JOURNAL OF ECOLOGICAL SOCIETY

Vol. 10, 1997

Editor

Prakash Gole

Foreword

This issue of the Journal of the Ecological Society is slim and trim but fit for being that. I assess its fitness from the quality of the writing in it. No one will deny that the unchecked growth of population in India has wreaked havoc to the country's ecology. Our programmes for the protection of our unique wildlife, the conservation of our unsurpassing biodiversity, our once extensive and productive wetlands have been dealt mortal blows. We remain somnolent towards the crisis which is well and truly upon us. Our political leadership is inane, it displays a supreme unconcern for anything to do with Nature and its uncompromising laws. They scarcely understand, let alone recognize, the immutable law that anyone or anything which is in conflict with Nature must eventually decline and disappear from the face of this planet. Vasundhara is no longer Veerabhogya! All this and more is very clearly spelt out in the five articles within. So read on ....

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

Contents

The Elusive Barheaded Goose

Prakash Gole

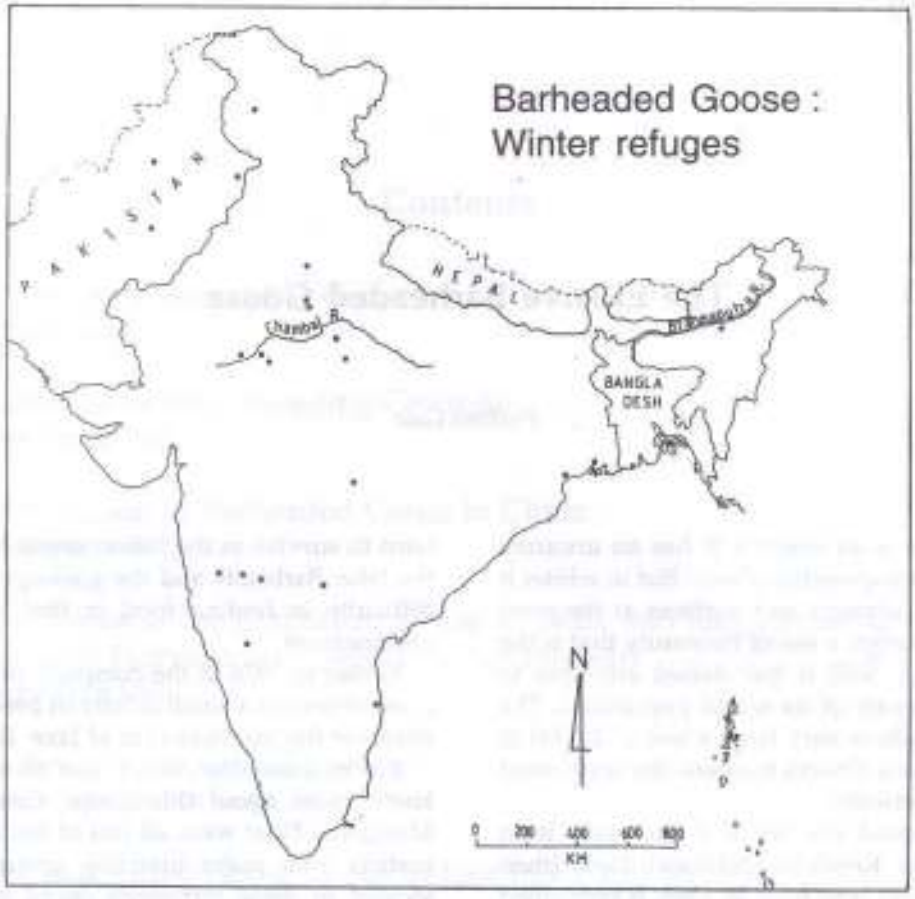
Barheaded goose is an enigma. It has an uncanny habit of breeding at impossible places. But in winter it appears to shed its shyness and surfaces at the most common places amongst a sea of humanity that is the Indian subcontinent. Still it has defied attempts to make a correct estimate of its world population. The estimates of its numbers vary from a low of 10,000 to as high as 50,000. As it always happens the truth must lie somewhere in between.

The goose charmed me when I first saw it in Bharatpur's famous Keoladeo National Park (then only a bird sanctuary) way back in 1969. It enthralled me when I encountered it on its supposed breeding grounds in Ladakh; but it overwhelmed me when in 1980 I discovered its largest breeding ground within Indian limits : a 2-3 ha island in a small lake just off the southern tip of Tso Moriri lake in one of the most remote and forlorn corners of Ladakh. True to its genre the site selected was almost a moonscape, stony, barren and brackish with not a blade of grass growing anywhere. On the island 41 pairs of geese had their nests which were nothing more than a scrape in the bare ground in which 2 to 4 eggs had been laid. Other geese who were there in almost equal numbers appeared to have the least interest in building their own nest. They would rather peek in other's affairs, arouse their ire and if got a chance even try stealing an egg or two. A few eggs were lying outside the nests with no one to attend to them probably due to the high-handedness of these marauders. A few pairs even had their young ones in toe, tiny golden balls floating in the lake. The geese were constantly upending bringing up small insects or algal matter floating just under the lake surface. Tiny fish abounded in freshwater streams that debouched into the lake. But they would find it hard to survive in the bitter, saline liquid that formed the lake. Barheads and the goslings however, had no difficulty in finding food in that most inhospitable environment.

Earlier in 1976 in the company of late Dr Salim Ali I had observed a small colony of breeding geese on an island at the northern end of lake Tso moriri.

But in those days it was not an easy task to get to know more about this goose. Central Asia, China, Mongolia, Tibet were all out of bounds and no information from major breeding grounds of this goose located in these territories could be had. From the scraps of information available from USSR and Mongolia the best guess of its world population I could hazard was a little over 10,000.

During the Sarus crane survey (1988-90) I had an opportunity to travel extensively in the west, north, central and eastern states of India. I visited several wetlands where wintering flocks of Barheads could be observed. I found that Rajasthan and Assam held the two large segments of the Barhead population that wintered in India. The rest wintered in Haryana, Uttar Pradesh and Madhya Pradesh and a few flying to Maharashtra, Karnatak and Tamilnadu. In some years a spectacular assemblage could be seen in Orissa's famous Chilika Lake. They appeared to be passage migrants in Kashmir. With the inauguration of the Asian Mid-winter Waterfowl Count in 1987 systematic counts began to be made and more information assembled. Every year the number of Barheads counted in India showed an increase. Information came in from China, Nepal, Burma, Bangla Desh and Pakistan. I was then able to revise my original estimate of its world population, which I now figured to be a little over 20,000. The numbers in wintering areas continued to



increase which led IWRB to put forth an estimate of 50,000 in 1994.

In recent years (1995-97) Joost van der Ven from the Netherlands did surveys in Central Asia and nearby Russian territories. In general he found that conditions on its breeding grounds were far from satisfactory. In the summer of 1997 I had an opportunity to travel with him to the Barhead's most important breeding wetland in Kyrgyzystan, lake Song Kul, situated at an altitude of 3100 metres. There we could plainly see the difficulties the breeding pairs faced in that harsh environment.

On my return from Kyrgyzystan I felt that efforts must be renewed to bring this goose under the right focus. I wrote to several people in India and abroad requesting information from them. The result is this volume of our Journal devoted largely to Barheaded Goose (*Anser indicus*). Admittedly it does not pretend to present a comprehensive coverage. We failed to get information from Chinese and Mongolian scientists. Recent information from Pakistan, Bangla Desh and Nepal is also lacking though this goose never wintered in these areas in any significant numbers. Information from India is adequate though again not comprehensive. Contributors from India have pinpointed threats that the goose faces in winter. Hunting, other human interference in wetlands, changes in agriculture leading to scarcity of preferred food have been listed as threats. We do not know if the goose suffers from pesticide poisoning. But it is a possibility as the goose may be utilizing the same fields as used by the Sarus which is known to suffer from pesticides.

As pointed out by Joost van der Ven this goose was never abundant and disturbances on its breeding and wintering areas do cause concern about its future welfare. There is ample reason for all of us who love and admire waterfowl to be vigilant and insist on proper conservation measures for this handsome goose.

Prakash Gole
Coordinator for *Anser indicus*
Goose Specialist Group, Wetlands International

Barheads on their Breeding Grounds

Joost van der Ven

People in Europe do not have to travel to Asia if they want to see Barheaded geese. After they were kept in many private collections, they escaped and settled at many places in Europe. In my Dutch garden there are regularly two to eight "wild" Barheads. One is laying eggs every year but without any result. On the coast of Schleswig-Holstein (Germany) one can find flocks of these geese among the real local wintering geese: Greylag, Anser anser; Barnacle, Anser leucopsis; Brent, Branta bernicla and even Canada goose, Branta canadensis. The last one really settled in northern Europe since the beginning of this century after escapes and introductions in Sweden. The Barheaded goose seems to breed in the wild successfully only in Norway/Sweden where a small population exists. In autumn they are migrating to Germany and the Netherlands.

But the "real" *Anser indicus* can only be found in Asia itself: wintering in China and India or breeding in the remote areas of Central Asia. The Asian midwinter counts gave updated information about the population size. People in (former) USSR believed there were only 1-2000 birds left, which was the result of their isolated information and lack of international contacts. The figure given by Madge and Burn (Wildfowl 1988) of 10,000 geese as the whole population of A. indicus should be regarded as a big under estimate of the reality.

After some years of counts, the Indian figure mentioned for many years seems more realistic. The estimation by the Goose Working Group of IWRB (Prakash Gole) of 25,000 birds is more probable. The figure mentioned in the report of the Asian Waterfowl Census 1987-91, of 50,000 geese seems to be an overestimation. As total counts in Asia in winter reached 27,000 geese, most areas in India and Burma were covered. Though more information about China is included, still our knowledge is rather limited. One year of counts will not give the type of information necessary for population estimates. 35,000 geese as a total population seems the best realistic figure. Anyhow a goose population of such a size has to be regarded as vulnerable and special protection measures are absolutely necessary. In most areas hunting is not a real threat as this bird is respected in many areas and is on the Red Lists of many countries. On some migration routes some illegal hunting might take place. Egg-collecting goes on in several breeding areas though it is illegal. It is not related to starving people but freely available eggs are cheaper than those in a shop. It is more related to greediness of people than anything else and partly related to tradition: collecting nice things in springtime!

Anser indicus was more numerous in the beginning of this century as indicated by Indian sources which are reliable. But it has never been an abundant goose due to its restricted breeding areas high in the mountains. Like the Black-necked Crane (*Grus nigricollis*) it has its own remote environment and it was and never will be abundant. We are more and more convinced that the crucial protection problems for this goose are to be found in its breeding grounds. To ensure safe breeding areas and more control over the breeding success should have first priority in all activities related to this goose.

The breeding areas of the Bar-headed goose are scattered all over Central Asia but it is difficult to imagine where all these geese will nest. The total number of breeding pairs in Kyrgyzystan, Uzbekistan and Tadzjikistan will not be more than 150-200 pairs.

From Kazakstan no breeding areas are known. In the Altai and Tuva (both in Russian Federation, RF) the real figure is unknown but might be roughly the same as in the Central Asian Republics. However, some unknown breeding areas might exist. Large breeding areas and populations are in Mongolia and China where at least 10,000 nests should be found. (see Prof. Lu's note in this volume - Ed.).

In this article we will deal with three different breeding areas: Kyrgyzystan (Song Kul); Tuva and China with recent information from C A von Truenfels in his book "Unter Panda und Pinguinen", Hamburg 1995.

1. Song Kul in Kyrgyzystan

Bar-headed geese are not only breeding in remote areas, they apparently also preferred areas closed to ornithologists! All the above mentioned areas in USSR, Mongolia and China were closed till about five years ago. In 1993 I visited Kyrgyzystan for the first time and found Bar-heads in the larger lakes. In 1997 Prakash Gole and I visited one breeding site in Kyrgyzystan after I visited the same area in 1996 too. The Song Kul lake in Central Kyrgyzystan lies at over 3000 metre above the sea level surrounded by mountains 4-4500 metre high. The water surface is nearly 300 sq. kms., the lake being 30 km long and 16 km wide. In total there is 125 km of coastline. The average depth of the lake is 9 metres, the deepest point being 22 metres. In July the highest water level is reached when all the snow of the surrounding mountains melts.

This lake proves once more that Bar-heads do not look for easy sites. With an average annual temperature of -3 to 5° C., only in July the water reaches 13° C. The lake freezes completely in October and only in the beginning of June the lake is without ice, about four months in total. In May however, the shallow coastal waters are already melting. The ice is one metre thick at the end of the winter. After September one will not find any birds except a desperate crow or an eagle! Around the lake there are extensive steppes grazed by herds of Yak, sheep and horses. Only the yaks stay the whole winter as they know areas without snow during the winter, high up in the mountains. There are no villages and no shepherds or fishermen from September till June. People from the southern villages however, are reaching the lake in early spring. They are illegally hunting and collect eggs from ducks, geese, gulls, terns and grebes. Only in the eastern and western parts of the lake are some marshes and islands.

In 1996 the geese were breeding on one high island but in 1997 they preferred three low islands. In total we found 10 nests on these three islands. Two of these nests were partly destroyed, the eggs cold and apparently not used by the geese. Their nests were surrounded by many nests of gulls, terns and ducks. Grebes were breeding around the islands. On one island we found six nests with respectively 6, 2, 4, 4, 4 eggs (and one with four eggs not occupied). As the weather was extremely bad we only spent a very short time on the islands to avoid any further disturbance.

On the next day we visited all the islands by boat. No other breeding Barheads were found. A Greylag nest was found among many nests of ducks, Blackheaded gulls, Common terns, Coots, Redshanks and Grebe-species. The limiting factor in Song Kul seems to be lack of adequate and safe breeding places. Egg-collecting people and foxes could have reached most of the areas. In 1996 a project was prepared to enlarge and stabilize some islands but was rejected by the management of the reserve. In the last ten years the melting ice has formed a large, narrow peninsula. It should be interesting to cut this off from the main coast to make it a real island. If one takes care that no foxes will stay there after the winter, it will create excellent breeding possibilities for geese and ducks. As the whole lake is a nature reserve, better enforcement of the rules should be carried out: better management, more control against illegal egg-collection and illegal hunting.

Apart from the breeding geese, there was a group of over 50 summering, non-breeding Bar-heads. Feeding grounds seem to be unlimited.

There is one more lake in Kyrgyzystan known to have a colony of Bar-headed geese. It is Tsjatur Kul near the Chinese border in the south of the country. As there are no islands, Bar-heads are breeding on floating rafts of old plant material and also near the water line. There is no information about their breeding success but it is supposed to be very low. The total number of pairs is not more than 20-30 according to the latest information. There is no real protection to this site, though this lake is also a nature reserve.

Captive breeding of Bar-heads is being attempted near Lake Issyk Kul in the north. Some of these were released on Song Kul and migrated with the wild geese.

2. Tuva

Tuva, one of the RF republics, is situated north of Mongolia and south west of Baikal Lake. I visited Tuva several times in 1993, 1995 and 1997. An interesting chapter on Bar-headed geese can be found in

Baranov's book : Birds of Tuva (in Russian). As Tuva has rivers and trees but hardly any islands in the lakes, Anser indicus is breeding here in old Black Kite's nests high in trees. The birds are concentrated in the south western part of the country where they also breed in rock cliffs in the mountains. The total breeding population however, will not be much over 100 pairs, though the number of non-breeders again is relatively high. Upto 500 geese are summering in the region. Immediately after breeding they move to rivers and lakes, mainly in Mongolia. In September 1997 I found only three adult birds in the lake near Erzin on the Mongolian border.

3. China

Last year C A von Treuenfels (WWF Germany) published his book "Unter Pandas und Pinguinen" (With Pandas and Penguins). Mr Von Treuenfels assisted in all European crane meetings and is well informed about modern nature conservation problems.

