

YOSEMITE CENTER FOR

STUDY OF THE HUMAN DIMENSIONS OF

WILDLIFE CONSERVATION

A non-profit corporation

Second Tri-annual Progress Report

on the

MAN AND MAKALU PROJECT

prepared by

James D. Bland

Post Office Siswa Budibara
Siswa VDC, Ward No. 9, Chitre
Sankhuwasaba District
Nepal

For those who received my first progress report, you will notice I have changed my reporting schedule from quarterly to tri-annual. Tri-annual reports will be less taxing on what is currently a one-man operation, and will better suit the seasonal pattern of my workload. Hereafter, progress reports will be filed as follows:

<u>Report</u>	<u>Season</u>	<u>Period Covered</u>	<u>Filing Date</u>
First	Winter	1 November - 28 February	1 March
Second	Spring	1 March - 30 June	1 July
Third	Summer-Fall	1 July - 31 October	1 November

The organization of this report is as follows. First, a chronological review of the most important activities undertaken during this reporting period (1 January through 30 June, 1993). More detailed discussions are indented so readers can pass over them if desired. Second, major findings and shortcomings of this reporting period. Third, a few memorable experiences to lighten the reading. Fourth, work plans for the next reporting period and beyond. Fifth, a list of additional funds applied for during this reporting period. At the end, appendices pertaining to preliminary findings and analyses.

CHRONOLOGICAL REVIEW OF IMPORTANT ACTIVITIES

3 JAN. Kathmandu: Departed Kathmandu for Hile, the last village on the way to Khandbari that is accessible by road. Traveled for 2 days in a commercial truck rented by the Makalu-Barun Conservation Project (MBCP). Chaperoned MBCP's 35 porter-loads of books and office equipment in exchange for being able to add my 8 porter-loads of equipment to the shipment.

5 JAN. Hile: Departed Hile with 40 porters headed for Khandbari, Sangkhuwsaba's District Center, 3 day's travel by foot along the banks of the Arun River.

7-24 JAN. Khandbari: Stored my equipment and set up a temporary work area in the MBCP office, checked into the Arati Hotel. Met MBCP Khandbari Staff, the District Forest Officer, Community Development Officer, KARDET staff Julian Gayfer and Mr. Govinda, and several SAGUN researchers. Wrote my First Quarterly Progress Report. Interviewed 5 young men for a job as my guide/assistant. Hired Jit Bahadur Basnet, an unemployed college student. Departed Khandbari 24 JAN with J.B. Basnet and 2 porters on an expedition to search for a remote study area.

Originally planned to visit the Upper Sangkhuwa, Upper Siswa, Maghang, Upper Apsuwa, and Bhote Khola areas in succession, and then select the most appropriate Sherpa/Bhotia village for study. In Khandbari I learned the Bhote Khola area, nearest the Chinese (Tibetan) border, was closed to foreigners, so I deleted it from my itinerary. This information was contradictory to what I had been told at the Immigration Office in Kathmandu, but was common knowledge in Khandbari.

25-26 JAN. Thanku: Met the staffs of the Thanku Veterinary Center and Post Office. Stored supplies at the Veterinary Center while we explored the upper Siswa and Sangkhuwa Rivers.

27 JAN. Bala: Camped at the home of Barun and Tulsai Rai, where a German scholar, Mr. Martens, has lived occasionally for many years (Martens was not present). Learned there were only 2 Sherpa villages above Bala: Rammite and Chitre. Both are located on the ridge dividing the Sangkhuwa and Siswa drainages. I was amazed at how little the people of lower elevations knew of the villages and people of higher elevations.

28-30 JAN. Chitre: Stayed at the home of Sundupe and Pasang Sherpa, who were building a large Khumbu-style home they hoped to someday convert to a trekker's hotel. Visited nearby pastures and forests with Sundupe. Sundupe said if I chose to study in Chitre he would rent me the top floor of his new building, and the entire village would be at my disposal. Aside from its small pool of Sherpa laborers, I felt Chitre would be an ideal site for my study. I considered that spring would soon be upon me and decided that my time would be better spent in Chitre than searching for an alternative study site elsewhere.

Chitre is situated on one of the main trails between Sangkhuwasaba and Khumbu Districts. It is the most remote permanently-inhabited village on the Sangkhuwa side of the high passes. It is 6 day's walk from the nearest road (Hile), 4 days from the nearest airport (Tumlingtar), and 3 days from the District Center (Khandbari). The village consists of 10 households and some 50 inhabitants, all Sherpas. Local forests, literally a stone's throw from the village, are of the mixed-broadleaf type. Principal canopy dominants include maple, oak, magnolia, rhododendron and alder. Major crops are potato and corn, with some wheat. Principal livestock are yak-cow hybrids (chaunri) and water buffalo. Most chaunri are kept at remote pastures by certain members of each household. Water buffalo are grazed on nearby pastures in the wet season and mostly stall fed in the dry season. The village was apparently established by the grandfather of the village men some 130-150 years ago. The grandfather came from Solu, and strong ties with Solu remain, as well as with Khumbu. Chitre's Lama was trained at a Solu monastery.

31 JAN - 3 FEB. Khandbari: Prepared to undertake another expedition to the Upper Siswa River. I planned to use photographs from several elevated points there to make a photographic panorama of Chitre's forests. High resolution topographic maps and aerial photographs were not available for Chitre, so I decided to base my study on my own photographs.

4 - 9 FEB. Upper Siswa: Took photographs from Kulung, Khyampalung and Phaledo (above Yangsima). At each site I recorded the time, exposure, elevation, azimuth angle to Chitre, and angle of the sun for each photograph.

13 FEB - 3 MAR. Kathmandu: Had slides of Chitre's forests processed and custom enlargements made to my specifications. Had repairs done to my computer printer and had a wood stove and 'Sherman-style' small mammal traps custom made to my specifications. Bought rabies vaccine that I could self-administer. Completed a 1992 Final Report for California Department of Fish and Game and sent it to Sacramento. Met with Dr. Tirtha Maskey and Dr. Kattel of HMG Department of Nation Parks and Wildlife Conservation (DNPWC) to update them on my progress and plead for speedy approval of my study and collecting permit application. Also met with officials of IUCN, HMG Forest Ministry, and HMG Natural History Museum.

4 - 7 MAR. Khandbari: Made preparations to live in Chitre. Departed Khandbari for Chitre on 7 March with 12 porters carrying equipment and food supplies.

10 - 14 MAR. Chitre: Helped with final carpentry details on the new building we would inhabit. Arranged my equipment as best I could and partitioned a makeshift work area, which my landlord dubbed the 'ahpis.' Hosted a SAGUN research team that was considering Chitre and neighboring Besinda as potential study sites. Began making daily journeys to local forests to learn local birds by sight and sound. Began collecting leaf samples from local trees and shrubs. Used my photographic panorama of Chitre forests to learn and record local place names. Spent a day in Besinda with the SAGUN team. Observed Besinda's last remnant of forest, preserved primarily for religious purposes. Learned Besinda Rais use Chitre forests in spring to collect lokta bark (from which they make

rope and paper), and in spring and summer for grazing sheep and goats. Learned that there was no sizable area of forest on the Siswa-Sangkhuwa Divide that was not used by Rai livestock to some degree. This information contradicted what Sundupe Sherpa had told me earlier, and was a bit of a set-back for my overall study plan (now I would have to go even further afield to find a 'pristine' vegetation community to use as an experimental control site).

15 - 23 MAR. Chitre: Visited each Chitre household and asked prepared questions regarding seasonal cropping patterns, household makeup, and forest resource harvest. I had anticipated resistance to these questions but found very little, possibly because Sundupe Sherpa accompanied me to each house, possibly because Sundupe recommended we share a bottle of rakshi, local moonshine, with the head of each household before we began questioning.

The people of Chitre use names of isolated pastures (kharka) when referring to associated forest-use areas. I asked the head of each household to rank these areas according to their importance to his household for various forest resources, including pasture, fodder, fuelwood, timber, leaf litter, bamboo, and fencing. I then did a quick analysis to see how the rank order of use areas was related to distance from the village.

Visited all local forest use-areas to become familiar with their location and general physical attributes.

24 MAR. Chitre: Attended Youl Sang Puja, an annual event during which local Lamas perform rituals which Sherpas believe will keep hail from destroying their sprouting crops.

29 MAR - 20 APR. Chitre: Selected 7 forest use-areas for detailed study. The sites are positioned along the Khandbari-Namche trail, a convenient distance gradient extending from Chitre into uninhabited forest (Appendix 1). The nearest site, Chitre Bari, includes croplands and houses, the next, Chitre Kharka, is a pasture with lots of scrub and a little cropland. The 4 sites at intermediate distances are forests with small kharkas. The furthest site is a remote forest and kharka some 2 hour's walk from the Chitre (and much further from other villages).

At each of the 7 use-areas I established a square 9 ha study plot. Within each study plot I cleared 6 parallel 300-meter trails, 50 meters apart. Every 25 meters along each trail I established a sampling station. The 66 sampling stations constituted a co-ordinate grid on which I proceeded to sample birds, small mammals, ground beetles and plants at each plot.

