

Avian diversity conservation in India with special reference to Rajasthan

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ABSTRACT

We are losing avian diversity at an alarming rate, due to destruction / degradation of natural habitat i.e. forest and grass lands, lack of sufficient rains in National Parks and also due to poaching by villagers, 'baheliyas' for various purposes and for illegal export to foreign countries. Although Wild Life (Protection) Act, 1972, Government of India (as amended in 1991), does not allow poaching and illegal trade of birds and wild life, somehow it is continuing uninterrupted. Conservation efforts by the Central Ministries, Government of India, Ministry of Environment & Forests, Government of India, Research Institutions, Agricultural Universities, State Veterinary Departments, NGOs like WWF India, New Delhi, Wild Life Institute of India, Dehradun, BNHS (Bombay Natural History Society, Mumbai), SACON (Salim Ali Centre for Ornithology and Natural History, Coimbatore (T.N) and others are underway for the conservation of avian genetic resources in the country.

Key Words: Avian, Diversity, Migration, Ringing and Conservation.

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INTRODUCTION

There are nearly 9,000 bird species in the world, while in India there are around 1,300 bird species, representing about 20 orders and 75 families. Thus richness of bird diversity in India is well recognized. Out of 1,300 bird species, around 900 species are resident, while around 400 are migratory. Major migrating birds are winter migrants, only small group is summer migrants and few are passage migrant. Some of the winter migratory bird species arrive in India by the months of September-October and return to their "breeding land" by March-April. These include Demoiselle Cranes (*Anthropoides virgo*), Common Cranes, Gadwal (*Anas strepera*), Mallard (*Anas platyrhynchos*), Eurasian Wigeon (*A. penelope*), Northern Pintail (*A. acuta*) etc. [Harsh Vardhan, 1980; Ali S and SD Ripley 1983; Ali Salim 2002; Singh Samar 2006]. These birds come from countries like Siberia, Central Asia, Eastern Europe, Mongolia and China etc., in order to spend winter months in India. These birds migrate to India, on account of changes in temperature in the Northern hemisphere, which does not allow these birds to feed, as the areas remain covered with snow.

It is reported that Arctic Tern (*Sterna paradisaea*) flies about 11,000 kms. from North Pole to South Pole. During the process of migration, thousands of migrating birds die in course of their journeys, killed by humans for their beautiful feathers and meat in countries like Afghanistan, Pakistan as well as in other countries. Siberian cranes used to come to Keoladeo National Park, Bharatpur but during the last one decade these birds did not visit Keoladeo National Park. The central flock of these cranes

has become extinct, hence their absence in this Park. As many as 176 bird species are endemic to the Indian sub-continent, while around 78 species of birds are considered threatened ones. In India the rarest birds are Himalayan Quail and Pink headed duck. *Birds Scenario in Rajasthan:* The State of Rajasthan has been endowed with varied eco-systems and remarkable diversity of bird species. Some of the prominent birds of Rajasthan- are Great-Indian Bustard (GIB-Godavan), Lesser Floricans, Houbra Bustard, Indian Peafowl, Vultures, Greater and Lesser Flamingos, Pigeons, Indian Saras, Crane, House Crow, Owls, Grey Partridges, common Grey Quail, Jungle Bush Quail, Indian Roller (Nilkanth), wood Pecker, Black Drongo (Kotwal), Bulbul, Wagtail, Baya Weaver, Ostrich, Grey Heron (Anjan), Barheaded Goose (Hans), Eagles, Shikra (Baaz), and many others. (Satya Kumar, S and K Shivakumar 2007).

In Rajasthan as many as 510 bird species have been reported from time to time by the Tourism & Wild Life Society of India (TWSI), Jaipur, an NGO. 12 km from Bundi, on the Bundi-Chittorgarh Road a flock of more than 200 Demoiselle Cranes (locally known as 'Kuranja') have been reported camping at Ramnagar Talab, coming in winter from Siberia, Mongolia and China (The Hindustan Times dt.26.10.2011).

Birds beneficial for Agriculture-(destroyers of insects/pests): As many as 48 bird species are reported to prey, primarily on insects/pests. The prominent ones are Cattle Egrate, Black Drongo, Indian Myna, Bank Myna, Brahming Myna, Pied Myna, Rosy Pastor, Wagtails, House Sparrow and Green bee-eater. Nocturnal Barn Owl is an exclusive predator of rodents, whereas

Spotted Owlet largely feeds on the adult coleopteron and lepidopteron insects, grubs, and other pests (Rao Vasudeva V, 2008).