He describes (in German) his visit to Qinghai Lake Nature Reserve, formerly called Bird Island. It is situated in Qinghai province, north of Tibet. The island is no longer an island but a peninsula. But Barheads have kept it as their breeding site. Lack of trees(Tuva) and lack of islands(Kyrgyzystan) forced the geese to use the peninsula. The altitude of this lake is also over 3000 metres, excellent for these high altitude geese. It is mentioned by Von Treuenfels that years ago when the island was still an island, 3000 geese pairs were breeding there. Now 2000 pairs are breeding. Only such a large colony of geese (in this case together with Blackheaded gulls) can survive on a peninsula; and they must be very lucky as foxes and other predators will find such a colony a very easy target. As far as we know it is the first description of such a large colony and proves again that the main breeding area for these geese is in China/Tibet. From the point of view of bird preservation breeding areas on the borders of the population's range are worth fighting for. If we are unable to keep these breeding areas alright, the future of the entire population is in danger.

It should be very helpful if Mongolian ornithologists would give some information about breeding and resting areas of Anser indicus from their country. To develop a reliable plan for the survival of these geese, such information is absolutely necessary. Information from the Central Asian Republics from former USSR will now become available rather quick and with more information from China, it will be possible to get a good picture of the breeding results. Continuous mid-winter counts in India, Burma and China will give information about fluctuations in the population.

To enjoy Bar-headed geese one has to suffer together with them. Only in the wintering areas one will recognize the combination of nice temperatures and presence of geese.

Joost van der Ven
P O Box 157, 3940 AD Doorn, The Netherlands

Distribution of Barheaded Goose in China

Prof Jianjian Lu

Bar-headed Goose (*Anser indicus*) is breeding in the western part of China, mainly in Qinghai-Tibet Plateau area and wintering in the south west part of China. Occasionally it appears in the middle and lower course of the Yangtze river. It is estimated that about 10,000 pairs are breeding in China each year.

Main Wintering Areas

I CAOHAI NATURE RESERVE (24° 30'-25° N, 102° 58'-103° 02' E)
1660 individuals were counted in the winter of 1988/89
2066 individuals were counted in the winter of 1990/91

II NAPAHAI NATURE RESERVE (27° 49'-27° 55' N, 99° 37'-99° 40' E)
800 individuals were counted in the winter of 1985/86

III ARTETAO (39° 05' N, 75° 50'E)
400 idividuals were counted in the winter of 1990/91

IV LHASA HE (29° 38' N, 91° 05' E)
110 individuals were counted in the winter of 1985/86
380 individuals were counted in the winter of 1987/88

V YANGCAOYONG CUO (29° 00' N, 90° 45' E)
678 individuals were counted in the winter of 1987/88

VI DAZOUKA (29° 20' N, 89° 35' E)
478 individuals were counted in the winter of 1985/86
788 individuals were counted in the winter of 1987/88

Main Breeding Sites

1. Qinghai Hu Nature Reserve (36° 28'-36° 25' N, 97° 53'-101° 13' E)
   5520 individuals were counted in the 1988 breeding season
2. Longbaotaotan Nature Reserve (33° 09'-33° 17' N, 96° 24'-96° 37' E)
   2000 nests were counted in the 1988 breeding season
3. Tuoso Hu (37° 10'-37° 20' N, 96° 49'- 97° 30' E)
   555 adults and 142 young birds were counted in the 1987 breeding season
4. Pangong Hu (34° 50' N, 98° 10' E)
   127 adults were counted in the 1985 breeding season
5. Ga Hai Nature Reserve (34° 12' N, 102° 20' E)
   Not counted
6. Chaka Yanhu (36° 18'-36° 45' N, 99° 02'-99° 12'E)
   Not counted
7. Donggeicuona Hu (35° 17' N, 98° 35'E)
   Not counted
8. Mado Hu (34° 50' N, 98° 10'E)
   Not counted
9. Eling Hu (34° 55' N, 97° 43' E)
   Not counted
10. Zhaling Hu (34° 55' N, 97° 15' E)
    Not counted
11. Yilan Cuo (33° 05' N, 93° 15' E)
    Not counted
12. Ayakekum Hu (37° 30' N, 89° 30' E)
    Not counted
13. Aqikekule Hu (37° 05' N, 88° 25' E)
    Not counted

14. Bayinbuluke Nature Reserve (43° 25'-43° 28' N, 83° 02'-86° E)
    Not counted
15. Southeastern Altai Mountain (46° 50' N, 90° 52' E)
    Not counted
16. Mafangyong Cuo (30° 34' N, 81° 05' E)
    Not counted
17. Qiangtang Lakes (30°-36° 30' N, 79°-95° E)
    Not counted

In the breeding seasons from 1983 to 1985 the number of banded geese was 802 (1983:304, 1984:417, 1985:81) including 665 young and 137 adults. They were banded in Qinghai Lake. 22 bands have been so far (1990) recovered : 2 from India, 1 from Bangla Desh and the rest from China.

(Cited from "Present status and conservation of geese in China" in Magadan Conference Proceedings, Magadan, USSR, 1990)

Prof Jianjian Lu
Department of Biology
East China Normal University
Shanghai 200 062, Peoples' Republic of China

Distribution of Barheaded Goose (*Anser indicus*) in China

The Status of the Barheaded Goose in Delhi and the Adjoining Areas of Haryana and Western Uttar Pradesh

Abdul Jamil Urfi

Due to the presence of rivers the Yamuna and the Ganges, the Delhi region and adjoining areas of Haryana and Western Uttar Pradesh abound with wetlands. In this region 21 families of water dependent birds (excluding Passerines) are represented[1]. This includes 23 species of Pelicaniiforms and Ciconiiform with nesting records, and 35 species of passage / overwintering waterfowl and waders.

A report on the status of the Barheaded Goose in the above mentioned region is presented here. But I must confess at the outset that a rather limited data base has been utilized in this report — a few prominent works from the Delhi region and some of my own published observations. Unfortunately, I have not been able to access the widely scattered though vast literature on wintering ducks from Delhi and adjoining areas. Still, I hope that the present review will throw some light on the status of this goose, which is now believed to be under pressure in its wintering range.

The area under review is shown in the map. It includes the state of Delhi and adjoining areas in Haryana (uptill Sultanpur and Sonipat on the East and North respectively) and western Uttar Pradesh (uptill Aligarh district in the South-East).

Status

The Barheaded Goose is among the three species of geese with wintering record in the region. As the table shows it is among the moderately common goose, encountered in small to medium sized flocks and starts arriving in late winter (November). It is presumed to be over-wintering in this area.

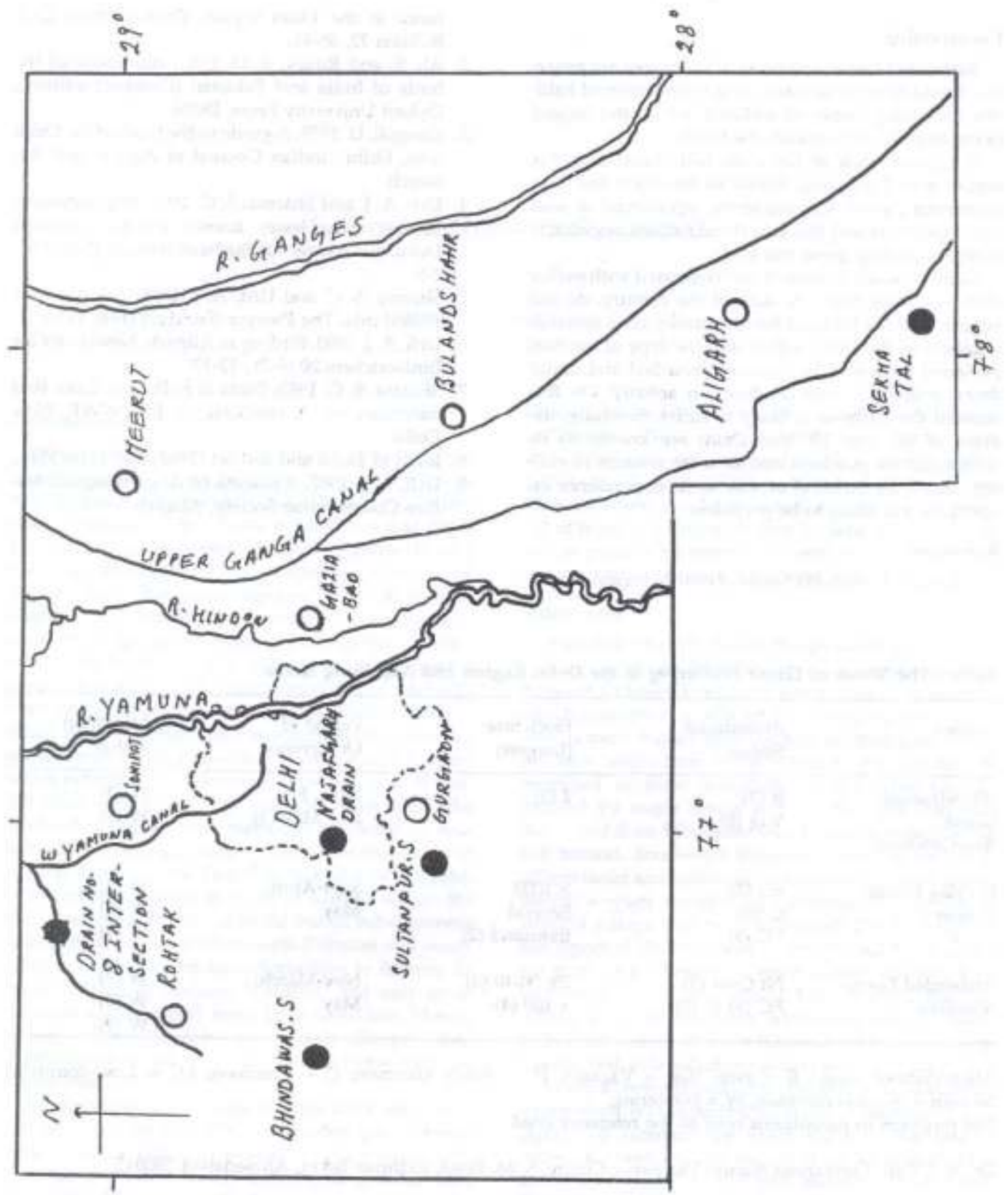
Habitat Preference

The Barhead is known to affect large jheels and rivers. The sand bars of large rivers offer safe daytime roosts[2]. Regarding its diet it is described as 'almost exclusively vegetarian', feeding on gram, tubers, tender shoots of wheat, gram and other winter crops and also paddy in stubbles[2].

In the Delhi region the Barhead was encountered at sandbanks of the river Yamuna and jheels such as Badshahpur, Najafgarh and Sultanpur[3]. However, most of the recent sightings have not really been in wetlands but in areas close to them. For instance, Barheads were sighted on the grassy slopes and dried basin of Drain No. 8 in Sonipat district[4]; in the grassy, wet meadows of Bhindawas Bird Sanctuary in Haryana[5]; in a marshy agricultural field adjoining the river canal, close to Sekha Tal near Aligarh in Western Uttar Pradesh[6]. In the traditional areas described in Ganguli[3], Barheads are still to be seen such as at 'Sultanpur Jheel' in Haryana[7].

Flock Size

In literature the Barhead is reported to occur in small family parties of 5 to 6 birds or in gaggles with upto 100 birds or more[2]. The largest flocks described in Ganguli are 29 birds on 31 December 1959 at Badshahpur Jheel and the observation of 30-40 birds at Sultanpur Jheel in November 1969 by Sir Hugh Elliot. My own observations about flock sizes in the region are : a small flock of 15 birds, in company of Greylag Geese at Sekha[6] and a large flock of about 100 plus birds at Drain No. 8 near Sonipat[4].


29°
28°
77°
78°
R. GANGES
BULANDSHAHR
ALIGARH
SEKHA TAL
MEERUT
UPPER GANGA CANAL
GHAZIABAD
R. HINDON
R. YAMUNA
DELHI
NAJAFGARH DRAIN
GURGAON
SULTANPUR S.
SONIPAT
W YAMUNA CANAL
DRAIN NO. 8 INTERSECTION ROHTAK
BHINDAWAS S.
N

Conservation

Barheaded Geese wintering in Delhi area are generally found close to wetlands and their preferred habitats are grassy banks of wetland, wet/water logged fields and marshy agricultural fields.

A cursory look at the map will reveal that this region is well irrigated, thanks to the rivers and their numerous canals. Consequently, agriculture is well developed here and this area should afford large tracts where wintering geese can feed.

Contemporary records when compared with earlier ones — dating from the turn of the century, do not suggest that the Barhead has drastically gone down in numbers in the Delhi region. But the type of habitats preferred by it may be severely disturbed and under threat primarily from construction activity. On this account the Barhead is likely to suffer. Secondly, the areas of Western UP and Delhi are known to be frequented by poachers and so some amount of culling, either for its meat or due to its dependence on agriculture is likely to be prevalent.

References

1. Urfi, A. J. 1995. Wetlands of ornithological significance in the Delhi region, Oriental Bird Club Bulletin 22, 38-41.
2. Ali, S. and Ripley, S. D. 1983. Handbook of the birds of India and Pakistan (Compact edition). Oxford University Press, Delhi.
3. Ganguli, U. 1975. A guide to the birds of the Delhi area, Delhi : Indian Council of Agricultural Research.
4. Urfi, A. J. and Sharma, S. C. 1992. Bird conservation at some lesser known wetlands around Delhi. Newsletter for Birdwatchers, 32 (5 and 6) : 2-5.
5. Sharma, S. C. and Urfi, A. J. 1995. A heaven for Waterbirds, The Pioneer (Sunday) (Feb. 19) 6.
6. Urfi, A. J. 1980. Birding in Aligarh, Newsletter for Birdwatchers 20 (6-7) : 12-13.
7. Sharma, S. C. 1985. Birds of Sultanpur Lake Bird Sanctuary — A checklist — ESG-WWF, New Delhi.
8. Birds of Delhi and district (1967) Field checklist.
9. Urfi, A. J. 1987. Avifauna of Aligarh region, Nature Conservation Society, Aligarh.

Table : The Status of Geese Wintering in the Delhi Region and Adjoining Areas.

Species	Abundance Status	Flock Size (Largest)	Period of Occurrence	Migration Status
Whitefronted Goose *Anser albifrons*	R (3) Vag (8)	2 (3)	Nov., Feb. and May (3)	W (3) W (8)
Greylag Goose *A anser*	FC (3) C (8); LC (9)	> 1000 Several thousand (2)	Sept-April; May	W (3) W (8) W (9)
Barheaded Goose *A indicus*	Nt Com (3) FC (8); C (9)	29; 30-40 (3) + 100 (4)	Nov-March; May	W (3) W (8) W (9)

Abbreviations used : R = rare; Vag = Vagrant; FC = Fairly common; C = Common; LC = Less common; Nt com = Not too common; W = Wintering.
The numbers in parenthesis refer to the reference cited.

Dr. A. J. Urfi. Sundarvan Nature Discovery Centre, S. M. Road, Jodhpur Tekra, Ahmedabad 380015

Barheaded Goose in Rajasthan

Rakesh Vyas, Bharat Singh

Introduction

Wetland birds of the genus *Anser* are represented by eight species which have been seen in the Indian sub-continent. Pink-footed goose (Home 1926, Maharajah of Bikaner 1946), Snow goose (Mundkar 1991), Tundra Bean goose (Baker), Shushkin's goose (Hurrell 1947) are all extremely rare vagrants and only one sighting each has been reported from Rajputana, Gujerath and Assam. (All reported in relevant volumes of the Journal of Bombay Natural History Society). White-fronted goose and Lesser White-fronted goose are sparse winter visitors recorded sporadically from Sind (Pakistan), Kashmir, Uttar Pradesh, Bengal, Bihar, Assam, Orissa and Rajasthan. Eastern Greylag goose Anser anser, is distributed over a wider range, which extends from western Europe to China. It winters from central to south and south-east Asia. The Bar-headed goose *Anser indicus*, is restricted to Asia having its breeding colonies in high elevation lakes in Central Asia from the Tien shan to Kokonor in China. Few birds are known to breed in Ladakh within the Indian territory. It winters in the Indian sub-continent having its western range in north Pakistan and straggling to Burma in the east. According to Roberts its present status in Pakistan is suspect and only small numbers are recorded from Dera Gazikhan, Marala barrage (The Chenab river), Salt Range lakes (Khabbaki lake) and on the Indus river below Panjnad headworks.