21 - 30 APR. Chitre: Conducted a count of all bird species on all study plots.

1 MAY - 15 JUN. Chitre: Spot-mapped the breeding territories of 12 selected species of ground-nesting birds that defend their territories by song. All observations were recorded in relation to the co-ordinate grid of sampling stations.

4 MAY. Chitre: Attended and photographed a Sherpa Wedding in Chitre.

9 MAY. Chitre: Attended Kali Khola Panchami, a Rai Puja held at a small temple at the headwaters of Chitre's water supply, the Kali Khola.

Three Rai Shamen 'danced,' conducted rituals and 'spoke for' the local deity that resides there. This 'very powerful' deity is said to protect those who worship him from bear attack, but can cause earthquakes and landslides if angered. One Shamen performed an elaborate ritual specifically for me, including a gyrating dance and guttural chants that were supposedly the words of the deity.

10 MAY - PRESENT: Wrapping up small mammal and ground beetle work. Taking photographs essential for lectures about the study: key bird species, forests, people gathering and using forest resources, field techniques, etc.

MAJOR FINDINGS AND SHORTCOMINGS.

FINDINGS

1. Relationship of forest resource harvest and travel distance. Predictable patterns occurred with respect to the distance Chitre inhabitants traveled to collect various forest resources. The two study areas very near Chitre--Chitre Bari and Chitre Kharka--had been so thoroughly transformed to "domestic landscapes" (pasture and croplands) that they were used only to a minor degree for pasture, fuelwood, and fencewood. Amongst the 4 forested study areas, basically four use-patterns emerged (Appendix 2). With some resources, such as forest litter, more distant areas were less important. I tentatively interpret this as an indication that nearby leaf litter resources (forest canopy) have not been exploited to an un-sustainable degree in the past so Chitre residents are more likely to collect leaf litter near the village, where less time and energy are required. Although there are preferences for certain species of leaves, practically 'any leaf will do' for mulch so abundant leaf litter nearby does not equate to a healthy (species-rich) forest nearby. The second pattern to emerge was one of increasing importance with distance. This pattern was typified by timber resources. I tentatively interpret this as an indication that timber resources on nearby plots have been harvested at an un-sustainable rate in the past. Today Chitre residents must travel to more distant areas for the bulk of their timber needs. An alternative interpretation would be that Chitre's inhabitants currently limit the amount of timber they harvest from nearby plots. Thus far I have found no evidence to support this alternative interpretation, but I will look into this further. The third pattern was one where all needs for a resource were met very near the village. Fuelwood and fencewood were of this pattern. As with litter, species preference do exist, but in a pinch 'any wood will do' and so most fuelwood and fencewood needs can be met with the more hardy and fast-growing tree and shrub species that grow in 'disturbed' areas near the village. The final pattern was one where the resource is harvested only at distant sites, typified by bamboo. I tentatively interpret this to mean that bamboo has been over-harvested near the village in the past. But there is a related problem unique to bamboo. Entire patches of bamboo over large areas occasionally bloom and die off. I was told that some 40 years ago bamboo was available near Chitre, but after a natural die-off heavy grazing of the new shoots killed the colony and no effort was made to reestablish it.

2. Number and status of bird species at Chitre. Within 45 minutes walking distance from Chitre, along the Khandbari-Namche trail, I observed 103 species of birds between 10 March and 15 June (Appendix 3). My work focused on diurnal ground- and understory-dwelling species, however, so 5 groups in particular were under-observed: pigeons, owls, swifts, martins, and leaf warblers. For each bird observed I noted its location (including grid position if within a study plot), behavior and vegetation stratum. Eighteen of the 103 species were early spring migrants briefly passing through on their way to higher-elevation breeding areas. Five of the 103 species are classified as vulnerable, 2 as rare, and 2 as endangered (Appendix 3). Some species that are rare elsewhere in the Himalayas are relatively abundant at Chitre, so I was able to make a number of noteworthy contributions to Nepalese ornithology (Appendix 4). The status and biology of some species I worked with on a daily basis were previously very poorly known (Appendix 5).

3. Diversity of ground-nesting birds available. I was very pleased to find that Chitre's forests are inhabited by an abundance of ground-nesting birds, many of which defend their breeding territories by song. My study design depended on

the presence of such birds. I eventually focused on the 12 most abundant and most vocal species, which I describe in Appendix 5. Being aware that I might be the first and last person to do such detailed work with the rare and endangered species gave me a special sense of diligence.

4. First breeding density data for 12 bird species. The spot-mapping technique I used produced breeding density data for understory bird species that defended their breeding territories by song. To my knowledge the density data presented in Appendix 6 are the first such data available for these species.

5. First analysis of color phase frequency for 3 dimorphic species. Three of the species I focused on breed in two color phases. Scaly-breasted Wren-Babblers and Brown Wren-Babblers both have 'white' and 'fulvous' color phases, and some male White-browed Shortwings breed in a first-year female-like plumage.

	No. of known territories	No. (%) of terr. checked for color	No. (%) light [blue] ind.	No. (%) fulvous [brown] ind.
Scaly-breasted Wren-Babbler	9	7 (78)	3 (43)	4 (57)
Brown Wren-Babbler	11	8 (73)	2 (25)	6 (75)
White-browed Shortwing	28	24 (86)	[7 (29)]	[17 (71)]

Why and how these color phases occur is a matter of evolutionary biology which I would like to pursue at a later date, so an analysis of their frequency of occurrence is an essential first step. I attempted to observe the color phase of all of the territorial Wren-Babblers and Shortwings I was aware of. For Wren-Babblers, in which sexes are alike, I tried to get a 50% sample: one individual from each pair (with unmarked birds it would have been impossible to determine whether I was observing one individual or its mate over successive days, as individuals are remarkably solitary even within their breeding territories). If in the future I am able to mark individual birds I will be able to study to what degree, if any, color-phases interbreed.

6. Bird diversity and density in relation to distance from Chitre village. This subject is touching on the core of my research, and will receive much further analysis in the future. The current data, however, establish the kinds of positive and negative relationships between people and wildlife that I will now study in great detail. Many of the species studied this year were clearly more or less abundant in near or distant forest stands (Appendix 6). The density and diversity of bird species is not, of course, a simple matter of distance from the village. In-depth multivariate statistical analysis will be necessary to understand which factors contribute most to these distribution patterns. In particular, vegetation, topography and past land-use must be considered along with distance. My on-going investigation of local culture and land-use practices will elucidate the role Chitre's inhabitants have played in vegetation (and hence habitat) change.

7. Increased environmental awareness among Chitre Sherpas. I am now more convinced than ever that a species-rich, resource-producing village forest is possible here, if Chitre's inhabitants have the will to make it happen. There is no question that the interest in such concepts has increased considerably since I arrived here and got local people involved in my work. One of my panoramic photographs of the Chitre area, which I display in my dining room,

has become quite a topic of conversation. Prior to displaying the photograph, local people gave me the impression they believed Chitre's forests and forest resources to be sufficiently abundant, and that they had not considered any serious threat to them. My photograph 'from afar' shows quite convincingly, and unintentionally I might add, that the forests from Chitre down are basically gone. Chitre's inhabitants understand very well that life in Besinda, the Rai village just below, is very difficult, and that this is in large part due to the poor condition of the village's forests and soils. The Rai people of this region, with their slash-and-burn practices and large herds, have an insatiable appetite for forest. Chitre's Sherpas also understand that not only do Rais use the forests surrounding Chitre, they had traditional kipat rights to them. I once pointed out Besinda's denuded slopes on my photograph, as well as a new Yangsima Rai kharka and slash-and-burn patch at the base of Chitre's Bhurmala Forest. The kharka was apparently the first major encroachment of Yangsima Rais into Bhurmala Forest, which is on the Chitre side of the Siswa River from other Yangsima lands. I told my Sherpa friends, maybe too mater-of-fact, that it was only a matter of time before Chitre's forests would be like Besinda's. The discussion became quite lively at that point, faster than I could follow, but I'm certain my guests did not disagree with me. Since that day I have overheard people referring to my photograph in conversation on many occasions.

8. Spring livestock grazing may adversely affect nesting success. Livestock are grazed on small pastures, or kharkas, scattered throughout Chitre area forests. Rai (not Sherpa) herders erect temporary bamboo huts at these pastures and their livestock range widely through the surrounding forest. The principal livestock species are sheep and goats. A herd may consist of from 6 to 200 animals, and the duration of stay at one kharka ranges from 1 day to more than 2 months. Herds are moved from one kharka to another in succession. The use of each kharka is very traditional: the date a herd arrives and departs a particular kharka is essentially the same every year. The impact of these herds on non-woody vegetation is dramatic. After only 3 days' inhabitation by 150 goats and sheep one pasture was turned entirely black from urine and feces. When I first saw this I thought the herder's fire had gotten out of control. In the nearby forest the herd had removed most of herbaceous plant biomass below one meter height. The steep, moist, topsoil was thoroughly trampled. I was amazed to see goats and sheep relishing such thorny and semi-woody plants as Rhubus and Berberis, as well as ferns, lichen, and bamboo. Dead logs served as access routes to creeping and climbing vegetation. Such logs, with the mantle of shrubby plants that engulf them, are prime nesting habitat for such bird species as the rare White-browed Shortwing and endangered Tailed Wren-Babbler.

