BLACK-NECK CRANE IN LADAKH 1980

Our Jonga(Jeep) swung sharply over the bend and stopped. We were about ten kilometers short of Chushul and had just left behind the vast blue expanse of the Pangong Lake. Now we stopped on the slope of a mountain overlooking the extensive marshes and salt flats of Chushul that stretched below us. Immediately below the sandy, boulder-strewn slope of the mountain, was desert bordered by rounded clumps of Caragana(Tibetan furze) that grew along a stream. Beyond the stream grassy humps encrusted with soda(good washing soda) were interspersed with brackish pools and powdery-white soda flats. Flocks of sheep and herds of yak were grazing and blue smoke curled up from a shepherd's tent. Orange-golden specks in the brackish pools indicated the presence of Brahminy ducks(Tadorna ferruginea).

I looked east through my binoculars and carefully examined a small pool enclosed on three sides by sand-dunes. In the centre of the pool I could detect a tiny white spot. "That must surely be the crane", I exclaimed and shouted to my colleague. He and our army liaison officer came over and also saw the white speck. Next we jumped into the Jonga, the vehicle rolled down the slope, crossed the desert and was parked near Caragana. We hurriedly zig-zagged through the thorny Caragana bushes, waded through a small stream and cautiously climbing over the sand-dune, looked beyond. In the centre of the pool was a small platform of aquatic reeds on which sat a white bird with a black neck, his black tail towards us. The Black-neck Crane(Grus nigricollis) pair was nesting in the same pool near Chushul where it was first seen nesting in 1978.

Even before we reached Chushul we knew that the Crane pair had arrived there. The report was received en route. The army officer who located the pair first, saw it foraging in and around that pool for most of the time. That was on 24th May. In 1978 we had also seen a pair foraging on 25th May and knew that the pair started incubation from 26th May. Now in 1980 it appeared that the Crane pair was following the same schedule, the last egg having probably laid on 25th May and incubation started the next day. The pair was punctual to the dot.

It was a good beginning, the Crane pair having been located on the very first day of the expedition. Early next morning, at the edge of the pool, we set up the hide and while my colleague Mr Nagarkar, collected plant and animal specimens from the marsh, I was with the cranes the whole day, without the pair having any idea of my presence. In 1978 I had seen the male and the female taking equal share in incubation. This year the female bird was found to be on the nest for far longer stretches than the male.

To the west of Chushul village, lies another marsh with a fresh-water lake in the southern corner. In 1976 a Crane pair had nested on one of the tiny islands in the lake. This year as we started investigating this marsh, we saw a single Black-neck Crane searching for food in the marsh beyond the lake. We awaited the appearance of its mate, but in vain. I felt sorry for this lone female. Probably her mate had succumbed during the hazardous migratory journey.

But this was not to be the only lone crane that we came across. Down south, deep inside the picturesque

Hanle river valley, with its multi-coloured mountains, verdant meadows and stark, oven-hot desert, we met another loner. This was in the marsh overlooked by the famous Hanle monastery. Here in 1976 and again in 1978, we had seen a single Crane pair. In July 1976, the pair had a chick, and must have nested in the marsh. In 1978 the pair did not nest but used the marsh as their feeding ground before moving on elsewhere to nest. Now in 1980 only one bird was present. What happened to his mate was anybody's guess.

However, the Hanle marsh proved to be botanically quite interesting. From the marsh my colleague collected an aquatic lichen that floated in shallow, sweet-water pools. Lichen is a symbiotic relationship between a fungus and an algae and is one of the primary, pioneering plants that grows even on rocks and in conditions where other plants cannot survive. It dinintegrates rock by a chemical reaction and thus helps to form soil. The Hanle lichen proved to be edible too. People in this vegetable-starved region, mix it with meat and potato and find the plant quite nutritious. The lichen grows everywhere in marshy pools in Ladakh and may prove to be the first edible lichen discovered in India. We also found it to be a good addition to our scant supplies of potato and onion and our Ladakhi cook was delighted to see us consuming Chhusha (its local name) with relish.

For a long time we watched the lone Crane feeding in the marsh. Later we carefully examined the places where he fed. He apparently was uprooting and swallowing a species of Carex, a sedge with a small tuber-

-like root. He could also be consuming a trifoliate aquatic plant floating in fresh water. As material to build his nest, the Crane uses another aquatic plant which grows profusely in still, fresh-water pools all over Ladakh. The plant has tough, leathery stems and tangled masses of roots that lie submerged in water. The stem has a head like an erect plume which juts out of water. The Crane uproots these stmes and piles them in a heap to make the nest.

The loner at Hanle proved to be the harbinger of something more exciting. Skirting the hillock topped by the monastery, the Hanle river meanders north through a wide sandy plain. Here to the west of the river the land slopes gently into an expanse of meadows interspersed with Caragana that grows along the river many arms. To the east the land rises into a series of sandy ridges that stretch up to the mountains towering over the horizon. The main arm of the river is wide but shallow and in the midst of the stream, on a tiny island, was found the second nest of a pair of Black-neck Crane. The small hump of an island was heaped over by the same plant, a species of Myriophyllum,(Local name Zema), on which rested two reddish-brown eggs. The nest was just opposite the Purple Mountain, a strikingly-coloured hill and a famous land-mark in this region. Moreover, the nest-site was not far away from the desert track. I thought that the nest was in a rather exposed spot and made arrangements with the Forest Ranger to keep a guard to protect it. Inspite of the presence of the guard one egg was later on stolen. But the thief was subsequently apprehended and the egg was confiscated.

We coursed along the Hanle river to the north and met the famous Indus at Loma. Now our way lay

still north along the combined flow of these two rivers till we reached the Puga valley. After crossing the Indus at Mahe we entered the valley and moved along the Puga stream which flows into the Indus from west. Thick, shrubby growth of Myricaria eleganc borders this stream. When the pink, plume-like flowers of this bush blossom in late June, the rippling pink mass reminds one of hordes of lesser flamingoes feeding en masse with their necks low down.

From Puga the track runs right upto Karzok Gompa situated on the shores of the famous high-altitude lake Tso Moriri. The track skirts Kiagar Tso, another brackish lake that appeared to breed sand-flies in millions, the insects rising in dense clouds to smother you as you approach this Tso(lake). An abundant food-supply, I thought, for the birds who dare nest in the inhospitable desert and salt embankments of the lake. Beyond the Kiagar the track descends into the Chuksang stream which, even in the middle of June, was frozen solid, a thick slab of ice more than hundred feet wide. We had to move upstream quite a distance through boulders and shingle to find a narrow crossing for our vehicles to pass over snow.

Karzok Gompa is reputed to be one of the highest permanent settlements in the world. Here, at 15000 feet altitude, men plough and till fields, barley and buck-wheat grows and ripens in the short summer and flocks of sheep graze on grass growing abundantly along mountain streams. Houses huddle around the Gompa(monastery) and as you wander through the dusty lanes, the chirp of the Robin accentor(Prunnela rubeculloides), and the Great Rosefinch (Carpodacus rubicilla) can be heard and as one sits on the Gompa terrace, Mountain finches(Leucosticte brandti) and Snow finches(Montifringilla adamsi) unafraid, keep you company.

Our objective lay however, to the south end of the Tso Moriri where a crane pair was sighted in 1978. The journey ahead was on horseback, the path first winding through large sand-stone slabs and then through Caragana which, in the middle of June looked fresh and vibrant in its sap green leaves and lemon-yellow flowers. Short-toed larks (Calandrella acutirostris) and Desert wheatears (Oenanthe deserti) flitted about and occasionally a group of Brahminy ducks or a small skein of Barheaded geese (Anser indicus) flew past. At one point the track climbed precipitously over a cliff that offered a direct fall or a steep slide into the lake five hundred feet below if the normally sure-footed pony missed by an inch.

At the south end of the Tso Moriri we had expected to find a marsh similar to the one at Chushul or at Hanle. Instead we had to pitch our camp in a vast, grassy plain through which a stream, in innumerable channels, flowed ~~o~~ into the Tso Moriri. At places its flow had furrowed the plain into wide, middy gullies in which a few Brahminy ducks could be seen. Where the stream met the lake, pairs of Great crested grebe (Podiceps cristatus) and Bar-headed geese idled. Occasionally a male Lesser sand-plover (Charadrius mongolus) flew past, uttering its shrill note and alighted paces ahead of its mate and turning around tried to chase her. But in vain did we search for the Black-necked Crane pair and multitudes of Bar-headed geese that were reported to be found there. The plain appeared to be endless. Our only find on the first day was lone Bharal (Pseudois nayaur). The local shepherd however, insisted that at the foot of the eastern range the geese could be found. From the look of the terrain, the plain appeared to stretch right up to the foot of the mountains. How could the geese nest in a level plain which offers them no protection, thought I.

The shepherd was however, willing to show us the geese and early the next morning, he, together with our two game-trackers, rode towards east. We awaited their return eagerly in the camp.

We were not to be disappointed. The news they ~~brou~~ brought back was indeed exciting. They had seen a colony of 300 to 400 geese nesting at the foot of the mountains. A Black-neck Crane pair was also seen in the vicinity. So after a hurried lunch, we set out on horses to the wonder area.

After traversing the plain for a few kilometers and crossing numerous channels, we came to a sand-dune. As we began climbing it, we sensed that the opposite side fell steeply into a deep trough full of water. A sizeable lake with a knoll of an island in the centre, had impeded our way. The island about 100 meters long, and half as wide, was nowhere less than 100 meters away from any shore. It had a fairly flat top with all its sides sloping into the lake. Innumerable Bar-headed geese were seen perched on the island. Some were incubating eggs on nests which were mere scrapes on the ground, walled by mud and lined by feathers. 45 nests could be counted on slopes and a few were spaced on the flat top. Some eggs were lying away from any nest, perhaps abandoned by the birds. Egg-shells were lying here and there indicating that some eggs had already hatched in the first fortnight of June. But only one pair with 4 chicks could be seen on the island. There were about 200 geese on the island while 25-30 were swimming in the lake. The geese felt perfectly safe and were not at all disturbed by our presence on the shore. Much commuting was going on to and from the island and the incoming birds were greeted with much bowing and waving of the necks. Occasionally, fights broke out, aggressiv

males chasing intruders away from their territory. An arm of the lake extended south where also more than 25 pairs of geese, some with yellow, downy chicks in tow, could be seen.

