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SOME MANAGEMENT CONSIDERATIONS FOR BIRD SANCTUARIES

The Need for Management:

Of late a spate of demands for creation of bird sanctuaries has surfaced from groups and associations of bird-watchers. In Maharashtra the movement gathered momentum after the inauguration of Mula-Mutha Bird Reserve by Dr.Sálim Ali in 1977. The All-Maharashtra Bird-watchers' Meet which is an annual event, has recommended creation of bird sanctuaries at Mayani, about 70 km.s north of Sangli, at Jayakwadi, about 50 km.s south of Aurangabad and at Nandur-Madhmeshwar 60 km.s east of Nasik. These three proposals have been accepted in principle by the government and areas around all these three wetlands (irrigation reservoirs and their environs) have been declared as protected areas.

Once the decision to 'develop' a particular area as a Sanctuary is taken, the Forest Department goes ahead with planting trees in the area. For example, the foreshore area of the Mayani reservoir, the area between the road and the lake, was planted up by the Department with such trees as Mango, Sissoo, Erythrina, Bombax, Eucalyptus, Leucaena etc. Another activity on which the Department starts work immediately is to allocate space for building tourist accommodation of various sorts and begin construction as soon as funds become available.

Such activities may or may not adversely affect wild birds that are found at a particular place. On the whole, however, the composition of bird species found at such places, undergoes a change as a result of such actions. For example, in 1977 in the presence of Dr. Sálim Ali, a stretch of about 2 km.s on the banks of the Mula-Mutha in Yerawada, a suburb of Pune, was declared a protected area by the Forest Department of Maharashtra. Shallow water habitats used by a number of migratory birds such as blackwinged stilts, other waders and Garganeys together with resident birds, were thus protected. On the north bank of the river a stony upland with grass and thorn scrub attracted hordes of Yellow Wagtails. I distinctly remember the clouds of wagtails that rose as Dr. Sálim Ali followed by a throng of bird-watchers, arrived on the north bank. However, in subsequent years there was a marked decline in the number of Yellow Wagtails as the Department planted a variety of trees on this plateau. A few wagtails now use fringes of this plateau, while the deciduous forest that occupies most of the flat land attracts arboreal birds such as Koel, Golden Oriole, Coppersmith, Flowerpeckers, and even Green Pigeons that were not found in this 'reserve' before.

Thus by bringing about a change in the habitatat structure at a particular place, the composition of bird-species was also changed. This is neither 'conscious management' nor does it have any scientific basis. But it may not be proper to blame the Department alone for lack of scientific considerations. Many times, voluntary organisations who put up proposals for creation of bird sanctuaries are also tantalizingly vague in their objectives. In most such proposals there is no mention of target species that the proposers want to protect. Instead the proposers usually desire protection to a particular place with all the species that use the gamut of habitats existing at that place. Such place may be a wetland or woodland or a combination of the two. No conscious management, except maintenance of the status quo, may be desired also. However, the maintenance of the status quo does involve management as the balance of existing habitats is likely to change by the very act of declaration of the reserve and also by extraneous forces beyond the control of the manager.

To take the example of the Mula-Mutha bird reserve again: the level of water is crucial to the maintenance of shallow-water habitats used by numerous waders. However, as demand for water for irrigation in the downstream areas increased, more water is now released from the Khadakwasla reservoir upstream. This action flooded and drowned many of the 'wet meadows' used by Snipes. These birds have progressively become rare in the reserve. Also as Pune city expanded, the underground sewage system became overburdened and the quantity of sewage entering the river increased markedly. This changed the water quality, attracting more scavenging birds such as Blackwinged Stilts and Gull-billed Terns that picked up organisms thriving in the fertilised water and driven away such birds as Bronze-winged and Pheasant-tailed Jacana (Gole P. 1984). Moreover, the spread of water hyacinth is increasing year after year, reducing the open water areas used by migratory ducks such as Garganey and Pintail for foraging and resting. The composition of birds and habitats is no longer what it was in 1977 when the reserve was created.

As bird-watching becomes more popular, the demand for protection to particular bird-species and to places used by birds, is going to increase and without conscious management it is going to be difficult to translate these objectives into actual practice. What happens if such management actions are not backed up by scientific considerations and research may be illustrated by the example of Keoladeo Ghana National Park near Bharatpur. There the complete ban on grazing was no doubt prompted by the most worthy consideration of affording total protection to the habitat of birds in the Park. But as it was not backed by any detailed scientific study, it produced certain results that were wholly unpredicted.

It is therefore, evident that in order to produce desired results management actions should be backed by adequate scientific investigation and research. This paper offers certain suggestions to the managers of bird sanctuaries to enable them to carry out studies and organise data that such studies will produce, in such a way as to facilitate decision-making.

The Basic Data:

1. The first requirement will be to know what birds are found at a particular place through the seasons. If the proposal for creation of a bird sanctuary is drawn

up by a group of bird-watchers or a voluntary agency of bird and nature enthusiasts, a list of birds will usually be found to be attached. Some lists will also show status of bird-species, whether they are rare, common, abundant, vagrant etc. and which of them are breeding and which are local or long-distance migrants. If such a list is not enclosed, it is advisable to ask for one or start collecting this information.

2. The next important requirement is to chart the landuse pattern and the character of habitats available. Vegetational details such as dominant plant communities and their successional stages, distribution of vegetation in the area and ecotones should be added to the land-use map of the area.

3. The next step would be to study the habitat-use of different bird-species. The U. S. Dept. of Agriculture, Forest Service classifies habitat use on the basis of the two most important activities of any animal, viz. feeding and reproduction (Sept. 1979). It is not difficult to adapt this system of classification to Indian conditions. In Table 1 a system of classification that may prove suitable to Indian conditions is suggested.

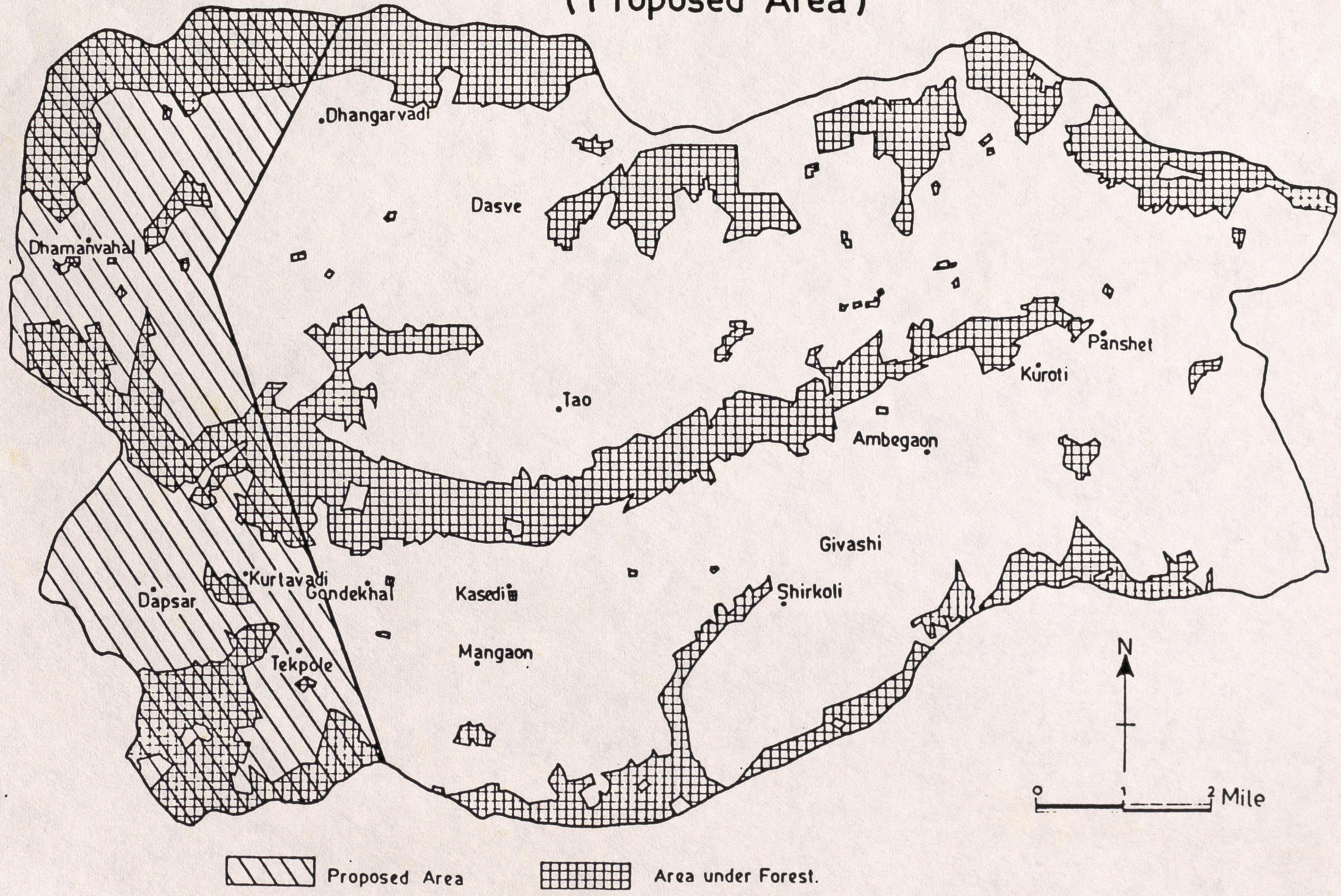
Once information on these three basic requirements is at hand, it can be organised in such a way as to pin-point what effects a particular action will produce. How many species of plants and birds will be affected, how they will be affected and where. If a target species is designated, a particular measure designed to afford it more protection may affect other species. Through the above arrangement of the data, the manager can gauge which other species will be affected and how. A versatility rating is assigned to each species. The most versatile or the least specialised species are generally less affected as they can use other habitats if a particular one becomes unavailable through a specific management action. The least versatile species are more vulnerable and require careful treatment if they are to be preserved.

Example of a Woodland Bird Sanctuary:

A concrete example will show how the data in a particular case can be organised. The example that will be considered is of a woodland area in Western Ghats. The proposal to create a wild-life sanctuary in the extreme west of the catchment area of Panshet dam, 45 km.s south-west of Pune is contained in an ecolocal survey report submitted by Ecological Society to the Department of Environment, Govt. of India in August 1985.

The accompanying map will show the location of this 2387 ha. (5896 acres) proposed sanctuary. The area includes the crest-line of Western Ghats where rainfall annually averages 800 to 900 cm.s. With such an average of rainfall the vegetational climax should be evergreen forest. At one time this indeed was the case as can be deduced from a number

WESTERN GHATS WILDLIFE SANCTUARY
(Proposed Area)



of Sacred Groves scattered in this area. Due to religious sentiments vegetation in these groves was not cut down and these therefore, exhibit specimens of relict vegetation, the type of forest that once dominated this high rainfall area.

Outside the groves however, the original vegetation is now replaced by secondary types as shifting cultivation, making of charcoal, cutting of wood for fuel and house timber and grazing have taken their toll. Most of this area is now occupied by grasses or shrubs or by heavily pollarded or coppiced trees. Certain fruit trees such as Jamun (Syzygium cumini) and Mango (Mangifera indica) are left standing and heavily eroded areas can only support Euphorbia nerrifolia.

Much of the valley land is now submerged under the Panshet reservoir. Lower slopes are cultivated for paddy and the middle are under shifting cultivation. The tops of the hills are reserve forest areas encroached upon, cut up and burnt at many places. The population in this area is however, low, around 600 souls, giving a ratio of one human being for 10 ha. or 25 acres. The survey report prepared by Ecological Society recommends shifting of this population to govt. land near the dam and their resettlement through co-operative dairying and animal husbandry.

The aim of creating a wildlife sanctuary in this area is to afford protection to certain species of plants and animals, birds and insects that are fast disappearing from Western Ghats as evergreen and semi-evergreen forests are cut down.

83 species of the birds have so far been recorded here of which 11 species use the semi-evergreen or evergreen biotope in various ways. Mammals include Barking Deer, Jackal, Porcupine, Wild Boar and Rhesus Macaque.

83 species of birds recorded in this area can be classified into Life Forms categorised in Table 1, according to their use of habitats for reproduction and feeding. This classification is given in Table 2. A majority of bird species (62%) are seen to be covered by life forms 6 and 7 i.e. they use trees for reproduction and feed either on ground, in bushes or trees. Good management of tree cover and more open habitats such as open glades, and shrubs interspersed with trees will prove beneficial to a majority of the species. But the manager needs more information to decide how he should manage these areas - what trees to be maintained, what to be removed and when etc.. He should therefore, know what activities birds carry out through different seasons, which habitat-types they use to carry out these activities and when. It is therefore, necessary that the manager of a Sanctuary should be assisted by competent ornithologists who can gather such information by actual field observation, by netting and ringing birds etc.. In this example ornithologists of Ecological Society were able, in the two-year survey period, to gather information on the occurrence of birds through the seasons and the types of habitat different species use for different activities.

Table No. 3 gives information about the frequency of occurrence of birds in the reserve area. While 32 species both reproduce and feed in the area, the rest use the available habitats for feeding only and reproduce outside the reserve area. Among the birds that breed, 18 species use trees for nesting, 7 use bushes or ground and 6 other nest in varied habitats such as mud-banks, cliffs, holes in trees, ledges etc.. While only 8 species breed in the period June to December, 24 species nest during the first 6 months of the year. With this basic information at hand, the manager can plan his actions in such a way as to cause the least disturbance to breeding birds during the prime breeding season.

However, for intelligent planning of management, more data are obviously required. It is essential to know which habitats, out of the available habitat-pattern, are used by birds for feeding only, for reproduction only and for both feeding and reproduction. Table No. 4 lists the available habitats in the reserve and classifies birds according to how they use them. The highest number of bird species are seen to use riverine vegetation for reproduction as well as feeding. 20 species reproduce in this habitat out of which 18 species use it for reproduction as well as feeding. Another 31 species use this habitat only for feeding. As such in this reserve riverine vegetation demonstrates prime bird use and any action that will disturb this habitat should be avoided and measures should be taken to protect and enrich this vegetation.

Next in importance comes the habitat represented by the tree cover consisting mainly of Syzygium cumini, Mangifera indica, Macaranga peltata and Actinodaphne hookeri. In this example, this tree cover represents Sacred Groves scattered in this area. Protection to these groves will provide protection to 16 breeding birds out of which 13 both reproduce and feed in this habitat; and to 27 other species that only feed there. Third in importance appears to be village environs where fruit trees and bamboo are planted by villagers. Among the more open habitats those represented by Strobilanthus and Dendrocalamus stand out.

