ON THE TRAIL OF BLACKNECKED CRANES WINTERING IN INDIA

A Report on Explorations in West & East Kameng Division of Arunachal Pradesh

Prakash Gole
Vice Admiral M P Awati, PVSM VrC(Retd)

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RESULTS OF ACADEMIC IMPORTANCE

1. Blacknecked cranes winter in the same latitudinal range viz. around 27 N in Bhutan and Arunachal Pradesh, India.

2. The 3 critical requisites in the winter staging area of Blacknecked crane are grain food, invertebrate food and roosting site. Of these three availability of roosting area provides the most critical variable.

3. A benign human attitude towards cranes has helped them consistently use a particular wintering locale.

RESULTS OF PRACTICAL IMPORTANCE

1. Only 2-3 pairs of Blacknecked crane winter in some valleys in the west and east Kameng Division of Arunachal Pradesh.

2. They are probably a fringe population of the main wintering flock to be found in Bhutan.

3. Presence of outsiders and activities alien to the human culture traditional in the wintering area probably deter them.

4. As such developmental activities in valleys where they winter need to be planned very carefully.

5. Cranes are protected even by hunter-gatherer tribes. As such these elegant birds seem to evoke benign feelings even among the so-called primitive people.

RECOMMENDATIONS

1. Sangti valley from West Kameng Division of Arunachal Pradesh appears to be the principal wintering area for Blacknecked cranes in India. As such the valley should be protected from outside influences; the development activities in the valley should be so planned as not to disturb the habitat used by the cranes (especially rice fields and wet areas) and the valley should be declared a Blacknecked crane sanctuary. It should extend from Sangti village to Khasow village an area of about 200 ha.

2. A public awareness campaign should be planned in west and east Kameng divisions through colourful posters and brochures giving salient information of these cranes.

3. The Sangti appears to be an ideal locale to initiate a crane captive-breeding programme for Blacknecked cranes. Government land for sheep breeding centre may be made available for such a programme. This seems to be the only answer to the fearful rapidity with which India is losing her cranes and their habitat.

4. The rain forest between Bhalukpong and Nechifu at over 2000 metre altitude are the most magnificent in India. The richness of floral variety is truly mind-boggling. Here is surely a great variety of gene wealth which needs to be documented. The heritage also needs to be protected against all comers. We are not at all convinced that the civil administration is aware of what their territory possesses. The army on the other hand is very much aware of what this richness in nature´s bounty and

variety should mean. We found great enthusiasm among all ranks to involve themselves in the protection of this heritage.

But the enthusiasm should be backed by knowledge. This is where voluntary organizations and others can help in training suitable young officers etc. in field ornithology, field botany, collections, annotating and recording the thousands upon thousands of plants, birds, small mammals, arthropoda etc. which must live here. These organizations should prepare packaged training and education programmes to suit each area where the army is stationed. As an initial step formation headquarters must be supplied with basic literature and field guides on ornithology and other subjects.

The army have expressed themselves enthusiastically in favour of the proposed Blackneck sanctuary. They are prepared to ensure its sanctity. Their active help should be secured in the management of the sanctuary and its protection.

5. The promising habitat available for cranes in the Seppa valley in east Kameng division of AP should be carefully monitored every winter. Forest and wildlife staff of the Department should be alerted through use of posters etc. to keep a watch on the arrival of cranes.