To the south this lake ended in shallow pools and mud-flats. A Black-neck Crane pair was seen foraging in the mud. The pair was wary and at our approach flew away. We followed and the pair flew back again. Apparently they were reluctant to leave that area. But our search for the nest drew a blank. True, there was only one place, the island, where they could have nested in safety. Probably the pair might be taking over the island as the geese finish nesting and lead their broods away.

At the north end of the Tso Moriri also, about a kilometer inside the lake, the geese nested on a narrow strip of an island. Here while the flat top was occupied by Brown-headed gulls(Larus brunnicephalus), the Bar-headed geese preferred the sloping sides. Eight nests could be seen on the slope facing the northern end of the lake. The opposite slope was not visible but undoubtedly had more nests as indicated by birds alighting on that side. More than 25 pairs could be seen at the north end.

Surprisingly enough the Bar-heads were not to be seen on the Startsapuk Tso, a fresh-water lake that feeds the shrinking salt lake Tso Kar. In July 1976 we had watched with surprise the multitudes of birds on this magnificent sheet of water. There were hundreds of Brahminy ducks, nesting pairs of Great crested grebes, hordes of Brown-headed gulls and about 70 Bar-headed geese. In early May 1978 also we had seen about 20 geese here. But not a single one could be seen in June 1980. There were of course, about 150 Brown-headed gulls, 100 Brahminys and 25-30 Great crested grebes.

Though a narrow channel the water from this lake flows into the vast sodary wilderness of Tso Kar, a brackish shrinking body of water surrounded by immense deposits of natron or sub-carbonate of soda. There are several lagoons on its northern side in which common salt is found. The salt-marshes on this side give sustenance to innumerable Brahminy duck pairs, some Redshanks(Tringa totanus) and Lesser sand plovers. In summer shepherds bring their flocks to a small settlement nearby, called Thugje Gompa which sustains itself on a small trickle of a stream. We had heard in Leh that a Black-neck Crane pair had nested there before. But in May 1978 we did not see any crane in this area. At that time I had thought that as the marsh was smaller and was without any fresh water, no cranes would nest there. Imagine our surprise when this year we saw two Crane pairs near Thugje Gompa. One pair was in the salt marsh proper, but the other was in an utterly desolate spot, a vast field of white soda, bordered by a small brackish lagoon. The pair in the marsh was obviously in courtship as they grequently bugled, the male dancing around the female and jumping into the air to the accompaniment of much waving of necks. The other pair was searching for food. No nest could be found but the shepherds assured us that the Cranes did nest in the area.

News awaited us when we returned to Puga from the Tso Kar. The eggs of the Crane pair at Chushul had hatched and our guard had seen one chick following the parents about in the marsh. As I was anxious to see the Crane chicks, I rushed back to Chushul.

I reached Chushul in the evening. Though quite late, the officer in Chushul was anxious to show me the chick. The sun had already set when we reached the breeding marsh. The Crane pair was peacefully foraging in the south-eastern corner. At their ~~f~~ feet I could detect something orange. The binoculars revealed them to be downy chicks. There were obviously two and not one chick as was earlier reported. The parents were catching or lifting some tiny matter from the marsh and putting them before the chicks to swallow. The chicks could swim and move easily in the marsh. After a while, as darkness began to engulf the marsh, the female crane sat down at the edge of the marsh and the chicks ran over to take shelter under the comforting wings of the mother. The father crane, after a gratifying look at his family, went about in search of his dinner. So ended one more day in the life of the crane family.

On returning to the camp, I questioned our guard closely. He told me that the first chick hatched out on 11th June and within four hours of hatching, came out of the nest and began following his parents. On the 12th morning pipping could be heard from the remaining egg which hatched late the same evening. If incubation had started on 25th May, the total incubation period lasted 18 days only.

The next day was spent in observing the feeding and post-hatching behaviour of the Crane pair. Then the chicks were 8 days old, and could follow the parents easily in the marsh. The parents continued to bring them and find for them food from time to time. Sometimes one chick would follow the male and the other the female who fed them. The male wandered away from his family but the mother was ~~al~~ always with the chicks and would not allow them to wander far. At noon time the family came to a rather open, loafing

spot', a part of the eastern shore without any grass. The Chicks came ashore and slept soundly here for half an hour while the parents gave a thorough preening to their feathers When some shepherd children, out of curiosity, came towards the pair, both gave alarm calls and while the chicks crouched in tall grass, the parents moved away in different directions. The family fed actively in the evening. The chicks were obviously fed on some small animal matter as cranes were seen to catch something from the marsh and offered that to the chicks. The marsh abounded in cat-fish (2 to 4 inches long), fresh-water gastropods, water bugs, and disticus beetles. Numerous tiny snalls lurked in the aquatic vegetation.

The bright orange colour of the chicks was rather ineffective as camouflage and they could be easily located in the sap green of the marsh. It was not therefore, difficult to catch them for ringing. As they were caught, Parents gave loud alarm calls and the female gave a distraction display by feigning injury. Once the chicks were caught the Cranes stopped calling and simply looked on helplessly. I filmed the chicks and put plastic bands around both their legs. They were released at the spot from where they had been captured.

As our guard was returning after putting the chicks in the marsh, the male, with a loud shriek, came dashing forward to attack him but stopped short ny about 15 feet. The chicks remained motionless for some time. Then the elder one who was 9 inches tall got up and went to the mother who had come nearer and was sitting in the marsh as if exhausted by the terrifying experience. In the evening we paid another visit to the marsh and saw the whole family foraging peacefully in the south-eastern corner.

The study of the post-hatching behaviour and ringing of the crane chicks was a fitting climax to our expedition.

'Let us make 1980 a Crane Year', my colleague Lavkumar had said when we were planning the expedition. The Black-neck Crane community must be aware of this intention. For they seemed to have flown in into Ladakh in some numbers. We could locate six pairs and two more birds who were unfortunately without a mate. We could collect a lot of valuable botanical and some zoological material that will tell us more about the ecology of this handsome bird. The unforgettable sight of the breeding colony of Bar-headed geese came as a bonus. As I was returning to Leh from the Crane area, I was wondering if so many crane pairs nest in Ladakh every year, will it be impossible to undertake a captive breeding programme in the near future to try to augment their numbers by releasing them ultimately in the wild?

THE END

Prakash Gole
Hon. Rep. WWF-I
277 Sindh Housing Society
Poona 411 007

BLACK-NECK CRANE BREEDING IN LADAK

Grus nigricollis or the Black-neck Crane was discovered to modern science as recently as 1876 by the famous Russian naturalist-explorer Przewalski who sighted several crane pairs near Lake Koko Nor in north-eastern Tibet. Though discovered not so long ago, Grus nigricollis still enjoys the somewhat dubious distinction of being the least known of the fifteen crane species found all over the world.

In 1974 during their researches on this bird, G. Archibald and M. Oesting of the International Crane Foundation found that the last report of wild birds dated from 1948 and that there was no further report in the next twenty-six years. This lack of information stems from the fact that breeding and wintering areas of this crane lie in a region which was till very recently physically and politically inaccessible.

Observations recorded by Przewalski suggest that these cranes breed in an area between lake Koko Nor and Szechwan in China. Schafer(1938) and Dolan(1939) found the cranes breeding in north-western Szechwan while other pbservers like Ludlow(1920), Meinertzhagen(1927), and Dr Salim Ali(1947), found them breeding in south-western Tibet. Walton(1938) mentioned that they both bred and wintered around Lhasa in Tibet. Other wintering areas recorded by observers include south-central Tibet(Bailey 1910, Ludlow 1927, Walton 1946), south-west Szechwan and north-west Yunnan(Schafer 1938 and Dolan 1939). Small flocks were found to winter also in Vietnam on the plain of Hanoi and in the province of Hadgon(Delacour 1927).

All these breeding and wintering areas except Vietnam fall in regions presently under the sovereignty of Peoples' Republic of China and are still inaccessible to the world's scientific community. The only known breeding areas outside this region is in India, in Ladak, the north-eastern part of the state of Kashmir. Ladak occupies the western fringe of the Tibetan plateau, presumed to be the main breeding ground of this crane. Except Vietnam, the only wintering area outside China is also in India, in the Apa Tani valley of Assam(now Arunachal Pradesh) (Betts 1948). India was thus the obvious choice for initiating a study of black-neck cranes outside China.

In India The Black-neck Crane Study Project which was conducted in several phases, was made possible because of a grant from the International Crane Foundation received through the US National Appeal of the World Wild-life Fund. In the first phase an expedition led by Dr Salim Ali went to Ladak in 1976 to study the status and distribution of G. nigricollis in that area. In the second phase Lavkumar Khacher, the originator of this Project, went to Arunachal Pradesh in January-February 1978 to observe the wintering flock. He found that the cranes no longer wintered in the Apa Tani valley. He however, was successful in locating another flock wintering near Boomthang in Bhutan.

In the summer of 1976 Dr Salim Ali's expedition was not successful in locating nests of this crane. The writer, who was a member of this expedition, went to Ladak again in the spring of 1978 to locate and study breeding pairs of G. nigricollis. The present study is based mainly on the findings of the 1978 expedition to Ladak.

The Highlands of Ladak

Ladak is reputed to be one of the most elevated plateaus inhabited by man. Mean height of this region is 4000 meters. The region lies in the Himalayan rain-shadow and moisture-laden mosnsoon winds rapidly dry up as they begin crossing the Himalayan ranges. Consequently the rainfall here is meagre amounting to 12 to 20 cm.s per year. As a result of this low rainfall, the whole country is practically a desert, except where water is available from streams fed by the melting of snow on the high ranges. The climate of Ladak is most singular, burning heat by day followed by piercing cold at night. The mean temperature in summer is only a few degrees above the freezing point.

Lack of precipitation and high altitude have severely restricted the range of vegetation. Poplars and willows are grown along streams in low-lying valleys though trees are almost unknown around 4000 meters. Here plant-life comes either in the shape of sparse grass, herbaceous plants or low thorny scrub. Above 4000 meters practically the only shrub is the Tibetan furze, a species of Caragana, somewhat resembling the English gorse.