The birds play an important role in maintaining delicate balance of nature. The necessary observations by bird watchers / Ornithologists (scientists) indicate that above mentioned birds consume 40% to 80% of insects/pests of crops, within few days of their appearance and thus contribute to contain the damage by insects and pests of crops to a greater extent. Such beneficial birds need conservation on priority basis [Rao Shyamsunder 2002-a, 2002-b, 2010].

There is a specific and intricate relationship between plants and the birds and some birds help in the cross-fertilization of flowers too. The weaver bird or baya (*Proceus philippinus*) is known for its architectural qualities, its nests add beauty to trees, they are intricately fabricated with long leaf strips of grasses [Sharma, Satish Kumar, 1995] and it is a sacred bird for Kathodi folk. Thus these birds have been doing yeomen service to the mankind but man in return has not done anything for them.

Harmful Birds species for agri-horticultural crops: There are about 63 bird species, which have been identified in damaging various crops viz., cereals-like pearl millet, sorghum, paddy etc (52 bird species), pulse crops (14 bird species), oilseed crops (15 bird species) as well as fruit plants like apple, guava, grapes etc (23 bird species). Some of the prominent bird species which damage crop plants include the Indian peafowl, House crow, Jungle crow, Rock pigeon, Ring Dove, Spotted Dove, Black throated Weaver bird, Grey Partridge, Rose-ringed Parakeet, common Myna, Red-vented Bulbul, common Babbler, Jungle Babbler and many others (Rao, P. Shyam Sunder, 2002-a, 2002-b, Rao, Vasudeva, V 2008).

The damage of paddy crop by weaver-birds can be reduced by keeping small tracts of bajra (Pearl millet) near paddy crop fields, as alternate food for birds. Naturally occurring trees of palas/dhak (*Butea monosperma*) known as flame of the forests, attracts many depredatory bird species during flowering stage of crops, thus reducing bird visits/damage to crop areas (source—"Importance of Birds in Agricultural Landscape" All India Network Project on Agricultural Ornithology, ANGR, Agricultural University, Rajendra Nagar, Hyderabad 500030).

Some of the common diseases prevalent in poultry birds in Rajasthan are:

Type	Diseases
Viral diseases	Marek's disease, Ranikhet, Gumboro, Infectious bronchitis, Fowl pox, Avian Influenza, Chicken-anaemia
Bacterial diseases	Infectious Coryza which is on account of cold leading to pneumonia, Coli Bacillosis, Avian Mycoplasmosis, Spirochetosis and Pullorum

Fungal Diseases	Aflatoxicosis and flaves
Parasitic diseases	Coccidiosis, Ascariasis and Taeniasis
Nutritional disorders	Fatty Liver syndrome, Rickets, Ostomalasia, and curly Toe Paralysis

The required vaccines against viral diseases are available in the market. However there is no report of Avian Influenza in Rajasthan during the last one year or so. Introduction of lichi disease of poultry through cross-border transmission is quite prevalent. While in recent years cases of H5N1 and avian influenza virus have already been reported from about a dozen countries, including India (from Sikkim, West Bengal and Manipur in eastern region) at an alarming rate. These poultry birds were killed in order to control spread of dreaded virus. There is an urgent need for developing Bio-security system for poultry and other birds and disease surveillance and monitoring for early detection and preparedness for outbreaks of diseases and control needs to be taken up on priority basis in India.

Birds in Mythology: Peacock or Indian peafowl (*Pavo cristatus*) is India's National Bird. The dazzling display of the cock is truly a sight to behold. Much religious significance and even superstition is attached to this beautiful bird. It has found a prominent place in art, architecture, music, folklore and literature over the ages. The peacock is considered a divine creature in Indian mythology, especially as the 'Vahan' of Kartikeya (son of Lord Shiva) the army commander of all the 'gods'. Lord Krishna's association with the peacock is verily legendary, peacock feathers always adorned his headgear, popularly known as 'Mor-Mukut'. It is believed that Lord Krishna danced like a peacock to court his beloved Radha and when he played his mellifluous flute the peacocks danced in unison with the 'Gopies'. Even now the temples dedicated to Lord Krishna display the peacocks prominently on the entrance gates (Vardhan Harsh, 2008; Sadale Nalini and Nene YL 2008). Peafowl population is decreasing fast in Rajasthan, because of the use of drug diclofenac, which killed such birds.