Unfortunately, I had not anticipated such grazing on my study plots, so I have only a few data to describe its effect on territorial birds. At two such pastures territorial Hodgson's tree pipits, pasture-nesters, did not return to their territories after the herds left. I also have some evidence that a territorial White-browed Shortwing was displaced from its territory by a herd, but spot-mapping data of unmarked individuals are not sufficient to state this with certainty.

SHORTCOMINGS

1. Live-traps are not catching a diversity of species. My 'Sherman-style' small mammal traps have been quite successful at catching one particular species of red rat, but that's about it. Likewise, my pitfalls have only been catching one, maybe two, species of shrew and one or two species of Carabid beetle. I know there are more species out there because I've seen them. In light of this limited success, I will probably be limited to comparing relative densities of

these common species at different sites, and unable to compare species composition.

4.2 Audio recording equipment inadequate. I tried recording bird songs with my Walkman and a microphone on a makeshift bamboo boom, with predictable results. Good sound recordings would be very useful in my work, and it is likely that the songs of many species here have never been recorded. I will try to bring good audio recording equipment next year, though the cost may be prohibitive.

4.3 Video recorder got as far as India. My wife brought YCWC's video recorder to India in February to record her work with Siberian cranes. The plan was to bring it to Nepal as well and record some of my work. However, Indian Immigration Officials recorded the equipment in my wife's passport, so the only way she could have handed it over to me (without paying a tax when she left India without the equipment) would have been for us to meet at the Delhi Immigration Office. We'll try again next year.

ON THE LIGHTER SIDE, MAYBE.

In the course of 12 weeks of daily work in the forest I have plucked and preserved some 600 leaches from my body and clothing. Fortunately only 10 or so have eluded my ever-watchful eye. I estimate that by the end of this wet season my pint collecting jar will be full to the brim. Yes, they are very nasty, but not so much so as to make it impossible to do field work during the monsoon, as many people have suggested.

I do not know what the Rai Shaman (or Kali Khola deity ?) said to me during his spectacular performance. I have been hesitant to ask the Sherpa who accompanied me. I think I prefer to assume he wished me well in my endeavors to study and preserve the local forest. He may also have thanked me for the bottle of local moonshine I donated, which the Shaman was obliged to drink on behalf of the deity.

Soon after I arrived in Chitre I found myself in the middle of a domestic dispute. My landlady came to my room one morning, laid down on the floor and started pouting and shaking. My assistant explained that her husband, my landlord, had clubbed her over the head with a piece of firewood. Her head was bleeding. She obviously felt we could be of more help than her relatives. I was incensed, and began wondering what I, as a naive outsider, could do for her. A half-hour later her husband entered the room, pale and hunched over. At first he asked if I had any medicine for kidney stones, but upon further questioning for groin pain in general. The parts of the puzzle began to fall together. The previous evening the two had gotten very drunk, not an uncommon occurrence in Chitre. Some bad words were shared, Pasang received a piece of firewood on the head and Sundupe a fist or foot in the groin. They would not divulge who struck first. They have been much more amicable since.

When I arrived in Chitre I knew very little of the habitat associations of local birds. Ali and Ripley provide general habitat information in their Handbook, but little detailed information has been recorded on habitat associations of Himalayan passerines. My study design called for a guild of relatively abundant ground-dwelling species, but I had little idea which species these might be, whether they would be sufficiently abundant for my work, nor which species would defend their breeding territories by song. I was, therefore, delighted to find that Chitre's forests abounded with a colorful variety of endearing little songsters. All objectivity aside, I can say that meeting with them each morning, recognizing their familiar behavior and song, was a source of joy that saw me through many essentially lonely days.

WORK PLANNED FOR THE NEXT REPORTING PERIOD AND BEYOND

Next reporting period (1 July - 31 October, 1993).

1. Small mammal and ground beetle work. Currently in progress and will be completed by July 15th.
2. Household fuelwood monitoring. Local people have just finished restocking their fuelwood supplies for the year, so now is an ideal time to sample the composition of their woodpiles. I will first measure the cubic meters of fuelwood in storage at each house, then sample for size and species composition of individual sticks. I will also begin sampling the amount of fuelwood used at each Chitre household on a bi-monthly basis, using Fox's method (see my study proposal for details). I foresee no social barriers to this work.
3. Vegetation analysis. By mid-July I will begin sampling vegetation at the 66 sampling stations in each of my 9 ha plots. My assistants will not enjoy crawling through vegetation during the monsoon/leach season, but they very much appreciate any opportunity to earn a salary. I will sample vegetation in two phases. First I'll measure relatively constant parameters like the physical environment and tree densities and diameters. After this work, which will take several weeks, I will return to all study plots in rapid succession to measure quickly-changing parameters like cover values for trees, shrubs and ferns. I will also set up a related sampling scheme to monitor how tree and fern cover values change over a 12-month period.
4. Interviews. As I conduct my fuelwood monitoring work I will ask the people of Chitre about the history of the village, its people, and its forests. I'm particularly interested in verbal accounts of recent vegetation change from senior members of the village.
5. Search for additional study sites. Sometime in late September or October I will explore the east-facing slope of Siswa Canyon to find an undisturbed 'control' site, and a set of kharkas where I will base my work next spring.

Next Year (after February 1st, 1994).

My initial observations of the effects of kharka-based grazing on vegetation and wildlife habitats have inspired a new and improved study plan. I had originally planned to conduct experimental work on the effects of fuelwood harvest, but in the Chitre area a study of kharka-based grazing will be more feasible, more 'true-to-life', and more immediately applicable to management. I am not abandoning the question of fuelwood, it's an integral part of the species diversity/distance/land-use 'descriptive' work I am currently wrapping up at Chitre. I believe kharka-based grazing, however, will be more appropriate for experimental work, at least in this area.

My basic plan (although I'm still thinking through the details) will be to look at breeding density and nesting success of ground-nesting birds on kharkas that are grazed at different stages of the nesting season. Recall that livestock here are moved from one kharka to another in succession. Thus, amongst the many kharkas in the Siswa Drainage, for example, some kharkas are grazed in early spring, others mid-spring, others late spring, etc. I will use the same bird species and ornithological techniques used this year, plus thorough nest-searching and monitoring. If grazing occurs after birds have established territories but before nests are built, what proportion of territories are abandoned, and by which species? If grazing occurs when eggs are present, what proportion of nests are destroyed, and of which species? If grazing occurs when chicks are present in nests, what proportion of the chicks do not fledge successfully? I will also study the related question of how

construction and placement of nests, an inherited trait peculiar to each species (see Appendix 5), makes different species more or less vulnerable to livestock. I suspect this may very well be the reason some species in this region have become rare or endangered.

With an adequate sample of kharkas from each of 2 or 3 'time blocks' (plus controls) I should be able to show how grazing during each time block affects the reproductive success of various ground-nesting birds. I will then conduct a 'door-to-door' survey to determine what proportion of a large sample of kharkas in the Siswa Drainage (ca. 10 sq. km) are grazed in various time blocks, for what duration, with how many animals, and with which species. Then, working from aerial photographs, I will estimate (with some field-checking) the total area (ha) mixed broad-leaf canopy cover, the total number and size of kharkas, the area (ha) of forest affected by kharka-based grazing in various time blocks, and the area (ha) unaffected by kharka-based grazing.

By combining estimates of the number and type of kharkas in the Siswa Drainage with estimates of breeding densities for selected bird species in various affected and unaffected areas I will, in the end, be able to: 1) estimate the total breeding population of selected bird species in the Siswa Drainage, 2) assess whether the Siswa Drainage breeding population of any of the selected bird species is likely to decline as a result of grazing-caused reproductive failure, and 3) describe which kharka-based grazing activities are most detrimental to ground-nesting birds, and why.