Parallel mountain ranges run through Ladak from south-east to north-west. Space between the mountains is occupied by level plains filled by sand gravel. Snow-line begins around 5000 meters and in summer water from the melting snow-cap collects in depressions in the valleys giving rise to fresh-water lakes and swamps. River Indus enters Ladak near its southern tip, flows generally in the north-west direction and is joined on the way by such major streams as the Zanskar, the Suru and the Dras.

In addition, there are several land-locked lakes and pools in Ladak with water that is mostly brackish and bitter.

At one time these lakes appear to have been of fresh water and had outlets as can be deduced from the abundance of fresh-water shells on their banks. Their waters vaporised by sun and condensed by the cold of the night could have produced rain in the plains and snow on mountain tops. That the region was once wetter and consequently more verdant, may be deduced from the existence of numerous vast ravines, many of them 150 meters deep and as many meters wide. These could possibly have been formed by large, rushing glacial torrents. The entire region extending right into the Central Asian highlands could at one time possibly a great wet-land giving rise to a varied wetland avifauna. The black-neck may possibly have come to evolve during this 'green age', and is now precariously clinging to marshes and bogs that are rapidly drying up. That the region is experiencing a progressive desiccation can be witnessed from the past levels of shorelines of lakes, which are many meters higher than the present levels.

Status of Grus nigricollis in Ladak

Even as recently as the 19th century, observers did not fail to notice the variety and abundance of waterfowl around marshes and lakes in Ladak(W. Moorcroft & G. Trebect 1825, Cunningham 1840). First definite sightings of G. nigricollis were however, reported by Osmaston and Meinertzhagen in the twenties of the present

century(Osmaston 1925, Meinertzhagen 1927). No further reports of the continuing existence of this crane in Ladak came out till Dr Salim Ali led his expedition there in 1976 and confirmed the existence and nesting of this crane. This expedition explored the surroundings of all the known marshes and lakes of Ladak except those that lie athwart the India-China border. They located a pair and a lone bird in marshes around Chushul and a pair with a chick in the marsh at Hanle(See map.). Unfortumately the Chushul pair was robbed of its eggs before the arrival of the expedition there and the birds at Hanle had already in mid-July become independent of the nest.

In 1978 the writer reached Ladak in early May to search for a breeding pair. Areas surveyed in the summer of 1976 were re-surveyed. In addition, on reaching Leh, the headquarters of Ladak, reports of the occurrence of cranes were received from two places not previously surveyed viz. a marsh near Thugje Gompa to the south-east of Tso(lake) Kar and the plain of Howrang near Tangtse(See map). These two places were also explored but as in 1976 crane pairs were located only in Hanle and Chushul. The pair at Chushul was found to be nesting. Lavkumar who followed the writer into Ladak in the summer of 1978 located another pair with a chick near the south end of Tso(lake) Moriri. This makes three pairs and a chick to be the latest tally for Ladak.

Breeding Habitat at Hanle and Chushul

Hanle: Latitude N 32 47', Longitude E 79 4',

altitude 4330 meters, is situated in one of the principal plains in Ladak. This ten to thirteen kilometers wide plain is overlooked by an impressive Buddhist (Lamaist) monastery built on a hillock. Small streams meander over the surface of the plain. The surface is saline where not swampy and is also very uneven being covered with little bumps encrusted with soda(probably hydrochlorate of soda and hydrochlorate of magnesia). The saline surface has given rise to little puddles of brackish water wherever water from streams had spread into hollows in the plain. A species of sedge is found all over the plain. The fresh-water stream contain fish, some mollusc, a species of algae, submerged aquatic vegetation(Hydrilla sp.) and some moss.

Chushul: Latitude N 33 35', Longitude E 78 43' and altitude 4310 meters, lies south of the Pangong lake in the corner of a vast sandy plain. There is also a smaller plain to the west of Chushul. Here a fresh-water stream has created a sizeable lake which is surrounded by swampy ground to the east and meadows and Tibetan furze to the south and west. The lake holds some tiny islands and in 1976 a clutch of two crane eggs was collected from the nest from one of these islands.

In the vast sandy plain to the east of Chushul are scattered a fresh-water stream, brackish pools, alkaline swamps and extensive stretches of grassland and Tibetan furze. This plain is more alkaline than the one to the west and has little fresh water. In 1976 a solitary crane was seen here. In May 1978 a crane pair was first located in the alkaline swamp. It was seen to

fly in the direction of the fresh-water stream beyond some high sand dunes. A samll pool overgrown with aquatic vegetation was discovered beyond the and-dunes. The pair of cranes had their nest in the centre of this pool.

Arrival of Cranes in Ladak

According to earlier observers nesting in SW Tibet and Ladak began in mid-June and continued into July(Osmaston 1925, Meinerhatzhagen 1927 and Ali 1947). As such in 1976 Dr Salim Ali's expedition reached Ladak by the end of June and explored the areas in July. They found however, that in mid-July the chick had already become independent of the nest, i. e. nesting began by the end of May or early June. Hence the present writer decided to go earlier i. e. reach Ladak by the end of April to witness the arrival of cranes on their breeding ground.

According to Betts(1954) the cranes leave their wintering ground in late February or early March and Przewalski(1876) had reported that they arrived around lake Koko Nor by late March. Schafer(1938) considered the western China migration complete by mid-April. Lavkumar Khacher(1980) in his field report from Bhutan says that the cranes leave en masse in March. To elicit information about the arrival of cranes in Ladak, black-neck crane photographs were used. The earliest authentic report of the sighting of a crane pair came from an army officer. He saw a pair on 18th April at Dungti on the banks of the Indus near the southern tip of Ladak(See map). Another pair was seen at the same place by the same officer on 1st May. On 5th May the writer located a pair in the marsh at Hanle but was told

by local people that the pair was to be seen on the marsh since a week before, i. e. it must have reached Hanle by the end of April. Apparently the cranes entered Ladak from the south in the second fortnight of April and reached the breeding marshes a few days later.

Most of the sightings in Ladak refer to pairs and not flocks. Pattern of sightings in Ladak appears to show that a few pairs individually straggle into Ladak every year for breeding.

Pre-nesting Behaviour

Schafer(1938) had reported that birds arriving on breeding grounds arrived as mated pairs and have then been observed in nuptial displays(Ali 1947). The pair that was located in the Hanle marsh on May 5, 1978 though perhpas mated, was obviously not in a hurry to go ahead with nest-construction. Indeed after a stay of about a fortnight at this place the pair moved elsewhere.

Observations of this pair revealed that it was using the Hanle marsh mainly as feeding and roosting territory. The birds generally fed not far away from flocks of grazing sheep. In the early morning they were usually seen in the south-west corner where they used probably to roost near a shallow stream. Then they moved gradually towards north feeding intermittently. In mid-morning they used to fly out of the marsh towards north probably on a foraging expedition. They used to return to the SW corner around mid-day. Normally when one fed the other looked around. Sometimes if there was no movement of shepherds nearby both would feed together.

The male who was a little taller than the female used to stand normally behind the female. Most of the time they moved together, keeping a distance of about one and a half meters between them. Sometimes however, the female walked a few paces away from the male only to come back to join him a few minutes later.

They fed by probing with their bills in the mud and plucking aquatic vegetation. Only the bill was seen to be submerged in the shallow puddle where they fed. They would probe two-three times in quick succession and then swallow. But no conspicuous lump that travels slowly by peristalsis down the neck of the bird, could be seen. The brackish puddle where they usually fed, when examined, was found to contain a species of sedge(Cyperaceae), the same that was to be found all over the plain. No tubers could be found. The pair also fed in fresh-water streams running through the plain. The streams contained fish, about 6 to 8 cm.s long, some mollusc, a species of algae, submerged aquatic vegetation(Hydrilla sp. mainly) and some moss. Several times they were seen to drink water from the fresh-water streams. These observations perhaps showed that the cranes fed mainly on the sedge and other aquatic vegetation. To Lavkumar Khacher (1980) who saw the pair at Chushul, the cranes appeared to be feeding on some minute life in water. He surmised that the pair fed mainly on the huge shoals of shrimp-like larvae that teemed in all the fresh-water and brackish pools. These were picked up near the surface and he did not observe the birds submerging the bill and plucking out anything from water.

. From time to time they shook their body, fluffed their feathers and flapped their wings. They would often preen their abdomenal and breast feathers and also gave particular attention to wing-feathers. Several times the beak was rubbed on the feathers on the breast and on the back. The top of the head was also rubbed on the back. The birds were probably transferring the oil from the uropygial gland to the various body surfaces.

On the whole the pair was very silent and only once uttered a short alarm call followed by a joint flight of a few meters to get away from the path of a shepherd. However, the pair tolerated the presence of local people around them. The writer managed to get within twenty meters of the pair as he was wearing the local costume. Once when he tried to get closer, the male uttered a throaty croak, croak and moved away. Their trumpeting ♂ call was heard only once when the pair ♂ returned from their foraging expedition. They descended calling once, facing the wind and turning and twisting in the air.

Their nuptial display was also observed only once at Hanle. One day as they returned to the marsh at mid-day, the male, on landing, suddenly began waving his long neck up and down and tip-toed three-four paces ahead. Then he turned and spreading its wings came dancing back, still waving his neck, to face the female. He also uttered a soft call as he began his display. When the male came closer, the female responded by a similar up and down motion of her neck. The male then turned again

to stand beside his mate, still waving his neck ceremonially. The female however, did not respond this time but stood still. They resumed feeding after a few seconds. A short courtship display of the pair that nested near Chushul was also witnessed prior to the day on which the nest was located. Probably the clutch was not complete till that day. On that day the male was seen once to dance around the female with his wings spread and with a short run tried to lead her. On another occasion as the pair returned to their breeding area, the birds faced eachother with wings spread on either sides and with beaks pointing skywards, unison-called.

The Breeding Pair of Chushul

The pair at the Hanle Marsh subsequently moved elsewhere and the search for the breeding pair had to be continued. Success came during the last leg of the expedition when a pair and their nest was located near Chushul on 26th May 1978.

