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Population Trend of the Black Coot (*Fulica atra*) in the Punjab, Pakistan During 1989 Through 2008

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Abstract.-The Black Coot **(***Fulica atra*) was studied at Head Qadirabad, Head Marala, Head Rasul, Chashma Barrage, Taunsa Barrage and Patisar Lake from 1989 through 2008 during midwinter (January) each year. In total 852,758 coots were counted. The maximum population of coots was recorded during 1989 at Chashma Barrage, whereas the minimum population was recorded during 2008 at Head Marala. Overall 92% population was declined at six sites together in twenty years while locality wise, the highest decline was 99% at Patisar Lake followed by 93%, 88%, 80%, and 70% for Chashma, Head Rasool, Taunsa, and Head Qadirabad respectively. Illegal hunting and netting of coot, habitat degradation due to livestock grazing, cutting of aquatic vegetation, use of land for agricultural purposes, and shortage of water at wetlands were the major threats for population decline. There is an urgent need to protect and conserve this innocent species through management planning of these important wetlands.

Key words: Coot, population trend, wetland.

INTRODUCTION

The Black Coot (*Fulica atra* Linnaeus, 1758) belongs to family *Rallidae* and order *Gruiformes*. Coots are monogamous and relatively long-lived birds with the oldest ringed individuals being 18 years old (Cramp, 1980). It is widely distributed in Europe, Australia, New Zealand, Africa and Asia; it migrates in winter further in west and south Asia to avoid freezing water (Cramp, 1980). It is a winter migrant to Punjab in Pakistan and concentrates mainly on the larger lakes, irrigation barrages and headworks of the Indus basin, river deltas as well as open marshes, freshwater meadows and sewage ponds. The species inhabits still or slow flowing waters and shows a preference for shallow water adjacent to deeper water for diving, and muddy substrates, emergent, floating or submerged vegetation.

It is a game bird and its shooting is permitted under the Punjab Wildlife Act, 1974 but its illegal netting is practiced on large scale by the fishermen. The fishermen drive them with boats at night into flight nets, suspended on bamboo poles out in the middle of large lakes. The netted birds are sold in the markets of big cities and used as a traditional food item causing the decrease of this species with the passage of time in the Punjab. Ricardo (2007) reported that reliable plans for bird conservation depend on accurate prediction of habitat change effects on their distribution and abundance patterns. For the effective management of a species or population; Rubin *et al*. (1998) stressed on the need of accurate knowledge of its spatial distribution. With this aim the present study was conducted to determine the population trend of this species, so that it could provide a baseline for its conservation management.

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MATERIALS AND METHODS

Study area

Head Qadirabad, Head Marala, Head Rasul, Chashma Barrage, Taunsa Barrage and Patisar Lake are the wetland of international importance (Fig.1). The area, status and location of these wetlands are shown in Table I. These wetlands are very important wintering areas for waterfowl, particularly family

Anatidae. They are also a complex of aquatic and terrestrial habitats which accommodate a large variety of birds, fish and reptiles.

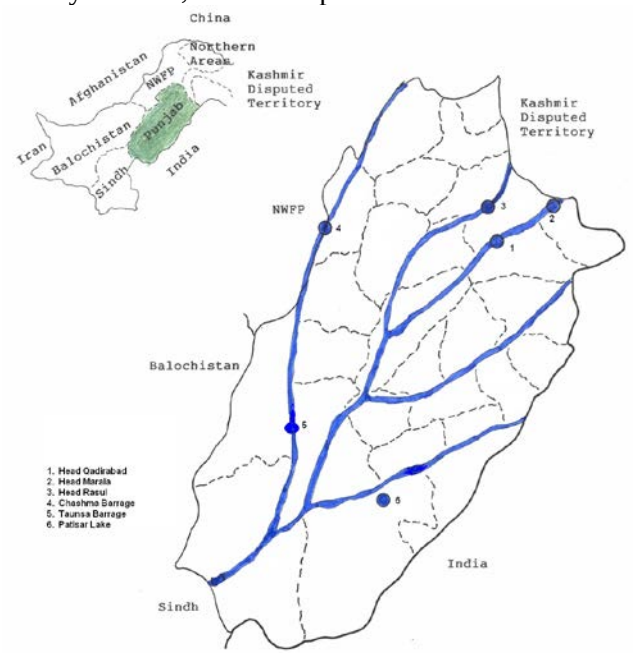

Fig. 1. Location of study area in the Punjab.

Table I.- Area, status and locations of various wetlands, surveyed for counting of coot.