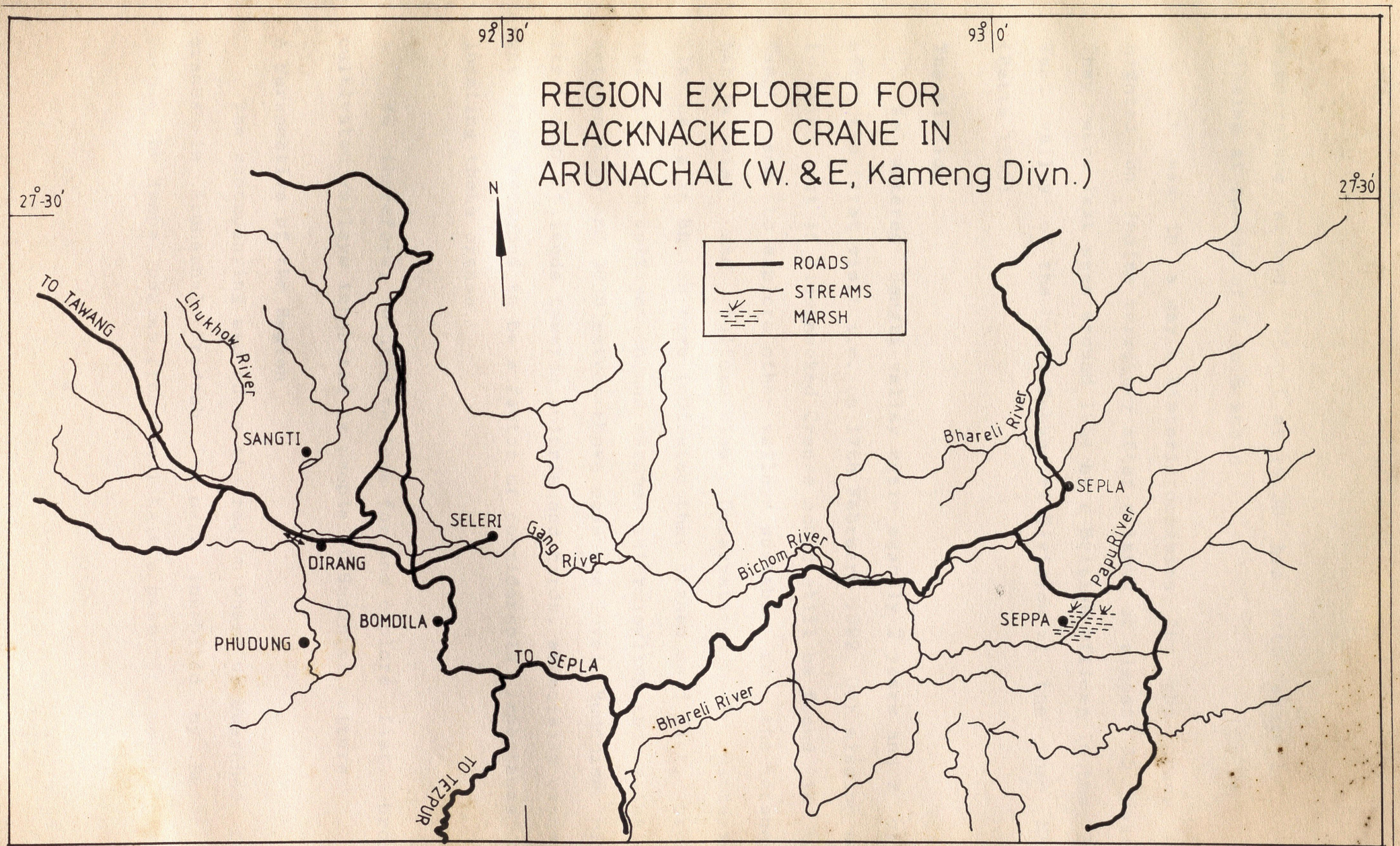
ON THE TRAIL OF WINTERING BLACKNECKED CRANES IN INDIA

Explorations in the west and east Kameng Divisions of Arunachal Pradesh

Introduction

"Iss saal nahin aaye saab!" the Monpa Sonam Nima greeted us as we entered Sangti valley. The day before we, i.e. myself and Vice Admiral M P Awati(retd.), had left Tezpur in Assam and crossing into Arunachal Pradesh near Bhalukpong began travelling on the road to Tawang which ran through Bomdi La and Se La the two famous passes. Dirang a charming little town nestles northwest of Bomdi La on the banks of the Gang river that originates on the Se La watershed. From the north two streams debouch into the Gang, Chukhow to the west of Dirang and Sangti Chhu slightly to its east.

Travelling along the Sangti Chhu we had reached Sangti village about 15 kms north of Dirang, when Nima greeted us. He knew what we were looking for. In February 1990 when we had first visited his village it was he who had recognised the photograph of Blacknecked crane (Grus nigricollis) and told us that he had seen them in the valley. From a vantage point we had scanned the whole broad valley, especially the harvested rice fields not yet fully dry; and sure enough we did locate a pair of these cranes quietly foraging in a flooded paddy field. It was Thursday, 15th February, a day of mild, clear weather with


92° 30'
93° 0'
REGION EXPLORED FOR
BLACKNACKED CRANE IN
ARUNACHAL (W. & E, Kameng Divn.)
27°-30'
27°-30'
N
ROADS
STREAMS
MARSH
TO TAWANG
Chukhow River
SANGTI
SELERI
Gang River
DIRANG
BOMDILA
PHUDUNG
TO SEPLA
TO TEZPUR
Bhareli River
Bichom River
Bhareli River
SEPLA
Papu River
SEPPA

temperature around 15 C at 14.30 hrs with easterly winds blowing at speeds of 5 to 8 knots.