The Nest

Previous observers have noted that the nest of G. nigricollis comes in varied shapes, from a mere scrape on a small island(Dresser 1906, Schafer 1938, Ludlow 1928), a construction of reeds used year after year(Ali 1947, Osmaston 1925) to a mud-formed flamingo-like nest(Schafer 1939). That it nests also in company with bar-headed goose(Anser indicus) was also noted(Bailey 1938).

The nest that was located near Chushul was situated in a fresh-water pool overgrown with aquatic vegetation. It was about 50 meters from the banks, in the centre of the pool and could not be reached without wading

through half a meter deep ice-cold water. A platform of aquatic vegetation, it was about 0.25 meters high, 1.5 meters long and about 0.6 meters wide. It was made entirely of one kind of aquatic plant(local name Zema, a Hydrilla sp.). The nesting material had yellowed and dried and was probably from last year's growth. There appeared to be no addition of fresh green material.

Probable Date of Egg-laying

In south-central Tibet and Szechwan observers have reported that eggs were laid from late May to mid-June(Ludlow 1928, Baker 1928, Schafer 1938). S. Ali (1947) ascribes mid-June as the probable egg-laying period for SW Tibet. For Ladak, Osmaston(1925) and Meinertzhagen(1927) were of the opinion that nesting begins by mid-June and continued in July. When the present nest was located on 26th May, two eggs have already been laid. But from the freshness of the eggs they appeared to be not more than a day or two old; for in the next two days they became quite sullied as the birds tried to shuffle them with their muddy, wet feet. It is also interesting to note that on the previous day (25 th May) the crane pair was located about 3 km.s away from the nest and was absent from the vicinity of the nest for a long time. This probably shows that the full clutch had not been laid till that date and incubation had not really begun. The clutch was probably completed on 25th evening or 26th morning for the pair started incubation right in earnest from 26th May onwards.

. The base colour of the eggs was creamy with brown blotches and they appeared to be more than twice as large as an ordinary chicken egg.

Behaviour at the Nest

Both the birds were found to incubate eggs alternately. They were seen to take almost an equal share in incubation. Out of the total period of 24 hours that the nest was observed, the female incubated for 10 hrs. 15 m. the male for 9 hours 50 m. and the nest remained unattended for almost a period of 4 hours. At such times both the birds would either feed or preen near the edge of the pool. The non-incubating bird would generally remain feeding near the periphery of the pool. The pair was extremely wary and suspicioussus and did not tolerate the presence of even local people. Even if a local shepherd or a horse-man appeared some 200 meters away the incubating bird would slink off the nest. Once a bird thus left the nest, he would not return but his mate would come forward and settle on the eggs. Sometimes this change-over was quite quick, the incubating bird leaving the eggs within 15 to 20.minutes of taking over and his mate who had perhaps sat on the eggs for more than an hour, obliged to come back to the nest.

The change-over even when it was taking place normally, was not seen to be accompanied by any ceremony. Normally each bird would incubate eggs for a period of one to one and half hours. When the bird had finished feeding, he would slowly come forward, would approach the sitting bird from behind and climb on to the nest. The sitting

bird would then stand and both would start re-arranging the nesting material. The sitting bird would slowly shift and the incoming bird take up his position, all the while re-arranging nesting material. When the latter was on the eggs, he would sit down shuffling the eggs into position. The former who now stood with his tail over the head of the sitting bird, went on re-arranging material as he slowly descended the platform. He then would flap his wings, stretch his body and slowly move away to the edge pf the pool.

On the whole the nesting pair was extremely silent. Only once when their nest was approached for closer examination and photography, did the incubating bird utter a short alarm call.

The eggs remained unattended often and sometimes for long periods when the birds apprehended some disturbance. When the nest was discovered the incubating bird moved away. It took three hours for the bird to return to the nest and start incubating once again. Subsequently, whenever the incubating bird apprehended disturbance, it would go away from the nest and it would take about 25 minutes for the other bird to come back to the nest. As the evening approached the birds did not leave the eggs for a longer time. In late evenings the bird returned to incubate within five minutes.

Night observation revealed that the incubating bird sat on eggs for longer periods and the other would rest within two meters from the nest, standing often on one leg for a s much as 45 minutes at a time. Once or twice very early in the morning i. e. around 4.30, the

the sitting bird stood up, stretched his legs and sat down again. When it was clear day-light the bird was seen rising and going away to join his mate standing at the edge of the pool. Together they stood for about ten minutes preening their feathers. The other bird then slowly came forward and sat to incubate.

The sitting bird would normally sit facing the sun, his beak resting on his chest and the nape touching his back. But often he would extend his neck to look on all sides. While feeding the birds would many times splash water with sideways sweeps of their bills as if they wanted to wipe off mud adhering to their beaks. Sometimes they would immerse their heads completely in water and splash water on their own body, as if they were taking a wash.

Predation

Even if the eggs remained unattended for as much as half an hour, no predatory birds were seen to attack the nest. In fact predatory birds like ravens (Corvus corax) were not evident in the nesting area. A pair of brown-headed gulls(Larus brunneicephalus) and three pairs of common terns(Sterna hirundo) appeared to be residents of this marsh. Normally these birds remained quite indifferent to the presence of the nest and the nesting pair of cranes. Only once the gull was observed to swoop down on the incubating bird who ducked to avoid its attack. Once when the bird had left the nest, a pair of common terns landed on the nest platform but they did no damage. Three pairs of ruddy shelducks(Tadorna ferruginea) were also normally seen feeding around. They were extremely wary and raised an alarm on the slightest suspicion. In a way they helped the breeding pair by warning them of danger.

Post-hatching Period

The eggs located in 1978 at Chushul were subsequently believed to be lost either to predators like raven or to human beings or to unseasonal rains and consequent floodslate in the summer of that year. Hence post-hatching behaviour could not be observed. However, in 1976 certain behavioural patterns were observed of a pair that had a chick. The chick was a ball of orange-brown down and its height(at about 20 days of age) was roughly 25 cm.s. During day time the chick was seen to move between hi parents and was apparently able to pick up food on its own. The pair was extremely wary and at one time when the writer tried to approach closer, the male feigned injury and with lowered neck, drooping wings and a halting gait tried to lead him away from the chick who took shelter in grass. The male and female birds then flew a short distance and began giving alarm calls. After the writer withdrew they flew back to the approximate place where the chick was hiding and the chick ran up to join them.

Conservation

Apparently the number of crane pairs in Ladak was never large. In 1925 Osmaston had recorded 13 cranes while in 1927 Meinertzhagen had seen 12 birds. In recent years only two or three pairs have been located. As such collection of eggs from several nests to start a breeding programme as earlier visualised in the Project could not become a practical proposition. The main problem in Ladak is how to give protection to this small number of breeding pairs and their habitat.

. In Ladak the Thung Thung or the blackneck crane is considered to be a bird of good omen and is never molested by local people. However, there have been occasional instances of birds having been killed for sport by people who do not share the local religious sentiments. Also before the study project commenced, rarity of this bird was not known generally and one welcome effect of the continuance of this study has been to generate among civil and military officials of that area, an awareness of the importance of this bird to the world of science. Co-operation of these officials is essential for any conservation measures to succeed.

The bird is alreay included in the Schedule I of the Wildlife Protection Act and is thus legally fully protected. Once this status of the bird becomes generally known(Distribution of pictures of cranes with appeals to give it protection, is being initiated)stray poaching is likely to stop. The army has already issued strict orders prohibiting shooting of all wildlife. The major threat to the bird then comes from disturbance to its breeding areas. In all these areas, grazing of sheep horses and yaks has been heavy. Flocks of sheep undoubtedly provide a certain amount of protection to the cranes, as a foraging crane is extremely difficult to locate in a flock of sheep. But an increase in the movement of sheep and shepherds is bound to affect the privacy of a nesting pair.

It is essential that at least a part of the marshes and meadows should be kept free of these animals.

This may be achieved by building mud or stone-chip walls around the core of these areas, as is the practice in Ladak, for demarcating cultivated plots. Grass from the core areas may be allowed to be cut in autumn or after the birds have left for their winter homes. It is also necessary to discourage human settlements in close proximity to these wetlands. This is especially necessary at Hanle and Chushul. People and animals may be allowed to use definite paths and areas for movement. This can be achieved by declaring these wetlands as water-bird sanctuaries.

Acknowledgements

Everyone associated with this study will be grateful to the International Crane Foundation for making it possible through a generous grant.

The writer personally is grateful to Dr Salim Ali and Lavkumar Khacher for allowing him to work in different phases of this project.

He is also grateful to the World Wildlife Fund-India for the administrative and other help received.

He would also like to express a sense of gratitude to the civil and militaryn officers who extended excellent logistical support to the expeditions.

Lastly a special word of thanks goes to those people of Ladak who made his stay enjoyable and memorable.

REFERENCES

1. Archibald G. and Oesting M.: The Black-necked Crane(Grus nigricollis). Prepared For the World Working Group on Crnaes, I. C. B. P. May 1974.
2. Cunningham A. : Ladak: Physical, Statistical, Historical. Reprint 1977
3. Khacher Lavkumar: Blacknecked Cranes, Grus nigricollis. Their Conservation needs based on findings during 1978 and 1980 field surveys. February 1980.
4. Moorcroft W. and Trebeck G. : Travels in Hindostan etc. from 1819 to 1825. Vol I and Vol II Reprint 1971.