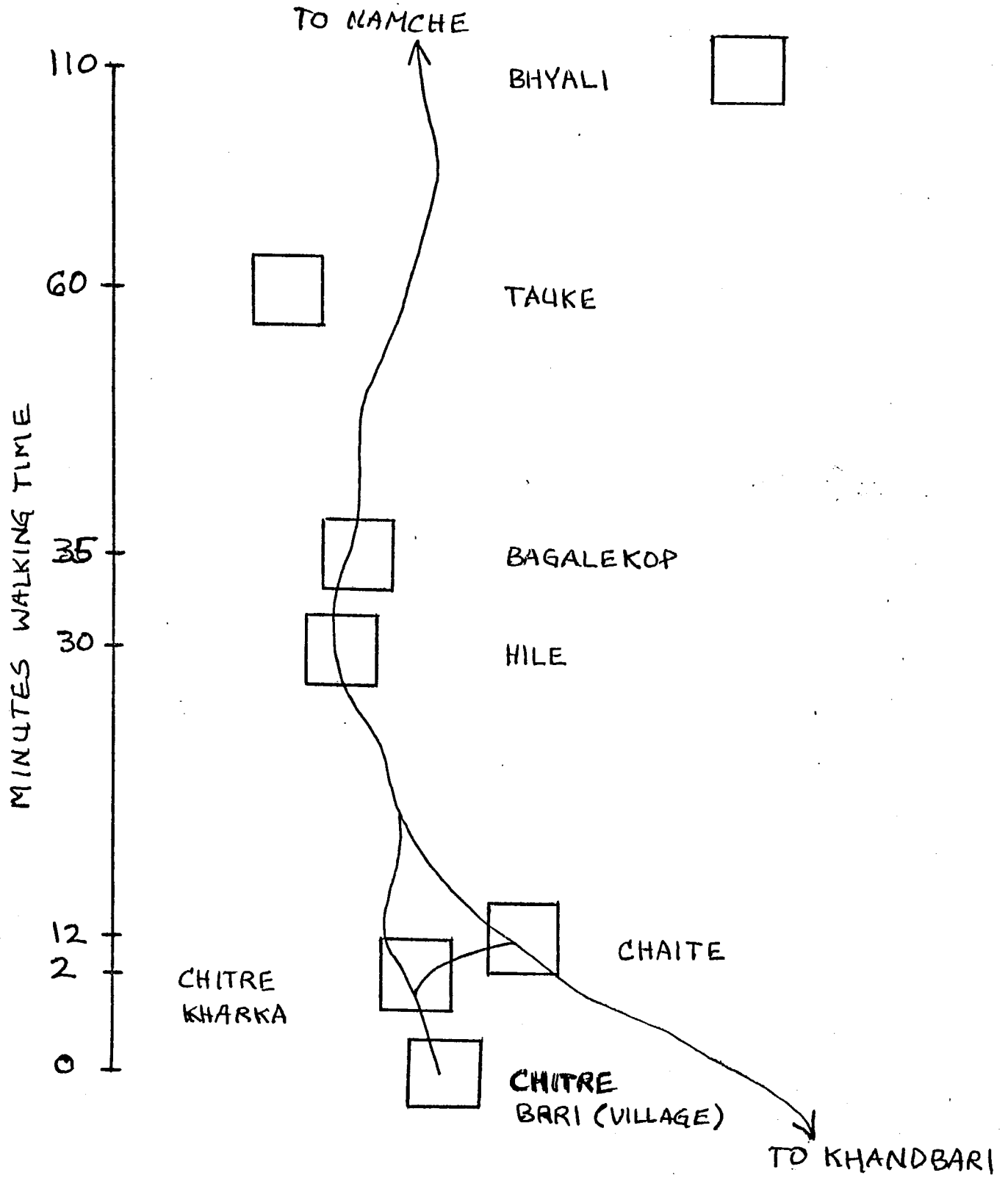
SOURCES OF FUNDS APPLIED FOR DURING THIS REPORTING PERIOD

1. Conservation and Research Fund, Chicago Zoological Society.
2. Virginia Smith Scholarship Fund, Merced County School District
3. Cyril Smith Scholarship Fund, Merced County School District.

LITERATURE CITED

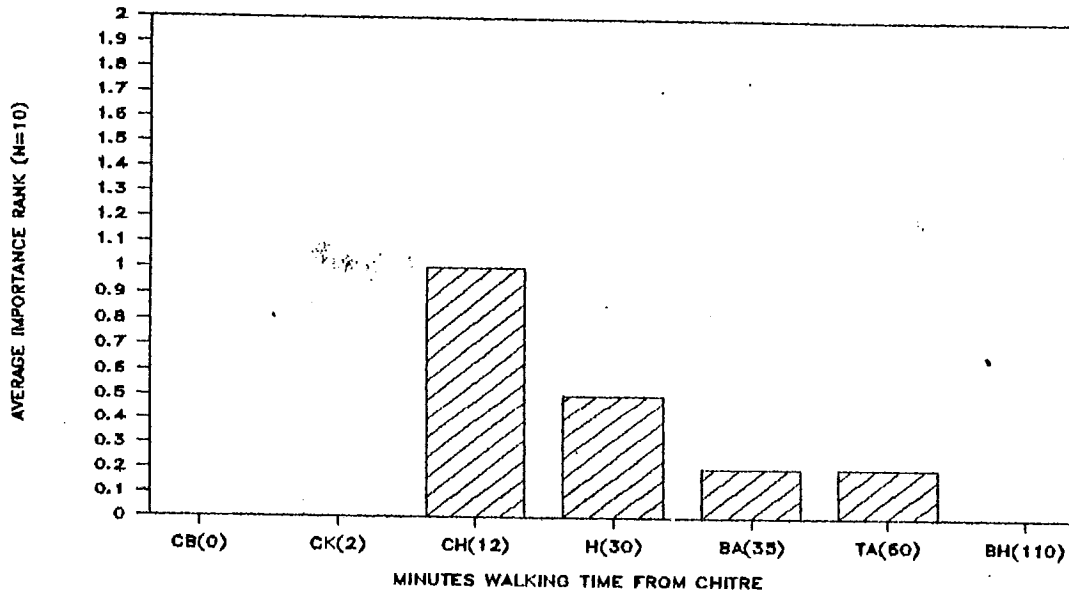
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APPENDIX 1. Distribution of 9 ha study plots along a distance gradient extending from Chitre Village.

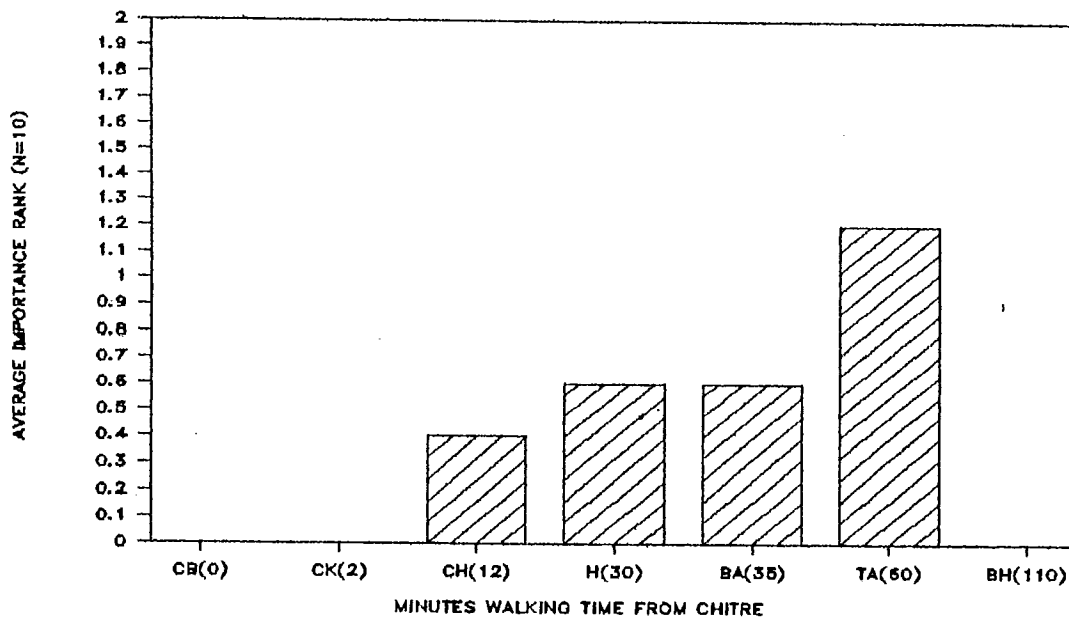


APPENDIX 2. The rank importance of study plots for harvest of 7 forest resources in relation to the distance of study plots (minutes walking time) from Chitre Village (N = 10 households). CB = Chitre Bari (crops and houses), CK = Chitre Kharka (pasture), CH = Chaite (forest with kharka), H = Hile (forest with kharka), BA = Bagalekop (forest with kharka), TA = Tauke (forest with kharka), BH = Bhyali (forest with kharka).