The 'Jatayu' is a prominent character in the epic Ramayana. Garuda is a raptorial bird, considered as a sacred bird by Hindus. It is designated as the kings of Birds. Lord Vishnu flies with his two wives on 'Garuda', even Lord Krishna used 'Garuda'. During olden days—birds like pigeon, 'baz' (falcons) etc were used as messengers. Rajasthan's state bird is the Great Indian Bustard (GIB) (*Ardeotis nigriceps*), which is an indigenous bird of India. It is popularly known as Godavan. Once widespread in semi-arid open scrubland and grassland plains, the GIB underwent a drastic decline in their numbers, due to illegal hunting and habitat destruction by men throughout the 20th Century. Bustard species like Macqueen's Bustard (*Chlamydotis macqueeni*) and Great Indian Bustard have been exploited a great deal through falconry by the Arab Sheikhs. Such hunting by Arab

Sheikhs (from Abu Dhabi, Bahrain, Kuwait, Qatar and Saudi Arabia) was not restricted by the central and state governments until 1979. The Wild Life (Protection) Act, 1972, (as amended in 1991) of the Government of India does not allow poaching and illegal trade of such birds and wild life in the Country. Mr. Harsh Vardhan of Tourism and Wild Life Society of India (TWSI), Jaipur, with the support of late Mr. K.C. Kulish, chairman, 'Jan Mangal Public Charitable Trust' Jaipur, with the support of Press – News Papers like Rajasthan Patrika, Indian Express, Times of India etc., took up the noble cause of the conservation of wild life and other threatened bird species like Great Indian bustard, vultures, peacocks, Tigers etc. He started vigorous campaign at State and National levels from 1978 onwards, in order to bring about awareness among general public as well as the Government. This created a great impact and as a result the Governments of Rajasthan as well as Union Government of India had to ban hunting of Indian Bustards by Arab Sheikhs in the deserts of Rajasthan following protests led by Jaipur based TWSI (NGO).

The TWSI in association with WWF–India (Rajasthan Chapter) and some other Indian NGOs/ foreign organizations (like Bird Life International Cambridge, U.K.) has been instrumental in organizing Birding fairs at Man Sagar Lake, Jaipur every year during the month of January-February for the awareness of school children and common public to make them nature loving (Harsh Vardhan 2000, 2001, 2002, 2003, 2005, 2007, 2008 & 2009).

The most common birds of prey (or raptor) are hawks, eagles, vultures (giddhs), falcons like Laggar Falcon (*Falco juggar*), Peregrine Falcon (*F. peregrinus*) etc. to name a few. A large number of useful birds are facing extinction like vultures – which have been acting as scavengers (eating dead animals). Ghughu (owl) acts as night watchmen, drango acts as a 'Kotwal' (policemen), while Tailor Bird and Wood-peckers act as craftsmen. Koel (Kokila) calls are very pleasing, Neel Kanth (Indian Roller) with attractive colouration on body head is considered very auspicious.

The birds like Partridges, Jungle Fowls and Quails have been hunted mercilessly as a hobby in early days by emperors, kings as well as invaders. Now a day 'bahelias' (poachers) and even village people are more active in catching and killing these birds. Birds like hornbills, male house sparrows (*Passer domesticus*) etc are traded for their medicinal use. Several species of Falcons are trapped to meet the falconry demand in the Middle East countries. The bulk of the bird trade consists of Munias, Parakeets, Waders, Buntings, Ducks, Mynas, Larks, Pipits, Doves, Owls and Pigeons etc. (Kumar Satish 1995; An overview of wild life trade in India, PANDA WWF- India, Vol 2/issue -2 April-June 2009, pp 1-11]. There is a need for National Avian (birds) inventory as well at state level bird inventories in order to take stock of avian diversity existing at present.

Conservation Programmes of Avian Genetic Resources in India:
The following central ministries / research institutions, agricultural universities / state's departments of veterinary; NGOs – like WWF, India, New Delhi, and some local communities are involved in conservation efforts viz; .

