize the difficulties surrounding the revision of hereditary rights to both grazings and the harvesting of 'minor forest products' (i.e. fuel-wood, herbs, bamboo). Lack of access to the area from the snow-bound eastern side, and precipitous terrain to the north should also facilitate the control of illegal encroachments into the area once it achieves protected status. The topography of other areas we surveyed did not pre-adapt them so well for effective protection.

Whilst the case we have just made is unambiguous in pointing out the suitability of Inner Seraj as a potential site for a Biosphere Reserve and National Park, it omits what we consider to be the most important ingredient of any protection plan. As we say in the last paragraph of our report, ".... little can accomplished without some measure of support from the local people" (Gaston et al. 1981b, p. 144). The same sentiment is crucial to the success of social forestry programmes in various parts of India. Such community-based production of fuel-wood necessarily requires a high level of cooperation between the households in a village, so that the panchyat can enforce grazing and timber-harvesting regulations effectively (Eckholm 1979).

It is easy for the ecologically-educated to appreciate the value of such voluntary schemes, but the frequently illiterate local participants must be educated in the basic ideas of conservation, to give them some understanding of the processes now destroying the ecology of the whole Himalayan region. Only then will they be more inclined to think of the longer-term prospects for their area rather than of short-term revenue returns. Such an education programme already exists in the U.P. hills in the shape of 'Chipko Andolan' (literally, 'the movement to hug trees'). Whilst it has a somewhat spiritual tone, Chipko is also an intensely practical movement. The careful fencing, terracing and weeding of new forestry plantations by its adherents in UP have resulted in remarkable 90% sapling survival rates (Centre for Science & Environment 1982, p.55). Sadly, the deterioration of hill environments in U.P. had to reach the stage at which the labour-force started to emigrate to neighbouring states (including Himachal) before the Chipko philosophy gained mass appeal. It is still disappointing that the influence of Chipko has not yet spread into the nearby hill-districts of Himachal, which share with those in U.P. all the environmental problems associated with watershed deforestation in steep terrain (Eckholm 1975).

At present wildlife is seen by many in Himachal as either a source of revenue (e.g. Monal, Musk Deer) or trouble for farmers

(e.g. Black Bear, Rhesus and Langur damaging crops) and graziers (e.g. Brown Bear, Leopard & Snow Leopard worrying flocks). Nevertheless we have seen for ourselves that such attitudes can change very rapidly. During 1980 it was commonplace for men in Kulu to adorn their hats with a Monal head-crest; in the spring of 1983 we never saw one. The Monal was then less common than it was either 3 or 30 years previously (see above), but it is nowhere near extinct. Hence one may conclude that a complete ban on hunting, in force during 1982-84 in Kulu District, had some influence on public sentiment, at least.

All education programmes are likely to have their major impact on the younger generation,but many would argue that by the time its present members achieve positions of influence in their families or villages there will be too little timber, grass or soil left in the hills to enable people to live there (Ashish 1980; Engineer 1982). Stop-gap policies, involving commercial profit for participants in sustainable-yield programmes for the local production of wood and forage, would seem to be the only quick answer to this problem of inertia, as Shankar Jha (1983) has recently pointed out in connection with timber production:

> "Reafforestation is only possible if the government harnesses the energies of millions of people throughout the country. And the only way to do that is to give them an immediate financial stake in the success of the programme."

Hence the recent emergence of farm forestry, which involves land-owners planting trees instead of edible crops, in return for annual maintenance payments and at least a share in the profits accrued when the timber is eventually felled.

The schemes discussed so far for increasing or sustaining the production of essential natural resources in the hills amount to modifications of existing farming practices. This still leaves the problem of how local people could be persuaded to accept responsibility for the stewardship of a large area of near-sacrosanct primary habitat. What follows is a scheme designed for implimentation in the proposed National Park in Inner Seraj; hopefully plans with the same underlying philosophy (Batisse 1981) can be applied elsewhere.

