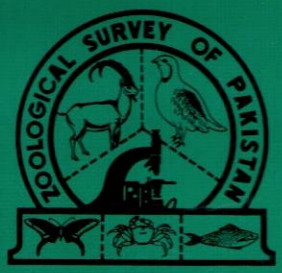
RECORDS

ZOOLOGICAL SURVERY
OF PAKISTAN



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A special thanks go to Zoologist (Altaf Hussain Narejo) for his keen interest in the Online Directory of Zoological Survey of Pakistan.

(Cover Photo)

Crocodylus Palustris

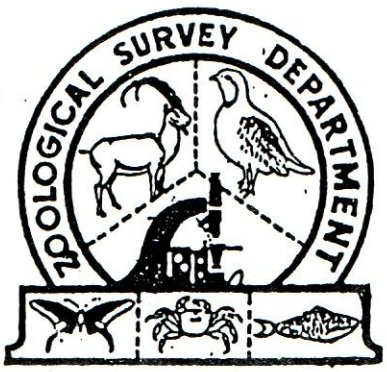
The largest species of reptiles, highly demanded throughout the world because of its economic importance and commercial value. Its status in Pakistan is vulnerable. Zoological Survey Department is undertaking a project titled "Current status of Marsh Crocodile in Sindh and Balochistan" for its better conservation and management in Pakistan.

RECORDS

ZOOLOGICAL SURVEY

OF

PAKISTAN



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BIOCHEMICAL STUDIES OF SOME SEAWEED SPECIES FROM KARACHI COAST

PARVEEN AKHTAR AND VIQAR SULTANA

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ABSTRACT.—The present study deals with biochemical composition of 10 seaweed species; one belonging to chlorophyceae and nine to phaeophyceae. The results revealed that all these ten seaweed species had high nutritive value because of high content of carbohydrate 24.5-55.5% in brown seaweed and 32.9% in green seaweed. Mineral contents were 5.6 - 40.2% in brown species and 18.6% in green species. Less amount of lipid (3-6.5%) in brown seaweed was found, as compared to in green seaweed (9.8%).

KEY WORDS : Seaweed, Nutritive value.

INTRODUCTION :

Ocean and seas cover 71% of the earth's surface and constitute the single largest reservoir of life on the earth. Amongst marine natural product "seaweed" represent an under-explored source of new natural products with potential applications. Many workers have tried to exploite seaweed as unconventional source of supplementary diet for human being and animal consumption and source of fertilizer (Levering *et al.,* 1969; Chapman, 1980 and Alam & Qasim, 1994). More than 100 species, mostly of phaeophyceae and chlorophyceae are used as food in different parts of the world specially in Japan, China, Sri Lanka, and Thailand etc. Algae are important as the chief source of food and oxygen to all marine and fresh water animals. Recent researches on chlorophyceae have revealed that it can be served as an efficient source of food for man as it contains high percentage of proteins and all the vitamins from A to D. As seaweed are rich in carbohydrate, protein, and lipid content and due to appreciable amount of certain important essential amino acids, fatty acids and minerals, seaweed could be used as an alternative food (Chapman & Chapman, 1980; Qasim, 1991). The present study has been carried out to investigate the biochemical components of seaweed which could be used as a source of food materials.

MATERIALS & METHODS :

Seaweed species were collected from Buleji and Paradise point, Karachi in different seasons at low tide. Different species of seaweed exposed on sands and rocks were collected, washed under tap water and dried under shade. These seaweed were then powdered in an electrical millar and stored in polyethylene bags until used. The biochemical contents such as water, carbohydrate, ash, protein and lipid were estimated by using standard methods. Water content was determined by standard method of AOAC, (1980). Ash content of seaweed species was determined by ashing the sample at 550 °C for 8 hours (AOAC, 1960). Total carbohydrate content was determined by Dubois, *et al.,*(1956) method. The protein content in the sample was estimated by standard Lowery *et al.,* (1951) method. Total lipid was determined by method as described by Folch *et al.,* (1957).

RESULT & DISCUSSION:

Ten seaweed species belonging to chlorophyceae and phaeophyceae were collected from Buleji & Paradise point and identified (Table-I).

TABLE -1 Seaweed Collected from Karachi Coast

S. No.	Name of Seaweed	Locality
1.	Green	
(i).	*Caulerpa racemosa (Forsk.) J. Ag.*	Buleji
2.	Brown	
(i).	*Colpomenia sinuosa (Roth.) Derb et Sol.*	Buleji
(ii).	*Iyengaria stellata (Borg.) Borg*	Buleji
(iii).	*Padina pavonia (L) Lamour*	Paradise Point
(iv).	*Sargassum binderi*	Buleji
(v).	*S. swartzii (Turn.) C. Ag.*	Buleji
(vi).	*S. tenerrimum J. Ag.*	Buleji
(vii).	*Spatoglassum variable Fig. Et De Notar*	Paradise Point
(viii).	*Stoechospermum marginatum (C. Ag.) Kutz*	Buleji
(ix).	*Stokeyia indicia Thivy et Doshi*	Buleji

The constituents were calculated as percentage dry weight of seaweed. The proximate composition of this investigation is given in Table -II.

TABLE -II Biochemical Composition of Seaweeds

No.	Name of Seaweeds	Water %	Ash %	Protein %	Lipid %	Carbohydrate %
1.	Green					
(i).	*Caulerpa racemosa (Forsk) J. Ag.*	87.7 ± 1.1	18.6 ± 0.9	18.4±2.4	9.8 ± 2.5	32.9 ± 0.5
2.	Brown					
(i).	*Colpomenia sinuosa (Roth.) Derb et Sol.*	89.9±1.3	13.7 ± 0.4	05.1 ± 1.8	03. ±1.3	49.1 ± 0.4
(ii).	*Iyengaria stellata (Borg) Borg.*	88.5 ± 0.7	19.8 ± 0.2	07.3 ± 1.7	04.4 ± 2.8	38.2 ± 0.9
(iii).	*Padina pavonia (L) Lamour*	79.4 ± 0.5	07.5 ± 0.1	06.7 ± 0.9	05.1 ± 1.8	32 ±5.6
(iv).	*Sargassum binderi*	88.2 ± 0.4	05.6 ± 0.2	08.7 ± 2.3	4.5 ± 0.4	32 ± 0.3
(v).	*S. swartzii (Turn.) C. Ag.*	85.6 ±0.7	40.2 ± 1.3	07.5 ± 5.6	03.5 ±0.2	24.8 ± 0.4
(vi).	*S. tenerrimum J. Ag.*	86.7 ±0.7	07.7 ±0.2	07.0 ± 0.9	04.7±1.6	28.3 ± 0.6
(vii).	*S. variable fig. Et. De Notar*	80.8 ±0.2	35.±1.6	06.8 ± 0.2	06.5 ± 0.2	39.5 ± 0.6
(viii)	*Stoechospermum marginatum* (C.Ag) Kutz.	91.7 ±1.2	29.6±0.7	05.3 ± 1.6	05.7 ± 0.1	24.5 ±1.8
(ix).	*Stokeyia indicia* Thivy et Doshi	82.3 ± 2.3	18.2 ±2.6	14.2 ± 0.9	03.5 ± 0.7	55.5 ±1.9

Values are means ± SD, with n=4.

Caulerpa racemosa (green) was found to contain 87.7% of water. Water content in brown seaweed ranged from 79.4- 91.7%. Results revealed that water was major constituent of all the seaweed examined. The ash value of *C. racemosa* was 18.6%. Significant variation in ash content (5.6-40.2%) has been observed in brown seaweed. Lowest value was obtained for *Sargassum binderi* and highest for *S. swartzii.* Another major component of these seaweed species was found to be carbohydrate. *C. racemosa* (green) contained 32.9% and it significantly varied from 24.5-55.5% in brown species. The carbohydrate of seaweed are resistant to the action of digestive enzymes and their nutritive value is very low but polysaccharides of algae have great importance in the treatment of many diseases *e.g.* hypoglycemia and tumor (Lamela *et. al.*, 1989 and Takashi, *et. al.* 1995). The protein content was estimated higher in *C. racemosa* (18.4%) and it varied from 5.1-14.2% in brown seaweed. It was found highest in *stokeyia indicia* and lowest in *Colpomenia sinousa.* The amount of protein content in seaweed is higher than other food materials such as cereals, eggs and some other food materials (Katheresan, 1992). The lipid composition of *C. racemosa* was 9.8% whereas in brown seaweed, it varied from 3-6.5% Lowest value was observed in *C. sinuosa* and highest in *Spatoglassum variabile* (Table II).

It has been concluded that these seaweed species contain vital components which are required for physiological process of human and animal nutrition. Seaweed are rich in carbohydrate, protein, lipid and minerals and do not cause any disorder of lungs, kidneys, stomach and intestine (Katheresan, 1992). So they could be used as a potential source of food.

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DISTRIBUTION AND POPULATION OF HOG DEER IN DISTRICT SANGHAR, SINDH

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ABSTRACT.—The present study deals with the distribution and population of Hog Deer *(Axis porcinus)* in Sanghar District, Sindh. The studies were conducted during April, 1997 to December 1997. In addition to population status all the factors affecting the population and habitat of the species were monitored. As the animal is nocturnal and very shy, indirect methords were used for population estimates. Estimated population was 140-150. Hunting, habitat destruction and disturbance were major threats to the species.

KEY. WORDS : Hog Deer Distribution ranges, Nara canal.

INTRODUCTION

Hog deer *(Axis porcinus)* is ranked among one of the threatened species of Pakistan. It has been exterminated from a number of its previous haunts and its population is on decline in its present distribution ranges.

Hog deer belongs to the order Artiodactyla and Family Cervidae. It is smallest of the Indian Rusa-like deer. It extends through Himalayan foothills zone of India through Assam to Myanmar and Thailand, but is quite local in distribution and not found elsewhere in Indian peninsula (Roberts, 1997). In Pakistan, Hog deer was once distributed throughout the riverine tracts of Sindh and Punjab but now it is facing danger of extinction. Very little and fragmented information is available regarding the status of the species in the country. Ahmed et al (1975) and Roberts (1997) provided information about its distribution. Scott (1989) referred to the occurrence of the animal in the adjacent areas of some major wetlands of Pakistan.

During the present studies detailed surveys were conducted to determine the distribution and abundance of Hog deer in adjacent areas of Nara Canal, District Sanghar, Sindh.

STUDY AREA

Nara Canal originates from Sukkur Barrage and passes from Khairpur Sanghar and Tharparkar Districts. There is a series of marshes, lakes and swamps with reed vegetation and scrub forest at margins along the canal which harbour a diversity of flora and fauna including the threatened species *i.e.* Hog deer, Marbled teal, Smooth-coated otter etc. The study area extends along the Nara canal from Head Jamrao down to Baqar Goth. Hog deer population is found in three fragments *i.e.* Chotiart reservoir, Pir Pagara Reserve and Awadhki forest. These areas are described below.

CHOTIARI RESERVOIR :

The Chotiari Reservoir in Sanghar district lies between lower Nara Canal, which forms western and southern margins and dunes area on frings of Thar Desert, which forms the north eastren and eastren boundaries.