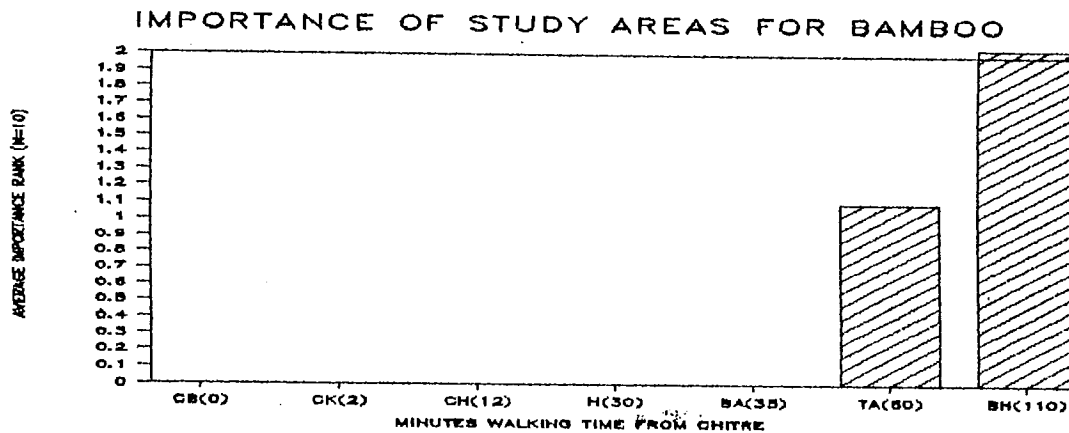
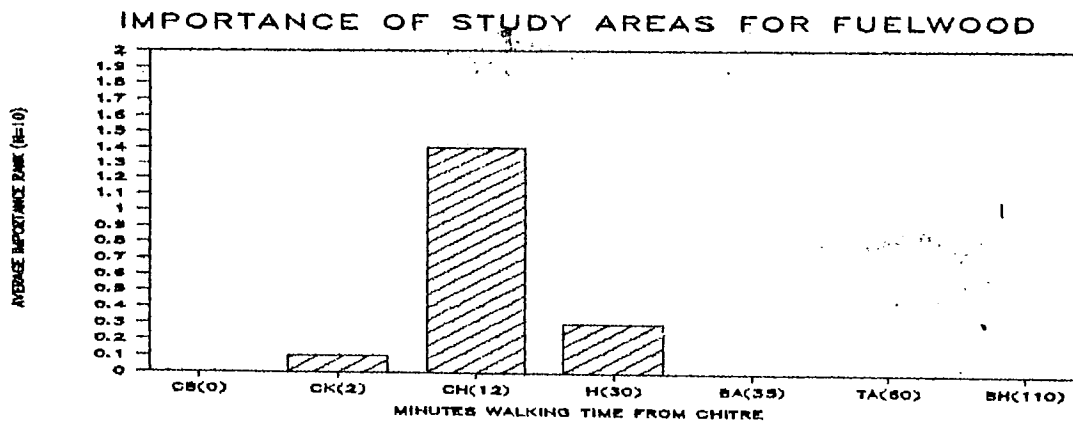
IMPORTANCE OF STUDY AREAS FOR LITTER



IMPORTANCE OF STUDY AREAS FOR TIMBER



APPENDIX 2 (continued).



APPENDIX 3. Birds observed at Chitre between 10 March and 15 June, 1993.

Species	Seasonal status in Chitre (1)	Proved breeding in Chitre ? (2)	Relative abundance, Chitre (3)	Status in Nepal (4)
1. Harrier, Hen	M	no	R	(C,M)
2. Sparrowhawk, Besra	?	no	R	(U,R)
3. Eagle, Black	B	no	I	(FC,R)
4. Hawk-eagle, Mtn. (Hodgson's)	B	no	I	(FC,L,R/M)
5. Kestrel, Common	?	no	R	(C,R/M)
6. Partridge, Common Hill	B	yes (a,f)	O	(FC,R)
7. Pheasant, Satyr Tragopan (Crimson Horned)	?	no	R	(U,R) [V]
8. Kalij	B	yes (f)	I	(FC,R)
9. Pigeon, Snow	M	no	R	(C,R)
10. Wedge-tailed Green	B	no	I	(FC,R)
11. Woodpigeon, Ashy	B	no	R	(C,R)
12. Dove, Rufous Turtle (Oriental Turtle)	B	no	R	(C,R)
13. Hawk-cuckoo, Large	B	no	C	(FC,M)
14. Cuckoo, Common (Eurasian)	B	no	C	(C,M)
15. Oriental (Himalayan)	B	no	C	(C,R)
16. Lesser (small)	B	no	O	(FC,M)
17. Owl, Tawny	B	no	I	(UC,R)
18. Barbet, Great (Great Himalayan)	B	no	O	(C,R)
19. Golden-throated	?	no	R	(O,L,R)
20. Woodpecker, Bay (Red-eared Rufous)	B	no	I	(S,R) [V]
21. Darjeeling Pied	B	no	I	(FC,R)
22. Swallow, Barn	M	no	R	(C,R/M)
23. Nepal House-Martin	?	no	R	(FC,R)
24. Pipit, Olive-backed (Hodgson's Tree)	B	yes (a,c,d,e,f)	O	(C,R)
25. Wagtail, Grey	B	no	R	(C,R)
26. Minivet, Longtailed	B	no	O	(C,R)
27. Bulbul, Striated	B	no	I	(O,L,R)
28. Shortwing, Gould's	M	no	R	(S,R) [R]
29. White-browed	B	yes (a,c,d,e)	C	(VU,R) [R]
30. Rubythroat, Himalayan (White-tailed)	M	no	R	(O,R)
31. Chat, Blue (Indian Blue Robin)	B	yes (a)	C	(FC,M)
32. Redstart, Blue-fronted	M	no	I	(C,R)
33. Robin, white-tailed (White-tailed blue)	B	yes (a)	I	(O,L,R)

APPENDIX 3 (continued).

Species	Seasonal status in Chitre (1)	Proved breeding in Chitre ? (2)	Relative abundance, Chitre (3)	Status in Nepal (4)
34. Bush-robin, Orange-flanked	M	no	I	(C, R)
35. Bushchat, Grey (Dark-grey)	B	yes (a, c, d, e)	C	(FC, R)
36. Thrush, Plain-backed (Plain-backed Mtn)	M	no	R	(FC, R)
37. Long-tailed (Long-tailed Mtn)	M	no	R	(O, R)
38. Scaly (Speckled Mtn)	B	no	R	(FC, R)
39. Dark-throated (Black-throated)	M	no	I	(C, M)
40. Blackbird, White-collared	M	no	O	(FC, R)
41. Grey-winged	B	yes (a, c, f)	O	(C, R)
42. Ground Warbler, Chestnut-headed	B	yes (a)	C	(FC, R)
43. Slaty-bellied (Grey-bellied)	B	yes (a)	I	(O, R)
44. Bush Warbler, Strong-footed (Brown-flanked)	B	yes (a)	R	(O, L, R)
45. Rufous-capped (Grey-sided)	B	no	R	(C, M)
46. Prinia, Brown Hill (Striated)	B	yes (a)	R	(C, R)
47. Warbler, yellow-eyed (Golden-spectacled)	B	yes (a, c)	C	(C, R)
48. Chestnut-crowned	B	no	I	(O, R)
49. Grey-headed (Grey-hooded)	B	no	O	(C, R)
50. Leaf Warbler, * Grey-faced (Ashy-throated)	B	no	I	(FC, R)
51. Niltava, Beautiful (Rufous-bellied)	B	yes (a, d)	O	(C, R)
52. Flycatcher, Verditer	B	yes (a, c, f)	I	(O, R/M)
53. Orange-gorgetted (Rufous-gorgetted)	B	yes (a)	I	(C, R)
54. Grey-headed	B	no	I	(VC, M)
55. Blue Flycatcher, Pygmy	B	yes (a, e)	R	(S, L, R) [VI]
56. Slaty-backed (Rusty-breasted)	B	yes (a)	R	(S, L, R)
57. Rufous-breasted (Snowy-browed)	B	yes (a, e, f)	O	(O, R)

APPENDIX 3 (continued).

Species	Seasonal status in Chitre (1)	Proved breeding in Chitre ? (2)	Relative abundance, Chitre (3)	Status in Nepal (4)
58. Fantail Flycatcher, Yellow-bellied	B	no	I	(VC, R)
59. Scimitar Babbler, Rufous-necked (Streaked-breasted)	B	yes (a)	I	(FC, R)
60. Slender-billed	B	yes (a)	R	(S, R) [VI]
61. Wren-babbler, Scaly-breasted Brown (Lesser Scaly -breasted)	B	yes (a)	O	(FC, R)
62. Tailed	B	yes (a,b,f)	O	(O, R)
63. Babbler, Red-headed (Rufous-capped)	B	yes (e,f)	R	(U, L, R) [E]
64. Parrotbill, Nepal (Black-throated)	B	yes (a,b,c,f)	I	(FC, R)
65. Laughing-thrush, Striated	B	no	I	(O, R)
66. Streaked	B	no	I	(C, L, R)
67. Black-faced	M	yes (a, f)	R	(O, R)
68. Red-headed (Chestnut-crowned)	B	no	I	(C, R)
69. Leiothrix, Red-billed (Pekin Robin)	B	yes (a, f)	C	(C, R)
70. Shrike-babbler Black-headed (Rufous-bellied)	B	no	R	(FC, R)
71. Red-winged (White-browed)	B	yes (e, f)	R	(S, L, R) [E]
72. Green	B	no	R	(FC, R)
73. Chestnut-throated (Black-eared)	B	yes (e)	R	(O, R)
74. Barwing, Hoary	B	yes (e)	I	(O, L, R)
75. Minla, Blue-winged	B	no	I	(FC, R)
76. Bar-throated (Chestnut-tailed)	B	no	O	(FC, R)
77. Red-tailed	B	no	O	(C, R)
78. Tit-babbler, Chestnut-headed	B	no	I	(C, R)
79. White-browed	B	yes (a, c)	C	(C, R)
80. Sibia, Black-capped	B	no	I	(C, R)
81. Yuhina, Yellow-naped (Whiskered)	B	no	C	(C, R)
Stripe-throated	B	yes (c, d, e)	O	(C, R)

APPENDIX 3 (continued).