Wetlands	Area	Status	Location
Head Qadirabad	2850 ha	Wildlife sanctuary	73º.41' 40" E ,32º.18' 20" N
Head Marala	1620 ha	Game reserve	74º 31' E, 32º 45' N
Head Rasul	1138 ha	Game reserve	73º 33' E, 32º 43' N
Chashma Barrage	32700 ha	Wildlife sanctuary	71º 22' E, 32º 25' N
Tounsa Barrage	6576 ha	Wildlife sanctuary	70º 50' E, 30º 42' N
Patisar Lake	1935 ha	National park	71º 57' E, 29º 22' N

Sites description

Qadirabad barrage

It is a water storage reservoir surrounded by agricultural land on the River Chenab. Two embankments extend out into the reservoir and hold back shallow lagoons as the water level in the main river channel falls. Land exposed as the water recedes is leased to local farmers for cultivation. The pH of water varies from 6.8-7.2. Subtropical climate is predominated with very hot summer and cool winter. The annual rainfall varies from 200-500 mm, and the relative humidity from 25-85%. The average minimum temperature in January is 5.5°C, and the average maximum in June is 46°C. The pond area of the wetland has dense aquatic submerged, floating and marginal aquatic vegetation. The aquatic vegetation includes *Carex fedia, Hydrilla verticillata, Phragmites karka, Typha angustata, Potamogeton crispus, P. pectinatus, Nelumbo nucifera, Nymphaea lotus, Vallisneria spiralis, Saccharum* sp., *Zannichellia palustris,* and *Chara* sp. The natural vegetation of the surrounding plains is tropical thorn forest dominated by *Capparis decidua, Acacia nilotica, Tamarix aphylla, Prospopis cineraria, Zizyphus mauritiana, Z. nummularia, Eleusine compressa Panicum antidotale, Calotropis procera,* and *Dalbergia sissoo* (Savage, 1968).

Rasul barrage

It is a water storage reservoir created by damming at the Jhelum River for irrigation and there are many associated marshes and extensive sand banks. The water level in the main channel when falls it results in two embankments extend out from the reservoir with back shallow lagoons. The maximum depth is 6.5m but generally the water level fluctuates by about 2m. The pH value of water varies between 6.8 and 7.2. The climate is subtropical with monsoonal hot summer and cool winter. The annual rainfall varies from 200-500 mm, and the relative humidity from 25-85%. The average minimum temperature is 5.5°C in January and the average maximum in June 40°C. The aquatic vegetation includes *Nymphaea lotus, Carex fedia, Hydrilla verticillata, Nelumbo nucifera, Potamogeton crispus, Phragmites karka, P. pectinatus, Vallisneria spiralis, Typha angustata,* and *Zannichellia palustris.* The hills of the Salt Range to the northwest support a subtropical semi-evergreen forest dominated by *Acacia modesta, Olea ferruginea,* and *Dodonea viscosa.* The natural vegetation of the plains to the southeast are tropical thorn forest with species like *Prosopis cineraria, Acacia nilotica, Tamarix aphylla, Capparis decidua, Zizyphus mauritiana, Z. nummularia, Eleusine compressa, Erianthus* sp, *Calotropis procera, Dalbergia sissoo, Panicum antidotale,* and *Saccharum spp. A*long roads and agricultural land

Acacia nilotica have been extensively planted (Koning and Koning-Rat, 1975, 1976; Carp, 1980; Roberts, 1984).

Chashma barrage

Lies 25 km southwest of Mianwali, on the Mianwali to Dera Ismail Khan Road, Punjab. It is a large barrage constructed in 1971 on the Indus River with a series of embankments or flood bunds which, at low water levels, divide the reservoir into five shallow lakes each of up to 250 ha in area. Exposed land is leased to local farmers for cultivation when the water recedes. The depth of the five lakes varies from 0.2m (dry season) to 8.0m (flood season); while the main river channel varies from 4.6-8.8 m in depth; pH values of water range from 6.5-7.2. The climate is generally subtropical with hot summers and cool winters. The annual rainfall varies from 300-500 mm with maximum rains in monsoon, and the relative humidity ranges 22-85%. The average maximum temperature in June is 41°C and the average minimum in January is 4.5°C. The aquatic vegetation consists of *Typha angustata, Phragmites karka, Hydrilla verticillata, Potamogeton pectinatus, Nelumbium speciosum, Nymphaea lotus, Saccharum spontaneum, Zannichellia palustris* and *Vallisneria spiralis.* The natural vegetation of the region is a mixture of subtropical semi-evergreen scrub and tropical thorn forest with species such as *Prosopis cineraria, Acacia modesta, A. nilotica, Olea ferruginea, Dodonea viscosa, Adhatoda vasica, Gymnosporea royleana, Zizyphus mauritiana, Z. nummularia, Reptonia buxifolia, Chrysopogon aucheri, Salvadora oleoides, Heteropogon contortus, Tamarix aphy/la, T. dioica, Lasiurus hirsutus,* and *Panicum antidotale. Prosopis glandulosa* has been introduced in the area. Most of the natural thorn forest on the plains to the east side of the Indus has been cleared for agricultural land and for irrigated plantations of *Dalbergia sissoo* and other species (Savage, 1972; Roberts, 1984; Ahmad, 1987).