The reservoir has an approximate area of 25,000 acres. After remodeling, the flooded area will be 49,000 acres. Present water level has an elevation of 74 feet, which after remodeling will be 87.5 feet.

The area comprises of a series of open water bodies, fringed with extensive reed beds. A number of sand dunes occurs in the area with elevation of upto 120 feet. In the areas adjacent to main reservoir, there are number of isolated dhands. To the east of the reservoir there are sand dunes, with elevation upto 150 feet.

The site has different ecological zones *i.e.* deep water, shallow marshes, riverine forest, ephemeral channels, agriculture land and sand dunes. Aquatic area has submerged and marginal vegetation including *Hydrilla verticilleta, vallisnaria spirals, Nymphyaea lolus, Nelurmbeium speciosorn, Phragmites Karka, Typha angustata, and Saccherum spp.* Sand dunes have typical desert vegetation such as *Calligonum polignoides, Capparis decidua, Calotropis procera and Salvadora persica.*

Pir Pagara Reserve :

Pir Pagara reserve is 27 Km north west of Sanghar, 10 Km north east of Gujri along left bank of Nara canal in Deh Akanwari.

This reserve consists of area of Deh Akanwari in the surrounding of Goth Bilawal Abupota, Goth Alla Dino Bahin, Goth Ishaq Abupota, Goth Nawab Bahin, Goth Abdul Karim Rajpur etc.

A big area of the reserve has agriculture land whereas riverine forest is present along the Nara canal. The area having riverine forest is important for Hog deer population and extends from RD83 to RD 98 at Pir Pagara Bridge. It is an area of about 500 acres mostly consisting of reeds of *Typhea angustata.* There is also a dense forest in some area dominated partially by *Populus euphratica* and partially by *Dalbergia sisso, Ziziphus jujuba* and *Phyllanthus multfiftorrus* which are common on the margins of embankments. In the adjacent sand dunes *Calligonum polignoides and Prosopis cineraria* are common.

Awadhki Forest :

Awadhki forest is situated 43 Km north of Sanghar close to village Awandhki. Plantation may be seen in Island surrounded by two branches of the Nara canal. It has an approximate area of 80 hectares. The forest consists of *Populus euphratica* with reed vegetation.

MATERIALS AND METHODS

Informations regarding occurrence and distribution of the Hogdeer in the study

areas, were obtained from local people. These informations were confirmed through survey of the area by direct sighting of the animal and their signs including faecal pallets, foot prints etc.

Due to nocturnal and shy habits of the animal, its peculiar habitat and topography of the site, only tracks counting method was found to be most reliable method for population studies.

Track counts method for a number of wild species have been used. Estimation of number requires specific modeling of the relationship between animal numbers, spatial distribution and abundance of tracks. For direct counting of animals, night surveys were conducted by using search light.

During this study, samples were taken randomly. Fresh tracks of foot prints were counted and population of the total area of similar homogenous habitat was estimated.

RESULTS AND DISCUSSIONS

The papulation of Hogdeer in chotiari reservoir was mainly concentrated in reed vegetation and scrub forest on both sides of Ajo Canal (Chandan Wah), in the adjacent areas of Siddiq Mullah Goth, Balu Jamali Goth and Ditta Jamali Goth. In the south, animals are found upto Goth Hasan Hingaro which is the southern margin of occurrence of the Hogdeer Chotiari reservoir. In the east, the species is restricted in the west of Suiri Bhit. In the north, main concentration remains in the area between Chandan Wah and Mir Khan Manguana. However, animals are sparsely spread along the canal in the north east. Hogdeer population is also extended upto south west of Goth Piru Bahin. This is northern margin of its distribution in the Chotiari reserve.

In Pir Pagara reserve, the animal population was found in riverine forest along Nara canal mainly between RD 83 to RD 98. Few Hogdeer were found in Awadhki forest.

Estimated population of the Hogdeer in different areas in October, 1997.

Name of the Area	Population
Chotiari Reserve	80-95
Pir Pagara Reserve	50-55
Awadhki Forest	6-7

According to Robert (1997) population of Hog deer in east Nara had been reduced due to control of flooding efforts and reduction of suitable habitat and only 20 to 30

individuals still survived in the swamps area of Sandori lake. The present study reveals that the population in east Nara is not so drastically less, but dispersed in adjoing areas. However, it is not on Sandhori Lake but in other areas.

THREATS :

There are a number of factors which are affecting population of the animal in the area. These are as follows :

Hunting Pressure : In the area of Chotiari reservoir, there is a lot of hunting pressure. It was reported that 15-20 animals were hunted annually. During study period, hunting parties were seen in the area and 7 animals were reported to be hunted by them.

Hunting pressure in the areas of Pir Pagara reserve and Awadhki forest is relatively less.

Habitat Degradation: In Chotiari reservoir, habitat of the animal has been badly degraded due to activities of remodeling of the reservoir. Riverine Forest has been cleared from area for getting clay for construction of the Bund.

Disturbance$: There is high disturbance caused by machinery used for remodeling of the canal and reservoir. In addition agriculture activities and livestock grazing also cause disturbance$.

Pesticides : Cotton is sown in the field adjacent to the forest having hog deer population in it. Pesticides are regularly used on this crop which may be harmful to the animals.

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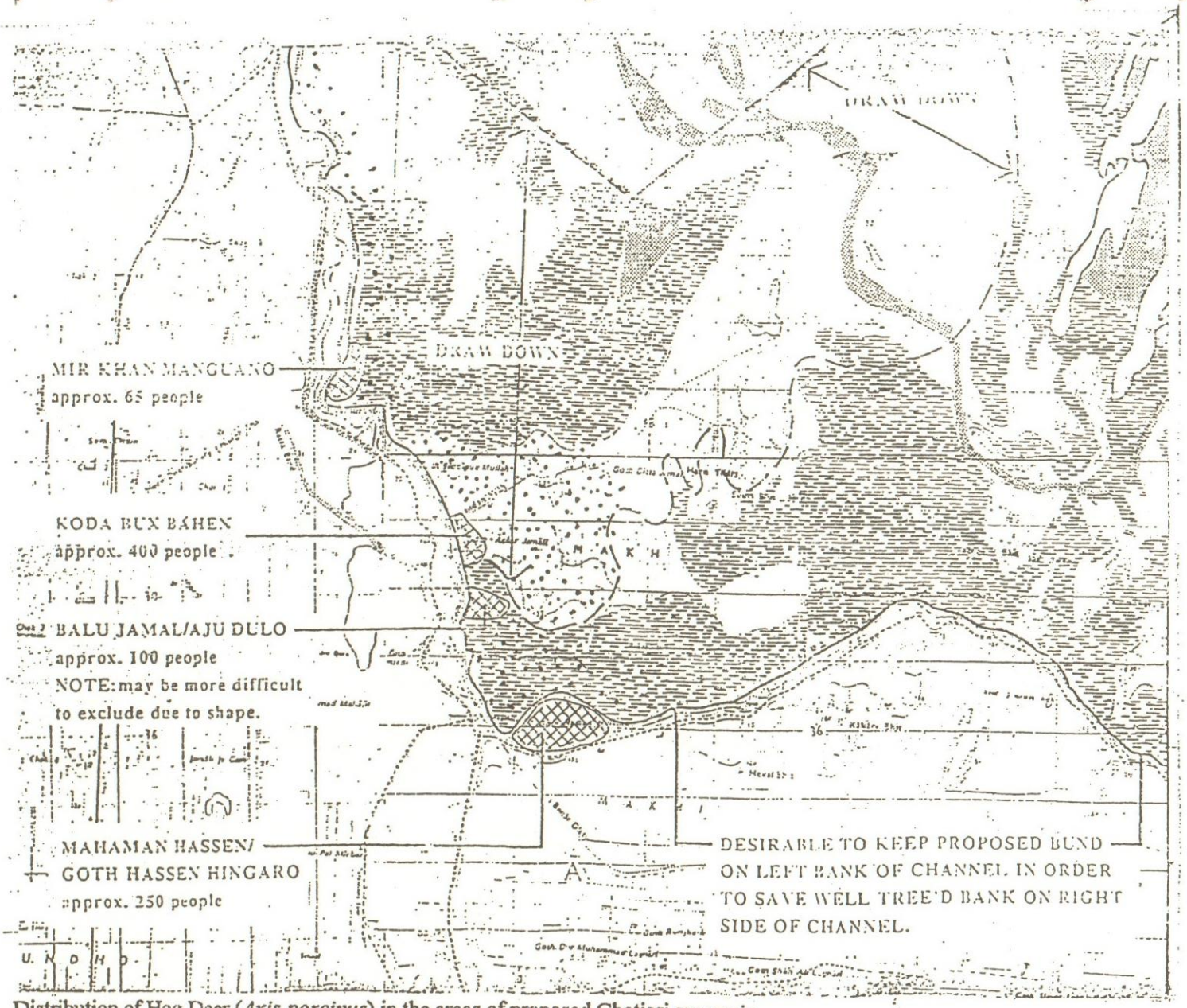
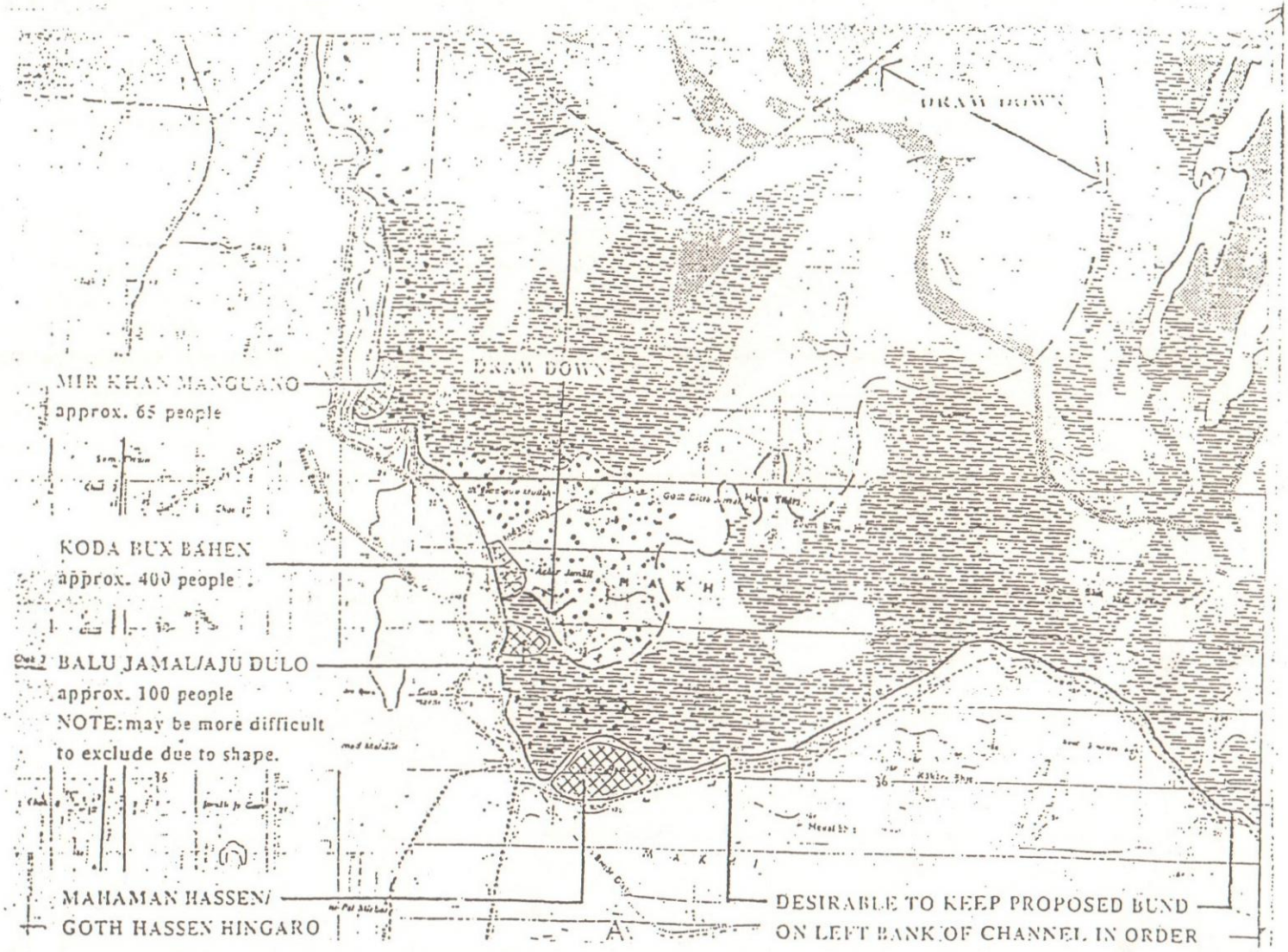


