

TWENTIETH CENTURY CHANGES IN THE AVIFAUNA OF PAKISTAN

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Invited by a former colleague of Dr. Sálím Ali and eminent member of our Society to contribute such an article, I do so with some hesitation. Any attempt to comment on the changes in population levels or status of birds during the past ninety years or so, must remain largely on a speculative and anecdotal level, rather than through a scientific approach. It must be limited by the paucity of baseline data, and further weakened by the lack of any recent population studies in Pakistan, with the single exception of water fowl counts during midwinter, conducted on most of the major wetlands (Scott 1989). Nevertheless, whether we consider ourselves as 'just nature lovers', or seriously concerned about conservation, there is an urgent need to recognise biodiversity 'hot spots', and changes in bird populations as valuable ecological indicators, both of the more vulnerable ecosystems as well as areas where man's exploitation of natural resources is causing undue long term damage. We are all aware of the growing detrimental effect upon former relatively stable undisturbed habitats, whether it be reclamation of former desert through massive new irrigation projects, the effects of more intensive agricultural practices with more complete jungle clearance and greatly increased use of agrochemicals, or deforestation in the catchment areas of the north, to meet ever growing fuel wood needs. The Indus river and its surrounding plains are the very backbone and nerve centre of Pakistan's economy, and responsible for 90% of her food production. Miracles have been achieved as has also been the case in India, but we have yet to evaluate the long term costs. The whole hydrological system of this mighty river and its tributaries has been profoundly changed. Many of the five rivers of the Punjab and the lower reaches of the Indus itself are practically dry during the midwinter months due to

offtake from thirteen irrigation barrages, and one of the biggest and most complex irrigation systems in the world. Even after the monsoon rains, many former areas of seasonal inundation no longer receive sufficient flood water to remain even as swamps. As a result, vast tracts of former riverain forest have dried out or been cut down, and salinity levels in the Indus mouth and surrounding Arabian sea have been significantly raised, with detrimental effects upon an important fish spawning and nursery area.

All these twentieth century changes have had a varying effect on wild birds, and before considering such changes a few statistical pointers will reinforce the above generalities. Human population pressure, with its ever growing demands for exploitation of natural resources, is known to be the direct cause of the disappearance of many of our larger and more spectacular birds. When the author first came out to India in 1946, I recall the anxiety expressed in the local press in 1947 with the great influx of human refugees, when the population of West Pakistan, as it was then called, was estimated to have swollen to 45 million. Latest estimates by Washington based research groups, Worldwatch and the World Bank, put the present population at not less than 121 million. A total increase of 2.66% in a period which demographers would categorise as spanning only two generations (25 years being taken as one generation). Turning to the agricultural revolution, comparable figures are difficult to obtain, but the Sind Gazetteer (Sorley, Edit. 1968), for example, recorded the total area under cultivation in that province in the years 1900-1901 as 27,130 hectares. By 1956 (the latest figures published) this had risen to 59,797 hectares. The total national area under cultivation increased from 14.69 million hectares in 1947-48 to 20.73 million hectares in 1989-90 (Environment & Urban Affairs Div., Govt. Pakistan, 1992). Similarly, the total area under irrigated cultivation in 1950-51 was 9.25 million hectares which had risen to 15.68 million hectares by 1989-90 (Environment & Urban

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Affairs Div., op.cit.). In 1947, canals were reported as taking up 65 million acre feet of water from the rivers. This rose to 95 million acre feet by 1976 (Pakistan Fact Sheet. Water. 1989). There are conflicting figures given for the total area in Pakistan under natural and plantation forest, with a low of only 3.6% of her total area (Jalal *et al.* 1977), up to 4.3 million hectares (Biswas 1987). Fuelwood needs are estimated at 16.6 million (cu. m.) of timber annually, whilst the Pakistan Forest Institute estimated the total annual increment or growth of wood at 11.3 million cu. m., which means that annual growth only provides 62% of annual offtake from the forests. Sadly, 90% of this timber is used for fuel rather than for construction.