It was in a way a historic occasion for the crane was sighted on Indian territory after a lapse of almost 35 years. They were last seen around 1954 by a British officer in the Apa Tani valley of the Upper Subansiri Division of the then NEFA (Betts 1955).

The Mission

We entered Sangti valley again exactly 2 years and 2 days after the first visit i.e. on 17th February 1992. Our mission was to find out if Blacknecked Cranes could still be found in the Sangti and to explore other valleys suitable for the cranes: habitat-wise and culture-wise. Observations of wintering Blacknecks in Bhutan have indicated that cranes used flat, broad valleys with cultivation and marshes intermingling and situated between 1500 and 2800 metres above mean sea level. Buddhism with its benign attitude towards animals and birds, especially cranes, was also reckoned to be a factor of considerable importance in locating these cranes.

We therefore, wanted to look for and explore flat, broad cultivated valleys inhabited by people of Buddhist culture.

A Perspective of the Region

The accompanying map shows the region where we searched for cranes in Arunachal Pradesh. The part inhabited by Buddhist people the Monpa, begins from Bomdi La the pass 2650 metre high.

From Bomdi La the road descends into the valley of the Gang river which originates from glacial lakes west of Se La at a height of about 4575 metres. The region between Bomdi La and Se La is drained by this river and its tributaries flowing into it from north and south. The Gang in turn joins the Bichom that drains the ranges east of Bomdi La. Further east the Bichom joins the Bhareli draining the mountains north of Sepla, the headquarters of the East Kameng Division of Arunachal. The Bhareli flows into the Brahmaputra east of Tezpur in Assam.

The region between Se La (in west Kameng) and Sepla (in east Kameng) lies east of and adjacent to our border with Bhutan. Rivers in the eastern part of Bhutan also drain into the Brahmaputra river system.Some of these rivers have also carved broad valleys where in 1980 and 1988 I had located large flocks of Blacknecked crane. For example, in west-central Bhutan's Phobjikha valley I had studied 101 Blacknecked cranes while in Tashi Yangtsi region of east Bhutan I had located 146 Blacknecks. I reasoned that the valleys on the Indian side adjacent to Tashi Yangtsi area might harbour a certain number of Blacknecked cranes if the factors that were seen to be associated with Blacknecks wintering in Bhutan were also available to them on the Indian side.

The cultural factor viz. the presence of a benign religion that tended to protect cranes has already been noted. Availability of adequate forage was an equally important factor together with proper roosting sites. At an altitude above 2000 metres cranes were seen to subsist on marsh plants and insects as

also on wheat and barley from harvested fields. At altitudes below 2000 metres they subsisted on grains gleaned in paddy fields. The valleys between Se La and Sepla on the Indian side lay not only in the same latitudinal zone but also presented more or less the same conditions that prevailed in the valleys of Bhutan.

Investigation in the Sangti valley

Weather did not exactly favour us during our second visit to the Sangti(Lat. 27-26" N and Long. 92 E). In 1990 the weather was sunny, even warm in the afternoon with temperature around 15 C and light, easterly breezes. On 17th February 1992 the weather was cold, heavy mist lay on the hills and the breeze blowing from the snow-bound Se La brought shivers.The temperature was around 5 C. At night it dropped to zero and thick frost lay on the lawns of the sheep breeding farm in the valley where we stayed.

We did not notice any major change in the landscape of the valley. The road was still not pucca, there was no major settlement before Sangti village though logs of wood recently cut down were stacked along the route. We learnt later of large-scale illegal felling having been discovered and stopped by Forest Dept. Hence the logs lying in situ. The hills on both sides of the stream (Sangti chhu) were mainly covered by aspen and a shrub identified as Thimus. I thought pines were less in evidence than before.

We soon came upon a group of Monpa, one of them a school teacher in Sapper further west, knew that Blacknecked cranes had

come to Sangti in 1990. He felt that they could be seen on the Gang river near Sapper. As we proceeded in the direction of Sangti village, we met other Monpas who had no recent knowledge of the crane. Sonam Nima only confirmed what everybody knew: Blacknecks were not to be seen in the valley this winter!

When we reached the village and began scanning the paddy fields, I became aware of the increase in the settlement of the valley. The number of houses had gone up from about 45 to 68. A school buildings complex had come up near the north-eastern end of paddy field area and a track was being widened to link the village with the school. Next day we also heard dynamites being used in road construction.

In 1990 we had not noticed cattle grazing in paddy fields, though a few sheep and goats were there. Now some cattle were seen also, probably a result of increase in human settlement.

