# Report of the Subcommittee Constituted by the Government of A. P.

(Vide G.O.Ms. No. 154, M.A., Dt. 9-3-1977)

## On Ecological Survey of Kolleru Lake, Andhra Pradesh

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ANDHRA PRADESH

**Andhra Pradesh State Board**
**for**
**Prevention & Control of Water Pollution**
**Secunderabad**

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IN (RETD)

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# REPORT OF THE SUB-COMMITTEE ON ECOLOGICAL SURVEY OF KOLLERU LAKE

## 1.0 Back ground information:

1.1 The Kolleru Lake is a large wet land having a natural depression which gets filled up with Fresh Water. The total catchment area of this Lake is around 4600 Sq.K.Ms. The maximum estimated inflow is 1,10,920 cusecs. The only outlet from this lake is Upputeru, which is 39 miles (63 K.M.) long and joins the Bay of Bengal. This lake lies between latitude 81°05' and 81°21' E occupying parts of West Godavari District and Krishna District of Coastal Andhra Pradesh. The Lake area is surrounded by densely populated villages and there are some Island villages as well. Sreeparru on the Northern side, Kaikaluru and Akiveedu on the Southern side are the important transportation nodal points. Kolleru Lake is 20 K,M. from Eluru Railway Station on Vijayawada Waltair Railway line. Regular ferry services are available from Akiveedu and Kaikaluru to the Island villages of Kolleru Lake. Two Rivers Budameru and the Tammileru, drain into the Lake. This water gradually leaves the Lake and flows into Upputeru (outlet) which conveys it to Bay of Bengal. The Kolleru Lake in addition to its bountifullness of Fishery resources, also provides a habitat for the migratory birds. The birds are indiscriminately killed resulting in depletion in their population.

1.2 The Indian Board for Wild Life in its IIIrd Session held from 14th to 16th February, 1958 recommended to protect the grey pelicans at Kolleru Lake in Andhra Pradesh and notify the lake as a Bird Sanctuary. Prof. K.K. Neelakantan, (Kerala State) after a detailed study submitted a report to Andhra Pradesh Government on 18-2-1961 recommending the protection of pelicans and

constituting a Bird Sanctuary. The Government of Andhra Pradesh in their G.O.Ms.No. 1986 F & A dated 11-9-1963, constituted the area of the Kolleru Lake along with 20 miles radius around the lake as a Bird Sanctuary. The Wild Life (Protection) Act, 1972 came into existance in 1972 and was made applicable to Andhra Pradesh State in August, 1973. Under this Act all the Sanctuaries notified earlier would be deemed to be Sanctuaries under this Act. Under Section 33 of the Wild Life (Protection) Act, 1972, the Chief Wild Life Warden shall be the authority who shall control, manage and maintain all Sanctuaries and for that purpose, within the limits of any Sanctuary.

a) may construct such roads, bridges, buildings, fences or barrier gates, and carry out such other works as he may consider necessary for the purposes of such sanctuary;

b) shall take such steps as will ensure the security of wild animals in the sanctuary and the preservation of the sanctuary and wild animals therein;

c) may take such measures, in the interests of Wild Life, as he may consider necessary for the improvement of any habitat;

d) may regulate, control or prohibit, in keeping with the interests of Wild Life, the grazing or movement of cattle;

e) may regulate, control or prohibit, any fishing.

## 2.0 The Committee and Terms of reference:

2.1 In the Ist Meeting of the State Level Committee on Environment (constituted in G.O.Ms.No.262, M.A., dated 28-5-76) under Agenda Item No. 4 "Specific Projects of Environmental Interests", it was suggested

that studies must be made of all aspects of ecology concerning the Kolleru. Accordingly the matter was discussed at the State Level Committee Meeting and all the members expressed fear about the degradation in the quality of water in the Kolleru Lake. Pesticides which enter the Lake have proved harmful to man when fish from polluted waters is consumed. It was therefore felt by the Committee that Environmental Studies on Kolleru Lake are necessary and the Lake should be saved before its Environment deteriorates beyond the point of no return.

Dr. P.G.Sastry, one of the members of the State Level Committee on Environment suggested that a committee be constituted to study the ecology of various Lakes in the State. The State Level Committee on Environment accepted the proposal and suggested that the committee comprising of persons from various disciplines be constituted to undertake Ecological Survey of Kolleru Lake, to begin with and to recommend to the Government for constituting such a committee as proposed by Dr.P.G.Sastry. The said committee will make suitable recommendations to the Government for safeguarding the Environment and Ecology of Kolleru Lake. Based on these discussions and the Minutes of the Meeting issued and also on the letter addressed by the Member-Secretary, Convenor of the State Level Committee to Government on 3-12-76, the Government of Andhra Pradesh in G.O.Ms.No. 154, M.A. dated 9-3-77 (Housing, Municipal Administration & Urban Development Department) issued orders constituting the "Committee on Ecological Survey of Kolleru Lake", apart from another committee on conservation of catchment areas. The terms of reference to the "Committee on Ecological Survey of Kolleru Lake" are, to undertake Ecological Survey of Kolleru Lake and to make suitable recommendations to

Government for safeguarding the Environment and Ecology Kolleru Lake. (A copy of G.O.Ms.No. 154, M.A., dated 9-3-77 is appended, Vide Appendix I).

3.0 Meeting of the Committee:

3.1 The Committee has met 5 times as follows:

i) First Meeting of the Committee held on 17-8-77 at 11.00 A.M. in A.P.State Board Office, Secunderabad.

During the meeting, it was decided to prepare guidelines on various problems concerning Kolleru Lake and for this purpose, it was felt desirable to collect information available with various Departments which will serve as baseline data to proceed with the Ecological Survey of Kolleru Lake.

ii) The Second Meeting of the Committee was held on 24-6-78 at 11.00 A.M. in A.P.State Board Office, Secunderabad.

The Committee has visited Kolleru Lake during 25th to 27th of June, 78 as was decided in the IInd Meeting of the Committee and held further discussions at site, during this field visit. After this visit, the Convenor of the Committee prepared a preliminary report on the Ecological aspects of Kolleru Lake and sent a copy to all the Members of the Committee for perusal and offer suggestions and comments at an early date.

iii) The Third Meeting of the Committee was held on 7-8-81 at 11.00 A.M. in the A.P.State Board Office, Secunderabad.

No comments on the Minutes of the third meeting were received from the members. In pursuance

of the decision taken in the Third Meeting, a questionnaire was prepared for collecting the information and communicated to all concerned with a request to furnish the information available with them.

iv) The Fourth Meeting of the Committee was held on 28-12-81 at Vijayawada and then the Committee visited the Lake on 29-12-81 and had a further meeting at Eluru on 30-12-1981.

v) The First Meeting of the Committee was held on 13-7-82 in Pollution Control Board Office, Secunderabad, to discuss the draft report prepared by the Convenor and finalising the report.

4.0 Hydrology of the Lake:

4.1 Kolleru is a wet land (fresh water body) lying between the Deltas of Godavari & Krishna Rivers, with a water spread of 260 Sq. Miles or 674 Sq. kilometers at contour (+) 7.00 feet (+ 2.14 meters). The capacity of the lake between + 3.00 feet and + 7.00 feet contour is 614 million cubic meters.

Four rivers, a few minor streams and ten Delta drains discharge into Kolleru vide statement enclosed. (Appendix IV). The total catchment area of all the streams and drains put together is 1839 Sq.Miles or 4600 Sq.Ms. The mean annual rainfall in the catchment is ranging between 35 inches to 39.8 inches. The depth of water in the lake is only 3 feet to 5 feet for most part of the season and reaches a maximum depth of 10 to 13 feet in high floods.

The normal flood discharge into the lake is estimated at 66000 cusecs, with a C value of 500 for upland

catchment and a C value of 92 for Deltaic catchment. The total yield with a uniform C value of 500, will be about 75,000 cusecs. Upputeru river is the only outlet from the Kolleru Lake into the Sea. The river is 39 miles (63 K.Ms.) long and has a carrying capacity of 10,000 cusecs. This tidal river Upputeru is capable of gradually discharging the upland floods which are impounded in the depression i.e., wet land which is acting as a flood moderator. The maximum water levels in the lake for 65 years between 1916 to 1980 is furnished in Appendix V. (extract from the report of Shri Ramakrishnayya, Superintending Engineer). It is seen from the table that the maximum water level in the lake exceed (+) 7.00 feet in 34 out of 65 years. High flood levels of (+) 9.00 feet or more were reached in the years 1916, 1939, 1949, 1959, 1962, 1964 and 1978. The maximum water level touched is (+) 10.70 in 1964.

The Kolleru Lake is gradually silting and the rate of siltation is estimated at about 2.5 Cms. per year. A contour survey of the lake bed was done prior to 1900, and capacities of the lake worked out. During 1966-67 a fresh contour survey was done upto (+) 7 ft. contour. During 1972-74 a fresh survey was upto (+) 5 ft. contour. The survey indicates the reduction in the capacity of the lake vide Appendix VI.

4.2 Intrusion of Tidal Waters into the Lake:

Kolleru is a fresh water lake. The Upputeru river is the only outlet from the Lake into the Sea. The normal tide is (+) 3 feet. The summer tide is (+) 3 feet. The summer tide is (+) 5 feet. During the flood times the tidal effect i.e., salt water intrusion is not felt above mile 12/2. During normal periods the tide effect is upto Tadinada lock i.e., mile 8/0. Local enquiries reveal that

the tidal effect in summer is felt upto Upputeru road bridge i.e., mile 6/6. When Parentala Kanuma is deepened and joined to bed of Kolleru Lake for improving flood discharge capacity, it is feared that tidal effect may creep into Kolleru Lake and may endanger the quality of water affecting agriculture and pisciculture and Flora and Fauna generally. The risk increases as the summer water level in the lake falls down below (+) 3.00 due to improvements being carried out to Upputeru increasing its discharge capacity to 20,000 cusecs.

5.0 Irrigation & Agriculture:

5.1 A total of about 1,00,000 acres of land in the foreshore around the lake and also in the bed of the lake upto (+) 3 ft. contour is under cultivation. The first crop is a risk crop as the lands are subject to inundation by floods. The second crop is more stable and yields about 20 bags per acre and the cost of production is reported to be Rs. 1,000/- per acre. Transplantation in 2nd crop is being done as late as February and harvesting is done in Summer months. Due to late transplantation inadequacy of water is felt. About 40 Kgs. per hectare nitrogenous fertilizer is applied to the Ist crop and 120 Kgs. per hectare of fertilizer to the 2nd crop. The effective utilisation of fertilizer leaches into the lake waters, increasing the nutrient levels in the lake thus contributing to Eutrophication of the lake.

The problem of inundation of crops in and around Kolleru Lake bed, by flood waters and consequent loss to farmers was identified even prior to 1935 and the subject received continuous attention all these years. The issue, as to how far the Government is justified in spending public money to relieve submersion and reduce

the risk to farmers who raise the crop knowing well that the area is liable for submersion, was debated for long. Several schemes to control inundation, including reservoirs across, Budameru and Thammileru were suggested by British Engineers even at the beginning of this century but could not be implemented due to financial constraints, or other objections.

5.2 After the deluge caused in 1964 floods, Mitra Committee was appointed and this committee made the following important recommendations in 1965.

a) A reservoir on Budameru with 2000 Mcft. capacity.
b) Increasing the capacity of Brahmayalingam and Segupore Ammah tank to 500 Mcft. capacity.
c) A reservoir on Thammileru with 3000 Mcft. Capacity.
d) To increase the discharge capacity of Upputeru to 15,000 cusecs in the first instance and ultimately to 20,000 cusecs capacity.

The objective of widening the Upputeru is to limit the submergence of Kolleru Lake to a period not exceeding 7 days at + 7.00 ft. contour.

5.3 A fresh contour survey of Kolleru Lake bed conducted by the PWD (Irrigation Department) during 1974 to 1976 revealed that the lake bed was not at (-) 3 feet and is silted up by 3 feet and is no longer acting as a cushion for early floods. The number of streams and drains joining Kolleru are not effectively flowing down Kolleru, due to this siltation. It was therefore felt necessary to formulate a channelisation scheme, for Kolleru estimated to cost Rs. 197.60 lakhs. Under this scheme, it is proposed to excavate a main pilot channel

from Pedayadlagadi bridge to Parentala Kanuma for a length of 16 K.Ms and also to excavate link pilot channels to the inflowing drains for a total length of 80 K.Ms. The channel will have a bed width of 50 ft. (1st stage) and 150 ft. in 2nd stage. The work on this channelisation scheme is taken up and the work is in progress. So far an expenditure of Rs. 116.82 lakhs has been incurred out of an estimated cost of Rs. 192.60 lakhs (January, 1982).

Upputeru is being improved to carry a discharge of 20,000 cusecs ultimately when the lake level is (+) 7.00 ft. So far about 50 feet wide pilot channel was excavated and it will be widened, by another 100 feet as per proposals formulated by the Irrigation Department.

The other works taken up by the Irrigation Department to control inundation in Kolleru are as under:

1. Thammileru : A 3TMc reservoir is completed near Eernagudem. This will moderate the floods from Thammileru to 6000 cusecs from 16000 cusecs.
2. Budameru : 7500 cusecs of Budameru water is being diverted to river Krishna.

As a result of the above works the flood discharge into Kolleru is estimated to come down to 44,500 cusecs.

5.4 All the above measures will more or less bring about the desired objective of the Irrigation Department of limiting the submergence of Kolleru Lake area to a period not exceeding 7 days at (+) 7.00 feet contour and reduce the risk to the Ist crop upto + 7.00 feet contour considerably. But these very measures will

result in new problems to Kolleru Lake i.e., the problem of depleting the lake during dry season to very low levels of (+) 2 feet or (+) 1.00 ft. so as to make the lake unfit for navigation, on the one side and also the problem of scarcity of water both for agriculture and pisciculture affecting the yields, Flora and Fauna. As matters stand now, the fish yield from the lake has fallen from about 8000 tonnes per annum to 7000 tonnes per annum due to depletion of water level in the lake and disappearance of certain species of Flora and Fauna. This is also resulting in further extension of cultivation of lake bed even to lands below (+) 3 feet contour as these are exposed due to depletion of water level. It will be therefore necessary to construct a regulator either across Upputeru near the Road bridge or across Parentala Kanuma connecting Upputeru to facilitiate maintaining a minimum water level in the lake to facilitate navigation and protect Pisciculture and also to prevent tidal intrusion into the lake waters.

6.00 Aqua-culture in Kolleru Lake:

6.1 Kolleru is the biggest freshwater lake in the State of Andhra Pradesh and is a unique Fishery resource noted for 'live fish' exported daily in live fish tin carriers to Howrah market. Properly estimated records of fish landings are not available. The Department of Fisheries estimates the production at 7000 tonnes per annum. This lake is also a natural source for other aquatic life like crabs, prawns, snails and wild fish on which migratory birds depend for their food.

The first ever attempt to have a plan for development of fisheries in Kolleru Lake was made in 1974. The results of these developments are the aquaculture tanks.

In the G.O.Memo.No. 4922/Fish/74-1, Forests and Rural Development Department of 9-11-74, a joint team consisting of officers of the Department of Agriculture, Fisheries and cooperation was constituted and entrusted with the task of suggesting among other things, ways and means of improving the Fishery resources of the lake. This team submitted its report in 1974. This was followed by constituting another special team (G.O.Memo.No. 664, P.W.D. dt. 9.6.1975) charged with the task of localising and demarcating the area failing between plus 3 ft. and plus 4 ft. contours with a view to identify the lands required to be set apart for Fishery tanks by raising and maintaining earthen bunds for fish production. This committee submitted its report in 1976.

6.2 In the meantime, based on recommendations made by the Collectors of West Godavari and Krishna Districts, and with the material furnished by the Department of Fisheries, Andhra Pradesh and funded by Andhra Pradesh Agricultural Development Bank, a scheme for construction of 70 tanks was formulated with a total outlay of Rs. 209.26 lakhs. These tanks were registered for primary cooperative societies of 100 fishermen each. 6711 fishermen were thus benefited.

35 numbers of 50 acre tanks (water spread 40 acres plus 10 acre bunds) in Krishna District and 35 tanks with 4 compartments each (total 50 acres) in West Godavari have been completed by 1980. These tanks were constructed by the societies themselves with the help of Panchayat Raj Engineering Department. All these were located at +3 contour. However, supplemental schemes have come up in 1980 resulting in another 26 tanks in Krishna and 16 in West Godavari District which have

encroached on +2 contour also now.

As per the discussions held with the Deputy Director of Fisheries, Kolleru and his Officers at Eluru, it appears all the tanks were excavated adjacent to water supply channels like Godavari canal. A few were adjacent to 'Jadas' and gundams (creeks & pools). It is indicated by the Fisheries Department Officials that there is no way to construct fish culture tanks at +4 contour and above, since there is no water supply source at that level.

The ponds have come into production during late 1979 and early 1980 only and started making some profits and societies are now paying off the arrear loans to banks. The average production per hectare in "A" category ponds (i.e., well-managed) is 1000 Kg which is relatively low as compared to research results given by National Institutes. Many of the tanks are also not well-managed by the registered fisheries cooperative societies under whom they function. If the existing tanks are managed, well, sufficient production can be expected without going into further encroachment by way of expansion, on +2 contour and still lower contours.

Besides the Government excavated ponds under ARDC finance, Several Private farms of an extent of 100 acres and more have come up in 1980 and 1981. These belong to patta owners and almost all of these farms are also between +2 ft. to +4 ft. contours. In fact most of these lands are under pattas only. It is not clear how these developments can be controlled now after heavy inputs have gone into them such as excavation, manure, feed and fertilizing costs.

6.3 The lake has got its own natural varieties of live

fish plus the major carps which are now being cultured in the tanks.

All the farms have heavy submergent vegetation like Jammu and floating vegetation like Ipomoea. But the area outside the farm bunds are also covered by heavy Eichhornia. As per all the reports Eichhornia has become a pest in the lake. Introduction of exotic species of fish such as the grass carp and silver carp in Fish ponds and the lake is not recommended at this stage.

6.4 The problem areas of Pisciculture Development in Kolleru Lake are:

1) Lack of water for fish culture tanks above +4 feet contour.
2) The private pisciculturists are excavating ponds indiscriminately, obstructing free-flow of water.
3) Indisciminate release of water from pisciculture tanks rich in unused feeds, faecal decomposed matter, resulting in pollution of adjacent water area.
4) The large inputs which have already gone into existing tanks, growth of stocked fish and the actual production must be closely monitored before any further expansion is taken up.

It is therefore necessary (1) to ensure water availability upto +5 feet contour. (2) To prevent pollution due to water letout from the fish ponds (3) Too many tanks of large expansion shall not be encouraged in the over all interests of the lake and to prevent obstruction to the free flow of water. (4) It is also necessary to deepen the jadas and gundams (creeks & pools) to maintain the natural fishery and other

aquatic life.

7.0 Forestry in Kolleru Lake Area:

7.1 It is reported that about 60 species of migratory Birds used to visit the lake every year and due to felling of trees which were serving as nesting grounds, the birds, stopped coming to the lake, and as a result the ecology of the Lake is affected. It is therefore necessary to allocate sufficient land around the lake for afforestation schemes and to plant trees. This measure will also prevent soil erosion and consequent siltation of the Lake.