Distribution of Hog Deer (*Axis porcinus*) in the areas of proposed Chotiari reservoir.


DRAW DOWN
DRAW DOWN
MIR KHAN MANGUANO
approx. 65 people
KODA BUX BAHEN
approx. 400 people
BALU JAMAL/AJU DULO
approx. 100 people
NOTE: may be more difficult
to exclude due to shape.
MAHAMAN HASSEN/
GOTH HASSEN HINGARO
DESIRABLE TO KEEP PROPOSED BUND
ON LEFT BANK OF CHANNEL IN ORDER

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MULLETS OF KORANGI CREEK, KARACHI

FAHMIDA IFFAT

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ABSTRACT.—8 species of mullets of the family Mugilidae, which form a sizable part of the fish landings at Korangi fish harbour, are described in this paper. All the species of the family are so remarkably uniform in their external morphology that it becomes very difficult to correctly identify up to species level. The importance of gill rakers and pyloric caeca in the identification of mullets has been discussed in the paper.

KEY WORDS : Mullets, Gill rakers, Pyloric caeca, scale count.

INTRODUCTION :

During the course of morphometric and bionomical studies on some of the important fishes, it was observed that mullets form a sizable part of the fish landings at the Korangi fish harbour. Some very interesting facts came to the knowledge which inspired the author to examine as many species of Mugilidae as possible. Examination of fish catches landed at Korangi Fish Harbour during 1987 to 1991, resulted in the identification of the following 8 species of mullets.

1.	*Mugil cephalus*	(Linnaeus, 1758)
2.	*Valamugil sheli*	(Forsskal, 1775)
3.	*Valamugil, speigleri*	(Bleeker, 1858)
4.	*Liza abu*	(Heckel 1846)
5.	*Liza carinata*	(Valenciennes, 1836)
6.	*Liza parsia*	(Hamilton Buchanan, 1822)
7.	*Liza subviridis*	(Valenciennes, 1836)
8.	*Liza vaigiensis*	(Quoy and Gaimard, 1824)

Mullets are so similar in their external morphology that sometimes it becomes very difficult to identify up to species level. The features usually considered for their identification are scale counts, number of fin spines and rays and relative measurements of body parts. However, in addition to the above, some other prominent characters in respect of gill rakers and number of pyloric caeca have been found more useful in determining species. These have, therefore, been discussed in the present study under the materials and methods.

Although all the species of Mugilidae are relished as food, yet, this family has not received attention of research workers for detailed studies on distribution, migratory pattern and life history of mullets. Even the systematic work done so far, is too inadequate, Qureshi (1955) listed 6 species; Jaleel and Khaliluddin (1981) listed 5 species, Bianchi (1885) desribed 12 species, Hoda (1988) listed 13 species and Ahmad (1966) reported 8 species of the family Mugilidae. The present study is based on the material collected from Korangi Fish Harbour.

MATERIALS AND METHODS :

More than 200 fresh mullets were obtained from fish landings at Korangi Fish Harbour for examination and preserved in 8% formaldehyde. FAO field guide by Bianchi has been found very useful for the identification of species. At least ten specimens of each species were examined. Parameters considered for determination of species are described below :—

Scales :

Lateral line (L1) scales were counted from the scales immedialtey above the insertion of the pectoral fin (i.e. just behind the head) to the caudal flexure. The transverse (tr) scale count is the number of scales between the origin of the dorsal fin and origin of the pelvic fin.

Gill Rakers :

Gill Rakers are of special significance in separation of various species in Mugilidae. It has been observed that counting of rakers on the first gill arch is easier than on the other arches, because the first gill arch has longer gill rakers than the other arches. Following five categories of rakers among Mugilidae, have been recognized :

(i) Fringes short, coarse and widely spaced

(ii) Fringes long, and close-set.

(iii) Fringes long, coarse and wide set

(iv) Fringes long, coarse and close set

(v) Fringes long, fine and close-set giving a feathery appearance.

Pyloric Caeca :

The number of Pyloric Caeca has been found different in mullets and fairly constant within a species. This character is also helpful in the identification of species.

ABBREVIATIONS :

A = anal fin, number of spines indicated by Roman numerals

D 1 = first dorsal fin, Roman numerals indicate the number of Spines

D 2 = Secondary dorsal fin.

D 1 sc = The number of scales between the operculum and the vertical from the Origin of the first dorsal fin.

D2 sc = The number of scales between the operculum and the vertical from the Origin of the Second dorsal fin.

LI = The number of scales in the longitudinal series along lateral line.

P = Pectoral fin.

tr = The number of scales in transverse series.

SYSTEMATICS :

1- *Mugil cephalus* Linnaeus, 1758

Synonyms *Mugil our Forsskal, 1775*
Mugil japonious Schlegal, 1845

Local names Boi, Meengh (Sindhi)
Murbo, Tagan (Balochi)

English name Grey mullet

Size 35 cm

Description D1, IV, D2, i8, AIII 8, P(16) 17, LI 37-43, tr 14-15, D1 sc 13, D2 sc 25.

Easily distinguished by its robust body, rounded profile, almost flat interorbital, long category V gill rakers giving feathery appearance, Caudal fin deeply forked, Greyish above, silver below :

2. *Valamugil seheli* (Forsskal, 1775)

Synonyms *Mugil axillaris* Valenciennes, 1836
Mugil caeruleomaculatus Lacepede, 1803

Local names Boi, Phara (Sindhi)
Murbo, Mundsar (Balochi)

English name Bulespot grey mullet

Size 24 cm

Description : D1 IV, D2 i8, AIII 9, LI 38-42, tr-13, D1 sc 11-13, D2 sc 23-26.

Valamugil seheli is distinguished by its moderately robust body, bluntly pointed head, long category IV rakers, Second dorsal and anal fins densely scaled. Caudal fin fulcate, Pyloric caeca 7.

3. Valamugil speigleri (Bleeker, 1858)

Synonyms *Mugil cunnesius Cantor, 1850, Gunther 1861.*

Local names Bio, Pharra (Sindhi)
Murbo, Anjara (Balochi)

English names Speigler's mullet

Size 14 cm

Description D1 IV, D2, i8, AIII 9, P 17, LI 37-40, tr-11 D1 sc 12-13, D2 sc 23-24.

Distinguished from other members of the genus by its high scale count, Moderately robust body, bluntly pointed head, scale free up to posterior nostril, Second dorsal and anal fins densely scaled, Gill rakers category V, Pyloric caeca 4.

4. ***Liza abu.*** (Heckel, 1846)

Synonyms *Mugil abu* Berg, 1949
Mugil hashni Misra, 1943

Local names Boi, Mori, (Sindhi)
Anjara (Balochi)

English name *Abu mullet,*
Size 20 cm

Description D1 IV, D2 i8, AIII 8-10, P 16-17, LI 44-50, tr 14-15, DI sc 12-13, D2 sc 29-30

Body moderately robust, head bluntly pointed, scale free to just behind posterior nostrils Caudal fin only shallowly forked. Gill rakers category IV, Pyloric caeca 4.

5. ***Liza carinata*** (Valenciennes, 1836)

Synonyms *Mugil carinatus,* Blecker 1853
Mugil carinatus Day 1865

Local names Boi, Mori (Sindhi)
Murbo (Balochi)

English name Keeled mullet.

Size 22 cm

Description D1, IV, D2 i8, AIII 9, P-17, LI-35-40, tr - 13, D1 sc 11, D2, sc 21-22.

The keeled back readily distinguishes this species from all other Mugil species. Body robust, head bluntly pointed mostly scaly. First dorsal fin originates nearer to snout than to caudal base. Second dorsal and anal fins lightly scaled anteriorly having long base. Gill rakers category IV, Pyloric caeca 5.

6. ***Liza parsia*** (Hamilton Buchanan, 1822)

Synonyms *Mugil parsia* Day 1865
Liza parsia Munro, 1955

Local names	Boi	(Sindhi)
	Murbo	(Balochi)
English name	Gold spot mullet.	
Size	16 cm.	
Description	D1 IV, D2 i8, AIII 9, P 15, LI 31-35, tr-11, D1 sc 11, D2 sc-21.	

Body moderately robust, head bluntly pointed, scale free halfway to anterior nostrils interorbital slightly convex. Eye diameter greater than mouth length, Gill rakers moderately long category IV, Caudal fin deeply forked, Pyloric caeca 5. Most common mullet around Karachi coastal waters mostly confused with L. subviridis which has a relatively short snout. It's mouth corner does not reach as far back as in *Liza parsia*, *Liza parsia* is the only member of the genus whose mid gape is at a level above mid pupil.

7. *Liza subviridis* (Valenciennes, 1836)

Synonyms	*Mugil dussumieri*	valenciennes, 1836
	Mugil jerdoni	Day, 1876
Local names	Boi,	(Sindhi)
	Maing, Murbo	(Balochi)
English name	Greenback mullet.	
Size	30 cm	
Description	D1 IV, D2 i8, AIII (8) 9, P-15, LI 27-32, tr-11, D1 sc 10-11, D2 sc 20.	

Body moderately robust, head bluntly pointed scale free anterior nostril. Second dorsal densely scaled caudal fin moderately forked, Pyloric caeca 5. Gill rakers short category IV.

8. *Liza vaigiensis* (Quoy & Gaimard, 1824)

Synonyms	*Mugil waigiensis*	Bleeker, 1859
	Liza vaigiensis	Seale, 1906
Local names	Bhangan	(Sindhi)
	Murbo, Gid	(Balochi)
English name	Square tail mullet.	
Size	55 cm.	
Description	D1 IV, D2 i8, AIII 8, P 17, LI 24-26, tr 8, D1 sc 9, D2 sc 18.	