Marala headworks

It is a water storage reservoir, constructed on the Chenab River for irrigation and it is surrounded by the croplands. When the water level in the main river channel falls, two embankments extend out into the reservoir and hold back shallow lagoons. Land is leased to local farmers for cultivation when exposed at low water levels. The depth of water in the lagoons varies from 0.2-5m; the pH of water ranges 6.8-7.2. Climate of the area is dry subtropical with very hot summer and cool winter. The annual rainfall varies from 200-500 mm, and the relative humidity from 25-85%. The average maximum temperature in June is 36°C while average minimum in January is 5.5°C. The aquatic vegetation consists of *Hydrilla verticillata, Phragmites karka, Zannichellia palustris, Carex fedia, Nelumbo nucifera, Nymphaea lotus, Typha angustata, Potamogeton crispus, P. pectinatus,* and *Vallisneria spiralis.* The natural vegetation of the adjacent plains is tropical thorn forest with species such as *Tamarix aphylla, Prosopis cineraria, Acacia nilotica, Zizyphus mauritiana, Z. nummularia, Eleusine compressa, Dalbergia sissoo, Erianthus* sp, *Capparis decidua, Panicum antidotale* and *Saccharum* sp. *A*long the nearby roads and around fields *Acacia nilotica* have been extensively planted (Savage, 1968).

Taunsa barrage

It is situated at 20 km northwest of Kot Adu, Muzaffargarh District, Punjab Province. It is also a large water storage reservoir near the town of Taunsa on the Indus River, constructed for irrigation purposes. Five embankments project out into the reservoir and retain shallow lagoons as the water level in the main river channel falls. Land is leased to local farmers for cultivation at low water levels. The depth of water in the main channel varies depending on flood levels from 5.0-11.5m, while in the seepage lagoons, the depth varies from 0.2-5m. The pH value is 6.5-7.0. The climate is dry subtropical with an annual rainfall of 200-450 mm, and a relative humidity ranging from 25-88%. The average minimum temperature in January is 4.5-5.5°C, and the average maximum in June is 42.0-45.0°C. The aquatic vegetation in the seepage lagoons includes *Nelumbium speciosum, Nymphaea lotus, Carex fedia, , Typha angustata, Hydrilla verticillata, Potamogeton crispus, P. pectinatus, Phragmites karka, Ranunculus aquatilis, Vallisneria spiralis, Saccharum spontaneum* and *Zannichellia palustris.* The adjacent lands mostly are under cultivation and the major crops are cotton, wheat,

sugar cane, and fodder crops. Riverine forest along the Indus is dominated by *Dalbergia sissoo* and *Populus euphratica* in association with *Tamarix dioica*. Other natural vegetation includes *Prosopis cineraria, Acacia nilotica, Salsola barysoma, Pisum arvense, Eleusine compressa, Cynodon dactylon,* and *Panicum antidotale* (Savage, 1968; Koning and Koning-Rat, 1975; Carp, 1980; Groombridge, 1982; Robert, 1984; Karpovicz, 1985).