- The ministry of environment & forests (MoEF), government of India, New Delhi.
- Wild life institute of India, Dehradun.
- Ministry of agriculture, government of India.
- Department of agricultural research and education (DARE) / Indian council of agriculture research (ICAR), New Delhi.
- Central avian research institute, Izatnagar-243122 (UP) and its regional centre, Baramunda, Bhubaneshwar-751003(Orrisa).
- Salim Ali centre for ornithology and Natural History (SACON) Coimbatore (T.N).
- Bombay natural history society (BNHS), Mumbai
- All India network project on agricultural ornithology, ANGR agricultural university, Rajendra Nagar, Hyderabad 500030 (AP).
- Project Directorate on Poultry, Rajendra Nagar, Hyderabad 500030 (AP).
- Department of forest, government of Rajasthan, Jaipur, as well as forest departments in other State's of India.
- Rajasthan Tourism Department, Jaipur, as well as Tourism Departments in other States of India.
- NGOs like;
- Tourism & Wild Life Society (TWSI), Jaipur.
- WWF –India, New Delhi.
- Jan Mangal Public Charitable Trust, Jaipur.
- National Nature Society, Malviya Nagar, Jaipur
- Bombay Natural History Society (BNHS).
- Salim Ali Centre for Ornithology and Natural History, (SACON), Coimbatore (T.N)
- Wild life Conservation Society, India, Bengaluru
- Nature Conservation 3076/5, 4th Cross Gokulam Park, Mysore

There is need to involve village panchayats, local communities and young students/women folk of villages for awareness campaign for conservation of local birds/biodiversity. A 'Bio-diversity Register' proposed by MoEF, Govt. of India, should also be maintained by every village Panchayat to take stock of existing biodiversity and to take appropriate steps for its conservation.

Vulture (Gidh) Conservation programme: There are 8-9 vulture species in India. Recently a rare species of long billed vulture has been spotted in Ajmer district of Rajasthan. Vultures play a vital sportive ecological role; their importance in cleansing the environment and maintaining the balance of nature need not to be ignored. In recent years there has been a sudden decline in the status of most species of vultures in India due to use and spread of

killer drug diclofenac. It should be banned and replaced by alternate safe drug like Meloxicam. The Bombay Natural History Society as well as Tourism & Wild Life Society of India (TWSI) Jaipur, has done pioneering work in focusing the attention of all concerned in vulture conservation efforts in India as the vultures are a crucial link in the food chain. They eat away the carcass of dead animals and help in keeping the earth and environment clean and free of disease. In the absence of vultures, the dead bodies of animals begin to decay in open resulting in various diseases, spread of infectious viruses and bacteria, which thrive on it and thus pose a threat to animal and human health.

The MoEF, Government of India has formulated an Action Plan for effective vulture conservation in the country, which is being implemented to stop further decline in their population and to revive the vulture population. The MoEF has supported vulture breeding centres at Pinjore (Haryana), Buxa in West Bengal and Rain Forest in Assam, including captive breeding centres at Bhopal (MP), Bhubaneswar (Orissa), Junagarh (Gujarat) and Hyderabad (Andhra Pradesh) [MoEF, Govt. of India: Annual Report 2007-2008]. It is considered as sacred bird by the Parsi community.

Conservation of Siberian Cranes: Memorandum of Understanding by the Government of India (MoEF) with Iran, Kazakhstan, Pakistan and Russian federation for conservation of Siberian cranes is already in operation (MoEF Annual Report 2006-07). The former minister of State MoEF, Government of India, during his visit to Keoladeo National Park (Bharatpur) on 2nd February 2011 had announced the launch of Siberian cranes breeding center at Keoladeo National Park. "The plan would be chalked out in consultation with the International Crane Federation and World Wild Life Fund (WWF).

Following bird Sanctuaries'/national parks/sacred groves, *in-situ* community conservation as well as wetlands are playing their role in conservations of bird genetic resources in Rajasthan:

- Keoladeo National Park (Bharatpur) – a Ramsagar site.
- Jal Mahal (Man Sagar) Lake, Jaipur - a bird rich area.
- Chandlai lake, near Shivdaspur on Kota-Jaipur Road (Rajasthan)
- Ramnagar Talab (12 km from Bundi, on Bundi-Chittorgarh Road, Kanak Sagar, Gothra, Jait Sagar and others.
- Sambhar Lake- a Ramsagar site (Rajasthan)
- Desert National Park, Jaisalmer (Rajasthan), which is located partly in the district of Jaisalmer and partly in Barmer district of Rajasthan - which is an ideal habitat for Great Indian Bustard.
- Community conservation involves local community, Panchayat raj Institutions, women folk etc.
- Peafowl or Peacock -- Conservation reserves are in Rajasthan, Karnataka, Orissa and Kerala State.
- World Pheasant association of India (WPA), 143-B, (1ST Floor) Shahpur Jat, New Delhi-110049 has declared: Four Peafowl Conservation Reserves during the last two years.

- o Adjoining Dungarpur town in district of Dungarpur (Rajasthan).
- o Bankapura in Haveri district of Karnataka.
- o Aska in district Ganjam, in Odisha.
- o Cholannur in district Malapuram in Kerala.