THE BLACKNECKED CRANE : SURVEY OF BREEDING LOCATIONS & STUDY OF ITS BREEDING BIOLOGY IN LADAKH, MAY-JUNE 1980

Itinerary

14 May 1980	Bombay to Srinagar by air
15 & 16 May	At Srinagar
17 May	Srinagar to Leh by air
17 to 23 May	At Leh
24 May	Leh to Darbukh
25 May	Darbukh - Howrang - Darbukh
26 May	Darbukh to Chushul
27, 28, 29, 30 May	At Chushul
31 May	Chushul to Hanle
1, 2, 3 June	At Hanle & Purple Mountain meadows
4 June	Hanle to Nyoma
5 June	At Nyoma
6 June	Nyoma to Puga
7 June	Puga - Startsapuk Tso - Puga
8 June	Puga to Karzok
9 June	Karzok to Tso Moriri south end
10, 11, 12 June	At Tso Moriri south end
13 June	Tso Moriri(S) to Karzok
14 June	Karzok-Puga-Kyari
15 June	Kyari to Puga
16 June	Puga - Thugje Gompa - Puga
17 June	Puga to Chushul
18, 19, 20, 21 June	At Chushul
22 June	Chushul to Darbukh
23 June	Darbukh to Leh
24, 25 June	At Leh

26 June	Leh-Panamik-Diksit(Nubra valley)
27 June	Diskit to Leh
28, 29 June	At Leh
30 June	Leh to Srinagar by air
1 July	At Srinagar
2 July	Srinagar to Pune by air

INTRODUCTION

The preliminary report submitted earler deals with the description of the route followed and highlights the principal sightings and findings at each place. It now remains to summarize and collate the findings with a view to formulate recommendations for the propagation and conservation of the Blacknecked Crane(Grus nigricollis) and its breeding habitat in Ladakh.

It will be recalled that in May 1978 a nest of a pair of blacknecked crane had been located in Ladakh and their behaviour at the nest had been observed. The hatching out of chicks and post-hatching behaviour of parents could not be observed then. The 1980 visit to Ladakh was therfore, undertaken with a view to:

1. Note the incubation period and hatching success breeding cranes;
2. Search for more nesting sites and nesting families of cranes; and
3. Make an ecological study of crane breeding marshes by collecting botanical and animal specimens in order to see how they can best be conserved.(It was with an intention of achieving this objective that Mr Nagarkar, a botanist from the Maharashtra Associaition for Cultivation of Science, was included in the team.)

Major findings of the expedition are as follows:

1. The number of Blacknecked Cranes located in Ladakh in 1980 was 14, six pairs and two lone cranes. This number is the highest in recent years and exceeds that reported by Osmaston in 1923.
2. Two nests of this crane were found and the third was very reliably reported. It is for the first time that so many nests have been reported from Ladakh.
3. Biological investigations of breeding marshes revealed some interesting new plants including an aquatic lichen, the first edible lichen known from Indian soil.
4. Collection and study of high-altitude lichens from this region was attempted for the first time.
5. A new breeding location and perhaps the biggest breeding colony within Indian limits of Barheaded Geese(Anser indicus) was found near the south end of Tso Moriri
6. The survey added some new ornithological records to the list of birds from Ladakh and was also successful in filming the Tibetan Sandgrouse for the first time.

Let us now briefly discuss the ornithological observations made during the survey.

i) The nesting pair at Chushul

That the pair had arrived and was moving around their breeding pool(first located in 1978) was communicated to us on 24th May 1980 even before we reached Chushul. (The officers in the area were alerted to keep a look-out for these birds. This was achieved by distribution of pocket-sized colour post-cards produced and dispatched by the WWF-I.). The nest, a structure similar to the one found in 1978, was constructed almost at the same spot(a little more towards SE) in the breeding pool at Chushul.

When the nest was located in Chushul, the incubation was already on. It was possible that the last egg was laid on 25th May and incubation started immediately thereafter. The cranes were seen to follow the schedule that they followed in 1978.

The incubating pair was kept under observation for three days. Incubating behaviour differed little from that observed in 1978 except that the male was seen to take far less share in incubation than the female. Especially in the evening there was no change over and the female continued to incubate all through the evening.

A lone crane, probably a female, was located in the marsh to the west of Chushul. It quietly foraged the whole day, but was very wary and flew and circled high over the marsh, giving alarm calls, when it was approached.

When we returned to Chushul on 17th June, the lone crane was still in the marsh.

ii) Search for other nests:

All the known areas from where occurrence of Black-necked cranes was reported, were visited.

The Hanle marsh harboured no crane pair in 1980. A lone crane was observed here foraging in different parts of the marsh. It was noted that movement of people and domestic animals had increased considerably. This factor might have inihibited nesting of cranes here. It appears that the cranes have stopped using this marsh for nesting as even in 1978 no nest was reported from here.

A nest was however, found near the Purple Mountain meadows. In 1978 it was noted that the meadows offered no protection to a nesting pair and could hardly be expected to be used for nesting.

The nest that was found in 1980 was nowhere in the meadows but was built in the midst of the shallow but swift-flowing Hanle river. The two eggs rested on a small earthen hump which was heaped over by Myriophyllum plant, the same one used by the Chushul pair for nest-making.

On 1st June we had seen the crane pair quietly foraging in the meadows and hardly suspected that they would soon nest. On 3rd June when we found the nest, the clutch was complete and the female was incubating. It was possible that the last egg was laid on 2nd June or in the early morning of the third and incubation started thereafter.

The shallow river afforded scant protection to the nest. One egg from the clutch was subsequently stolen but the forest guard who was keeping a watch on the site was successful in apprehending the theif and confiscating the egg.

Two crane apirs were located near Thugje Gompa on the Tso Kar and one pair was seen near the south end of the Tso Moriri. Both were not nesting. But one more nesting pair was reliably reported from Lam Tso still further south.

iii) Hatching success and post-hatching behaviour of crane pairs:

The first egg of the Chushul pair hatched out on 11th June, giving probably a period of 18 to 19 days of incubation. The second egg hatched on the late evening of 12th June. Thus bot the chicks were out of eggs within a period of 20 days.

The remaining egg at the Purple Mountain meadows hatched out on 26 th June which gives a slightly longer period of incubation, 24 days. The nest-site being very much exposed, the pair might have faced constant disturbance from human beings and animals.

The chicks were found to be quite precocious and could leave the nest and follow parents around within a few hours of hatching out. It was observed that all through the day the parents would search for small animal matter in the marsh around the nest and would bring the chicks food from time to time. The chicks would take food from the parental beak. The male used to wander away from the family but the mother was always with the chicks. During the noon the family wwould rest and preen and would again feed in the evening. The chicks were fed on fresh-water gastropods, water bugs, ditiscus beetles and tiny snails.

As the chicks grew up the family widened the area of its movement. But it must have faced enemies for one of the chicks was mysteriously lost and the other was found to be seriously wounded. Efforts to save him by administering medical care were not successful and the wounded chick also died in the middle of August. In 1978 their fate was probably the same as reported by Lavkumar.

The chick of the Purple Mountain meadows pair survived and grew up to be a juvenile. Thus out of the 3 known chicks, one grew up giving a survival rate of about 33 p.c.

The Chushul family continued to be in the area till 22nd October. The exact date of the departure of the other nesting pair is not known.

Let us now summarise what is so far known of the breeding biology of the blacknecked crane nesting in Ladakh:

a) Blacknecked cranes arrive in Ladakh from the south using the Indus river as their flyway, in the second fortnight of April. They arrive in pairs and not in flocks.

b) They reach their breeding grounds in end of April or in the first week of May.

c) On arrival the pairs stay and move around their nesting sites during the day. Sometimes they also fly away to other favourable feeding areas but return to breeding marshes for roosting.

d) On the whole the pairs remain quiet, giving alarm calls if threatened but courtship, dancing, bugling and other animated forms of behaviour are not much evident.

e) Nest-construction has not been observed but probably takes place in the third week of May. Share of sexes in nest-construction is not known.

f) The nests observed are of two types: one a platform of aquatic vegetation built in a shallow pool and the other is a small heap of aquatic vegetation on a tiny island in a lake(1976) or in a shallow river.

g) Two eggs are laid with an interval of 12 to 24 hours.

h) Both sexes incubate eggs but the share of the female appears to be greater. The non-incubating bird feeds and roosts near the nest.

i) The eggs hatch within 18 to 24 days of laying. The interval between the two hatchings is probably 24 to 36 hours. The chicks are precocious and can leave the nest within a few hours of hatching out.

j) The chicks are fed by both parents on small animal matter. The female takes a larger share and seldom goes away from the chicks.

k) As their movements increase, chicks are exposed to greater risks and succumb. Their survival rate is low, seen to be 33 p.c. in 1980

l) Chicks that survive grow up rapidly and are ready to leave Ladakh with their parents in late October as winter sets in.

Results of a detailed examination of botanical specimens collected from the crane breeding habitat, are still awaited.We may however, summarise what we so far know of the breeding habitat of the crane and how the cranes use this habitat.

Principal breeding marshes of G. nigricollis in Ladakh appear to be the ones at Chushul and Hanle. Breeding of this crane has been also observed near Purple Mountain meadows and near the south end of the Tso Moriri. According to local people the crane breeds also on Tso Kar and Lam Tso. Crane pairs had been observed on the Tso Kar and though not nesting, this salty expanse undoubtedly provides food and sustenance to the pairs.

Extensive marshes and grasslands surround Chushul. Nests of the crane have been reported from both these marshlands. The nests have invariably been built in the midst of a pool or a lake. Swampy ground surrounding these pools and lakes provide all the food that the crane pair and later the crane family needs. Preservation of these wetlands is thus vital to the nesting of cranes.

At one time these wetlands supported many pairs of nesting Bar-headed Geese(Osmaston 1925). The geese have stopped ~~anything~~ nesting here in recent years. Perhaps the wetland has progressively been desiccating or human and animal disturbance may have increased. It thus appears necessary to follow and devise a management plan(including water management) for the betterment of these wetlands.

Grasslands surrounding these wetlands provide ample forage to flocks of domestic animals. Proper management of this important resource will benefit not only wild life but also animal husbandry with consequent beneficial effects on the economy.

The broad plain at Hanle was once the biggest sheet of freshwater in Ladakh(Cunningham 1834). The lake has now dried up leaving behind a very uneven and saline surface covered with little bumps encrusted with soda. Meandering streams over the plain have left shallow pools and puddles full of mostly brackish water. There is evidence that the Crane used to nest here till 1976 when a pair with a chick was seen. No nesting was reported thereafter. This may be due to i) increase in the movement of men and their flocks of domestic animals and ii) to the continued progressive desiccation of the marsh. However, as will be noted hereafter, the marsh continues to be a very important source of food for wild as well as domestic animals .