Suitable trees like Acacia arabica, Barring-Tonia, Palmyrah, etc. may be planted in the peripheral areas of the Lake and in the islands of lake for enhancing the scenic beauty of the landscape, besides providing adequate nesting and resting places for the Birds, which are lacking at present. All un-inhabited islands in the Kolleru Lake, must be reserved for the exclusive use as foraging and resting grounds for the birds.

8.0 Wild Life:

8.1 Kolleru Lake has been listed as one of the most significant Wetlands in this sub-continent. A wet-land is any shallow lake or marsh with a depth not exceeding six meters. Its importance also lies in the fact that it serves as an important habitat for a large veriety of water birds, passerines (song birds & perchers) and a fair number of raptores (bird of prey). With a variety of eco-systems operating within the overall wetland environment consisting of the lake area served by a large number of inlets. It provides a spread of conditions and factors highly conductive to attracting a wide

spectrum of birdlife resident and seasonal migrants.

8.2 The present situation, considered in the light of the major and ornithological tragedy which overtook Kolleru in the early '60s cannot and should not be viewed with any sense of equanimity. This refers to Kolleru's erstwhile status as the largest Pelicanry in the sub-continent attracting a major concentration of the Grey Pelican (Pelecanus phillipensis) which used the lake and its environs for feeding on its main diet - fish - and for nesting activities. It was some time after 1973 that the Pelicans started deserting the area, resulting in a situation where no pelicans are now to be found anywhere in the vicinity of the Lake. This must be considered as a loss of major proportions, not merely because the birds have deserted the area but because of the ecological significance of this phenomenon. It is now an accepted principle that the desertion of any habitat by a single or group of species of fauna must be taken as a clear indication of loss of viability or degradation of the ecological factors associated with the species' compatibility with that habitat, in terms of diminishing food supply, lack of nesting facilities, human disturbance or loss of habitat values due to pollution. The desertion of Kolleru by the Grey Pelicans must be evaluated in this context and the causes are not difficult to identify. These are: (a) Human activity on an increasing scale (associated with) in addition to operation of numerous pumps throughout the year; (b) Pollution of the lake by heavy discharge of pesticides and insecticides affecting fish life, and (c) disappearance of suitable trees for nest building. A number of other factors such as setting up of fish tanks, rearing of domestic ducks etc., may have been additional reasons, any effort

towards getting the Pelicans to return to Kolleru must obviously take these factors into account.

8.3 A check-list of Birds to be found in the area over a 12 month period is an urgent necessity. Apart from its intrinsic value, it may well provide additional indications of habitat value of the Lake area, and also help in monitoring its health on a continuing basis. Some of the most significant species found in the area are 1) Jacana (2) Various species of storks (3) Herons (4) Wild Species of Ducks (5) Dartar (6) Cormorant (7) Large variety of passerines (8) Raptores.

8.4 Other Fauna:

Records and reports would indicate that Kolleru and its environs had in the past proved to be a suitable habitat for large and lesser mammals like Leopard, Sambhar & Chital, Jackal, jungle cat and a number of species of snakes and other smaller reptiles. Very little is known of their present status in the area and, here again, a check list would be valuable.

8.5 Flora:

The Lake area teems with a wide range of grasses, reeds, weeds and marine plants which require to be systematically tabulated for scientific study in terms of their relationship to the environment.

Herbal Plants:

Information would indicate that some 190 odd species of Herbal plants have been identified within the Kolleru Lake complex which are collected for Ayurvedic and other systems of medicine. This is a field which

obviously acquires special significance in the light of the importance being given to these systems of medicine by the Government.

Finally, it is probable that the catchment area of about 4600 Sq. Kilometers also provides additional habitat for a large variety of fauna and flora of which little is known at present, or at least recorded. The catchment area needs careful study with particular reference to soil stability in view of the heavy siltation of the Lake.

9.0 Human Habitation:

9.1 There are 122 villages in the lake area of which 46 are bed villages and 76 are belt villages. The population in these villages is around 2 lakhs. As the lake abounds in diverse varieties of fish of great commercial value, fishing is the main source of livelihood for the villagers. Agriculture is the 2nd important occupation for the people of Kolleru. The bed and adjoining lands of the lake above (+) 0.91 meters (+3 feet) are cultivated during Rabi Season (2nd crop) and the lands above +1.53 meters (+5 ft. contour) are cultivated, both for Ist and IInd crops. As the lake waters are depleted due to improvements to drainage, there is a tendency on the part of the villagers to encroach deeper and deeper into the lake bed i.e., even below (+) 3 feet contour.

9.2 Another important occupation of the people of Kolleru is duck-rearing as an ancillary to agriculture and pisciculture. Large number of Snails feeding on the tender shoots of aquatic vegetation in the Lake are hand picked bu local people to serve as feed for the ducks.

The ecological impact of these activities have to be carefully studied in terms of overall problems of conservation of the wet land of international significance.

9.3 The adverse impact of a large population of 2 lakhs inhabiting the lake area on the ecology of the lake and its environs is conspicuous. The tree cover in the belt area of the lake has been practically removed to convert land for agricultural use. Pressure of population has forced people to encroach into the bed of the lake for cultivation. Human and agricultural wastes are polluting the lake. Pressure has been put on the State Government to protect the lands below the bed of the lake even upto (+) 3 ft. contour from submergence, by improving drainage, thus forcing the lake to shrink. The roads are being formed across the lake to link villages fragmenting the lake into a number of ponds. Man has encroached into the nesting/resting and feeding grounds of the birds in the lake area. Some species of the Birds have now stopped visiting the lake. If further pressure of human population is allowed to be built up in the lake area the sheer hunger for land will result in further encroachment into the lake bed even below (+) 3 feet contour and the lake and the aquatic life in the lake may practically disappear and the lake area may be transformed into a Delta causing enormous damage to crops, property, and life in its foreshore area. If the lake is to be preserved and its ecological balance restored it is necessary to shift some habitation of the lake by resettiling them elsewhere. Vigorous family planning programme have to be launched in the area to restrict further growth of population in the area and to reduce pressure on land.

10.0 Communications:

10.1 The Kolleru Lake area is bounded by the Kaikaluru Akiveedu Road on the south and the Vijayawada - Eluru, Tadepalligudem road (NH) on the north. The Eluru - Kaikaluru link road cuts across the lake and is serving as a facility for transportation of fish to the nearest Rail Heads for Export. There is also a canal linking Agadala Lanka from Eluru canal and also a few roads linking Eluru to a number of villages on the northern belt. Unfortunately, the main road linking Eluru and Kaikaluru cutting across the Lake has become a serious hindrance to the free flow of water in the lake. Due to its blocking effect the western side of the lake is full of weeds and is getting silted up faster, such dimunition of flood moderation capacity of the Lake leads to the unaundation of lands under crops in many fertile villages of Krishna District.

The problem of blockage of water way in the lake is made more acute by the road building activity undertaken by the Panchayat Raj Engineering Department to form several roads across the Lake for providing communication facilities for Kolleru Lake villages under the minimum needs programme. The net work of roads proposed, criss-crossing the lake will completely alter the face of the lake and in combination with fish ponds scattered all over the lake, will fragment the lake into a large number of separate water ponds, bringing about a splintering effect, analogous to a broken mirror robbing the lake of its functional unity and terribly interfering with the flow of water through the lake, during floods, and promoting confinement of nutrients and pollutants

in the Lake area which can bring about adverse ecological chages that cause irreparable damage to the plant, animal and human population.

It is high time that we recognise the problem and put a halt to this road building programme and instead promote water ways with boat facility to promote communication between villages in the Lake area which will be in harmony with the eco-system of the Lake.

11.0 Pollution of the Lake by Industrial & Domestic & other Waste Discharges:

11.1 Due to domestic, industrial & Agricultural and other wastes discharged into the Basin of the Lake, the lake water is subject to pollution. There are about 15 drains and streams which bring water into the Kolleru Lake.

A statement showing the details of industrial effluents joining Kolleru Lake through different drains with all details such as location of industry, products manufactured, production capacity per day, raw materials used in the process, whether consent given or not, standards fixed in consent order, quantity of effluents per day, characteristics of effluent, point of discharge of effluent and treatment plant details if any is appended (vide Appendix VII). As could be seen from this statement, it is evident that about ten industries are discharging their effluents ultimately into Kolleru Lake.

Some more industries are in the process of being setting up in the vicinity of the lake Basin. Apart from the above industrial wastes finding entry into lake through the drains, there are lot of Agricultural wastes coming from the catchment area of the lake, through the irrigation drains and these wastes contain lot of

pollutants, due to usage of Fertilizers and pesticides in the Agricultural operations. The domestic effluents from the villages and Towns in the catchment area also find entry ultimately into the lake. As a result of all these waste discharges, the quality of lake water is getting deteriorated gradually.

The A.P.State Board for Prevention & Control of Water Pollution has directed all the industries to take steps for providing effluent treatment facilities in their premises and to ensure that the trade effluents conforming to the standards prescribed by the Board are discharged outside their premises. On directives of the Board some of the industries have taken action to put up effluent treatment works. The Board is monitoring the quality of trade effluents discharged by the industries periodically and taking action for directing the industries to take corrective steps wherever needed.

All Municipal Towns and Villages in the catchment area of the lake shall be insisted upon for treating their domestic wastes to the surface water standards before letting them out into natural drainage courses. All Municipal Towns in the catchment area have been directed to obtain the consent of the Pollution Control Board and they are being directed to go in for sewage and sullage utilization schemes for Agriculture purposes after providing adequate treatment. Similarly all Panchayats, Towns and villages are to be insisted upon and provided with adequate finance for treating the domestic wastes to the required standards. If major towns like Vijayawada, Eluru, Gudiwada, Tadepalligudem, Kaikalur, Vuyyuru, Hanuman Junction etc., are provided with adequate treatment facilities for sewage and sullage and if the

effluent is utilised for sewage farming considerable reduction in the pollution load entering the Lake can be achieved.

## 12.0 Eutrophication of the Lake and Physico Chemical Environment of Lake Waters:

12.1 The physico chemical environment of Kolleru Lake was studied by Dr. Rama Murthy in the year 1972. His findings are as follows: The wind is mostly Easterly and South-Easterly with an average speed ranging between 7.4 to 17.9 kilometers per hour. The lake area receives an average annual rainfall of 1000 mm. Based on the pH and other parameters of the water quality and environment, the lake can be divided into Eastern and Western zones and their characteristics are summerised as follows:

| Characteristics | Western Zone | Eastern Zone |
|---|---|---|
| 1. Temperature (ranges between 24° - 32°C) | High | Low |
| 2. pH | 7.2 to 7.8 | 7.8 to 8.2 |
| 3. Transperency (ranges between 30 cm to 138 cm) | Low | High |
| 4. Dissolved Oxygen (range 4 to 12 mg/l) | Relatively High | Low |
| 5. Bathymetry | Comparitively shallow | Comparitively higher depth. |
| 6. Sand silt clay ratio | Contains mostly clayey silt and silt. | Silty clay and clay. |
| 7. Organic matter | Relatively Low | Relatively high. |
| 8. $CaCo_3$ content | Comparatively Low | Comparatively High. |
| 9. Iron & Manganese | High | Low |

| | Characteristics | Western Zone | Eastern Zone |
|---|---|---|---|
| 10. | Potassium | High | Low |
| 11. | Phosphorous | Low | High |
| 12. | Copper, Zinc, Nickel & Molybdemn. | Low | High |

The extensive cultivation of the lands in and around the foreshore areas, extending deep into the lake bed upto (+) 3 contour accompanied by the use of fertilizers 60% of which leach into the Lake Waters, the industrial and Domestic effluents discharged into the drains or rivers flowing into the Lake. The silt carried into the Lake by the inflow of silt laden waters of Budameru and Thammileru are factors contributing to enrichment of nutrients in the lake leading to outrophication. The high nutrient levels in the Lake waters is supporting a luxuriant growth of macrophyte distribution through out the Lake resulting in extensive weed problem affecting fish production and drainage and navigation.

13.0 Aquatic Life in the Lake of special significance:

13.1 Studies on Weed biology of Kolleru Lake have been carried out by Dr. V.Seshavataram, Reader in Botony, Andhra University and Dr.B.S.M. Dutt, UGC Retired Scientist of A.N.R.College, Gudiwada. According to them the lake shows only littoral vegetation. The vegetation shows variation in different spots with the emergent, submerged and free floating aquatic macrophytes in the lake with a heavy incrustation of periphytum on them.

13.2 The list of aquatic plants encountered during the survey include (a) Emergent plants occuring on exposed or submerged soils such as 1. Phragmites Karka trin 2. Typha aungusta ta Boary and Chaub 3. Scirpus articulatus

linn and 4. Paspalidium germinetum skept (b) floating leaved Hydrophytes such as 1. Apnogeton Grispum thumb 2. Nymphaea noucheli Bun 3. Alternathera sessiles 4. Ipomoea aquatica forsk (c) submerged hydrophytes which grow in submerged soils soils at all water depths such as 1. Villeshneria spiralis 2. Blyxa octandra, 3. Limnophila indica etc., (d) Free floating hydrophytes occur on standing and slow flowing waters. Examples are 1. Salvinia auriculata, 2. Utricularia stellarys, 3. Pistia stratiotes. It will be worthwhile to investigate into the potential of many aquatic mecrophytes of the lake as a source of compost, fertiliser, feed for live stock, fibre for paper making and also as source of human food. It is reported that Ipomoea aquatica, a common weed of Kolleru Lake is an important vegetable crop in Hong Kong.

13.3 Phytoplankton, comprising of different algal species is present in the lake water. However algal blooming and subsequent depletion of oxygen in the lake have not occurred. This is due to a very luxuriant growth of macrophytes distribution through out the lake, which is probably responsible for the decrease in phytoplankton population.

13.4 The following aquatic fauna also occur in the lake.

1. Six species of snails.
2. Prawns & crabs.
3. 13 species of Fish such as Labco Rohita, Cyprinus, Carpio, Cirrhina Marigela, Catla-catla, Murrel etc.

14.0 Soil Conservation:

14.1 The Lake is surrounded by alluvium on all sides. About 10 K.M. towards West, North West and North East of the Lake, Geological formations of Khondolites, Gondwanas, Deccan traps and tertiary sendiments are present. No soil conservation schemes are under implementation in the catchment of the lake except for a few scattered plantations. Due to the depletion of vegetative cover in the catchment area that has taken place over the years, the soils are getting eroded and washed down into the lake, through the flood waters of Thammileru and Budameru and other drains and the lake is getting silted up at the rate of 2.5 Cms. per year. It is learnt that the Deputy Director, Soil Conservation, Anakapalli is taking up a study of soil conservation status in Kolleru. It is necessary that this study is completed early and soil conservation schemes including afforestation schemes in the Kolleru catchment area are formulated and implemented in a time bound programme to arrest the siltation of the lake and protect the soil cover in the catchment area of the lake.

15.0 Tourism:

15.1 The Kolleru Lake is a source of delight for those who admire the beauty of Nature and love recreation activities like boating, fishing and bird-watching. A number of colourful migratory birds from as far away as Siberia used to arrive here during October and depart by the middle of April, There are more than 60 species of birds and a bird sanctuary in the area. The Lake still attracts colourful migratory Birds like Storks etc. However due to the occupation of the islands by man,

destruction of trees on which these birds used to rest their number has dwindled. Eleven species of water birds and 35 species of perching birds are identified.

15.2 The Tourism Department has proposals for development of Tourism in Kolleru Lake area at a cost of Rs.22,50 lakhs. Any development undertaken by the Tourism Department shall be in consonance with the ecological requirement of the Lake and the Wild Life protection Act.

16.0 Studies made:

Kolleru Lake being a Wet land of International importance attracted the attention of several Scientists and Engineers who made studies on various aspects of the lake, and the information provided by the authors in their reports has been of considerable help to the committee in understanding the problems of the lake. The reports made available to the committee are briefly indicated in Appendix VIII.

17.0 Problems faced by the Kolleru Ecosystem and corrective action to be taken:

17.1 The scenario presented in paras supra indicates the ecological crisis faced by the Lake. The problem areas can be summarised as follows:

1. Rapid siltation of lake with consequent loss of flood absorption capacity and flooding of catchment areas upto (+) 10 feet contour. The causal factors are depletion of vegetative cover of catchment area of the lake, leading to soil erosion obstruction of water ways by indiscriminate construction of roads and fish ponds and inadequate capacity of upputeru drain to provide for flood discharges. The Irrigation Department has formu-

lated and is executing schemes for improving drainage to prevent submersion of lands in the catchment area of the lake above (+) 7 feet contour by widening and deepening Upputeru to increase its discharge capacity to 20,000 cusecs and digging pilot channels in the lake from Pedayadlagadi bridge to Parentala Kanuma.

2. . Depleting the water in the lake to as low a level as (+) 3 feet contour in dry season resulting in (i) shrinkage of lake area (ii) Encroachment of lake bed, by people, extending agricultural operations upto level (+) 3 feet and (iii) In adequacy of water for Aqua culture. The causal factor is the lack of a regulator on the outlet system i.e., the Upputeru river to maintain a minimum water level in lake around (+) 5 feet contour.

3. The desertion of the lake by the pelicans, and great loss of Bird Life in the Lake, seriously affecting the viability of the lake as a Bird Sanctuary.

The causal factors are (i) Degradation of Ecological factors of the lake associated with species compatability with their habitat, in terms of diminishing food supply, lack of nesting facilities, and loss of habitat value due to pollution (ii) Human activity on an increasing scale associated with operation of numerous pumps throughout the year (iii) Cutting of trees resulting in disappearance of suitable trees for nest building (iv) Construction of innumerable fish tanks and rearing of domestic ducks may be the other factors.

4. Eutrophication of the lake resulting in extensive weed growth affecting the fauna and flora in the lake and causing ecological imbalance. The causal factors are (i) pollution of lake waters by Nitrogen and phosphorous

fertilizers and pesticides, used for agriculture and extension of agriculture into lake bed (ii) pollution caused by domestic and industrial waste discharges and discharge of polluted waters from aquaculture ponds (iii) soil erosion and consequent silting of the lake and increase in phosphorous levels in the lake due to deforestation and soil erosion and waste discharge.

5. High population pressure in the lake area resulting in excessive ecological demand on the lake and its environs by way of agricultural and fish production and distrubance of the ecosystem of the lake by encroachment, Road building, Tree cutting pollution, and destruction of wild life.

17.2 The corrective action lies in ensuring that the lake is not bled dry in summer but a minimum water level of about (+) 5.00 feet is maintained by constructing a suitable regulator on the outlet system, and developing a proper land use pattern for the peripheral area of the lake between (+) 5.00 feet and (+) 10.00 ft. contour, based on aerial photographic surveys and demarcation of areas for afforestation, fruit gardens, agriculture, pisciculture, feeding and nesting area of birds, Tourism etc., in consonance with the provisions of the wild life protection Act, 1972 and the Ramsar Convention. Schemes have to be evolved for shifting of population from some areas of the lake including islands which are suitable to serve as feeding and nesting areas for birds, so that there is no disturbance to bird life due to human activity and other areas to the extent possible. Alternative means of livelihood for the desplaced population such as Brackish water fisheries, handicrafts, salt manufacture along the sea coast and Upputeru. Duck rearing may be considered in the selected areas in the belt villages.