Some of the important Bird Sanctuaries located in some other states of India include:

- The Nal Sarovar Lake – a Bird Sanctuary in Gujarat.
- Eagle nest Wild Life Sanctuary in West Kameng district of Arunachal Pradesh – a bird paradise and a crucible for community conservation.
- Sultanpur National Park in Haryana
- Chilika Lake Bird sanctuary in Odisha.
- Assam Barrage Bird Sanctuary, Uttarakhand.
- Dudwa National Park (U.P.)
- Corbet National Park, Uttarakhand.
- Great Himalayan National Park, Himachal Pradesh.

Sacred Groves and their role in conservation of Bio-diversity:

Sacred groves (in-situ community conservation) are patches of natural vegetation demarcated by ancient societies and protected on the basis of religious practices and cultural traditions. They are distinct segments of various landscapes containing trees and other forms of life, and geographical features. They exemplify the perceived inter-link between man and his natural environment, as well as ecological prudence. (Gadgil and Vartak, 1975). In other words - sacred groves can be defined as "areas with particular types of trees, dedicated to local deities or ancestral spirits, which are protected by local communities through social traditions and taboos incorporating spiritual and ecological values". The concept of sacred groves is still alive and is an example of successful traditional *in-situ* conservation of biodiversity by communities.

The conservation of sacred - grove in India has ancient roots, right from Vedic period. Even in present days ethnic groups (tribal like Bhils, Santhals Garasia, Sahariya, Kalbeliya, Kathodis etc.,) conserve religiously preserved forest patches through their customs, taboos and local festivals associated with the deities. These forest pockets serve the vital functions of conserving 'biological diversity' of flora, fauna, micro-flora, animals, birds, medicinal plants land races, wild relatives of crop plants and natural water resources. They harbour plants of great ethno-botanical importance. Additionally, the high density of plants also helps in soil and water conservation. There is an urgent need for awareness, as well as plantations of local trees around such sacred groves, for their protection and also to fulfill the need of local communities for their fuel needs etc.

According to the experts, there are nearly 13,720 sacred groves in various parts of India. Recently, a novel scheme has been conceived by the Indira Gandhi Rashtriya Manav Sangrahalaya (IGRMS) to preserve the great ecological legacy in

Madhya Pradesh. The prototypes of groves based on regions, kaver of Kerala, sarna of Bihar and Madhya Pradesh, Koil Kader of Tamilnadu, mewar bukhar of Meghalaya, Oran of Rajasthan and devarahatti of Maharashtra are reassembled in a 200 acre site in Bhopal (Vajpayi, Yogesh, 2000). It augurs well that international agencies like UNESCO, WWF and World Bank have also joined the hand wagon in preserving this unique ecological heritage.

The Most important bird areas in Rajasthan are given below:-

S.No. Important Birds Areas in Rajasthan

- 1 Alniya Dam Kota
- 2 Bardha Dam Bundi
- 3 Desert National Park, Jaisalmer & Barmer
- 4 Diyatra Bikaner And Jaisalmer
- 5 Gawana, Arain, Mangaliawas, Ramsagar, Goyal, Ratakot and Badar, Ajmer
- 6 Jai camand and Jaisalmer WLS, Udaipur
- 7 Keolodeo National Park, Bharatpur
- 8 Khichan Jodhpur
- 9 Kumbhargarh WLS, Udaipur, Pali Rajsamand
- 10 Mount Abu WLS, Sirohi
- 11 National Chambal WLS, Kota and Bundi
- 12 Phulwari WLS, Udaipur
- 13 Ramsagar Dam, Bundi
- 14 Ranthambhore Tiger Reserve, Swai Madhopur
- 15 Sajjanganrh WLS, Udaipur
- 16 Sambhar Lake, Jaipur, Nagaur and Ajmer
- 17 Sareli Dam, Bhilwara
- 18 Sariska WLS, Alwar
- 19 Sei Dam, Udaipur
- 20 Sitamata WLS, Chittorgarh and Udaipur
- 21 Sonkhaliya, Ajmer
- 22 Tal Chapar WLS, Churu
- 23 Udaipur Lake complex, Udaipur
- 24 Bagdarrah closed area, Udaipur

(References: Islam, M.Z. and Rahmani (2004) Important Bird areas in India : Priority site for conservation. Indian Bird Conservation network: Bombay Natural History Society and Bird Life International (U.K.) pp xviii + 1133)