Body robust, head bluntly pointed, dorsal anal and caudal fins black at their edges. Brownish above, silvery below. Recognized by dark longitudinal streaks along scale rows, Gill rakers category III, Pyloric caeca 14-16.

ACKNOWLEDGEMENT

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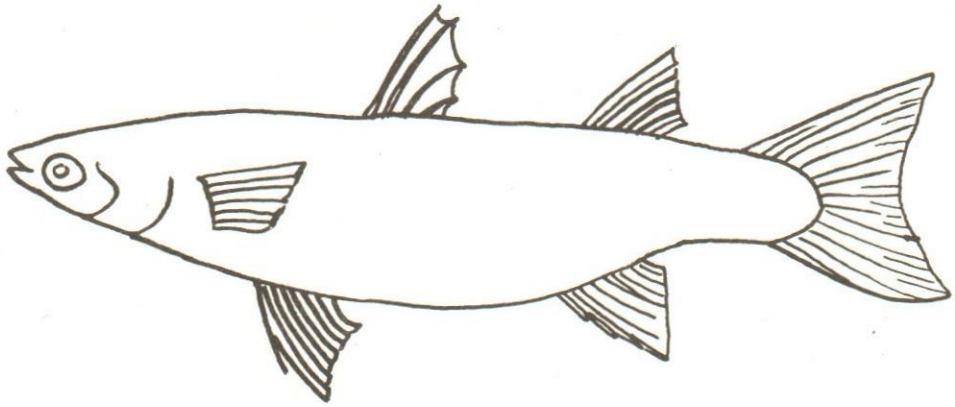
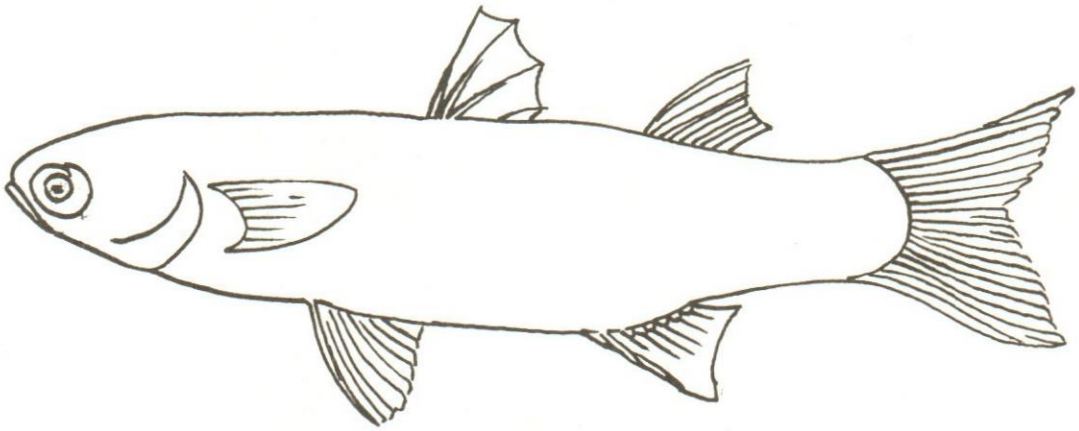
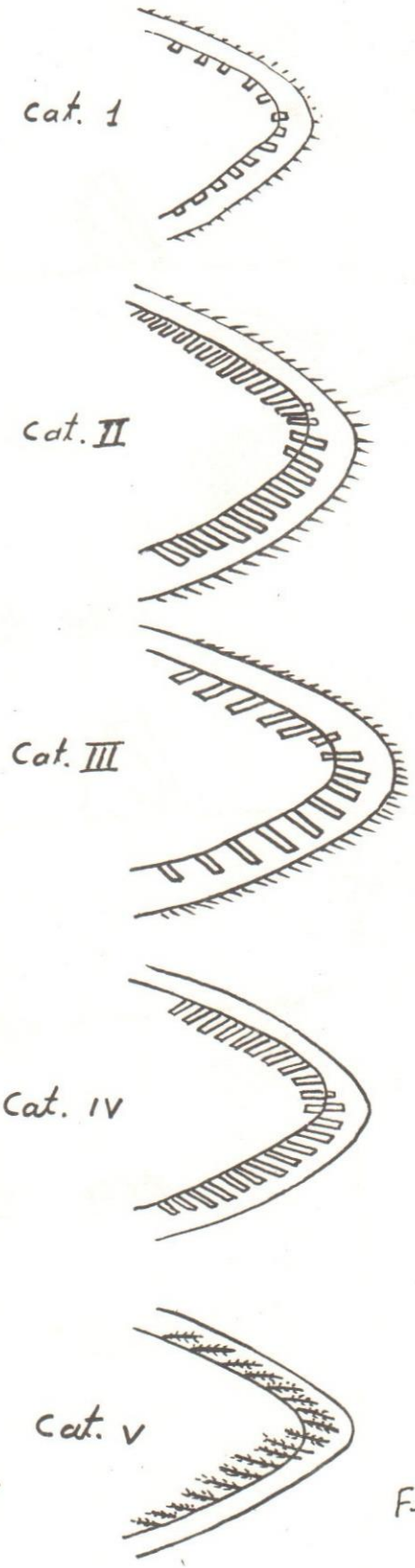


Liza parsia



Liza subviridis

FIG-1



Categories of Gillrakers

Fig-2

Records Zool. Sur. of Pak. Vol. XIV. P.P. 19—26, 2002.

REPORT ON THE ASIAN WATERBIRD CENSUS 2002 ON THE WETLANDS OF SINDH AND N.W.F.P.

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The International Waterfowl Census (IWC) is a scheme to monitor wintering waterbirds initiated by the IWRB in 1967. Traditionally, the census was restricted to Anatidae and common Coot, but in the mid 1980's as new continents became involved, all wetland families of waterbirds were included. It extends over Asia, parts of western oceania, large parts of Africa, Europe and the Neotropics. The census is coordinated by the Asian Wetland Bureau (AWB) (now Wetlands International-Asia Pacific) as the Asian Waterbird Census (AWC) in Asia (east of Iran and the Arabian sea) and Oceania jointly with the Wetlands International for countries west of Iran in Asia, by the WLI as the African Waterfowl Census (AFWC) in parts of Africa and in Europe and northern Africa as the western Palaearctic Waterfowl Census, and by the Wetlands for the Americas (WA) as the Census Neotropical de Aves acuatices in the Neotropics.

The aim of the IWC is to provide information on the status and distribution of species, size and status of waterbird flyway and identification of important sites through the estimation of population size and analysis of population trends. This information is made available in annual reports, special publication, workshops and conferences, to the decision-makers in designating wetlands to the Ramsar Convention, protecting threatened species and assessing wetland values and to monitor threats. The census has also been useful to increase the general awareness of wetlands and their waterbirds.

ASIAN WATERBIRD CENSUS IN PAKISTAN :

The census in Pakistan is done by the Zoological Survey Department, the Provincial Wildlife Departments, WWF Pakistan and NCCW. About 75 important wetlands of the country have been covered during the recent period.

The dates for the Asian Weterbirds Census 2002 were 05-20 January 2002.

A : WATERBIRD CENSUS IN SINDH :

The census was jointly undertaken in parts of Sindh Province by the Zoological Survey Department, Sindh Wildlife Department and the World Wide Fund for Nature, Pakistan. The following 17 wetlands of Sindh were covered during the period.

* Rehri creek, Karachi coast.
* Clifton beach, Karachi coast.
* Hawkesbay, Karachi coast.
* Cape Monze, Karachi coast.
* Charwo, Tando Bago.
* Phoosna I & II, Tando Bago
* Thari, Matli.
* Jubho/Kur., Badin
* Nurr-ri-Badin
* Lungh, Larkana.

* Drig. Larkana.
* Hub Dam, Karachi.
* Haleji, Thatta.
* Keenjhar, Thatta.
* Hadero, Thatta.
* Bhodesar II, Nagarparkar.
* Narayaser, Nagarparkar.

RESULTS :

The detailed results of the waterbird census are given in Table 1.

The following wetlands in Sindh were supporting more than 20,000 waterbirds each :

- Nurr-ri
- Haleji lake.
- Lungh lake.
- Drig lake.
- Keenjhar lake.

Common Coot *(Fulica atra)* was the most numerous species followed by Shoveller *(Anas clypeata)* & Common teal *(Anas crecca)*. Other important species observed here include : White-eyed Pochard *(Aythya nyroca)* & White Stork *(Ciconia ciconia)*. The main threats to the waterbirds and the wetlands in Sindh are hunting/netting/poaching of waterbirds, disturbance due to fishing activities, recreation, cattle grazing and drought.

In 2001, Haleji, Nurr-ri, Keenjhar, Lungh, Jubho and Phoosna each supported more than 20,000 waterbirds whereas Haleji, Manchar, Keenjhar and Phoosna had more than 20,000 waterbirds each in 2000 (Sindh Wildlife Department Census Reports 2000 & 2001).

B : WATERBIRD CENSUS IN N.W.F.P.

The following six wetlands in N.W.F.P. were surveyed during the period.

1. Chashma Barrage, D.I. Khan.
2. Indus Waterfowl Refuge, D.I. Khan.
3. Tarbella reservoir, Haripur.
4. Tanda dam, Kohat.
5. River Kabul, Nowshera.
6. Thanedarwala, Laki Marwat, Bannu.

The census was jointly undertaken by the Zoological Survey Department, Forest and Widlife Department, N.W.F.P. and the National Council for Conservation of Wildlife in Pakistan, Islamabad.

RESULTS :

The detailed counts of the waterbirds are given in Table 2.

The results show that Chashma barrage had the highest population of 55,610 birds, while the Indus waterfowl Refuge was the second highest having the bird population of 16,634. These two are the most important wetlands of the province. In 2001, Chashma barrage had a concentration of 51498 birds whereas Indus waterfowl Refuge had a population of 26,472 (Zoological Survey department waterfowl census report 2001).

The main threats to the waterbirds and wetlands are : hunting/poaching, cattle grazing, tourism/recreation and partial reclamation.

As regards the important species recorded during the census, the following are noteworthy : Ruddy Shelduck *(Tadorna ferruginea)*, Ferruginous Duck *(Aythya nyroca)*, Sociable Plover *(Vanellus gregarius)* and White winged Black Tern *(Sterna lecopterus)*.

ACKNOWLEDGEMENTS :

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6.	Asad Lodhi	Wildlife Department, N.W.F.P.
7.	Ahmad Husain Nizamani	Sindh Wildlife Department.
8.	Rafiq Ahmad Rajput	
9.	Babar Husain	World Wide Fund for Nature-Pakistan.

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.	Zoological Survey Department	2001	Waterfowl Census Report 2001 (unpublished report).