I have derived the basis for evaluating changes in bird fauna from written observations from Baluchistan (Meinertzhagen 1920), from Sind (Ticehurst 1922-24), from Punjab (Whistler, for Jhang area 1922, and Rawalpindi district 1930); from the Murree Hills (Whistler 1930 and Magrath 1909), and for the Punjab Salt Range (Waite 1948). All these writers, it must be remembered, were summarising observations over earlier periods than the publication dates reveal. Added to these published commentaries on the status of certain species are my own observations from 1947 up to 1984 when I retired to Britain, with frequent shorter visits to Pakistan in every subsequent year until 1995.

Any bird species population has three essential requirements for maintenance levels. Firstly, it requires sufficient natural shelter to hide or escape from predators and to be able to forage or hunt. Secondly, there must be adequate amounts of suitable food available. Thirdly, freedom from physical disturbance or harassment by predators in order to breed. In my experience, nearly every instance where a population is declining can be attributed to some extent to loss of suitable habitat. If sport hunters or hunters who persecute a species for commercial gain can be considered as merely another element in the predator/ prey relationship, then there is evidence that this becomes the major factor only when a species is considered on cultural grounds as a highly desirable target, but this must be coupled with a

relatively small existing population (which usually makes the target all the more desirable). The following survey will show how important this factor has been on larger, more spectacular, species. Wherever detailed ecological studies have been conducted upon a wide range of bird species in the Subcontinent, shortage of food has never been recorded as a restraint on population levels.

A more or less random survey follows, categorising birds in the older conventional taxonomic order (Voous 1977, not Sibley and Monroe 1990).

Procellariiformes, Pelecaniformes - Petrels, Shearwaters, Boobies, Cormorants and Pelicans: Despite clear indications of over fishing in Pakistan's coastal waters, there is no evidence of decline in sea bird levels along the Arabian sea coast. This is because birds hunt visually, whether by diving or under water swimming, and this is a more efficient method of catching single marine prey species than the large scale netting by fishermen, even when using sophisticated sonar detection aids and excessively long mono-filament nets. There is evidence that Boobies (*Sula* spp.) in the Indian Ocean as a whole have declined seriously in numbers, and this is thought to be due to predation by human egg harvesting in remote breeding islands outside our territory.

Anseriformes - Ducks and Geese: Ticehurst (1922-24) reported that "without doubt the Gadwall was the commonest duck" as a winter visitor to Sind. Similarly, Whistler (1922) reported that it was by far the commonest duck in Jhang district in the winter. Waite (1948) writing his observations in the 1930s wrote that Mallard 'were to be met with in small numbers', and Ticehurst (op.cit.) wrote that the Mallard 'was to be met with in variable numbers, being strangely absent in many suitable lakes'. This author's own observations, corroborated by recent wildfowl counts conducted under the auspices of the IWRB, confirm that the Gadwall is today comparatively rare all over the Indus basin as a winter visitor, whereas the Mallard is today by far the most abundant migrant species. The Cotton Teal (*Nettapus coromandelianus*) was considered 'rather local and

rare' (Ticehurst, op.cit.). Waite (op.cit.) and Whistler (1930) do not record the Cotton Teal at all as having occurred in northern Punjab, whereas I have found it resident in the seepage zone around the Islam Headworks on the Indus in the Salt Range. It is also widespread and resident in Sind today, though only occurring in small numbers outside of the southern part of that province. Evidently this Oriental species has spread westwards, perhaps favoured by creation of well vegetated seepage zones upstream of every major irrigation barrage.

Greylag geese and Barheaded geese have declined dramatically in numbers. Ticehurst, who lived in Sind during the World War I years, described both species as 'common enough, with huge flocks to be met with on the larger Sind lakes'. Today, wildfowl censuses of every major wetland in Pakistan (Scott 1989) usually reveal a midwinter national total of barely 20 to 30 Greylags, mostly with only three or four individuals at one place. Barheaded geese have undoubtedly suffered from disturbance by domestic stock grazing in their northern breeding lakes, with increased exploitation of such upland steppes by grazing co-operatives in Tibet. Recent wildfowl censuses have only revealed small numbers wintering on the Indus river by Taunsa barrage in south central Punjab, and below Guddu barrage in northern Sind. Perhaps these depressing census figures will emphasise the great value and importance of Keoladeo National Park (Bharatpur) as a winter refuge for these two species.