Poultry (chicken) Diversity in India: India is rich in its poultry biodiversity. Many unique indigenous poultry breeds, well adapted to specific region, are facing threat of extinction on account of lack of serious efforts for their conservation. There are 23 local breeds of poultry (chicken) in India namely – Cari Gold, Debendra, Dhanraj, Gramalakshmi, Gramapriya, Kadaknath, Kalinga Brown, Kashmir Faverolla, Krishna-J, Miri, Mrityunjay, Nicobari, Vanaraja, Yamuna, Ankleshwar, Bursa, Chittagong, Danki, Daothigir, Ghagus, Harringhatta Black, Kalasthi and Punjab Brown. In addition, a few improved breeds of chicken have been developed by the ICAR Project Directorate of Poultry, Rajendranagar Hyderabad (A.P) like Vanaraja (a dual purpose-meat and egg producer) and Gramapriya (predominantly a egg

laying bird). These birds have performed well in different climatic conditions across the country in rural/tribal areas.

India ranks third in egg production and fifth in meat production in the world. There exists a wide gap in the per capita consumption of chicken products between urban and rural people. The rural population is predominantly dependent on cereal and vegetable protein sources, which are deficient in essential amino acids like – lysine, methionine and threomine. In rural areas small/marginal farmers normally take up backyard poultry farming. There is need for policies and programmes to be framed both at macro and micro levels for conservation of existing biodiversity of poultry (chicken), before it is lost forever. (Sources: Annual Report 2008-2009 Project Directorate Poultry (ICAR) Rajendranagar, Hyderabad (A.P); 2009 - “Ranchi Declaration on Conservation of Farm Animal Genetic Resources”.

Wetlands conservation by MoEF, Government of India: The MoEF, Government of India has been taking care of wetlands in the country under “National Wetlands Conservation Programme” right from 1987 onwards with the objectives : To lay down policy guidelines for implementing programmes of conservation and management of wetlands in India; undertake priority wetlands for intensive conservation measures, to monitor implementation of the programme of conservation, management and research; and to prepare an inventory of Indian wetlands. In view of the above objectives, a national committee on wetlands was constituted by the MoEF, Government of India.

Based on the recommendations of the national committee on wetlands, 94 wetlands have been identified for the conservation, under National Wetlands Conservation Programme during 2006-07. The main activities under the programme are: data collection and survey, identification of problems, mapping of wetlands, landscape - planning, hydrology, control of encroachments, eutrophication and abatement, aquatic weed control, wildlife and birds conservation, fisheries development, environmental awareness, research on various aspects of wetland processes and functioning and organization of workshops and trainings programmes, progress activities undertaken under wetland conservation in various states of India. Wetlands have diverse flora and fauna. Such habitats have large number of birds and have diverse aquatic vegetation.

Migration of Birds their Ringing or Banding: Birds are naturally adapted to high body temperatures, apparently because of their tremendous capacity to fly great distances in search of food and water. This ability also enables them to leave areas of extremely hot or cold temperatures and move to areas of more convenient climate. In addition, feathers also play a part in insulating birds from the heat of the sun.

Migration of birds is one of the unique ornithological phenomenon as well as unsolved mystery. Every year during spring and autumn and early winters, millions of birds take to air and set out on their long journey from northern regions of Asia,

Europe across oceans and continents/countries to southern warmer areas. They make return journey again during spring and early summers. These migratory birds are very punctual, unless delayed by bad weather. In other words migration can be defined as the regularity of the back and forth swing between two end countries. The birds return to the same areas often to the same garden in both their summer and winter, which may be separated by as much several thousand miles (Ali, Salim and Laeeq Futehally, 2006. 'Common Birds', National Book Trust of India). *Ringling or Banding of Birds*: Ringing is done by capturing a bird and putting on to its leg-a-light band of aluminium or plastic tag. The band bears a number, date, identification mark and the address to which these bird watchers are requested to return the ring. The birds are then set free. This ringing activity has precisely established that main migrating movement is generally north to south in autumn and vice-versa in spring.