Family planning schemes have to be introduced in the lake area on an intensive scale to check the growth of population and consequent pressure on the ecological demand on the lake.

Pollution of the Lake from agricultural drainage, fish pond discharges, industrial and domestic wastes has to be controlled. Afforestation and soil conservation schemes have to be promoted. The construction of roads across the lake to link villages has to be stopped and the fish ponds obstructing the water way shall be re-modelled to ensure adequate water way.

Periodical removal of the weeds in a controlled manner in the lake in areas other than those earmarked for birds shall be carried out to reduce nutrient levels to acceptable limits, without giving scope for algal blooms.

All developmental activities in the area are to be planned so as to be in harmony with the ecological balance of the system.

18.0 Studies to be made:

18.1 To ensure development of the lake and its hinter land on sound ecological lines and restore ecological balance in the lake by reversing the process of Eutrophi-cation, it is necessary to carryout scientific studies on several aspects of the lake relating to Hydrology, Geo-morphology, ecology, and soil conservation status in the catchment area. It is necessary to organise aerial photographical studies of the lake area to identify present land use pattern, areas affected by soil erosion, available in and around the lake, both surface and sub-surface resources to draw up programme for conservation

and development and establishing nature reserves and promoting the growth of water fowl population in the wet land. A detailed study of the fauna and flora, in the lake and its environs has to be undertaken and documented. The changes in the ecological character of the wet land and its water shed, brought about by development, pollution or other human interference, has to be continuously monitored. It is also necessary to carryout a detailed socio-economic study of the people in the region, plan rehabilitation programmes for the people to be evacuated from the lake area, to restore the ecological balance of the lake (vide note on international values of wet lands as appended in Appendix - IX).

19.0 Summary of Recommendations:

The study now made by the committee on Kolleru brings home the urgent need for an ecological approach which enables water quality control in the lake to be set up in a broader context than in the case when human interests only are adopted as the sole criteria. Any activity in the sanctuary area which is not in accordance with the provisions of the Wild Life Protection Act, 1972 will have to be referred to the Government of India in the Ministry of Agriculture. The committee therefore makes the following recommendations, for safeguarding the environment and restoring the ecological balance of the Kolleru Lake and its environs, and reclaim the lake as a Bird Sanctuary.

1. Full lake level contour of Kolleru shall be fixed at (+) 7.00 and no agriculture shall be allowed below this contour and all private land in the lake bed below this level shall be acquired by the State and any land

assigned to private party shall be resumed by the Government.

2. a) Land use pattern for the peripheral area around the Lake shall be developed between (+) 5.00 feet (+) 10.00 feet contour or upto the limit of the sanctuary demarcating areas for afforestation, fruit gardening, agriculture and pisciculture and bird sanctuary (Nesting area), Tourism. This planning shall be preferably based on an aerial photographic survey of the Lake region.

b) A socio-economic survey of local population to identify all existing activities which are conducive to the disruption of Environment and are in contravention of the existing Environmental laws shall be made and such activities listed out, and formal clearance obtained from the concerned authority in order to establish a base data for future activities.

3. The fringe area around the lake between (+) 7.00 contour (+) 3.00 contour shall be reserved for afforestation and fruit gardens.

4. A minimum of 2000 acres at Agadalalanka on the north east part of the lake and the islands in the lake shall be reserved as nesting area for the bird sanctuary, as a complex of varying habitats suitable for a large spread of species already found in the area and in particular the water fowls and all human settlements from the area shall be evacuated and people settled elsewhere. The fish ponds if any in this area shall be abandoned.

5. The existing fish ponds (aquaculture ponds) obstructing the water way shall be removed or remodelled to ensure adequate water way. Further construction of

aquaculture ponds shall be discouraged. Instead wild capture of fish shall be promoted except by set nets. In the areas set apart for birds no fishing operation shall be allowed and every effort shall be made to transfer the present human settlements to equally viable areas in the neighbourhood.

6. The construction of roads across the lake waters to link villages shall be stopped forthwith. Instead water ways shall be promoted to link the village. Existing roads causing obstruction to water way shall be dismentled or remodelled to provide adequate water way.

7. Soil conservation and afforestation schemes in the catchment area of the lake shall be formulated and implemented to prevent soil erision. Check dams shall be constructed across all the drains discharging into the lake to minimise transportation of silt into the lake.

8. A regulator shall be constructed acorss Upputeru to facilitate maintaining a minimum water level at (+) 5.00 feet in the Kolleru Lake. The Upputeru shall be widened deepened and provided with adequate bed slope to ensure a minimum discharge capacity of 15,000 cusecs.

9. Brackish water pisciculture and duck rearing and salt manufacture shall be promoted along the sea coast and Upputeru, to rehabilitate people evacuated from Kolleru Lake area, after carrying out a socio-economic survey of the people living in the area. The estuary of the Upputeru shall however be left free. Family planning scheme shall be introduced in the Lake area in an intensive scale and vigorously pursued to restrain the growth of population.

10. Industrial waste water discharged into the drains

or water courses leading to the Lake shall be treated to surface water standards as laid down by the Pollution Control Board. The Phosphate level in the effluents shall be brought down to 1 mg/lit, and the promotion of industries around the lake within the sanctuary limits shall be discouraged.

11. Domestic waste waters and sewage from towns and villages around the lake shall be treated to standards stipulated by Pollution Control Board and the effluent shall be put to agricultural use. The possibility of providing an intercepting drain alround the lake to divert, drainage water from agricultural fields from entering the lake shall be urgently explored and these measures will improve the soil conditions for afforestation.

12. The A.P.State Board for Prevention & Control of Water Pollution shall establish a monitoring station at Eluru to regularly monitor the effluent water quality from industries and towns and villages around the lake and also the quality of the lake waters. A hydrobiological station with Laboratory facilities shall be established for monitoring ecological quality of the lake water.

13. The industrial waste waters entering the Chandrayya Drain, which discharges into Kolleru shall be diverted to the Sea through Mullapudi Drain. This work which is already taken up shall be completed on a war footing.

14. Periodical removal of undesirable weeds in a controlled manner in the lake in areas other than those earmarked for the Birds shall be carried out to reduce nutrient levels in the lake to acceptable limits. The possibility of utilising weeds Jammu & Kikkus in Paper

Industry and weeds like water hyacinth for production of Biogas, or cattle feed shall be explored. The scope for Hindicrafts shall be explored and encouraged.

15. The scope for Biological control of weeds in the Lake shall be explored in consultation with common wealth Biological control organisation, Bangalore.

16. A crash programme for the conservation of the Ecosystem of the Lake based on scientific studies relating to Hydrology, Geomorphology and ecology of the Lake and preferably Aerial photographic techniques to identify present land use pattern, area affected by soil erosion and resources available in and around the Lake shall be evolved. A detailed study of the Fauna and Flora in the Lake and its environs shall be undertaken and documented.

17. All major development activities in and around the sanctuary area shall be taken up only after preparing an Environmental Impact Statement.

18. The primary concern of the Kolleru Lake development committee shall be for the conservation and restoration of the Ecosystem of the Lake and any development activity undertaken shall be in conformity with this primary objective. Therefore, this authority shall be renamed as Kolleru Lake Conservation Authority and shall be provided with adequate funds to take up conservation schemes on the lines of the these recommendations including necessary scientific studies to be made in this regard.

19. The Kolleru Lake conservation authority shall have a few specialists knowledgable in the fields of Hydrology, Ecology, Forestry and Wild Life Conservation and Fisheries

Science and Pollution Control as Members duly nominated by the State Government to advise the authority on various aspects of development to promote conservation.

| Sl. No. | Name of Member | Designation | Signature & Date. |
|---|---|---|---|
| 1. | Prof. T.Shivaji Rao, | Professor of Environmental Engineering & Principal, Andhra University Engineering College, Waltair (Chairman of the Committee) | Sd/- 4-8-82. |
| 2. | Dr. Iqbal Ali, | Director, A.P.Engineering Research Laboratory, Himayatsagar, Hyderabad (Member) | Sd/- |
| 3. | Sri Y.S.Murthy, | Scientist & Head, NEERI Zonal Laboratory, R.R.L. Campus, Tarnaka, Hyderabad. (Member). | Sd/- |
| 4. | Dr. P.G.Sastry, | Professor & Head of of Water Resources and Civil Engineering, Regional Engineering College, Warangal - 506 004. (Member). | Sd/- |

| Sl. No. | Name of Member | Designation | Signature & Date. |
|---|---|---|---|
| 5. | Sri N.Anjaneyulu Naidu, | Director of Agriculture, Government of Andhra Pradesh, Hyderabad (Member). | Sd/- |
| 6. | Sri M.L.Swamy, | Engineer-in-Chief, (I & P) Department, Erram Manzil, Hyderabad. (Member). | Sd/- |
| 7. | Capt. N.C.Tyabji, | Hony. Representative World Wild Life Fund, (India), 624/1, Road No. 10, Banjara Hills, Hyderabad. (Member) | Sd/- |
| 8. | Sri H.K.Babu, I.A.S., | Director of Fisheries, Government of Andhra Pradesh, Hyderabad (Member)<br><br>Please see remarks vide Appendix XI. | Sd/- 13-8-1982. |
| 9. | Sri A.K. Mathur, | Chief Conservator of Forests, Government of Andhra Pradesh, Hyderabad. (Member) | Sd/- |

| Sl. No; | Name of Member | Designation | Signature & Date. |
|---|---|---|---|
| 10. | Sri S.M.Balasubrahmanyam, I.A.S., | Director of Tourism Government of Andhra Pradesh, Hyderabad (Member). | Sd/- |
| 11. | Sri P.Ramayya Naidu, | Member-Secretary, A.P.State Board for Prevention & Control of Water Pollution, Secunderabad. (Member-Convenor). | Sd/- |

# A P P E N D I X - I

## GOVERNMENT OF ANDHRA PRADESH

## ABSTRACT

COMMITTEE - State Level Committee on Environment - Meeting held on 20-11-76 - Recommendations for formation of Committees - Constitution - Orders - Issued.

-x-x-x

persons from various disciplines to undertake ecological survey of Kolleru Lake and to make suitable recommendations to Government for safe-guarding the Environment and ecology of Kolleru lake.

iii) Formation of two working groups to deal with various problems associated with the environment in consultation with the Secretary to Government, Housing, Municipal Administration & Urban Development Department.

3. The Committee has also suggested that the Andhra University may set up an Institute for Environmental Studies and take up the matter with the University Grants Commission.

4. The Government after careful consideration have decided to constitute the committee with the following members for the purposes referred to in recommendations (i) and (ii) above.

COMMITTEE ON CONSERVATION OF CATCHMENT AREAS

| | | |
|---|---|---|
| 1. | Secretary to the Govt. of Andhra Pradesh, Major Projects Department. | Chairman |
| 2. | Secretary to the Govt. of Andhra Pradesh, Housing, Municipal Administration & Urban Development Department | Member |
| 3. | Secretary to the Govt. of Andhra Pradesh, Forest & Rural Development Department. | Member |
| 4. | Secretary to the Govt. of Andhra Pradesh, Irrigation & Power Dept., | Member |
| 5. | Secretary to the Govt. of Andhra Pradesh, Panchayat Raj Department. | Member |
| 6. | Member-Secretary, A.P. Pollution Control Board. | Member |

| | | |
|---|---|---|
| 7. | Chief Conservator of Forests. | Convener. |

COMMITTEE ON ECOLOGICAL SURVEY OF KOLLERU LAKE

| | | |
|---|---|---|
| 1. | Prof. T. Shivaji Rao,<br>Andhra University, Waltair. | Chairman |
| 2. | Dr. Iqbal Ali | Member |
| 3. | Sri Y.S. Murthy, NEERI, Nagpur. | Member |
| 4. | Dr. P.G. Sastry,<br>Regional Engg. College, Warangal. | Member |
| 5. | Director of Agriculture. | Member |
| 6. | Chief Engineer ( Major Irrgn.&Gl) | Member |
| 7. | Member-Secretary,<br>Water Pollution Control Board. | Convener. |

5. The Government hereby direct that the committee shall be treated as first class committees and the members of the above committees who are residing outside the Hyderabad City and the Andhra Pradesh State, be paid the travelling allowance and daily allowance admissible to the Class I Officers under the Andhra Pradesh Travelling Allowance Rules.

6. The expenditure in this regard shall be met from the funds of the A.P. State Board for Prevention & Control of Water Pollution.

7. The Member-Secretary of the Board is authorised to draw and pay the travelling allowance and daily allowance as ordered above to the members as and when the meetings are convened.

8. The Registrar, Andhra University is requested to take up the matter relating to setting up of an Institute for Environmental Studies in the University with the

University Grants Commission without any commitment on the part of the State Government or the State Level Committee on Environment.

9. The proposal relating to the formation of working groups to deal with the various problems associated with the environment is deferred for the present.

(BY ORDER AND IN THE NAME OF THE GOVERNOR OF ANDHRA PRADESH)

G.V. RAMAKRISHNA
SECRETARY TO GOVERNMENT.

To
All the members concerned.
The Member-Secretary, A.P. Pollution Control Board &
Convenor State Level Committee on
Environment, H.No.6-6-115/124, Kavadiguda,
Secunderabad.
The Registrar, Andhra University, Waltair, A.P.(with C.L)
Copy to the Chief Engineer, PH, Hyd. A.P.
Copy to the General Administration (Services-C) Dept.
Copy to the O.P. (Circulation) Dept.
Copy to the Secretary, Education Dept.

// FORWARDED BY ORDER //

Sd/- Section Officer.

// true copy //

21/8/82

*cud/-

21/8/82

ACCOUNTS OFFICER,
POLLUTION CONTROL BOARD,
SECUNDERABAD.

# A P P E N D I X II

## EXTRACTS FROM THE ORIGINAL REPORT ON THE PELICANRY NEAR THE KOLLERU IN WEST GODAVARI DISTRICT AND RECOMMENDATIONS FOR ITS PROTECTION AS AN OFFICIALLY CONSTITUTED BIRD SANCTUARY.

BY

K.K.NEELAKANTAN,
PROFESSOR OF ENGLISH,
UNIVERSITY COLLEGE,
TRIVENDRUM, (KERALA STATE).

(SUBMITTED TO GOVERNMENT OF ANDHRA PRADESH IN 1961).

### I) (1) Location of the Pelicanry:

The pelicanry is situated in the area laying between the towns of Ganapavaram and Undi in the West Godavari Dist. It lies between latitudes $16^{\circ}35'$ and $16^{\circ}45'$ and longitudes $81^{\circ}25'$ and $81^{\circ}30'$. It is 7 to 8 miles east of the Kolleru Lake.

### I) (2) History of the pelicanry:

To the best of our knowledge, the pelican seems to have nested for many generations near Sarepalli village and, south of it, at Aredu village. According to the villagers, Aredu was the place favoured by the birds for 60 to 70 years at least. In the early 1940's, the villagers of Aredu prevented the Pelican from settling down in its accustomed breeding places. Consequently the birds moved a few miles north and began to concentrate near Sarepalli and the area just south of it.

Till 1955 the birds nested in the neighbourhood of Sarepalli, but then they moved south again and, for the first time, colonised the area just west of Kolamuru villages. In 1960-61, presumbly because of harassment at the 1959-60 site, the birds had moved nearer to Kolleru village, extended the nesting area upto Aredu, and built some 200 nests at least at Sarepalli.

Though there is evidence of periodic shifting of their nesting sites by pelicans, it is at the same time quite obvious that so long as they are left alone, the birds move about only within a very limited area. Therefore, the area within the towns and villages of Ganapavaram, Pippara, Gollalakoderu, and Akividu alone need by proclaimed as the sanctuary for the present. ITS BOUNDS WILL BE:

The Venkayya-Weyyeru canal in the West;
the Ganapavaram-Pippara road in the north;
the Pippara-Bhimavaram canal in the east;
and the Akividu-Undi road in the south.

Approximate are:- 35 Square Miles.

The existence of this pelicanry was not known to naturalists till 1949, between 1949 and 1959 the numbers have increased, indicating a possible desertion of smaller breeding sites elsewhere (due to adverse conditions and persecutions perhaps) and a greater concentration at the Kolamuru Pelicanry.

I. (3) <u>The Importance of this Pelicanry:</u>

This is the only pelicanry where the GREY PELICAN is known to be breeding and flourishing in such numbers. The only large pelicanry known to science was in Burma in the sitting plain below Shwegying. This has competely been wiped out by the development of the area. (See Smythesis: Birds of Burma, 1953). The only major breeding place of the Grey Pelican in the world is the one under report. (It is desirable to give a name to this pelicanry. I suggest that the pelicanry be named after a universally respected leader of the Andhra people so as to appeal to popular sentiment).

If this unique colony is not afforded proper protection, no important pelicanry will exist anywhere, and the Grey Pelican may even become extinct. Apart from the sentimental and scientific aspects, there are economic factors which shall be discussed later.

Suffice to say, for the present, that the disappearance of this pelicanry will be serious and irredeemable loss to the Andhra State as well as to the nations.

II. The Breeding Habits of the Pelican:

The Grey Pelican spends about 9 months every year at the pelicanry. Outside this period the huge flocks disperse all over the country and their movements are only imperfectly known. Many hundreds seem to remain in the neighbourhood of the pelicanry during these 3 months also. It will not be wrong to say that a proportion of the breeding population of pelicans remains throughout the year in this region in and around the Kolleru lake and the south of it upto the seacost and the Guyyeru creek.

At the pelicanry the birds arrive in September or October and they leave only in May or June.

These dates are based on the report of the local people, but there is remarkable unanimity of opinion with regard to them, they are not likely to be wrong. For the present purpose, we may take it that the pelican arrives in September and leave in June.

Soon after their arrival at the breeding place, the birds begin nest-building. Nests are placed on palmyra (toddy) palms, bushy-topped trees like the rain

tree, the Babool, the Jambool tree etc., Coconut and mango trees are also occupied where these are present, but at the Kolamuru site these trees of economic value are almost absent. The nests are constructed of sticks and straw. The straw is gathered after the harvest, and the quantity used by the birds is such a small percentage of the total yield that most farmers do not resent the loss.

By about the end of November or early in December the birds lay eggs. Average number of eggs per nest is three. The eggs are hatched by January and most of the young ones are fully fledged by April. In or just before June the birds disappear from the pelicanry. The pelican is a social species and prefers to nest in fairly compact colonies. On a single palmyra tree there may be as many as 4 or 5 nests. On certain large, many-branched trees (like the Rain Tree), there are at times as many as 30 nests. This concentration of nests and birds in a comparatively small are is an important factor in protection as will be explained latter.

The food of the pelican is fish fresh-water of brackishwater fish. This is obtained from the Kolleru Lake and from various other sources such as the swamps, cannals, rivers and tanks. During different parts of the year the birds seem to favour different feeding places. In August and September when the rains have flooded the 'Balnks' (the uninhabited, flat areas south of Akividu, Undi and Bhimavaram - mainly in the Bhimavaram and Kaikalur taluks) large flocks of pelicanas regularly haunt these areas and fish in the shallow water. In March, April and May large flocks hunts the Kolleru and forage there. In between they appear to obtain much of their food from the innumerable cannals, tanks etc., nearer the pelicanry. As I

have not had the facilities for a systematic and thorough study of the food-sources of the pelican, it is not possible to give a more precise account of this aspect. However, for the present purpose, it is enough to state that all waters in and around the pelicanry to a distance of 15 to 20 miles from Aredu to Kolamaru, and the entire Kolleru Lake form the source of food for the pelicans breeding at the pelicanry.