Deciding to explore the valley beyond Sangti village, we proceeded along the stream in the direction of Lachang situated NE of Sangti village. Crossing the Khasho stream we entered Kachow village to be met by the village school teacher Dorjee Thangkar. He reported that 6 Blacknecked cranes had visited Sangti in early 1991 but none had come this year. We also met the village elder Langa Dorjee who narrated in Assamese that 30-40 years ago 10-12 Blacknecks used to visit the valley. Some outsiders had shot one of them. Monpas had protested telling the outsiders that their crops would fail if these birds were harmed. Hunting stopped thereafter but the number of cranes went on

declining till only 2-3 came in 1991. The range forest officer Kalung Bida translated Dorjee's statement for us and we recorded the whole interview.

Towards Lachang the valley narrowed, flat fields along the stream gave way to terraced cultivation on slopes which began closing in on the stream from both sides. Paddy cultivation was replaced by maize on hillsides which became steeper as we proceeded. As the habitat which cranes used near Sangti village was no longer in evidence, we decided to stop short of Lachang. Not far from Lachang the map showed glaciers indicating sudden increase in height and steepness.

We also explored the stream that flowed into Sangti chhu from the northwest. There again the valley bottom was narrow, steeper slopes converging to terminate the crane habitat beyond Sangti village.

The only habitat suitable for cranes was around the paddy fields of Sangti village and cranes were reported to be using it till 1991. As the human culture was friendly, the increase in settlement and grazing cattle was not such as to deprive cranes of food, freedom of movement and shelter. The only factor of disturbance to which cranes were not used appeared to be road contruction and the use of dynamite. The unusual human activity accompanied by frightening booms must have scared them away, we surmised. Once road construction was over there was nothing to prevent cranes from entering the Sangti, we thought.

Because of the disturbance in the Sangti could they have taken shelter in some adjacent valley which offered them a suitable habitat? This question could be answered only at the end of our exploration of the region north and west of Bomdi La.

Investigation in Chukhow valley

About 11 kms northwest of Dirang, the Chukhow river, originating in the mountains to the north, flows into the Gang river. Chukhow valley is broad near the junction of the two streams but narrows markedly 3 kms north as one moves away from the junction.

When we reached the junction and showed Blacknecked crane pictures to local people, they averred that 3-4 cranes had visited that area in 1991. Crossing the streams by a suspension bridge, we examined paddy fields stretching on the west of the Chukhow stream. Its eastern bank however, was steep and terraced with maize and fruit gardens being cultivated in patches. Even on the west side the flat stretch along the stream was only about 100 metres wide. Terracing began after it with increasingly narrow terraces on upper slopes. There was however, plenty of fallen grain in harvested fields.

We continued our walk towards north to the point where the valley became so narrow that cultivation almost ceased. At a small settlement we enquired again but were told that cranes had never visited that part of the valley. Then we returned.

Looking at the favourable but narrow habitat available for

cranes and lack of shelter anywhere in the valley, we surmised that cranes might be visiting Chukhow valley either on passage or for short bouts of feeding from their base at Sangti.

Investigation east of Dirang

As no more broad valleys could be seen on the map west of Dirang, we decided to explore the downstream reaches of the Gang river i.e. the region east of Dirang. The river Gang has carved a rather broad valley before it meets the Bichom further east. Though the valley floor is not broad enough to accommodate cultivation, wide spur tops overlooking the stream accommodate both cultivation and settlement. At some point the valley was so deep and the spur tops were at such a height as to replace sub-tropical vegetation with tropical. At Saleri while the slopes were covered with pine, the settlement itself was amidst banana and bamboo growing at a height of about 1000 metres. Paddy cultivation was however, not in evidence and the fields were not as extensive as to provide at least a 1 kilometre radius view on all sides for cranes.

We reached all the bigger settlements like Chander, Rahung and Saleri occupying spur tops but local people were unanimous in telling us that they had never seen a crane around their villages. The people were followers of Do-Ni-Po-Lo (earth-nether world-sun-moon) and not Buddhists.

It appeared therefore, that human culture, no less than the presence of a suitable habitat, determined the occurrence of

Blacknecked crane in a particular area.

Investigation in the East Kameng Division

Blacknecked cranes were not unknown further east. In the fifties they used to winter in the Apa Tani valley around Jiro, i.e. in the Upper Subansiri Division east of the Kameng divisions of Arunachal Pradesh. But Lavkumar Khacher in 1978 (Khacher 1981) and I in 1990 (Gole 1990) had confirmed that these cranes had stopped migrating to the Apa Tani area. Where did they go? Did they shift to some other valley nearby where suitable habitat existed?