To arrive at the Versatility Rating of each bird species, it will be necessary to know the successional stages of vegetation used by different bird species. Vegetational stages that are more or less common to woodland areas are: 1. Grass and forb, 2. Sapling, 3. Pole, 4. Young forest, 5. Mature forest and 5. Aged, declining trees. Though no specific information was collected on the use of successional stages by birds in different habitats, it is possible to give rough indication of such use from work done by ornithologists. Thus the number of species using different successional stages of the plant communities in our example, is as follows:

Successional stage	No. of bird species using it for Reproduction	Feeding
Grass and forb	4	36
Shrub-seedling	0	10
Pole-Sapling	11	22
Young trees	7	42
Mature trees	24	34
Aged, declining trees	5	9

(Species feeding in open water & breeding outside the reserve are excluded.)

Species from each life form can be thus classified according to the dominant plant communities and their successional stages that they use. Now the Versatility Rating will be:

VR = No. of plant communities used for Reproduction + No. of successional stages

Plus

No. of plant communities used for feeding. + No. of successional stages

Different species can now be classified into species with Low, Medium and High VR. In this example the number of species in these three grades are:

Species with Low VR (total score 1 to 5)	34
Species with Medium VR (total score 6 to 10)	39
Species with High VR (total score above 10)	10
Total	83

Steps to reach Management Goals:

In this example, there are 10 versatile species which can utilise a variety of habitats (plant communities and successional stages) and therefore, are likely to be least affected by various management actions. These species include Redwhiskered and Redvented Bulbul, Scimitar and Jungle Babler, Magpie Robin, Shikra, Crow-pheasant, Jungle Crow, Quaker Babbler and Small Green Barbet. These are common species belonging to a variety of habitats including woodland in various stages of growth and decay. The 11 species from semi-evergreen and ever-green forest which need protection in this reserve include: Blue Chat (5), Grey Jungle Fowl (10), Scarlet Minivet (7), Rufous Turtle Dove (3), Emerald Dove (6), Yellowbrowed Bulbul (5), Black Bulbul (9), Yellow-backed Sunbird (5), Brown Wood Owl (10), Small Sunbird (5) and Chest-nut-bellied Nuthatch (4). The brackets show their VR Score. Most of these use mature and old trees for reproduction and feeding. In this reserve Sacred Groves signify such a forest. Protection and maintenance of these groves will no doubt benefit these species. But the expansion of this habitat cannot be the sole aim of the management. Many other species depend on more open habitats. All of them cannot be wished away. But intelligent management may also try eliminating certain unwanted species and attracting others which have vanished due to continued destruction of their habitat. In the present example, species like little Brown Dove, Indian Robin and Green Bee-eater have no place in a high-rainfall area. These species were able to invade the reserve with the creation of xerophytic conditions. The data presented should be able to tell the manager how he can keep controlling their numbers. Likewise the complete absence of Woodpeckers is striking in this example. The manager would do well to keep a certain number of dead and dying trees to attract woodpeckers.

The task of the manager does not end with the conservation of target species. His goal should be the improvement of the overall quality of the reserve in terms of biological diversity. This implies change in the status quo. Indeed the very act of declaration of a reserve tends to change the status quo for it restricts human use of the area. Presentation of the data in the form described so far has equipped the manager with the knowledge of the basic requirements of the birds with whom he would be dealing. This should enable him to be selective - bring about conscious elimination of certain species in preference to certain other species. To judiciously plan his actions he will need more information about the niches occupied by different species, their behaviourial traits, their habits - learned or inherited, their food preferences, the size of their territories or home ranges and specific requirements if any, of each species. The importance of continuous collection of data and research cannot be overemphasised. Management of bird sanctuaries to be effective, will have to be backed by a competent team of ornithologists and ecologists.

Example of a Wetland Bird Sanctuary:

The second example considers management of a proposed wetland reserve. The Mula-Mutha Bird Reserve has already been alluded to. Though over 120 bird-species have been recorded in this reserve so far, 96 species that more commonly occur here are taken for consideration. The reserve area consists of a one and half kilometer stretch of the Mula-Mutha river in the suburb of Yerawada of Pune city. Birds start congregating there every September and remain there in numbers till the river-water rises during the rainy season and the usual shallow water habitats are no longer available. The normal water-level is regained in September. The following broad habitats are available for birds in this reserve:

No.	Name of Habitat	Dominant Plant community
1.	Open Water	Hydrilla verticillata, Lemna gibba, Ceratophylum demersum, Vallisneria spirallis, Potamogeton crispus and P. indicus
2.	Water Edges	Cryptocoryne retrospirallis, Cyperus pangorei, Polygonum glabrum and Typha angustata
3.	Midstream rocks & Islands	Ipomoea sp. Portulata oleracea, Marselia Rorripa indica
4.	Backwaters and pools in rocks	Rotulla tennui
5.	Meadows, wet & dry	Polygonum glabrum, Cynodon dactylon, Alternanthera sessilis
6.	Grass & Scrub	Lantana camara, Acacia arabica
7.	Woodland	Erythrina sp. Cassia sp. Dalbergia sissoo, Leucaena leucocephala.

No target species have been specified by the proposers. However, the reserve is well-known for the numbers of migrants it attracts in winter. These include ducks (Garganey, Pintail and Common Teal), Waders (Blackwinged stilts, Sandpipers & Stints, Greenshank, Ruff & reeve etc.), birds of prey, terns, wagtails etc. Ducks and waders throng the reserve from October to March. A number of resident birds also use the above habitats for feeding and resting or roosting. Species that breed here are however, few viz. Little Brown Dove, Indian Robin, Streaked Fantail and Indian Wren Warbler, Rock Bush Quail, Rain Quail and Little Grebe.

This situation may be considered as typical of all the wetland reserves that have been proposed in recent years.

In the original proposal a list of birds occurring at this place was attached. There have been some changes in the status of certain species over the years and Table No.5&6 lists 96 species that commonly occur at present. A look at the list and the types of habitats available, will make obvious two broad management objectives. These are:

1. To improve the quality of habitats so as to attract greater numbers of migrant birds, and
2. To induce more resident birds to stay and breed in the reserve.

However, the reserve being very close to the city, certain factors which are beyond the control of the manager impinge and have to be considered. These are:

1. Human use: The stretch of the river is used by people for bathing, washing clothes and utensils and for fishing as a non-commercial activity. Birds appear to be used to the presence of the people. Though hunting and trapping are no major threats, a certain amount of grazing by cattle, horses and sheep and goats, is also carried on. However, this has not materially altered the character of any habitat.
2. Quality of the river water and the water level. The quality of water depends on the quantity of sewage

let out in the river by the city. A sewage treatment plant is coming up in the upstream stretches of the river. Once it becomes operational the quality is likely to improve. The water level depends on the quantity of water released from the Khadakwasla reservoir upstream.

3. In recent years Eicohornia crassipes or water hyacinth spreads rapidly during the entire river course through the city as soon as floods recede after the monsoons and the river flow becomes sluggish. The municipal corporation tries to remove it but the efforts to remove it from the Sanctuary area have not been persistent.

It may now be worthwhile to classify birds according to Life Forms. This will bring into focus species that use the same habitats for feeding and reproduction and indicate to the manager diverse species that will be affected if a particular habitat is interfered with. However, reproduction being not an important activity in the reserve at present, resting and/or roosting is considered in its place. A number of migrant birds spend the night in the reserve itself. These include some ducks, Black-winged Stilts, waders, terns etc.. The number of species in different life forms is as follows:

Life Form	1	2	3	4	5	6	7	8	9	10	11	12	13	14
No. of Species	-	3	14	10	14	17	16	-	8	3	2	5	-	4

The frequency of occurrence of different species is given in Table 5&6. 26 species use the reserve for feeding for more than 9 months; 50 species feed here from 5 to 8 months and transients include 20 species that feed in the reserve for 1 to 4 months. Of the 50 species that roost in the reserve, 15 are found from 9 to 12 months, 24 roost from 5 to 8 months and 11 roost from 1 to 4 months. Next let us consider the different plant communities used by birds in different habitats. Information from Table 5 is condensed below:

Habitat No.	1		2		3		4		5		6		7	
	R	F	R	F	R	F	R	F	R	F	R	F	R	F
No. of Species	-	19	14	43	45	48	-	27	1	35	7	47	14	33

The most important resting and roosting habitat appears to be rocks and islands midstream followed by edges of water and woodland. The most important feeding habitats are rocks and islands, scrubland and edges of water, in that order. Midstream rocks and islands is the most important habitat from the point of resting/roosting and feeding.

Steps to meet Management Goals:

The first objective that we have mentioned involves improvement in the quality of the hibitat to attract greater numbers of migrant birds such as ducks and waders. Many of these use mid-streak rocks for resting and roosting, feed in the open water or shallows nearby and also along the edges of river banks. The shallow open water habitat is used by 19 species for feeding. These include a number of migratory ducks. The main threat to this habitat comes from the spread of water hyacinth which tends to cover open water areas from February onwards and practically occupies the whole of it by March end. Its timely removal will benefit ducks and other species that use this habitat. This weed also occupies nooks and crannies, bays and inlets of the river course where the water-flow is sluggish. Thus edges of water are also affected and 14 species that rest/ roost here and 43 species that feed here are faced with problems. Timely removal of this weed will benefit all of them.

The use of the open water habitat by birds is also dependent on the quality of aquatic vegetation. The dominant aquatic plant communities found at present may be the result of increased fertility of water due to greater inflow of sewage. Their food value and use by birds need investigation. Once this information is available the manager can be selective in eliminating some vegetation in preference to some other species with better potential of bird use. Similarly vegetation at the edges of water also needs to be examined from the same point of view.

Besides ducks the other important group of migrants is waders. They feed in shallow water or in mud along the water's edge and some of them roost on rocks mid-stream. In the last few years due to the maintenance of a higher water level, such mud-filled shallow areas have contracted. The manager can examine the edges of water to see if at places such areas can be created.

The second objective mainly concerns resident birds. As already noted the activity of plantation on the north bank has on the whole benefitted the resident birds. Several new species have been attracted though the activity proved inimical to the large flocks of Yellow Wagtail that used the grass and scrub area before it was planted up. Some of the wagtails have now shifted to the eastern extremity of the reserve where this type of habitat is still available to them. The plantation on the north bank can be made more attractive to birds by planting more nectar-producing flower trees, more trees that produce berries and gradually eliminating exotic, quick-growing trees that were planted simply because they grow very quickly.

A look at the habitat-use of birds should convince the manager of the importance of meadows and shrubbery. 8 species use these habitats for roosting while 92 species seek food here. By studying the feeding habits of these birds the manager can enhance the habitats' usefulness to birds. Again certain plant species may have to be eliminated, while planting of certain species can be taken up. The need for a continuous study of birds should once again be emphasised.

The proper management of meadows and shrubland will help birds such as Partridges and Quails and may attract other ground-nesting birds as well as birds that nest in shrubs. However, solitude and absence of disturbance are necessary to ensure breeding success. The manager will do well to keep certain pockets away from human disturbance. Likewise near the water's edge pockets of dense Typha or other water-side thickets will provide shelter and breeding places for Coot, Indian and Purple Moorhen etc.

At present the number of breeding species is low and tree-nesters are even fewer. But as the forest on the north bank matures it may provide suitable places for some more species. However, between the sanctuary and the private estate further to the north, there is a buffer zone which provides the necessary solitude to nesting birds. This is not yet adequately planted up. If suitable nesting trees such as Ficus, Acacia etc. are planted here, they may eventually provide nesting space to such colonial nesters as Cormorants, Egrets, Herons and Storks. However, these will not breed unless adequate food is made available to feed their nestlings. The manager should consult fisheries experts to enable him to augment fish in river waters.

The basic data that are presented here thus provide the manager a working base on which to build up his management practices. Continuous research on birds that are placed under his care will open up new vistas and suggest novel ideas that will enrich his experience and place newer tools in his hands to reach management goals. His task becomes immensely easier if he is backed by a team of competent ornithologists. For the development of the science of Bird Sanctuary Management, it is necessary to attract this unfeathered biped who alone can study 'feathered bipeds'.

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Table No. 1

CLASSIFYING WILD FAUNA ACCORDING TO LIFE FORMS

ACTIVITY

Life Form	Reproduction or Roosting	Feeding
1	In water	In water
2	On and around water	In water
3	In and around water	In and around water
4	In grass or bushes around water	In and around water
5	On ground among rocks, grass or in cultivation	Among rocks, grass, in cultivation or in water
6	In bushes or in medium high trees	On ground, in bushes or trees in water or in air
7	In tall deciduous or evergreen trees	On ground, in bushes or trees, in and around water or in air
8	In coniferous trees	On ground, in bushes or trees, around water or in air
9	In a burrow in mud-cliffs, rock-faces, and ledges along water courses	On ground, in water or in air
10	On rock cliffs, ledges or in caves	On the ground or in air
11	In an excavated hole in a tree	On the ground, in bushes or trees or in air
12	In a hole or nest in a tree made by another species	On ground, in bushes or trees or in air
13	In a hole or burrow underground	On ground, in water or in bushes or trees
14	In a hole or ledge in a man-made structure	On ground, in bushes or trees or in air

TABLE NO. 2

WESTERN GHATS WILDLIFE SANCTUARY (PROPOSED) : CLASSIFICATION OF BIRDS ACCORDING TO LIFE FORMS

L I F E F O R M S									
One	Three	Four	Five	Six	Seven	Nine	Ten	Eleven	Twelve
Blackheaded Gull	Grey Wagtail Large Pied Wagtail	Spotbill Duck White- breasted Waterhen Blue Chat	Jungle Bush Quail Red Spur- fowl Redwatt- led Lapwing Indian Robin Orange- headed Ground Thrush	Pond Heron Cattle Egret Black- winged Kite Grey Jungle Fowl Little Brown Dove Baybacked Shrike Rufous- backed Shrike Black- headed Cuckoo Shrike Scarlet Minivet Redwhis- kered Bulbul Redven- ted	Shikra Sparrow- hawk Crested Hawk Eagle Booted Hawk Eagle White- backed Vulture Crested Serpent Eagle Osprey Kestrel Rufous Turtle Dove Emerald Dove Crow- pheasant Jungle Nightjar Crested Tree Swift	Honey Buzzard Small Blue Kingfisher Whitebrea- sted Kingfisher Green Bee-eater Wiretailed Swallow Malabar Whistling Thrush	Tawney Eagle Longbilled Vulture Shaheen Falcon Blue Rock Pigeon Great Horned Owl Alpine Swift Crag Martin	Small Green Barbet	Collared Scope Owl Brown Fish Owl Spotted Owlet Brown Wood Owl Grey- headed Myna Jungle Myna Brahminy Myna

Table No. 2 (contd.)