Galliformes - Pheasants, Francolins, and Quail: In the 1930s Whistler reported that the Cheer pheasant (*Catreus wallichi*) still survived in the Galis of Hazara district, and it was hunted by Ainsworth Harrison (pers. comm. and photos) in the Margalla hills (now a National Park adjacent to Islamabad) during the 1950s. Recent surveys in several widely separated areas (Mirza 1977 and 1978) have indicated that this pheasant is probably extinct in the wild in Pakistan, though there has been a captive bred re-introduction project. When I acquired a summer cottage in Dunga Gali in 1960 in the Galis, a local villager, hoping to please me, offered to take me shooting Monal (*Lophophorus impejanus*) on

Mukshpuri mountain nearby and indeed they did survive there in small numbers. Today they are extinct throughout the Murree hill range. Whistler also described the White Crested Kalij (*Lophura leucomelana hamiltonii*) as fairly common in the Murree foothills. By the late 1960s it was very rare in any of the foothill regions and indeed extinct from some of its former haunts (Mirza, WWF Pakistan Surveys, 1977). Happily the creation of Islamabad as a new capital and the relocation of settlers from the Margalla hills, which was later declared as a National Park, has in this one locality enabled the Kalij to make a remarkable recovery, and there are good numbers surviving within this small area. Down in the plains, the Black Francolin (*Francolinus francolinus*) has become a rare bird, confined to a few pockets where there are man-made irrigated plantations or in the few remaining riverain forest tracts. When the author first came out to the Subcontinent in 1946, this species literally swarmed over large tracts of lower Sind where we had farming interests, and it was relatively common even in cultivated areas of the Punjab, whereas today it is totally absent from most cultivated tracts. The more desert adaptable Grey Francolin (*F. pondicerianus*) has fortunately fared much better.

Ciconiiformes - Storks, Ibises, Bitterns and Egrets: Whereas the White Stork (*Ciconia ciconia*) in Asia is everywhere much rarer than at the beginning of this century, such indigenous species as the Painted Stork (*Mycteria leucocephala*) and the Blacknecked Stork (*Ephippiorhynchus asiaticus*) have become virtually extinct in Pakistan. Whistler, writing about Jhang in the Punjab, described the Blacknecked Stork as reasonably common, and in the 1960s there was always a pair or two to be seen (author obs.) on Lal Sohanran Lake in Bahawalpur district, whence they have long since disappeared. Trapping of young Painted Storks, plus hunting for food of adults by local fishermen in Sind, has wiped out the breeding population of this species which has become extremely rare. Ticehurst in Sind reported the Black Ibis (*Pseudibis papillosa*) as very common, the White Ibis (*Threskiornis melanocephalus*) as fairly common, the Glossy Ibis

(*Plegadis falcinellus*) as very common, and the Openbill Stork (*Anastomus oscitans*) as common, though he considered the Blacknecked Stork as 'not common'. Today, the Black Ibis is a rare summer visitor to border areas of lower Sind only, the breeding White Ibises in the Indus delta have been all but wiped out by animal trappers for the zoo trade, as was the fate of the Painted Stork. There is no evidence that Openbilled Stork have bred in Pakistan since the turn of the century, though small numbers have been reported (Koning and Walmsley 1973) wintering on remote wetlands on the India-Pakistan border in the Rann of Kutch. By contrast Lesser, Medium and Great White Egrets have all become more plentiful, judging by Ticehurst's writings, and these species seem to be more tolerant of human proximity and also able to exploit smaller areas of inundation. Certainly Ticehurst described the Great White Egret (*Egretta alba*) as rare in Sind, whereas today it is common to see scores feeding in close proximity on all the larger lakes.