Externally the enormous salt-encrusted basin and the shrinking lake at Tso Kar with its extensive deposits of Natron or sub-carbonate of soda, appears to be utterly inhospitable to all life. However, it provides sustenance to hundreds of Brahminy ducks(Tadorna ferruginea)and redshanks (Tringa totanus) and other waders. Crane pairs have been sighted here in the past as well as in 1980. Though some shepherds bring their flocks of sheep and horses to the meagre pastures in this basin, their number is unlikely to increase substantially and the lake, I believe, will continue to provide sustenance to wildlife.

The most important breeding ground for birds however, is not the Tso Kar but the freshwater lake Startsapuk Tso which drains out in the former. Hundreds of Brownheaded gulls(Larus brunneicephalus), Great crested grebes(Podiceps cristatus) breed on it and some Barheaded geese and Brahminy Ducks breed in the surrounding cliffs. The lake is shallow & full of aquatic vegetation, an important food source. There appear to be no human factors threatening this habitat.

To its north and south where freshwater streams debouch into it, lake Tso Moriri is bound by mud flats, grassland and belts of caragana. There is a small island near the north end where Brownheaded gulls and Barheaded geese nest. There is a sizeable subsidiary lake to the south (of Tso Moriri) which also has an island in the center. About 100 pairs of Barheaded geese nest here. This lake is also not very deep and abounds in aquatic vegetation.

It will now be useful to see how the crane and other wildlife utilize these habitats, what exactly is of importance to them and so needs to be conserved.

Vegetation in all these areas mainly consists of species that are confined to alpine type of flora. In the surrounding drier areas there are plants that are peculiar to desert areas. The spiky caragana affords shelter and food(its yellow flowers)to smaller animals and birds. Grasses and sedges like species of Carex provide forage to cranes and geese not to speak of hordes of sheep, horses and yak who feed on them. A trifoliate plant floating in water was also found to be a source of food to the crane. Stretches of still water abound in a submerged aquatic plant, a species of Myriophyllum which is used by the crane to build its nest. In addition these stretches harbour an aquatic lichen belonging to the genus Collema which was found to be edible and is consumed by the local people. This is the first edible lichen to be found within Indian limits.

The shallow lake sides of Startsapuk Tso and Tso Moriri are full of weeds that are used by Brownheaded gulls & Great crested grebes for nesting and one, a species of Potamage-ton, is used as food by Barheaded geese.

In summer all the streams that flow through these wetlands abound in fish which provide an important source of

food. Species of freshwater gastropods, water bugs, ditiscus beetles, tiny snails and shrimp are also found in these streams and pools and are utilised by cranes and other birds as food. A freshwater algae and an algae growing in saline waters were seen to be used as food mainly by Brahminy ducks,

It can therefore, be seen that these wetlands provide sustenance not only to birds and other wildlife but also to man and his animals. Their conservation and proper utilisation is therefore, of paramount importance to the economy of Ladakh. Protection to Blacknecked crane and its habitat need not be viewed as an end in itself. Proper management of this important natural resource may prove an important contributory factor in the betterment of the people and economy of Ladakh.

In the interests of the conservation of Blacknecked Crane and its habitat, the following recommendations appear to be in order:

Recommendations:

1. The first requirement is of course, legal. Blacknecked Crane is included in Schedule I of the Indian Wildlife Act(1972), but is not so recognised by in Jammu and Kashmir. This lacunae needs to be urgently filled up and the bird be given the same status in the State of J & K.
2. The investigator has distributed posters made from colour photographs of the Crane to most of the civil and military establishments in Ladakh. This effort to enhance public awareness of this birds needs to be followed up. The Govt. is well advised to produce a colourful poster of this bird for general distribution. Agencies like the WWF-I may fruitfully collaborate with the Govt. in producing it.
3. The Forest Department should have in Ladakh a small cell with trained guards to monitor movements of these cranes

from April to October and to protect nesting pairs from disturbance. Guards should have roving duties so that areas like Tso Moriri, Startsapuk Tso, Lam Tso and other remote areas are under continuous observation.

The WWF-I can perhaps help here by organising a short orientation course for the guards in the ornithology of the crane and other rare species like Barheaded geese.

4. Management plans with an accent on water-management, for the breeding marshes of Chushul and Hanle are urgently needed. One of the objectives of the plans should be to channel more water in certain shallow places to create pools which can provide a safer nesting habitat for the crane and other bird-species.
The plans should aim at demarcating areas that are to be left for use by man and his animals and areas that are to be reserved for wildlife.
Artificial rafts located in these pools can provide safer and additional nesting places for water-birds.
5. It is necessary that the marshes at Hanle and Chushul are declared as protected places and army and para-military personnel are actively involved in their protection. A system of honorary wildlife wardens drawn from these agencies may go a long way in achieving effective protection.
6. Number of Blacknecked cranes in Ladakh continues to be low and the survival rate of chicks is also poor. To augment this number it may be necessary to try breeding of these cranes in captivity. This may be initiated by collecting one egg from each of the breeding pairs and bringing them to Leh for brooding by a hen or a goose. The eggs can be transported on one of the routine army

flights. The chicks may initially be kept in small pens under proper care.

Once the chicks grow up they can be removed to an aviary and large pens provided for them in a suitable habitat that closely resembles the breeding areas. A suitable wetland near Shé has already been identified where this Crane Breeding Centre can be built up. The Department may initiate proceedings to acquire this area.

The WWF-I may provide assistance in following ways to make this Captive Breeding Programme a success:

i) Providing a small portable incubator for the transport of eggs to Leh;

ii) Providing crane baby food and medicines for the chicks;

iii) Providing training to Forest personnel in aviculture for bringing up the chicks;

iv) Providing plans and designs for the construction of pens and other facilities at the Crane Breeding Centre.

It will be useful if the stock at the Breeding Centre is increased by collection of eggs every year.

ACKNOWLEDGEMENTS

The investigator is extremely grateful to armed forces, to the Forest and Wildlife Dept. of J & K Govt., to civil administration under the Development Commissioner and to numerous individuals and agencies for their generous help.

He is also grateful to the Central office of WWF-I for administrative help and to Dr Sálim Ali for his guidance and useful comments in the preparation of this report.

TITLE OF PROJECT :

An Inquiry into the Ecology, Distribution, and Behaviour of the Blacknecked Crane, Grus nigricollis, in India.

PROJECT DESCRIPTION :

Introduction - Since its inception in 1973 as a public, non-profit organization, the International Crane Foundation (ICF) has sponsored and conducted research projects on cranes in Australia, Canada, India, Iran, Japan, Korea, the U.S., and the U.S.S.R. In addition, ICF has encouraged co-operation among crane biologists throughout the world, and in 1975 hosted an International Crance Workshop at its headquarters near Baraboo, Wisconsin. The purpose of the workshop was to pool information on the distribution, status and biology of cranes and to focus attention on particularly important conservation problems. Over 65 scientists from Japan, Canada and the U.S. attended the workshop, and papers from a dozen other nations were read as well.

During the workshop, Oesting and Archibald (in press) presented a literature review on the Blacknecked Crane, Grus nigricollis. Their exhaustive report made it clear that very little information is available on the ecology, behaviour and status of this crane and that a pressing need exists for an indepth study of the species in the field.

This proposal outlines a study which should provide a great deal of data on the natural history of the Blacknecked Crane, including separate studies of the breeding and wintering ecology of this bird. Phase I, a winter study in Arunachal Pradesh and Bhutan, will be conducted by Mr. Lavkumar Khacher, Education Officer of the World Wildlife Fund - India. Mr. Khacher has extensive experience with Himalayan fauna and was the earliest scientist to urge a detailed survey of the high plateau communities in Ladakh.

Phase II of the study will be conducted on the breeding grounds of the Blacknecked Crane in eastern Ladakh.

During Phase II of the study, an attempt will be made to establish a captive population of Blacknecked Cranes by removing eggs from the nests of wild pairs., This technique has proven very successful in the past for other species of cranes; ICF has established captive populations of five different crane forms using this method : three subspecies of Sandhill Cranes, Grus canadensis, in co-operation with the U.S. and Canadian Govts; a captive population of common Cranes, G.grus, in co-operation with the Govt. of Sweden; and in June of 1977, ICF imported four eggs of the endangered Siberian Crane through a co-operative agreement on environmental protection between the U.S. Dept. of the Interior and the Central Laboratory for Nature Conservation of the U.S.S.R.'s Ministry of Agriculture. The Siberian Cranes produced from these eggs will be used later to restock areas of western Siberia through co-operative agreements with the U.S.S.R. and Iran.

OBJECTIVES : The study has the following objectives :

1. To define the distribution and status of the Blacknecked crane in India with a view to :
   a) Locating wintering flocks in one or more place in Arunachal Pradesh and Bhutan.
   b) Determining the breeding locations and estimating the numbers of nesting pairs in Ladakh.
   c) Identifying possible wintering habitat in Ladakh.
2. To determine the habitat requirements of the species in summer and winter habitats.
3. To study the breeding biology of the crane, viz.
   a) Territorail behaviour
   b) Nuptial behaviour (dancing, copulation, unison-calling)
   c) Nesting behaviour (site, nest construction)
   d) Incubation (onset, duration, male and female incubation duties)

e) Hatching and rearing of young (mortality factors, food)

f) Molts and development of flight in molting adults and in the chicks.

g) Congregation into flocks in late summer and migration departure.

h) Feeding and roosting sites of nonbreeding birds and their general behaviour from spring through autumn.

4. To identify a captive breeding population by :

a) Collecting twelve eggs from nests with two-egg clutches.

b) Hatching and rearing resulting chicks under expert ICF supervision.

5. To identify possible localities in Ladakh and Arunachal pradesh for sanctuaries and prepare recommendations to the Govt. of India for implementation.

JUSTIFICATION :

Of the 15 species of cranes, the Tibetan or Blacknecked Crane is the least known. This species, the last crane to be scientifically described, inhabits the high plateaus of Tiber, Ladakh and Central China where it breeds in the vacinity of alpine lakes and bogs (Prjewalsky, 1876). The remove and often inaccessible nature of this crane's habitat and the traditionally xenophobic attitude of the Tibetan Govt. long prevented scientists from conducting sustematic surveys of the flora and fauna of Tibet the little information we do have of the Blacknecked crane before 1950, when Tibet came under Chinese influence, is limited to a few British Officers on official duty in Tibet or to the rare missionary or botanist who managed to enter the 'Forbidden Kingdom'and to do some bird study on the side. Reports of this species come mainly from southern and far eastern Tibet, and virtually nothing is known of the vast Chanthang Plateau north of the Brahma - putra River where this crane undoubtedly extend its range.