TABLE 2— Details of Waterbird Counts on the Wetlands of NWFP

S. No.	SCIENTIFIC NAME	COMMON NAME	WETLANDS OF N.W.F.P.					
			Thane-darwala	Chashma Barrage	Indus Water-fowl Refuge	Tanda Dam	River Kabul	Tarbela Reser-voir
1.	*Charadrius alexandrinus*	Kentish plover	19	410	67	—	—	17
2.	*Calidris minuta*	Little stint	27	1200	270	23	63	32
3.	*Actitis hypoleucos*	Common sandpiper	19	360	609	19	49	38
4.	*Ardea cinerea*	Gery heron	9	280	329	21	11	9
5.	*Larus argentatus*	Herring gull	—	112	17	—	—	—
6.	*Larus ridibundus*	Black headed gull	—	460	93	—	—	29
7.	*Sterna hirundo*	Common tern	—	—	33	8	—	22
8.	*Himantopus himantopus*	Black-winged stilt	—	147	759	—	—	—
9.	*Egretta garzetta*	Little egret	7	700	627	—	7	13
10.	*Charadrius dubius*	Little ringed plover	—	—	—	—	—	—
11.	*Sterna albifrons*	Little tern	3	79	162	—	—	—
12.	*Vanellus indicus*	Red wattled lapwing	13	—	57	—	13	—
13.	*Tringa glareola*	Wood sand piper	—	—	—	—	13	—
14.	*Vanellus malabaricus*	Yellow-wattled lapwing	—	—	—	—	9	—
15.	*Egretta intermedia*	Intermediate egret	7	360	445	13	19	9
16.	*Aythya ferina*	Common pochard	—	7000	750	—	—	—
17.	*Anas crecca*	Common teal	72	6000	700	19	62	90
18.	*Anas strepera*	Gadwall	—	3100	160	—	—	—
19.	*Anas platyrhynchos*	Mallard	140	8000	1070	270	39	210
20.	*Aythya fuligula*	Tufted Duck	—	80	—	—	—	—
21.	*Fulica atra*	Common coot	—	5000	1070	—	—	—
22.	*Glareola lactea*	Small Indian pratincole	—	—	127	—	—	—
23.	*Podiceps cristatus*	Great crested grebe	—	—	13	—	—	—
24.	*Podiceps nigricollis*	Black necked grebe	—	58	—	7	—	3
25.	*Phalacrocorax niger*	Little cormorant	—	1200	2200	—	9	—
26.	*Bubulcus ibis*	Cattle egret	—	—	—	—	12	—
27.	*Gallinula chloropus*	Moorhen	—	47	27	—	9	—
28.	*Tringa nebularia*	Greenshank	—	—	79	—	—	—
29.	*Tringa ochropus*	Green sandpiper	—	141	19	—	—	—
30.	*Gallinago gallinago*	Common snipe	70	260	1161	18	19	53
31.	*Phalacrocorax carbo*	Great cormorant	—	2000	1800	—	—	23
32.	*Ardeola grayii*	Indian pond heron	8	64	75	3	9	17
33.	*Amauroris phoenicurus*	White breasted waterhen	—	23	38	—	—	—
34.	*Larus ichthyaetus*	Great black headed gul	—	560	31	—	—	9
35.	*Nycticorax nycticorax*	Black c. night heron	—	90	55	—	7	—
36.	*Egretta alba*	Great egret	5	310	590	29	12	19
37.	*Anas penelope*	Eurasian wigeon	43	6000	930	—	13	160
38.	*Sterna acuticauda*	Black bellied tern	9	143	—	—	—	—
39.	*Todorna ferruginea*	Ruddy shelduck	—	11	—	—	—	—
40.	*Anas acuta*	Northern pintail	—	7060	1060	—	—	10
41.	*Anas clypeata*	Northern shoveller	—	4000	830	—	—	25
42.	*Anthya nyroca*	Ferruginous duck	—	180	—	—	—	—
43.	*Sterna aurantia*	Indian river tern	—	130	22	—	—	18
44.	*Platalea leucorodia*	White Spoonbill	—	—	37	—	—	—
45.	*Sterna leucopterus*	White winged black terr	—	—	112	—	—	—
46.	*Vanellus gregarius*	Sociable plover	—	—	—	—	6	—
47.	*Podiceps ruficollis*	Little grebe	—	37	—	3	—	9
		Total :	451	55602	16424	433	381	815

TABLE 1— **Detalis of Bird Counts on the Wetlands of Sindh**

S. No.	SCIENTIFIC NAME	COMMON NAME	WETLANDS OF SINDH															
			Rehri Cree	Clifton Beach	Hawk-asbay	Cape Monze	Hub-Dam	Haleji	Keen-jhar	Hadero	Charwo	Phoos-na I &II	Thari, Matli	Jubho/ Kur	Nurr/ ri.	Lungh Lake	Drig Lake	Bhod-esar II	Naray-asar
1.	*Limosa lapponica*	Bar tailed godwit	12	53	903	—	70	—	112	—	—	—	—	—	880	—	—	—	—
2.	*Charadrius alexandrinus*	Kentish plover	440	608	116	7	—	—	—	77	—	—	—	—	—	—	—	—	—
3.	*Pluvialis squaterola*	Grey plover	—	2	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
4.	*Calidris minuta*	Little stint	450	—	774	19	200	180	220	271	—	—	—	—	197	—	—	—	—
5.	*Numenius arquata*	Curlew	3	8	—	17	—	—	4	—	—	—	—	—	—	—	—	—	—
6.	*Tringa totanus*	Common redshank	150	26	18	46	10	40	1	8	—	—	—	—	—	—	125	18	4
7.	*Actitis hypoleucos*	Common sandpiper	40	3	46	—	170	82	84	16	—	—	—	—	—	—	—	—	8
8.	*Xenus cinereus*	Terek sandpiper	10	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
9.	*Egetta sacra*	Reef heron	40	—	67	—	—	—	—	—	—	—	—	—	—	—	—	—	—
10.	*Ardea cinerea*	Grey heron	120	16	28	9	26	24	44	16	—	—	—	6	12	—	—	—	—
11.	*Larus argentatus*	Herring gull	1200	—	—	—	18	12	77	4	—	—	—	68	170	—	—	—	—
12.	*Larus ridibundus*	Black headed gull	600	38	77	—	188	98	320	220	—	4	—	110	182	—	—	—	—
13.	*Larus genei*	Slender billed gull	400	1830	250	200	—	—	—	—	—	—	—	—	—	—	—	—	—
14.	*Sterna hirundo*	Common tern	500	—	—	—	—	—	—	12	—	—	—	—	—	—	—	—	—
15.	*Himantopus himantopus*	Black-winged stilt	—	30	154	—	120	160	270	—	24	—	124	—	—	—	—	12	24
16.	*Calidris alpina*	Dunlin	—	—	717	—	—	—	—	—	—	—	—	—	—	—	—	—	—
17.	*Phoenicopterus roseus*	Greater Flamingo	—	166	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
18.	*Phalacrocorax carbo*	Large cormorant	—	1581	7	—	220	—	—	70	—	—	—	—	—	—	—	—	—
19.	*Larus fuscus*	Lesser black backed gull	—	321	76	250	—	—	—	—	—	—	—	—	—	—	—	—	—
20.	*Egretta garzetta*	Little egret	—	50	—	3	112	80	86	42	10	—	—	—	—	100	40	2	4
21.	*Charadrius dubius*	Little ringed plover	—	42	24	—	—	14	—	2	—	—	—	—	—	—	—	—	—
22.	*Sterna albifrons*	Little tern	—	72	12	—	18	14	46	4	—	—	—	—	—	—	—	—	4
23.	*Pandion haliaetus*	Osprey	—	48	16	3	—	—	—	—	—	—	1	—	—	—	—	—	—
24.	*Haematopus ostralegus*	Oyster catcher	—	221	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
25.	*Milvus migrans*	Pariah Kite	—	330	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
26.	*Vanellus indicus*	Red wattled lapwing	—	7	—	—	110	46	220	10	—	—	—	—	—	34	240	2	12
27.	*Philomachus pugnax*	Ruff	—	26	9	—	—	—	—	—	—	—	—	—	—	—	60	—	—
28.	*Tringa glareola*	Wood sandpiper	—	—	19	—	—	—	—	—	—	—	—	—	—	—	—	—	—
29.	*Vanellus malabaricus*	Yellow wattled lapwing	—	—	1	—	—	—	—	—	—	—	—	—	—	—	—	—	—
30.	*Tadorna tadorna*	Common shelduck	—	—	53	—	—	—	—	—	—	—	—	—	160	—	—	—	—
31.	*Egretta intermedia*	Intermediate egret	—	—	124	—	32	55	22	4	—	4	—	—	—	80	50	—	—
32.	*Pelecanus onocrotalus*	Pelican	—	—	113	—	—	—	—	—	—	—	—	—	—	—	—	—	—

Contd.—

S. No.	SCIENTIFIC NAME	COMMON NAME	WETLANDS OF SINDH																
			Rehri Creek	Clifton Beach	Hawk-asbay	Cape Monze	Hub-Dam	Haleji	Keen-jhar	Hadero	Charwo	Phoose-na I &II	Thari, Matli	Jubho/ Kur	Nurr/ ri.	Lungh Lake	Drig Lake	Bhod-esar II	Naray-asar
33.	*Recurvirostra avosetta*	Avocet	—	—	1163	—	—	—	—	20	—	—	—	—	—	—	—	—	—
34.	*Phalacrocorax fuscicollis*	Indian shag	—	—	18	—	—	—	—	—	—	—	—	—	—	—	—	—	—
35.	*Sturnus vulgaris*	Common starling	—	—	16	—	—	—	—	—	—	—	—	—	—	—	—	—	—
36.	*Motacilla flava*	Yellow wagtail	—	—	5	—	—	—	—	—	—	—	—	—	—	—	—	—	—
37.	*Aythya ferina*	Common pochard	—	—	—	9	650	3500	2500	1100	62	2050	80	2440	417	200	300	—	—
38.	*Anas penelope*	Wigeon	—	—	—	1	310	2450	2650	900	—	621	160	1210	2500	500	300	—	—
39.	*Anas crecca*	Common teal	—	—	—	15	1650	5260	1200	1200	—	1620	2025	2200	6700	8000	6000	—	22
40.	*Tringa stagnatilis*	Marsh sandpiper	—	—	—	2	—	—	6	4	—	—	—	—	—	—	—	—	—
41.	*Numenius phaeopus*	Whimbrel	—	—	—	3	—	—	—	—	—	—	—	—	—	—	—	—	—
42.	*Thalassius sandvicensis*	Sandwich tern	—	—	—	1	—	—	—	—	—	—	—	—	—	—	—	—	—
43.	*Hydroprogne caspia*	Caspian tern	—	—	—	6	6	2	18	—	—	—	—	2	4	—	—	—	—
44.	*Circus aeruginosus*	Marsh harrier	—	—	—	4	6	—	4	7	1	1	—	—	—	—	—	—	—
45.	*Anas strepera*	Gadwall	—	—	—	—	116	2500	1100	5	—	251	1500	960	8392	1000	500	—	12
46.	*Anas platyrhynchos*	Mallard	—	—	—	—	806	350	—	—	—	—	—	—	—	20	10	—	—
47.	*Anas acuta*	Pintail	—	—	—	—	162	2800	1655	2050	—	3150	1260	730	9780	4000	3500	—	10
48.	*Anas clypeata*	Northern shoveller	—	—	—	—	995	4850	2600	560	—	480	400	1480	1250	15000	12000	—	16
49.	*Aythya fuligula*	Tufted Duck	—	—	—	—	460	850	12	1050	—	6	—	270	460	—	—	—	—
50.	*Fulica atra*	Common Coot	—	—	—	—	1680	—	—	—	—	—	—	—	—	—	—	—	—
51.	*Podiceps cristatus*	Great crested grebe	—	—	—	—	1	2	—	—	—	—	—	—	—	—	—	—	—
52.	*Podiceps nigricollis*	Black necked grebe	—	—	—	—	32	110	—	—	—	—	—	—	—	—	—	—	—
53.	*Phalacrocorax niger*	Little cormorant	—	—	—	—	370	250	172	190	52	25	—	—	—	—	—	—	6
54.	*Bulbulcus ibis*	Cattle egret	—	—	—	—	86	170	46	—	—	—	—	—	—	—	—	—	—
55.	*Vanellus leucura*	White tailed plover	—	—	—	—	44	21	44	—	—	—	—	—	—	19	50	—	—
56.	*Tringa nebularia*	Greenshank	—	—	—	—	22	6	4	1	—	—	—	—	—	—	—	—	2
57.	*Tringa ochropus*	Green sandpiper	—	—	—	—	96	66	110	20	—	4	—	—	—	—	—	2	4
58.	*Phalaropus lobatus*	Red necked phalarope	—	—	—	—	2	—	—	—	—	—	—	—	—	—	—	—	—
59.	*Gallinago gallinago*	Common snipe	—	—	—	—	4	26	32	6	—	—	—	—	—	—	—	—	—
60.	*Gelochelidon nilotica*	Gull billed tern	—	—	—	—	12	40	224	26	—	—	—	—	—	—	—	—	—
61.	*Haliaeetus leucorhyphus*	Pallas's fishing eagle	—	—	—	—	2	—	—	—	—	—	—	—	—	—	—	—	—
62.	*Aquila heliaca*	Imperial eagle	—	—	—	—	2	—	—	—	—	—	—	—	—	—	—	—	—
63.	*Aquila clanga*	Greater spotted eagle	—	—	—	—	4	4	6	—	1	1	—	—	—	—	—	—	—
64.	*Merpos persicus*	Blue cheeked bee eater	—	—	—	—	6	—	—	—	—	—	—	—	—	—	—	—	—
65.	*Ardeola grayii*	Indian pond heron	—	—	—	—	110	190	—	—	—	—	—	—	—	—	—	4	32
66.	*Plegadis falcinellus*	Glossy ibis	—	—	—	—	12	—	—	—	—	—	—	—	—	—	—	—	—
67.	*Nettapus coromandelianus*	Indian cotton teal	—	—	—	—	215	—	—	—	—	—	—	—	—	—	—	—	—