Charadriiformes - Snipe, waders, plovers, gulls and terns: Regimental Game books provide a valuable record of shooting bags in the early part of this century, and the Kurram valley is an important migration route over the Himalaya for snipe and cranes. Shooting bags of Common Snipe (*Gallinago gallinago*) from this area record up to 200 birds from as few as five guns in one afternoon in the 1930s, whilst today it would be difficult to flush more than a few dozen in a full day's walk through rice stubbles in this valley. The Sociable Plover (*Chettusia gregaria*) was described by Ticehurst as a fairly common winter visitor in Sind, and by Whistler in Jhang as an abundant winter visitor. Undoubtedly, changes in agricultural practices in its former central Asian breeding grounds have pushed this species to a very limited breeding area of wormwood (*Artemisia* sp.) steppe in northern Kazakhstan (Knystautas 1987), so that it is one of Pakistan's rarest winter visitors. In 34 years I only obtained one record from the Thar desert. The Great Stone Plover (*Esacus recurvirostris*) was described by Whistler in Jhang as a common summer breeder along the Chenab river, and in Sind Ticehurst wrote

that it occurred all down the Indus. Due to decreased flow of water in the rivers enabling seasonal cultivation right in the riverain beds and as far as main channel banks, there is very little undisturbed breeding habitat for this species which has become comparatively rare. The same has happened to the numbers of fresh water terns, with colonies of Gullbilled Terns (*Gelochelidon nilotica*) which both Waite and Whistler recorded on the Jhelum and Chenab rivers in summer having virtually disappeared, and very few Blackbellied Terns (*Sterna acuticauda*) or Indian River Terns (*S. aurantia*) are able to breed successfully due to disturbance of their nesting grounds. Gullbilled Terns, however, do not appear to have decreased in numbers around Pakistan's coastal areas. I have no evidence of any species of Laridae having declined noticeably.

Accipitriformes - Hawks, eagles, falcons, and vultures: The most dramatic decline within this order is amongst the falcons which have become the target of every local bird trapper because of the high prices paid by those 'oil wealthy' countries whose passion is falconry. The species which have declined most dramatically are the Saker (*Falco cherrug*), and Peregrine (*F. peregrinus*), with surprisingly the Laggar (*F. jugger*) and the Red Headed Merlin (*F. chicquera*), since these smaller falcons are often used, after being trapped, to lure their larger predatory cousins. Snares, set with feral pigeons as decoys, trap all these species indiscriminately and even less valuable species are not released back into the wild. Only the Kestrel (*F. tinnunculus*) seems common, if not increasing in numbers, being present all over the Indus plains in winter and breeding throughout the northern areas right up to the border with China. Two species of vulture appear to have declined also. Ticehurst described the Egyptian Vulture (*Neophron percnopterus*) as excessively common in all the larger towns of Sind. Today, though not rare, it is by no means common and totally absent from many of the larger towns. Both Waite in the Salt Range, and Whistler in Jhang described the Black or King Vulture (*Sarcogyps calvus*) as a breeding resident, though in small numbers, and Ticehurst recorded it as fairly common throughout

Sind. In 34 years I only came across stray individuals both in Sind and Punjab on less than six occasions, and believe that a resident population no longer exists in Pakistan, though these birds may wander widely in winter and some may still breed in Tharparkar border areas.

Gruiformes - Cranes, bustards, and rails:

Sálim Ali in the first volume of his handbook series (1968) and Stuart Baker in the FAUNA OF INDIA series (1929) quote Phillips describing a migrating flock of Demoiselle cranes (*Anthropoides virgo*) in 1929 in Punjab as comprising a dense flock of 50 m wide and 38 km long, totalling hundreds of thousands. Today, few skeins of more than 50 to 80 birds are ever seen together on migration anywhere throughout Pakistan. Indeed most of the population wintering in the Rann of Kutch in India migrates to the west through Baluchistan, not crossing Punjab at all. Intolerant of disturbance from humans and requiring vast wilderness areas for safe nesting, all the crane species have declined dramatically, especially those wintering in the Subcontinent. The story of the Houbara Bustard (*Chlamydotis undulata*) is even sadder due to the high level of hunting which continues every year by visiting Arab dignitaries at the invitation of the Pakistan Government. Though hunted by the ancient art of falconry, modern sophisticated methods of detection and vast financial resources employed in scouring their main spring migration routes through Baluchistan have taken a heavy toll on the population. Due to restrictions placed on the Provincial Wildlife Departments on any attempts at monitoring the hunting camps and conducting population surveys, there is no concrete evidence of surviving numbers, but their population is reported by Russian experts (Alekseev 1980) to have declined alarmingly from their main breeding grounds in the Kuzil Kum desert. Another problem affecting the Common Crane (*Grus grus*), which migrates through the Kurram valley, is the increasing fashion amongst the Frontier tribes to snare them with skilful throwing of weighted 'bolero' cords, using captive birds staked out as decoys. The NWFP Govt. has enacted legislation to both limit and regulate such hunting and the International Crane