LIFE FORMS									
One	Three	Four	Five	Six	Seven	Nine	Ten	Eleven	Twelve
				Bulbul Spotted Babbler Scimitar Babbler Rufous Babbler Jungle Babbler Verditer Flycatcher Paradise Flycatcher Blacknaped Flycatcher Chiffchaff Leaf Warbler Magpie Robin Pied Bush Chat Bluehead- ed Rock Thrush Blackbird Common Rosefinch	Golden Oriole Grey Drongo Jungle Crow Yellow- browed Bulbul Black Bulbul Quaker Babbler Greyheaded Flycatcher Yellow- cheeked Tit Chestnut- bellied Nuthatch TreePipit Thickbilled Flowerpecker Tickell's Flowerpecker Small Sunbird Yellowbacked Sunbird				

Table No. 3

PROPOSED WESTERN GHATS WILDLIFE SANCTUARY : FREQUENCY OF OCCURRENCE

R = Reproduction F = Feeding

Life Form	Name of Bird	Month of the Year											
		1	2	3	4	5	6	7	8	9	10	11	12
1	Blackheaded Gull	-	-	-	-	-	-	-	-	-	F	F	F
3	Grey Wagtail	F	F	-	-	-	-	-	-	F	F	F	F
4	Spotbill Duck	-	-	-	-	-	-	-	-	-	F	F	F
	Whitebreasted Waterhen	F	F	F	F	F	-	-	-	RF	RF	F	F
	Blue Chat	F	F	F	F	F	-	-	-	-	-	F	F
5	Jungle Bush Quail	F	F	F	F	F	-	-	-	F	F	F	F
	Red Spurfowl	F	F	RF	RF	F	-	-	-	F	F	F	F
	Redwattled Lapwing	F	F	F	F	F	-	-	-	-	F	F	F
	Indian Robin	F	F	F	RF	RF	-	-	-	-	F	F	F
	Ground Thrush	F	F	F	RF	RF	F	-	-	-	F	F	F
6	Pond Heron	F	F	F	F	F	-	-	-	-	F	F	F
	Cattle Egret	F	F	F	F	F	-	-	-	F	F	F	F
	Blackwinged Kite	F	F	F	F	F	-	-	-	-	F	F	F
	Grey Jungle Fowl	F	F	F	RF	RF	RF	F	F	F	F	F	F

Table No. 3 (contd.)

Life Form	Name of Bird	Month of the Year											
		1	2	3	4	5	6	7	8	9	10	11	12
6	Little Brown Dove	F	F	F	F	F	-	-	-	-	-	F	F
	Baybacked Shrike	F	F	F	F	F	-	-	-	-	F	F	F
	Rufousbacked Shrike	F	F	F	F	F	-	-	-	-	F	F	F
	Blackheaded Cuckoo Shrike	F	F	F	RF	RF	-	-	-	F	F	F	F
	Scarlet Minivet	F	F	RF	RF	F	-	-	F	F	F	F	F
	Redwhiskered Bulbul	F	F	RF	RF	RF	-	-	RF	RF	F	F	
	Redvented Bulbul	F	F	RF	RF	F	-	-	F	F	F	F	
	Spotted Babbler	F	F	RF	RF	F	-	-	-	F	F	F	
	Scimitar Babbler	F	F	RF	RF	RF	F	F	F	F	F	F	F
	Rufous Babbler	F	F	F	F	F	-	-	-	-	F	F	F

Table No. 3 (contd.)

Life Form	Name of Bird	Month of the Year											
		1	2	3	4	5	6	7	8	9	10	11	12
6	Jungle Babbler	F	F	F	F	F	-	-	-	-	F	F	F
	Verditer Flycatcher	F	F	F	-	-	-	-	-	-	-	F	F
	Paradise Flycatcher	F	F	F	RF	RF	-	F	F	F	F	F	F
	Blacknaped Flycatcher	F	F	F	F	F	-	-	-	-	F	F	F
	Chiffchaff	F	F	F	-	-	-	-	-	-	-	F	F
	Leaf Warbler	F	F	F	-	-	-	-	-	-	F	F	F
	Magpie Robin	F	F	RF	RF	RF	-	-	-	F	F	F	F
	Pied Bush Chat	F	F	RF	RF	RF	-	-	-	F	F	F	F
	Blueheaded Rock Thrush	F	F	F	F	F	-	-	-	-	F	F	F
	Blackbird	F	F	F	F	F	-	-	-	-	-	F	F
	Common Rosefinch	F	F	F	F	F	-	-	-	-	-	F	F
7	Shikra	F	F	F	F	F	-	-	-	F	RF	RF	RF
	Sparrowhawk	F	F	F	F	F	-	-	-	-	F	F	F
	Crested Hawk Eagle	F	F	F	F	F	-	-	-	-	-	F	F
	Booted Hawk Eagle	F	F	-	-	-	-	-	-	-	-	F	F

Table No. 3 (contd.)

Life Form	Name of Bird	Month of the Year 1	2	3	4	5	6	7	8	9	10	11	12
7	Whitebacked Vulture	F	F	F	F	F	-	-	-	-	F	F	F
	Crested Serpent Eagle	F	RF	RF	RF	F	-	-	-	F	F	F	F
	Osprey	F	F	-	-	-	-	-	-	-	F	F	F
	Kestrel	F	F	F	-	-	-	-	-	F	F	F	F
	Rufous Turtle Dove	F	F	F	F	F	-	-	-	-	F	F	F.
	Emerald Dove	F	F	F	RF	RF	RF	-	-	F	F	F	F
	Crow-pheasant	F	F	F	F	F	F	-	-	RF	RF	F	F
	Jungle Nightjar	F	F	RF	RF	RF	-	-	-	F	F	F	F
	Crested Tree Swift	F	F	F	RF	RF	-	-	--	F	F	F	F
	Golden Oriole	F	F	F	F	F	-	-	-	-	F	F	F
	Grey Drongo	F	F	RF	RF	RF	-	-	-	F	F	F	F
	Jungle Crow	F	F	F	F	F	F	F	RF	RF	F	F	F
	Yellowbrowed Bulbul	F	F	F	F	F	-	-	-	-	F	F	F
	Black Bulbul	F	F	F	F	RF	RF	-	-	-	F	F	F
	Quaker Babbler	F	F	F	F	RF	RF	-	-	F	F	F	F
	Greyheaded Flycatcher	F	F	F	-	-	-	-	-	-	F	F	F

Table No. 3 (contd.)

Life Form	Name of Bird	1	2	3	4	5	6	7	8	9	10	11	12
		Month of the Year											
7	Yellowchecked Tit	F	F	F	F	F	-	-	-	F	F	F	F
	Chestnutbellied Nuthatch	F	F	F	-	-	-	-	-	-	-	F	F
	Tree Pipit	F	F	F	-	-	-	-	-	-	F	F	F
	Thickbilled Flowerpecker	F	F	F	-	-	-	-	-	F	F	F	F
	Tickell's Flowerpecker	F	F	F	-	-	-	-	-	-	F	F	F
	Small Sunbird	F	F	F	F	F	-	-	-	F	F	F	F
	Yellowbacked Sunbird	F	F	F	F	F	-	-	-	F	F	F	F
9	Honey Buzzard	F	F	F	F	F	-	-	-	-	-	F	F
	Small Blue Kingfisher	F	F	F	F	F	F	-	-	-	RF	RF	F
	Whitebreasted Kingfisher	F	F	F	F	F	-	-	-	F	F	F	F

Table No. 3 (contd.)

Life Form	Name of Bird	Month of the Year											
		1	2	3	4	5	6	7	8	9	10	11	12
9	Green Bee-eater	F	F	F	F	F	-	-	-	-	F	F	F
	Wiretailed Swallow	F	F	F	F	F	-	-	-	-	F	F	F
10	Tawny Eagle	F	F	F	F	F	-	-	-	-	-	F	F
	Longbilled Vulture	F	F	F	F	F	-	-	-	-	F	F	F
	Shaheen Falcon	F	F	F	F	F	-	-	-	-	F	F	F
	Blue Rock Pigeon	F	F	F	F	F	-	-	-	-	F	F	F
	Great Horned Owl	F	RF	RF	F	F	-	-	-	F	F	F	F
	Alpine Swift	F	F	F	F	F	-	-	-	F	F	F	F
	Crag Martin	F	F	F	-	-	-	-	-	-	F	F	F
11	Small Green Barbet	F	F	RF	RF	RF	-	-	-	F	F	F	F
12	Collared Scops Owl	F	F	F	F	-	-	-	-	-	F	F	F
	Brown Fish Owl	F	F	F	F	F	-	-	-	F	F	F	F
	Spotted Owlet	F	F	F	-	-	-	-	-	-	F	F	F
	Brown Wood Owl	F	F	F	F	F	F	-	-	F	RF	RF	RF
	Greyheaded Myna	-	-	-	F	F	-	-	-	-	-	-	-
	Jungle Myna	F	F	F	F	F	-	-	-	-	F	F	F
	Brahminy Myna	F	F	F	F	F	-	-	-	-	-	F	F

Table No. 4

PROPOSED WESTERN GHATS WILDLIFE SANCTUARY : HABITAT-USE OF BIRDS

R = Reproduction F = Feeding

Life Form	Name of Bird	Open Water	Water Edges	Riverine Vegetation	Village Environs	Woodfordia Lasiosiphon Xeromphis	Strobilanthus Butes Emblica	Syzygium Mangifera Macaranga Actinodaphne	Erythrina Euphorbia Memecylon	Dendrocalamus Phoenix Glochiodion
1	Blackheaded Gull	F	-	-	-	-	-	-	-	-
3	Grey Wagtail	-	F	F	-	-	-	-	-	-
4	Spotbill Duck	F	F	-	-	-	-	-	-	-
	Whitebreasted Waterhen	-	RF	RF	F	-	-	F	-	-
	Blue Chat	-	-	F	-	-	-	F	-	-
5	Jungle Bush Quail	-	-	-	-	F	F	-	-	F
	Red Spurfowl	-	-	-	-	F	RF	-	F	RF
	Redwattled Lapwing	-	F	-	F	-	-	-	F	-
	Indian Robin	-	-	-	RF	F	-	-	-	-
	Ground Thrush	-	-	RF	F	-	-	RF	-	F
6	Pond Heron	-	F	F	F	-	-	-	-	-
	Cattle Egret	-	F	F	F	-	-	-	-	-

Table No. 4 (contd.)

Life Form	Name of Bird	Open Water	Water Edges	Riverine Vegetation	Village Environs	Woodfordia Lasiosiphon Xeromphis	Strobilanthus Butea Emblica	Syzygium Mangifera Macaranga Actinodaphne	Erythrina Euphorbia Memecylon	Dendrocalamus Phoenix Glochiodion
6	Blackwinged Kite	-	-	-	-	F	F	-	-	F
	Grey Jungle Fowl	-	-	-	-	-	RF	F	-	F
	Little Brown Dove	-	-	-	F	F	-	-	-	-
	Baybacked Shrike	-	-	-	F	F	-	—	F	-
	Rufousbacked Shrike	-	-	-	F	F	F	-	F	-
	Blackheaded Cuckoo Shrike	-	-	RF	F	-	-	RF	F	-
	Scarlet Minivet	-	-	-	-	-	-	RF	F	F
	Redwhiskered Bulbul	-	-	RF	F	F	RF	F	F	F
	Redvented Bulbul	-	-	F	RF	F	RF	-	F	F
	Spotted Babbler	-	-	F	-	-	RF	R	F	RF
	Scimitar Babbler	-	-	RF	F	-	F	RF	-	-
	Rufous Babbler	-	-	-	-	F	F	-	-	F

Table No. 4 (contd.)

Life Form	Name of Bird	Open Water	Water Edges	Riverine Vegetation	Village Environ	Woodfordia Lasiosiphon Xeromphis	Strobilanthus Butea Emblica	Syzygium Mangifera Macaranga Actinodaphne	Erythrina Euphorbia Memecylon	Dendrocalamus Phoenix Glochiodion
6	Jungle Babbler	-	-	-	-	F	F	-	-	F
	Verditer Flycatcher	-	-	F	F	-	-	F	F	-
	Blacknaped Flycatcher	-	-	F	-	-	-	F	-	F
	Chiffchaff	-	-	-	F	F	F	-	F	F
	Leaf warbler	-	-	-	F	F	F	-	F	F
	Magpie Robin	-	-	RF	RF	-	-	F	F	F
	Pied Bush Chat	-	-	-	RF	F	RF	-	F	F
	Blueheaded Rock Thrush	-	-	F	-	-	F	F	-	-
	Blackbird	-	-	F	F	-	-	F	F	-
	Common Rosefinch	-	-	F	F	-	F	-	-	F
7	Shikra	-	-	RF	-	-	-	RF	F	F
	Sparrowhawk	-	-	F	F	-	--	F	F	F
	Crested Hawk Eagle	-	-	-	-	F	F	F	-	F
	Booted Hawk Eagle	-	-	-	-	F	F	-	-	F

Table No. 4 (contd.)

Life Form	Name of Bird	Open Water	Water Edges	Riverine Vegetation	Village Environs	Woodfordia Lasiosiphon Xeromphis	Strobilanthus Butea Emblica	Syzygium Mangifera Macaranga Actinodaphne	Erythrina Euphorbia Memecylon	Dendrocalamus Phoenix Glochiodion
7	Whitebacked Vulture	-	-	-	F	F	-	-	-	-
	Crested Serpent Eagle	-	-	F	-	-	F	R	F	RF
	Osprey	F	F	-	-	-	-	-	-	-
	Kestrel	-	-	-	F	-	F	-	F	F
	Rufous Turtle Dove	-	-	F	-	-	-	F	-	-
	Emerald Dove	-	-	RF	-	-	-	RF	-	-
	Crow-pheasant	-	-	RF	RF	-	F	F	F	F
	Jungle Nightjar	-	-	RF	F	-	F	RF	F	-
	Crested Tree Swift	-	-	RF	F	-	F	-	R	F
	Golden Oriole	-	-	F	F	-	-	-	F	F
	Grey Drongo	-	-	RF	-	-	-	RF	F	-
	Jungle Crow	-	-	RF	RF	-	-	F	F	F
	Yellowbrowed Bulbul	-	-	F	-	-	-	F	-	-
	Black Bulbul	-	-	F	F	-	-	RF	F	-

Table No. 4 (contd.)

Life Form	Name of Bird	Open Water	Water Edges	Riverine Vegetation	Village Environs	Woodfordia Lasiosiphon Xeromphis	Strobilanthus Butea Emblica	Syzygium Mangifera Macaranga Actinodaphne	Erythrina Euphorbia Memecylon	Dendrocalamus Phoenix Glochiodion
7	Quaker Babbler	-	-	RF	F	-	F	RF	F	F
	Greyheaded Flycatcher	-	-	F	-	-	-	F	-	-
	Yellowcheeked Tit	-	-	F	F	-	-	F	-	-
	Chestnutbellied Nuthatch	-	-	F	-	-	-	F	-	-
	Tree Pipit	-	-	F	-	-	F	-	F	-
	Thickbilled Flowerpecker	-	-	F	F	-	-	F	-	-
	Tickell's Flowerpecker	-	-	F	F	-	-	F	-	-
	Small Sunbird	-	-	F	F	-	-	F	-	-
	Yellowbacked Sunbird	-	-	F	F	-	-	F	-	-
9	Honey Buzzard	-	-	-	-	F	F	-	F	F
	Small Blue Kingfisher	-	RF	RF	-	-	-	-	-	-
	Whitebreasted Kingfisher	-	F	F	F	-	-	-	F	-
	Green Bee-eater	-	-	-	F	F	-	F	F	4

Table No. 4 (contd.)