While scanning through the literature we found precious little written about Barheaded goose, Anser indicus, in the journals. Available sight records suggest that it is fairly widely distributed in India. East Rajasthan, Karnatak and Assam and occasionally Orissa (Chilika lake) are its strongholds. Its sightings in Gujerath, Bombay, Hyderabad have been noted with enthusiasm and reported by M. K. Himmatsinhji (1990), L. M. Raol (1988) S. Khacher (1971), K. N. Blundell (1949) and M. Rahimullah (1946) in the Journal of Bombay Natural History Society. (S. N. Varu in a pers. commu. reported a pair with a juvenile staying in Nov. 1987 near Bhuj, Kutch-Ed.)

Study Area

Wetlands of Kota, Bundi, Baran and Jhalawad districts in south-east Rajasthan were observed regularly between October-April for 5 years. Eastern Rajasthan which comprises of 39% of the total land area of the state is more humid than the arid western part. Rainfall here ranges from 500 to 1000mm. per year and is restricted to three monsoon months. This part is drained by major rivers such as the Chambal, the Banas and their tributaries which leave fertile alluvial soil behind. South-east Rajasthan abounds in lakes, village tanks and bunds, large and medium-size dams, canals, seepage marshes and riverine islands. These support a large variety of waterfowl. The first author has reported 106 species of waterfowl out of which 50 are migratory. These sites were visited regularly and bird records were maintained. Lakhewa and Ranpur village tanks, Abheda tank, Alniya and Bharda reservoirs were visited at more frequent intervals (twice a month) and detailed observations were recorded.

In the absence of authentic information, anecdotal information was collected from old shikaris and villagers. To ascertain the exact status of Barheaded goose, a questionnaire was sent to knowledgeable persons of Udaipur, Jodhpur, Bikaner, Jaipur and Bharatpur.

Discussion

The earliest arrival of Bar-headed goose takes place after the first week of November. Gaggles of 20-100 individuals fly from one waterbody to another in search of food and safe roosting sites. Their numbers gradually swell to 250-300 in the months of February-March. It seems possible that on return migration more birds utilize this area as a staging area. This is also the time when water-logged parts of the tanks and reservoirs are exposed and grasses and weeds start growing in the slush. A particular weed locally known as Chana grass is the favourite food of Bar-headed goose, Ruddy shelduck, Wigeon and Coot. The geese are attracted to these patches of weeds in fairly good numbers but as the rising temperature causes quick evaporation of moisture from the soil, grasses too disappear quickly and within 3-4 weeks the party is over. The geese then leave for their breeding grounds. Depending on the water levels in medium-size dams birds depart from south-east Rajasthan by the second week of April. Only once three Barheads were seen at Alniya on 14th May.

As the water of the village tanks and reservoirs is used for irrigation, water levels fluctuate drastically with the water requirement of the crops growing in the command area. Normally village tanks dry off between 15th January and 15th February. Reservoirs follow the same trend. In certain good monsoon years Alniya reservoir retains enough water for summer when Greater Flamingo, Spoonbill, Storks and Sarus crane utilize this water body in good numbers. In the crop fields Barheads show a preference for gram, wheat and coriander. As farmers are growing more oilseeds like mustard, there is little attraction left for geese in this part of Rajasthan. We have noted a declining trend in their annual arrivals as may be seen from the records of 5 representative waterbodies near Kota city (Table 2). Lakhawa, Ranpur and Alniya are 15, 19 and 24 kms from Kota. Birds were counted on the same day twice a month during the migratory season(Oct-Apr) every year. Abheda and Bharda were also situated close to eachother and thus were covered likewise. Average number of geese on these wetlands during a month show a decline over a six-year period except Feb-Mar 1995, when a large gaggle of about 300 geese was moving between Ranpur and Alniya. The big and noisy gaggles flying back and forth from roosting sites to foraging sites have become a thing of the past. Roosting parties of Barheads have also disappeared from riverine islands where they congregated in big numbers about two decades back.

The Greylag goose is one of the early arriving migratory birds in south-east Rajasthan. A gaggle of 57-76 individuals is a regular winter visitor to Abheda and Bardha. Besides these sites Greylags have only been sighted on Manpura and Sorsan tanks in Baran district in small numbers. These birds also leave early for their breeding grounds and by the last week of February they are completely gone.

Rest of Rajasthan

Reports received from the western part of Rajasthan are not very encouraging. Dr Ishwar Prakash (Pers. communication) informs that he has not been finding Bar-headed goose around Jodhpur for past few years. (Indra Kumar Sharma in a personal communication reported 7 Barheads at Guda-Bishnoiya tank in 1990 and 1991- Ed.) Dr Asad Rahmani in his recently released book "Wildlife in the Thar" states that Bar-headed geese are common in some localities like Tal Chhapar, Sambhar Lake and Kolia (near Didwana). He cites the Rajasthan Forest Department's census figures for Tal Chhapar as 52 for '90-91 and 125 for '92-93. (He also reported observing 200-250 Barheads in a stretch of 27 km in the Chambal sanctuary in 1991 : A. Rahmani personal communication-Ed.)

According to Dr Satish Sharma and Reza Tehsin, it is a common winter migrant on the wetlands of south Rajasthan. Their observations suggest a decline of approximately 70% in their numbers over the last two decades. They attribute it to heavy hunting pressure and pesticide poisoning due to their increased and indiscriminate use on crops.

Keoladeo National Park in Bharatpur in east Rajasthan remains a stronghold of Barheads and Greylag geese. The Asian waterfowl census figures are indicative of the fact. In the years 1989, 1990, 1991, 1992 and 1993 the number of individuals of Bar-headed geese counted was 1035, 4072, 1790, 650 and 1297 respectively. (An observer in 1992 when very few geese were counted, remarked that only 17 birds were found in juvenile plumage among 576 birds examined : J. Philippona pers. communication-Ed.). In 1992 in the rest of Rajasthan only 306 Barheads were counted. These were from the Kota area only. Rajasthan plays host to about 15-20% of Barheaded geese wintering in India. In 1990 the proportion was 29%. Dausa, Bhilwada and Rajsamand districts have a good potential of harbouring this magnificent bird, but it needs to be looked into.

Threats

Hunting seems to be the biggest threat to the exist-

ence of Bar-headed goose in Rajasthan. It is known as 'Bhatya' throughout Rajasthan and hunted with impunity in all parts. Hunting is rampant inspite of its declining numbers. As their gaggles fly in a predictable manner between waterbodies and cropfields, they become an easy target for the guns. Farmers are also not tolerant and use weapons or poison against the geese.

Conservation

The declining trend in the numbers of Bar-headed goose needs to be arrested through conservational activities. The government and the NGOs must come together to create awareness about the threatened status of this bird. It should be immediately put on the Schedule I of the Wildlife Protection Act 1972. The carrying of firearms must be banned within 100 metres of selected wetlands between October and April every year. The conservation of Bar-headed goose is possible through conservation education, awareness programmes, legal measures and good wetland management practices.

Acknowledgement

We are thankful to Dr Ishwar Prakash, Dr Satish Sharma and Reza Tehsin for their timely and praiseworthy response and the concern shown by them about depleting numbers of Barheaded geese in Rajasthan. We are also thankful to Dr Asad Rahmani for his suggestions and information on the status of this bird in western Rajasthan. Shri Hari Singh furnished information on its status in Banas district and Shergarh. Shri A. H. Zaidi, Anil Nair, Himmat singh were helpful companions during the surveys. The help of all these persons is gratefully acknowledged.

Rakesh Vyas, Bharat Singh
Hadoti Naturalists Society
2P 22 Vigyan Nagar, Kota 324 005, Rajasthan

Table 1 : **Important Wetlands of Kota, Bundi, Baran and Jhalawad Districts**

Medium-size Reservoirs

1. Alniya* (Kota), 2. Sawan Bhadon* (Kota), 3. Ram Sagar* (Kota), 4. Cuda* (Bundi), 5. Bardha* (Bundi), and 6. Bhim Sagar (Jhalawad).

Village Tanks

1. Ranpur*, 2. Lakhwa*, 3. Abheda*, 4. Borawas*, 5. Ummedganj, 6. Udpuria, 7. Nimoda, 8. Dayara, 9. Polai, 10. Karadia*, 11. Simalya, 12. Ayana, 13. Jhalawad, 14. Jhalrapatan*, 15. Atru, 16. Chhipabarod, 17. Charchenma*, 18. Talwas, 19. Kanaksagar*, 20. Kalyanpur, 21. Niyana, 22. Manpura*, 23. Sorsan and 24. Rain Basera.

Canals

1. Right Main Canal of the Chambal and seepage marshes (1 to 66 kms)*
2. Left Main Canal (Bundi district).

* shows presence of Bar-headed geese.

Table 2 : Average Number of Barheaded Goose on Main Wetland Complexes

Year		Lakhwa-Ranpur-Alniya	Bardha-Abheda
1989	Oct	-	-
	Nov	56	-
	Dec	65	3
1990	Jan	99	-
	Feb	33	-
	Mar	-	-
	Apr	-	-
	Oct	-	-
	Nov	2	40
	Dec	65	-
1991	Jan	88	6
	Feb	70	-
	Mar	20	-
	Apr	2	-
	Oct	-	-
	Nov	2	-
	Dec	27	17
1992	Jan	71	14
	Feb	36	-
	Mar	8	-
	Apr	-	-
	Oct	-	-
	Nov	-	-
	Dec	8	23
1993	Jan	30	16
	Feb	58	3
	Mar	-	-
	Apr	-	-
	Oct	-	-
	Nov	2	3
	Dec	12	18
1994	Jan	42	1
	Feb	28	-
	Mar	19	-
	Apr	-	-
	Oct	-	-
	Nov	6	2
	Dec	31	23
1995	Jan	42	6
	Feb	28	-
	Mar	19	-
	Apr	-	-
	Oct	-	-
	Nov	7	-

The Barheaded Goose in North-Eastern India and Bhutan

Anwaruddin Choudhury

The Barheaded Goose (*Anser indicus*) is a common winter visitor to the wetlands and fields of Assam (Choudhury 1990a). Elsewhere in north-eastern India and adjacent Bhutan, it is uncommon or a passage migrant. A brief account on the status of the species in Assam was published in Choudhury (1990b). It has been estimated that at least 50,000 geese winter in south and south-east Asia (Lu 1992, Bishop 1992).

During the last one and a half decade I had the good fortune to traverse north-eastern India including parts of Bhutan as a part of the general wildlife survey. During such trips I observed A. indicus on many occasions. In this paper I summarize the current status of this species as observed in the field.

Assam

Assam is among the most important wintering grounds of this species. It arrives in late October/ November and is mostly gone by the beginning of April. It occurs on larger beels (ox-bow lakes and depressions), marshes, large man-made tanks, rivers- especially the Brahmaputra and wet fields. This species has been found to be common in Kaziranga National Park, Pani-Dihing Bird Sanctuary, Joysagar tank, and in parts of the Brahmaputra river, especially from Kaziranga upstream. It has also been recorded in Dibru-Saikhowa Sanctuary, Bordoibam-Bilmukh Bird Sanctuary, Laokhowa Sanctuary, Burhachapori Sanctuary, Deepor beel Bird Sanctuary, Pabitora Sanctuary, Orang (Rajiv Gandhi) Sanctuary, Manas National Park, Sibsagar tank, and in many other wetlands spread over Dhubri, Bongaigaon, Goalpara, Barpeta, Nalbari, Kamrup, Darrang, Morigaon and Nagaon districts.

In the Barak Valley districts of Kachar, Hailakandi and Karimganj it has become very rare. It has been recorded from Jabda haor (haor = a wetland complex), Chatla haor, Andhari beel (all in Kachar), Bauwwa beel (Hailakandi), Sonbeel and Ratabeel (both in Karimganj).

In the historic man-made Joysagar tank (area: c. 63 ha) near Sibsagar town in upper Assam, large flocks are often seen in winter. They are also less shy and could be observed for long hours from a short distance (upto about 150 metres). On 21 march 1987 I observed two flocks of about 150 birds each floating in the tank. The largest congregation observed on this tank was 316+ geese on 25 December 1987. The geese remain in the tank during the day spending the night in the chapories (islands, sandspits) of the Brahmaputra river and in Pani Dihing Bird Sanctuary. In another large historic tank, the Sibsagar (area= c. 52 ha), in the main town area, they arrive late (January is usual) and are seen in small flocks often in association with the Greylags *A. anser*.

Kaziranga National Park is by far the most important single protected area for the species in the entire north-east India. A few thousand geese winter in the meadows and wetlands of this park. During any visit to sites such as Sohola beel in Agoratoli Range one could see at least a few hundred of geese in winter. For example, on 5 December 1995, I observed 3 groups totalling 750+ birds (c. 300, c. 300 c. 150). On that date the number of Greylags in the beel was only 50+. During the Mid-winter Asian Waterfowl Census 1987-91, upto a total of 4060 geese were observed in counts in different wetlands of the park each year. (Perennou et al 1994). This could be treated as an underestimate as only those wetlands which were approachable by vehicles were covered leaving out many other inside

the park.

The only other area where 1000+ geese were counted was Pani Dihing Sanctuary where 2598 were counted two times (Perennou et al, 1994). Both Kaziranga and Pani Dihing are listed as potential sites to be recognized as of international importance for this species (Perennou et al ibid). During the Waterfowl Census in Asia between 1987-91, Kaziranga and Pani Dihing emerged as the most important sites among the 6 listed as internationally important. These two sites alone accounted for 51.4% of the geese counted in 8 such sites in 1987-91.

Arunachal Pradesh

In this state Barheads are mostly seen in late October/November and in March/early April when they fly through the river gorges of the Siang, Dibang and also the Subansiri during migration. In fact these 3 river gorges are among the major flyways for most of the winter migrants. However, in areas like D'Ering Memorial Sanctuary and in the lower reaches of the Siang, Dibang and the Lohit rivers, the geese are often seen in winter. The species could be termed as common during the passage and rarer rest of the winter.

Manipur

The large freshwater lake, Loktag in Manipur is a known wintering site of Barheaded goose (Higgins 1933). However, during a recent survey in January 1996, I did not see a single bird in the lake. In fact compared to the early part of this century, when ducks and geese used to be shot in thousands (Higgins 1933-34), the numbers have been greatly reduced. In 2 days of the count, which was the first mid-winter census in Loktag, we could find only about 2000 ducks in a wetland of more than 200 sq km. (25% coverage). Loktag is the largest freshwater wetland in the entire north-eastern India.

Bhutan

In Bhutan, the species is mostly a passage migrant. On 12 March 1996, I observed 30+ geese in flight over the Manas river inside the Royal Manas National Park. They were certainly on migration as many birds fly through the Manas river. The sighting was significant as the species was not recorded during many of the other recent surveys (Clements 1992, Inskipp & Inskipp 1993a and 1993b).

Threats

The species is threatened by habitat loss/destruction and poaching. Wetlands, the main habitat of the species are threatened due to reclamation for wet paddy cultivation, siltation, pollution and overfishing including prolonged human activities. Poaching is widespread outside the protected areas. Guns and nets are both used. While only a few are shot, a large number are caught live with specially woven nets for consumption and sale in local markets in the interior areas. Instances of poisoning are also known. In fact, in large lakes like Loktag, poaching is by far the major reason for the sharp decline of the species. In the historic Joysagar and Sibsagar tanks, these birds are usually not molested as these tanks are considered sacred by the locals.