Foundation has helped with a vigorous campaign of education about their declining numbers, but the people of that region have always been proud of their independence and show a disdain for too much Government regulation.

Pteroclidiformes - Sandgrouse: In the 1950s there were still many small desert tracts in the Punjab around Vehari, Jhang and Lodhran where I recall sandgrouse were common. All these tracts have now been brought under cultivation, largely through the sinking of tubewells in areas which could not be commanded by canal irrigation. Except for small numbers in parts of the Thal and the Salt Range, no sandgrouse occur now in the Punjab. In Sind some of their traditional watering places where they congregated in thousands, according to Ticehurst's accounts, are deserted today because of constant disturbance and use by domestic animal flocks. As a generalisation, sandgrouse — like the desert itself in Pakistan — have both retreated further into the border areas.

Coraciiformes - Rollers, kingfishers and hornbills: The Grey Hornbill (*Tockus birostris*) was not listed by Whistler as occurring around Jhang, though Currie (1916) wrote that it was relatively uncommon around Lahore, but since his day due to increased tree plantation following canal development, it has spread gradually eastwards and southwards into Punjab, from its original confines around the Lahore and the foothill zone. During my 28 years residence at Khanewal in south Punjab, I only began to see stray hornbill visitors from the late 1980s, and they breed from Sialkot down to Renala Khurd. There do not appear to be any significant changes in the population of Pakistan's 4 kingfisher species, nor rollers, and indeed rural telephone lines, seepage from borrow pits following irrigation, and increased area under plough are all factors favouring food and hunting by these families.

Psittaciformes - Long tail parakeets: In Whistler's day, the Plum-headed Parakeet (*Psittacula cyanocephala*) was believed to be a rare winter visitor, but today it is not uncommon as a breeding resident in the Margalla and Murree foothills. Perhaps this restricted zone is more thoroughly

watched by ornithologists since the creation of Islamabad as the nearby capital. Rose-ringed Parakeets (*P. krameri*) are considered pests in Pakistan, helped no doubt by the great increase in citrus orchard plantations, and growing of such oilseed crops as sunflower (Roberts 1991).

Piciformes - Woodpeckers and barbets:

Again Whistler considered the Bluethroated Barbet (*Megalaima asiatica*) as a rare visitor to the Murree foothills. Today, its calls can often be heard within the city limits of Islamabad and it is a breeding resident up to 1800 m in the Murree hills. By contrast, some of the lower altitude woodpeckers, dependent upon deciduous tree species, have virtually disappeared from the lower hill ranges. I regularly encountered *Picoides macei* in the foothills and *Dendrocopus hyperythrus* in Kao forest in the Galis during the 1960s, but have not been able to confirm sightings by these species by anyone in the last few decades. Local villagers selectively lop deciduous trees in spring for cattle and buffalo forage, maintaining traditional rights which were only sustainable when the human population was much smaller, and this is clearly converting many of these forests into mainly coniferous stands. Without being able to give any explanation, I must state that the Grey headed Woodpecker (*Picus canus*) was relatively common in both Whistler's (1930) and Magrath's (1909) time in the Murree hills. Today it appears to be very rare or has perhaps entirely disappeared from its former haunts.

Passeriformes - Warblers, chats, wheatears, redstarts and finches, etc: To prevent this account from becoming tediously long, I will select only a few random but interesting examples from among this highly varied and species - abundant order.