Life Form	Name of Bird	Open Water	Water Edges	Riverine Vegetation	Village Environs	Woodfordia Lasiosiphon Xeromphis	Strobilanthus Butea Emblica	Syzygium Mangifera Macaranga Actinodaphne	Erythrina Euphorbia Memecylon	Dendrocalamus Phoenix Glochiodion
9	Wiretailed Swallow	F	F	F	-	-	-	-	-	-
10	Tawny Eagle	-	-	-	F	F	F	-	F	F
	Longbilled Vulture	-	-	-	F	F	-	-	-	-
	Shaheen Falcon	-	F	-	-	F	F	-	F	F
	Blue Rock Pigeon	-	-	-	F	F	-	-	-	-
	Great Horned Owl	-	-	F	F	F	-	-	-	RF
	Alpine Swift	-	-	-	-	-	F	F	F	F
	Crag Martin	F	F	-	-	F	F	-	-	F
11	Small Green Barbet	-	-	RF	F	-	F	RF	F	F
12	Collared Scops Owl	-	-	F	-	-	-	F	-	-
	Brown Fish Owl	F	F	F	-	-	-	-	-	-
	Spotted Owlet	-	-	-	F	-	-	-	-	-
	Brown Wood Owl	-	-	F	F	-	-	RF	F	-
	Greyheaded Myna	-	-	-	-	-	-	F	-	-
	Jungle Myna	-	-	F	F	-	-	F	F	F
	Brahminy Myna	-	-	-	F	-	F	-	F	-

Table No. 5

MULA-MUTHA RIVER BIRD SANCTUARY (PROPOSED)

CLASSIFICATION OF BIRDS ACCORDING TO LIFE FORM & FREQUENCY OF OCCURRENCE

F = Feeding R = Roosting/Resting

Life Form	Name of Bird	Months of the year											
		1	2	3	4	5	6	7	8	9	10	11	12
7	Little Cormorant	F	F	F	F	-	-	-	F	F	F	F	F
7	Little Egret	F	F	F	F	F	F	-	-	-	F	F	F
7	Grey Heron	F	F	F	F	F	-	-	-	F	F	F	F
7	Cattle Egret	F	F	F	F	F	F	-	-	-	F	F	F
7	Pond Heron	F	F	F	F	F	F	-	-	F	F	F	F
7	Night Heron	F	F	F	F	F	-	-	-	-	F	F	F
7	Whitenecked Stork	F	F	F	-	-	-	-	-	F	F	F	F
6	Openbilled Stork	F	F	F	-	-	-	-	-	-	-	-	F
4	Spotbill Duck	F	F	F	-	-	-	-	-	F	-	-	F
2	Shoveller	F	F	F	-	-	-	-	-	-	-	-	F
2	Little Grebe	F	RF	RF	F	F	F	-	-	F	F	F	F
3	Pintail	F	F	F	-	-	-	-	-	-	F	F	F
3	Common Teal	F	F	F	-	-	-	-	-	-	-	F	F
3	Garganey	F	F	F	F	-	-	-	-	F	F	F	F
10	Scavenger Vulture	F	F	-	-	F	-	-	-	-	-	-	F

Table No. 5 (contd.)

Life Form	Name of Bird	Months of the Year											
		1	2	3	4	5	6	7	8	9	10	11	12
6	Blackwinged Kite	F	F	F	F	-	-	-	-	F	F	F	F
7	Pariah Kite	F	F	F	F	F	F	-	-	F	F	F	F
4	Marsh Harrier	F	F	F	-	-	-	-	-	-	F	F	F
6	White-eyed Buzzard	F	F	F	F	-	-	-	-	-	F	F	F
10	Redheaded Merlin	F	F	F	-	-	-	-	-	-	F	F	F
7	Kestrel	F	F	F	-	-	-	-	-	F	F	F	F
5	Painted Partridge	-	-	-	-	-	-	F	F	F	-	-	-
5	Grey Partridge	F	F	-	-	-	-	-	-	-	F	F	F
4	Rain Quail	-	-	-	-	-	F	F	F	F	-	-	-
5	Jungle Bush Quail	-	-	-	-	-	F	F	F	F	F	-	-
5	Rock Bush Quail	F	F	F	F	F	-	-	-	-	F	F	F
4	Indian Moorhen	F	F	-	-	-	-	-	-	-	F	F	F
6	Whitebreasted Waterhen	F	F	-	-	-	-	-	-	F	F	F	F
4	Purple Moorhen	F	F	F	-	-	-	-	-	F	F	F	F
3	Coot	F	F	F	F	-	-	-	-	F	F	F	F
4	Painted Snipe	F	F	-	-	-	-	F	F	F	F	-	-
2	Pheasant-tailed Jacana	-	-	F	F	F	F	-	-	-	-	-	-

Table No. 5 (contd.)

Life Form	Name of Bird	Months of the Year											
		1	2	3	4	5	6	7	8	9	10	11	12
5	Redwattled Lapwing	F	F	F	F	F	F	F	F	F	F	F	F
3	Little Ringed Plover	F	F	F	F	F	-	-	-	-	-	F	F
3	Kentish Plover	F	F	F	F	-	-	-	-	-	-	F	F
3	Ruff & Reeve	F	F	F	-	-	-	-	-	-	F	F	F
3	Common Sandpipier	F	F	F	F	F	-	-	F	F	F	F	F
3	Green-shank	F	F	F	F	-	-	-	-	F	F	F	F
3	Little Stint	F	F	F	-	-	-	-	-	-	F	F	F
3	Temminck's Stint	F	F	F	-	-	-	-	-	-	F	F	F
4	Common Snipe	F	F	F	-	-	-	-	-	-	-	F	F
3	River Tern	F	F	F	F	-	-	-	-	-	F	F	F
3	Gullbilled Tern	F	F	F	F	-	-	-	-	F	F	F	F
7	Shikra	F	F	F	-	-	-	-	-	-	-	F	F
14	Blue Rock Pigeon	F	F	F	F	F	F	F	F	F	F	F	F
6	Little Brown Dove	F	F	F	F	RF	RF	F	F	F	F	F	F
6	Koel	F	F	F	F	F	F	-	-	F	F	F	F
7	Crow-pheasant	F	F	F	-	-	-	-	-	F	F	F	F
6	Hawk-cuckoo	-	-	-	-	-	F	F	F	F	F	F	F
11	Coppersmith	F	F	F	F	-	-	-	-	-	F	F	F

Table No. 5 (contd.)

Life Form	Name of Bird	Months of the Year											
		1	2	3	4	5	6	7	8	9	10	11	12
7	Plaintive Cuckoo	-	-	-	-	-	F	F	-	-	-	-	-
12	Spotted Owlet	F	F	-	-	-	-	-	-	-	-	-	F
14	House Swift	F	F	F	F	-	-	-	F	F	F	F	F
14	Hoopoe	F	F	F	F	F	-	-	-	F	F	F	F
6	Indian Roller	F	F	F	-	-	-	-	-	-	-	-	F
3	Blackwinged Stilt	F	F	F	F	-	-	-	-	F	F	F	F
9	Small Green Bee-eater	F	F	F	F	F	F	-	-	-	F	F	F
9	Pied Kingfisher	F	F	F	-	-	-	-	-	F	F	F	F
9	Small Blue Kingfisher	F	F	F	F	-	-	-	-	F	F	F	F
9	White-breasted Kingfisher	F	F	F	F	F	-	-	-	-	F	F	F
11	Grey Hornbill	F	F	F	-	-	-	-	-	-	F	F	F
6	Wryneck	F	F	-	-	-	-	-	-	-	-	-	F
4	Yellow Wagtail	F	F	F	F	-	-	-	-	F	F	F	F
5	Indian Pipit	F	F	-	-	-	-	-	-	-	-	F	F
9	Redrumped Swallow	F	F	F	F	-	-	-	-	F	F	F	F
9	Wiretailed Swallow	F	F	F	F	-	-	-	-	F	F	F	F
9	Common Swallow	F	F	F	F	-	-	-	-	-	F	F	F

Table No. 5 (contd.)

Life Form	Name of Bird	Months of the Year 1	2	3	4	5	6	7	8	9	10	11	12
6	Baybacked Shrike	F	F	F	-	-	-	-	-	-	-	F	F
6	Rufousbacked Shrike	F	F	F	F	F	F	-	-	-	F	F	F
7	King Crow	F	F	F	F	F	F	-	-	F	F	F	F
7	Golden Oriole	F	F	F	-	-	-	-	-	-	-	F	F
12	Common Myna	F	F	F	F	F	F	F	F	F	F	F	F
12	Brahminy Myna	F	F	F	F	F	-	-	F	F	F	F	F
7	Jungle Crow	F	F	F	F	F	RF	RF	RF	F	F	F	F
7	House Crow	F	F	F	F	F	F	F	F	F	F	F	F
12	Grey Tit	F	F	-	-	-	-	F	F	F	-	-	-
6	Redvented Bulbul	F	F	F	F	F	F	RF	RF	RF	F	F	F
12	Jungle Myna	F	F	F	F	F	-	-	-	-	-	-	F
6	Large Grey Babbler	F	F	F	F	F	-	-	-	-	F	F	F
4	Bluethroat	F	F	F	-	-	-	-	-	-	-	-	F
5	Streaked Fantail Warbler	-	-	-	-	-	-	RF	RF	F	-	-	-
5	Indian Wren warbler	-	-	-	-	-	F	RF	RF	F	F	-	-
6	Ashy Wren Warbler	F	F	F	F	F	F	RF	RF	F	F	F	F
6	Tailor-Bird	-	-	-	-	-	F	RF	RF	F	F	-	-
5	Indian Robin	F	F	F	F	RF	RF	F	F	F	F	F	F

Table No. 5 (contd.)

Life Form	Name of Bird	Months of the Year											
		1	2	3	4	5	6	7	8	9	10	11	12
10	Blue Rock Thrush	F	F	F	-	-	-	-	-	-	-	-	F
5	Stonechat	F	F	F	-	-	-	-	-	-	-	-	F
4	Yellowheaded Wagtail	F	F	F	-	-	-	-	-	-	-	-	-
5	white Wagtail	F	F	F	-	-	-	-	-	-	-	-	F
9	Large Pied Wagtail	F	F	F	F	F	F	F	F	F	F	F	F
5	Rufous-tailed Finch-lark	F	F	F	F	F	-	-	-	-	F	F	F
6	Weaver Bird	-	-	-	-	F	F	RF	RF	RF	-	-	-
6	White-throated Munia	-	F	F	F	F	-	-	-	-	-	-	-
5	Blackheaded Munia	-	-	-	-	F	F	-	-	-	-	-	-
5	Red Munia	-	F	F	F	F	-	-	-	-	-	-	-
14	House Sparrow	F	F	F	F	F	F	F	F	F	F	F	F

Table No. 6

MULA-MUTHA RIVER BIRD SANCTUARY (PROPOSED)

CLASSIFICATION OF BIRDS ACCORDING TO HABITAT-USE

F = Feeding R = Roosting/Resting

Life Form	Name of Bird	NATURE OF HABITAT						
		Open Water Hydrilla Lemna Ceratophy-lum Vallisne-ria Potamoge-ton	Water edges Crypto-coryne Cyperus Plygonum Typha	Rocks midstream Ipomoea Marselia Portulata Rorripa	Back-waters Rotulla Tennuis	Meadows Polygonum Cynodon Alternan-thera	Scrub-land Acacia arabica Lanatana camara	Woodland Erythrina Cassia Bauhinia Leucaena
7	Little Cormorant	F	-	R	-	-	-	-
7	Little Egret	-	F	RF	F	F	-	-
7	Grey Heron	-	F	RF	F	-	-	-
7	Cattle Egret	-	F	RF	F	F	F	-
7	Pond Heron	-	RF	RF	F	F	-	-
7	Night Heron	-	F	-	-	F	-	-
7	Whitenecked Stork	-	F	F	-	F	-	-
6	Openbilled Stork	-	F	F	-	-	-	-
4	Spotbill Duck	F	RF	RF	-	-	-	-
2	Shoveller	F	RF	R	-	-	-	-

Table No. 6 (contd.)

MULA-MUTHA RIVER BIRD SANCTUARY (PROPOSED)

CLASSIFICATION OF BIRDS ACCORDING TO HABITAT-USE

Life Form	Name of Bird	NATURE OF HABITAT						
		Open water	Water edges	Rocks midstream	Back-Waters	Meadows	Scrub land	Woodland
2	Little Grebe	F	RF	-	-	-	-	-
3	Pintail	F	RF	RF	-	-	-	-
3	Common Teal	F	RF	RF	-	-	-	-
3	Garganey	F	RF	RF	F	-	-	-
10	Scavenger Vulture	-	-	-	-	F	-	
6	Blackwinged Kite	-	-	-	-	-	F	F
7	Pariah Kite	-	-	RF	F	F	F	-
4	Marsh Harrier	-	F	RF	-	F	-	-
6	White-eyed Buzzard	-	-	-	-	-	F	RF
10	Redheaded Merlin	-	-	F	-	-	F	RF
7	Kestrel	-	-	-	-	-	F	RF
5	Painted Partridge	-	-	-	-	-	RF	R
5	Grey Partridge	-	-	-	-	F	F	R
4	Rain Quail	-	F	-	-	F	RF	-
5	Jungle Bush Quail	-	-	-	-	F	F	RF
5	Rock Bush Quail	-	-	-	-	F	F	-
4	Indian Moorhen	F	F	RF	-	-	-	-

Table No. 6 (contd.)

MULA-MUTHA RIVER BIRD SANCTUARY (PROPOSED)

CLASSIFICATION OF BIRDS ACCORDING TO HABITAT-USE

Life Form	Name of Bird	NATURE OF HABITAT						
		Open Water	Water edges	Rocks Midstream	Back-Waters	Meadows	Scrub land	Woodland
6	Whitebreasted Waterhen	-	F	RF	F	-	-	-
4	Purple Moorhen	-	F	RF	-	-	-	-
3	Coot	F	RF	RF	-	-	-	-
4	Painted Snipe	-	RF	RF	-	F	-	-
2	Pheasant-tailed Jacana	F	RF	RF	-	-	-	-
5	Redwattled Lapwing	-	RF	RF	F	F	F	-
3	Little Ringed Plover	-	F	RF	F	-	-	-
3	Kentish Plover	-	F	RF	F	-	-	-
3	Ruff & Reeve	-	F	RF	F	-	-	-
3	Common Sandpipier	-	F	RF	F	F	-	-
3	Green-shank	-	F	RF	F	-	-	-
3	Little Stint	-	F	RF	F	-	-	-
3	Temminck's Stint	-	F	RF	F	-	-	-
4	Common Snipe	-	F	RF	-	RF	-	-
3	River Tern	F	-	RF	-	-	-	-
3	Gullbilled Tern	F	-	RF	-	-	-	-
7	Shikra	-	-	-	-	-	F	RF
14	Blue Rock Pigeon	-	-	RF	-	F	F	-

Table No. 6 (contd.)