Species	Seasonal status in Chitre (1)	Proved breeding in Chitre ? (2)	Relative abundance, Chitre (3)	Status in Nepal (4)
82. Rufous-vented	B	no	R	(C,R)
83. Tit, Red-headed	B	no	I	(C,R)
84. Green-backed	B	no	O	(C,R)
85. Yellow-cheeked (Black-lored)	M	no	I	(C,R)
86. Nuthatch, White-tailed	B	no	I	(C,R)
87. Sunbird, Nepal	B	yes (a,b)	C	(C,R)
88. Fire-tailed	M	no	O	(FC,R)
89. Flowerpecker, Fire-breasted (Buff-bellied)	B	no	R	(C,R)
90. Drongo, Ashy (Grey)	B	no	R	(C,R)
91. Blue Magpie, Yellow-billed	B	no	R	(C,R)
92. Treepie, Himalayan	B	no	I	(C,R)
93. Nutcracker, Eurasian	M	no	R	(C,R)
94. Crow, Jungle (Large-billed)	B	no	I	(C,R)
95. Siskin, Tibetan (Tibetan Serin)	M	no	R	(U,L,M)
96. Goldfinch, Himalayan (Yellow-breasted Greenfinch)	B	no	I	(C,R)
97. Mountain-finch, Hodgson's (Plain)	M	no	R	(C,R)
98. Rosefinch, Common (Scarlet)	M	no	R	(C,R/M)
99. Finch, Juniper (Crimson-browed)	M	no	R	(U,R)
100. Scarlet	B	no	R	(U,L,R) [V]
101. Black Finch, Golden crowned (Gold-naped)	B	no	R	(U,R)
102. Bullfinch, Red-headed	M	no	R	(FC,R)
103. Bunting, Little	M	no	O	(FC,M)

(1) M = observed during a relatively short period of time, generally prior to known breeding season. B = observed throughout the species' known breeding season. ? = observed during known breeding season but too infrequently to confer breeding status.

(2) Following C. and T. Inskipp's criteria for proved breeding: (a) Observed singing or scolding at breeding territory on more than 3 spot-mapping

APPENDIX 3 (continued).

visits (not one of Inskipp's criteria, which are intended for bird watchers, but a recognized scientific technique). (b) Observed carrying nesting material (by itself not proof of breeding). (c) Observed nest with eggs. (d) Observed nest with young. (e) Observed carrying food. (f) Observed fledgling(s).

(3) Relative abundance rankings for all species (ie., migrants) are for the period during which they occurred in Chitre. C = Common: observed very frequently. O = Occasional: observed a few times during each full day in the field. I = Infrequent: observed once every few days. R = Rare: fewer than 4 individuals observed (some territorial individuals were seen on multiple occasions).

(4) Following C. and T. Inskipp (1985): VC = very common, C = common, FC = fairly common, O = Occasional, U = uncommon, VU = very uncommon, S = scarce, L = local, R = resident, M = migrant.

Following Inskipp (1989): [V] = Vulnerable: believed to become endangered in the future if factors causing its decline continue, [R] = Rare: not currently vulnerable or endangered, but Nepalese population is small and therefore at risk, [E] = Endangered: extinction is believed likely if factors causing its decline continue.

* I was not sufficiently confident with other Leaf Warbler species to record them. Additional leaf warblers likely to occur at Chitre include Blyth's, Dull Green, Large-billed, Orange-barred, Yellow-rumped, Plain, Dusky, and Tickell's Leaf Warblers.

APPENDIX 4. Significant contributions to Nepalese ornithology during this reporting period (1 Jan - 30 Jun, 1993). References to current knowledge are based on Ali and Ripley (1987) and C. and T. Inskipp (1985). Unfortunately, the most recent edition of C. and T. Inskipp is not currently available in Nepal, so a few points below are not current. I use the term 'site record' to refer to one of C. and T. Inskipp's 1/2 degree (56 sq. km) observation-recording blocks. Some blocks contain multiple sightings, so single 'sight records' are not necessarily equal to single sightings, though they often are. See Appendix 3 for the criteria for establishing first proved breeding records.

1. Common Hill Partridge (Arborophila torqueola): First proved breeding record for Nepal.
2. Kalij Pheasant (Lophura leucomelana): The transition from L. l. leucomelana to the west of the Arun River and L. l. melanota to the east has not been established. I have collected feathers that tentatively fit A&R's description of leucomelana but I'm still awaiting an opportunity for a good observation, and hopefully a photograph.
3. Bay Woodpecker (Blythipicus pyrrhotis): Classified Vulnerable. Only 10 site records. First record from the Arun Drainage.
4. Hodgson's Tree Pipit (Anthus hodgsoni): A&R report breeding season as May through July and clutch as normally 4, sometimes 3 or 5. I observed 2 week-old chicks in a nest in a Chitre potato field on May 1st, indicating courtship, nest building and incubation began in early April. Whether the clutch was originally greater than 2 is uncertain.
5. Gould's Shortwing (Brachypteryx stellata). Classified as Rare. Only 9 site records for Nepal. Observed a pair on April 23rd, undoubtedly migrating to higher-elevation breeding grounds.
6. White-browed Shortwing (Brachypteryx montana). Classified Rare. First proved breeding record for Nepal.
7. Chestnut-headed Ground Warbler (Tesia castaneocoronata): First proved breeding record for Nepal.
8. Strong-footed Bush Warbler (Cettia fortipes): Only 7 site records for Nepal. First proved breeding record for Nepal.
9. Rufous-breasted Blue Flycatcher (Muscicapa hyperythra): A&R describe the species' habitat as "dense primary forest with luxuriant undergrowth." I recorded an approximately equal number of breeding territories near the edge of small pastures, where the subcanopy was relatively sparse. Preferred subcanopy at Chitre appears to be rather open but with an abundance of leafless vertical stems.
10. Slender-billed Scimitar Babbler (Xiphirhynchus superciliaris): Classified Vulnerable. Only 8 site records for Nepal. First proved breeding record for Nepal.
11. Tailed Wren-Babbler (Spelaornis caudatus): Classified Endangered. Only 2 previous site records for Nepal, the first being Hodgson's type specimen for Nepal. First proved breeding record for Nepal. Observed 5 different parties, 2 with broods. Broods observed several days in succession in same general area. Probable first photographs of adults and fledglings. Superior descriptions of some vocalizations.
12. Black-headed Shrike-Babbler (Pteruthius rufiventer): Classified as Endangered. Only 7 site records for Nepal. First proved breeding record for Nepal. Located a tree where adult male was delivering insects but my assistant was unable to find the nest (some 15 m height in a wet, mossy, tree and too risky for me I felt). The species' nest has not yet been described, and A&R suggest it will be "extremely difficult to find."

APPENDIX 4 (continued).

13. Green Shrike-Babbler (Pteruthius xanthochloris): First proved breeding record for Nepal.
14. Chestnut-throated Shrike-Babbler (Pteruthius melanotis): Only 9 site records for Nepal. First proved breeding record for Nepal.
15. Chestnut-headed Tit-Babbler (Alcippe castaneiceps). First proved breeding record for Nepal.
16. Nepal Sunbird (Aethopyga nepalensis): First proved breeding record for Nepal.
17. Tibetan Siskin (Serinus tibetanus): Only 6 site records for Nepal. First record from the Arun Drainage.
18. Scarlet Finch (Haematospiza sipahi): Classified Vulnerable. Only 7 site records for Nepal and no proved breeding record. I observed a trio in flight in mid-June which probably included an immature, but I can not be certain. The second individual with "female" plumage appeared somewhat smaller than the first, and had a less prominent yellow rump patch.

AS WELL AS:

1. First breeding density data for the 12 species listed in Appendix 5.
2. Probable first photographs of the rare White-browed Shortwing (at nest) and endangered Tailed Wren-Babbler (with brood).
3. New set of identification cues for a difficult group of Temperate mixed-forest flycatchers "that go tseep."
4. Approximate arrival and departure dates for many altitudinal migrants (not previously well known).

APPENDIX 5. Summary of the current knowledge of 12 bird species upon which this study focused (from S. Ali and D. Ripley (1987) and C. and T. Inskipp (1985)). The elevation of the Chitre area ranges from 2350 to 2500 m (7700-8250 ft).

Scaly-breasted Wren-Babbler (Muscicapidae, Timaliinae: Phoebastria albiventer)

References: A&R no. 1198, plate 75, figure 5. I&I p. 299.

Appearance: Wren-like, practically no tail. Sexes alike. Two color phases. White phase: Upperparts and sides scaly olive-brown, chin and upper belly white with black spots. Fulvous phase: white of white phase replaced with fulvous.

Status: Subcontinent: common. Nepal: fairly common. Resident.

Distribution: Western Himalayas to southern China, south to Nagaland and North Vietnam. Altitudinal migrant: winters below 2700 m, breeds between 2700 and 3900 m (in the Himalayas).

Breeding habitat: "Wet ravines, thick forest with plenty of undergrowth, often near streams, waist-high growth of ferns and nettles."