Focusing first on the Murree hills which were so well documented at the turn of the century, birds not recorded or described as comparatively scarce, such as the Rustycheeked Scimitar Babbler (*Pomatorhinus erythrogenys*), the Blackchinned Babbler (*Stachyris pyrrhops*) and Bluethroated Flycatcher (*Muscicapa rubeculoides*), all seem to be well distributed in the foothill zone or their limited range has been more closely surveyed. All these

species appear to survive and indeed flourish within a limited altitudinal zone. By contrast the Yellowcheeked Tit (*Parus xanthogenys*), quite common around Murree as a breeding bird (and with a good series of specimens thence in Museum collection) during Magrath's and Whistler's day, appears to be extinct within Pakistan except as a rare winter visitor (only one published record by Mallalieu 1988) during the last thirty years. Another species apparently extinct for Pakistan is the Whitethroated Laughing thrush (*Garrulax albogularis*). In the 1960s there was a resident band of this gregarious species in Kao forest in the Galis, and at the turn of the century it extended eastwards to Murree (Cock and Marshall 1873). There have been no sightings of this noisy and conspicuous babbler since my records in the 1960s. Some of the higher altitude species, which from all early records were always rare in the western part of their range just extending into Pakistan, are today still surviving in small numbers, as documented by recent ornithological surveys (WPA Annual reports) by teams of expert young ornithologists funded to carry out Western Tragopan surveys. Examples are the Black-browed Flycatcher Warbler (*Seicercus burkii*), the Green Shrike-babbler (*Pteruthius xanthochloris*) and the Whitethroated Tit (*Aegithalos niveogularis*).

Turning to the threatened habitats in the plains, the indigenous species of the riverain tract have had varying fortunes. The Sind Jungle Sparrow (*Passer pyrrhonotus*), rare in Ticehurst's day along the lower Indus and virtually absent from the Punjab, has adapted well to tree-lined major canals, as indeed has the Yellow-bellied Wren Warbler (*Prinia flaviventris*), exploiting seepage areas. Both are common and apparently spreading. But Jerdon's Babbler (*Chrysomma altilostris*), probably one of the Subcontinent's rarest endemics, remains confined to a few isolated pockets, and appears to be suffering from inter-specific competition with its close relative, the Yellow-eyed Babbler (*C. sinensis*). The Whitetailed Bushchat (*Saxicola leucura*) though never as rare as the former, appears to be dwindling because of the shrinkage of its habitat, *Saccharum*

grass thickets along the major river banks. Major irrigation schemes have increased both road and canal side tree plantation, which has favoured species more dependent on arboreal foraging. The Redvented Bulbul (*Pycnonotus cafer*) has spread and increased everywhere, driving out the less aggressive Whitecheeked Bulbul (*P. leucogenys*). This applies equally to the hill species (Oriental Bird Club checklist) or sub-species, *P. leucogenys leucogenys*, which now competes with the Redvented up to 1800 m.

These changes are borne out by accounts of their former status by Whistler, Waite and Ticehurst. Species which benefit from man's activities or food can be divided into two ecological categories — commensal such as *Passer domesticus*, *Acridotheres tristis*, and *Corvus splendens*, and synanthropic such as *Ploceus philippinus* and *P. manyar*. The latter two weavers have undoubtedly increased as a result of more widespread rice cultivation. In remote rural villages, the House Sparrow has become a major pest of ripening cereal crops (Roberts 1992).

What are the lessons or conclusions, if any, which can be drawn from the above review?

We do not want our descendants to live in a world populated only by Mynas, House Sparrows and House Crows, and we have already lost forever some of the ornithological spectacles such as mass migrations or huge gregarious nesting colonies, which earlier writers thrilled to relate. The pressures for growing more food and exploiting our forest resources will increase inevitably in the future and in Pakistan one can expect riverain tracts, seasonal wetlands, and even desert to be under threat. Perhaps the only safeguard is to persuade our political leaders to value such preserved areas or wildlife sanctuaries more than they have done recently, to give such areas greater protection and to try to establish peripheral buffer zones, and help rural communities to gain real benefit from ecotourism. Policies which are already being advocated and successfully put into practice in other countries, are thankfully being tried in several pilot projects in Pakistan. No matter how discouraging the signs, it is surely the duty of all of us BNHS supporters to help create more responsible attitudes and awareness of the sometimes hidden value of such remnant wilderness areas wherever they may occur.