Though the staple diet of the pelican is fish, it is not an enemy of the fishermen. Neither fishermen nor the other inhabitants of the area look upon the pelican as a pest in this regard. The Assistant Fisheries Inspector, Akividu, whom I met in December, 1959, was also of the opinion that the pelican was not a pest to the industry. It is only a fed 'educated' persons, who have no knowledge at first hand, who assert that "two pelicans can eat up all the fish in a tank in a few minutes".

Considering the fact that fish is abundant in the area and satisfies all the requirements of fishermen, it is evident that the pelican's activities do not injured the fishing industry.

A very important economic factor is that the Pelican's excreta (guano) is rich in phosphates and other chemicals of inestimable value as fertilizers. As the pelicans build their nests on field and canal bunds, and spend hours soaring about over the paddy fields, a major portion of the guano is deposited, widely scattered, in the area. The guano falls into the water, dissolves and gets distributed all over. The benefit occuring from the addition of this excellent natural fertilizer is not realized by all the farmers of the locality, but many appreciate it; and agricultural experts consulted by me have unhesitatingly declared that the benefit must be very great.

The consensus of opinion among local people is that the birds do very little harm and that theie droppings are of real value as manure. Some villagers regularly collect the guano and use it as manure for fruit trees.

(The value of guano as manure is so great that in some parts of the world the state gets a good prpportion of its revenue by selling the guano. Peru, South America, for example depends on the guano produced by a close relative of the pelican for most of its revenue).

III. Dangers to which the Birds are Exposed:

1. General: Till recently the pelican was well protected in this region because the villagers respected the triditional principle of protecting these friendly and harmless birds and had sentimental objection to disturbing them. Hindus, who are in a majority in the locality, had sentimental objection to eating the flesh and eggs of the pelican. Moreover they did not relish the taste of the pelican's flesh and there was no market for pelican flesh or eggs. During the past 12 years or so there has been a change in the attitude of the local pelple. Now only a few villagers earnestly desire to protect the birds. Many are absolutely indifferent. Some even resent the presence of the pelican, and would like to prevent it from nesting in their trees. In the Kolleru area many low caste Hindus have begun to eat the flesh of the pelican.

There is also evidence of a recent trend to trade in pelican flesh (especially of the young ones) and eggs. Against organized gangs which set out to kill the pelican or to carry away its eggs and young, the few villagers who wish to protect the birds are quite helpess.

2. Outside the Pelicanry:

(a) At Matlam and Peddalanka:

Before arriving at the pelicanry and settling down to breed, pelicans congregate in July, August, September, October and even in November, in the vast, uninhabited 'balnks' which are under water for most of this period. Especially near Peddalanka, the pelican is numerous in September, October, and November. Then numbers rapidly decrease till the middle of January. From mid-January till the end March hundreds of pelicans come to this area to feed. They spend much of their time in the Matlam drain. Some sportsmen are said to be in the habit of coming to shoot the pelican purely for fun during this period.

An old man of 90, permanently residing at Matlam, said that till 1957 very large flocks of pelicans used to visit the area from August to February. He thought that the conversion of the 'Blanks' into paddy fields and the shooting by sportsmen were responsible for the marked fall in numbers.

The Matlam-Peddalanka-Putlapudilanka area appears to be an important forging place for the pelicans through out the year. In December, 1960, I saw large flocks of pelicans overhead at Matlam and Peddalanka through the local people said that very few pelicans visited the locality then.

(b) The Guyyeru creek area (Girisipudi, Ollanka and Naida-marru Island:

The pelican seems to visit this locality in large number only in April when most shallow waters have dried up. Here the pelican is shot at times for its flesh as

well as for the skin of the pouch out of which drum-heads are made. The professional duck-hunters, who regularly shoot and net ducks in large numbers, leave the pelican alone. But the recent discovery of a market for pelican flesh in the towns might make these men shoot and trap the pelican also.

(c) At the Pelicanry (Saripalle, Aredu and Kolamuru):

As has been mentioned already, the inhabitants of this area are no longer very zealous in protecting the pelican. Sentiment has lost its hold over them and sentimental tolerance of the pelican evokes only contempt in the younger generation.

There is a superstition that the egg of the pelican is a remedy for leprosy, but loss of eggs on this count is not at all serious. A more dangerous supertition is that the quano of the pelican encourages the growth of weeds and injures the paddy. Among those with whom I discussed this notion was Mr.Gangaprasada Rao, Head of the Regional Research Centre, I.C.A.R., Mohol, Sholapur. This expert concurred with others and declared that if the guano helped the weeds to grow, it could never be injurious to paddy. If the farmers weeded their fields properly, the paddy would derive all the benefit from the rich manure. Too much of guano accumulating at one spot could result in the destruction of all vegetation, but at the pelicanry this danger does not exist. Deposits of excreta may be formed on the bunds, but whatever falls into the fields normally gets dissolved, well diluted, and is automatically distributed over the entire area. Some villagers resent the injury to palmyra palms and other trees on which the birds, at Aredu the birds found on coconut and mango trees, and nested freely

on them. This resulted in appreciable loss to the villagers, and they decided to prevent the birds from nesting in the village and its neighbourhood. At Kolamuru, fortunately, there are very few coconut and mango trees. All nests are on palymra palms or in babool, jambool and rain trees, none of which suffers permanent injury from the activities of the pelican. Their economic value is also insignificant. I understand that though palmyra leaves are used for tatching etc., by local people, the demand is not so great as to make the loss caused by the birds appear serious.

The pelican deprives the farmers of a certain quantity of straw, but, considering the benefit deprived from the excreta as manure, the loss is negligible and is amply compensated, by the higher yield of paddy. Most of the local farmers do not mind the loss of straw. Those who wish to prevent the pelican from taking straw from the ricks, do so quite effectively by topping the straw-heaps with thorny twigs.

On the whole, it may be said that most of the farmers ignore the loss of straw and palmyra leaves. To many it does not appear to be a loss at all.

A few farmers of Kolamuru have the mistaken notion that, when there is water in the fields of well-grown paddy, pelicans alight at night in the fields, to catch fish - and that this results in the beating down of the paddy and consequent loss. However, all available evidence goes to prove that this assault upon standing crops takes place only at night. The pelican does not feed at night or among thick vegetation. The birds that fly into the fields at night are in fact, wild ducks. Some of the local farmers know this quite well.

The feeling among a few farmers that the pelican is harmful because of (1) its habit of nesting on palmyra and other trees, (2) the injurious effects of its excreta, (3) its effect on the fishing industry and (4) its habit of taking straw for nest building etc., might influence other farmers, aspecially of the younger generation, and lead to an attempt to drive the pelicans sway from usual haunts. This would be most unfortunate, because the present site of the pelicanry has uncommon advantages and affords excellent facilities for protection. Apart from the farmers, most of whom do not, at present, wish to drive the pelicans away, there other enemies. At the Sarepalli site, early in the breeding season parties of mondeys (Rhesus) come occassionally and cause great havoc among the nests. At that time the nests, of loos straw and twigs, not yet commented by the excreta of the birds, contain eggs too. Out of their inhearent love of mischief the monkeys pull nests to pieces, fling the eggs and nest materials about and frighten away the adult birds.

Boys who graze cattle in the area also frequently remove fresh eggs for sale in the town.

(d) Major Hazards faced by the Birds at the Pelicanry:

Till January 1960 the impression I had (based on thorough enquiry conducted as late as the 3rd week of December, 1959) was that at Kolamuru and Sarepalle, the breeding birds, their eggs and young were secure from danger. But when MR.E.P.Gee, a member of the Indian Wild Life Board visited the pelicanry at Kolamuru in January, 1960, he was told by local farmers that a few days before his visit, some persons armed with spears had gone to

the pelicanry and speared about a 100 adult birds and sold them to hotels. On my 2nd Official visit to the pelicanry in December, 1960, I learnt that this practice was not continued after January 1960, but that persons belonging to the 'Yenadi' (scavenger) community, came from Bhimavaram and place in the neighbourhood, and removed large numbers of yound birds (unfledged nestlins) from their nests. They came with bullock carts at night and surreptitiously looted a large number of nests. On one occasion, it appears, some villagers apprenhended one such party, produced them before the Panchayat and got them fined.

It is much easier to find a market for young birds than adults, as the flesh of the young should be much less rank and tough than that of the adult. Moreover it can be more easily disguised as duck or chicken meat. Therefore, it is quite likely that during this 1960-61 and future seasons attempts may be made to carry away young birds from their nests for sale in the towns. IMMEDIATE AND EFFECTIVE STEPS HAVE TO BE TAKEN AGAINST SUCH PLUNDERING.

V. RECOMMENDATIONS FOR THE PROTECTION OF THE PELICAN AND THE PELICANRY:

1) GENERAL:- In view of the fact that the pelican is now known to breed in considerable numbers only at this pelicanry and that the number of adult birds found here is under 8000, there is sufficient ground for apprehension over the survival of the species. It may be remembered in this context that the pelican is a large, conspicuous bird and an easy target, and that the number of persons in possession of fire-arms is on the increase. Compared

with the many thousands of pelicans which used to breed in the Sittan plain of Burma, the 7000 or so birds which come to Kolamuru and Sarepalle pelicanry are a very small number, and they could be wiped out in no time at all if not properly protected. I suggest that shooting or otherwise harming the pelican should be declared illegal and an offence under the Wild Life Act, ALL OVER INDIA. As the flesh of the pelican is not good to eat, this prohibition will not be resented by sportsmen anywhere in the country. The Central and State Governments should prohibit the killing of the pelican. If, in due course, the population of pelicans shows a marked increase, relaxation of the law might be considered.

2) IN WEST GODAVARI AND KRISHNA DISTRICT:- As the pelican's breeding places are situated in the West Godavari District, and it obtains its food from various places in the Krishna District, the pelican should be declared a species protected THROUGHOUT THE YEAR in BOTH THE Districts.

The following should be declared serious offences, and heavy penalties fixed for such offences:-

(a) the killing of the pelican by shooting or any other method,
(b) the capture of live pelicans by any means,
(c) the possession of dead or live pelicans,
(d) any kind of traffic in pelicans, dead or alive, or in their flesh, skin, or eggs or young.

3. AT THE SANCTUARY PROPER:

The pelicanry area (See II(1) of page 1 and para 3 of page 3), should be declared an officially protected

BIRD SANCTUARY with a suitable name. (Preferably in honour of some Universally respected popular leaders of the Andhra people, or other historical personage).

It is neither practicable nor necessary to enclose the breeding grounds of the pelican. So long as there is no wilful disturbance of the breeding birds, they will be absolutely safe. The present sit of the pelicanry is very much superior to the old Area site because: 1) there are no fruit-bearing trees for the birds to destroy; 2) it is farther away from the thickly populated towns and villages; 3) it is much less conspicuous; and 4) it had definite boundaries on the east and the west - the Ganapavaram - Undi Road on the east and the Vemkayya - and - Weyyeru cannal on the west. Therefore it can be more easily demarkated. However, as it is out of sight of the villages it is easier for yandals to enter the pelicanry at night. The western side and the N.W. carner are particularly vulnerable.

4. STEPS FOR PROTECTION : WARDEN and WATCHMEN:

Four watchmen, in some sort of uniform, should be stationed at Kolamuru (if the pelicans shift from Kolamuru, the watchmen should be stationed at whichever village happens to be largest concentration of breeding birds). They should take turns guarding the pelicanry at night and going on regular beats at least thrice a day throughout the breeding area.

A Warden, an official of the rank of Range Officer, or Deputy Ranger at least, should be posted at Kolamuru to be in overall charge of the Sanctuary, and to represent the Government in courts of law whenever necessity arises. This official should be one who knows something

about the pelican's habits, haunts, economic value and importance to Science, so that he may be able to function as a guide to foreign tourists visiting or nithologists etc. The ideal thing will be for him to have some preliminary training under someone who knows all this, and, in all modesty, I have to confess that at present I am the only person whom I can think of for the job of training this warden: However, as it might not be easy to arrange for such training, I suggests that Sri B. Veerabhadra Rao, Forester, Nallajerla, Eluru Range, may be able to shoulder the responsibilities of the Warden without any elaborate training as he was with me throughout my trips of investigation in December, 1959 and December, 1960. He has now sufficient knowledge about the pelican, the breeding areas and foraging places etc. Therefore, it will be best to put this Forester in charge, at least for the time being. He should either be given a promotion or a decent special allowance to make the new post sufficiently attractive.

The 4 watchmen should be recruited from among the literate and unemployed young men of the pelicanry area, preferably from Kolamuru, Aredu and Sarepalle, as this will be an excellent incentive for the local people to view the Sanctuary Project with greater sympathy. Relations of farmers who own the lands where the pelicans nest should be given special preference.

To ensure the efficiency of the Warden and the Watchmen, there should be, in the early periods at least, frequent inspection by higher officials. If the Warden is given the rank of a Deputy Ranger, the Range Officer, Eluru, can inspect visit the Sanctuary as inspecting Officer. The District Forest Officer should also inspect

the sanctuary whenever possible - at least once every season when the birds are breeding.

All Government Officers (Forest, Revenue, Police, Block Development etc.) of the area encompassing Bhimavaram, Undi, Akividu, Eluru, Ganapavaram, Tadepalligudem should be empowered to deal with people who commit offence against the laws meant for the protection of the pelican.

5. PENALTIES:- Penalties for offences against these laws should be heavy enough to act as real deterrent.

As the present market price of a pelican seems to be about 50 paise a fine of Rs.10/- per bird, adult or young, killed by or found in the possession of the offender may be effective enough. Those found in possession of eggs or caught in the act of removing eggs or wilfully distrubing the nesting birds should be fined Rs.5/-. For organized attempts to kill or capture the pelican or its young, or to remove eggs, or to prevent the birds from nesting at the place of their choice, much heavier penalties should be imposed. For organized attempts to trade in pelican flesh (see para 1, page 11) a fine of Rs.100/- should be imposed.

6. RESTRICTIONS ON VISITORS etc.:- No one other than the farmers engaged in their legitimate agricultural activities should be allowed to approach within a hundred yards of any trees where the pelican is nesting. When the Sanctuary is established and has received publicity, there is likely to an onrush of visitors, coming mostly out of sheer curiosity, to the Sanctuary. As even now the movement of people below nest-trees upsets the birds

and at times results in the destruction of nests, eggs and young, unless visitors are prevented from approaching too close to the nest-trees, there will be a great loss of eggs, nests, young birds etc., and a frequent repitition of such incidents will lead to the desertion of the Sanctuary by the pelican.

The danger of too close an approach by visitors is much greater in those years when there is no second crop.

Considering the fact that there is a growing conviction among the young farmers that the pelicanry is not worth preserving, that the pelican is a nuisance which causes some loss of straw and almyra leaves it should be very seriously considered whether it is not feasible to provide the farmers of the sanctuary area with water for a second crop EVERY YEAR, instead of once in three years as now. The provision of water for the every second crop should be declared a compensation for whatever loss the birds might be causing. The rich manure deposited by the birds will make the second crop very profitable also. Moreover, the presence of standing crops in the fields will afford valuable protection to the birds for the following reasons:-

1. People will not be free to wander about in the area.
2. There will be watchmen appointed by the farmers to protect the crops at night, and the presence of these watchmen will prevent outsiders from coming at night and trying to kill or capture the birds and their young.
3. The local farmers, they realise that the availability of water for the second crop is

dependent on the presence of the pelican, will be really zealous in giving protection to the birds and their nests.

Providing water for a second crop to the farmers of this area is not likely to affect the routine of irrigation branch of the P.W.D. very seriously. Also, it will be cheaper and more productive than some of the drainage schemes now under consideration not far from this area.

A very important measure relates to the trees in the area. The cutting or any kind of tree in the ENTIRE sanctuary area (except within 100 years of a village, and those trees which stand inside a compound which has been in existence before 1955) should be prohibited.

The trees should be marked, numbered, any rigorously protected Special sanction may be given (by the District Forest Officer only on the recommendation of the warden) for the removal of dead trees or those which for some reason are best removed (trees attacked by pests, or by a disease that might spread among the other trees, or trees that seriously hinder agricultural activities). But such sanction should be given only when absolutely necessary.

I am convinced that palmyra trees do not suffer any permanent damage when birds nest on them as there is an abundance of these trees in the Aredu and Sarepalle areas though pelicans have been nesting there for more than 70 years, and no evidence of any destruction among the palmyra trees if found.

Coconut and mango trees do suffer injury, but these are normally found in the neighbourhood of villages.

The pelican may be prevented from alighting on or building nests on coconut trees by placing thorny branches of babool on the horizontal lower fronds. A few empty tins discourage the pelican from nesting on them.

Apart from taking an annual census of the trees in the Sanctuary area, the sanctuary staff should systematically plant palmyra, rain, babool and other suitable trees along the bunds of canals. On both sides of the road larger trees like the tamarind, the peepul and the banyan may be planted. This scheme should be started in the Aredu-Kolamuru rigion and gradually extended over the entire region. If the pelican is found to have no prejudice against taramind trees and banyan trees, these may also be planted at suitable places along the canal bunds and drain bunds, always bearing in mind the adverse effect of too much shade on paddy fields.

7. WARDEN'S DUTIES: Apart from those duties mentioned above, the warden should: 1) take a census of the nests in the Sanctuary on the 15th of every month from November to March, and maintain regular records.

2) prepare a map every season on which should be marked the exact places chosen by the birds for nest building. A large-scale map such as Village Officers keep should be used. Individual nests need not be marked, but the trees on which birds nest, with an approximate estimate of the nests on it, should be indicated.

3) gather information about all the places to which the pelicans go for food during the breeding season, and follow all the changes in the course of the season. He should plot these on a map.

4) maintain records to show for each season, the dates of:

a) the first appearance of the pelican in the Sanctuary;
b) the arrival of the main flock;
c) the commencement of nest-building;
d) the laying of the 1st egg;
e) the first hatching;
f) the final departure of the main flock; and
g) the final disappearance of the pelican from the Sanctuary.

I should be very happy to furnish the Warden, when he has taken charge, with a detailed and comprehensive list of his duties and tasks. The inclusion of such an account will serve no purpose now.

5) He should send a report about the Sanctuary every month to the D.F.O., and/or such other higher authorities as may be specified by the Department concerned.

6) The movements of the Grey Pelican are so little understood that 'ringing' (the fixing of numbered aluminimum rings to the legs of the nestlings) on a modest scale, preferably under the Bird Ringing Scheme, now on foot under the expert guidance of Dr. Salim Ali, Chairman of the Bird Wing, Indian Board of Wild Life, will be of great scientific value. As such work, and much more besides, need be considered in detail only when the sanctuary has been established, it need not be dwelt upon here.