After the consolidation of Chinese control over most of the Tibetan Plateau in 1959, former restrictions on travel by foreigners were made even stricter, excluding virtually all visitors to this interesting and little-known part of the world.

Mr. Lavkumar Khacher, co-originator of this project, was the last ornithologist to travel in Tibet before the Chinese takeover (Lavkumar, 1955).

The remoter areas of Ladakh bordering Tibet consist of high plateau country and habitat typical of the contiguous Chanthang and it is hereby that the westermost range of the Blacknecked Crane extends into India. That these cranes breed in Ladakh was reported by Osmaston in 1927, but the area remained unimportant and little-frequented. After Indian independance in 1947, rapid political developments in southern Asia conspired to make Ladakh a sensitive area and visitors, even Indian national were discouraged. It was not until the summer of 1976 that a WWF/BNHS team headed by Dr. Salim Ali confirmed the continued existence and breeding status of this crane in eastern Ladakh (WWF - India Report, 1976).

The factors which kept the Blacknecked Crane suquestered from the attention of ornithologists also provided for its protection. The remote, barren nature of the high plateaus, the traditional protectionist attitudes of the Tibetan peoples, & later, conversion of the area into a political 'no-man's-land' all worked to ensure the survival of the crane.

In the last two decades, however, the status of the 'Roof-top of the World' has changed dramatically and the security once enjoyed by Tibetan avifauna no longer exists. The high plateaus are now open to motorized transport and a considerable number of men holding none of the local sentiments toward wildlife carry firearms throughout the area. This, added to experiments at draining some of the larger bogs for expansion of pastures and cultivation, and the possibility of large-scale mining operations in the area in the near future, make the doom of conspicuous and specialized species like the crane a real danger in the foreseeable future.

Ironically, the Indian Govt.'s easing of restrictions on travel and commerce in Ladakh also provides the first opportunity for an indepth study of the breeding biology of the Blacknecked

Crane. In addition, there are recent reports of this species wintering in the Api Tani Valley of Arunachal Pradesh as well as in Bhutan, thus providing an apportunity for a study of the wintering biology of the crane as well.

Another of the principal aims of this project will be the establishment of a captive population of Blacknecked Cranes. Cranes do well in captivity; they adjust quickly to captive conditions and reproduce freely. Currently a captive population of 14 of the world's 15 species of cranes is being maintained at the International Crane Foundation's headquarters in Baraboo, Wisconsin. These birds are used for behavioral, physiological, and educational purposes and as a safeguard against the possible extinction of any species in the wild. Progency produced by this captive flock will eventually be used to restock former crane habitat.

The technique to be used to establish a captive population of Blacknecked Cranes is one which has proven completely successful in producing captive flocks of other species of cranes, including the extremely rare crane-Whooping crane, Grus americana. This technique involves locating nests of several pairs of cranes & removing one egg from each nest containing two eggs (occasional nests having one egg will not be disturbed.) Eggs removed from the nests are hatched in incubators and the chicks reared in captivity. The remaining eggs are left to the natural parents to hatch and raise normally.

Research on several species of cranes has shown that this method does not adversely affect there productive rate of these birds (Erickson, 1976). Although crane pairs normally lay a clutch of two eggs during each breeding season, they seldom raise more than one chick. This is particularly true of species which nestin harsh, rigorous, environments, or those having long migration routes. Evidently, the survival rate of each chick is low in such situations and the probability of both chicks surviving to maturity from a single clutch (i.e. the product of the separate

survival rates) is extremely small. This hypothesis is borne out by observations on the Siberian Crane, G. leucogeranus, & the Whopping Crane, both of which nest in far northern latitudes and fly thousands of miles to their wintering grounds. No 'twins' have been reported in either species for nearly a decade, though both appear to be reproducing normally (V.S.Saxena, personal communication; D. Blankenship, personal communication.)

METHODOLOGY AND TIMETABLE :

The study will be conducted in 1978 and in two phases : Phase I - January through February in the Apa Tani Valley in Arunachal Pradesh and possibly in the Tashi Yangste Valley in eastern Bhutan; Phase II - April through August 1978, In Ladakh.

PHASE I : The present status of the crane -- last reported in the winter of 1948 (Betts, 1954) - will be determined for the Api Tani Valley and possibly eastern Bhutan. Once a flock is located, day-long vigils will be conducted to observe :

1. Feeding habits. An attempt will be made to identify food items through a powerful scope and all organic matter will be collected for identification.
2. Movements between roosting and feeding areas.
3. Maintenance activities during resting periods.
4. Agonistic behaviour. Tapes and movies of the cranes' behavior will be taken.
5. Ratios between adults and juveniles, particularly between chicks and their parents.

An attempt will be made to ascertain the presence of other wintering flocks in adjacent valleys, and to evalute the effect of human activity on the wintering populations. Only one investigator, Mr. Khacher, will be in the field. He will attempt to interest local people in the study programme.

PHASE II : The breeding biology of the crane will be observed through scopes and behaviour recorded on movie film and tape. Particular care will be taken to record :

1. Econlogy of breeding birds. A collection will be made of

of plant and animal material within the habitat.

2. Behaviour or breeding adults. Dancing, copulation, nest-site ~~xxxxx~~ selection, nest construction, incubation, nest defence territotiality, and other behaviour patterns related to reproduction will be recorded.

3. Clutch size and hatching success. Factors affecting the latter will be carefully recorded.

4. Care of chicks, feeding, energy budgets of young birds, and mortality factors.

5. Response to human intrusion at all stages of nesting activity.

6. Agnostic reactions between pairs of cranes and between larger birds such as Steppe Eagles, Aquila nipalensis, and Raven Corvus corax, will also be recorded.

If chick mortality determined during Phase I is comparable to Whooping & Siberian Cranes, twelve eggs will be collected, one from each nest containing two eggs. The collection will be made about three weeks after start of incubation by parents and the eggs transported to Leh where Mr. Sauvey will organise the incubation and post-hatching care. Mr. Khacher will operate within the restricted zone; Mr. Sauvey will study any pairs outside the zone and take care of the hatching and rearing activities in Leh.

BIO-DATA

1.	NAME :	Prakash Gole
2.	DATE OF BIRTH :	11th January 1938
3.	PLACE :	Poona City
4.	EDUCATION :	M.A. B. Com. (Poona University)
5.	WORK-EXPERIENCE :	Research in Urban Economics in Gokhale Institute of Politics & Economics, Poona - 4. 1962 - 1967.
		Proprietor/Manager 'Rajas Prakashan'- a publishing firm.
		Partner - 'Sudarshan Rubber Works'- manufacturers of moulded rubber articles.
6.	OTHER ACTIVITIES :	Founder -'Bharat Outward Bound Pioneers' (1964) - an organisation to promote outward bound activities such as mountaineering.
		Hon. Representative -'World Wild-life Fund' - Indian Appeal
		Founder-member - 'Friends of Nature'
7.	HOBBIES :	Nature-watching Writing Hiking & travel

THE BLACKNECKED CRANE

(Rare and least known crane in the world)

On 24th May 1980 the World Wildlife Fund-India office in Bombay received a message. A pair of Blacknecked Crane (Grus nigricollis) was sighted in Ladak, the northernmost region of India, bordering Tibet. I was in Srinagar, the capital of Kashmir, when, an hour later, this message was relayed to me. The next plane ride found me in Ladak to begin my third encounter with blackenecked cranes.

The handsome blacknecked crane stands about 4 feet in height and has a patch of bare red skin on its forehead. Its beak is horny and eyes yellow with tufts of white feathers behind them. The plumage is greyish white but the long black neck and elongated black inner secondaries give the bird a majestic appearance. The only difference between male and female cranes is in height, the male being slightly taller than female.

Since 1976 I had been observing and studying these birds----and not without a reason. For these cranes have the somewhat dubious distinction of being the least known of the 15 species of crane found in the world. They are the only high-altitude cranes breeding around lakes and swamps at an altitude of over 14,000 feet in the highlands of Tibet and wintering in valleys between nine and ten thousand feet.

Even the existence of this crane was, till recently, unknown to the scientific world. It was 'discovered' only in 1876 by Przewalski, Russian naturalist and explorer, who saw several crane pairs near lake Koko Nor in northeastern Tibet. Other observers like Schaefer and Dolan who penetrated

Tibet in the thirties of the present century, saw the crane breeding in southwest Tibet and in northwest Szechwan and wintering around Lhasa and to the areas south and east of it. One flock even went as far as Vietnam in winter while a few birds travelled through the northeastern tip of India to winter in the Apa Tani valley of Arunachal Pradesh(erstwhile North East Frontier Agency).

It will be clear that the blacknecked crane's major breeding areas fall in regions presently under the sovereignty of People's Republic of China and are still closed to the world's scientific community. Indeed George Archibald who investigated the status of this bird for the International Council for Bird Preservation, had to conclude that the last report of wild blacknecked cranes dated from 1948 i.e. before the Chinese takeover of Tibet. That the birds bred in Ladak was first reported by two British ornithologists, Osmaston and Meinertzhagen, who went to Ladak in 1923 and 1925. But thereafter, there was no report from Ladak/s/as hardly any ornithologist ever visited the remote breeding grounds of this crane.

Then in the seventies, the US-based International Crane Foundation, dedicated to the conservation of cranes and keen to collect information on all the crane-species, decided to approach Dr Salim Ali, the well-known Indian ornithologist. Assisted by a grant from the ICF, Dr Ali was able to lead an expedition to Ladak in 1976 to investigate afresh the status of this bird. I travelled with Dr Ali as a member of his team.

Ladak, administratively a part of the state of Kashmir, is reputed to be one of the most elevated plateaus inhabited by man. This high plateau(mean elevation over 13,000 feet) is a cold desert as it falls under the

Himalayan rain shadow and consequently receives only a few inches of rainfall annually. Its climate is most singular, burning heat by day followed by piercing cold at night. Vegetation is restricted to a few species of willow and poplar that grow along streams flowing down the high Himalayan peaks. Above 13,000 feet plant life comes in the shape of sparse grass, herbaceous plants and low thorny scrub. The only shrub growing above 14,000 feet, the altitude where the crane nests, is the Tibetan Furze, a species of Caragana, resembling English gorse.