MULA-MUTHA RIVER BIRD SANCTUARY (PROPOSED)

CLASSIFICATION OF BIRDS ACCORDING TO HABITAT-USE -

Life Form	Name of Bird	NATURE OF HABITAT						
		Open Water	Water edges	Rocks Midstream	Back-Waters	Meadows	Scrub land	Woodland
6	Little Brown Dove	-	-	RF	-	-	F	RF
6	Koel	-	-	-	-	-	-	F
7	Crow-pheasant	-	-	-	-	-	F	F
6	Hawk-cuckoo	-	-	-	-	-	-	F
11	Coppersmith	-	-	-	-	-	-	F
7	Plaintive Cuckoo	-	-	-	-	-	-	F
12	Spotted Owlet	-	-	-	-	-	-	F
14	House Swift	F	-	F	-	F	F	-
14	Hoopoe	-	-	-	-	F	F	RF
6	Indian Roller	-	-	-	-	-	F	F
3	Blackwinged Stilt	F	F	RF	F	-	-	-
9	Small Green Bee-eater	-	-	-	-	-	F	F
9	Pied Kingfisher	F	RF	R	-	-	-	-
9	Small Blue Kingfisher	F	RF	RF	F	F	-	-
9	White-breasted Kingfisher	-	RF	RF	F	F	F	R
11	Grey Hornbill	-	-	-	-	-	-	F
6	Wryneck	-	-	-	-	-	-	F

Table No. 6 (contd.)

MULA-MUTHA RIVER BIRD SANCTUARY (PROPOSED)

CLASSIFICATION OF BIRDS ACCORDING TO HABITAT-USE

Life Form	Name of Bird	NATURE OF HABITAT						
		Open Water	Water edges	Rocks Midstream	Back-Waters	Meadows	Scrub land	Woodland
4	Yellow Wagtail	-	-	F	F	F	F	-
5	Indian Pipit	-	-	-	-	F	F	-
9	Redrumped Swallow	F	-	-	F	-	F	-
9	Wiretailed Swallow	F	F	F	-	-	-	-
9	Common Swallow	F	F	F	-	F	F	-
6	Baybacked Shrike	-	-	-	-	-	-	F
6	Rufousbacked Shrike	-	-	-	-	-	F	F
7	King Crow	-	-	-	-	F	F	RF
7	Golden Oriole	-	-	-	-	-	-	F
12	Common Myna	-	F	F	-	F	F	F
12	Brahminy Myna	-	-	F	-	-	F	RF
7	Jungle Crow	-	F	F	-	F	F	RF
7	House Crow	-	F	F	-	-	F	F
12	Grey Tit	-	-	-	-	-	-	F
6	Redvented Bulbul	-	-	F	-	-	RF	F
12	Jungle Myna	-	-	F	-	F	F	-
6	Large Grey Babbler	-	-	-	-	-	F	F
4	Bluethroat	-	F	-	F	F	-	-
5	Streaked Fantail Warbler	-	-	-	-	F	RF	-

Table No. 6 (contd.)

MULA-MUTHA RIVER BIRD SANCTUARY (PROPOSED)

CLASSIFICATION OF BIRDS ACCORDING TO HABITAT-USE

Life Form	Name of Bird	NATURE OF HABITAT						
		Open Water	Water edges	Rocks Midstream	Back-waters	Meadows	Scrub land	Woodland
5	Indian Wren Warbler	-	-	-	-	F	RF	-
6	Ashy Wren Warbler	-	-	-	-	-	RF	F
6	TailorBird	-	-	-	-	-	-	RF
5	Indian Robin	-	-	-	F	-	RF	F
10	Blue Rock Thrush	-	-	-	F	-	F	-
5	Stonechat	-	-	-	-	-	F	-
4	Yellowheaded Wagtail	-	F	F	F	F	-	-
5	White Wagtail	-	-	-	F	F	F	-
9	Large Pied Wagtail	-	F	F	-	-	-	-
5	Rufous-tailed Finch-lark	-	-	-	F	-	F	-
6	Weaver Bird	-	-	-	F	F	F	-
6	White-throated Munia	-	-	-	-	F	F	-
5	Blackheaded Munia	-	F	-	-	F	-	-
5	Red Munia	-	-	-	-	F	F	-
14	House Sparrow	-	F	F	-	-	F	F

Table No. 1

CLASSIFICATION OF BIRDS ACCORDING TO LIFE FORM, SEASONAL OCCURRENCE, REPRODUCTIVE CAPACITY & HOME RANGE

Letter Code	Life Form	Name of Bird	Scientific Name	Seasonal Occurrence (Months of Year)												Reproductive capacity	Home Range
				1	2	3	4	5	6	7	8	9	10	11	12		
PHNI	7	Little Cormorant	Phalacrocorax niger														

Table No. 2

CLASSIFICATION OF BIRDS ACCORDING TO HABITAT-TYPES AND/OR PLANT COMMUNITIES

Life Form	Name of Bird	Minimum Habitat Required for individual, Pair, colony or population	Habitat-types/Plant Communities						Special Habitats					Unique Habitats				
			1	2	3	4	5	etc.	1	2	3	4	etc.	1	2	3	4	etc.

Table No. 3

WILDLIFE ORIENTATION TO PLANT COMMUNITIES BY LIFE FORM

R = Reproduction F = Feeding

Code	Life Form	Name of Bird	Plant Communities						Total R	Total F
			1	2	3	4	5	6		
	1									
		Total No. of R								
		Species for F								

(Each Life Form will have its own table for the species covered by it.)

Table No. 4

WILDLIFE ORIENTATION TO SUCCESSIONAL STAGES BY LIFE FORM

Code	Life Form	Name of Bird	Successional Stages												TR	TF
			Grass-Forb		Shrub-Seedling		Pole-Sapling		Young Trees		Mature Trees		Old Trees			
			R	F	R	F	R	F	R	F	R	F	R	F		
		1														
		2														
		3														
		4														
		5														
Total No. of Species for		R														
		F														

TR = Total Reproduction TF = Total Feeding

(Each life Form will have its own table for the species covered by it)

Table No. 5

RELATIVE DEGREE OF USE BY THE LIFE FORM OF INDICATED PLANT COMMUNITIES & SUCCESSIONAL STAGES

Plant Community	Function	Successional Stage					
		1	2	3	4	5	6
1	R						
	F						
2	R						
	F						
3	R						
	F						
4	R						
	F						

R = Reproduction F = Feeding

(There will be one table for species from each Life Form)

FINAL REPORT ON THE PROPOSED BIRD SANCTUARY AT ISAPUR DAM PROJECT ON THE PAINGANGA RIVER DIST. YEOTMAL

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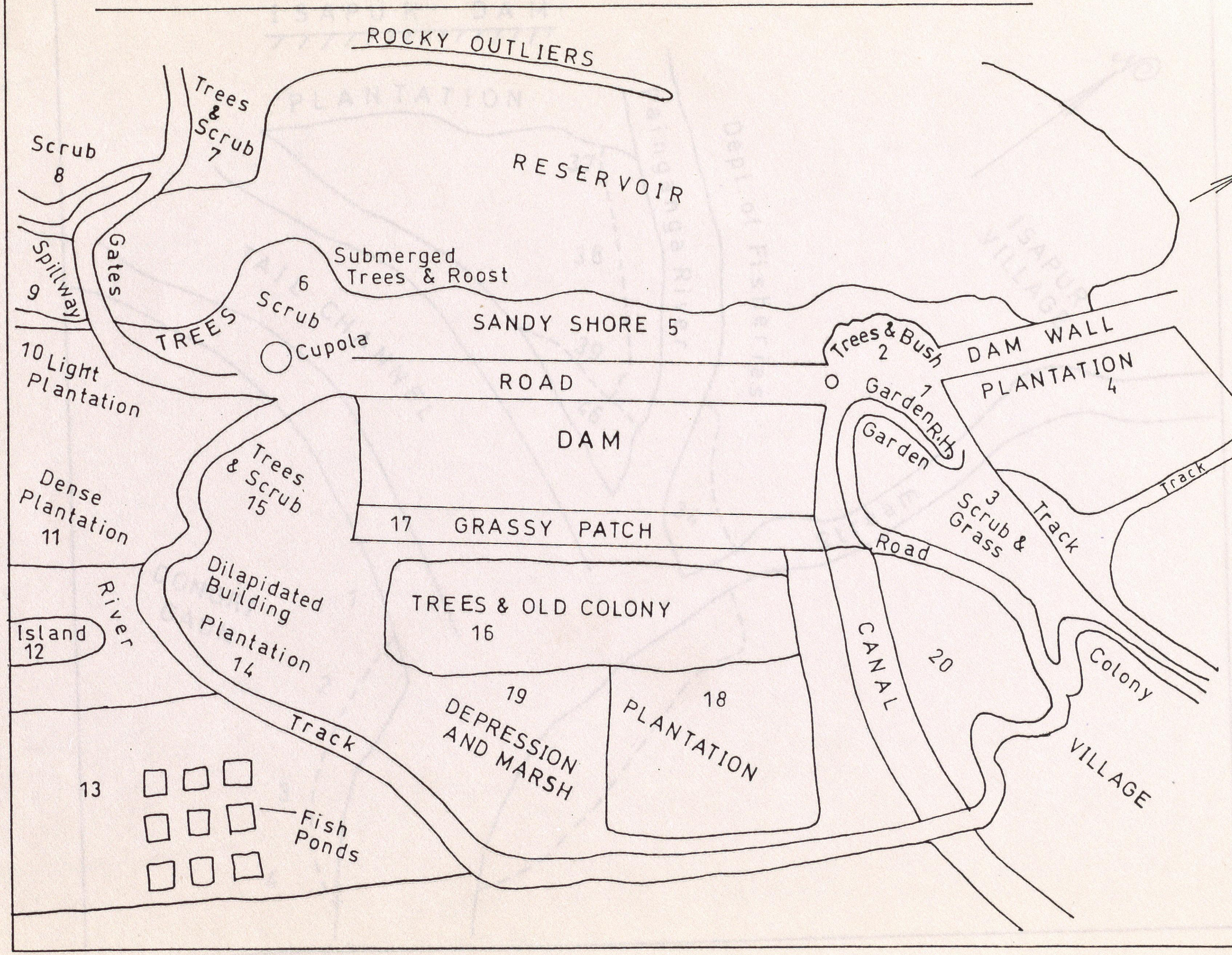
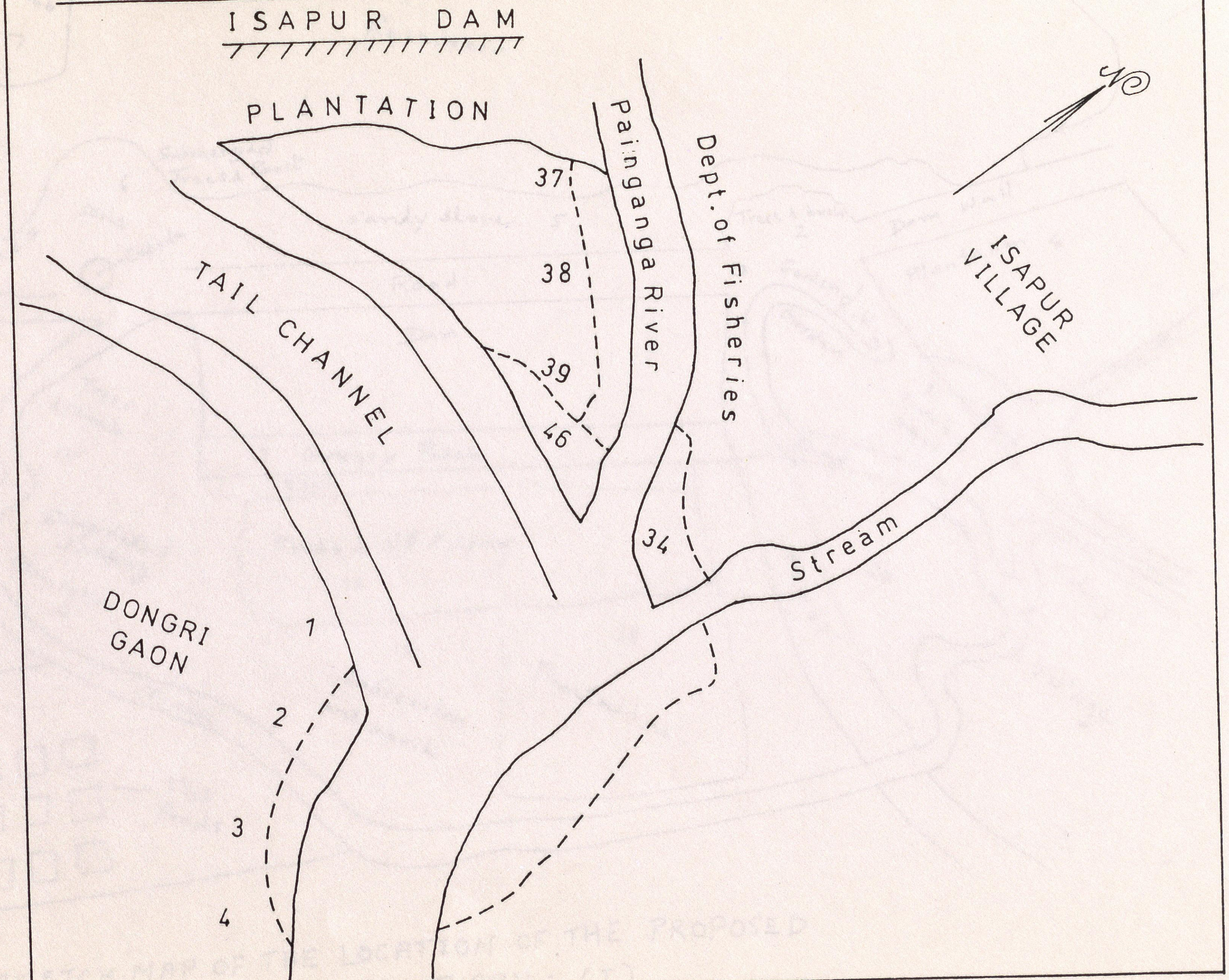
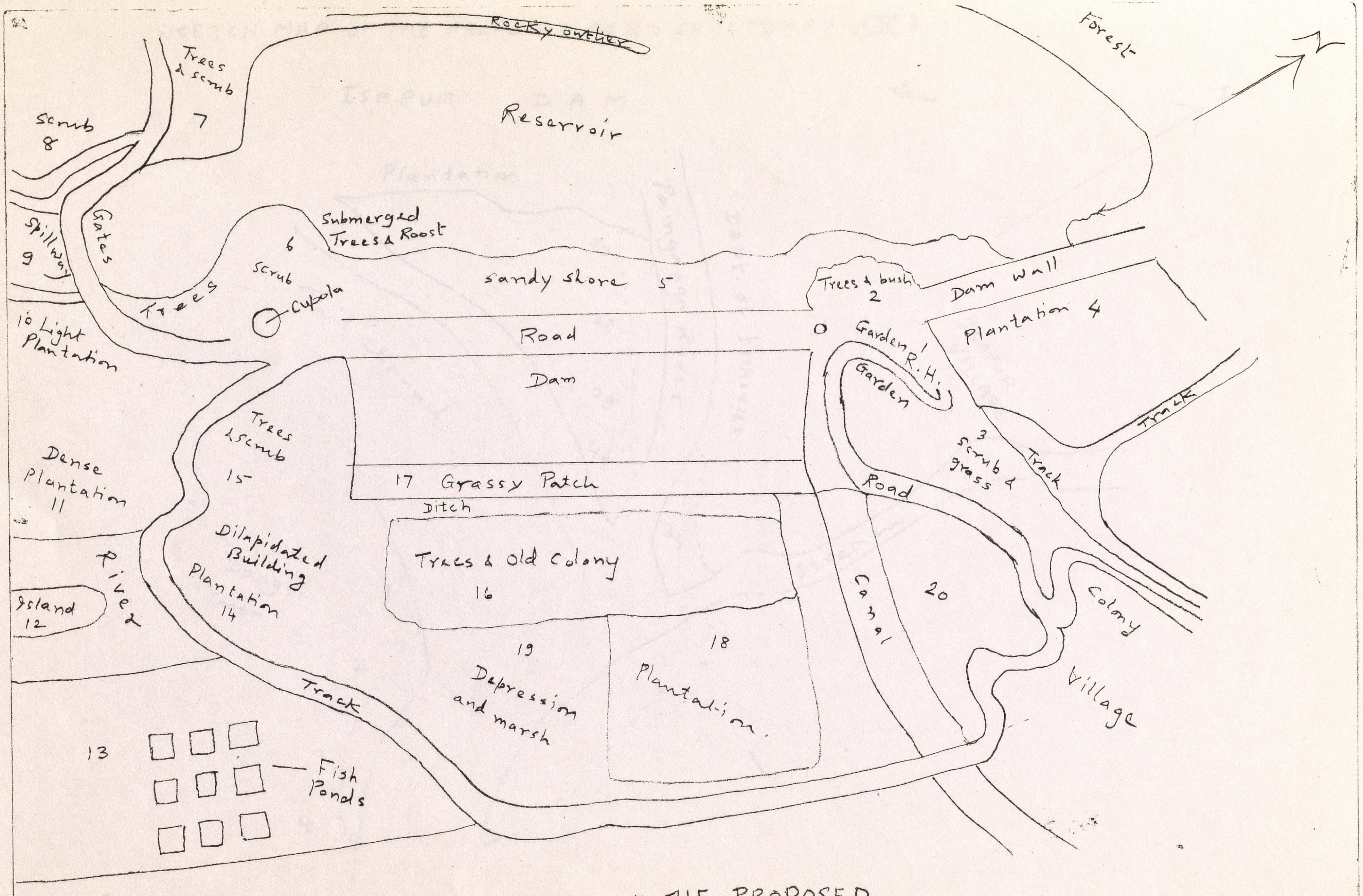
CONTENTS