Contd.—

S. No.	SCIENTIFIC NAME	COMMON NAME	WETLANDS OF SINDH																
			Rehri Creek	Clifton Beach	Hawk-asbay	Cape Monze	Hub-Dam	Haleji	Keen-jhar	Hadero	Charwo	Phoos-na I &II	Thari, Matli	Jubho/ Kur	Nur/ ri.	Lungh Lake	Drig Lake	Bhod-esar II	Naray-asar
68.	*Anas querquedula*	Garganey	—	—	—	—	—	55	—	—	—	—	—	—	—	—	—	—	—
69.	*Aythya nyroca*	White eyed pochard	—	—	—	—	—	30	—	—	—	—	—	—	—	—	500	—	—
70.	*Amaurornis phoenicurus*	waterhen	—	—	—	—	—	24	—	—	—	—	—	—	—	—	—	—	—
71.	*Porphyrio porphyrio*	Purple moorhen	—	—	—	—	—	112	—	—	—	—	—	—	—	85	45	—	—
72.	*Larus ichthyaeetus*	Great black headed gull	—	—	—	—	—	4	68	—	—	—	—	—	—	—	—	—	—
73.	*Chlidonias hybrida*	Whiskered tern	—	—	—	—	—	146	410	34	—	16	—	—	—	—	—	—	—
74.	*Haliastur indus*	Brahminy kite	—	—	—	—	—	6	2	—	—	—	—	—	—	—	—	—	—
75.	*Milvus migrans*	Black kite	—	—	—	—	—	42	—	—	—	—	—	—	—	—	—	—	—
76.	*Ceryle rudis*	Pied kingfishar	—	—	—	—	—	14	12	—	—	—	—	—	—	—	—	—	—
77.	*Centropus sinensis*	Crow pheasant	—	—	—	—	—	10	—	—	—	—	—	—	—	—	—	—	—
78.	*Gallinula chloropus*	Indian moorhen	—	—	—	—	—	120	—	—	—	—	—	—	—	—	—	—	—
79.	*Nycticorax nycticorax*	Black c. night heron	—	—	—	—	—	56	—	—	—	—	—	—	—	—	—	—	—
80.	*Egretta alba*	Great egret	—	—	—	—	—	120	—	—	—	—	—	—	—	—	—	—	—
81.	*Ardea purpurea*	Purple heron	—	—	—	—	—	4	—	—	—	—	—	—	—	—	—	—	—
82.	*Calidris temminckil*	Termmincks stint	—	—	—	—	—	40	—	—	—	—	—	—	—	—	—	—	—
83.	*Circus macrourus*	Pallied harrier	—	—	—	—	—	1	—	—	—	—	—	—	—	—	—	—	—
84.	*Buteo rufinus*	Long legged buzzard	—	—	—	—	—	1	—	—	—	—	—	—	—	—	—	—	—
85.	*Tachybaptus ruficollis*	Dabehick	—	—	—	—	—	—	2	—	—	—	—	—	—	—	—	2	16
86.	*Alcedo atthis*	Common kingfisher	—	—	—	—	—	—	—	—	—	1	—	—	—	—	—	—	—
87.	*Platalea leucorodia*	Spoonbill	—	—	—	—	—	—	—	—	—	—	—	75	95	—	300	—	—
88.	*Ciconia ciconia*	White stork	—	—	—	—	—	—	—	—	—	—	—	—	2	—	—	—	—
89.	*Turdoides caudatus*	Common babbler	—	—	—	—	—	—	—	—	—	—	—	—	—	115	280	—	—
90.	*Turdoides striatus*	Jungle babbler	—	—	—	—	—	—	—	—	—	—	—	—	—	80	318	—	—
91.	*Acrocephalus dumetorum*	Blythis reed warbler	—	—	—	—	—	—	—	—	—	—	—	—	—	35	32	—	—
92.	*Pycnonotus leucotis*	White cheeked bulbul	—	—	—	—	—	—	—	—	—	—	—	—	—	70	180	—	—
93.	*Coracias bengbalensis*	Indian roller	—	—	—	—	—	—	—	—	—	—	—	—	—	16	143	—	—
94.	*Upupa epops*	Hoopoe	—	—	—	—	—	—	—	—	—	—	—	—	—	2	9	—	—
95.	*Passer domesticus*	House sparrow	—	—	—	—	—	—	—	—	—	—	—	—	—	180	350	—	—
96.	*Prinia burnes*	Long tailed prinia	—	—	—	—	—	—	—	—	—	—	—	—	—	7	4	—	—
97.	*Acridotheres tristis*	Common myna	—	—	—	—	—	—	—	—	—	—	—	—	—	45	285	—	—
98.	*Acridotheres ginginianus*	Bank myna	—	—	—	—	—	—	—	—	—	—	—	—	—	85	170	—	—
99.	*Limosa limosa*	Godwit	—	—	—	—	—	—	—	—	—	—	—	—	—	—	80	—	—
100.	*Grus grus*	Common crane	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	12	—

Contd.—

S. No.	SCIENTIFIC NAME	COMMON NAME	WETLANDS OF SINDH																
			Rehri Cree	Clifton Beach	Hawk-asbay	Cape Monze	Hub-Dam	Haleji	Keen-jhar	Hadero	Charwo	Phoos--na I &II	Thari, Matli	Jublo/ Kur	Nurri-ri	Lungh Lake	Drig Lake	Bhod dessar II	Naray-area
101.	*Motacilla alba*	White wagtail	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	4	—
102.	*Streptopelia decaocto*	Indian collared dove	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	32	44
103.	*Streptopelia senegalensis*	Little brown dove	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	20	11
104.	*Pterocles exustus*	Chestnut bellied Sandgrouse	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	44	66
105.	*Hirundo concolor*	Dusky crag martin	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	6
106.	*Neophron percnopterus*	Egyptian vulture	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	1
107.	*Pavo criatatus*	Indian blue peafowl	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	12
		Total :	3965	5288	4834	567	8635	24812	14868	7904	158	8234	5550	9549	31181	29673	25861	153	306

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A NOTE ON THE FRESHWATER FISHES OF THE RIVER PORALI BALOCHISTAN

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ABSTRACT.—22 species of freshwater fishes belonging to 19 genera, 11 families and 8 orders of teleastean fishes are recorded from the river Porali (Balochistan).

KEY WORDS : Fresh water fishes, Balochistan, River Porali, Pakistan.

INTODUCTION

The fish fauna of the river Porali was studied by Zugmayer (1913). He recorded 18 species belonging to 16 genera and 8 families. Some species were added by Nazneen *et al.* (1989). Some specimens of fishes were collected by the 2nd and 3rd authors from Lasbella. Among these, there, is a specimen of *Acanthopagrus latus* recorded for the first time from Lasbela. All these species were recorded near Bela City.

SYSTEMATIC LIST

ORDER :CLUPEIFORMES
FAMILY : CLUPEIDAE

1. *Guduisa chapra* (Hamilton)
2. *Tenualosa ilisha* (Hamilton)

ORDER : OSTEOGLOSSIFORMES
FAMILY : NOTOPTERIDAE

3. *Chitala chitala* (Hamilton)

ORDER : CYPRINIFORMES
FAMILY : CYPRINIDAE

4. *Aspidoparia morar* (Hamilton)
5. *Cyprinion watsoni* (Day)
6. *Danio devario* (Hamilton)
7. *Labeo dero* (Hamilton)
8. *Puntius conchonius* (Hamilton)
9. *P. punjabensis* (Day)
10. *P. sophore* (Hamilton)
11. *Salmophasia bacaila* (Hamilton)
12. *Tor macrolepis* (Heckel)

ORDER : SILURIFORMES
FAMILY : BAGRIDAE

13. *Mystus gulio* (Hamilton)

ORDER : CYPRINODONTIFORMES
FAMILY : CYPRINODONTIDAE

14. *Aphanius dispar* (Ruppell)

FAMILY : POECILIIDAE

15. *Poecilia reticulata* (Peters)

ORDER : CHANNIFORMES
FAMILY: CHANNIDAE

16. *Channa gachua* (Hamilton)

ORDER : MUGILIFORMES
FAMILY: MUGILIDAE

17. *Mugil cephalus* (Linnaeus)

ORDER : MASTACEMBELIFORMES
FAMILY: MASTACEMBELIDAE

18. *Mastacembelus armatus* (Lacepede)

ORDER : PERCIFORMES
FAMILY : GOBIIDAE

19. *Boleophthalmus* boddarti (Hamilton)
20. *B. dussumieri* (Valenciennes)
21. Glossogobius giuris (Hamilton)

FAMILY : SPARIDAE

22. *Acnthopagrus latus* (Hottuyn)

The fish fauna of river Porali contains several species which are not normaly found in the freshwaters, such as : *Mugil cephalus, Boleophthalmus boddarti, Boleophthalmus dussumieri* and *Acanthopagrus latus.* Such species were already recorded by Zugmayer (1913) about 190 km. upstream from sea in this river quite above the influence of tidal waves.