The most important natural resources for villagers in Inner Seraj are a rich variety of medicinal plants, from both the forest floor and the alpine meadows, dupe roots from the meadows for making incense, morrel mushrooms (locally guchi; Morchella sp.) and bamboo from the forest. The collection of medicinal herbs can yield Rs 1-3,000 per year per household. All harvesting activities other than mushroom collecting are supposedly carried out only by households with rights to do so in particular places under the Settlement. In practice there is an escallating population of people without such rights harvesting all these products. Such 'outsiders' are said locally to constitute 50-90% of the collecting population. The competitive pressure they generate causes very uneconomical harvesting, because small or unripe products are taken, and much more time has to be spent by all collecting them.

The principal difficulty in establishing and maintaining any specially protected area within a National Park, particularly one containing land of extreme topography clothed in dense forest, is

the enforcement of restrictions on human activity. Just as successful reafforestation requires widespread local support, so it is with the conservation of shrinking primary environments. The planner's problem is to make conservation through the restriction of human impact seem worthwhile to people living in or near any reserve or sanctuary. In Inner Seraj local people express considerable resentment towards 'outsiders' without legal rights poaching the various natural resources that are either subsistence requirements or important sources of revenue for residents. In consequence it seems that local communities would be prepared to police their own home-areas if their actions, in either reporting illegal harvesting or apprehending non-residents, was backed by the force of law (and perhaps a bounty payment system!). It should be stressed that at least initially the only people who could recognise 'outsiders' are the permanent residents of an area. Forest Department staff are both too few and far too itinerant to be effective at present, but an increased financial commitment to conservation by both the state and central governments could radically alter this situation.

The human geography of Inner Seraj is peculiarly suited to a scheme of this kind. In the 5 km beyond the roadhead at Gushaini on the Tirthan there are 24 settlements: the largest village contains 28 households, of which there are 200 in all. The rest of the valley is uninhabited. The much broader Sainj valley harbours some 45 settlements in the 10 km above Sainj village, and a further 16 households share 26 dwellings dotted along the remaining 20 km of the upper valley. To the north, the upper parts of the Jiwa and Hurla valleys contain only one or two small settlements each. They both lie within the provisional boundary of the National Park, as notified recently by the State Legislature.

Households in the lower parts of the main valleys command most of the harvesting rights both close by and in the upper valleys. If poaching of all kinds can be reduced, the residents claim they could then easily satisfy their basic needs. At present this is becoming more and more difficult to achieve because of poachers. The management plan for Inner Seraj that we tender here hinges on allowing only householders resident to the east of Sainj and Gushaini villages to harvest minor forest products or timber from the area in which they live. In return we suggest they are given full official support in attempting to curtail illegal encroachments by non-residents from further afield.

The Sainj and Tirthan Valleys are extremely precipitous on both north and south banks in places, and there are only two good trails into either upper valley. Checkpoints through which any visitors to the interiors would virtually have to pass, could be established at the villages of Khrongsha and Sungsha on the Tirthan and at Lopah and Majhan on the Sainj (see Fig. 1). Further checkpoints at Bathad in the Palhachan valley, and Majharna in the Jiwa valley, would curtail intrusions into the central area from both north and south.

If local residents can be given exclusive rights to natural resources in their home area, there will then be an excellent opportunity to introduce a sustainable yield management scheme for natural resources in Inner Sainj. The prohibition of outside graziers, for instance, should release the space necessary for

the introduction of more efficient forage production and animal rearing systems. Such schemes require the large-scale enclosure of grazing land and forest as a protection against grazing by domestic stock, which are then stall-fed on the collected hay (Ashish 1979). Likely secondary effects of leaving large tracts undisturbed for several growing seasons would be increases in local stocks of open-country wildlife including Cheer, Goral and Barking Deer, provided hunting was controlled.

The only severe disruption to local people required of this plan is the rehousing of the 16 households occupying dwellings in Shakti and Maraur in upper Sainj. This possibility did not excessively disturb family members to whom it was put. Given that this human population is bound to increase in future and that its presence would give anyone a legitimate excuse to enter the heart of this area, resettlement seems preferable to the status quo. There is also some evidence that the local Goral population was decimated during 1979 by a mange-like desease suspected of originating from the local population of domestic stock. The presence of stock in the area would, in addition, enable local people to carry guns legally. Thus it would seem sensible to move these families to compensate them with new land and houses as nearby as possible, and to give their members jobs specifically associated with the National Park's management.