REFERENCES

- ALEKSEEV, A.F. (1980): Houbara Bustard (*Chlamydotis undulata*) in the North West Kyzyl Kum (in Russian). *Zool. Zhurnal*. 59 (8): 1263-66.
- ALI, S. & S.D. RIPLEY (1968): Handbook of the Birds of India and Pakistan. Oxford University Press, Bombay.
- BISWAS, A.K. (1987): Environmental Concerns in Pakistan, with Special Reference to Water and Forests. Environmental Conservation, Switzerland.
- COCK & C.H.T. MARSHALL (1873): Notes on a Collection of Eggs made at Murree. *Stray Feathers* 1: 348-358.
- CURRIE, A.J. (1916): The Birds of Lahore and the Vicinity. *J. Bombay nat. Hist. Soc.* 24 (3): 561-577.
- JALAL, H., A. MERRIAM, A. QAYYUM & T. STACEY (EDS). (1977): Pakistan Past and Present. Stacey International, London. pp. 288.
- KNYSTAUTAS, A. (1987): The Natural History of the USSR. Century Hutchinson Ltd., London. pp. 224.
- KONING, F.J. & J.G. WALMSLEY (1973): IWRB Mission to West Pakistan. *I.W.R.B. bulletin* No. 35: 64-73.
- MAGRATH, H.A.F. (1909): Bird Notes from Murree and the Galis. *J. Bombay nat. Hist. Soc.* 19 (1): 142-156.
- MALLALIEU, M. (1988): Birds in Islamabad, Pakistan, 1985-87. Privately published.
- MEINERTZHAGEN, R. (1920): Notes on the Birds of Quetta. *Ibis*: 132-195.
- MIRZA, Z.B. (1977): Report on a Pheasant Survey in Pakistan. WWF Pakistan, Lahore.
- MIRZA, Z.B. (1978): Pheasant Surveys in Pakistan. *American Pheasant and Waterfowl Society Magazine* 78 (1).
- PAKISTAN FACT SHEET. WATER (1989): National Management Consultants/I.U.C.N., Journalists' Resource Centre for the Environment-IUCN Pakistan.
- ROBERTS, T.J. (1991-92): The Birds of Pakistan, 2 Vols., Oxford University Press, Karachi.
- SCOTT, D.A. (Edit.) (1989): A Directory of Asian Wetlands. IUCN, Gland, Switzerland and Cambridge, U.K., pp. 1181.
- SIBLEY, C.G. & B.L. MONROE, JR. (1990): Distribution and Taxonomy of Birds of the World. Yale University Press, pp. 1111.
- SORLEY, H.T. (Edit.) (1968): The Gazetteer of West Pakistan (Sind). Govt. of Pakistan, Karachi. pp. 811.

- STUART BAKER, E.C. (1929): The Fauna of British India. Birds. Second Ed. Vol. 6.
- TICEHURST, C.B. (1922-24): The Birds of Sind (in 8 parts). *Ibis*, Vol. 4: 526-572, 605-662; 5: 1-43, 235-275 438-474 6: 110-46, 495-518.
- VOOUS, K.H. (1973 & 1977): Recent list of Holarctic Bird Species'. *Ibis*, part 1., 115: 612-38; part 2, 119: 223-250; part 3, 376-406.
- WAITE, H.W. (1948): The Birds of the Punjab Salt Range (Pakistan). *J. Bombay nat. Hist. Soc.* 48 (1): 92-117.
- WHISTLER, H. (1922): The Birds of Jhang District, S.W. Punjab. *Ibis* 4: 259-309.
- WHISTLER, H. (1930): The Birds of the Rawalpindi District, N.W. India. *Ibis* Vol. 6: 67-119: 247-279.



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