This list is only a preliminary list and there are many gaps. One of the species is *Crossocheilus diplocheilus* (Heckel), which is widely distributed in Balochistan and extends along the coast in the coastal rivers (Hingol and Dasht) into the east part of Iranian Balochistan and Sistan. It is certainly due to incomplete collection. Another

important gap is the family Nemacheilidae. So it is clear that a thorugh survey of this river will yield many more species. There are at least eight species of commercial importance. Among these the mahseer *Tor macrolepis* is most important food and game fish.

Even *Cyprinion watsoni* population of the river Porali was assigned to a distinct subspecies by Zugmayer. It grows to more than 9 inches in length and hence can be consumed as food. Other species include the "Palla", the "Grey Mullet" and the Bhanggan" etc which are consumed by man.

Other species of commercial importance are the "Samundari Khagga" *(Mystus gulio)* "Cheetal Pari" (*Chitala chitala)* and "Mar Mahi" (*Mastacembelus armatus)* which grow to a large size and are suitable for human consumption. Various species of *Puntius, Aphanius dispar* and *Poecilia reticulata* are ornamental fishes.

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A CHECKLIST OF THE FISHES OF THE PUNJAB, PAKISTAN

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ABSTRACT:—A checklist of the fishes recorded from the Punjab has been prepared and includes indigenous and exotic fish species. The current checklist consists of 118 species, belonging to 65 genera, 21 families and 9 orders. All species listed belong to the class Teleostomi, subclass Actinopterygii and infraclass Telestel.

KEY WORDS : Checklist, fishes Punjab.

INTRODUCTION

The continuous flow of new information on relationship and distribution of freshwater fishes of Pakistan and Azad Kashmir renders old checklist instantly obsolete in at least some respect and the need for revision and addition inevitably increases through time. Because this checklist is widely used as an official or quasi-official reference on the systematics and distribution of freshwater fishes within its area, we feel a special responsibility to avoid introducing sweeping changes in taxonomic concepts that would drastically affect the form and content of the list unless such proposed changes have been adequately debated and widely accepted on the basis of published evidence. This criteria is not based on inertia or innate conservatism, but on what we believe to be sound historical perspective. We are fully aware that many aspects of the present system of fish classification are based on tradition, but this does not necesarly make the traditional arrangement worng.

Due to some difficulties, it is not possible to revise the checklist previously published by us (Mirza, 1990; Mirza and Alam, 1994), so we are presenting a checklist of the fishes of The Punjab Province of Pakistan. This fauna of the Punjab is mostly uniform due to the construction of various link-canals. However, the snow-carps (Schizothoracinae) and the golden mahaseer *Tor macrolapis* are restricled to the upper parts of the rivers of the Punjab.

We are using the name *Tor macrolepis* instead of *Tor putitora.* As pointed out by Rainboth (1991), *Tor putitora* is restricted to the river Brahmaputra. So for the golden mahaseer of the Indus river system *Tor macrolepis* is the correct scientific name.

COHORT: CLUPEOCEPHALA
SUPERORDER: CLUPEOMORPHA
ORDER : CLUPEIFORMES
FAMILY: CLUPEIDAE

1. *Gudusia chapra* (Homilton)

COHORT ARCHAEOPHYLACES
SUPERORDER OSTEOGLOSSOMORPHA
ORDER : OSTEOGLOSSIFORMES
FAMILY : NOTOPTERIDAE

2. *Chitala chitala* (Hamilton) Cheetal pari

3.	*Notopterus notopterus* (Pallas)	But Pari
COHORT :	EUTELEOSTEI	
SUPERORDER :	OSTARIOPHYSI	
ORDER :	CYPRINIFORMES	
FAMILY :	CYPRINIDAE	
SUB-FAMILY :	ASPIDOPARINAE	
4.	*Aspidoparia morar* (Hamilton)	Gachal
SUB-FAMILY :	**CULTRINAE**	
5.	*Chela cachius* (Hamilton)	Bidda
6.	*Chela laubuca* (Hamilton)	Bidda
7.	*Salmophasia bacaila* (Hamilton)	Chal
8.	*Salmophasia punjabensis* (Day)	Punjabi Chal
9.	*Securicula gora* (Hamilton)	Big Chal
SUB-FAMILY :	**RASBORINAE**	
10.	*Amblypharyngodon mola* (Hamilton)	Mola Chilwa
11.	*Barilius bendelisis* (Hamilton)	Paths Chilwa
12.	*Barilius modestus* (Day)	Lahori Chilwa
13.	*Barilius naseeri* Mirza, Rafique & Awan	Naseeri Chilwa
14.	*Barilius pakistanicus* Mirza & Sadiq	Pakistani Chilwa
15.	*Barilius vagra* (Hamilton)	Lahori Chilwa
16.	*Brachydanio rerio* (Hamilton)	Zebra fish
17.	*Danio devario* (Hamilton)	Patha mackni
18.	*Esomus danricus* (Hamilton)	Soomara
19.	*Rasbora daniconius* (Hamilton)	Chari
20.	*Rasbura rasbora* (Hamilton)	
SUB-FAMILY:	**BARBINAE**	
21.	*Cirrhinus mrigala* (Hamilton)	Mrigal, Mori
22.	*Cirrhinus reba* (Hamilton)	Reba, Sunni
23.	*Cyprinion watsoni* (Day)	Sabzug
24.	*Gibelion catla* (Hamilton)	Catla, Theila
25.	*Labeo bata* (Hamilton)	Bata
26.	*Labeo boga* (Hamilton)	Bhangan
27.	*Labeo boggut* (Sykes)	Bhangana
28.	*Labeo caeruleus* (Day)	Blue rohu
29.	*Labeo calbasu* (Hamilton)	Kalbans
30.	*Labeo diplostomus* (Heckel)	Chhali
31.	*Labeo dyocheilus pakistanicus* Mirza and Awan	Pakistani Torki
32.	*Labeo gonius* (Hamilton)	Sereeha
33.	*Labeo microphthalmus* (Day)	Makrani rohu
34.	*Labeo nigripinnis* (Day)	Dambro
35.	*Labeo pangusia* (Hamilton)	Looni
36.	*Labeo rohita* (Hamilton)	Rohu, Dambra
37.	*Osteobrama cotio* (Hamilton)	Palero
38.	*Puntius chola* (Hamilton)	Chola popra
39.	*Puntius conchonius* (Hamilton)	Rosy barb
40.	*Puntius punjabensis* (Day)	Punjabi popra
41.	*Puntius sophore* (Hamilton)	Sophora popra
42.	*Puntius terio* (Hamilton)	Terio popra

	43.	*Puntius ticto* (Hamilton)	Ticto popra
	44.	*Puntius waagenii* (Day)	Waageni popra
	45.	*Systomus sarana* (Hamilton)	Kharni
	46.	*Tor macrolepis* (Heckel)	Golden mahseer
SUB-FAMILY:		**GARRINAE**	
	47.	*Crossocheilus diplocheilus* (Heckel)	Dogra
	48.	*Garra gotyla* (Gray)	Patherchatta
SUB-FAMILY:		**SCHIZOTHORACINAE**	
	49.	*Racoma labiata* McClelland	Soondal, Chan
	50.	*Schizopyge curvifrons* (Heckel)	Aina-barochhumo
	51.	*Schizopyge esocinus* (Heckel)	Ranth
	52.	*Schizothorax plagiostomus* (Heckel)	Mullah, Swati, Keermi, Galguli
SUB-FAMILY :		**CYPRININAE**	
	53.	*Carassius auratus* (Linnaeus)	Gold fish
	54.	*Cyprinus carpio* (Linnaeus)	Common carp
SUB-FAMILY :		**LEUCISCINAE**	
		Ctenopharyngodon idella (Valenciennes)	Grass carp
SUB-FAMILY :		**HYPOPHTAMICHTHYNAE**	
	55.	*Araistichthys nobilis* (Richardson)	Bighead carp
	56.	*Hypopthalmichthys molitrix* (Valenciennes)	Silver carp
FAMILY :		**COBITIDAE**	
SUB-FAMILY :		**BOTIINAE**	
	57.	*Botia birdi* (Chaudhuri)	Botia
SUB-FAMILY :		**COBITINAE**	
	58.	*Lepidocephalus guntea* (Hamilton)	Kandatori
FAMILY :		**NEMACHILIDAE**	
	59.	*Nemacheilus corica* (Hamilton)	Sundali
	60.	*Acanthocobitis botia* (Hamilton)	Sundali
	61.	*Schistura alepidota* (Mirza & Banarescu)	Sundali
	62.	*Schistura horai* (Menon)	Sundali
	63.	*Schistura kessleri* (Gunther)	Sundali
	64.	*Schistura prashari* (Hora)	Sundali
	65.	*Schistura punjabensis* (Hora)	Sundali
	66.	*Schistura shadiwalensis* Mirza & Nalbant	Sundali
	67.	*Schistura zonata* Meclelland	
	68.	*Triplophysa gracilis* (Day)	Singhat
ORDER :		**SILURIFORMES :**	
FAMILY		**BAGRIDAE**	
	69.	*Batasio pakistanicus* Mirza & Jan	Batasilo
	70.	*Mystus bleekeri* (Day)	Tingara
	71.	*Mystus cavasius* (Hamilton)	Tingara
	72.	*Mystus horai* Jayaram	Tingara
	73.	*Mystus vittatus* (Bloch)	Tingara
	74.	*Rita rita* (Hamilton)	Khagga
	75.	*Speratra sarwari* Mirza, Nwazd & Javed	Singhara, Singhari
FAMILY :		**SISORIDAE**	