In suggesting this, however, we are not advocating the total closure of the then uninhabited upper Sainj and Tirthan valleys. The topographies of both are so extreme that there is little scope for disturbance of wildlife over much of the area. Tourists that succeed in reaching places where wildlife can be seen at relatively close quarters will have to walk long distances at relatively high altitudes. The mass-commercialisation of a National Park in Inner Seraj is not therefore, feasible, but the provision of basic facilities for research ecologists and dedicated tourists seems very desirable. For the same reasons, local people should be allowed to continue their religious pilgrimages with local deities, including periodic visits to the sources of both the principal rivers. Indeed, any attempt to curtail such activities might jeopardize the whole management plan for this area. Such rituals are an important element of village life for a superstitious local community, whose members are, perhaps justifiably, suspicious of the planner's motives in creating a National Park.

With Inner Seraj in mind, we are very conscious of the need for further research on all aspects of the natural ecosystems of the Western Himalayas, and on the effects Man's diverse intrusions. At present we can make only the crudest predictions about how the vegetation and wildlife may respond to a total ban on grazing and burning. Also, we have only the testimony of local people from which to make inferences about present stocks or harvesting rates of medicinal plants and other minor forest products. All these matters require further investigation with the ultimate objective of insuring that the area's natural resources and the local human population can be sustained. Experience elsewhere in India makes it clear that satisfactory management of natural habitats can only be achieved with the cooperation of at least the majority of local people. Some form of compensation must be found to offset the inevitable adjustments to harvesting rights arising from this National Park's creation. Giving local people a personal stake in the

maintenance of the natural ecosystems of their home area should be more effective than mere financial recompence.

In conclusion we stress that the system of land management by local stewardship advocated here emphasises the potential for man, forests and wildlife to coexist in harmony. It is an attempt to translate the ideals underlying the Biosphere Reserve concept (UNESCO 1977; Batisse 1981) into a specific course of action at a particular locality. In a country like India, and even in the relatively sparsely populated middle-Himalayas, there no longer seems to be room for the luxury of wildlife reserves from which humanity is totally excluded. Present and predicted future pressures on India's natural resources make such a strategy completely impractical.

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TABLE 1. Numbers of resident and migrant bird species recorded at three localities in Kulu District, Himachal Pradesh (from Gaston et al. 1981b, p. 95).

		Manali	Parbati	Inner Seraj
Residents:	Passerines	25	29	42
	Others	22	24	26
	Total	47	53	68
Summer Migrants:	Passerines	31	25	33
	Others	13	10	16
	Total	44	35	49
Overall total:		91	88	117

TABLE 2. Similarity indices (S) between resident passerine bird faunas at six localities in Himachal Pradesh. Only species occurring at 1,900-3,100m, where the majority of survey time was spent, are included. (S = 2C/[A + B], where A and B are the number of species at two sites respectively and C is the number common to both; a high S value indicates close similarity [Odum 1971]).

	Manali	Parbati	Inner Seraj	Simla	Dharamsala
Parbati	0.74				
Inner Seraj	0.60	0.76			
Simla[1]	0.65	0.75	0.92		
Dharamsala[2]	0.63	0.75	0.85	0.91	
Chamba[3]	0.63	0.69	0.73	0.81	0.75

Footnote:

Data from: [1] Jones (1947-8) & AJG (pers. obs., 1977-80);

[2] Whistler (1926a);

[3] AJG (pers. obs., 1978-9).

LEGENDS FOR FIGURES

FIGURE 1. Map of the foothill regions of Himachal Pradesh, showing the principal mountain ridges (hatched) and rivers, and the location of towns ( ) and districts (*italics*) mentioned in the text. The Budhil Nalla, a tributary of the upper Ravi beside which Brahmaur is marked, was left unlabelled for lack of space.