Conservation

Sizeable populations of this species are being protected in reserves such as Kaziranga, Orang, Pabitora, Dibru-Saikhowa (Choudhury 1997), Laokhowa, Burhachapori, Pani-Dihing, Bordoibam-Bilmukh, Deepor beel and Manas. However, protection measures are inadequate in many of the areas such as Laokhowa and Deepor. Pani Dihing and Bordoibam-Bilmukh are new sanctuaries where protection staff are yet to be posted by the Wildlife Department.

In Arunachal Pradesh some of the passage migrants get a safe staging area in D'ering Memorial Sanctuary but protection measures there are also grossly inadequate (Choudhury 1992).

Recommendations

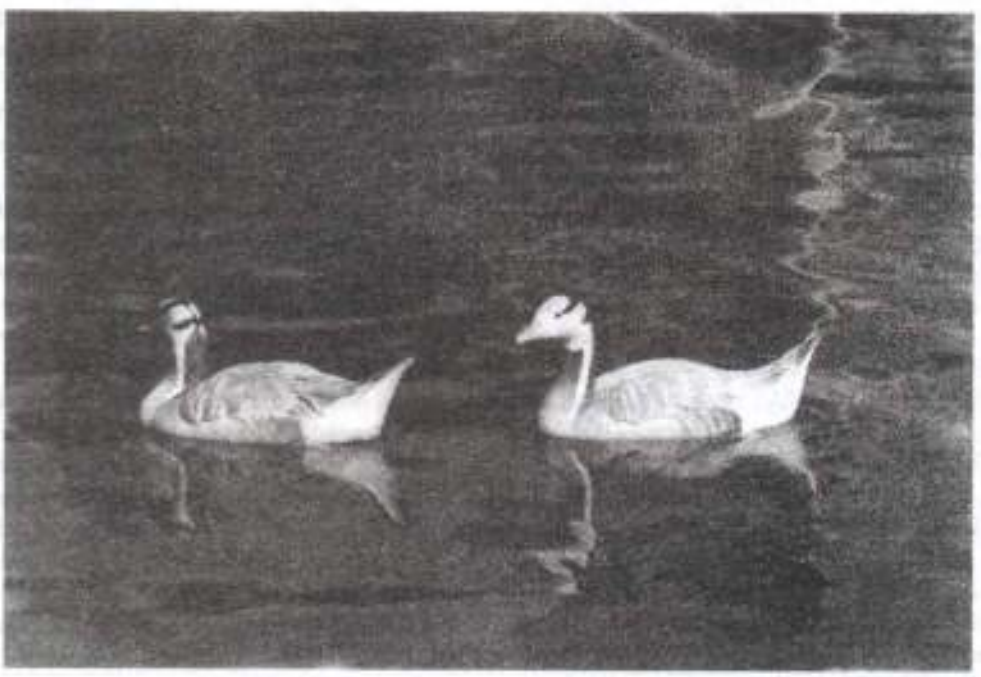
Creation of additional protected areas covering major wetlands spread over the Brahmaputra and Barak valleys and in parts of Loktag lake in Manipur are necessary. Protection measures in reserves such as Laokhowa, D'Ering Memorial, Pani Dihing, Bordoibam-Bilmukh and Dibru-Saikhowa need improvement. As all sites used by the goose are not possible to be protected, effective measures be taken to check poaching, especially live capture with the help of nets in which large numbers are caught. NGOs and the departmental staff may take up motivational programmes and can make regular raids on local markets to nab poachers.

Acknowledgements

For help during the fieldwork, I would like to thank the officials of the Forest Department of Assam and Arunachal Pradesh, MASS and Global Science Forum-NGOs based at Imphal, Manipur and many local villagers living close to wetlands.

References

1. Bishop M. A. 1992. Results of the Black-necked Crane, 1991-92, Winter Count in Bhutan, China and India, ICF Report, ICF, Baraboo, WI, USA, 9 pp.
2. Choudhury A. U. 1990a. Checklist of the Birds of Assam, Sofia Press and Publishers, Guwahati.
3. „ 1990b. Status of Barheaded Goose and Cranes in Assam, J. Eco Soc. 3:31-36.
4. „ 1992. Some Birds of D'Ering Sanctuary, Arunachal Forest News 10(1 & 2): 39-42.
5. „ 1997. The Status of Birds in Dibru-Saikhowa Sanctuary, Assam, India, OBC Bulletin 25 : 27-31.
6. Clements F. A. 1992. Recent Records of Birds from Bhutan, Forktail 7 : 57-74.
7. Higgins J. C. 1933-34. The Game Birds and Animals of Manipur State with Notes on their Numbers, Migration and Habit, 6 Parts JBNHS, Vols 36, 37.
8. Inskipp C. and Inskipp T. P. 1993a. Birds Recorded during a Visit to Bhutan in Autumn 1991, Forktail 8 : 97-112.
9. „ 1993b. Birds Recorded during a Visit to Bhutan in Spring 1993, Forktail 9: 121-142.
10. Lu J. 1992. Comments on Global Conservation Assessment and Management Plan, Unpub. manu.
11. Perennou C., Mundkar T., Scott D. A., Follestad A., Kvenild L. 1994. The Asian Waterfowl Census 1987-91 : Distribution and Status of Asian Waterfowl, AWB Publication No. 86, IWRB Publication No. 24, AWB Kuala Lumpur, Malaysia and Slimbridge, UK.



Barheaded Geese in Chilika (Orissa)

Dr U. N. Dev

Nothing is more enthralling in Chilika lake than a skein of Barheads (*Anser indicus*) appearing from nowhere, bursting out of the northern horizon. It is usually an early morning when the eastern sky is dappled with vermilion, against the silhoutte of a hill range, that these majestic geese come honking from the north, as they fly in a perfect arrowhead formation. They straight splash down on water and continue flapping their wings even though their long flight is over. The few that have landed on the grassy fields of Nalabana also keep flapping their wings for a few minutes after which they spread their large wings and call loudly, outstretching their long necks skywards. This practice among the just-arrived geese and ducks is probably to reassure eachother, that each one of them has arrived safely, that "They have made it" and they are successful in their long, hazardous flight. One of them having a slender neck and without a heavy knob at the root of the upper mandible, evidently their matriarch, is seen fluttering and hopping around the rest of the gaggle while the other gander and geese stand in a semi-circle calling "Aaung—Aaung". The cacophony continues for quite a while, till the matriarch lowers her head and starts with the first blade of grass from Chilika's soil.

A gaggle of Barheads in Chilika now may number only 30 to 40 or even less. There was a time when these large geese in Chilika used to be seen in hundreds, in one gaggle. The arrival of the geese heralds the peak winter season. Winter is not very harsh in Chilika, situated as it is on the north-eastern sea coast of the Indian peninsula. Escaping from the awesome winter in the north of the great Himalaya, most of the duck species, geese and plovers which breed around the places like lake Tso Moriri and Mansarovar, conduct an exodus to warmer places to spend the winter. The usual time for the arrival of migrants in the Chilika every year is recorded as the first and second week of October. Such birds include ducks as Pintail (*Anas acuta*), Shoveller (*Anas clypeata*), Wigeon (*Anas penelope*), Gadwall (*Anas strepera*), Common teal (*Anas crecca*) and Ruddy shelduck (*Tadorna ferruginea*) to join resident ducks like Lesser Whistling teal (*Dendrocygna javanica*), Cotton teal (*Nettapus coromandelianus*), and plovers and waders like Blacktailed godwit (*Limosa limosa*), Bartailed godwit (*Limosa lapponica*), Curlew (*Numenius arquata*), Redshank (*Tringa totanus*), Greenshank (*Tringa nebularia*), and many others, followed by raptors like Steppe eagle (*Aquila rapax*), White-tailed Sea-eagle (*Haliaeetus albicilla*), Ringtailed or Pallas Fishing eagle (*Haliaeetus leucoryphus*), Marsh harrier (*Circus aeruginosus*) and others. But during the first phase of migration Barheads are conspicuous by their absence.

Barheads arrive in Chilika not before the first week of December or the last week of November. The late arrival of these geese must be governed by some ecological factors. These geese seem to tolerate cold much more than any other duck or goose species. Till it is very cold and snow really started to accumulate they do not leave their breeding grounds. Secondly the young ones that have hatched must accompany them on their migratory flight to wintering sites thousands of kilometres away. Growth rate of these goslings is much slower than those of other ducks and waders which are smaller in size. After growth is accomplished, the young ones must fledge and complete a few sorties of trial flights before the long flight to the south is undertaken.

One of the striking features observed among the

Barheads is that the number of sub-adults is about 30% of the total number arriving in Chilika lake. They are identified by their dirty colour, a brownish-fawn shade through the hind neck and the absence of 'bars' across the nape from eye to eye with legs and feet dusky green and not yellow as in adults. The lesser number of sub-adults may indicate the population dynamics of this species. According to records it is known that Barheads lay about 3 to 6 eggs but during the period of growth there seems to be a lot of infant mortality, may be due to predation and disease.

Barheaded geese appear to be more terrestrial than aquatic. They spend most of their time foraging on grassy plains of Nalbana and keep changing places according to availability of food. "Doob grass" and tender shoots are their most favoured food and the geese are properly named in local Oriya language as Dooba Hamsa.

To be a favourable habitat for these geese, it must be a flat ground, preferably an island, unfrequented by humans or grazing buffalo. The top soil should be fine sand mixed with soft loam in places. The sub-soil must be peat and loam. The predominant vegetation here should be Doob grass.

It is also observed that Barheads have some water-fowl species as their camp-followers. The first among them is the Wigeon, Anas penelope which also loves to feed on Doob grass. Though both use the same habitat and the food, Barheads tolerate the presence of Wigeon because they seem to have a symbiotic relation. Generally Barheads are not very shy and fall an easy prey to natural predators and poachers as they cannot detect the approach of danger easily. If the Wigeon are present on the same ground, these smaller ducks are generally very alert, give alarm calls and fly off providing enough time for the Barheads to escape also. Another bird which seem to enjoy the company of Barheads is Redwattled lapwing (*Vanellus indicus*). It enjoys picking up insects exposed at the roots of grass disturbed by the feeding geese. They therefore, also have a symbiotic relationship with geese. When danger approaches the lapwing also emits the usual alarm call alerting the geese.

The sandy flats which are the most favoured habitat of geese have now become scarce. One such area of the Chilika was Gerasara which is now fully encroached upon by prawn culturists. This place which used to attract more than 100 geese is now surrounded by nylon nets for prawn culture. The flats are submerged having been dug out and there is anything but tranquillity in this area where prawns and dollar-spinning is the main theme. Garesara, the grand habitat of Barheads is gone forever. Now geese are usually seen around artificial mounds erected by the Wildlife Wing of the Forest Department. These places have watch-towers built by the government and heavily guarded by the departmental people. Good grass grows there but they are not frequented by buffalos. They offer a favourable habitat to geese.

Decline in the number of geese in Chilika can only be attributed to the loss of their habitat. On the other hand, their number has increased in Bhitarkanika, the tidal mangrove forest sanctuary punctuated with good swamps and grassy patches. They appear to have changed their wintering ground from Chilika to Bhitarkanika.

Human civilization is progressing day by day. Modernization brings many good and bad elements. In the Chilika during recent years, a wildlife division has been created, specially to look after the bird and other fauna of the lake and Nalabana sanctuary in particular. Where there was wanton bird killing in and around Nalabana and on the shores of villages surrounding the Chilika, no gunshots are heard now and we can heave a sigh of relief. But the silence of the poacher's gun should not be mistaken as the end of poaching. Loud gunshots easily attracted forest guards resulting in arrests and booking of cases, therefore, the poachers now adopt a soundless system of killing by using snares. Formerly they were made of horse's hair, but the nylon thread has revolutionised the process. By using nylon yarns of various thicknesses, birds as small as the Little stint (Calidris minuta) and as large as the Barhead can be easily snared. But again snares are to be set in particular places, are to be left there for a long time till a bird decided to go there and get entangled. Guards could locate the sites of snaring and methodically remove them foiling the effort of the poacher. Soon snares also became obsolete and poachers have adopted another novel method, which is something like this:

Some cooked rice or sprouting Bengal gram are soaked overnight in water in which the required dose of sedative tablets (powdered, available in local market) is dissolved. During a suitable hour of the day these soaked grains are scattered at places frequented by geese, ducks and waders. Birds are easily attracted to grain, get sedated and are caught. This is a more effective method of trapping birds as even after discovering the sprinkled grain no forest guard can totally remove them!

Continued on page 26

Wintering Status and Site Loyalty of Barheaded Goose, *Anser Indicus*, in Areas of Dharwad District, Karnataka, India

*Dr. J. C. Uttangi**

Introduction

The Barheaded Goose, *Anser indicus*, is a winter visitor mainly to the Indian sub-continent. Arriving from its breeding grounds in uplands of Central Asia, it moves down, to stage generally on Irrigation Tanks of Dharwad District, in Southern India, in November, with a population reaching a peak in January and finally, leaves its feeding grounds in March or early April. A Chinese ring No. M00-3981, BJ-POB 1928, banded to a young Barheaded Goose, by Prof. Chang Fu-Yuen on 28 July 1984 at Quinghai Lake, Ganca, BJ. China, was recovered by a fisherman from a goose caught accidently in his net in November 1986 at Haveri Irrigation Tank site in Dharwad District, a couple of months before the Asian mid-winter waterfowl census programme was launched for the first time in January 1987. After confirming its identity from the banding station at BJ. China, the ring was deposited in the BNHS museum at Bombay. The ring recovery not only showed the homing ability of the Barheaded Goose but also showed its tendency to be highly site loyal to a few Irrigation Tanks of Dharwad District. Remarkable facts regarding bird movements, stamina, speed, capacity to journey phenomenally long distances, sometimes extending thousands of kilometers between feeding and breeding places can be studied and understood through ring recovery. Reporting ring recoveries therefore is of paramount importance to researchers engaged in bird migration.

A survey of 54 Irrigation Tanks as stop over sites for migratory waterfowl in Dharwad District was carried out by the writer in the year 1992 under sponsorship of the U.K. based Oriental Bird Club (OBC). Thanks to the OBC for kindly granting funds to carry out the survey. Results obtained from this survey, as well as those recorded from the 1987-1996 Asian mid-winter counts of Barheaded Goose from 7 selected Irrigation Tanks of Dharwad District are examined and discussed in the present article. Observations made on Barheaded Goose most importantly refer to distribution, abundance, site loyalty, disturbances and threats to habitats and conservation measures. Certain aspects like feeding ecology, social behaviour, flocking, time of visits to feeding grounds, damage to crops and agricultural conflicts etc. need a more detailed study.

Material and Methods

The District of Dharwad having an area of nearly 8140 sq. km. occupies a unique geographical position in the centre of Deccan peninsula at 14°7'-16°N and 74°.48'-76°E, in North Karnataka. It is considered unique because, its 15 km. wide transition belt has an 'edge effect' at community level on bird diversity. Made up of a fractured edge of Shalmala river basin in the north and Vardha in the south, the western flank of the district has helped to create a succession of bunded Tanks called Irrigation Tanks for agricultural crops. These Tanks over the years, have given shelter to a large number of resident and migratory waterfowl species. The eastern flank encompassing Ron, Navalgund, Naragund, Gadag and Ranebennur Taluks is dry. Mostly, water pockets occur in taluks of Dharwad, Kalghatgi, Haveri, Hangal and Hirekerur along the hilly western zone. About 28 major seasonal Tanks with more than 100 acres in area are valuable

* Former Principal, Karnatak Science College, Dharwad, H. No. 36, Mission Compound, Dharwad 580001

for waterbirds. The minor ones with less than 100 acres and those under 50 are handed over to Mandal Panchayati for fisheries. The Barheaded Goose, a terrestrial feeder and being exclusively vegetarian in diet is forced to adapt its behaviour to the feeding situation and quality of food on its winter home range. Energy rich winter crops like gram, paddy, wheat, pulses, oil seeds and other leafy vegetables are easily available on the Indian soil. The nutritious quality of the food has influenced the bird in its choice to winter in areas of Dharwad. Another important reason, not accidental but natural, for its choice of Dharwad areas is availability of the two important components to its wintering habitat namely, 1) a suitable, safe and well protected water body to roost and 2) an adequately large tract of cultivated land with agricultural crop rich in energy that can easily be gathered from its roost.