8. ROADS, REST HOUSES ETC.

I feel that, in the circumstances, it is not advisable to construct any roads to the exactspot where

the birds nest. For one thing, the area of concentrated population varies from year to year. To take Kolamuru site one can go by jeep or in a small car along the bund of the Neelakodu Drain and the Uppuluru Canal. The bunds of these may be broadened and metalled to make them more suitable for motor traffic. But such vehicles as buses and trucks should never (NEVER) be allowed to use these roads. In 1960-61 some of the birds were nesting so near the main road that people could have looked at them from the road itself.

No rest house need be constructed near the Sanctuary for some years to come. Such visitors as are likely to come in the near future can find accommodation at Undi, Akividu and Bhimavaram in the existing Travellers' Bungalows.

There is bound to be an increase in the number of visitors when the Sanctuary has been given wide publicity. When there is a real demand for special accommodation by tourists who wish to visit the sanctuary, Rest House with all modern conveniences should be built at Ganapavaram, where, at present, there is no suitable Rest House. Visitors to the Sanctuary should be given special priority over all others at this rest house.

9. PROVISION FOR PROTECTION IN THE KOLLERU AREA.

1. The general prohibition will apply to the Kolleru also.

2. Inaddition to that, by special ordinance if possible, the pelican should be declared a rigidly protected bird in the entire Kolleru region. In March and April flocks of pelicans are seen in

the day time near Singarulukotta, Kolletikotta and many other places in the Kolleru. At this time there is regular shooting by local people many of whom eat the flesh of the pelican. The pelican is regularly sold also, though the price is only about half a rupee. Therefore, at this time one of the watchmen should be posted at Gokaranapuram to prevent disturbance and shooting of the pelican.

## X. THE SANCTUARY AS A POTENTIAL CENTRE OF SCIENTIFIC RESEARCH.

Though to-day the subject of field ornithology is more a pastime for a few enthusiasts ("occentrics"), it is fact becoming what it is already in most Western countries -- a subject of academic interest and real practical application. When we catch up with the rest of the world in this aspect also, this pelicanry is bound to become one of the most important centres of research. It is the most accessible place, superior even to Vedanthangal in Madras. The habits of the pelican are comparatively little known. Facilities for stay etc. are more easily found near this pelicanry than anywhere else in India. Wonderful opportunities exist in and around the place for the study of migrant birds (provers, ducks etc.) and for the study of the breeding biology of other water-birds like the Grey Heron ( a colony of some 100 pairs exists in the village of Kolamuru itself) and the Open-bill Stork etc.

## XI. SUMMARY OF POINTS REGARDING THE NEED FOR IMMEDIATE ACTION.

1. Our birds and animals are very important assets of which we are the trustees.

2. This pelicanry is the ONLY major breeding centre of the Grey (also known as the Spotted-billed) Pelican (Pelicans philippenses) now existing in India. As the bird is not known to be breeding elsewhere, this pelicanry may be the ONLY BREEDING place of the species of any importance.

3. The disappearance of the pelicanry may mean the extinction of this interesting species.

4. The pelicanry has considerable influence on the yield of the paddy fields of the area. Pelican-guano must be doing immense good to the fields and crops.

5. The pelicanry can be made an important tourist centre, especially attractive to foreign tourists, and thus a real source of income to the State.

6. Local people have begun to lose their sentimental respect for the pelican as well as for all forms of wild life. A market is coming into existence for pelican flesh and eggs.

7. Though the villagers might wish to protect the pelican they can do nothing to prevent organised gangs from raiding the pelicanry. Therefore official intervention is urgently needed.

8. The pelican is well known in the area and steps for its protection can be easily made effective.

9. The expense involved in setting up a Sanctuary is insignificant.

## XII. SUMMARY OF RECOMMENDATIONS FOR THE PROTECTION OF THE PELICAN AND THE PELICANRY.

1. The pelican should be declared by law a strictly protected bird all over West Godavari and Krishna Districts.

2. The area lying between the Kolleru, Ganapavara, and pippara in the north; between Pippara and Gollalakoderu in the east; between west should be declared by law a Sanctuary for the pelican and all other large water birds.

3. A warden and 4 watchmen should be at once appointed to protect the pelican at this breeding and feeding places.

4. Water for the second crops should be provided to the farmers of the Sanctuary area EVERY YEAR instead of once in 3 years as in the past. This should be emphatically declared to be a compensation for any possible loss incurred by them due to the presence of the pelican in their territories.

5. By holding meetings etc., public opinion should be shaped to lead to greater sympathy for the sanctuary scheme.

6. Illustrated articles stressing the unique nature of the pelicanry and its economic importance should be published in the local dailies weeklies etc.

7. Propaganda calaculated to attract tourists and naturalists should be carried on vigorously until the Sanctuary has been put firmly on the tourist map of India.

8. Posters in Telugu and English should be displayed at Railway Stations, tourist centres etc.

9. An illustrated hand-book about the Sanctuary should be produced and made available at a reasonable price - if it cannot be given gratis.

10. A special Rest House with all modern convenience should be constructed at Ganapavaram to provide accommodation to visitors to the Sanctuary.

11. Suggestions for the transport of guano to places outside the Sanctuary - as manure for fruit trees etc. - should never be entertained. The privilege of using the guano should be reserved exclusively for the local farmers.

12. The pelicanry should be given a name which will appeal to the civic pride or to the patriotism of the local people.

// True Copy //

ACCOUNTS OFFICER,
WATER POLLUTION CONTROL BOARD,
SECUNDERABAD.

## A P P E N D I X III

Copy of G.O.Ms.No.1986, Food & Agriculture Department, Dt. 11-9-1963.

FORESTS - Wildlife Pelican in Krishna and West Godavari Districts Protection of - Notification under sections (2) and (3) of the Wild Birds and Animals protection Act, 1912 - Approved - Publication in the Andhra Pradesh Gazette and the District Gazette of East and West Godavari - Ordered.

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Read the following:

From the Chief Conservator of Forests, Lr.No.31177/ 58-K2, dated 12-10-1962.

*****

O R D E R:

The draft notifications under section (2) and (3) of the Wild Birds and Animals Protection Act 1912 (Central Act VIII of 1912) submitted by the Chief Conservator of Forests with his letter read above for giving protection to the pelicans within a radius of 20 miles from Killeru Lake situated in West Godavari and Krishna Districts, as described in the schedule annexed to II, are approved, and forwarded to the Director of Printing, Hyderabad for publication in the next issue of the Andhra Pradesh Gazette.

2. NOTIFICATION - I

In exercise of the powers conferred by sub-section(2) of section 2 of the Wild Birds and Animals Protection Act, 1912 (Central Act 8 of 1912), the Governor of Andhra Pradesh hereby applies the provisions of the said Act to the spotted billed or Grey Pelicans (Pelicans Philippensis Omelin)

NOTIFICATION - II

Inexersise of the powers conferred by section 3 of

the Wild Birds and Animals Protection Act, 1912, (Central Act VIII of 1912) the Governor of Andhra Pradesh hereby declares the whole year to be closedtime throughout the area within a radius of 20 miles from Kolleru Lake, situated in west Godavari and Krishna Districts, particularly described in the Schedule below for spotted-billed or grey pelican (Pelicannus phillippensis Omelin) to which the said Act applies.

## Schedule

BOUNDARY DESCRIPTIONS:

NORTH : Starting from the point where the taluk boundary between Eluru and Chinthalapudi Taluks of West Godavari District starts on the District boundary between West Godavari and Krishna Districts, the boundary runs in easterly direction along the said common taluk boundary till it meets the road from Bapirajugudem to Jeelakarragudem; thence along the said road in north easterly direction upto Jeelakarragudem where it meets Velagalapalli - Jangareddigudem road; thence along Eluru - Jangareddygudem road upto Devalapalli, thence along Devulapalli - Dubacherla road till it meets the common taluk boundary between Kovvur and Eluru Taluks; thence along the common taluk boundary between Kovvur and Eluru Taluks and Kovvur and Tadepalligudem taluks upto the point where the taluk boundary between Tadepalligudem and Tanuku Taluks meets and Eluru canal crosses the Taluk boundary; thence along the taluk boundary between Kovvur and Tanuku Taluks till it crosses Nidadavolu-Narsapur Road.

EAST : Thence along the Nidadavolu-Narsapuram road upto Narsapuram (via) Maruteru; thence along the district boundary between West Godavari and East

Godavari Districts upto Bay of Bengal.

SOUTH : Thence the boundary runs along the Bay of Bengal in Western and South-Westerly direction in West Godavari and Krishna Districts upto Bandar.

WEST : From the above said points the boundary runs in northernly direction along the Bandar-Nuzvid road (via Gudivada) till it meets the District thence along the said common district boundary towards North to the Starting point.

3. The Collection of West Godavari and Krishna Districts are requested to get the notifications published in their respective district Gazettes.

( BY ORDER AND IN THE NAME OF THE GOVERNOR OF ANDHRA PRADESH)

Syed Gulam Rasool,
Deputy Secretary to Government.

// True Copy //

Ref.No.31177/58-F2-2, dated 4-10-1963:

Communicated for information and necessary action.

Sd/- P.S. Rao,
Chief Conservator of Forests.

// True Copy //

ACCOUNTS OFFICER,
POLLUTION CONTROL BOARD,
SECUNDERABAD.

## APPENDIX IV

STATEMENT SHOWING THE RIVERS AND DRAINS FLOWING INTO KOLLERU.

| Name of River Stream or Drain. | Catchment Area. | | TOTAL | Maximum Peak Flow. | | TOTAL |
|---|---|---|---|---|---|---|
| | Upland Square Miles. | Deltaic Square Miles. | | Upland Cusecs | Deltaic cusecs. | |
| 1. | 2. | 3. | 4. | 5. | 6. | 7. |
| A. RIVERS: | | | | | | |
| 1) Budameru. | 516 | 213 | 729 | 38,900 | 3,381 | 42,281 |
| 2) Ramileru | 103 | 16 | 119 | 12,089 | 584 | 12,673 |
| 3) Thammileru | 463 | 60 | 523 | 26,920 | 1,410 | 28,330 |
| 4) Gunderu | 208 | 36 | 244 | 15,800 | 1,004 | 16,804 |
| Minor Streams | 24 | .. | 24 | 3,744 | .. | 3,744 |
| TOTAL: | 1,314 | 325 | 1,639 | 97,453 | 6,379 | 1,03,832 |
| B. DELTA DRAINS: | | | | | | |
| 1) Kaikaluru Swamp drain-I | .. | 5 | 5 | .. | 269 | 269 |
| 2) Kaikaluru Swamp drain-II | .. | 10 | 10 | .. | 427 | 427 |
| 3) Motur Channel drain. | .. | 18 | 18 | .. | 632 | 632 |
| 4) Chandrayya drain. | .. | 44 | 44 | .. | 1,146 | 1,146 |
| 5) Peddapadu drain. | .. | 8 | 8 | .. | 378 | 378 |
| 6) Vatluru drain | .. | 10 | 10 | .. | 427 | 427 |
| 7) Mondicodu drain. | .. | 20 | 20 | .. | 854 | 854 |
| 8) Pandicodu drain. | .. | 36 | 36 | .. | 1,264 | 1,264 |
| 9) Siddapuram drain. | .. | 10 | 10 | .. | 427 | 427 |
| 10) C.W. Drain | .. | 36 | 36 | .. | 1,264 | 1,264 |
| Total for Delta drains. | .. | 197 | 197 | .. | 7,088 | 7,088 |
| Say. | .. | 200 | 200 | | | |
| GRANT TOTAL: | 1,314 | 525 | 1,839 | 97,453 | 13,467 | 1,10,920 |

## APPENDIX - V

KOLLERU LAKE MAXIMUM WATER LEVELS (OBSERVED AT KOLLETI KOTA)

FROM 1916 TO 1980.

Water levels arranged in Ascending order:-

| Sl.No. | Year | Reduced Water level in feet |
|---|---|---|
| 1 | 2 | 3 |
| 1. | 1918 | + 3.20 |
| 2. | 1937 | + 3.20 |
| 3. | 1920 | + 3.60 |
| 4. | 1922 | + 4.44 |
| 5. | 1952 | + 4.50 |
| 6. | 1926 | + 4.60 |
| 7. | 1929 | + 4.80 |
| 8. | 1934 | + 5.10 |
| 9. | 1979 | + 5.30 |
| 10. | 1967 | + 5.40 |
| 11. | 1977 | + 5.60 |
| 12. | 1919 | + 5.80 |
| 13. | 1942 | + 6.00 |
| 14. | 1945 | + 6.00 |
| 15. | 1965 | + 6.10 |
| 16. | 1946 | + 6.20 |
| 17. | 1953 | + 6.30 |
| 18. | 1935 | + 6.40 |
| 19. | 1971 | + 6.40 |
| 20. | 1928 | + 6.44 |
| 21. | 1936 | + 6.50 |
| 22. | 1968 | + 6.50 |
| 23. | 1923 | + 6.60 |
| 24. | 1948 | + 6.70 |

| 1. | 2. | 3. |
|---|---|---|
| 25. | 1966 | + 6.70 |
| 26. | 1980 | + 6.70 |
| 27. | 1973 | + 6.80 |
| 28. | 1921 | + 6.90 |
| 29. | 1951 | + 6.90 |
| 30. | 1924 | + 7.00 |
| 31. | 1950 | + 7.00 |
| 32. | 1930 | + 7.10 |
| 33. | 1947 | + 7.10 |
| 34. | 1972 | + 7.10 |
| 35. | 1917 | + 7.30 |
| 36. | 1938 | + 7.30 |
| 37. | 1954 | + 7.50 |
| 38. | 1974 | + 7.50 |
| 39. | 1940 | + 7.60 |
| 40. | 1941 | + 7.60 |
| 41. | 1941 | + 7.60 |
| 42. | 1933 | + 7.70 |
| 43. | 1970 | + 7.70 |
| 44. | 1931 | + 7.80 |
| 45. | 1925 | + 7.90 |
| 46. | 1961 | + 7.90 |
| 47. | 1955 | + 8.00 |
| 48. | 1948 | + 8.10 |
| 49. | 1956 | + 8.10 |
| 50. | 1960 | + 8.10 |
| 51. | 1958 | + 8.30 |
| 52. | 1976 | + 8.30 |
| 53. | 1977 | + 8.30 |
| 54. | 1975 | + 8.60 |

| 1. | 2. | 3. |
|---|---|---|
| 55. | 1932 | + 8.70 |
| 56. | 1969 | + 8.80 |
| 57. | 1957 | + 8.90 |
| 58. | 1963 | + 9.00 |
| 59. | 1949 | + 9.40 |
| 60. | 1962 | + 9.50 |
| 61. | 1939 | + 9.60 |
| 62. | 1959 | + 9.90 |
| 63. | 1978 | + 10.00 |
| 64. | 1916 | + 10.40 |
| 65. | 1964 | + 10.70 |

## APPENDIX VI

## COMPARATIVE STATEMENT OF TOTAL CAPACITIES.

| Sl. No. | Water level of lake in ft. | Total capacity in M.Cft. | | | Neglecting capacities '74-76 in +2 and +3 contours. | Remarks. |
|---|---|---|---|---|---|---|
| | | In the year 1900 | In the years 1966-67. | In the years 1974-76 | | |
| 1. | + 2.00 | .. | .. | 363 | .. | 1) 1900 Survey: Exact year not known. The year noted is approximate. |
| 2. | + 3.00 | .. | .. | 1,450 | .. | |
| 3. | + 4.00 | 4,156 | 2,202 | 3,429 | 1979 | 2) 1966-67 Survey: Detailed survey done upto +7 contour only. Beyond 7 contour the areas were computed based on block level plans of the delta ayacut taken during 1980 or '98. |
| 4. | + 5.00 | 9,012 | 5,115 | 6,300 | 4850 | |
| 5. | + 6.00 | 14,852 | 8,976 | .. | .. | |
| 6. | + 7.00 | 21,682 | 13,966 | .. | .. | |
| 7. | + 8.00 | 29,272 | 20,558 | .. | .. | |
| 8. | + 9.00 | 37,622 | .. | .. | .. | |
| 9. | + 10.00 | 47,132 | 37,478 | .. | .. | 3) 1974-76 - detailed contour survey was done upto 5 = contour only. |
| 10. | + 10.70 | 53,950 | .. | .. | .. | |

APPENDIX VII

DETAILS OF INDUSTRIAL EFFLUENTS JOINING

| Sl. No. | Name of the industry. | Location | Products manufactured. | Production capacity per day. | Raw materials. | Whether consent given or not. |
|---|---|---|---|---|---|---|
| 1 | 2 | 3 | 4 | 5 | 6 | 7 |
| 1. | Milk products Factory | Vijayawada Krishna Dist. | 1) Bottled Milk.<br>2) Ghee.<br>3) Milk powder. | 55,000 Ltd.,<br>3.3 M.T.<br>3.3 M.T. | Raw Milk. | No. |
| 2. | Sri Hanumathkali Varaprasad Babu Chemicals Private Ltd., | Kodurupadu, Krishna Dist. | 1) Rectified spirit.<br>2) Fusel Oil. | 11,000 Lts.,<br>110 M.T. | Molasses. | Yes |
| 3. | Krishna Paper Mills. | Seri Narasanna Palem. Veeravalli P.O., Krishna Dist. | Craft paper. | 2 Tonnes. | 1) Paddy straw<br>2) Waste paper<br>3) Gunny bags. | Yes |

...