Indian Scene: Prior to 1958, very little bird ringing was done on ducks. Since 1959, the Bombay Natural History Society (BNHS) had conducted organized project on ringing on birds for decades (1950s to 1980s) at Keoladeo National Park (Rajasthan), Harike Lake (Punjab), Point Calimere (Tamilnadu) and few other places. Some ringing was carried out in the Rann of Kutch, parts of Kashmir and in Borivali National Park Mumbai. (Sangha, Harkirat Singh 2000). Bird migration study was started through bird banding in India in 1959, financed by a grant from the World Health Organization (WHO) to the Bombay Natural History Society (BNHS), in order to find out whether birds were carriers of tick borne viral diseases. The study was thereafter continued intermittently upto 1973. The study was resumed in 1980, under the project "The population structure and movement of avifauna" funded by the US Fish and Wildlife Service through the ministry of environment and forests (MoEF), government of India (PL.480 Grant No. 885 1-658-01) This study continued upto September 1987 with Dr. Salim Ali, as principal investigator. From 1987-92 the study was extended under the project "Bird Migration". When the bird migration project came to an end in 1972 bird banding in India stopped completely.

During the four decades, BNHS had ringed over 400,000 birds in various parts of India but the recovery rate was only 1% . One of the reasons for such low recovery was the limited number of bird banding field stations and lack of trained persons to handle bird banding camps. Thus with a view to expand its ringing programme to several parts of the country, the BNHS offered an opportunity to volunteers to learn bird banding. The programme was funded by the US Fish and Wildlife Service.

Interesting disclosures were made through ringling experiments globally:

(i) An Arctic Tern (*Sterna paradisaea*) ringed as a chick not yet able to fly, on the Farne Island off the Northumberland coast in eastern Britain in the summer of 1982, reached Melbourne, Australia in October 1982, thus covering a sea journey of over 22,000 km in just three months from

fledging.

- (ii) A Manx Shearwater (*Puffinus puffinus*) ringed as an adult (at least 5 years old), breeding on Copleland Island, Northern Ireland, was (2003/2004) the oldest known wild bird in the world. Ringed in July 1953, it was re-trapped in July 2003, at least 55 years old. Manx Shearwaters migrated over 10,000 km to waters off southern Brazil and Argentina in winter, so this bird had covered a minimum of 1,000,000 km on migration alone (not counting day-to-day fishing trips).
- (iii) Another bird nearly as old, breeding on Bardsey Island off Wales was calculated to have flown over 8 million km. during its life (and this bird was still alive in 2003).

It is an essential search tool to find out migration pattern of birds in different parts of the country, so as to call for appropriate strategy for conservation of their habitats, which they prefer for stop-over or wintering stay. More organizations need to be invited to undertake such experiments and on an on-going basis. Startling data have been generated through ringling programmes about a particular species reaching another destination in what duration, staying at a place for what extent of time and season etc. It is expected to materialise when the MoEF comes out with new guidelines. It needs to be a twofold document: one on migratory species which will involve overseas institutions as rings are expected to be recovered there, and another on resident species which migrate within India for which a new inter-state avian cooperation will have to be devised. Ringling needs to be taken to schools as well so as to enable students and teacher community to learn the science of bird movements.

For want of such organized initiative, Indian avian experts, to this day, cannot describe the migration of endangered birds like Great Indian Bustard (GIB), Lesser Florican (LF) and Bengal Florican (BF). Is it the same GIB observed in Sudasari Habitat of desert National Park in Jaisalmer that was found in Shonkalia closed area near Ajmer, after a gap of few weeks? Most studies on LF have been carried out (BNHS, SACON etc) on the birds' breeding grounds which are in Gujarat, Maharashtra, Madhya Pradesh and Rajasthan and only during the annual monsoon season. It is such a season that these birds come under scrutiny. Ringling and colour marking or banding are commonly practiced in western countries to attract increasing number of volunteers.

Though it is considered as a scientific exercise, preparing check-list of birds of different parks, sanctuaries or water bodies (wetlands) is not difficult. Bird watchers and interested individual are contributing their knowledge on this topic and have offered their own lists, over the internet, inviting opinion of others in this field to accept or amend their versions. It has opened up healthy debate over bird-observations, behaviours, migration etc and valuable data made available at no cost. Such contributors need to be considered as part of the scientific community that

claims its sole authority over avian studies. They need to be encouraged by departments of forest, who are the sole custodians of wildlife management. As most officers and staff in such a department usually remain occupied with other tasks, they need to adopt a society-friendly view to facilitate individual bird watchers to publish their check-lists, revising them periodically and making them available at the entry-points of all Parks/Sanctuaries, at a token price. The authorities will ultimately find such talents of considerable advantage in their overall philosophy of management of parks and reserves.

New spheres requiring action in India: In order to be competitive in avian research, Indian scientific community shall have to embrace some new fields of working as are being practiced abroad in order to make bio-conservation user friendly, which is the emerging need for people. Some suggested disciplines can be:

- Conservation Ecology
- Landscape Ecology
- Ecotoxicology
- Environment Impact Assessment
- Nature Education etc.