SKETCH MAP OF THE LOCATION OF THE PROPOSED BIRD SANCTUARY: (I)



SKETCH MAP OF THE PROPOSED BIRD SANCTUARY : (II)





SKETCH MAP OF THE LOCATION OF THE PROPOSED BIRD SANCTUARY: (I)

SKETCH MAP OF THE PROPOSED BIRD SANCTUARY : (II)

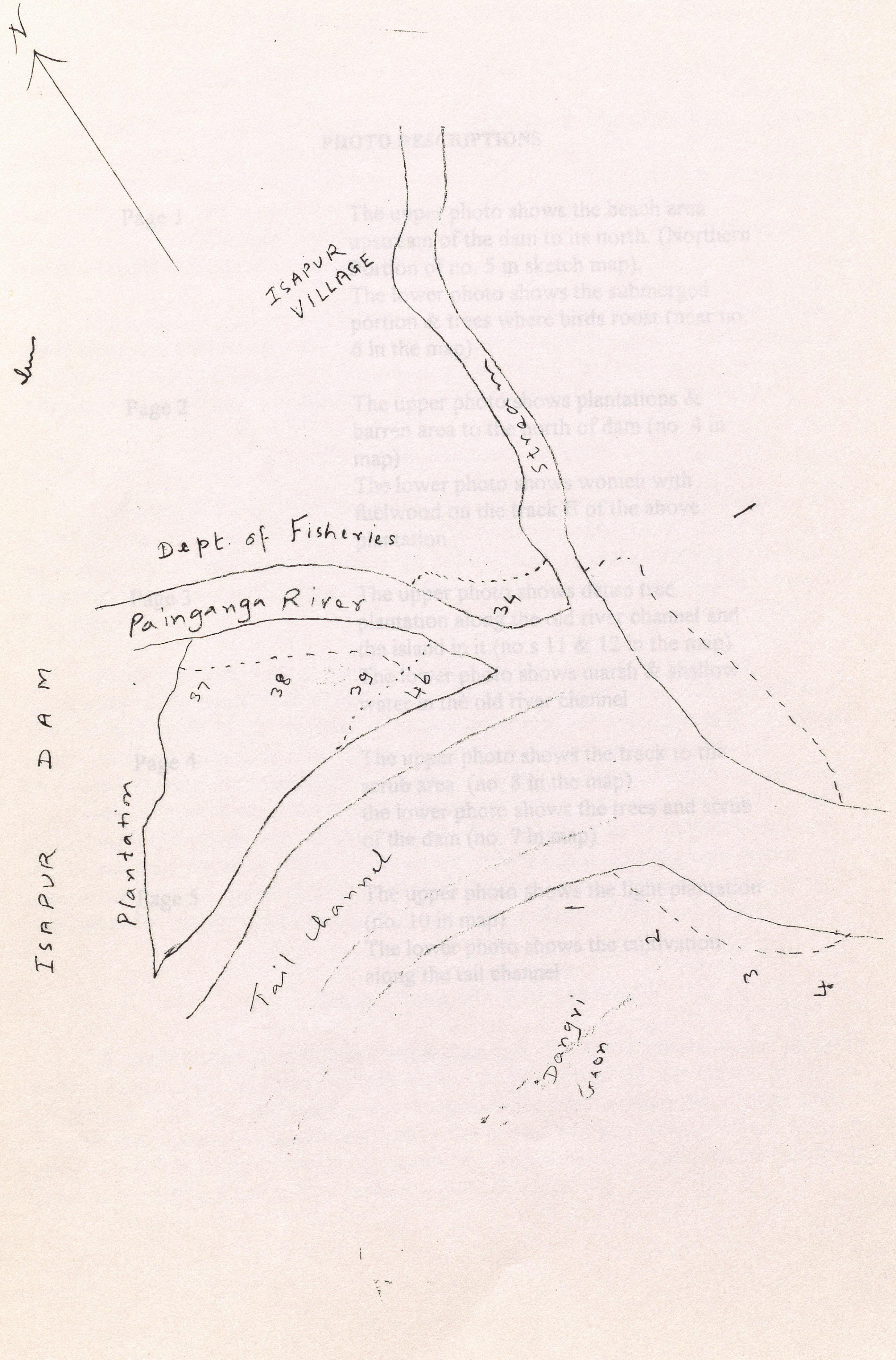


PHOTO DESCRIPTIONS

Page 1	The upper photo shows the beach area upstream of the dam to its north. (Northern Portion of no. 5 in sketch map). The lower photo shows the submerged portion & trees where birds roost (near no. 6 in the map)
Page 2	The upper photo shows plantations & barren area to the north of dam (no. 4 in map) The lower photo shows women with fuelwood on the track E of the above plantation
Page 3	The upper photo shows dense tree plantation along the old river channel and the island in it.(no.s 11 & 12 in the map) The lower photo shows marsh & shallow water in the old river channel
Page 4	The upper photo shows the track to the scrub area. (no. 8 in the map) the lower photo shows the trees and scrub of the dam (no. 7 in map)
Page 5	The upper photo shows the light plantation (no. 10 in map) The lower photo shows the cultivation along the tail channel

FINAL REPORT ON THE PROPOSED BIRD SANCTUARY AT ISAPUR DAM PROJECT ON THE PAINGANGA RIVER, DIST. YEOTMAL

Introduction

On the Painganga, an important tributary of the Godavari river, a major irrigation project was conceived way back in 1968. The project envisaged two dams, Isapur and Kayadhu in districts Yeotmal and Parbhani respectively. The earthen dam at Isapur is 3730 metres long, with a height of 48 metres. The reservoir created by the dam has a storage capacity of 1254 million cubic metres. At its full capacity the reservoir spreads over an area of a couple of hundred square kilometres.

The spread of the reservoir affected 29 villages. Though most of them have been rehabilitated, the fluctuating water levels of the reservoir affords opportunities to them of grazing and seasonal cultivation in the submergence area. As we shall see below these two activities were instrumental in different locations being proposed for the sanctuary.

The Bird Sanctuary Proposal

According to the information provided to us the creation of a bird sanctuary was one of the conditions imposed by the Environment Ministry of the Government of India while according environmental clearance for this irrigation project.(Vide letter no. Tan 8/upepra/Environmental clearance/5978 dated 14.9.99 from the Chief Engineer, Upper Penganga Project).

The proposal of creating a bird sanctuary was then referred to the Chief Conservator of Forests (Wildlife) of Government of Maharashtra. This office prepared a plan which involved 121.55 sq. kms. of submergence area to be included in the proposed sanctuary. The project authorities however, pointed out that if over so much area cultivation, grazing and fishing were prohibited as a result of the bird sanctuary, livelihood of a number of people would be affected, the government would lose some revenue and development of dairying etc. will get a setback. The ID proposed an alternative location for the sanctuary covering 139.68 ha. downstream of the dam. As the area is amply supplied with water, and as about two hundred thousand trees are standing in this area, it was contended that this location would be ideal for creation of the bird sanctuary.

Requirements of a Bird Sanctuary

A sanctuary for birds should provide their basic livelihood requirements. The basic survival needs of any life form are food, shelter and security for its own life and that of its off-springs. A bird may not utilise the same location for feeding and reproduction. For example, a bird may nest in trees but feed on the ground and vice versa. Different kinds of birds have different requirements and a sanctuary should provide conditions varied enough to meet the needs of a variety of birds, resident and migratory.

Any proposal for the creation of a bird sanctuary must therefore, include:

1. A family-wise list of birds that occur in the proposed area;
2. A statement showing locations where these birds could meet their basic life requirements of feeding and reproduction and
3. A statement showing how far the proposed area is in a position to meet these requirements.

As any natural entity such as a bird sanctuary is likely to be dynamic and not static, the sanctuary proposal should indicate how the sanctuary will fit into the total development scenario, how developmental factors will affect the area and what steps will be necessary to ward off adverse impacts.

A List of Birds & Their Status Observed in the Proposed Area

English Name	Marathi Name	Scientific Name	Status
Grey Francolin	Tittar	Francolinus pondicerianus	Common
Painted Francolin	Rangit tittar	Francolinus pictus	Uncommon
Rain Quail	Lahuri	Coturnix coromandelica	,,
Ruddy Shelduck	Chakrawak	Tadorna ferruginea	Few
Cotton Pygmy-goose	---------	Nettapus coromandelianus	Few
Gadwall	-------	Anas strepera	Few
Spotbilled Duck	-------	Anas poecilorhyncha	Common
Garganey	-------	Anas querquedula	Few
Pintail	-------	Anas acuta	Few
Redcrested Pochard	-------	Rhodonessa rufina	Few
Ferruginous Pochard	-------	Aythya nyroca	Few
Baer's Pochard	-------	Aythya baeri	Uncommon
Tufted Duck	-------	Aythya fuligula	Common
Eurasian Wryneck	-------	Jynx torquilla	Uncommon
Coppersmith Barbet	Tambat	Megalaima haemacephala	Common
Grey Hornbill	Shingchocha	Ocyceros birostris	Uncommon
Common Hoopoe	Sutar	Upupa epops	Common
Indian Roller	Neelkanth	Coracias benghalensis	Common
Common Kingfisher	Lahan Khandya	Alcedo atthis	Few
Whitethroated Kingfisher	Khandya	Halcyon smyrnensis	Common
Pied K.fisher	Bandya	Ceryle rudis	Few

English Name	Marathi Name	Scientific Name	Status
Green Bee-eater	Veda Raghu	Merops orientalis	Common
Com. Hawk-cuckoo	Pavsha	Hierococcyx varius	Few
Greater coucal	Bharadwaj	Centropus sinensis	Common
Roseringed Parakeet	Popat	Psittacula krameri	Common
Alexandrine Parakeet	Pahadi Popat	Psittacula eupatria	Few
Plum-Headed Parakeet	Pancharangi Popat	Psittacula cyanocephala	Few
House Swift	Bhingri	Apus affinis	Common
Eurasian Eagle owl	Ghubad	Bubo bubo	Rare
Collared Scops Owl	---------	Otus bakkamoena	Rare
Indian Nightjar	Ratwa	Caprimulgus asiaticus	Few
Rock Pigeon	Parwa	Columba livia	Common
Laughing Dove	Hola	Streptopilia senegalensis	Common
Spotted Dove	Kavda	Streptopilia chinensis	Few
Yellow-footedGreen pigeon	Harail	Treron phoenicoptera	Few
Purple Swamphen	Pankombdi	Porphyrio porphyrio	Few
Common Greenshank	------	Tringa nebularia	Few
Green Sandpiper	Tutwar	Tringa ochropus	Few
Common Sandpiper	Tutwar	Actitis Hypoleucos	Few
Pheasant-tailed Jacana	Kamalpakshi	Hydrophasianus chirurgus	Few
Redwattled Lapwing	Titwi	Vanellus indicus	Common
Blackheaded Gull	-------	Larus ridibundus	Rare
River Tern	------	Sterna aurantia	Few
Black-bellied Tern	------	Sterna acuticauda	Few
Black Kite	Ghar	Milvus migrans	Few
Himalayan Kite	-----	M. migrans lineatus	Few
Eurasian Marsh Harrier	Daldal Sasana	Circus aeruginosus	Few
Pallid Harrier	------	Circus macrourus	Few
Shikra	------	Accipiter badius	Few