KOLLERU LAKE THROUGH DIFFERENT DRAINS

| If consent given conditions of consent. | Quantity of effluent per day. | Treatment plant details if any. | Characteristics of effluent. | Point of discharge of effluent. | Remarks. |
|---|---|---|---|---|---|
| 8 | 9 | 10 | 11 | 12 | 13 |
| I. - | 7,00,000 Lts. | Not provided. | 1) pH 11.2<br>2) T.S.S. 600 mg/l.<br>3) Chlorides 78 "<br>4) Turbidity 2000<br>5) Total phospates 2 mg/l.<br>6) Ammonia Nitrogen 1.0 mg/l.<br>7) B.O.D. 1530 mg/l.<br>8) C.O.D. 2136 " | Drain leading to Budameru. | Budameru finally joins Kolleru Lake. |
| I. The maximum daily discharges shall not exceed 2,05,000 Lts.,<br>II. The characteristics of the effluents discharged shall not exceed the following tolerance limits.<br>1) pH 5.5 - 9.0<br>2) T.D.S. 2100 mg/l.<br>3) B.O.D. 500 "<br>4) Sulphates 1000 "<br>5) Chlorides 600 "<br>6) Oils & Grease 30 " | 2,05,000 Lts. | Anaerobic lagoons. | 1) pH 4.8<br>2) T.S. 36440 mg/l.<br>3) T.S.S. 840 "<br>4) B.O.D. 19500 " | Drain liquid to Budameru. | The lagoons are not working satisfactorily and they are not stabilized so far. Budameru River finally joins Kolleru Lake. |
| The characteristics of effluent shall not exceed the following tolerance limits.<br>pH 5.5 - 9.0<br>B.O.D. 30 mg/l.<br>C.O.D. 250 "<br>T.S.S. 100 " | 35,000 Lts. | Nil | 1) pH 6.3<br>2) T.S. 4740 mg/l.<br>3) T.S.S. 500 "<br>4) B.O.D. 2100 " | Veeravalli drain leading to Budameru. | Budameru finally joins Kolleru Lake. |

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| 4. | Agrifuraal Chemical Extrak'tions (P) Ltd., | Seri Narasa-nna palem Veera-valli (Post), Krishna Dist. | Furfural | 500 Kgs. | 1) Paddy Husk<br>2) Sugar cane bagasse. | Yes | Char ent fol pH Temp. Aceta T.S.S B.O.D C.O.D |
| 5. | Sri Hanuman Co-opera-tive Sugars Ltd., | Hanuman Junction Krishna Dist. | Sugar Mola-sses and filtercake. | Crushing capa-city 1250 M.T. | Sugar cane. | No. | |
| 6. a) | The K.C.P.Ltd., (Distillery Unit) | Vuyyuru, Krishna Dist. | 1) Industrial Alcohol.<br>2) Fusel Oil.<br>3) $CO_2$ | 30,000 Lts.,<br>5.0 M.T. | 1) Molasses<br>2) Urea<br>3) Sulphuric Acid. | - | |
| 6. b) | The K.C.P.Ltd., | -do- | 1) Sugar<br>2) Molasses<br>3) Bagasse<br>4) Filter cake. | 500 M.T.<br>200 M.T.<br>1500 M.T.<br>200 M.T. | Sugar cane | - | |

| | | | | | |
|---|---|---|---|---|---|
| Characteristics of effluent shall not exceed the following tolerance limits.<br>pH 5.5 - 9.0<br>Temp. 31°C<br>Acetates 5.0<br>T.S.S. 100 mg/l.<br>B.O.D. 30 "<br>C.O.D. 250 " | 24,000 Lts. | Nil | 1)pH 3.0<br>2)Acidity 1680 mg/l.<br>3)T.S. 520 "<br>4)T.S.S. 60 "<br>5)B.O.D. 6900 "<br>6)C.O.D. 10640 " | Veeravalli drain leading to Budameru. | Budameru finally joins Kolleru Lake. |
| - | - | - | - | Veeravalli drain leading to Budameru. | The factory is still under construction and not yet commissioned. Budameru finally joins Kolleru Lake. |
| - | 4,80,000 Lts. | Anaerobic digester. | 1)pH 5.22<br>2)T.S. 7600 mg/l.<br>3)T.S.S. 400 "<br>4)B.O.D. 3600 "<br>5)T.D.S. 1200 "<br>6)C.O.D. 14225 " | Chandrayya drain. | The existing capacity of effluent treatment plant is insufficient to treat the entire effluent generated in the plant to the required standards. The Chandrayya drain finally joins Kolleru Lake. |
| - | 27,24,000 Lts., | - | - | - | - |

| 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 |
|---|---|---|---|---|---|---|---|
| 7. | M/s.Lakshmi Chemical Industries Private Limited. | Gudivada, Krishna Dist. | Naphthol, A.S.G. | 20 Kg. | 1) Orthotoluidine base (O.T.base)<br>2) Acetoacetic ester<br>3) Monochlorobenzene<br>4) Caustic Soda<br>5) Triethanol amine<br>6) Hydrochloric acid. | - | |
| 8. | M/s.Kolleru Papers Ltd., | Bommuluru, Krishna Dist. | Writing and printing verieties of paper. | 30 M.T. | Paddy straw<br>waste papers<br>readymade pulp<br>caustic soda<br>lime Radhamine. | Yes. | The maximu should no 33,75,000 Character effluent exceed th limits.<br><br>pH 5.5<br>B.O.D.<br>C.O.D. 2<br>T.S.S. 1<br>Sulphides |

| 8 | 9 | 10 | 11 | 12 | 13 |
|---|---|---|---|---|---|
| - | 600 Lts. | Nil | 1) pH 7.2<br>2) T.D.S. 2560 mg/l.<br>3) C.O.D. 0.80 " | Drain leading to Chandrayya drain. | Chandrayya drain finally joins Kolleru Lake. |
| The maximum quantity should not exceed 33 33,75,000 lits/day Characteristics of effluent should not exceed the following limits.<br><br>pH 5.5 - 9.0<br>B.O.D. 30 mg/l.<br>C.O.D. 250 "<br>T.S.S. 100 "<br>Sulphides 2 " | 0.75 to 1.0 Mgd. | Holdup tanks. | 1) pH 6.8<br>2) T.S.S. 170 Mg/l.<br>3) B.O.D. 260 " | Ramileru drain. | Ramileru drain finally joins Kolleru Lake. Effluent treatment plant work is under progress. Till January '81 the factory authorities were letting out effluent into Peddapadu drain through Polimeru vagu. The Peddapadu drain finally joins Kolleru Lake. |

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| 9. | M/s.M.M.Mohiadeen | Eluru, West Godavari Dist. | Semi tanned Leathers. | 2500 Kgs. | Raw Hides Pungam oil Myrobolume extract sodium bisulphate sulphuric acid. | Yes | Dis int wit tio a) b) 1 2 3 4 5 6 7 8) 9) |
| 10. | West Godavari Co-operative Sugars Ltd., | Bhimadolu. | Sugar, Molasses, and Filter cake. | Crushing capacity 1250 M.T. | Sugarcane. | - | |
| 11. | Sri Raja Rajeshwari Paper Mills Ltd., | Eluru, West Godavari District. | Paper & Paper Boards. | 13 M.T. | 1) Paddy Straw 2) Gunny rags 3) Waste Paper | Yes | The Characteri the effluent sh exceed the fol. tolerance limi pH 6.5 - 9.0 Total Suspended B.O.D. - 30 mg/ |

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| s | Discharging the effluent into Thimmaleru River with the following conditions.<br>a) The maximum daily discharge shall not exceed 4500 lts.<br>b) The following parameters should not exceed.<br>1) pH 5.5 - 9.0<br>2) T.S.S. 100 mg/l.<br>3) $B.O.D._5$ 30 "<br>4) Hexavalent chromium 0.1 "<br>5) C.O.D. 250 "<br>6) Sulphides 2 "<br>7) Chlorides 600 "<br>8) Phenolic Compounds. 1.0 "<br>9) Tannin 50 " | 1000 Lts. | Nil | 1) pH 9.2<br>2) T.S.S. 280 mg/l.<br>3) Chlorides 2400 "<br>4) B.O.D. 630 " | Thammileru River. | The factory has taken up expansion work for manufacturing finished leather. Effluent Treatment Plant works are under progress. Thammileru River finally joins Kolleru Lake. |
| | - | 4,00,000 Lts. | - | 1) pH 6.2<br>2) T.S. 700 mg/l.<br>3) T.S.S. 20 "<br>4) B.O.D. 42 " | Balusu vagu drain. | Balusu vagu drain finally joins Kolleru Lake. |

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| | | | | | | |
|---|---|---|---|---|---|---|
| The Characteristics of the effluent shall not exceed the followed tolerance limits.<br>pH 5.5 - 9.0<br>Total Suspended Solids 100 mg/lit.<br>B.OD. - 30 mg/lit. | 22,50,000 lts. | Anaerobic lagoon followed by Aerated lagoon. | Pulp Mill / Paper Mill<br>1) pH 8.2 / 5.0<br>2) C.O.D. 3650 / 650<br>3) B.O.D. 1200 / 200<br>4) Total Solids. 7500 / 1500<br>5) S.S. 600 / 1000<br>6) % Sodium 70 | Ramileru drain which join Kolleru Lake. | Treatment plant under construction. |

## APPENDIX VIII

(STUDIES MADE)

The reports made available to the committee are briefly indicated below:

1) A case study or Kolleru lake and Upputeru river by Sri K. Ramakrishnaiah B.E., Superintending Engineer (Irrigation Circle, Eluru)

In this report the author has furnished substantial information on the Hydrology of the lake, Historical background, Irrigation & Agricuiture and the problems of submersion of cultivated lands and the various recommendations made and measures taken by the Irrigation Engineers in solving the problem of submersion and improving drainage in Kolleru Lake area.

2) Studies on ecology and weed biology of Kolleru Lake by Dr. V. Seshavataram of Andhra University and Dr. B.S.M. Dutt of A.N.R. College, Gudiwada. In their report the authors recorded their observation on the occurance of various species of Phytoplankton and Macrophytes in the various sections of Lake area and the factors operating in the Kolleru Lake eco-system were analysed.

3) Study on physico - chemical environment of the lake by Dr. M. Rama Murthy of Andhra University.

4) Techno-Economic evaluation of Aquaculture in Kolleru Lake by Dr. R.V. Rama Rao and Sri G. Mallikarjuna Rao of Andhra University.

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ACCOUNTS OFFICER,
POLLUTION CONTROL BOARD,
SECUNDERABAD.

## APPENDIX IX

## SOME INTERNATIONAL VALUES OF WETLANDS

Nature richly endowed much of the inland and coastal surface of the earth with valuable wetlands. Until recent times most of mankind has failed to recognize just how tremendous these values really are, for even today wetlands are among the most seriously endangered of all biotic communities and ecosystems. Uncounted thousands of hectares of highly productive wetlands throughout the world are still being destroyed by drainage, dredging, filling, mining, pollution and other forms of degradation, and converted to other uses. Many were of great international value, Ironically, some of the drained areas could not be used for the intended purpose.

The International Union for Conservation of Nature and Natural Resources, Gland, Switzerland, defines a wetland as follows:

> "Areas of submerged or water-saturated lands whether both natural or artificial, or permanent or temporary and whether the water is static, or flowing, or fresh, brackish or salt, water-dominated areas to be considered would include - marshes, sludges, begs, swamps, fens, peatlands, estuaries, bays, spunds, lagoons, ponds, lakes, rivers, springs and reservoirs, where marine or coastal waters are involved, waters upto depth of 6 meters at low tide are included".

Beginning some 50 to 100 years ago conservationists in Europe and North America started the long and difficult struggle to protect and preserve wetlands from destruction. Prior to that time few voices were raised in opposition to extensive drainage, dredging, filling and conversion of

wetlands to other uses. For example, it is estimated that originally there were 50,800,000 hectares of wetlands in the United States of America. These had been reduced to 32,000,000 hectares by 1954. The area drained since 1954 is now (1980) being determined.

Unfortunately, in the early days of apposition to destruction of wetlands and continuing to some extent upto the present time, the principal argument espoused by conservationists in opposition to drainage was the value of wetlands to migratory birds and other wildlife, and in particular waterfowl - ducks, geese, and swans. Information was lacking or overlooked on many other values such as wetlands role as nurseries for fin-and shell-fish production. Wetlands are multi-purpose in nature and are extremely high in biological productivity.

Opposing wetland distruction on the basis of their values to migratory birds usually failed. Fortunately in recent years other wetland values have been recognized, many of them on an economic or commercial basis. 'Money talks' and these economic values resulting from the production of finfish, shelfish, fur animals, waterfowl, amphibians, reptiles and other animals and plants have been successful in slowing the destruction of some wetlands. However, wetlands destruction continues at an alarming rate.

At this point it is timely to discuss the tremendous economic values of one type of wetland - estuaries. The U.S. Fish and Wildlife service defines an estuary as:

> "a semi-enclosed coastal water body having free connection with the open sea within which sea drained from the land".

It has been determined that entuaries are often far more biologically productive than the best farm lands. They

are of great value in the production of certain marine fishes, shelfish and other ferms of life. In the U.S.A. studies have shown that some unspoiled estuaries have a capital value of upto $200,000 per hectare.

The Wadden Sea shared by Denmark, West Germany, and the Netherlands in an outstanding example of a tremendously valuable estuary producing fish and shelfish each year to the value of about U.S. $140 million. Recent studies indicate that its future may be threatened by pollution, and industrial development.

That progress can be made in the struggle to save a significant part of the world's wetlands is shown by the interests currently underway throughout the world. This is illustrated by the Ramsar Conference convened by the Government of Iran at Ramsar, in 1971 and sponsored or co-sponsored by some eight international conservation agencies. The Governments of ten European nations, two Asian and three Middle Eastern countries, plus south Africa and the Soviet Union sent representatives to the Conference while six more nations sent observers and many international non-government agencies also sent observers. This Conference drawnup the 'Convention on Wetlands of International Importance - Especially as Waterfowl Habitat'.

The Ramsar accomplishments were the culmination of tremendous efforts over many years by the participants. The firm basis for the Ramsar Convention was laid in a series of preparatory meetings over a period of ten years held in France, Scotland, the Netherlands, Poland, Turkey, and the Soviet Union, with participation by many other States and agencies. Unfortunately to date, ratification of the Ramsar Convention by the World community of States has not been as high as expected.

(As on September 1, 1980, 27 States had ratified or acceeded to the Convention. Parties to the Convention will meet November 24-28, 1980 at Cagliari, Italy, to review progress and discuss possible changes).

In 1976-77 the Council of Europe adopted a Wetlands Compaign to focus attention in the necessity of action to save these unique natural features. Earlier, progress in North America in preserving wetlands was notable during the 1960s. This was given a great boost in 1961 when the U.S. Congress enacted the Wetlands loan Act authorizing $105 million for wetland acquisition for conservation purposes. Since then the U.S. Fish and Wildlife service has acquired more than an additional 700,000 ha. of wetlands habitat in the prairie pothole 'duck factory' region of the north central United States. Total cost has been US. $165 Million through 1970.

The Canadian Government and the Canadian Provinces have major wetland preservation programmes. Ducks unlimited (Canada), a private conservation agency, has an enviable record in acquiring lands via egsements, then flooding them to create excellent wetland habitat in the major migratery bird production and habitat zone of North America.

Inspite of these significant results, in North America wetlands continue to be destroyed at an alarming rate. For example, during the 1960s in the United States some 140,000 ha. of wetlands in the northern prairies were drained. More than 800,000 ha. of river bottom land overflow areas were protected from flooding and put into cropland in the Mississippi River delta and about 350,000 acres (141,645 ha) of extremely valuable coastal marshes

and estuaries were destroyed by development for other purposes.

Worldwide, the many aspects of wetlands bring benefits to vast numbers of people. Tragically these many values are often not realized by landowners and others who may have little, if any, incentive to preserve them. Often this is because of the lack of knowledge of their intrinsic value as wetlands.

Following are some of the tangible and intangible values of wetlands. New values and uses continue to be discovered.

Tangible wetland values

1. Recreational values

Wetlands, particularly coastal and estuarine, offer unequalled values in their diversity of life, scenery, esthetics, and opportunities for recreation. Hundreds of millions of people worldwide visit wetlands annually to study, observe and enjoy the natural life present. Undoubtedly, recreational values are equivalent to millions of dollers annually. Examples of such areas are the Wadden Sea (Denmark, West Germany, and the Netherlands) Camargue (France), Parc National des Diseaux du djoudj (Senegal), Okeefenokee Swamp (Georgia, U.S.A.), Lake Nakuru (Kenya, East Africa).

2. Production of plant and Animal Life:

(a) Fish production: Wetlands throb with life. Esturies serve as spawning, rearing and nursery areas producing finfish, shellfish, shrimp, lobsters, clams, and other animals.

(b) Waterfowl production:

Every year wetlands produce or provide habitat for hundreds of millions of migratory birds including ducks, geese, swans, shorebirds, flamingos, etc., They serve as breeding rearing, migration and wintering grounds on every continent. More than 160s species of birds are dependent upon wetlands for their existence in North Americalalone.

(c) Fur animals: Muskrats, beavers, mink, others nutria and other forms are directly dependent upon wetlands for their existence. These animals are valuable fur producers. The flesh of some is used as human food.

(d) Amphobians and reptiles: Wetlands in warm climates produce valuable crops in the form of frogs, alligators, crocodiles and related animals of great value for food and leather.

(e) Upland wildlife and big game : Wetlands provide nesting habitat for many species of game birds such as pheasants, grouse, partridge, etc., and are vital as roosting cover during winter. The presence of emergent vegetation in wetland areas provides escape and winter cover for white-tailed deer in the prairie regions of North America, and food for moose or other ungulates.

3. Timber production:

Wetlands produce valuable timber such as cypress, hemlock, and poplar.

4. Berry Production:

Important foods for human consumption are produced in wetlands, including cranberries, blue-berries, lingon berries, salmon berries and many other edible

fruits. Wild rice is an extremely valuable crop.

5. Boating:

Millions of persons pursue and enjoy boating, sailing canceing, ice boating, ice skating, swimming, water skiing and other sports on open-water wetlands. England's Norfolk Boards is an example.

6. Water supply:

Wetlands help recharge underground aquifers; are important direct source of water for domestic use, for use by livestock, for ice harvest, for transport by boat and sled, for irrigation, contribution to underground water supply, for industrial use.

7. Forage and fuel:

Wetlands are important producers of plant material for forage, fodder, and bedding for livestock, for that ching roofs, for utensils, for construction of homes, for insulating material, for construction of livestock shelters, Wetlands have produced billions of tons of peat, a most important source of fuel in many lands.

8. Fire protection:

Wetlands serve as fire breaks and barriers to range and forest fires, and as sources of water in fire fighting.

9. Water control and the hydrologic cycle:

Wetlands by their nature serve the important functions of water regime regulation and play vital roles in flood and arosion control. Estuarine wetlands serve as vital buffers to coastal storms. They keep water on the land where it serves man best. They serve as biological filters and recycle nutrients.

Intangible Values:

1. Scientific and educational:

Wetlands offer unequalled opportunities for scientific studies of ecosystems, biotic communities, biological productivity, and scientific research. They provide outstanding outdoor laboratories and class-rooms for students. Examples are the Camargue in southern France; the Delta Marsh in Maintoba, Canada, the Wildfowl Trust properties at Slimbridge, Gloucester, England.

2. Esthetic Values:

Wetlands provide esthetic ejoyment to millions of persons from the urban areas who visit them for the pleasure and appreciation they get from these natural wildreness and primative areas - where they can see, hear and feel mother nature at her best, where they can bird-watch and study and photograph nature.

Wetlands are important in bringing visitors from many lands together to enjoy a common interest while promoting a better understanding among people Significant attractions can be found in almost every country - even in arid lands where wetlands are relatively rare - and priceless. Lake Ichkowl in Tunisia is an example.

3. Endangered Species:

Many wetlands support and provide the sole habitat for endangered animals and plants, others serve as vital stopping stones on migration routes for endangered migratory birds. Some wetlands, if destroyed, would see the end of magnificant flocks of birds, i.e., the flamingos of Lake Nakuru, Kenya, and pelicans in the Rift Lakes of Ethiopia.

4. Recycling values:

Wetlands as complete ecosystems are of great value in recycling nutrients and organic wastes, in recycling and rendering harmless certain toxic chemicals. Wetlands produce oxygen thus helping to maintain the supply of this vital element.

5. Maintenance of Gene Pools:

Many wetlands are complete ecosystems and thus are vital in the maintenance of gene pools. Their genetic values cannot be ignored or overlooked.

From all of the foregoing it is clear that wetlands have important international values, many that should be protected through cooperative international effort. The Ramsar Convention serves this purpose, and states which have not yet become parties to the Convention should do so. Instruments of ratification or accession should be deposited with the Director General of UNESCO.

Wetlands are vital links in the web of life. Their loss or continuing destruction - and the inevitable loss of species that always follows - will only make man and his societies much the poorer for it.

Sd/-
Superintendent.

// True Copy //

ACCOUNTS OFFICER,
POLLUTION CONTROL BOARD,
SECUNDERABAD.