Barheaded Goose roosting on 7 Irrigation Tank habitats almost regularly were counted over a series of ten years between 1987-1996. A group of 3 volunteers was involved in the count. One was in charge of counts from the bunded side of the Tanks. The other two were asked to go round the Tanks but on opposite sides. Flying birds were also noted down separately. In case of large flocks gross counts were taken. Final numbers were confirmed after exchanging information from all the 3 persons.

Results

Since natural wetlands are gradually disappearing in developing countries, the artificial ones like reservoirs and minor Irrigation Tanks created by man for agricultural use, are becoming more and more valuable for waterfowl survival. For Barheaded Goose however, Tank water bodies do not provide feeding areas but serve as sites for communal roosting from where the birds conduct flights in twilights of evening and morning to nearby agricultural fields to forage and return back to their roost and rest for most of the day. Water body therefore is a crucial element that determines the feeding success of the Barheaded Goose and consequently its breeding success in Central Asia. When necessary the Goose can easily avail of the opportunity of using smaller tanks inbetween as subsidiary areas for resting and preening. Out of the 7 tanks mentioned in the Table the density of roosting Barheaded Goose is highest in Akkialur and Naregal Tanks of Hangal Taluka. This may show that the Barheaded Goose is extremely faithful and loyal to these two Tanks in the District. In fact one can also see a kind of family stability existing in the migrating Barheaded Goose, as young and old winter together and depart together. From the point of wetland conservation, the 2 perennial Tanks where the goose gather regularly, namely Akkialur Tank with 75 hectares of area and Naregal Tank with 122 hectares deserve conservation measures in every possible way.

Disturbances and Threats

Nearby disturbances by people washing clothes and cowboys bathing cattle in the Tank and other disturbances created by unusual shouting by swimmers are not easily tolerated by roosting birds. Fisheries activities using boat and nets freely in the middle of the Tank frighten birds. Regular use of noisy vehicles on bunds and exercising dogs and cattle close to

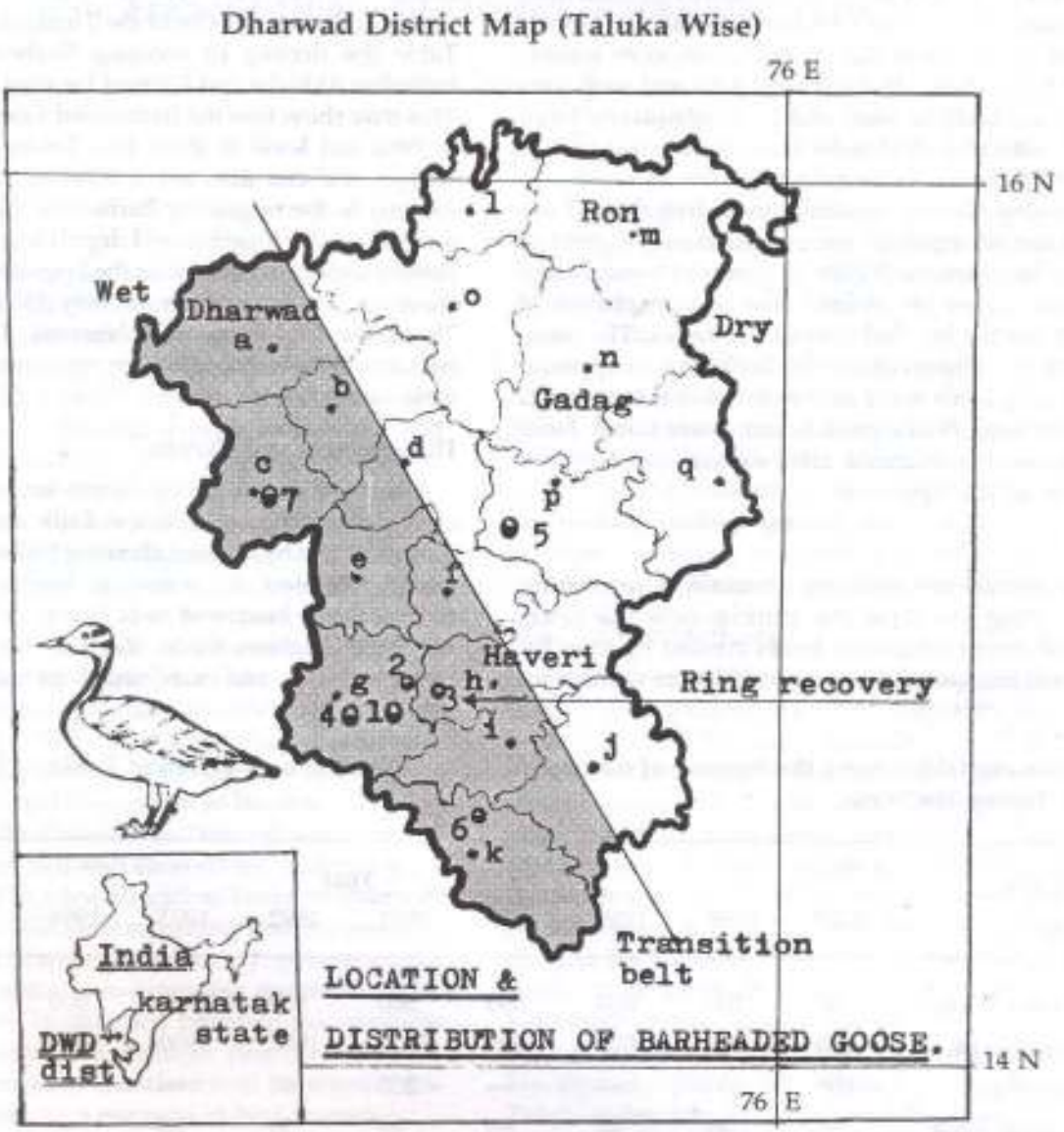
The following table shows the number of Barheaded Goose Roosting on 7 different Tanks of Dharwad District during 1987-1996.

Tank site	Year									
	1987	1988	1989	1990	1991	1992	1993	1994	1995	1996
1. Akkialur Tank	80	200	600	500	900	500	1000	800	60	500
2. Naregal Tank	400	500	800	900	1500	1000	1800	1000	100	1000
3. Haveri Tank	100	300	—	—	200	47	—	—	50	—
4. Havanagi Tank	50	40	—	60	—	30	20	—	30	—
5. Magadi Tank	70	60	—	—	—	80	—	—	—	—
6. Gundagatti Tank	30	—	—	20	—	40	—	—	—	—
7. Hirehonnalli Tank	20	—	—	—	15	25	—	—	10	—

the site keep the birds restless. Indiscriminate cutting of border vegetation and exploitation of aquatic plants and grass ruins the aesthetic value of the Tank site and its ecosystem.

Conservation Measures

1) It would be better if separate arrangements are made for washing and bathing both for villagers and their cattle. 2) To solve agricultural conflicts to a certain extent a few paddy-fields may be set aside exclusively for goose as protected feeding areas. 3) There should be no fisheries activities on roosting sites. 4) In the existing schedule of the Irrigation Department there is no provision for wildlife protection and deforestation control and population control. 5) The highest protection needed today is stopping the encroachment process into the Tank area. 6) Colour banding on the goose would make its identification easy on wintering grounds. 7) Waterfowl conservation should not suffer due to Departmental tussles.



Map 1 : a) Dharwad Taluka, b) Hubli, c) Kalghatgi, d) Kundagol, e) Shiggaon, f) Savanur, g) Hangal, h) Haveri, i) Byadgi, j) Ranebennur, k) Hirekerur, l) Naragund, m) Ron, n) Gadag, o) Navalgund, p) Shirahatti and q) Mundargi

Tanks : 1) Akkialur, 2) Naregal, 3) Haveri, 4) Havanagi, 5) Magadi, 6) Gundagatti, 7) Hirehonnalli

The Barheaded Goose in Tamilnadu

V. Santharam

Though Tamilnadu is not included in the winter range of Barheaded goose (Ripley 1982), there are many records, some old and some recent, which prove that this goose is indeed a fairly regular though rare winter visitor to this state. Due to time constraints and lack of facilities I have not been able to do an extensive literature survey on the records of this goose in Tamilnadu and have been compelled to put together whatever I was able to obtain in a short period.

Jerdon (1864) writes that he had once seen a couple of these geese in "the extreme south of India in August, in a small sequestered tank. This pair may have been breeding there, but perhaps they were wounded or sickly birds." Dewar (1905) has included this species in his list of birds of Madras but has not given further details. The Madras Museum has a specimen in its collection procured from "Madras" (Satyamurti 1970). Baker and Inglis (1930) say, "Geese probably of this species are reported to frequent the sea coast as far south as Pamban island." Buxton (1943) has encountered them in the Salem district in December (13 birds) and January (ca. 70 birds).

In his list of birds of Pt. Calimere, Sugathan (1982) states that the Barheaded goose was rare. Krishnan (1987) has also reported his sighting of this bird in Pt. Calimere. He also recalled a record from Tiruchi where it has been shot. He had seen 40 birds at Karungulam in late January 1983 and 50 birds near Kunthakulam in January 1985 (both near Tirunelveli).

At the Kaliveli tank, south Arcot district, near Pondicherry, it has been recorded by Pieter (1987) and by Perennou and Santharam (1990) who felt that this wetland is a regular stopover for the birds migrating further south and the goose was seen here from late November to mid-December. In Guindy National Park 5 geese probably of this species, were noticed in flight in December 1986. (The author in a pers. commu. stated that he had seen 11 Barheads on 11.1.88 on the shores of Pulicat Lake while some other members saw 13 in the same locality on 30.1.88-Ed.). Members of the Madras Naturalists' Society encountered two birds at the Thenneri tank, some 55 kms west of Madras in February 1992. The counts from Tamilnadu of this bird during the Asian Waterfowl Census in various years are as follows :

61 (1987), 0 (1988), 297 (1989), 34 (1990), 260 (1991), 2 (1992) and 146 (1993).

(Courtsey IWRB/AWB Reports).

These figures suggest that the Bar-headed goose is a regular winter visitor but more work has to be done to determine its status and preferred winter sites.

References

1. Baker H. R. and Inglis C. M. 1930. The Birds of Southern India, Govt. Press, Madras.
2. Buxton A. 1943. Small Game Shooting in the Salem District, Journal of Bombay Natural History Society (JBNHS) XLIV (1) : 119-121.
3. Dewar D. 1905. A list of birds seen in and around Madras, JBNHS XVI (3) : 484-498.
4. Jerdon T. C. 1864. The Birds of India (3 Vols) George Wyman and Co. Calcutta.
5. Krishnan M. 1987. Occurrence of the Barheaded Goose (Anser indicus) in south India, JBNHS 84 : 204.
6. Perennou C. and Santharam V. 1990. The Status of Some Birds in South-eastern India, JBNHS 87 : 306-307.

7. Pieter 1987. Kaliveli Tank and Yedayanthittu Estuary, A Little-known Wetland Habitat in Tamilnadu, JBNHS 84 : 210-14.
8. Ripley S. D. 1982. A Synopsis of the Birds of India and Pakistan, BNHS/OUP, Bombay.
9. Satyamurti S. T. 1970. Guide to the Bird Gallery, Madras Govt. Museum, Madras.
10. Sugathan R. 1982. Some Interesting Aspects of the Avifauna of the Pt. Calimere Sanctuary, Thanjavur Dist., Tamilnadu, JBNHS 79 : 567-575.

V. Santharam
68, Ist Floor, Santhome High Road
Chennai 600028

Continued from page 21

Barheaded geese are the most coveted trophy as these birds fetch more than Rs.100/- per bird in the market. Unless some solution is worked to stop this trapping Chilika will lose the remaining geese also. Barheads can be termed as one of the bio-indicators of a healthy wetland. Could we expect that one day large gaggles of these handsome geese will grace Chilika again? This is possible through better and more enlightened management; through educating the people and taking them into confidence and not through policing only.

Dr U. N. Dev
Director
Bihang Institute, Bhubaneshwar-7, Orissa

Barheaded Goose in Maharashtra

Dilip Yardi, Ramesh Ladkhedkar, Kishore Rithe and Prakash Gole

Occurrence of Barheaded goose has only been noticed in Maharashtra since the eighties. As they occur on some tanks more than 100 years old, they probably were wintering in Maharashtra since long. In 1983-84 they were noted by some observers from Pune on the Veer reservoir about 70 km south of Pune on the Nira river. In 1985 Prakash Gole and Joost van der Ven saw a flock of about 30 geese on the Rajewadi tank in Satara district. This tank is over 100 year old. This and the Veer reservoir seem to be their regular haunt as they have been seen their year after year. In 1995 and 1996 Prakash Gole noted flocks of over 80 geese at Rajewadi and over 40 geese at Veer in 1996 and 1997 (again in company of J. van der Ven!).

To the east of Pune they were occasionally reported from the Ujni reservoir 100 km east of Pune and about 10 geese have been wintering on the Hipparga tank near Solapur since 1985.

In the Aurangabad division flocks of about 20-30 geese were reported from tanks west of Aurangabad city by Shri Ghate of Amalner since 1993 while Shri Dilip Yardi gives the following distribution of Barheads on tanks around Aurangabad city :

Name of the Reservoir	No. of Anser indicus in 1994	1995	1996
1. Sukhna	2	-	2
2. Jayakwadi	6	4	2
3. Dheku	2	2	-

He further reports that a pair had been observed on Sukhna reservoir on 26.10.97.

Shri R. Ladkhedkar of Vidarbha Nature and Human Science Centre of Nagpur writes that Vidarbha, the eastern part of Maharashtra belongs to the south-central eco-system of India. During the north-south winter migration waterfowl in general and Bar-headed geese in particular pass through this region in great numbers. Some of them disperse in Vidarbha and stay around traditional water bodies till the arrival of summer.