I knew Buddhism was not a prevailing religion in the Apa Tani area or in other nearby areas such as the East Kameng Division. Though the Apa Tanis, Nishings and other tribes inhabiting these districts are hunter-gatherers, the cranes were not totally unprotected. Their occurrence in the midst of hunter-gatherers was itself a proof of a measure of protection that they enjoyed. This was confirmed by Apa Tanis when they told me in 1990 that they never killed the crane lest some evil befell their families. It was the entry of increasing number of outsiders in the valley that drove away the crane.

We therefore, wanted to look for a valley where suitable habitat existed and where outside culture had not yet penetrated to any extent.

The map showed an extensive marsh near Seppa (or Sebba)

along a tributary of the Bhareli in the East Kameng Division of AP. Even Lavkumar Khacher had thought that the marsh needed to be explored (Khacher 1981).

Sepla and Seppa

The road to Bomdi La from Tezpur branches off at a point called Nachifu and heads east in the direction of Sepla, the district headquarters of the East Kameng Division. The dense rain-forest at Nachifu gradually gave place to moist deciduous by the time Paliji was reached and deep down in the valley the river Bichom was glimpsed. It was in fact the flow of the Gang and the Bichom, the former merging with the latter further west.

The Bichom was crossed near Bana where the great river had uprooted the mighty supports of a huge suspension bridge. A few kilometres ahead the Bichom met the Bhareli coming from Sepla to the northeast. Their joint flow turned south and running through a deep, narrow gorge entered the plains near the Assam-AP border and ultimately joined the Brahmaputra east of Tezpur.

From Bana we went to Sepla to meet forest department and other officials. The DFO turned out to be an Apa Tani himself and had seen cranes in his childhood in the Apa Tani valley. According to him the number of cranes that used to visit the valley was not more than 2-3 and he had seen them from far away and could not note any details. He however, told us that Apa Tanis were familiar with Kendah (the Apa Tani name for Blacknecks) and knew of their arrival and departure.

Our destination being the great marsh shown in the map, we headed southeast towards a place called Lumdung, 24 kms from Sepla. The dirt road climbed through a tropical forest of giant tree ferns. But the people had cut down the forest to cultivate Eleusine coracana. Wild banana and bamboo grew wherever the slopes lay fallow for some years. As we crossed a pass at a height of 2000 metres a broad valley opened out below through which a river meandered. Stretches of marsh bordered the stream, the rest of the almost 3 km wide valley having gone under paddy cultivation. Lumdung turned out to be a small settlement on the northern slope over looking the valley and the marsh through which the Papu river flowed.

From a vantage point we scanned the whole valley which was about 6 km long and 3 km wide stretching northeast to southwest. No birds could be seen though the habitat looked extremely promising. The wet and dry paddy fields now lay fallow and deserted. There was no human movement or cattle grazing in the valley. We appeared to have reached a uniquely undisturbed habitat.

We accosted the first human we came across and showed him the Blackneck pictures. He was a Nishing, the hunter-gatherer tribe that inhabited the valley. He said that a few of these birds came to the valley and they called the birds Pani-hans. But he indicated that the birds he was referring to were smaller in height than cranes. The paddy fields according to him, having been harvested, people had gone to the jungles to hunt. They also

did not keep any cattle. We started on the road that led down into the valley. On the way we kept on meeting more Nishings who however, denied any knowledge of cranes. We soon reached Sede near the valley floor where a group of Nishing gathered around us. There were many young men among them. They told us that they had seen 3-4 of these birds. One of the village elders also supported them. In their dialect they called the Blacknecked crane ONWA. They further informed that they never hunted these birds as it was feared that the family of the man who hunted them would be visited by death. We recorded the interview on tape. The Nishing who lived on the upper slopes however, seemed to have no knowledge of cranes.

With such conflicting evidence, it was difficult to reach any conclusion. While the people who lived nearer the valley bottom would know better the birds that visited the valley, their occurrence must be quite irregular and sporadic to have gone unnoticed by others who lived on upper slopes. The habitat however, looked quite promising with all the factors that could attract cranes being present, viz. availability of winter forage, undisturbed view on all sides, little competition from grazing cattle and lack of disturbance from human movement. The place was however, situated at a lower height than Apa Tani and Sangti valleys or the valleys in Bhutan where Blacknecks wintered. While the height of Seppa valley was around 1200 metres, none of the other valleys was lower than 1500 metres above MSL.