Parallel mountain ranges run through Ladak from southeast to northwest. Space between the mountains is occupied by level plains filled with sand and gravel. In these shallow depressions meander mountain streams giving rise to wide swamps around which most of the bird and animal life is concentrated. Another feature of Ladak is the existence of huge land-locked lakes like the Pangong and the Tso Moriri. They are brackish and have no outlets, a result of past tectonic movements.

Why is this crane restricted to such high and inhospitable regions? Probably the crane evolved at a time when this region was far more wet and verdant. A few million years ago the lakes had outlets and contained freshwater as evidenced by the abundance of freshwater shells on their banks. In those times the region received plenty of rainfall and snow on higher mountains. Large, glacial torrents flowed down the mountains creating deep and wide ravines that can be seen even to-day. The entire region extending right into the central Asian highlands was at one time a great wetland giving rise to a varied wetland avifauna.(Ancient rock carvings at Tangtse show primitive men hunting stags with bow and arrow. The stag is an animal found only in forested

regions). The crane which evolved during this 'green age', is now precariously clinging to marshes and bogs which are rapidly drying up as the region is being progressively desiccated.

Follwing Osmaston and Meinertzhagen, Dr Ali's expedition explored all the known marshes and lakes of Ladak, in July 1976. But we could find only two pairs of blacknecked crane, one pair with a chick at Hanle in the south and the other in Chushul to the east. The nest of the latter was found to be rifled by egg-collectors.

Apparently in July, the nesting season was over. Therefore, in 1978 I went to Ladak in April, early enough to observe the arrival of cranes in Ladak from their winter quarters. Cranes appeared to enter Ladak from the south, using the Indus river as their flyway. The first crane pair was sighted in the deep south on 18th April. Perhaps the same pair reached the breeding marsh at Hanle, further north, by the end of April. Another pair was sighted on the Indus on 1st May.

I watched the pair at Hanle. In the field I was wearing the local costume normally put on by shepherds of Ladak, and mingled with flocks of sheep grazing in the Hanle marsh. In this dress the cranes will allow you to come close for they are not afraid of the local people who consider the birds sacred and do not molest them.

For most of the day the crane pair foraged in the vast, swampy plain at Hanle. It fed mainly on the abundant sedge(a species of Carex) with a tuberlike root growing in the brackish pools. They searched for aquatic insects, molluscs and shrimps in the marsh and drank water from freshwater streams. They also flew to some meadows nearby byt returned to the marsh in the afternoon for roosting.

One day I was privileged to observe their courtship. As the pair returned to the marsh in the afternoon, the male suddenly began pumping his neck up and down and tip-toed a few paces ahead. Then he turned and spreading his wings, came dancing back, his neck still in ceremonial motion, to face the female. He also uttered a soft note as he began his display. As the male came closer, the female responded by a similar up and down motion of her neck. Both resumed feeding at the end of the ecstacy.

The pair however, did not nest in the marsh that year, but left Hanle a fortnight later.

It was at the end of May 1978 that I was able to locate a nest near Chushul. Chushul is a tiny village, situated near India's border with Tibet and was the scene of a fierce, hand to hand combat between Indian and Chinese troops in 1962. There are vast, sandy plains to the east and west of Chushul. In the extensive plain to the east, are scattered freshwater streams, brackish pools, alkaline swamps and wide stretches of grassland and Tibetan Furze. As I started exploring the plain, I came across a line of high sand dunes. Carefully negotiating the dunes I looked beyond. A small pool overgrown with aquatic vegetation lay beofre me. A pair of blacknecked crane had their nest in the center of this pool.

The nest was a platform of aquatic vegetation heaped to a height of about a foot above water. It was five feet long and two feet wide. The nest was made of entirely of one aquatic plant, a species of Myriophyllum, with tough leathery stems having a head like an erect plume and with tangled masses of hairlike roots that lie submerged in water. In local language the plant is called Zema. The

blacknecked cranes build other types of nests also. Some are mere scrapes in the ground on an island, while others are mounds of mud similar to those built by flamingoes. In May 1980 I found another nest in Ladak. It was constructed on a small hump in the middle of a shallow but swift-flowing river. The mound was heaped over by Myriophyllum stems.

Normally two eggs are laid by the female, probably at an interval of 24 to 36 hours. The base colour of the egg-shell is pale grey speckled with brown blotches all over.

Both sexes incubate the eggs, the female taking a larger share. The non-incubating bird forages nearby in the marsh and roosts near the nest, standing in water, often on one leg only. The change-over at the nest is simple and without any ceremony.

At this stage the pair is extremely wary, leaving the nest at the merest hint of danger. They do not tolerate the presence of people even in local costume. The pair remains silent on the whole, giving short alarm calls if danger threatens. Except man and to a lesser extent raven, there are few predators that may threaten the nest.

The eggs hatch within 20 days only, with an interval of 24 hours between the two. The precocious chicks leave the nest within a few hours of hatching out and start following their parents around the marsh on their wobbly feet. Both parents feed the chicks on tiny animal matter such as freshwater gastropods, water bugs and ditiscus beetles. The chicks take these from the parental beak. At noon the family comes to a rather open, loafing spot to have their siesta. While the chicks sleep soundly, the parents give a thorough preening to their feathers.

The family feeds actively till late in the evening. As darkness begins to engulf the marsh the mother crane sits down at the edge of the marsh and the chicks run over to take shelter under her comforting wings. The father crane, after a gratifying look at the family goes about in search of his dinner. So ends a day in the life of the crane family.

As the chicks grow, the family enlarges the area of their movement and is no longer restricted to the breeding marsh. But once the security of the marsh is lost, they have to face enemies, more numerous and more powerful, like wolves and foxes. The survival rate of chicks is not high. In fact both in 1978 and 1980 none of the chicks of the Chushul family survived. The family leaves Ladak by October end(in 1980 the Chushul pair left on 22nd October) as winter sets in and pools and marshlands are frozen.

Where does the blacknecked crane migrate in winter? The only known wintering areas outside China and Tibet were Vietnam(the plain of Hanoi) and the Apa Tani valley in the north-eastern corner of India, from where a flock of about 30 blacknecked cranes was reported by Colonel Betts in 1955. But Lavkumar, an Indian ornithologist, who visited the Apa Tani valley in the winter of 1978 failed to find any cranes there. He found that with the introduction of firearms in the valley, the tribals began persecuting the cranes and the flock has stopped coming to the valley. But there were reports of sightings from the adjacent kingdom of Bhutan and Lavkumar did succeed in locating a flock of 20 cranes in the Boomthang valley in central Bhutan.

In Boomthang Lavkumar saw the cranes foraging in widely separated pairs and family parties but roosting in a flock in a small area of marshland. During the day the cranes gleaned fallen grain from stubble fields and dug up earthworms and hibernating frogs from boggy areas. Some of the pairs

defended feeding territories by ousting other cranes if they tried to encroach.

I visited Boomthang in February 1981. I did see the wintering flock of about 20 birds there, but the marsh where the flock used to roost was no more. It was reclaimed and is now a cultivated field. The cranes have to adapt their behaviour by roosting in drier areas along a mountain slope, not in one flock but several small groups.

Then my enquiries among the local people in Bhutan led me to another valley, Popshika, in west-central Bhutan. This picturesque valley, like Boomthang, is situated at an altitude of 10,000 feet, but unlike Boomthang is only sparsely populated. In fact, the entire valley floor is an extensive marsh, perhaps the biggest in Bhutan, only reclaimed at the edges at certain places, for agriculture. In this valley I saw 13 blacknecked cranes. But my stay in Popshika was short and I could not explore the whole marsh which undoubtedly remains an ideal ground for many more crane pairs to winter.

As in Boomthang, the cranes in Popshika were foraging in fields and boggy areas in widely separated pairs and small groups. Fields were greener here than in Boomthang and cranes were consuming vegetable matter in addition to their winter food of insects and frogs.

The wintering flocks that myself and Lavkumar saw in Bhutan showed a predominance of adults over chicks. Only a couple of families were accompanied by juvenile birds, confirming our fears that the survival rate of young birds is very low. If the cranes are to be saved from a progressive decline in numbers, something has to be done and that too immediately.

In June 1980 I had gone to Ladak again and succeeded in locating six pairs and two lone cranes in different parts of the region(see map). Though only three pairs nested, the number was the largest in recent yeers and was even greater than the one observed by Osmaston in 1923. Are we succeeding in rehabilitating the blacknecked crane in Ladak?

Though the crane is not molested by local people in Ladak, occasional instances ~~of~~ have occurred of birds having been killed for sport by people who do not share the local religious sentiments. But thanks to efforts made by World Wildlfie Fund-India and to the perseverance of international expert bodies like the International Crane Foundation, the Government of India have now fully protected the blacknecked crane. Strict orders have gone to the troops not to indulge in shooting of any wild life in Ladak. To educate the public and to avoid stray instances of shooting due to lack of information, I distributed large, colourful crane posters made from beautiful photographs provided by the ICF. The cranes are perhaps responding to the greater measure of security available to them.

The threat to the crane's breeding habitat is however, not easy to avoid. It comes from the excessive movement of men and grazing animals, sheep, yaks and ponies, in and around the breeding marshes. The crane has stopped nesting in the Hanle marsh as the movement of men and animals there has increased perceptibly. It may be necessary to keep at least large parts of these marshes free of man and his domestic animals. The World Wildlife Fund-India has recommended to the Government of India and of Kashmir that the marshes at Hanle and Chushul should be declared as sanctuaries for waterbirds.

In mountaineous Bhutan, flat land is at a premium, and all marshlands are looked upon as potential cultivated fields. In fact a scheme is on the anvil of draining the Popshika marsh. But the Forest Directorate of Bhutan has shown a lively interest in cranes and there are hopes that this scheme will be substantially modified.

If all these governments act quickly and decisively, the future of the blacknecked crane, though not rosy, will remain hopeful.

PRAKASH GOLE
277 Sindh Housing Society
Poona 411 007
Maharashtra, India.