Habits: Terrestrial, solitary in winter. "Creeps about in dense, tangled undergrowth, searching for insects among the mulch, roots and moss-covered logs. A great skulker, very difficult to observe but also very inquisitive."

Breeding: April to June. Nest placed in moss-covered banks, under moss-covered rocks, or in moss on trunks of large trees. Both sexes incubate.

Brown Wren-Babbler (Muscicapidae, Timaliinae: Phoebastria pusilla)

References: A&R no. 1199, plate 75, figure 3. I&I p. 299.

Appearance: Identical to Scaly-breasted, including color phases, except slightly smaller. Distinguished from Scaly-breasted by song.

Status: Subcontinent: common. Nepal: occasional. Resident.

Distribution: Central Nepal east to southern China and south to Malaysia. Altitudinal migrant: winters below 1000 m, breeds between 1500 and 3000 m.

Breeding habitat: "Wet evergreen forest with mossy boulders, fallen logs and decaying vegetation--particularly near streams."

Habits: "Similar to Scaly-breasted: terrestrial, solitary in winter, skulking, restless and inquisitive."

Breeding: April to July. Nest built in moss hanging from tree trunks or vertical rocks in shady forest, usually at 1-2 m height but rarely up to 6 meters.

Orange-gorgetted Flycatcher (Muscicapidae, Muscicapinae: Muscicapa strophilata)

References: A&R no. 1414, plate 81, figure 12. I&I p. 293.

Appearance: Sparrow-sized. Mostly gray, brown and black. Orange-red upper breast and white at base of tail distinctive.

Status: Nepal: common. Resident.

Distribution: Western Himalayas through southwest China, south to Indochina. Altitudinal migrant: winters below 2400 m, breeds between 2400 and 3700 m.

Breeding habitat: Oak, rhododendron, conifer, birch and mixed forests. Closed-canopy forest with little undergrowth as well as open forest with dense understory.

Habits: Sometimes solitary. Forages in mid- and shrub canopies, occasionally higher or lower. Sallies out from bare branches or fallen logs for flying insects.

Breeding: April to June. Nest built on the ground, on a sloping bank, or in a hole in a tree up to 3 and sometime 6 m high. Many details of breeding biology unrecorded.

APPENDIX 5 (continued).

Rufous-breasted Blue Flycatcher (Muscicapidae, Muscicapinae: Muscicapa hyperythra)

References: A&R no. 1417, plate 82, figure 5. I&I p. 292.

Appearance: Sparrow-sized. Male: slaty blue above, rufous below, white eye-brow.

Status: Nepal: occasional. Resident.

Distribution: West of Nepal (Kumaon) to northern Thailand and south through Indochina to the Philippines. Attitudinal migrant: winters below 1700 m, breeds between 2100 and 3000 m.

Breeding habitat: "Dense primary forest with luxuriant undergrowth."

Habits: Sometimes solitary. "Forages low in bushes and dense, dank thickets, flitting among branches or runs about mouse-like mounting fallen tree stems and making sallies after flying insects."

Breeding: April to June. Nest built in very wet and dense forest in holes in mossy banks, hollows in tree trunks, between boulders, amongst exposed roots, or in moss hanging from a branch, usually near the ground.

Beautiful Niltava (Muscicapidae, Muscicapinae: Muscicapa sundara)

References: A&R no. 1432, plate 82, figure 14. I&I p. 286.

Appearance: Large sparrow. Male: iridescent blues above, orange-red below, velvety-black face.

Status: Subcontinent: common. Nepal: common. Resident.

Distribution: Western Himalayas to southwest China and south to Laos.

Attitudinal migrant: winters below 2300 m, breeds between 1800 and 3200 m.

Breeding habitat: Dense undergrowth in open forest, secondary growth and brush-covered hillsides.

Habits: Keeps singly in winter, sometimes in mixed foraging flocks. Forages in low undergrowth, near and on the ground.

Breeding: April to July. Nest built in a hole in a bank, in clefts or crevices of rocks, or in cavities in dead stumps, close to the ground. Both sexes build nest and incubate.

Slaty-bellied Ground Warbler (Muscicapidae, Sylviinae: Tesia cyaniventer)

References: A&R no. 1471, plate 87, figure 15. I&I p. 263.

Appearance: Wren-like. Practically no tail. Sexes alike. Olive-green above, ashy-gray below.

Status: Subcontinent: fairly common. Nepal: occasional. Resident.

Distribution: Western Himalayas to southwest China and south to Bangladesh. Attitudinal migrant: winters below 1800 m, breeds between 1500 and 2550 m.

Breeding habitat: "Bamboo and dense shady forest near small streams in wet ravines with tangled undergrowth of ferns and nettles."

Habits: Mostly solitary. Mostly terrestrial, 'skulking in dense undergrowth.' Song period chiefly April and May.

Breeding: May to July. Nest placed ca. 30 cm up in low bushes, creepers, or moss growing on tree trunks or rocks.

Chestnut-headed Ground Warbler (Muscicapidae, Sylviinae: Tesia castaneocoronata)

References: A&R no. 1473, plate 87, figure 17. I&I p. 263.

Appearance: Wren-like. Very short tail. Sexes alike. Top of head bright chestnut, rest of upperparts dark olive-green, underparts bright lemon-yellow.

Status: Subcontinent: Fairly common. Nepal: Fairly common. Resident.

APPENDIX 5 (continued).

Chestnut-headed Ground Warbler (continued).

Distribution: Western Himalayas to southwest China and south to Bangladesh and northern Vietnam. Attitudinal migrant: winters below 1800 m, breeds between 1800 and ca. 3500 m.

Breeding habitat: " Light brush, ferns, nettles, as well as dense bamboo or brush, under tall, rather open forests, especially in dank ravines in the vicinity of streamlets."

Habits: Mostly solitary outside the breeding season. Generally keeps within a meter or so of the ground. Song period March through June.

Breeding: May to July. Nest woven into and suspended from a small branch with a couple meters of the ground.

White-browed Shortwing (Muscicapidae, Turdinae: Brachypteryx montana)

References: A&R no. 1640, plate 88, figure 5. I&I p. 242.

Appearance: Sparrow-sized, tail relatively short. Mature male: mostly dark slaty blue, belly ashy, face velvety black, brow white. Immature male: olive-brown throughout (like female), with white brow.

Status: Subcontinent: fairly common. Nepal: Rare, very uncommon. Resident.

Distribution: Western Himalayas to south China and south to Indonesia.

Attitudinal migrant: winters below 2400 m, breeds between 1500 and 3300 m.

Breeding habitat: Damp, shady, oak and rhododendron forests with a dense undergrowth of fern or brush, in ravines or near streams.

Habits: Solitary except during breeding season. Mostly terrestrial. Keeps in low bushes or on the ground.

Breeding: May to July. Nest incorporated into moss growing on rocks, tree trunks, or banks, located near or on the ground.

Blue Chat (Muscicapidae, Turdinae: Erithacus brunneus)

References: A&R no. 1650, plate 88, figure 11. I&I p. 243.

Appearance: Large sparrow. Tail relatively short. Male: slaty blue above, chestnut-orange below, cheeks black, brow white.

Status: Subcontinent: common. Nepal: fairly common. Migrant.

Distribution: Western Himalayas to southwest China. Attitudinal migrant: winters 'in the eastern Himalayan foothills and south India,' breeds between 1600 and 3300 m.

Breeding habitat: Dense undergrowth of rhododendron, bamboo, Berberis and other bushes in open oak or conifer forest.

Habits: Solitary except in breeding season. Terrestrial. Skulks through lowest branches of undergrowth, occasionally foraging on the ground.

Seldom shows itself except in breeding season when males sing from tops of bushes.

Breeding: May to July. Nest placed on the ground, generally on a bank, well concealed between roots or stones. Song period mid-April to mid-July, with a resumption in August and September.

White-tailed Robin (Muscicapidae, Turdinae: Cinclidium leucurum)

References: A&R no. 1681, plate 89, figure 14. I&I p. 250.

Appearance: Bulbul/Thrush-sized. Male: Dark indigo and black, white on base of tail.

Status: Subcontinent: locally common. Nepal: Occasional, local. Resident.

Distribution: Central Nepal to southwest China and south to Malaysia.

Attitudinal migrant: winters below 1500 m, breeds between 1200 and 2700 m.

Breeding habitat: Undergrowth of shady, broad-leaf evergreen forest, usually near small streams.

APPENDIX 5 (continued).

White-tailed Robin (continued).

Habits: Solitary and very secretive. Forages in bushes and on the ground, where it turns over dead leaves. Song period mid-March through mid-September.

Breeding: April through August. Often produce 2 broods a year, in the same nest. Nest built in a cavity near a stream, on a vertical rock or mossy bank, or sometimes in boulders or roots overhanging a stream. Nest built by both sexes, female does most incubation.

Dark-grey Bush-Chat (Muscicapidae, Turdinae: *Saxicola ferrea*)

References: A&R no. 1705, plate 91, figure 8. I&I p. 252.