About Seppa, the marsh of the Papu river, we kept our fingers crossed. It looked probable that sporadically cranes did

visit the valley as Nishings living near valley bottom told us. Nishings even had a name for them in their dialect. The habitat being extremely good, the valley deserves monitoring every winter. We have alerted the DFO at Sepla who would be the best person to keep a watch on the valley even though any kind of forest operations are not being undertaken in the valley at present.

HABITAT SUITABILITY FOR BLACKNECKED CRANES IN ARUNACHAL PRADESH

Let us now see if we can in any way quantify the habitat suitability of the valleys we investigated in AP. Cranes use a valley like the Sangti mainly for feeding and roosting during winter.

Actual observations in Sangti valley showed that cranes used the flat valley bottom on both banks of the Sangti chhu, an area with a zigzag length of almost 2.5 kms and width varying between 0.5 and 1.0 kms. The period of use was tentatively placed at from December to March. How can we define habitat suitability for cranes? One can identify 3 requisites that can be considered critical in supplying winter staging habitat for Blacknecked cranes. These requisites are grain food, invertebrate food and roosting requirements. It may be added that if feeding and roosting requirements are met, loafing requirements, another essential requisite, of cranes will be met also. These need not be identified as a separate critical sub-component of winter crane habitat.

Cover Type Origins of Habitat Requirements

Blacknecked cranes were observed to obtain their food (grains) from stubble grainfields. The grain food consisted mainly of rice with lesser amounts of wheat, maize and barley taken wherever available (e.g. in Bhutan). Cropland thus becomes a major cover type supplying food. Invertebrate food consisted of earthworms, beetles, worms and snails. Time budget analysis of foraging behaviour in Bhutan indicated that cranes spent about one-third of the total diurnal foraging time in wet areas where such food was available. Though no data are available on the percentage of total food formed by invertebrates, the time spent in wet areas (wet meadows and marshes) to obtain this food, makes invertebrate food a distinct habitat requirement.

Roosting requirements, as observed in winter in Bhutan, are supplied by marshes and river channels. Habitat conditions observed in valleys of Arunachal Pradesh do not necessitate any sub-division of this habitat into one or more sub-components.

Cover types that may modify the value of habitat rquirements supplied by types (cropland, wet meadows, marshes and river channel) are identified as presence of woody vegetation less than or greater than 1 metre in height.

In Arunachal Pradesh availability of grain food for cranes was not seen to be a problem as most areas considered here, supported paddy fields and other grain crops. Of course technological improvements and land-use changes may alter this

situation in future. The area of cropland thus becomes a significant variable. But some part of it may be rendered unsuitable for cranes due to presence of disturbance factors. There will be zones of varying widths around disturbance factors which cannot be used by cranes, as they would supply no grain food to them. The disturbance factors and widths of zones identified as supplying no grain food are presented in Table 1.

Table 1

Types of disturbances resulting in avoidance of cover types by Blacknecked crane and the size of affected area.

Type of disturbance	Width in metres of affected area	
	Cropland	Wet areas
Gravel road	100	50
Single dwelling	50	30
Group of dwellings	150	75
Bridge	100	100
Powerline	50	50

Again as invertebrate food was gathered by cranes from mesic habitats, the area of wet meadows and marshes becomes a variable of interest here. The disturbance factors are the same as those used to adjust total area of cropland. But it was observed that the degree of disturbance tolerated by cranes in using wet habitats is greater than that found when dry habitat was used.

Variables associated with roosting requirements could be identified as the area available, i.e. the radius of unobstructed view around the roosting site. A minimum depth of water of 10 to 30 cms in and around the roost site was also considered to be essential for roosting cranes. Otherwise optimum roost sites will not be used if they are within disturbance zones. Disturbance

factors affecting roost sites and the corresponding disturbance zones in metres are shown in Table 2.

Table 2

Types of disturbances influencing use of potential riverine roost sites by Blacknecked cranes & the size of affected areas.

Types of disturbance	Width in metres of affected area
Gravel road	100
Single dwelling	150
Group of dwellings	250
Bridge	250
Powerline	100

What is the focal point or the key sub-component of winter staging habitat of cranes? From observational data in Bhutan it appears that roosting requirements and not the cover type supplying food provide the focal point. Proximity of cover types supplying food to cranes was seen to vary between 1 and 8 kms. Food resources located beyond 8 kms are assumed to decrease in importance linearly. In the Arunachal such data are lacking but the occurrence of cranes in particular valleys only, indicates that food sources located beyond these valleys are only of marginal importance to Blacknecked cranes.