Patisar lake

An abandoned water storage reservoir on the edge of the Cholistan Desert, located in the Lal Suhanra National Park, 25 km east of Bahawalpur and ten km south of the Sutlej River. The lake appeared now with abundant aquatic vegetation, extensive reed-beds and 13 small islands. The lake was originally constructed as a storage reservoir to provide water for irrigation during periods of water shortage, but is no longer used for this purpose. The lake is fed by the Desert Branch of the Bahawal Canal, and also receives excess water from irrigated land nearby. The lake is permanent with stable water level throughout the year, with an average depth of 4.5m, a maximum depth of 6.0m, and a pH value of 6.8. The lake suffered badly from a drought period in the late 1970s, but was subsequently restored to its former level with diverted floodwater. The climate is arid subtropical with extreme hot summers and mild winters. The annual rainfall is about 150-200 mm, and the relative humidity ranges from 25-72%. The mean minimum temperature in January is 11.5°C, and the mean maximum in June is 37°C (extremes of 1°C and 49°C have been recorded). The lake supports extensive reed-beds and an abundant growth of submerged and floating aquatic vegetation. *Saccharum spontaneum* grows in dense stands along the margin of the lake, and *Salvinia natans* covers much of the shallow water areas near the lake edge. Other aquatic plants include *Chara* sp., *Hydrilla verticillata, Phragmites karka, Typha angustata, Vallisneria spiralis, Nelumbium speciosum, Nymphaea lotus, Potamogeton crispus, P. pectinatus, P. perfoliatus, Eichhornia crassipes, Zannichellia palustris* and *Ranunculus aquatillis.* The natural plant communities around the lake include tropical thorn forest, *Suaeda-Salsola* scrub and riverine *Tamarix* forest. The dominant species include *Prosopis cineraria, P. juliflora, Acacia nilotica, Salvadora oleoides, Capparis decidua, Zizyphus nummularia, Z. mauritiana, Tamarix aphylla, T. dioica, Albizzia lebbek, Haloxylon recurvum, Calligonum polygonoides, Leptadenia pyrotechnica, Salsola foetida, Suaeda fruticosa, Calotropis procera. Crotalaria burhia, Aristida mutabilis, Eleusine compressa, Aerua javanica, Pennisetum divisum,* and *Cynodon dactylon* (Savage, 1968, 1972; Bokhari, 1970; Koning and Koning-Rat, 1975; Masud, 1980; Roberts, 1984).

Procedure adopted

All the six sites were surveyed for Black Coot population counts during mid-winter (January) from 1989-2008. Surveys were conducted on foot and by boat, in morning from 7:00 to 10:00 and evening from 14:00 to 17:00 and average of both the timings were taken. Banks of Heads and barrages were surveyed by walking whereas pond areas were surveyed by wooden boat. Every year, at each site, surveys were conducted by the same observer with same method. Total count method was applied by following the Bibby and Burgess (1992); care was taken that the same individual not counted twice. Binoculars (10x50 mm) Minolta and Swift Telemaster Model 841, Zoom-scope (15 x - 60x.60mm) were used to identify the species. Informal discussions and dialogues with the locals were also carried out to gather the information about the natural resources of the wetlands and their management.

RESULTS AND DISCUSSIONS

Approximately 853,000 Black Coot were estimated at six study sites during 1989 through 2008, with a mean value of 42,638 birds per year. The maximum population recorded was 180,068 birds with mean value of 30,011 birds per survey in 1989. The minimum population recorded was 13,676 birds with mean value of 2,279 birds per survey in 2008. Among the sites, the total maximum population was 769,535 birds with mean value of 38477 at Chashma Barrage. The total minimum population, 424 birds, with mean value of 21.2, was recorded at Head Marala. During twenty year study

period an overall declining trend in population of coot was observed at each study site (Table II, Fig. 2). The comparison of 2008 population with

Table II.- Number of Coot recorded at six wetlands during 1989 to 2008.

Year	Head Qadirabad	Head Marala	Head Rasool	Chashma Barrage	Taunsa Barrage	Patisar Lake	Total	Mean
1989	3600	0	5050	165418	4000	2000	180068	30011
1990	3618	0	1567	85605	782	1570	93142	15524
1991	3000	0	1000	82400	680	1400	88480	14747
1992	1702	0	4720	1450	330	1600	9802	1633.7
1993	270	0	1635	25723	308	576	28512	4752
1994	915	0	240	60000	650	250	62055	10343
1995	67	0	3900	80000	693	1050	85710	14285
1996	2565	4	280	73500	7408	56	83813	13969
1997	456	0	1055	18650	300	60	20521	3420.2
1998	0	18	1750	3000	5000	300	10068	1678
1999	0	40	100	14000	1300	0	15440	2573.3
2000	477	70	89	14730	1400	157	16923	2820.5
2001	205	0	85	17400	100	50	17840	2973.3
2002	950	96	1900	14700	200	0	17846	2974.3
2003	350	0	173	13000	900	55	14478	2413
2004	205	0	170	15000	100	4	15479	2579.8
2005	1105	0	620	15650	1200	35	18610	3101.7
2006	200	18	188	36000	600	40	37046	6174.3
2007	213	37	0	22309	680	10	23249	3874.8
2008	1105	141	600	11000	800	30	13676	2279.3
Total:	21003	424	25122	769535	27431	9243	**852758**	142126
Mean	1050.15	21.2	1256.1	38476.75	1371.55	462.15	42638	7106.3
%	2.46	0.05	0.29	90.24	3.22	1.08		

1989 revealed a 99% decline at Patisar Lake followed by 93% (Chashma), 88% (Head Rasool), 80% (Taunsa) and 70% at Head Qadirabad while overall 92% population was declined at six sites together. However, at Head Marala no coot was observed between the years 1989-1995 but later on this site was also visited irregularly by the coots. Moreover the fluctuations in populations were also recorded at each site perhaps depending on degree of disturbance/overexploitation through different years.