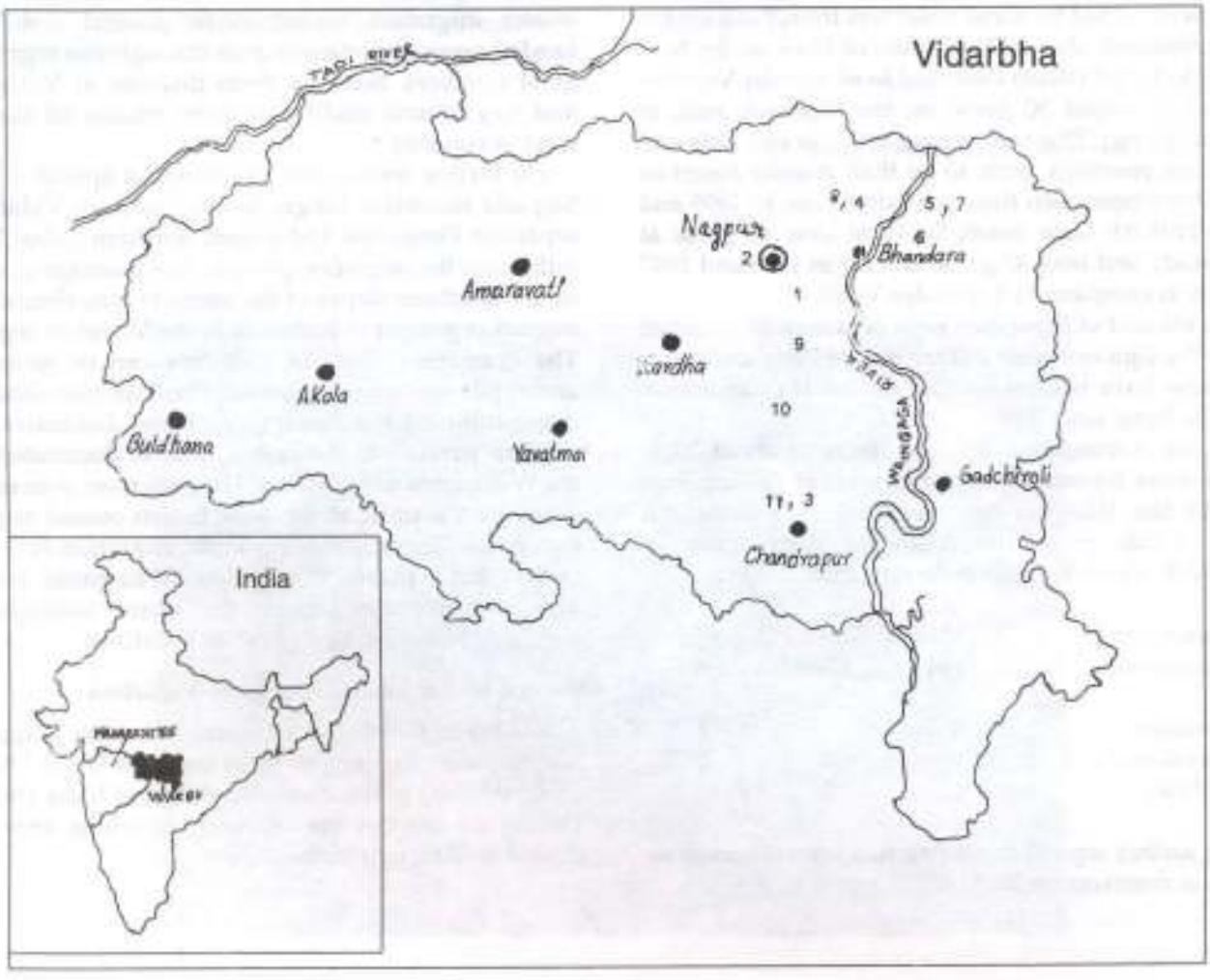
He further writes that the east-west spread of the Satpuda mountain ranges in the northern Vidarbha separates Peninsular India from northern India. This influences the migration pattern. The drainage system on the southern slopes of the Satpuda may determine migration pattern of Barheads in the Vidarbha region. The drainage system in Vidarbha can be grouped under two major river systems. The Tapi river (and its major tributary the Purna river) basin dominates the western part while the eastern part is dominated by the Wainganga river system. The Tapi river is an entry point for Vidarbha at the west Indian coastal migration route. The major north-south migration route in central India passes through the Wainganga basin. This may perhaps explain the recent widespread sightings of Bar-headed geese in Vidarbha.

Record of Bar-headed Geese in Vidarbha

D'Abreau (Curator of Central Museum, Nagpur) has recorded sighting of these geese at Umred tank (Nagpur dist.) in the checklist of central India (1923). During the nineties the following sightings were recorded by different birdwatchers :

	Name of the Lake	Year of sighting	No. of geese	Reference city	Name of the Observer
1.	Paradgaon	1996	23	Nagpur	Gopal Thosar
2.	Telhra	1996	1	"	"
3.	Tadoba	1995	20	Chandrapur	"
4.	Bodra	1996	12	Bhandara	Narayan Patil
5.	Itiyadoh	1996	40	"	"
6.	Gavrada	1996	10	"	"
7.	Kelwad	1996	20	"	"
8.	Chorkhamara	1996	8	Bhandara	Rajkamal Job
9.	Ghodzari	1993	30	Nagpur	R. Ladkhedkar
10.	Chargaon/Chandai	1993	50	Chandrapur	"
11.	Irai	1994	50	Chandrapur	Ajay Dolke
12.	Sawardi	1995	3	Amaravati	Kishore Rithe
13.	Suryaganga	1995	6	"	"
14.	Wadali	1996	1	"	"

Thus Bar-headed goose in relatively small numbers is distributed in winter throughout the major regions of Maharashtra state viz. western Maharashtra, Marathwada and Vidarbha.



Channel Morphology, Plant Association Groups and Habitat Diversity of River Kanand (Maharashtra)

Dr. Arun Andhale and Dr. Shrikant Karlekar***

Abstract

Vegetation is an important factor of a drainage basin, especially the river channel. Since 1967, although considerable interest has been created in fluvial geomorphological aspects of drainage basins, the significance of vegetation has not been considered in an integrated way. It appears from the recently published accounts of channel forms and processes that there is now a general agreement over the significance of vegetation in the management of a river channel. The precise way in which this factor affects the river behaviour is however, still not very clear.

The study focuses on the influence of a variety of channel variables on the bed vegetation in downstream direction and across the channel. The associations and correlations between these factors and the bed vegetation do reveal the complexity of environmental interactions.

The methodology adopted was based on specific lithological, hydrological and vegetational aspects of the river channel. The primary focus of this work is to ascertain the linkages between geomorphological, hydrological and ecological processes and the bed vegetation which are a part of phytogeomorphology and ecology of the river basin.

Introduction

Terrestrial ecosystems include river ecosystems which have many significant points. Detailed understanding of a river ecosystem would not be possible without the knowledge of fluvial geomorphology. The study of any fluvial system includes the study of different variables of river morphology such as channel depth, width, discharge, slope and the river vegetation. The vegetation asepct however, has not been considered in an integrated way till recently (Gregory and Gurnell 1988).

The fluvial systems are normally very complex. The main streams can be classified as lowland streams, upland streams and mountain streams (Haslam 1978). To understand these complex ecosystems, it is necessary to study the phytogeomorphological aspects like river vegetation and river morphology. This paper is devoted to such aspects of fluvial ecosystems. In this study the relations between river morphology, plant association groups, habitats and substrate types are examined in a gravel bed of a stream named Kanand river, a tributary of the major river Nira.

The Study Area : Location and Geomorphic Environment

The study area is the channel of the river Kanand a tributary of the river Nira. It drains the major part of Velhe tahasil of Pune district. The river basin covers an area between 73° 32' E to 73° 45' E longitudes and 18° 15' to 18° 20' N latitudes.

The river originates in the high rainfall zone of Western Ghats and flows over trappean landscape represented by Basalt. The drainage of the river is governed by the regional slope of upland Maharashtra. It is considered as representative of upper reaches of most of the rivers originating in the Western Ghat region of Maharashtra.

The river rises at an altitude of 1205 m and meets the river Gunjavani at 670.5 m ASL. The basin is bounded by Rajgad and Torna forts to the south, attaining a height of 1402 m and 1411.2 m ASL respectively. The source region of the river Kanand is characterised by exposed basaltic lava flows, capped

by laterite at some places. The drainage network and hydrogeomorphic environment (Fig. 1B) of this stream is a result of specific hydrogeomorphic conditions (Table 1). These conditions have in turn affected the vegetation in the channel. The bankful width of the channel is 51 m., whereas the low flow width is nearly half of it which is around 27 m. The channel bed slope has a gradient of 2.18%. The valley floor of the river has also a gradient of 2.15%. The total length of the river course under study is 25 km between its source and confluence with the river Gunjavani.

Materials and Methods

The channel vegetation along the river Kanand was studied in pre- and post-monsoon seasons, at least for seven years, from 1988 to 1994. The study was exclusively based on field observations and field measurements in the said river reach. The detailed study was carried out for the identification of bed plants, their habitats, substrates and plant association groups along channel cross sections.

Bed sediment samples were collected for different plant species. The flowers, twigs, leaves and roots were collected from the field and species were identified. The area of vegetation patches was measured and the total plants in that area were counted and classified into different habitats.

The Plant Habitats

The plants in the Kanand river were classified into following broad habitats (Gole 1983) :

1) The plants of the marshy places : The plants such as *Asteracantha longifolia* and *Homonoia riparia* found in marshy, stagnant water and in the shallow pools on the river bed were found grouped in this habitat.

2) The partly submerged plants : These are aquatic plants and the lower portion of their shoot was found partly submerged in water. *Cyperus rotundus* and *Crinum sp* were the plants found in this habitat.

3) Plants of rock crevices : The species like *Cynodon dactylon* and *Phyllanthus niruri* were invariably found to grow on the joints and crevices of rocks on the bed.

4) The sand and gravel bars : The most common habitat in the river was the sand and gravel bar. The point bar and the mid stream bars were the ideal locations. *Lantana camara* and *Eugenia heyneana* were the species found growing luxuriantly on these bars.

The Channel Morphology

The morphology of a river changes from its source to mouth. The change in morphology is the result of a change in gradient width, depth and discharge. There are marked variations in most of these parameters as a result of lithology, topography and human interferences in downstream direction. All these changes are reflected in the variation in the pattern of vegetation across and along the channel (Fig. 3).

The study of hydrogeomorphic parameters (Table 1) clearly indicates that the river basin is not mature and has maintained a steep gradient. The valley floor slope and channel slope ratio is considered to be a variable of stability (Kale and Rajguru 1988). For the river Kanand it is 0.99, indicating a less stable channel, leading to observed non-existence of bed plants to a distance of 11 km from the source. Therefore, one can consider the channel stability as an important aspect of river vegetation. The Kanand basin is less circular in shape and has pronounced elongation (Fig. 1). In this respect, the drainage basin is comparable with the rivers of Konkan (Dikshit 1981, Karlekar 1981). The other geomorphic parameters like relief, width and depth show that the channel of the river Kanand is in incision phase. This is confirmed by the presence of knicks and inflection points at a few places in the river. Such points occur at 14 to 16 km from source and between 550 to 700 m ASL (Fig. 1B). Gorges and pot holes are the characteristics of river Kanand. The stream of Kanand exhibits a valley asymmetry as well as channel asymmetry.

Plant Association Groups and Habitat Diversity

Plant association refers to a group of plant species sharing similar environmental conditions. The environmental conditions for plant growth in the channel are governed by substrate and supply of water. Each association group in the river Kanand has distinctive and dominant plant species (Fig. 4). In the river, plant association shows a downstream variation from source to the confluence.

To study the association of plant species in the river Kanand, the river stretch was divided into five major sectors (Fig. 4) each with a length of five km thalweg distance. It was found that the channel upto a distance of 11 km from the source does not show significant growth of plants, except some algal growth. This stretch of the river bed has a steep gradient and is mainly a channel cut into the rock.

The channel upto a distance of 11 km from the source is devoid of vegetation. Downstream, the dominant associations could be identified upto the confluence. The major species upto 16 km are *Tamarix ericoides*, *Eugenia heyneana*, *Cyperus rotundus* and *Cynadon dactylon*. *Acacia arabica* was also found associated but rarely with the gravel and sand bar habitat.

The *Crinum sp.* (Nadi Kanda) was also seen in this section, in partly sumberged habitat. The species mentioned above also belong to the bank vegetation. Since they are growing in the bed of the stream, they suggest drastic fluctuations in the flow of the stream.

The river reach between 16 km to 21 km from the source, shows slight variation in association of the species. Hereafter, *Cynodon dactylon* becomes dominant rather than *Tamarix ericoides*. The frequency of occurrence of *Tamarix ericoides* decreases significantly. The new species *Homonoia riparia* and *Crinum* are reported from the sand bar and partly submerged habitat. Downstream of 21 km, *Cynodon dactylon* shows its dominance in association but the frequency of *Homonoia riparia* decreases, which is replaced by another species, *Argemone mexicana* and *Acacia* in bushes. These associations are dependent on the flow regimes.

This definite variation in association of plant species is due to changes in the habitat. Existence of preferred habitat favours the growth of a specific plant species and dictates its dominance in the association. The channel to a distance of 11 km from the source is rocky and cannot provide the favourable substratum and habitat to the species, therefore it is devoid of vegetation. The channel between 11 km and 14 km from the source has gravel bar and marshy habitats. Downstream of this, gravel bar habitat is replaced by the sand bar habitat and partly submerged habitat which are sometimes accompanied by habitats of rock crevices and marshy environment.

Conclusion

Thus channel morphology directly affects the plant association groups (Fig. 3 and 4). The pattern of habitats discussed here is the result of morphological changes in the river channel. Field observations and detailed studies of vegetation in the river Kanand also suggest that bars covered with vegetation are more stable. The luxuriant growth of different species or that of one single species leads to impoundment of water. The vegetation makes for flow training and acts as an obstacle to bed material.

Table 2 gives the sectionwise account of morphology of the Kanand river channel, plant associations and habitat diversity including the substrate preferred by association groups of plants and habitats.

A wide range of variation (Fig. 3) in the vegetation pattern in the river Kanand is due to the rapid changes in the gradient and the flow pattern. The vegetation pattern seen in upper reaches (Fig. 3/1, 2 and 3) is significantly different from the one observed in lower reaches (Fig. 3/16, 17 and 18). These changes are also due to heterogeneity of sedimentary environments within the stream.

On the bed of the river Kanand, in fact, several substrate types occur at one site. This results in the association of specific plants at a particular site. The *Tamarix ericoides* and *Homonoia riparia* association is associated with gravelly substrate. The *Eugenia heyneana* and *Cipadessa fruticosa* association was found to grow in a substrate comprised of coarse and medium sand. *Phyllanthus niruri* prefers sandy silty substrate. In general the changes in particle size from gravel to coarse sand to clay and the development of soil affect the species composition in the bed of the river channel.

An important obervation in the study area is that the recent growth of vegetation is found to be associated with sand bars and the old growth on the terraces.

The emphasis, thoughout the study, was on the longitudinal and transverse variations in river bed vegetation in terms of its frequency of occurrence and habitat diversity. Since the study was conducted in the stream channel from the hilly terrain, there were rapid changes in the gradient, which assured some variation in the plant species. The study area lies upstream of sediment control structures like dams and bunds in the lower reaches. Moreover, human intereference in the system is not significant. In the course of this study it was also noted that the channel is undergoing metamorphosis due to a decrease in relative proportion of vegetation. The silting of the bed is on the increase and the terraces on the sides, are being destroyed at a rapid rate.

Although there is insignificant human interference in the river system as a whole, relatively more disturbance is observed on the bank of channel in the form of agricultural practices. These have induced the erosion of bank and destruction of channel walls leading to the silting of river bed.

References

1. Dikshit, K. R. 1981. The Western Ghats, A Geomorphoic Overview, New Perspectives in Geography, P. Dayal Felicitation Vol., Ed. Singh L. R., Thinkers Lib. Allahabad, 1-25.
2. Gole, Prakash 1983. Survey of river plants in Pune city, based on ecological factors, in order to prepare ecodevelopment plan to improve river front of Pune (Ecological Soct. Pune).
3. Gregory, K. J., Gurnell, A. M. 1988. Vegetation and river channel, form and process,

Biogeomorphology, Ed. Heather Viles, Basil Blackwell, New York, 11-39.
4. Haslam, S. M. 1978-79. River plants, Cambridge Univ. Press.
5. Kale, V. S., Rajguru, S. N. 1988. Morphology and denundation chronology of coastal and upland river basins of western Deccan trappean landscape (India) A collation, Z. Geomorph N.F. 32, 311-327.
6. Karlekar, S. N. 1981. A Geomorphic Study of South Konkan, Unpb. Thesis Pune Univ.