FIGURE2. Map of the Upper Beas catchment in Kulu District, Himachal Pradesh.

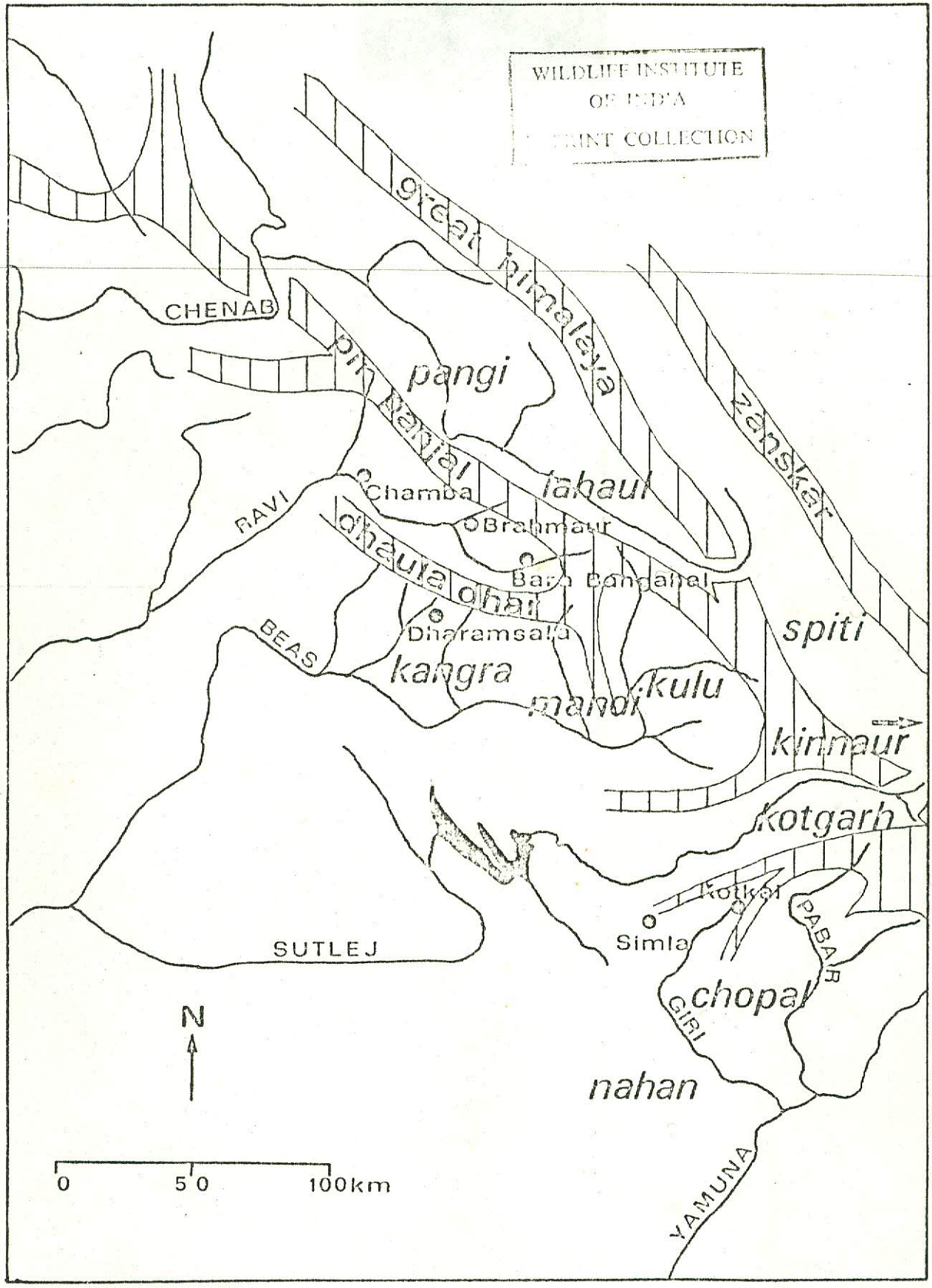

Fig 1