Observational data on the composition of habitat requirements that go to make the optimum winter habitat for cranes are also lacking. Rough estimates of the composition of habitat requirements in wintering sites of Blacknecked crane in Bhutan and Arunachal Pradesh are given below:

Table 3

Wintering Site	Cropland %	Wetland %	Riverine %
In Bhutan			
Bumthang	70	Nil	5
Bumdiling	60	10	20
Chortenkhola	80	5	Nil
Phobjikha	55	20	5
In Arunachal			
Sangti	50	15	10

(The remaining area in each of these valleys is under human settlement).

The suitability of a given roost site is a function of 3 variables: the area of unobstructed view, the mean depth of water and the presence or absence of disturbance factors within defined distances from the site. Optimum roosting conditions for Blacknecked cranes may be defined as:

a) unobstructed view of greater than 100 metres;

b) mean depth of water between 10 and 30 cms and

c) freedom from disturbance factors within defined distance.

There may be situations where values other than optimum can be compensatory between the 3 variables. But if any of the values is 0.0 then the overall suitability of the site should be 0.0. Therefore, the suggested function for overall suitability of a site will be a geometric mean of the 3 variables:

$$RS = (UA \times WD \times DF)^{1/3}$$

where RS = roosting suitability, UA = unobstructed area, WD = water depth and DF = presence or absence of disturbance factors.

UA and WD can be expressed as indices with values ranging from 0.0 to 1.0 with optimum value equal to 1.0. Only 2 values viz. 1.0 or 0.0 are possible for disturbance factors: 1.0 if no disturbance exists within the respective distance and 0.0 if one or a combination of disturbance factors exists within the defined distance.

Let us now see the RS for different valleys in AP investigated during the current expedition. The index values for the 3 variables and and the resulting RS in different locations are presented below.

Table 4

Roosting suitability for Blacknecked cranes in different valleys of Arunachal Pradesh

Name of the valley	UA	WD	DF	RS
Sangti	1.0	0.7	1.0	0.88
Chukhow	0.8	0.6	1.0	0.78
Sareli	0.4	0.5	0.0	0.00
Seppa	1.0	0.6	1.0	0.84

The total food availability for cranes at a particular site can only be estimated if we take into account the fact that food availability decreases with the increase in distance from roosting site of a particular cropland or wetland. For Sangti

valley if the total area available is 200 ha. of which about 100 ha. is cropland, 30 ha. wetland, 20 ha. riverine habitat and 50 ha. of human settlement, the food availability in different sectors of cropland can be estimated as follows:

50 ha. within 1 km of roosting : index value 1.0
25 ha. within 2 kms of roosting: index value 0.66
15 ha. within 3 kms of roosting: index value 0.33
10 ha. within 4 kms of roosting; index value 0.11

Evaluation of distances for cover types serving as potential food sources will yield adjusted grain food suitability values. For Sangti valley these values will be:

50 x 1.0 = 50; 25 x 0.66 = 16.5; 15 x 0.33 = 4.95; 10 x 0.11=1.1. Total grain food suitability value is: 72.55.

Likewise invertebrate food suitability in different sectors of wet areas (wet meadows and marshes) may be presented as follows:

10 ha. within 0.5 km of roosting : index value 1.0
10 ha. within 1.0 km of roosting : index value 0.66
5 ha. within 1.5 kms of roosting: index value 0.33
5 ha. within 2.0 kms of roosting: index value 0.11

The adjusted values of invertebrate food suitability will be :
10 x 1.0 = 10; 10 x 0.66 = 6.6; 5 x 0.33 = 1.65; 5 x 0.11 = 0.55. Total invertebrate food suitability value is 18.80.

If these totals are divided by the total study area (i.e. 200 ha.) they will give percent of a defined study area that provides grain and invertebrate food.

72.55 / 200 = 0.3627 and 18.80 / 200 = 0.0940 & 0.88 / 200=0.0044. These figures are estimates of the usable habitat resources per unit area.

The 3 variables viz. cropland, wetlandand riverine habitat constitute respectively 50%, 15% and 10% of the total area of the valley. Therefore resources per unit cover type area will be:

0.3627 / 0.5 = 0.7254; 0.0940 / 15 = 0.0062; 0.0044 / 10=0.00044.

One pair of Blacknecked crane was sighted in Sangti valley in Feb. 1990. It therefore, appears that the above figures indicate resource availability per unit cover type area for one pair of Blacknecked cranes wintering in AP. The lowest of these adjusted values viz. 0.00044 represents the overall Blacknecked crane habitat suitability of the area under study.