## APPENDIX X

THIS CONFERENCE WAS CONVENED BY THE GOVERNMENT OF IRAN. IT WAS SPONSORED BY THE INTERNATIONAL WILDFOWL RESEARCH BUREAU, AND CO-SPONSORED BY THE FOOD AND AGRICULTURAL ORGANISATION, UNITED NATIONS EDUCATIONAL, SCIENTIFIC AND CULTURAL ORGANIZATION, INTERNATIONAL BIOLOGICAL PROGRAMME, INTERNATIONAL UNION FOR CONSERVATION OF NATURE AND NATURAL RESOURCES, INTERNATIONAL COUNCIL FOR BIRD PRESERVATION, WORLD WILDLIFE FUND, AND CONSEIL INTERNATIONAL DE LA CHASSE

---

FINAL ACT OF THE INTERNATIONAL CONFERENCE ON THE CONSERVATION OF WETLANDS AND WATERFOWL.

Held at Ramsar, Iran, 30 January to 3 February 1971.

1. The imperial Government of Iran, in accordance with recommendations of earlier international meetings on wetlands and waterfowl conservation, convened an international conference on the Conservation of Wetlands and Waterfowl, with a view to promoting international collaboration in this field.

2. The Conference met at Ramsar, Iran, from 30 January to 2 February 1971.

3. Credential were received by the Secretariat of the Conference from the Governments of the following States:

| | | |
|---|---|---|
| Belgium | Iran | Sweden |
| Denmark | Ireland | Switzerland |
| Finland | Jordan | Turkey |
| France | The Netherlands | Union of Soviet Socialist Republics. |
| Federal Republic of Germany. | Pakistan, South africa. | " |
| India | Spain | United Kingdom. |

4. The Governments of the following countries sent observers to the Conference:

| | | |
|---|---|---|
| Bulgaria | Hungary | Rumania |
| Greece | Italy | |

5. The following Specialized Agencies of the United Nations sent Observers to the Conference:

Food and Agricultural Organization (FAO)
United Nations Educational, Scientific and Cultural Organisation (UNESCO)

6. The following Non-Governmental Organizations sent Observers to sent Conference:

Conseil International de la Chasse (CIC)
International Council for Bird Preservation (ICBP)
International Union for Conservation of Nature and Natural Resources (IUCN)
International Wildfowl Research Bureau (IWRB)
Special Committee for the International Biological Programme of the International Council of Scientific Unions (IBP) World Wildlife Fund (WWF).

7. The Conference elected Mr.E.Firuz, Head of the imperial Iranian Delegation, as President of the Conference.

8. The Conference elected as Vice-President, Dr.V.D. Denisov, Head of the Delegation of the Union of Soviet Socialist Republics, and Prof.Dr.M.F.Morzers-Bruyns, Head of the Delegation of the Kingdom of the Netherlands.

9. The Iranian Game and Fish Department and the International Wildfowl Research Bureau (IWRB) provided the Secretariat of the Conference. Prof.G.V.T.Matthews, Director of IWRB, was appointed Repporteur-General of the Conference.

10. The following Committees were established by the Conference:

Credentials Committee

| | |
|---|---|
| Mr. S.A. Hejmadi | (India) |
| Mr. A.Dakhgan | (Jordan) |
| Dr. L.E.Esping | (Sweden) (Acting as Repporteur) |

Drafting Committee:

Count Cornet d'Elzius (Belgium)
Dr. W.Erz (Federal Republic of Germany)
Dr. M.Nabavi (Iran)
Dr. E.J.Ph. Roberts (The Netherlands)
Prof. Yu.Isakov (USSR)
Rapporteurs: Sir Hugh Elliott (IBP)
Mr. F.G. Nicholls (IUCN)

11. The Conference was deeply impressed by the decision included in the Message sent to it by H.I.M.Mohammad Reza Pahlavi, Bryamehr, Shahanshah of Iran, that the Imperial Iranian Government would place one of its wetland ecosystems of special global significance in joint trust with a suitable international agency, such as the United Nations Organization, to conserve and administer for all mankind. The Conference commanded this most important precedent to other Governments.

12. The Government of Iran in convening the Conference referred to it the draft of a Convention on Wetlands of international importance, especially as Waterfowl Habitat, which had resulted from an International meeting of experts held at Espoo, Finland, in March 1970. This draft, together with comments of the Governments of France, the Netherlands, Sweden and

the USSR concerning it, constituted the basis for discussions by the Conference.

13. On the basis of its deliberations, as recorded in the summary records of its sessions, the Conference prepared and adopted in accordance with its rules of procedure a final text of the Convention on Wetlands of international importance, Especially as Waterfowl Habitat, which is appended as Annex 1 to this final Act.

14. In the course of discussions on the draft Convention, the Conference agreed that whilst the final text of the Convention does not include an article concerning territorial application, this will not preclude parties to the Convention indicating at any time to which territories constitutionally associated with them, the Convention shall apply.

15. In approving the final text of the Convention, the Head of the Delegation of the Union of Soviet Socialist Republics abstained from approving Articles I because it contained the provision that only members of the United Nations, the Specialized Agencies, the International Atomic Energy Agency or Parties to the Statue of the International Court of Justice may become parties to the Convention. His Delegation believed that all countries should have the right to become parties to the Convention, since this would contribute to the cause of conservation of wetlands and waterfowl, and he noted that birds recognized no boundaries. He expressed the hope that these views will be taken into consideration by governments at the time the Convention is opened for signature.

16. The Representative of UNESCO stated that UNESCO was willing to accept the duties of Depository as specified in the final text of the Convention, subject to final legal clearance by the Organization and subsequent notification of its acceptance to the Imperial Government of Iran.

17. The Representative of IUCN state that he was authorized to accept on behalf of IUCN the bureau duties specified in the final text of the Convention.

18. The Conference invited the Imperial Government of India to take the necessary steps to prepare the final document containing English, French, German and Russian texts of the Convention and, after submission for verification to the Governments represented at this Conference, to open the convention for signature at a convenient date.

19. During the course of discussion of the draft Convention the Conference decided to note the following points:

a) The waterfowl referred to in the Convention include the following groups of birds:

| | |
|---|---|
| Gaviiformes | (Divers) |
| Podicipediformes | (Grebes) |
| Pelicaniformes | (Pelicaus, Cormorants, Darters) |
| Ciconiiformes | (Herons, Bitterns, Storks, Loises, Flamingos) |
| Anseriformes | (Screamers, Swans, Geese, Ducks) |
| Gruiformes | (Cranes) |
| Ralliformes | (Coots, Rails) |
| Charadriiformes | (Waders, Gulls, Terns) |

b) The entries in the List of Wtlands of International importance which is to be maintained under the Convention could usefully be supplemented by descriptions of the biotopes involved and an enumeration of the bird species especially in need of protection therein.

20. The Conference adopted eleven Recommendations which are submitted to the Governments and other Bodies concerned for consideration and appropriate action.

Although in sympathy with the intention of Recommendations 1 to 5, Delegates from some countries refrained from voting on them for the formal reason that they did not wish to be involved in the internal affairs of the countries concerned. These Recommendations are appended as Annexure II to this Final Act and relate to:

1) Conservation of the Waddensea, northwestern Europe.
2) Conservation of Thjorsarver, Iceland.
3) Conservation of North Bull Island, Ireland.
4) Conservation of Lakes Ab-i-Istada and Dasht-a--Nawar, Afghanistan.
5) Conservation of the Medway Estuary, England.
6) Oil Pollution.
7) Pesticides.
8) Promotion of Wetlands Research.
9) Promotion of Hunting Research.
10) African Wetlands.
11) Wetlands and the Man and the Biosphere Programme.

In witness whereof, the Representative have signed this Final Act.

Done at Ramsar this third day of February, One thousand nine hundred and seventy one, in a single copy of the

English language.

The original text of this Final Act shall be deposited by the Government of Iran with the Director General of the United Nations Educational, Scientific and Cultural Organization who shall send a certified copy of this instrument to each of the Government represented at the Conference.

(Signed by the President and Repporteur-General, and Representatives of Denmark, Finland, France, the Federal Republic of Germany, India, Ireland, Iran, Jordan, the Netherlands, Pakistan, South Africa, Spain, Sweden, Switzerland, Turkey, Union of Sovient Socialist Republics and Great Britain).

( A N N E X U R E - I )

Conservation on Wetlands of International Importance, Especially Waterfowl Habitat:

Final Test Adopted
by the International Conference of Wetlands
and Waterfowl at Ramsar, Iran,
on 2nd February, 1971.

The contracting parties,
Recognizing the interdependence
of Man and his environment:

Considering the fundamental ecological functions of wetlands as regulators of water regimes and as habitats supporting a characteristic flora and fauna, especially waterfowl:

Being convinced that wetlands constitute a resource of great economic cultural, scientific and recreational value, the loss of which would be irreparable:

Desiring to stem the progressive encroachment on and loss of wetlands now and in the future;

Recognizing that waterfowl in their seasonal migrations may transcend frontiers and so should be regarded as an international resource;

Being confident that the conservation of wetlands and their flora and fauna can be ensured by combining far-sighted national policies with co-ordinated international action;

Have agreed as follows:

Article I

1. For the purpose of this Convention wetlands are areas of marsh, fen, peatland or water, whether natural or artificial, permanent or temporary, with water that is static or flowing, fresh, brackish or salt, including areas of marine water the depth of which at low tide does not exceed six metres;

2. For the purpose of this Convention waterfowl are birds ecologically dependent on wetlands.

Article 2:

1. Each contracting party shall designate suitable wetlands within its territory for inclusion in a list of Wetlands of International importance, hereinafter referred to as the list". Which is maintained by the bureau established under Article 8. The boundaries of each wetland shall be precisely described and also delimited on a map and they may incorporate riparian and coastal zones adjacent to the wetlands, and islands or bodies of marine water deeper than six metres at low tide lying within the wetlands, expecially where these have importance as waterfowl habitats.

2. Wetlands should be selected for the list on account of their international significance in terms of ecology, botany, zoology, limnology or hydrology. In the first instance wetlands of internal importance to waterfowl at any season should be included.

3. The inclusion of a wetland in the List does not prejudice the exclusive sovereign rights of the Contracting party in whose territory the wetland is situated.

4. Each contracting Party shall designate at least one wetland to be include in the List when signing this Convention or when depositing its instrument of ratification or accession, as provided in Article 9.

5. Any Contracting Party shall have the right to add to the List further wetlands situated within its territory, to extend the boundaries of those wetlands already included by it in the List, or, because of its urgent national interests, to delete or restrict the boundaries of wetlands already included by it in the List and shall, at the earliest possible time, inform the organization or government responsible for the continuing bureau duties specified in Article 8 of any such changes.

6. Each contracting party shall consider its international responsibilities for the conservation, management and wise use of migratory stocks of waterfowl, both when designating entries for the List and when exercising its right to change entries in the List relating to wetlands within its territory.

Article 3:

1. The Contracting Parties shall formulate and implement their planning so as to promote the conservation of the wetlands included in the List, and as far as possible the wise use of wetlands in their territory.

2. Each Contracting Party shall arrange to be informed at the earliest possible time it the ecological character of any wetland in its territory and included in the List has changed is changing or is likely to change as the result of technological developments, pollution or other human interference. Information on such changes shall be passed without delay to the organization or government responsible for the continuing bureau duties specified in Article 8.

Article 4:

1. Each Contracting Party shall promote the conservation of wetlands and waterfowl by establishing nature reserves on wetlands, whether they are included in the List or not and provide adequately for their wardening.

2. Where a Contracting Party in its urgent national interest, deletes or restricts the boundaries of a wetland included in the List, it should as far as possible compensate for any loss of wetland resources, and in particular it should create additional nature reserves for waterfowl and for the protection, either in the same area or elsewhere, of an adequate portion of the original habitat.

3. The Contracting Parties shall encourage research and the exchange of data and publications regarding wetlands and their flora and fauna.

4. The Contracting Parties shall endeavour through management to increase waterfowl populations on appropriate wetlands.

5. The Contracting Parties shall promote the training of personnel competent in the fields of wetland research, management and wardening.

Article 5:

The Contracting Parties shall consult with each other about implementing obligations arising from this Convention especially in the case of a wetland extending over the territories of more than one Contracting Party or where a water system is shared by Contracting Parties. They shall at the same time endeavour to co-ordinate and support present and future policies and regulations concerning the conservation of wetlands and their flora and fauna.

Article 6:

1. The Contracting Parties shall, as the necessity arises convene Conferences on the Conservation of Wetlands and Waterfowl.

2. These Conferences shall have an advisory character and shall be competent inter alia:

   a) to discuss the implementation of this Convention;
   b) to discuss additions to and changes in the List;
   c) to consider information regarding changes in the ecological character of wetlands included in the List provided in accordance with paragraph 2 of Article 3;

d) to make general or specific recommendations to the Contracting Parties regarding the conservation, management and wise use of wetlands and their flora and fauna;

e) to request relevant international bodies to prepare reports and statistics on matters which are essentially international in character affecting wetlands.

3. The Contracting Parties shall ensure that those responsible at all levels for wetlands management shall be informed of, and take into consideration, recommendations of such Conferences concerning the conservation, management and wise use of wetlands and their flora and fauna.

Article 7:

1. The representatives of the Contracting parties at such Conferences should include persons who are experts on wetlands of waterfowl by reason of knowledge and experience gained in scientific administrative or other appropriate capacities.

2. Each of the Contracting Parties represented at a Conference shall have one vote, recommendations being adopted by a simple majority of the votes cast, provided that not less than half the Contracting Parties cost votes.

Article 8:

1. The internation union for Conservation of Nature and Natural Resources shall perform the continuing bureau duties under this Convention until such

time as another organization or government is appointed by a majority of two thirds of all Contracting parties.

2. The continuing bureau duties shall be, inter alia:

a) to assist in the convening and organizing of Conferences specified in Article 6;

b) to maintain the List of Wetlands of international importance and to be informed by the Contracting parties of any additions, extensions, deletions or restrictions concerning wetlands included in the List provided in accordance with Paragraph 5 to Article 2;

c) to be informed by the Contracting Parties of any changes in the ecological character of wetlands included in the List provided in accordance with paragraph 2 of Article 3;

d) to forward notification of any alterations to the List, or changes in character of wetlands included therein, to all Contracting Parties and to arrange for these matters to be discussed at the next Conference;

e) to make known to the Contracting Party concerned, the recommendations of the Conferences in respect of such alterations to the List or of changes in the character of wetlands included therein.

Article 9:

1. This Convention shall remain open for signature indefinitely.

2. Any member of the United Nations or of one of the

specialized Agencies or of the international Atomic Energy Agency or Party to the Statute of the International Court of Justice may become a party to this convention by;

a) Signature without reservation as to retification;
b) Signature subject to ratification followed by ratification;
c) accession.

3. Ratification or accession shall be effected by the deposit of an instrument of ratification or accession with the Director General of the United Nations Educational, Scientific and Cultural Organization (hereinafter referred to as "the Depository").

Article 10:

1. This Convention shall enter into force four months after seven States have become Parties to this Convention in accordance with Paragraph 2 of Article 9.

2. Thereafter this Convention shall enter into force for each Contracting Party four months after the day of its signature without reservation as to ratification, or its deposit of an instrument of ratification or accession.

Article 11:

1. This Convention shall continue in force for an indefinite period.

2. Any Contracting Party may denounce this Convention after a period of five years from the date of which

it entered into force for that Party by giving written notice thereof to the Depository. Denunciation shall take effect four months after the day on which notice thereof is received by the Depository.

Article 12:

1. The Depository shall inform all States that have signed and acceded to this Convention as soon as possible of:

   a) signature to this Convention;
   b) deposits of instruments of ratification of this Convention;
   c) deposits of instruments of accession to this Convention;
   d) the date of entry into force of this Convention;
   e) notifications of denunciation of this Convention.

2. When this Convention has entered into force, the Depository shall have it registered with the Secretariat of the United Nations in accordance with Article 102 of the Charter. In witness whereof, the undersigned, being duly authorised to that effect, have signed this Convention.

Done at . . . . . this . . . . . day of . . . . . 19 . . in a single original in the English, French German and Russian languages, in any case of divergency the English test prevailing, which shall be deposited with the Depository which shall send true copies thereof to all Contracting parties.

(Annexure II)

RECOMMENDATIONS ADOPTED BY THE INTERNATIONAL CONFERENCE ON THE CONSERVATION OF WETLANDS AND WATERFOWL.

AT RAMSAR, Iran, on 3 FEBRUARY 1971

Conservation of specific wetlands

Recommendation 1, Conservation of the Waddensea, northwestern Europe.

The Conference,

Considering that multi-disciplinary international research in recent years has shown convincingly the unrivalled value of the Waddensea as a natural resource; because of its high biolgical productivity and its geographical situation it is of vital importance for literally millions of Eurasian waterfowl;

Recognizing that this area in the territories of Denmark, the Federal Republic of Germany and the Netherlands is threatened by development plans involving the construction of dams and dykes, the establishment of industries and other human impacts which are altering the present ecological situation;

Being especially aware of the immediate danger of pollution by industrial waste and sewage waters;

Recommends to the Governments of Denmark, the Federal Republic of Germany and the Netherlands that action be taken to tait the implementation of any such planning until appropriate research has demonstrated that no harmful effects will result.

and further recommends that consideration be given to including the Waddensea area in the List of Wetlands of International importance to be established under the proposed Wetlands Convention.

Recommendation 2. Conservation of Thjorsarver, iceland.

The Conference,

Being informed of the international importance of the Thjorsarver in central iceland as the breeding ground of more than half the world population of Anser brechyrhynchus;

Being aware of the valuable ecological research being started in the area;

Recommends to the Government of iceland that it delay the proposal to flood Thjorsarver for hydro-electric purposes until the results of research permit a re-evaluation of resources allocation in this area.

Recommendation 3. Conservation of North Bull Island, Ireland.

The Conference,

Noting that development has commenced of North Bull Island near Dublin, a vitally important waterfowl habitat;

Considering that it ranks fourth in importance among ireland's list of wetlands, is the winter habitat of many thousands of waterfowl, and moreover is the only wetland of international significance within a capital city in Europe;

Being deeply concerned at the development of the area;

Recommends to the Government of Ireland that this wetlands should be excluded from further development.

Recommendation 4. Conservation of Lakes Ab-i-Istada and Dasht-e-Nawar, Afghanistan.

The Conference.

Being advised that recent studies of wetlands in Afghanistan have shown that Lakes Ab-i-Istada and Dasht-e-Nawar are of great international importance as wintering and breeding places for waterfowl including for varying periods the greater part of world population of the Siberian Crane Grus ieucogeranus;

Recommends to the Government of Afghanistan that these valuable wetlands to given protection from disturbance at all times, and suggests that they seek financial or other assistance from international organizations if this is required.

Recommendation 5. Conservation of the Medway Estuary, England.

The Conference,

Noting that it is proposed that the Medway Estuary in Kent, England, be considered for development as a maritime industrial development area (MIDA):

Taking into consideration that the area is of outstanding international importance to migratory waterfowl and could well become critically important as a wintering ground for part of the fifth of the world population of the darkbellied race of the Brent groose, Branta bernicla, that would be displaced if Foulness became the site for London's third airport or a "Europort" dock complex;

Recommends that the United Kingdom Government exclude this vitally important area from such development projects.