Birds are all around homes and offices all over India. The decline of house sparrows in Bangalore should be as much a cause of concern as loss of (grassland) habitat for Bustards in some of the States of India, to the authorities as well as the civil society representatives who are taking up issues in a new way. The solution to such issues does not lie with the MoEF, Government of India alone, as species density is impacted by people, their animals, their development related issues, for which multiple organizations function, almost in total disregard to the environmental conservation framework that is meant to govern the landscape through some comprehensive Acts. Integration of university-led-research with environmental issues is of urgent importance, which again is not within the purview of the MOEF, Government of India.

REFERENCES

Ali S and Ripley SD. 1983. Hand Book of the Birds of India and Pakistan. Compact Edition. Bombay Natural History Society, Oxford University Press, Delhi. 737pp.

Ali Salim. 2002. The Book of Indian Birds Published by Bombay Natural History Society, Oxford University Press; 326 pp.

Ali Salim and Laeeq Futehally. 2006. Common Birds, National Book Trust of India.

Gadgil and Vartak VD. 1976. Sacred groves of India: a plea for continued conservation. *Journal of Bombay Natural History Society* 72:623-647.

Harsh Vardhan. 1980. The major review of the bird species. International Symposium on Bustard, held at Mansagar Lake, Jaipur, November 1-3, Organized by TWSI, Jaipur.

Harsh Vardhan. 2000. Indian Birding Fair: Mansagar Lake, Jaipur held on November 25-26; Dedicated to "Scientific

Experiments on Wild Life; 23p.

Harsh Vardhan. 2001. Indian Birding Fair: Mansagar Lake (Jal Mahal), Jaipur, held on November 1-2; 27p. Dedicated to Saras Crane.

Harsh Vardhan. 2002. Indian Birding Fair: Mansagar Lake (Jal Mahal), Jaipur held on December 3-4; 27p (A mini Keoladeo National Park in offing).

Harsh Vardhan. 2003. Indian Birding Fair: Mansagar Lake, Jaipur, held on November 28-29; 21p.

Harsh Vardhan. 2005. 8th Birding Fair: Mansagar Lake, Jaipur, held on January 12-13; 26p.

Harsh Vardhan. 2007. 10th Birding Fair: Mansagar Lake, Jaipur, held on January 22-23, 2005; 23p. Dedicated to Bustard Conservation.

Harsh Vardhan. 2008. 11th Birding Fair: Mansagar Lake, Jaipur, held on Jan 9-10 2008; 23p. Dedicated to Peacock, Indian National Bird.

Harsh Vardhan. 2009. 12th Birding Fair: Mansagar Lake, Jaipur, held on Feb. 6-7, 2009; 25p. Dedicated to Communities in Conservation.

National Wetlands Conservation Programme MoEF, Government of India, Annual Report, 2007-08. Pp.132-134

National Wetlands Conservation Programme MoEF, Government of India, Annual Report, 2008-09. Pp.153-156

National Wetlands Conservation Programme Source: MoEF, Government of India, Annual Report, 2006-07. Pp.122-124,

Rao P and Shyamsunder. 2002a. Technical Bulletin entitled "Research Accomplishments of AINP on Agricultural Ornithology"; 37p.

Rao P and Shyamsunder. 2002b. Avian Biodiversity: Issues and Conservation studies 2002 pp18-19; "ICAR NEWS" (April-June).

Rao V and Vasudeva. 2008. Tenth Plan Research Highlights of AINP on Agricultural Ornithology, Rajendra Nagar, Hyderabad 500030(AP); 44p.

Sadale Nalini and YL Nene (Eds). 2008. Mriga-Pakshi-Shastra (The Science of Animals and Birds, Asian Agri-History Foundation, Secunderabad, Hyderabad (AP).

Sangha Harkirat Singh. 2000. Bird Ringing in India: In Indian Birding Fair: Mansagar Lake, Jaipur held on 25-26 November, pp 10-11.

Sathyakumar S and Sivakumar K. (Eds). 2007. Galliformes of India. ENVIS Bulletin: Wildlife and Protected Areas Vol. 10(i) Wild Life Institute of India, Dehradun 252pp.

Sharma Satish Kumar. 1995. Ornithology of Indian Weaver Bird. Himanshu Publication, Udaipur.

Singh Samar. 2006. Ninth Birding Fair: Mansagar, Jaipur held on January 30-31.

Vajpayi Yogesh. 2000. Tree of Life. Indian Express (Sunday magazine, September