Similarly habitat suitability for other valleys can also be calculated (provided their total area and areas under different cover types are known). In the Chukhow valley local people had seen cranes. If the suitability values for the 3 variables in Chukhow are less than the values given above, the cranes may not find it expedient to use the valley as their winter staging area but may choose to visit it sporadically. The conditions in Seppa valley will probably approach the values obtained for the Sangti. If the cranes are not wintering there regularly, the reasons may not be inadequacy of food or shelter but something else such as low altitude of the valley, unsuitable climate etc. This aspect

of course will need further investigation.

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Prakash Gole

Vice Admiral M P Awati, PVSM,VrC (Retd.).

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BLACKNECKED CRANE : AN ENIGMA

Vice Admiral M P Awati PVSM VrC(Retd)

The Blacknecked Crane (Grus nigricollis) has been something of an enigma to me, since I first sighted it in the marshes of Chushul in Ladakh in June 1983. I like to think that I am one of a band of select Indians who have ever seen this very imposing avian perform its courtship dance during the brief Ladakhi summer. There is a very large flock of these cranes which winter in the Bumdiling valley of eastern Bhutan adjacent to the west Kameng district of Arunachal Pradesh. There had been reports of these birds some half a century ago in the Apa Tani valley in the vicinity of Jiro in the erstwhile North East Frontier Agency since grouped in the new frontier state of Arunachal Pradesh. We wanted to know if some if any of these birds still came to this part of India to winter. During our first effort in 1990 we succeeded in locating one pair of this crane in the Sangti valley north of Dirang between Bomdi La and Se La. There are at least two or three north-south valleys adjacent to the north bank of the Gang river which we could not investigate in 1990 for want of time.

This time round confirmed in our view that the Blackneck does visit Arunachal Pradesh during the winter we wished to scour the valleys in early January. Unfortunately circumstances contrived to put us into Sangti almost on the anniversary of the first contact made on 15th February 1990. We arrived in the valley in the early

afternoon of Tuesday 17th February 1992 to find it empty of the Blacknecks! Disappointment growing at our hearts we went as far up the valley as we could. Evidence and witnesses at Khasow village were aplenty to indicate that the cranes do indeed visit the Sangti valley between December and February. Estimates varied between a single pair to as many as three pairs. This year they had not come and the villagers were all agreed that the absence was not a good omen for harvest. Comparing notes and photographs of our previous visit in 1990 it was quite apparent that there were now more dwellings around the periphery of the rice fields, a school was abuilding at the northeastern end of the valley and an access road was being constructed along the northern edge of the Sangti. There was evidence too of the great Oak forests on the slopes above the valley being cut for lumber. Logs were slid down the slopes for floating down the Sangti river. This was Forest Department work apparently being contracted, and like everywhere else in India the contractors were apt to cut down ten where they had license for only one! We heard some very likely stories of Forest officials and enquiry commissioners being bribed by these contractors to let them freewheel. There is no doubt that this beautiful part of the country is being very rapidly divested of its once lovely forests. Does the State Forest Department care? I would not say that it does looking at some of the officers we met in Dirang and who accompanied us on our treks into the valleys.

Having been disappointed at Sangti we tried two other valleys between Bomdi La and Se La. There too we were disappointed despite some very good habitat. Everywhere the locals affirmed that the Blackneck was a frequenter of their territories but that this year he had not come. In both these locations the villagers felt that our best bet was the Sangti valley! I gained the impre--ssion that at no time did the crane visit west Kameng in large numbers and that this part of Arunachal is at best on the peri--phery of the cranes' main wintering ground in Bhutan as far as south Asia is concerned. Even the small breeding population in Ladakh is in all probability peripheral. The main population seems to be isolated in China migrating between Tibet and the south with seasons.

We next tried the extensive marshes near Lumdung in the Seppa area of the east Kameng district. Here in the valley of the Papu river we saw some of the most extensive marshes and rice fields in the Kameng districts. The population in this part is a mix of Nishings, Apa Tanis and some Akas, all followers of the Donipolo cult of nature worshippers as opposed to the mainly Buddhist Monpas west of the Kameng river. Here the evidence of Blackneck visits was more conflicting and therefore, less reliable. Also the country is close and given to extensive jhooming on the hillsides. The valleys of the Kameng, the Papu and the Bichom are replete with a variety of raptors : a very productive area for BNHS' raptor research project, I would say.

In sum then we were disappointed not to sight the Blacknecked crane but very glad to have had the opportunity to have visited an area so rich in flora and avifauna.