Scott (1989) reported that 6,530, 18,000, 61,500, 7,510 and 5,300 Black Coots at Head Qadirabad, Head Marala, Chashma Barrage, Taunsa Barrage and Patisar Lake respectively during January 1987. If we compare the mean population value of current study at each site with the population reported by Scott, it indicates a very serious decline in population of coots at each study site. Akbar *et al*. (2005-06, 2009) studied the population of waterfowl at Qadirabad Barrage, Chashma Barrage and Marala Head works and reported a decline in populations at those sites.

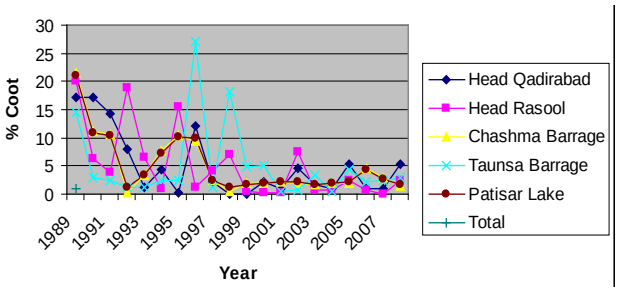

Fig. 2. Relative abundance (%) of coot population at various water bodies of Punjab, Pakistan.

A declining population in the study areas might be attributed to many different threats such as (i) illegal hunting, (ii) netting on a large scale as practiced by fishermen and netted birds being sold

in the market, (iii) land given on lease by the Punjab Irrigation and Power Department to the farmers for cultivation of crops at barrages and head works seriously degraded the natural habitat of wild birds, (iv) livestock grazing as practiced in the study areas., which continuously disturbed the wild birds who avoid their presence, (v) cutting of trees for fuel wood, (vi) removal of *Saccharum spontaneum* and *Typha domingensis* on commercial scale as being used in roof-making, fence around the houses, Morra (chair), prayer-mats, floor mats etc., which seriously exploited the vegetation and changed the ecosystem, (vii) unexpected and unpredictable rise and fall in water level due to flood also adversely affected bird's population (viii) Patisar Lake faced a severe problem of eutrophication as a result of high nutrient levels. This has led to increased biomass of aquatic vegetation and reduced areas of open water, thence to increased sediment disposition from decomposition of emergent and floating plants. Consequently there was a reduction in the reservoir's value as wintering habitat for waterfowl (ix) water was not being supplied regularly to Patisar Lake from Desert Branch, due to the shortage of irrigation water in the country and because of this the lake drying up, and (x) all the barrages, head works and lake have been silted up and their water-containing capacity has been decreased too much. Houdková (2003) and Musil and Fuchs (1994) also recorded similar declining trends in numbers of the Coot (*Fulica atra*) in the Czech Republic in 1988-2000. On the other hand Fisher *et al.* (2006) reviewed that lead poisoning from ammunition sources is also another factor in declining the terrestrial birds. Hunting for food, habitat degradation, and loss due to agricultural drainage schemes were considered the threats to coot population in Pakistan (Taylor and van-Perlo, 1998).

CONCLUSIONS AND SUGGESTIONS

It was concluded that the population of Black Coot in last two decades was dramatically reduced at all the wetlands of the Punjab and their present state had failed to provide safeguard to this bird. There is an urgent need to take immediate steps for the conservation of the Black Coot through management planning of these wetlands. In order to protect and conserve this bird. (i) Strict control be enforced on illegal hunting and netting through deployment of sufficient staff of Wildlife Department, (ii) complete ban be imposed on hunting for at least five years, (iii) eutrophication be controlled by removing biomass of aquatic vegetation, (iv) habitat of the wetlands be protected by controlling livestock grazing and vegetation exploitation, (v) land should not be used for agricultural purposes, (vi) local community should be involved in management of the wetlands, and (vii) public awareness about the local wildlife issues should be promoted.

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