English Name	Marathi Name	Scientific Name	Status
Oriental Honey-Buzzard	----------	Pernis ptilorhyncus	Few
White-eyed Buzzard	Sasana	Butastur teesa	Few
Booted Eagle	-------	Hieraaetus pennatus	Rare
Common Kestrel	Sasana	Falco tinnunculus	Few
Little Cormorant	Pankawla	Phalacrocorax niger	Common
Large Cormorant	,,	Phalacrocorax carbo	Few
Little Egret	Bagla	Egretta garzetta	Few
Great Egret	Motha Bagla	Casmerodius albus	Uncommon
Intermediate Egret	,,	Mesophoyx intermedia	Few
Cattle Egret	Gaibagla	Bubulcus ibis	Common
Pond Heron	Vanchak	Ardeola grayii	Common
Grey Heron	Rakhi Bagla	Ardea cinerea	Few
Black-Headed Ibis	--------	Threskiornis melanocephalus	Few
Black Ibis	-------	Pseudibis papillosa	Few
Goldenfronted Leafbird	Hirwa Bulbul	Chloropsis aurifrons	Rare
Bay-backed Shrike	Khatik	Lanius vittatus	Few
Longtailed Shrike	Khatik	Lanius schach	Common
Grey Shrike	------	Lanius excubitor	Uncommon
Rufous Treepie	------	Dendrocitta vagabunda	Few
House Crow	Kawla	Corvus splendens	Common
Largebilled Crow	Domkawla	Corvus macrorhynchos	Common
Eurasian Golden Oriole	Haldya	Oriolus oriolus	Few
Small Minivet	-------	Pericrocotus cinnamomeus	Few
Black Drongo	Kotwal	Dicrurus macrocercus	Many
Common Iora	--------	Aegithina tiphia	Few

English Name	Marathi Name	Scientific Name	Status
Common Woodshrike	-----	Tephrodornis pondicerianus	Few
Blue-capped Rock Thrush	-------	Monticola cynclorhynchus	Rare
Blue Rock Thrush	------	Monticola solitarius	Few
Red-throated Flycatcher	------	Ficedula parva	Few
Verditer Flycatcher	------	Eumyias thalassina	Few
Indian Robin	-------	Saxicoloides fulicata	Common
Black Redstart	-------	Phoenicurus ochruros	Few
Pied Bush Chat	Kalchat	Saxicola caprata	Common
Brahminy Starling	--------	Sturnus pagodarum	Few
Common Myna	Salunki	Acridotheres tristis	Many
Great Tit	--------	Parus major	Few
Sand Martin	--------	Riparia riparia	Common
Plain Martin	--------	Riparia paludicola	Few
Eurasian Crag Martin	--------	Hirundo rupestris	Few
Dusky Crag Martin	Pakoli	Hirundo concolor	Common
Barn Swallow	Pakoli	Hirundo rustica	Few
Wiretailed Swallow	---------	Hirundo smithii	Few
Red-rumped Swallow	Bhingri	Hirundo daurica	Common
Streak-throated Swallow	--------	Hirundo fluvicola	Few
Redvented Bulbul	Bulbul	Pycnonotus cafer	Common
Rufous-fronted Prinia	-----	Prinia buchanani	Few
Jungle Prinia	-----	Prinia sylvatica	Common
Plain Prinia	-----	Prinia inornata	Few

English Name	Marathi Name	Scientific Name	Status
Oriental White-eye	-------	Zosterops palpebrosa	Common
Blyth's Reed Warbler	--------	Acrocephalus dumetorum	Few
Great Reed Warbler	-------	Acrocephalus arundinaceus	Uncommon
Booted Warbler	-------	Hippolais caligata	Few
Lesser White-throat	-----------	Sylvia curruca	Few
Hume's Lesser White-throat	---------	Sylvia althaea	Uncommon
Common Tailorbird	Shimpi	Orthotomus sutorius	Few
Common Chiffchaff	-------	Phylloscopus collybita	Common
Yellow-eyed Babbler	------	Chrysomma sinense	Few
Large Grey Babbler	Satbhai	Turdoides malcomi	Common
Jungle Babbler	,,	Turdoides striatus	Few
Indian Bushlark	Chandol	Mirafra erythroptera	Few
Ashycrowned Sparrow-lark	---------	Eremopterix grisea	Few
Rufous-tailed Lark	-------	Ammomanes phoenicurus	Common
Sykse's Lark	---------	Galerida deva	Few
Oriental Skylark	Chandol	Alauda gulgula	Few
Pale-billed Flowerpecker	Fulchukhi	Dicaeum erythrorhynchos	Few
Purple-rumped Sunbird	Suryapakshi	Nectarinia zeylonica	Few
Purple Sunbird	,,	Nectarinia asiatica	Common
House Sparrow	Chimni	Passer domesticus	Common
Chestnut-shouldered Petronia	--------	Petronia xanthocollis	Few
White Wagtail	------	Motacilla alba	Few
White-browed Wagtail	Saheli	Motacilla maderaspatensis	Few
Yellow Wagtail	Dhobi	Motacilla flava	Common
Grey Wagtail	Dhobi	Motacilla cinerea	Few
Paddyfield Pipit	------	Anthus rufulus	Few

English Name	Marathi Name	Scientific Name	-Status
Blyth's Pipit	---------	Anthus godlewskii	Common
Tree Pipit	----------	Anthus trivialis	Few
Olive-backed Pipit	------	Anthus hodgsoni	Few
Red Avadavat	Lal Munia	Amandava amandava	Rare
Indian Silverbill	Munia	Lonchura malabarica	Few

The above list was compiled during two visits to the Sanctuary site undertaken during October 1999 and December 2000. The latter visit was necessary to find out what migratory species of birds are to be found in the area during winter. In all 130 species of birds were noted in the proposed Sanctuary area.

The birds use the proposed Sanctuary area because they get their life requirements there. Now let us examine the basic requirements of birds. To understand how they obtain these, it is necessary to introduce the concept of Habitat.

The Habitat Concept

In Nature the composite unit that provides the basic life requirements of a life form is termed as a habitat. It provides a bird all its survival needs such as shelter and life security, food, space for living, wandering, loafing, carrying out courtship to attract females, location for a nest, and space, security and food to raise offsprings. The space and area that a bird species requires to fulfil its life requirements may be small or big and as such habitats can be micro or macro. For example, a bird may get all his food from a single bush or a tree or may have to forage over several fields, or throughout a forest or a big lake to find enough food for itself and its family. The typical examples of a habitat may vary from a single vegetational unit to a total landscape such as forest, meadow, grassland, river basin, lake, agricultural fields, mountain slopes, valleys, sea coast etc. The physical relief, character of vegetation, availability of water, incidence of human activities provide a variety of habitats for birds.

In general, the greater the variety of habitats in a sanctuary, the greater the number and variety of birds that can be found in it.

It is not necessary to prohibit all human activities in the sanctuary area. Indeed well-managed and streamlined human activities result in increase in habitat variety and so can attract more kinds and numbers of birds. In the classification of birds observed it was noted that 7 species of birds depend entirely on human settlements to fulfil their needs.

The Requisite Habitat Pattern

If we examine the habitats necessary for the observed bird species to fulfil their basic needs, the following habitat pattern emerges:

Forest-related Habitats :	Forest edges, woodlands, secondary growth, forest clearings, groves of trees, plantations, evergreen to dry deciduous forests, hill slopes, gorges and ravines.
Open Habitats :	Scattered trees, grasslands, scrub, fallow fields, dry & wet meadows, cultivation, semi-arid areas, stony areas, rocky outcrops, wasteland, barren hill slopes, cliffs.
Water-related Habitats :	Streams, rivers, wetlands, marshes, jheels, canals, reservoirs, lakes, pools, banks of rivers and lakes, and lagoons, reed-beds.
Human Habitats :	Villages, towns, cities, buildings, roadsides, gardens, orchards, cultivation, old forts, ruins, walls and eaves of roofs, terraces.

Habitat Composition of the Proposed Sanctuary Area

The 139.68 ha area for the proposed sanctuary was found to comprise of a wooded zone downstream of the dam, along the channel area and adjacent to the waste weir of the dam. There are scattered wooded patches on the northern side of the embankment. These woods mainly partake of the character of plantation, dry deciduous tree growth, scrub and secondary growth. This character is reflected in the number bird species found to be using this area. There are more open area species(41) and scrub species (35) than forest and woodland species (32) noted in this area. The rest are related to aquatic habitats.Evidently the character and placement of vegetation need to change to attract more forest species.(See the photos).

In addition there are trees standing in water in the submergence area near the dam which are used by water birds for resting and roosting at night.

Water-related habitats here include the waste weir pool, tail channel, the river basin and its banks and embankments. The reservoir and adjacent mud-flats, grassy areas and scrub were found to be used by a number of bird species. These are outside the proposed sanctuary area at present.

The whole area was found to be surrounded to the south and east by cultivation and grazing and fallow lands. The river basin was also found to be used by people and their cattle for watering, washing, bathing etc.

The Habitat-use by Birds

The location of the proposed bird sanctuary at Isapur Dam site was visited in October 1999 & December 2000 to assess the composition of birds found there and the distribution of and quality of habitats they use. In October 1999 a total of 67 bird species were observed, while in Dec 2000, 108 bird species were noted, the number augmented mainly by the arrival of migrants from the northern latitudes. The birds were found to use the following habitats.

Habitat	Number of Birds using it	
	In October 1999	In December 2000
Grassland	6	19
Cultivation	3	3
Scrub	9	17
Semi-Arid	4	-
Wetland/Water	17	32
Sky/Air	3	12
Hill Slope	2	-
Woodland/Garden	13	18
Forest	3	-
Human Settlements	7	7
Total	67	108

A number of bird species were noted during both the visits. If these are taken into account, the total number of species noted in the proposed sanctuary area amounts to 130.

The complete list of bird species seen in the proposed sanctuary area has already been given.

Habitat- wise Distribution of Birds

Feeding and reproduction are the two main activities in which birds engage themselves. They may be using the same habitat for both these purposes or different habitats may be used for feeding and reproduction. Migratory birds that spend only the winter in our latitudes return to northern latitudes (Himalayas or beyond) in spring to breed there. Out of the total number of species noted in the proposed sanctuary 34 species migrate to breed in these northern areas. They however, use the feeding habitats in the sanctuary area during their stay here. The distribution of species according to their feeding habitat is given below.

Habitat	No of Species feeding in it
Trees, bushes, grasses & cultivation woodland edge	9
sandy, stony area, short grass & cultivation, scrub	22
crops, wet grass, scrub	10
lakes, marshes, aquatic vegetation	21
Open wooded country, farms & gardens	26

Cultivation, woodlands, streams, rivers	13
Open water streams, rivers, pools, canals	12
Villages, towns, cities, cliffs, old forts, ruins	10
Forest, woodland, grasses, cultivation, ravines,	7
Total	130

Breeding habitats of these birds are as follows:

Breeding Habitat	No. of species using it
Grass, scrub, standing crop	5
Nests in ground in a small depression under bush or stone	9
Bushes, rocky outcrops	3
Marsh or dense bank vegetation	1
A hole in a branch or a wall or mud cliff	16
Nest of rays, grass, twigs built in a tree	3
Low bush, often thorny	10
Nests colonially in trees	11
Nests colonially under overhangs, bridges or in caves	9
Medium sized tree, tall bush, bamboo clump or palm	11
Nests under water in aquatic vegetation	4
Nests in open near water or on roofs or terraces	1
Nests in a large tree	11
Nests colonially on island	2
Breeds in Himalayas	14
Breeds outside India	20
Total	130

The most important feeding habitats for the bird species found here are(See sketch map): open wooded country, groves and gardens, sandy-stony area, short grass, cultivation and scrub and lakes, marshes & aquatic vegetation. They are located (see map) near the Rest House, on the banks of the spillway and behind the Rest House, below the northern portion of the dam, in and around the reservoir and in and around the river course, downstream of the dam.

The most important breeding habitats for the species found here are: a hole in a tree or a branch; medium-sized and large trees and medium and tall bushes often thorny. Large and medium-sized trees which are likely to have cavities and holes in branches are to be found around the Rest House, as also on both banks of the spillway, and in and around the river course downstream of the dam. Scattered trees with grassy and stony areas with thorny bushes are to be found south west of the dam, on the upstream side just below the dam wall and behind the Rest House (see map).

All these areas if properly managed and protected will benefit a majority of bird species found here.

Protection and Quality Enhancement of the Habitats

At present the quality of most of the habitats in the proposed sanctuary area leaves much to be desired. The main threats to these habitats are:

1 Movement of people, vehicles and domestic animals throughout the area.

2 Grazing and wood cutting pressure

3 Stray attempts to kill birds.

The entire area proposed for the sanctuary needs to be therefore, well protected and guarded. A number of measures can be suggested to protect the entire area. Both barbed wire fencing and hedges can be used to ensure protection. Gates will have to be installed to control movement of people, vehicles and animals.

Likewise the quality of habitats can be improved through landscaping, introduction of certain indigenous and local plant species and habitat creation and extension measures. These are discussed in detail below:

Protection and Quality Enhancement Measures

In the accompanying sketch map numbers are given to different locations where theses measures will have to be carried out. These numbers will pin-point the location where necessary measures are to be carried out.

Thus in (1) an irregularly shaped pond with earthen banks and black cotton soil + clay mixed undulating bottom 1 to 1.5 m deep may be constructed. One of its sides should be planted with tall grass and the other with herbs and short grass. Nymphea sp. (or lotus) can be grown in the pond, cascading and dripping water let in. Indigenous trees such as Bombax, Erythrina, Butea & Ficus [Katesavar, Pangara, Palas and Vad, Pimpal] are to be planted around the Rest House.

In (2) the patch of woodland between the rest house & the reservoir needs to be protected. If effectively protected from grazing and cutting, the forest here will regenerate. To provide variety of habitats, rock piles, cut up tree stems of dead trees should be placed here. The slopes towards the reservoir should be managed by providing piles of excavated material from other areas to facilitate their use by burrowing animals and birds. Access to the beach should be regulated by providing a gate between the rest house and the northern portion of the dam.

In (3) the plateau behind the rest house should be protected by a barbed wire fencing and hedges of thorny plants. Dilapidated structures here should be kept as they are. Once protected the vegetation will naturally develop. The slopes facing NE should be protected by barbed wire fencing and two rows of thorny bushes so that people and cattle moving along the track leading north will not be able to use this important area.

In (4) thorny and other hedge plants in three rows should protect this area below the northern portion of the dam. A small stream running through this area be converted into one or two shallow ponds and then allowed to proceed. Tall grass, short grass and herbs should surround them. Their banks should be gently sloping and substrate semi-impervious. Salt licks and other dusting areas for birds can be placed inside this area. Some planting of indigenous fruiting or flowering bushes (see list in the appendix) is recommended here.