Appearance: Sparrow-sized. Male: pied black, white and gray.

Status: Subcontinent: common. Nepal: fairly common. Resident.

Distribution: Western Himalayas to southeast China and south to northern Indochina. Altitudinal migrant: winters below 2400 m (mostly 1200 m), breeds between 1500 and 3300 m.

Breeding habitat: Open scrub-covered hillsides particularly along fringes of forest, glades, and in the neighborhood of terraced cultivation.

Habits: Keeps singly or in pairs. Perches on favorite bush-tops, dropping to the ground or fluttering into the air for insects. Song period early April to late June with resumption in early September through late October.

Breeding: April to July. Nest place in a depression on sloping ground, well concealed by grass, sometimes under a stone, rarely in stone walls. Incubation by female only.

Hodgson's Tree Pipit (Motacillidae: *Anthus hodgsoni*)

References: A&R no. 1852, plate 97, figure 8. I&I p. 224.

Appearance: Sparrow-sized. Sexes alike. Upperparts brown streaked with darker brown. Underparts light buff, boldly streaked with dark brown.

Status: Subcontinent: common. Nepal: common. Resident.

Distribution: Western Himalayas to Japan and south to India, Indochina and the Philippines. Altitudinal migrant: winters below 2500 m, breeds between 2700 and 4500 m.

Breeding habitat: Grass and bracken-covered slopes, rocky ground and glades in open forest of oak, fir, pine, etc., abandoned cultivation and scrub with isolated trees.

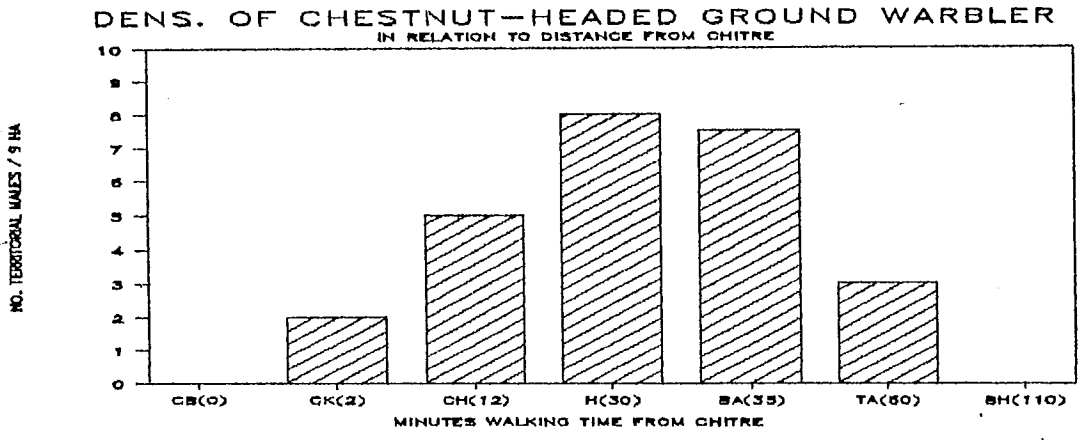
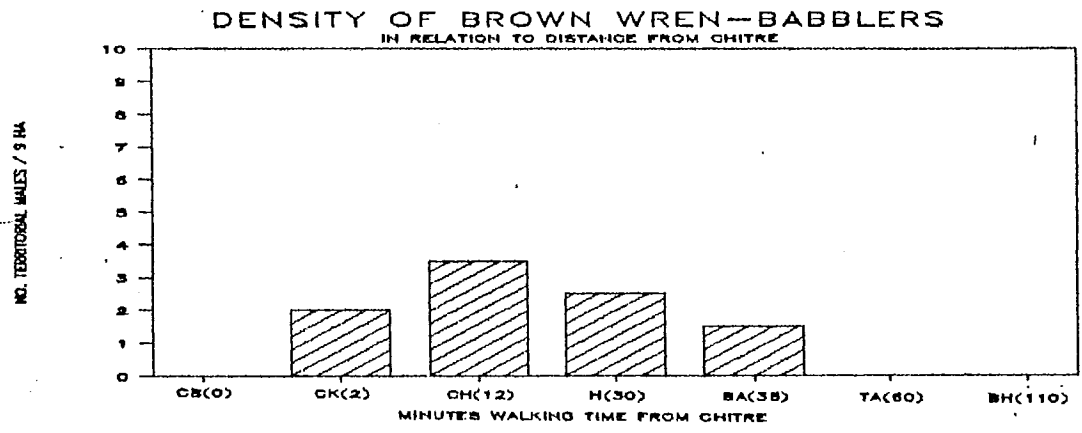
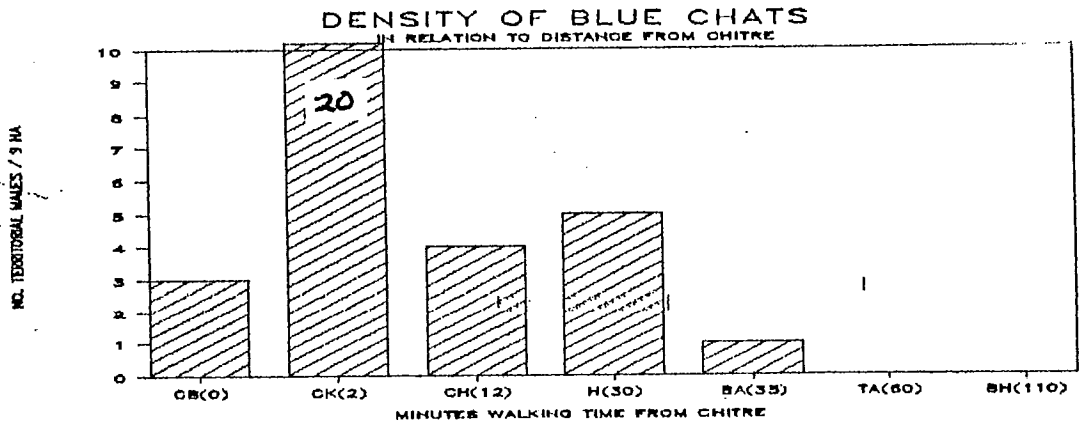
Habits: Keeps singly or in pairs. Very territorial. Runs about on the ground in search of insects, flying up into trees when disturbed.

Breeding: May through July. Nest placed on the ground usually under a tuft of grass or occasionally under a boulder.

APPENDIX 6. Breeding densities of 12 bird species in relation to distance from Chitre. Territories that extended significantly outside 9 ha plots were calculated as 0.5 pair. The Bhyali study plot was unique because a Rai kharka is maintained there throughout the early breeding season each year. Canopy-nesting birds of Bhyali appeared to reflect its remote setting (i.e., rare and primal forest-loving Black-headed Shrike-Babbler and Tawny Owl), but few ground nesting species bred on the plot. Many ground-nesting species were recorded just outside the plot however, presumably beyond the range of the kharka's livestock. CB = Chitre Bari (crops and houses), CK = Chitre Kharka (pasture), CH = Chaite (forest with kharka), H = Hile (forest with kharka), BA = Bagalekop (forest with kharka), TA = Tauke (forest with kharka), BH = Bhyali (forest with kharka). Distances of study sites in minutes from Chitre are in parentheses.

<u>Species</u>	<u>CB(0)</u>	<u>CK(2)</u>	<u>CH(12)</u>	<u>H(30)</u>	<u>BA(35)</u>	<u>TA(60)</u>	<u>BH(110)</u>
Scaly-breasted							
Wren-Babbler	0	0	3	2	1	2	0
Brown Wren-							
Babbler	0	2	3.5	2.5	1.5	0	0
Orange-							
gorgetted							
Flycatcher	0	0	0	2	2	0	0
Rufous-breasted							
Blue							
Flycatcher	0	0	4	2	6	4	1
Beautiful							
Niltava	0	1	4	3.5	1	3.5	3
Slaty-bellied							
Ground Warbler	0	0	0	0	1.5	0	1
Chestnut-headed							
Ground Warbler	0	2	5	8	7.5	3	0
White-browed							
Shortwing	0	0.5	5.5	6	7	3.5	0
Blue Chat	3	20	4	5	1	0	0
White-tailed							
Robin	0	1	1	2	0	1	1
Dark-gray							
Bush-Chat	5	2	0	0	0	0	0
Olive-backed							
Pipit	3	2	0	1	0	1	0
<hr/>							
No. of species	3/12	8/12	8/12	10/12	9/12	7/12	4/12
% of species	25	67	67	83	75	58	33

APPENDIX 6 (continued). Breeding densities of selected bird species which were greatest at nearby (Blue Chat), intermediate (Brown Wren-Babbler), and distant (Chestnut-headed Ground Warbler) study sites. Apparently, these species did not use the remote Bhyali plot because of the presence of livestock there.



APPENDIX 6 (continued). An example of a 'spot-map' resulting from breeding bird censuses. O = observation record, * = trail numbers, ** = station numbers. Distance between trails was 50 m, but between-trail distances were shortened proportionately here for ease of illustration.

SPECIES: CHESTNUT-HEADED GROUND WARBLER
 STUDY AREA: BAGALEKOP