Table 1 : Hydrogeomorphic Parameters

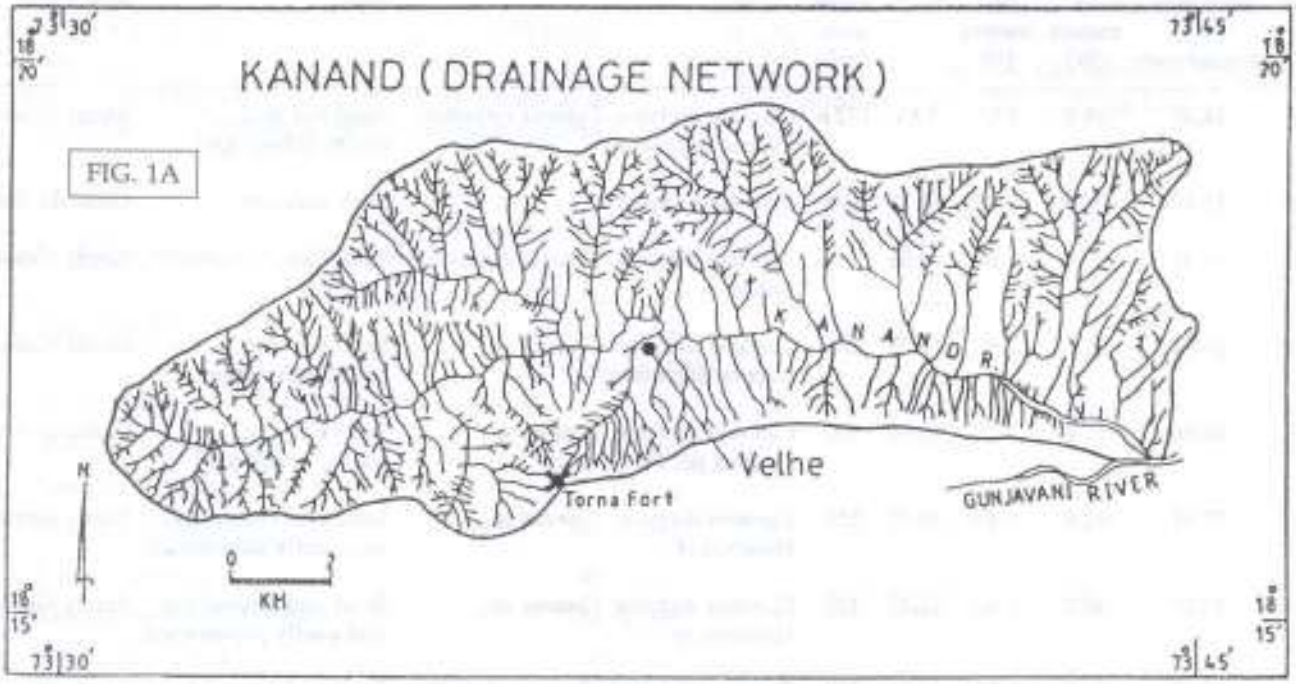
Sr. No.	Parameters	Kanand (Upto Sakhar)
1.	Area of Basin	119.79 km²
2.	Length of Basin	21.76 km
3.	Width of Basin	8.05 km
4.	Basin parameter	49.06 km
5.	Length of main channel	24.78 km
6.	Absolute height	1513 m
7.	Relative relief	843 m
8.	Channel slope	2.18%
9.	Basin circularity	0.126
10.	Valley floor slopes	2.15%
11.	Maximum width of channel	51 m
12.	Low flow width of the channel	27 m
13.	Valley slope / channel slope	.99

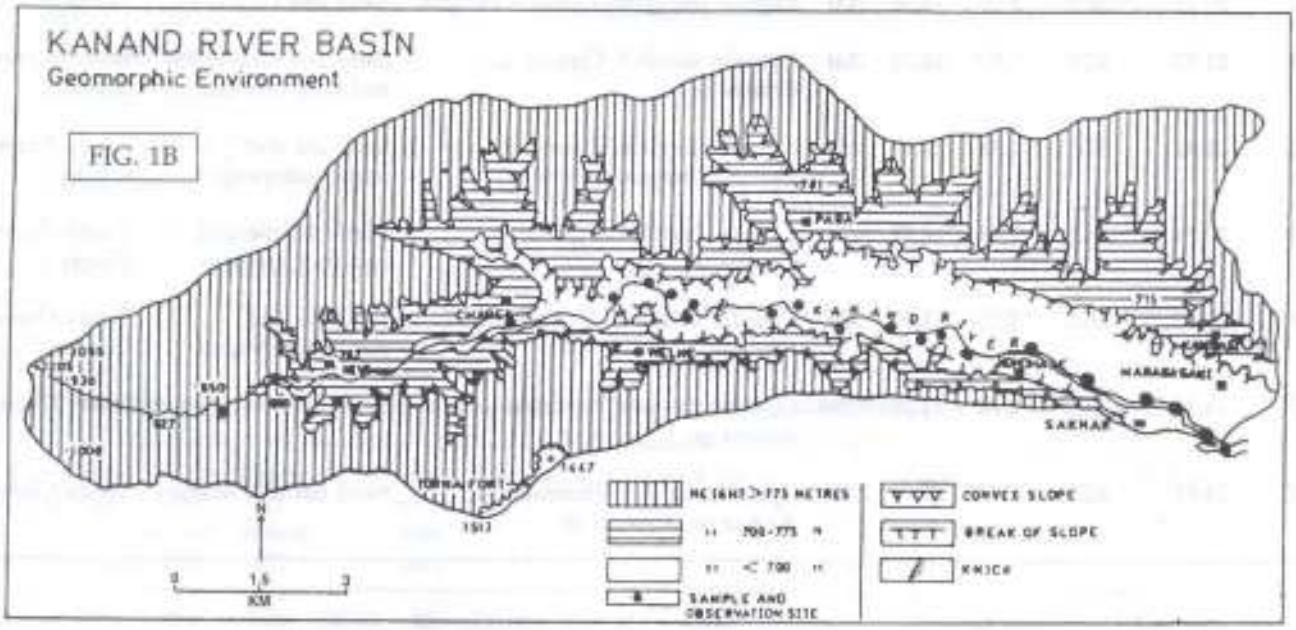
Table 2 : Morphology, plant association groups, habitat types and substrate types (River Kanand)

Sr. No.	Cumulative distance (km) downstream	Width in meters (W)	Depth in meters (D)	W/D	Vegetative area (m²)	Association groups of plants	Habitat type	Substrate type
1.	11.73	28.8	1.29	22.32	46	*Tamarix ericoides, Eugenia jambolana*	Gravel bar and Marshy	Gravelly
2.	13.0	40.2	2.46	16.34	153	*Tamarix ericoides, Eugenia jambolana, Cyperus rotundus*	Gravel bar and Marshy	Gravelly
3.	13.88	37.5	2.11	17.77	270	*Tamarix ericoides, Eugenia jambolana, Cynodon dactylon*	Sand and Gravel bar	Sandy Gravelly
4.	14.06	32.4	2.04	15.88	60	*Tamarix ericoides, Eugenia jambolana, Cyperus sp.*	Sand bar	Sandy Gravelly

Sr. No.	Cumulative distance (km) downstream	Width in meters (W)	Depth in meters (D)	W/D	Vegetative area (m^2)	Association groups of plants	Habitat type	Substrate type
5.	14.40	28.5	2.88	9.89	132.6	*Cynodon dactylon, Cyperus rotundus Cyperus rotundus*	Sand bar and partly submerged	Sandy Gravelly
6.	15.10	34.5	1.32	26.13	26.6	*Cynodon dactylon*	Rock crevices	Gravelly Sandy
7.	15.34	27.0	1.99	13.56	—	*Cynodon dactylon, Tamarix ericoides, Acacia sp.*	Sand bar	Sandy Gravelly
8.	16.14	31.2	1.92	16.25	178	*Cynodon dactylon, Cyperus sp., Eugenia jambolana*	Sand bar and partly submerged	Sandy Gravelly
9.	16.86	41.4	3.27	12.66	56	*Cynodon dactylon, Tamarix sp., Cyperus sp., Homonoa sp.*	Sand bar and partly submerged	Gravelly Sandy
10.	17.62	42.6	1.10	38.72	225	*Cynodon dactylon, Cyperus sp., Homonoa sp.*	Sand and Gravel bar and partly submerged	Sandy Gravelly
11.	18.15	40.2	1.80	22.33	220	*Cynodon dactylon, Cyperus sp., Homonoa sp.*	Sand and Gravel bar and partly submerged	Sandy Gravelly
12.	20.15	36.0	2.20	16.36	500	*Eugenia jambolana, Cynodon dactylon*	Sand and Gravel bar	Sandy
13.	21.03	42.0	1.70	24.70	200	*Cynodon dactylon, Cyperus sp., Crinum sp.*	Sand and Gravel bar and rock crevices	Sandy Gravelly, Clayey
14.	21.92	37.5	1.38	27.17	900	*Cynodon dactylon, Cyperus sp., Homonoia riparia, Crinum sp.*	Sand bar and partly submerged	Sandy Gravelly, Clayey
15.	22.74	34.5	2.46	14.02	420	*Cynodon dactylon, Cyperus sp., Crinum sp.*	Partly submerged and rock crevices	Sandy Gravelly, Clayey
16.	23.53	36.0	1.50	24.00	360	*Cynodon dactylon, Argemone mexicana, Cyperus sp.*	Sand bar and partly submerged	Sandy Gravelly, Clayey
17.	24.17	51.0	2.19	23.28	5350	*Cynodon dactylon, Argemone mexicana, Accacia sp., Cyperus sp.*	Sand bar and Marshy	Sandy Clayey
18.	24.61	42.0	1.83	22.95	2121	*Cynodon dactylon, Homonoia sp., Accacia sp., Cyperus sp.*	Sand bar and Marshy	Sandy Clayey

THE STUDY AREA — LOCATION AND GEOMORPHIC ENVIRONMENT

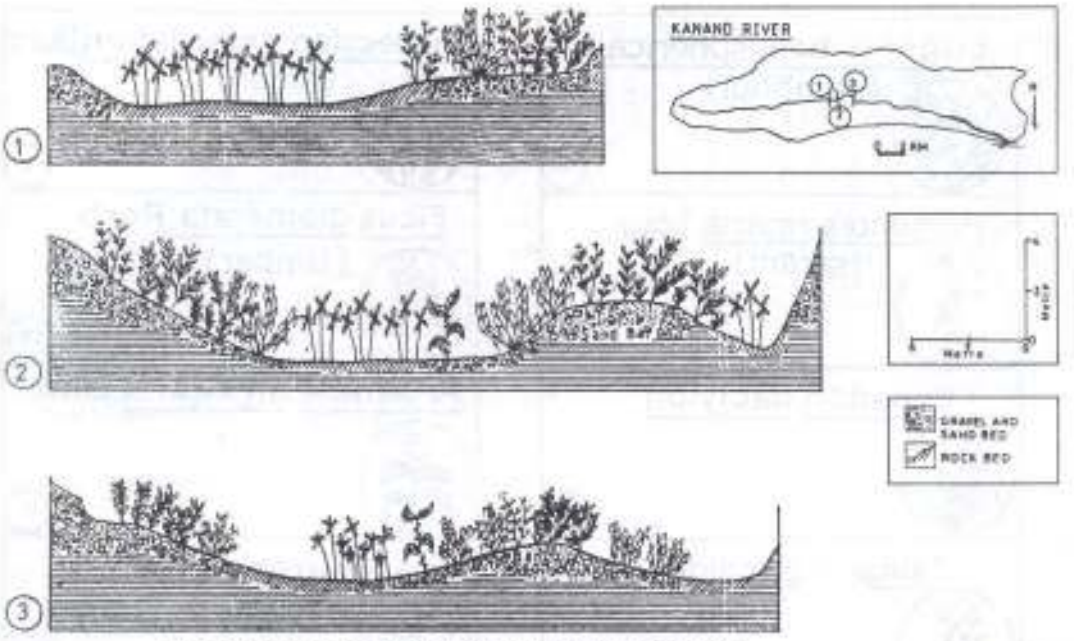




MAJOR BED PLANTS IN KANAND

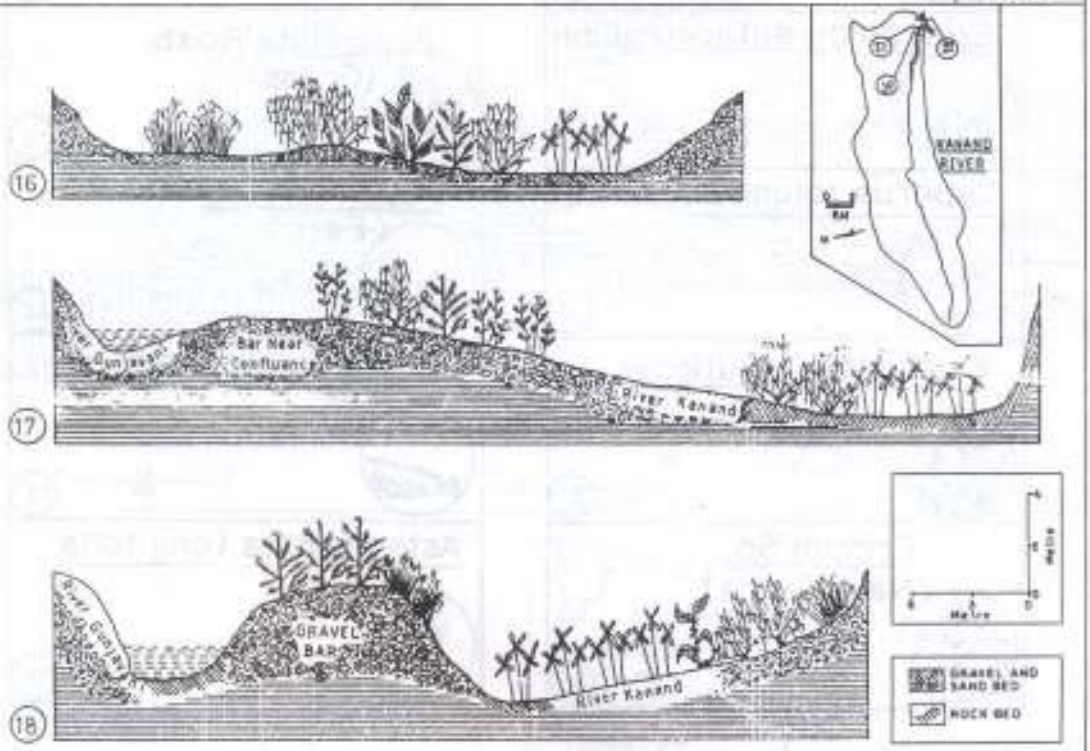
FIG. 2

THE PLANT PATTERNS ACROSS THE CHANNEL AT VARIOUS PLACES
RIVER KANAND



Refer fig 4 for Botanical Names of Plant Species

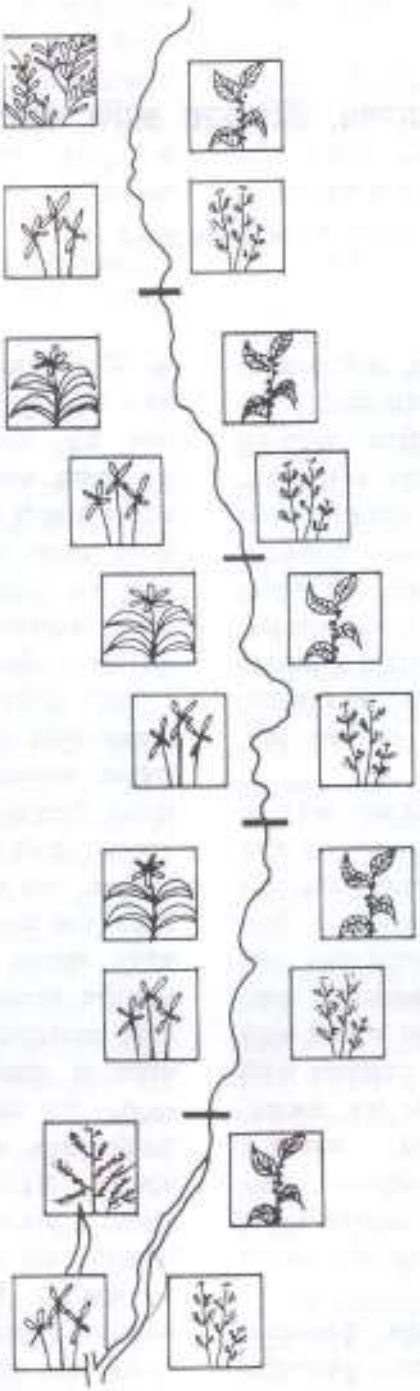
FIG. 3



Refer fig 4 for Botanical Names of Plant Species

FIG. 3

MAJOR PLANT ASSOCIATION GROUPS
ON THE BED (KANAND RIVER)



Refer fig 2 for Botanical Names of Plants

FIG. 4

सुधारणा, लैंगिकता आणि क्लोनिंग

डॉ. सुभाष आठले

हे विश्व अनादी व अनंत आहे. त्याचा पसारा, त्याचे वस्तुमान, त्याचे तेज, त्याची शक्ती, त्याचे वेग या सर्वच गोष्टी मानवी कल्पनेबाहेरच्या आहेत. गणिताची मदत घेतल्याशिवाय आपण त्या समजू शकत नाही. अणु-रचनेचे, अणू परमाणूंचे आकार, वेग, भ्रमणकक्षा, वस्तुमान वगैरेंची कल्पना, गणिताची मदत घेतल्याशिवाय आपण करू शकत नाही. पण ही विश्वाची अवाढव्य यंत्रणा काय किंवा अणूची सूक्ष्मतम यंत्रणा काय, त्या एखाद्या घड्याळाप्रमाणे नियमबद्ध आहेत. त्यामधील घटकांना स्वयंप्रज्ञाही नाही व आत्मभानही नाही. त्यांना संवेदनाही नाही व बुद्धिमत्ताही नाही, स्मृतीही नाही व प्रगतीही नाही. विस्मयपूर्ण आदर करावा, कौतुक करावे असे त्यामधे काही नाही. सर्व काही जड आहे, त्यामधे जडत्व आहे (Inertia), चैतन्य नाही!