In (5) the beach area exposed on the upstream of the dam is used by a variety of water birds. Entrance to this area should be regulated. Fishermen may be assigned a corner restricting their movement to other parts. Large boulders as well as erect stems may be placed here for perching and resting by birds. Shallow ponds may be dried up to attract waterfowl. The roosting area to its SW corner (submerged trees) should be protected.

In (6) is an excellent patch of scrub and dry deciduous trees where grassland, scrub & woodland birds can be observed. It is at present protected but cattle may gain entry into it. The barbed wire fencing already existing can be strengthened. Nature trails can be laid here. The banks on the spillway side can be made gently sloping with some rocks and boulders placed among them.

In (7) the patch of woodland needs to be protected by a hedge in three rows consisting of thorny bushes, fruiting and flowering trees and bushes. Snags and dead tree shrubs may be placed in the hedge at regular intervals. The bank of the reservoir here should be kept irregular and free of weeds; the banks of the reservoir starting from this patch and extending up to the rocky outliers (see sketch map) should be protected by two rows of hedges.

In (8) the open areas S of the tail channel may be reserved for creating camping and picnic amenities. Shady trees may be planted here. Foundations for pitching tents, for plinths for family get-togethers, some area devoted to undulating grassland and shrubs be provided. The track side be enclosed with hedges in two rows.

(9) and (10) with excellent tree cover, shallow water, an island and bank vegetation are the most important habitats of the sanctuary. At present an unmetalled road passes through this area which is used by people, cattle and vehicles such as jeeps and trucks. Movement on this road will have to be strictly regulated by erecting gates at both

ends. There should be no movement during the night and early mornings, till 8 a.m. The dense tree canopy may be opened up at a few places by selective cutting. Weeding operations will have to be carried out in the marshy portions. Downstream of this forest, a 15m. buffer between the river and the agriculture should be maintained. A Hide and a watch tower may be constructed overlooking the river course for bird watchers; the area around the old fisheries building may be acquired for the sanctuary and planted with indigenous trees and grasses.

(11)is the area under the Fisheries Department. It is a good supplement for the sanctuary as the trees and bushes around these wetlands where fish are raised also act as perching and roosting places for them. On the side of the river bank, the area also provides a useful habitat as it is not used for agriculture. With their permission a band of riverine vegetation can be planted on the river bank. Likewise hedges should be provided along the fence that runs along the road.

In (12) there is a depression where water collects and marshy conditions are created. This marsh can be developed by deepening the land at certain places, creating mounds and tiny islands and introducing marsh vegetation. The road should be screened by planting a hedge. Perches may be provided on sides. A hide may be placed on the colony side to observe marsh birds.

(13) is a grassy patch at the foot of the dam. Grazing should not be permitted on it. The patch, as it forms a part of the dam, should be well protected. If the grass grows too high, it may be hand cut leaving tussocks and unmowed areas in between.

(14) is an area where old stony buildings that seemed to be abandoned are to be found with some plantation around them. They can be hired out to student groups who will come to visit the sanctuary. However, no cooking and eating facilities should be allowed. These may be located near the village about 500 metres from this place.

In (15) there are some trees existing. Some undulating surface, planting of flowering and fruiting bushes and hedges to surround this area should be provided here. As the area is below the dam, piped water may be provided to create a little cascade and a drip. Hides may be built at some distance from them to view birds that come near these.

In (16) the area between the canal and (15) should be a path lined by hedges and tall trees on the canal side. A gate should be provided at the road end to allow entrance to this area which also includes the student accommodation area and marsh and hides. The Rest House side of the canal upto the road may be planted with trees with grass strips in between. Underpasses may be provided for wildlife to cross the road.

(17) is the junction of the river, the tail channel and a stream coming from the north. It is another important bird habitat whose quality can be enhanced through protection and other measures. Banks area need to be fenced. It will be ideal if farmers on both sides of the river cultivating survey nos. 37, 38, 39, 46,40 & 41 are asked to maintain

a 15m buffer near river banks. This may be planted with riverine vegetation. These shallow portions of the river and stream will provide ideal waterfowl habitat if supported by reeds, sedges, grasses & bushes on river banks. Some trees already exist on the side to provide perches and roosting area.

Recommended Trees and other Vegetation

1. Bombax malabaricum	Katesawar	
2. Butea monosperma	Palas	
3. Erythrina indica	Pangara	
4. Azadirachta indica	Kadulimb	
5. Ficus infectoria	Piparan	
6. Madhuka latifolia	Mahua	
7. Callistemon lanceolatus	Bottle brush	
8. Moringa oleifera	Shevga	
9. Magnolia stellata	Magnolia	
10. Adansonia digitata	Baobab	
11. Lagerstromia flos- regine	Queen's flower	
12. Peltophorum inerme	Rusty shield bearer	
13. Cordia sebestana		
14. Tecomella undulata		(Hedges)
15. Salvadora persica		(Hedges)
16. Psidium guava	Peru	
17. Bauhinia purpurea	Kanchan	
18. Cedrela tuna	Toon	
19. Polyalthea longifolia	Drooping Ashok	
20. Terminalia arjuna	Arjun	
21. Sesbania grandiflora		
22. Acacia catechu	Khair	(Hedge)
23. Acacia leucophloea	Hivar	(Hedge)
24. Acacia senegal		(Hedge)
25. Acacia tortilis		(Hedge)
26. Balanites aegyptica		(Hedge)
27. Capparis decidua		(Hedge)
28. Dendrocalamus strictus		
29. Moringa oleifera		
30. Ougeinia oojeinensis		
31. Pithecallobium dulce		
32. Salvadora oloeides		(Hedge)
33. Wrightia tinctoria		(Hedge)
34. Zizyphus mauritania		(Hedge)
35. Zizyphus nummularia		(Hedge)
36. Callotropis gigantea		(Hedge)
37. Morus alba		

Suggestions for Creating a Viable Sanctuary

During our visit we gathered the impression that the area including the reservoir presented a great potential for creation of the bird sanctuary. However, the present quality of various habitats left much to be desired. Most of the habitats were found to be affected by indiscriminate human interference, lack of maintenance, management, adequate supervision and of any kind of protective and conservational effort. If these shortcomings are overcome with positive management and meticulous protection, the proposed area can support far greater numbers and variety of birds.

However, the present extent of the area does not seem to be adequate for a viable sanctuary unit. It can be made viable by including within the sanctuary the portion of the reservoir adjacent to the dam (trees standing in water), bank areas of the reservoir on both flanks of the dam upto a distance of 2 kilometres and requesting the Forest Department to supervise the adjacent hill slope forests for wildlife and habitat protection. The reservoir portion so included within the sanctuary will afford protection to migratory and resident waterfowl that use the reservoir waters.

Grazing and cultivation from this portion of the bank area will have to be excluded and they will have to be managed as a mosaic of different habitats. Grazing and cultivation may be allowed outside this area. Mechanised fishing cannot be allowed in the area of the reservoir included in the sanctuary. These restrictions while benefiting birds, will not substantially affect the present human activity pattern, and income and revenue generation.

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Appendix

Habitat Requirements of Some Birds in the Proposed Sanctuary Area at Isapur Dam

Name of the Bird	Feeding Habitat	Breeding Habitat
Painted francolin	trees, bushes, grasses & cultivation at forest edges	grass, scrub, standing crops
Grey francolin	sandy, stony area to grassland & cultivation	bushes, rock outcrops
Rain quail	crops, wet grass, scrub	standing crop, grass
Gadwall	Lakes, marshes with aquatic vegetation	Breeds outside India
Spotbilled duck	As above	Marsh or dense bank-side vegetation
Pintail	as above & lagoons, estuaries, paddy fields	Breeds outside India
Garganey	as above & coastal lagoons	,,
Coppersmith barbet	Open wooded country & groves & gardens	A hole in a branch of a tree
Grey hornbill	woodlands, groves, gardens roadside trees, orchards, fruiting trees	Hole in a large tree
Common hoopoe	Woodland, cultivation & grassy areas	Tree hollow or a hole in the wall of a house
Indian roller	cultivation roadsides, woodland, wasteland	Untidy nest of grass, rags built in a tree
White-throated kingfisher	cultivation, woodland, forest edges, streams, rivers, tanks, sea coast, mangroves	Nest in a hole made in a steep earthen bank
Pied kingfisher	open water: streams, rivers, pools, canals, lakes, coastal lagoons	As above
Green bee-eater	open country: scattered trees, bushes, grasses, semi-arid land, coastal sands	Nests colonially in holes in embankments or steep earthen banks
Common hawk cuckoo	woodlands, forest edges, plantations, gardens with tall trees	Places its eggs in other birds' nests
Roseringed parakeet	woodland, groves, gardens & cultivation, moist deciduous forest	Holes in trees, walls & cliffs
House swift	villages, towns, cities, cliffs, old forts, ruins	Nests colonially under overhnags, caves, bridges

Name of the Bird	Feeding Habitat	Breeding Habitat
Eurasian eagle-owl	Forest, woodland, groves, cultivation, ravines	Nests in a tree hole
Grey nightjar	open country, woodland, scrub-covered hills	eggs laid in the open on a stony slope
Rock pigeon	valleys, towns, cities, cliffs, gorges, ravines	Nests in holes or shafts in cliffs, walls, large trees
Laughing dove	dry cultivation, roadsides, villages, scrub, hills	Nest in a low bush often thorny
Spotted dove	forest edges, woodlands, wet cultivation, village outskirts, gardens, pine forest	Nests in a medium-sized tree or tall bush, bamboo clump or palm
Green sandpiper	Banks of streams, rivers, canals, tanks, lakes, sea coast, marshes, wet fields	Breeds outside India
Redwattled lapwing	dry & wet cultivation, river & streamsides, tanks, road-sides, open country	Nests in open near water or on roofs or terraces of buildings
Black kite	cities, towns, villages and hills	Nests in a large tree
Eurasian marsh harrier	reedbeds, marshes, lakes, rivers, paddy fields, lagoons	Breeds outside India
Pallid harrier	slopes and plains covered with scrub, stones, cultivation	as above
Common kestrel	open country, cultivation, scrub-covered slopes and subalpine & alpine lands	Breeds in Himalayas
Little cormorant	Marshes, rivers, streams, canals, lakes, tanks,estua-ries,sea coast	Nests colonially in trees not far from water
Great cormorant	Large rivers, lakes, marshes, wetlands, coastal waters	Nests colonially in trees
Little egret	Lakes, rivers, streams, wet fields, estuaries, mangroves	Nests colonially in groves of trees near water
Grey heron	rivers, wetlands, marshes, lakes, estuaries, mangroves, sea coast	Nests in a tree in small colonies
Intermediate egret	marshes, rivers, streamsides, wet fields, estuaries, mangro-ves	Nests in tree groves & mangroves

Name of the Bird	Feeding Habitat	Breeding Habitat
Cattle egret	damp grassland, paddy fields, grassy banks of rivers, canals and rubbish dumps grazing lands in hills and plains	Nests colonially in trees with other egrets and herons
Pond heron	Marshes, rivers, streams, lakes, borrow pits, puddles, sea coast, mangroves	breeds in small colonies in trees in or near human settlements
Black ibis	dry grasslands, fields, edges of lakes, marshes, garbage dumps	Nests in a large tree often using old kite or vulture nests
Goldenfronted leaf bird	forest- evergreen to moist deciduous & secondary	Nest built in a forest tree
Long-tailed shrike	bushes, scattered trees, thorny vegetation, forest edges, cultivation, plantation, orchards	Nests in a bush or small tree
Great grey shrike	dry, open, stony, semi-arid country with thorn bushes, edges of cultivation	Nest built in a thorny tree or bush
Rufous tree pie	woodlands, gardens with large trees, groves, roadside avenue trees	Nest built in a tree
House crow	commensal of man	Nest built in a tree
Large-billed crow	as above	as above
Eurasian golden oriole	woodland, groves, orchards & forest edges, large gardens, avenue & large trees in human settlements	Nests in a tree
Black drongo	around villages, towns, cities, cultivation, woodland & open areas, near cattle	Nests in an isolated tree
Blue-capped rock thrush	forest- evergreen to moist deciduous, groves, coffee plantations	Nests in Himalayas
Indian robin	dry, stony, semi-arid areas with low scrub, rocky outcrops, deserted buildings & cultivation edges	Nests in a hole or cavity in a wall, earth bank, rock cavities
Pied bush chat	woodland edges, hill slopes & open ground around cultition, bushes , tamarisk and grass near streams	Nests in a hole in a wall or bank or under a grass tuft

Name of the Bird	Feeding Habitat	Breeding Habitat
Common myna	commensal of man	Nests in a bank or under eaves of buildings
Eurasian crag martin	rocky cliffs, gorges and ancient forts	Nests in the Himalayas
Barn swallow	edges of cultivation, open country, rivers	as above
Wire-tailed swallow	open country around rivers, streams, pools	nests under a bridge or a rock overhang near water
Redvented bulbul	Commensal of man & also forest edges, hills	Nests in buildings, bushes or low trees
Blyth's reed warbler	forest edges, woodlands, roadside bushes, banks of rivers, streams	Breeds outside India
Common tailor bird	Bushes, shrubs, roadside trees, gardens, forest edges & woodlands & trees near water	Nests in a shrub by stitching together large leaves
Large grey babbler	Open, scrubby areas near cultivation, villages, gardens in towns and cities	Nests in bushes or trees
Jungle babbler	Forest edges, clearings, plantations, secondary forest	Nests in a small tree
Lesser whitethroat	deciduous woodland, thorn scrub, acacias	Breeds in Himalayas
Indian bush lark	Stony scrub, fallow and open wasteland & Euphorbia clumps	Nests in grass tufts or under stones or bushes
Ashy-crowned sparrow-	stony scrub, thorn bushes, wasteland, tidal mudflats	Nests on ground in a small depression, under bush or stone
Oriental skylark	Dry & wet grassland, pastures, fallow land	Nests on ground under an earth clod or grass tuft
Pale-billed flowerpecker	forest edges, clearings, mangroves	Nest suspended in a tree
Purple-rumped sunbird	forest edges, woodland, secondary growth, gardens	Nest suspended from a branch in a tree or bush
Purple sunbird	open deciduous forest, scrub & gardens	As above
White-browed wagtail	Banks or rivers, streams, lakes, canals, irrigation barrages	Nest built under bridges or eaves of buildings near water

Name of Bird	Feeding Habitat	Breeding Habitat
Yellow wagtail	Damp pastures, grassy margins of lakes, swamps and rivers	Breeds in trans Himalayas
Grey wagtail	Streams, pools in hills & foothills in winter	Breeds in Himalayas
Olive-backed pipit	Forest clearings, planta- tions, groves & scattered trees	As above