P O L L U T I O N

Recommendation 6. Oil Pollution

The Conference,

Noting with anxiety the accelerated frequency of oil pollution of the sea by dessaters and by oil discharge from ships which do not respect the International Convention for the Prevention of the Pollution of the Sea by Oil;

Recommends to the appropriate States and International Organizations that they bring to the attention of competent authorities the primary importance of;

a) Ensuring strict supervision on coastal waters, especially in the Caspian Sea, the Baltic Sea, the Kattegat, the North Sea and the Channel;

b) Accelerating research into combatting oil pollution; and

c) applying promptly and regorously the statutory punishments.

Recommendation 7. Pesticides;

The conference,

Noting with concern the grave danger to wetlands and their flora and fauna represented by the use of persistent pesticides, such as chlorinated hydrocarbons, due to run off, discharge of waste products and deliberate application;

Deploring an apparent tendency for such pesticides although often banned or restricted in the countries of manufacture, to be exported in quantity and even offered for sale at reduced prices to less developed countries, which may lead to the degradation of natural areas including wetlands of international importance.

Recommends that governments both of countries from which such pesticides originate and of those in which their use is not yet fully controlled take all necessary measures to curtail and, wherever possible, ban or severely restrict the sale and use of persistent pesticides.

## RESEARCH AND INVESTIGATION

Recommendation 8. Promotion of wetlands research.

The Conference,

Being aware of the serious and deteriorating situation facing waterfowl in many parts of the palaearctic Region;

Realizing the need for improving scientific information for the correct assessment of wetlands for the proposed Wetlands Convention;

Recommends that Governments and all appropriate departments and institutions concerned with natural resources should assist and facilitate wetland research at all levels, and in particular;

a) That all countries which do not already carry out regular waterfowl counts on important wetlands should endeavour to do so at least twice a year on dates advised by the International Wildfowl Research Bureau;

b) that all countries should assess their wetlands in respect of the need to provide a chain of effective refuges, these being selected for their value for waterfowl as well as permanence despite varying conditions of rainfall in arid areas; and

c) that if countries are unable to undertake this work from their own resources they should seek assistance from appropriate International organizations.

Recommendation 9. Promotion of Hunting Research.

The Conference,

Recommends that waterfowl research organizations in different countries should undertake;

a) to make every effort to obtain data on the breeding success and productivity of the main species involved;

b) to produce general mortality data based on recovery of ringed birds to be compared with other measures of productivity; and

c) to carry out special studies on the effect of hunting on wildfowl populations, by means of ringing data and the use and development of realistic hunting kill or capture statistics.

and further recommends that international and national hunters organizations should;

a) encourage sportsmanlike methods in hunting, and stop actions which obviously lead to mass destruction or loss of waterfowl;

b) intensity educational measures to improve hunters knowledge of different species of waterfowl; and

c) make hunters aware of their responsibilities for conservation and wise use of waterfowl resources through proper hunting practices.

Recommendation 10. African Wetlands.

The Conference,

Noting with satisfaction, that the new African Convention on Conservation of Nature and Natural Resources, in force since 1969, deals specifically with wetlands as a productive natural resource and obliges the Contracting States to undertake ecologically sound measures for the conservation, management and utilization of wetlands;

Taking into consideration the importance of African wetlands as habitats for migratory waterfowl breeding in northern and central Eurasia, but wintering in Africa;

Recommends that African Governments encourage research on productivity of wetlands and, possibly with the help of UNESCO, establish an African List of wetlands of international imprtance, especially as waterfowl habitat, in conformity with the project MAR list for Europe, published in 1965 by the IUCN.

Recommendation 11. Wetlands and the Man and the Biosphere.

The Conference,

Noting with satisfaction UNESCO's new programme on "Man and the Biosphere" (MAB) involving the planning of world-wide research into, and the monitoring of, the

role and productivity of various ecosystems or major habitants, as a basis for conservation, management, wise utilization and sustained yield;

Recommends that wetlands in all parts of the world should be brought within the scope of the MAB programme.

// True Copy //

ACCOUNTS OFFICER,
POLLUTION CONTROL BOARD,
SECUNDERABAD.



.../-

## APPENDIX XI

**Copy of the D.O.Letter No.17173/C-3/82, dated 30-7-1982 from Sri H.K. Babu, I.A.S., Director of Fisheries, A.P. and Member of Ecological Survey of Kolleru Lake addressed to the Member Secretary, A.P.State Board for Prevention and Control of Water Pollution, Secunderabad.**

Dear Sri Ramayya Naidu,

Sub:- FIFTH MEETING of the Ecological Survey of Kolleru Lake to be held at 11.00 A.M. on 13-7-1982 in Board Office, Kavadiguda, Hyderabad - Regarding.

Ref:- Your Lr.No. 177/PCB/77-657, dated 30-6-82.

-:oOo:-

In the fifth meeting of the Ecological survey of Kollair lake held on 13-7-1982 the question of culture of grass carp has come up for detailed discussion. In the draft report of the Sub-Committee on ecological survey of Kollair lake it was noted that (1) Grass carp is an exotic fish (2) its introduction may be experimented in weed infested controlled ponds before releasing in open well and (3) its introduction must be done with caution. These points created an apprehension among the members that even if its culture is taken up in controlled ponds, the chances of its entry into the main lake through some sources or the other cannot be ruled out completely and hence the members suggested that its culture should not be taken up even in the controlled ponds. They have also quoted the instance of Tilapia which proved to be a menace. In this connection, I may point out that Indian carps already exist in the lakes. The Grass carp except in its feeding habits in all other aspects resembles indegenous carps. It is not a prolific breeder like Tilujia. It does not compete with the food of other fishes and hence

its culture along with other carps in controlled ponds is freely recommended by the fisheries scientists to have increased per hectare production. It does not normally breed in natural conditions and it often needs a provocation through pituitory harmone injection. The chances of its escape from the controlled tanks into lake are very remote. Even if by chance a few escape into the lake, there are no chances of its establishment in the lake as it does not breed there. Since there is luxuriant growth of vegetation which is preferred by the fish for its food, I do not find any justification in not making use of the natural facilities available to augment the fish production by conversion of the excess vegetation into fish flesh. It indirectly helps in controlling certain varieties of vegetation which is luxuriantly growing in the lake. However, before finalising your draft, I request you to obtain the opinion of the Director General of I.C.A.R. regarding the desirability of taking up its culture in the controlled ponds of the lake with reference to the objections for which the Committee has been constituted.

With regards,

Yours sincerely,

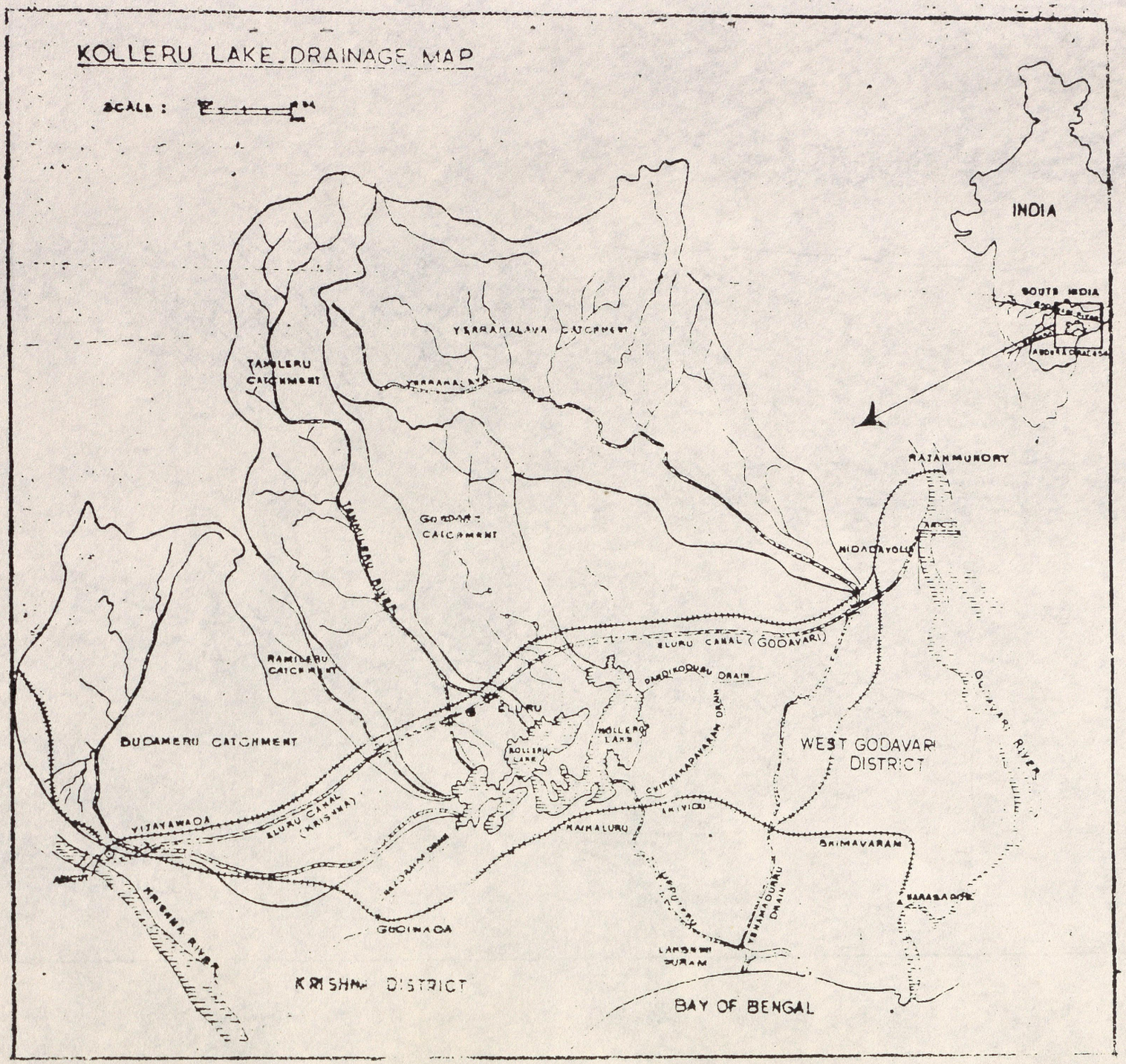
Sd/-
( M.K. BABU )

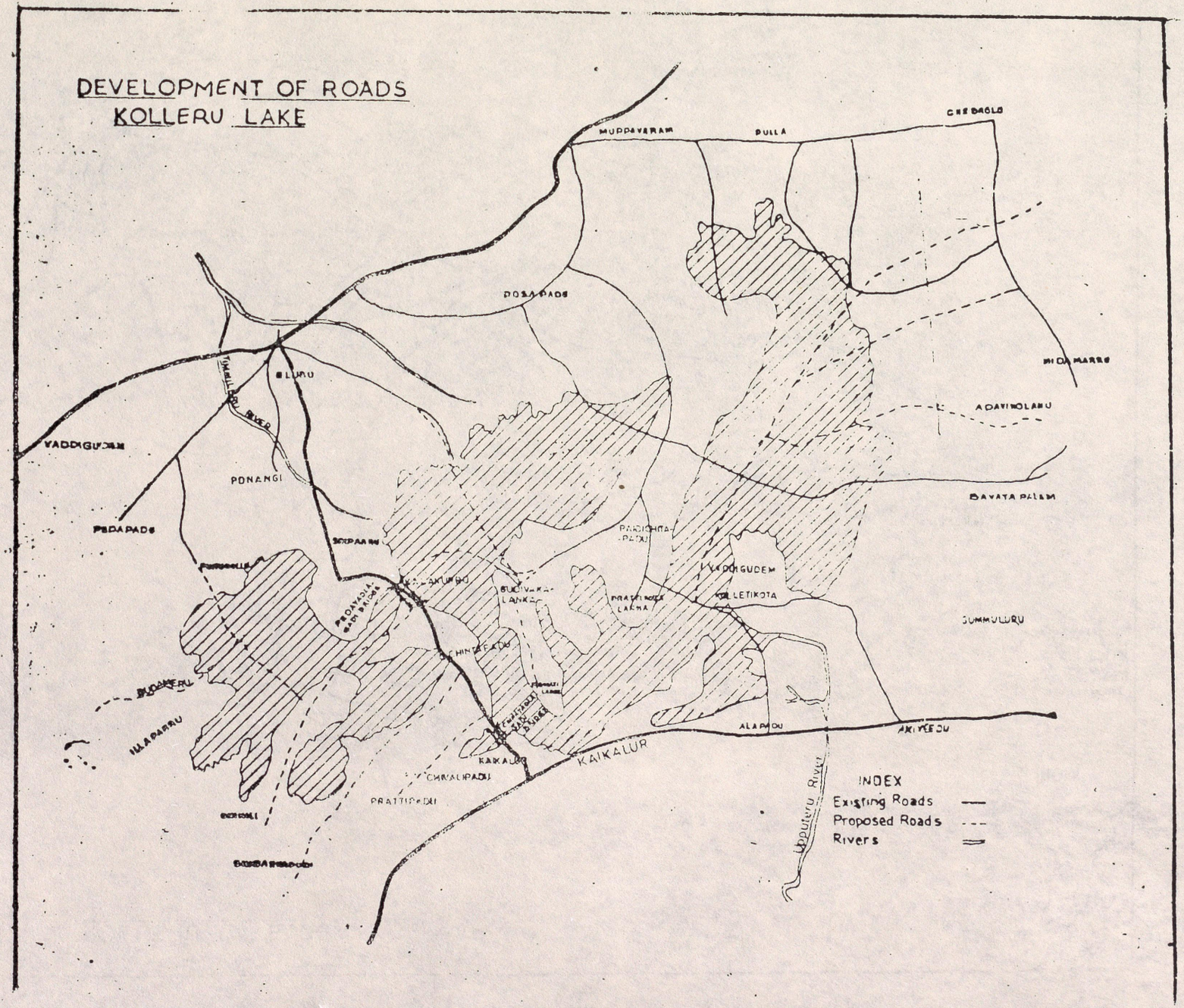
To

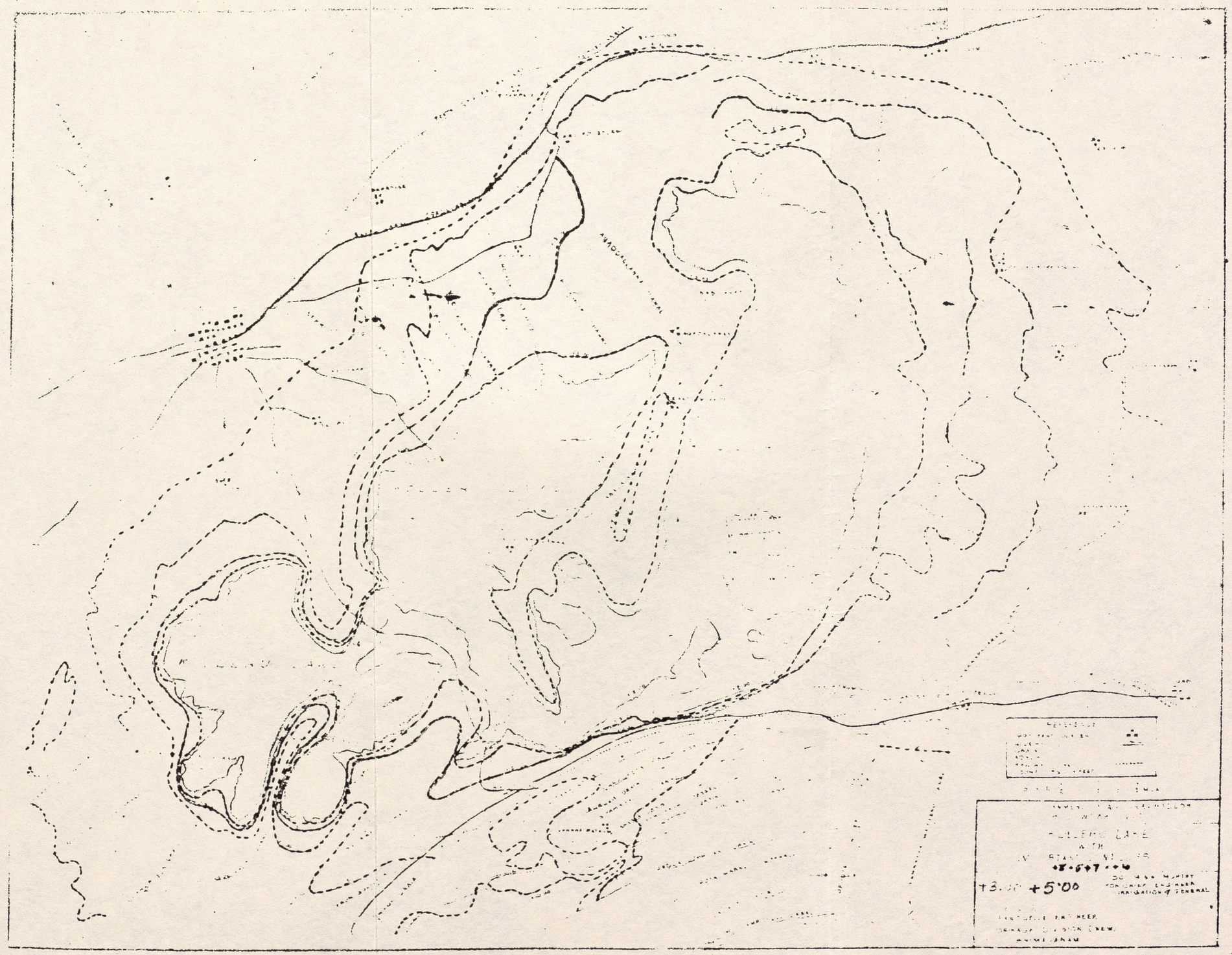
Sri P. Ramayya Naidu,
Member Secretary,
Pollution Control Board,
Kavadiguda,
Hyderabad - A.P.

// True Copy //

ACCOUNTS OFFICER,
POLLUTION CONTROL BOARD,
SECUNDERABAD.


KOLLERU LAKE_DRAINAGE MAP
SCALE :
INDIA
SOUTH INDIA
YERRAKALAVA CATCHMENT
TAMILERU CATCHMENT
RAJAHMUNDRY
NIDADAVOLU
ELURU CANAL (GODAVARI)
RAMILERU CATCHMENT
ELURU
BUDAMERU CATCHMENT
WEST GODAVARI DISTRICT
GODAVARI RIVER
VIJAYAWADA
ELURU CANAL (KRISHNA)
KAIKALURU
BHIMAVARAM
KRISHNA RIVER
GUDIWADA
KRISHNA DISTRICT
BAY OF BENGAL


DEVELOPMENT OF ROADS
KOLLERU LAKE
MUPPAVARAM
PULLA
DOSAPADU
ELURU
VADDIGUDEM
PONANGI
PEDAPADU
KAIKALUR
ADAVINOLANU
BAVATAPALEM
SUMMULURU
ALAPADU
INDEX
Existing Roads
Proposed Roads
Rivers


+3.00 +5.00

# KOLLERU LAKE

SCALE 1" = 1 MILE