मग खरोखरी विस्मय करण्याजोगे या विश्वात काय आहे? तर माझ्या मते पहिली विस्मययुक्त आदर बाळगण्यासारखी गोष्ट म्हणजे जीव. पृथ्वीवर अथवा विश्वात कोठेही पहिला सजीव पदार्थ कसा निर्माण झाला असेल हे पदार्थ-विज्ञानशास्त्राच्या किंवा रसायनशास्त्राच्या नियमांनी उलगडून दाखवणे कधीही शक्य होईल का नाही याबद्दल माझ्या मनात शंका आहे. महत्त्वाची गोष्ट म्हणजे सजीवाला निर्णय स्वातंत्र्य आहे. प्राप्त परिस्थितीत डावीकडे वळावे की उजवीकडे, हल्ला करावा की पळून जावे, प्रकाशाच्या दिशेने जावे की प्रकाशापासून दूर असे निर्णय सजीव घेऊ शकतात. सजीवांनी पृथ्वीवरील पर्यावरण बदलले. वनस्पतींनी वातावरणातील कार्बनडायॉक्साइड वापरून ऑक्सिजन तयार केला. नंतर ऑक्सिजन वापरून कार्बनडायॉक्साइड तयार करणारे प्राणी निर्माण झाले. जीवसृष्टीची उत्क्रांती होत होत अनेक प्रकारचे प्राणी, वनस्पती वगैरे तयार झाले.

यानंतरची विस्मयजनक गोष्ट होती लैंगिक पुनरुत्पादन. त्यापूर्वीच्या (vegetative) शाकीय पुनरुत्पादनात पुनरुत्पादित जीव हा त्यापूर्वीच्या जीवाची हुबेहूब नक्कल असे. त्यात फरक झाला तर अपघातानेच. त्यामुळे उत्क्रांतीची गती फार कमी होती. पण लैंगिक पुनरुत्पादनामध्ये दोन वेगवेगळे गुणधर्म असलेले जीव एकत्र येऊन गुणधर्मांचे वेगळेच एकत्रीकरण असलेल्या जीवाला जन्म देऊ लागले. त्यामुळे अपघाताने निर्माण झालेल्या गुणधर्मांतील फरकांचा परिणाम अनेक पटींनी गुणित झाला व भराभर उत्क्रांती होऊन सजीवांच्या अनेक जाती-प्रजाती-उपजाती निर्माण झाल्या. जीवनाच्या संघर्षामधे त्यातील काही टिकल्या, काही नष्ट झाल्या. ज्या टिकल्या त्या पर्यावरणातील अनुकूल प्रतिकूल बदलांचा फायदा उठवीत किंवा त्यांना तोंड देत वाढल्या, पसरल्या व अधिक उत्क्रांत झाल्या.

यानंतरची विस्मयजनक गोष्ट होती संस्कार. संस्काराचा उगम माणसापासूनच झाला. मानव सोडून इतर सर्व जीवांमधे एका पिढीच्या अनुभवाचा वारसा पुढील पिढीला मिळू शकत नाही. मागील पिढ्यांचा वारसा पुढील पिढ्यांना फक्त आनुवंशिक गुणांच्या आधारेच म्हणजे जनुक-रंगसूत्रे यांच्या माध्यमातूनच मिळायचा. नाही म्हणायला अधिक उत्क्रांत सस्तन प्राणी आपल्या पिलांना भक्ष्य मिळवणे, संरक्षण करणे, शिकार करणे, दडून बसणे वगैरेचे थोडेफार शिक्षण देतात. पण मानवाच्या तुलनेत ते दुर्लक्षणीय शिक्षण होय. संस्कारांमुळे मानवाने अनुवंशिकतेच्या मर्यादा ओलांडल्या व आपल्या अनुभवाचा, ज्ञानाचा, शहाणपणाचा फायदा तो आपल्या मुलांना व इतर मानवांना सरळपणे (directly) देऊ लागला. त्यामुळे मानवाची प्रगती इतर जीवांच्या तुलनेने फारच जलद झाली. भाषा, लेखन, छपाई, पुस्तके, कॉप्युटर्स, रेडिओ, टेलिव्हिजन वगैरे साधनांमुळे अनुभवांचे संकलन व संक्रमण यांची व्याप्ती फारच वाढली व लैंगिकतेवर संस्कारांनी मात केली. म्हणजे मुलाला जैविकरीत्या, अनुवंशाने आई-बापाकडून मिळणाऱ्या गुणधर्मापेक्षा, शिक्षणाने गुरूकडून मिळणाऱ्या शिक्षणाचे महत्त्व वाढू लागले आहे. अर्थात् आई-बापच गुरुचेही काम करतात – पण तो संस्काराचा (शिक्षणाचा) एक भाग होय.

या संस्काराच्या फायद्याबरोबरच दोन तोटेही मानवाला

स्वीकारावे लागले आहेत. एक म्हणजे मानवाची जैविक उत्क्रांती थांबली आहे. जैविक उत्क्रांतीसाठी आवश्यक गोष्ट म्हणजे अधिक चांगले गुणधर्म असलेल्या नराला वा मादीला अधिक मुले होणे, ती मुले जीवन संघर्षात अधिक यशस्वी होऊन त्यांनी पुन्हा अधिक पुनरुत्पादन करणे व त्यामानाने कमी चांगले गुणधर्म असलेल्या व्यक्तींना पुनरुत्पादनाची संधी कमी मिळणे व त्यांची प्रजा जीवनसंघर्षात अयशस्वी होऊन हळूहळू नष्ट होणे. अशा रीतीने चांगले गुणधर्म हळूहळू सर्व प्रजातीमधे पसरतात व तेवढी उत्क्रांती होते.

पण मानवाने आपल्या बुद्धीने पर्यावरण बदलून व समाजव्यवस्था निर्माण करून जीवनसंघर्षच पुष्कळसा संपवला आहे.

अधिक प्रगत मानवांची जननक्षमता कमी झालेली दिसते – इच्छापूर्वक संतती नियमनामुळे म्हणा किंवा इतर भौतिक सामाजिक प्रगतीचा एक अपरिहार्य परिणाम म्हणून म्हणा. औषधे, रोगप्रतिकारक लसी यांच्यामुळे नैसर्गिक रोगप्रतिकारक शक्तीलाही फारसे महत्त्व उरले नाही. यंत्रामुळे शारीरिक शक्तीला महत्त्व उरले नाही. चष्म्यांमुळे नैसर्गिक दृष्टीक्षमतेला महत्त्व उरले नाही. काळजीवाहू सरकारमुळे व कुटुंब व्यवस्थेमुळे दुर्बळ व्यक्तीही विवाह करून अपत्य निर्मिती करू शकतात. अशी ही यादी खूप वाढवता येईल! या सर्वांचा परिणाम म्हणून माणसाची आनुवंशिक उत्क्रांती थांबली आहे व अधोगतीच सुरू असण्याची शक्यता बरीच आहे.

दुसरा तोटा म्हणजे संस्काराने होणारे अनुभवांचे, शहाणपणाचे संक्रमण आपोआप होत नाही. आनुवंशिकतेने होणारे संक्रमण आपोआप होत असते. पण संस्कार प्रत्येक व्यक्तीवर नव्याने करावे लागतात. प्रत्येक व्यक्ती रानटी माणसाचेच आनुवंशिक गुणधर्म घेऊन जन्माला येते. कारण माणसाची बरीचशी प्रगती ही गेल्या काही हजार वर्षातलीच आहे व त्या प्रगतीचे आनुवंशिकतेत परिणाम दिसण्याच्या दृष्टीने हा कालावधी फार कमी आहे. शिवाय वर पाहिल्याप्रमाणे माणसाची आनुवंशिक दृष्ट्या उत्क्रांती थांबलीच आहे. एका प्रगत समाजव्यवस्थेमधे नांदण्यासाठी जे गुणधर्म माणसाला आवश्यक आहेत त्याच्याशी विसंगत असे गुणधर्म बऱ्याच वेळा माणसाला आनुवंशिकतेने मिळतात व त्यात फरक होण्याची शक्यता नाही. म्हणून या विसंगत गुणधर्मावर मात करण्यासाठी प्रत्येक व्यक्तीवर संस्कार करण्याची, त्याला शिक्षण देण्याची जरुरी असते. असे नाही की एका जोडप्यावर चांगले संस्कार केले की त्या जोडप्याच्या मुलांना ते संस्कार आपोआप, जन्मतः प्राप्त होतात. त्यामुळे संस्कार करण्याची ही क्रिया कधीच न संपणारी आहे. शिवाय संस्कार करणारी माणसे स्वतः सुसंस्कृत असावी लागतात. संस्कार करण्याची बरीच मोठी जबाबदारी पालकांची असते व त्यातील बराच भाग अनौपचारिक असतो. मुद्दाम शिकवण्याचा भाग त्यात कमी असतो. मुले पाहून, ऐकून, उदाहरणाने शिकत असतात. जन्मलेल्या प्रत्येक मुलावर सुसंस्कार करण्यासाठी मुळात सुसंस्कृत पालक व शिक्षकवर्ग आवश्यक आहे. तो कोठून आणणार? इतके करूनही सुसंस्कृत माणसातील मुळातील स्वार्थी, रानटी प्रवृत्ती कधी बंड करून उठतील व सर्व संस्कारांवर मात करतील हे सांगता येत नाही.

समाजातील अन्याय, शोषण, विषमता दूर करण्यासाठी झटणारे कार्यकर्ते बऱ्याच वेळा अशा निर्णयाला येतात की मुळात माणूसच बदलायला हवा. विशेषतः समाजवादी कार्यकर्ते असे वारंवार म्हणतात की आम्हाला माणूसच बदलायचा आहे किंवा आम्ही माणूसच नवीन घडवणार आहोत. माणूस बदलण्याची प्रक्रिया किती अवघड, कशी कधीच न संपणारी व कशी जवळजवळ अशक्य आहे हे सर्वांनीच ध्यानात घेणे आवश्यक आहे. याचा अर्थ सुसंस्कार करण्याचा प्रयत्नच सोडावा असे नाही. पण माणूस हा त्याच्या चांगल्या वाईट प्रवृत्ती-गुणांसह जसा सध्या आहे, तसाच यापुढेही हजारो वर्षे राहणार आहे हे वास्तव स्वीकारून मग त्यावरच आपली कौटुंबिक, सामाजिक, आर्थिक व राजकीय व्यवस्था बेतली पाहिजे. माणसामध्ये स्वार्थ, लोभ, मत्सर, क्रोध, काम, आळशीपणा, प्रसिद्धीची व स्तुतीची हाव, भीती हे सर्व गुण कमी-अधिक प्रमाणात असणारच हे लक्षात घेऊन, एकाच वेळी या प्रवृत्तींचा समाज-धारणेसाठी उपयोग करून घेणे व त्याच वेळी या प्रवृत्तींना योग्य बंधनात ठेवून त्यांना समाज विघातक स्वरूप धारण करता येणार नाही अशी डोळ्यात तेल घालून काळजी घेणे, यात जी व्यवस्था यशस्वी होईल तीच चिरस्थायी होऊ शकेल.

त्याच वेळी समाजातील जास्तीत जास्त मुलांवर त्यांच्या घरी, शाळेत व एकंदर समाजात चांगले संस्कार होतील याचा सतत प्रयत्न करीत रहावे लागेल. हे न संपणारे काम असेल व त्याच्यावर जास्तीत जास्त वेळ, पैसा व श्रम समाजाने खर्च केला पाहिजे. सुसंस्कृत समाजच अधिक सुखी, अधिक बंधनमुक्त व नवीन-नवीन आव्हाने स्वीकारणारा असू शकतो.

या सुसंस्कारांचा एक महत्त्वाचा भाग असा असावा – प्रत्येक व्यक्तीचे आपल्या मुलां-नातवंडांवर प्रेम असते. ती मूळ-प्रवृत्ती असते. माणसाच्या घडपडीचा एक महत्त्वाचा हेतू आपल्या मुलां-नातवंडांची योग्य तरतूद करणे हा असतो. याच प्रवृत्तीचा विकास करून, तिला योग्य वळण लावून, आपल्या सध्याच्या जीवन पद्धतीने, राहणीमानाने, आपण आपल्या मुलां-नातवंडांचे म्हणजेच पुढील पिढ्यांचे जीवन अशक्य किंवा रोगट करत नाही ना, या बद्दलची जागरुकता निर्माण करणे हा सुसंस्कारांचा महत्त्वाचा भाग रहावा या जागरुकतेतूनच प्रदूषण न करणे, पृथ्वीवरील साधन-संपत्तीची उधळपट्टी न करणे व सर्वच पर्यावरणाची काळजी घेणे ही महत्त्वाची नीती बनेल.

क्लोनिंगचा हेतू, लैंगिक पुनरुत्पादनाने संततीत निर्माण होणाऱ्या आनुवंशिक गुणधर्मांमधे जी विविधता व अनिश्चितता असते तिच्यावर मात करणे हा आहे. हापूस आंब्याच्या कोयीपासून आपण नवीन झाड लावत नाही तर त्याचे कलम करतो त्यातलाच हा प्रकार आहे. पाळीव प्राण्यांच्या बाबतीत कदाचित क्लोनिंग

उपयोगी ठरेल व समाजमान्य होऊ शकेल. पण माणसाच्या बाबतीत मात्र ते अवघड असेल, त्यापासून फायदाही काही असणार नाही व ते कधीही समाजमान्य होईल असे वाटत नाही. पण एखादे इंद्रिय बनवण्याइतका जर त्याचा उपयोग करता आला तर ते वैद्यकीय दृष्ट्या उपयोगी ठरण्याची व समाजमान्य होण्याची शक्यता आहे.

सारांश, माणसाच्या बाबतीत दोन दुर्दैवी गोष्टींचा स्वीकार केला पाहिजे. एक – त्याचा नैसर्गिक विकास किंवा जैविक उत्क्रांती थांबली आहे. दोन – त्याच्यावरील सुसंस्कारांचे संक्रमण आपोआप त्याच्या संततीमधे होत नाही. क्लोनिंगने एका माणसापासून नवीन माणूस बनवला तरी मूळ माणसाच्या संस्कारांचा, अनुभवांचा नवीन क्लोनसंभव माणसाला काही फायदा मिळणार नाही. क्लोनिंगमधे फक्त आनुवंशिक गुणच संक्रमित होतील. संस्कार पुनश्च करावे लागतीलच.

Cover transparency, courtesy :
Joost Van der Ven

Published by :
Prakash Gole, Director, Ecological Society, 1/B Abhimanshree Society, Pune 411008

Printed at :
Aksharchhaya, 2035 Sadashiv Peth, Tilak Road, Pune 411030