	76.	*Bagarius bagarius* (Hamilton)	Gonch, Funji Khagga
	77.	*Gagata cenis* (Hamilton)	Sanglai
	78.	*Gagata pakistanica* Mirza, Perveen & Javed	Sanglai
	79.	*Glyptothorax cavia* (Hamilton)	Sulemani
	80.	*Glyptothorax naziri* Mirza & Naik	Sulemani
	81.	*Glyptothorax pectinsptesus* (Mcclelland)	Sulemani
	82.	*Glyptothorax punjabensis* Mirza & Kashmiri	Sulemani
	83.	*Glyptothorax stocki* Mirza & Nijssen	Sulemani'
	84.	*Glyptothorax sufii* Bashir & Mirza	Sulemani
	85.	*Nangra nangra* (Hamilton)	Nangra
	86.	*Nangra robusta* Mirza & Awan	Nangra
	87.	*Sistor rabdophorus* (Hamilton)	Kirla
FAMILY :		**SLURIDAE**	
	88.	*Ompok bimaculatus* (Bloch)	Pafta
	89.	*Ompok pabda* (Hamilton)	Pafta
	90.	*Wallago attu* (Bloch & Schneider)	Mullee
FAMILY :		**HETEROPNEUSTIDAE**	
	91.	*Heteropneustes fossilis* (Bloch)	Singhi
FAMILY :		**AMBLY CIPITIDAE**	
	92.	*Amblyceps mangois* (Hamiltaon)	Billi
FAMILY :		**SCHILBEIDAE**	
	93.	*Ailia coila* (Hamilton)	Patasi
	94.	*Ailia punctata* (Day)	Potlas
	95.	*Clupisoma garua* (Hamilton)	Bachwa
	96.	*Clupisoma naziri* Mirza & Awan	Bachwa
	97.	*Eutropiichthys vacha* (Hamilton)	Jhalli
	98.	*Pseudeutropeus atherinoides* (Bloch)	Chali
SUPERORDER		**ACANTHOPTER YGII**	
ORDER		**BELONIFORMES**	
FAMILY :		**BELONIDAE**	
	99.	*Xenentodon cancila* (Hamilton)	Sardaryab, Kan
ORDER		**CHANNIFORMES**	
FAMILY		**CHANNIDAE**	
	100.	*Channa gachua* (Hamilton)	Saol
	101.	*Channa marulia* (Hamilton)	Daula
	102.	*Channa punctata* (Bloch)	Daula
	103.	*Channa striata* (Bloch)	Saoli
ORDER		**PERCIFORMES**	
FAMILY :		**CHANNIDAE**	
	104.	*Chanda nama* (Hamilton)	Sheesha
	105.	*Parambassis baculis* (Hamilton)	Sheesha
	106.	*Parambassis ranga* (Hamiiton)	Sheesha
FAMILY :		**NANDIDAE**	
	107.	*Nandus nandus* (Hamilton)	Patta, Leaf Fish
FAMILY :		**MUGILIDAE**	

	108.	*Sicamugil cascasia* (Hamilton)	Gachkingura
FAMILY :		**GOBIDAE**	
	109.	*Glossogobius giuris* (Hamilton)	Guloo
FAMILY :		**BELONTIIDAE**	
	110.	*Colisa fasciata* (Bloch & Schneider)	Bari-Kangi
	111.	*Colisa lalia* (Hamilton)	Chhoti-Kangi
FAMILY :		**CICHLIDAE**	
	112.	*Oreochromis aureus* (Steindachner)	Tilapia
	113.	*Orecochromis mossambicus* (Peters)	Tilapia
	114.	*Oreochromis niloticus* (Linnaeus)	Tilapia
ORDER		**SYNBRANCHIFORMES**	
FAMILY :		**SYNBRANCHIDAE**	
	115.	*Monopterus cuchia* (Hamilton)	Koochia
FAMILY :		**MASTACEMBELIDAE**	
	116.	*Macrognathus aral* (Bloch)	Gud
	117.	*Macrognathus pancalus* (Hamilton)	Groj
	118.	*Mastacembelus armatus* (Lacepede)	Bam, Marmahi

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TOXICITY AND TERATOMORPHIC EFFECTS OF MATCH (IGR) ON THIRD INSTAR LARVAE OF CITRUS BUTTERFLY *PAPILIO DEMOLEUS* LINN

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ABSTRACT.—Different concentration of Match (IGR) *viz*, 0.0625%, 0.125%, 0.25%, 0.5 and 1% were applied against 3rd instar larve of citrus butterfly, *Papilio demoleus*, L. Mortality count was made at 24 hours post treatment and data analyzed statistically. The LD_{50} value was calculated upon probit analysis and was found to be 0.52%. Morphological abnormalities produced by the compound in larvae pupae and adults were also observed. It was found, that at the dose of 0.0625%, larvae pupal intermediate was observed and at 0.25% pupa was found entirely hollow inside and at 1% butterfly completely failed to emerge out.

KEY WORDS : Toxicity, Teratomorphic effects, *Papilio sp.*, MATCH (IGR)

INTRODUCTION

Papilio demoleus L., lermon butterfly is a serious pest of citrus plants. It is recorded in Pakistan, Iran, Saudi Arabia, India, China, Japan and Africa (FAO 1970, 1972, Badawi 1981, Talbot 1939, Mushtaque 1974, and Atwal 1976). The larvae of this pest are vagarious foliage feeders. In case of sever infestation, citrus plants seriously affected and the young seeding get completely defoliated (Atwal 1976). In view of environmental protection and safety IGR's belong to a good candidate group.

Lot of work has been done (IGR) in respect of their effects on various life stages of insects. These included the works of Hsich & Steelman (1974), Mulla *et al* (1974) Schaefer *et al* (1974) Dame *et al* (1975) Mulla & Darwazeh (1975) Busuine *et al* (1976), Naqvi *et al* (1976) Bhakshi *et al,* (1982). Naqvi (1986) Temuri (1987). The present work bases on the toxic effect and insect growth regulating effect of the given IGR against citrus butterfly larvae.

MATERIALS AND METHODS

The under test compound MATCH 25 E.C. (IGR) was applied with the help of micro applicator to third instar larvae of *P. demoleus* L. The concentration of the chemical were 0.0625%, 0.125%, 025%, 0.5% and 1%, while the applied doses volume were kept constant. A control batch was kept for the determination of environmental effects. The treated larvae were kept in 6 inches high glass chimneys with one end of chimney capped with musline cloth. Observations were made upto 24, 48, 72 hours of post treatment. The unconscious and immovable larvae were considered as dead. Each experiment was repeated five times.

RESULTS AND DISCUSSION

Toxicity :

Third instar larvae of *P. demoleus L.*, were treated with MATCH (IGR) by injection method. Average mortality was calculated at 0.0625%, 0.125%, 0.25%, 0.5% and at 1% concentration as 36%, 36%, 48% 52% and 60% respectively after 24 hours of treatment. Prolonged toxic effects were reduced, upto emergence (Table 1, 2, and 3).

TABLE 1, Toxicity of MATCH (IGR) third instar larvae of *P. demoleus L.*, after 24 hours of treatment.

S. No.	Doses %	Mean mortality (%)	Standard deviation
1.	0.0625	36	8.366
2.	0.125	36	8.366
3.	0.25	48	5.477
4.	0.5	52	5.477
5.	1	60	7.07

$$Y=p^1(p)=0-0.3430 + 0.6494xi$$

The adequacy of model determined by comparing the value if deviance 2.3136 with 3 d.f. at p-value = 0.509405. The fitted model is significantly adequate describe the mortality behavior of larvae with MATCH concentration. The $L.D_{50}$ obtained from fitted probit regression is 0.5281788(%).

Teratomorphic effects of MATCH (IGR) was studied on 3rd instar larvae, pupa and emergence, after treatment. The is given in Table 2.

TABLE 2. Percent pupation and emergency after the treatment with MATCH (IGR) in various doses.

S. No.	Doses %	Number of larvae treated	Mortality at pupation stage (%)	Mortality at emergence stage (%)
1.	0.0625	10	37.5	25
2.	0.125	10	53.12	33
3.	0.25	10	42.3	33
4.	0.5	10	58.3	50
5.	1	10	50.0	50

The data of table 2 analyzed by fitting the two separate probit regression model to describe the pattern of mortality at pupation and emergence stage respectively. The fitted probit regression line, the LD_{50} given in the following table.

TABLE 2 (a)

Stages	Probit model	LD50
Pupation	y=-0.1318 + 0.2262 Xi	0.58267
Emergence	y=-0.5664 + 0.6694 Xi	0.846131

Teratomorphic effects :

As shown in table 3 the larvae were treated with different concentration of MATCH. In all the concentration, the maximum abnormality was found at 1% however, some difference in the mode of abnormality was noted. At lower dose concentration *i.e.* 0.0625%, larval pupal intermediate was found. Treatment with 0.25% dose concentration larval body shrinked. At 0.5% concentration the 3rd instar larvae entered the 4th instar stage but the body becomes shrinked and the instar duration was prolonged some larva die before entering 5th instar stage. In fifth instar, they showed reduction in size when treated with 0.125% concentration of MATCH. The remaining alive larvae, changed their color. A 0.25% concentration pupal body showed abnormality, becoming hollow inside. After the treatment, with 1% concentration some larvae died in 5th instar with reduced body, while some changed into pupa but soon died, where as some hatched into abnormal adult with short and wrinkled wings or it fails to fully emerge out. It was also observed that percent emergence is also effective when treated with different concentration of MATCH (IGR) and is very less than usual. The life period *P. demoleus* L., is also affected after treatment with MATCH (IGR) and is prolonged (2-3 days) and the duration of instar was also prolonged (2-3 days) more than normal duration.

TABLE 3. Teratomorphic effect of MATCH (IGR) on different instars and in pupa of *P. demoleus* L., with different doses of the compound.

Doses	Teratomorphic effects
0,0625%	Larval body enlarged and elongated larval pupal intermediate was obtained. Most of the larvae remained less active after the treatment.
0.125%	Abnormal 5th instar with reduced body.
0.25%	Larval body shrinked in 3rd instar stage, Pupa were found hollow inside.
0.5%	Larval body shrinked in 3rd instar stage as in 0.25% concentration. Highly melanized abnormal pupa with body colour brownish black.
0.1%	Larvae died in 5th instar, remaining larvae turned into pupae and soon died. In some pupae, skin become soft and brownish black in colour, adult unable to fully emerge out and died attached with the puparim.

Krishnan and Chockaligam (1989) described the effect of chitin synthesis inhibitor diflubenzuron incorporated with food inhibited the deposition of chitin in the cuticle. Our present studies show that when *P. demoleus* larvae treated with MATCH (another IGR) it failed to emerge out completely, which shows that MATCH inhibited the development of *P. demoleus* larvae. Both results show the same activity of two different IGR's the minor difference is due to nature of compound or the difference in insects species. In the present studied LD_{50} of MATCH against citrus butterfly larvae was found to be 0.528% FL larva and at different doses larval pupal intermediate and hollow pupae and retarded adult emergence has been observed.

Kasana *et al;* (1995) determined the toxic effect of Margoson-O when applied on citrus leaves against the citrus butterfly *P. demoleus* larvae and found that it gives the good control. In present work the effect of Match were tested against the *P. demoleus* larvae and in our study MATCH toxicity result confirms the Kasana *et.al;* (1995), findings.

Munir *et.al,* (1997) tested the toxicity of BF (Bakayan fruit extract) on *P. demoleus* larvae. After 72 hours of treatment 32% normality was calculated at the dose concentration of 20%. In present studies toxicity of MATCH (IGR) against *P. demoleus* larvae after 24 hours is calculated as 80% at the dose concentration of 1%. The difference in both the results show that MATCH is more effective.

On the basis of the result obtained from present work MATCH (IGR) LD_{50} was found to be 0.528 uL. Larva against 3rd instar larvae of *P. demoleus L.* MATCH produced 36% mortality at 0.0625% concentration and 0.125% concentration, 40% mortality at 0.25% concentration, 52% mortality at 0.5% concentration and 60% mortality at 1% concentration after 24 hours of treatment. Third generation pesticides *i.e.* IGR's are quite safe and effective in controlling different important plant. These pesticides are now in great use because of less residual effects and proved much safer from the pollution point of view with less mammalian toxicity. They can easily be used by farmers in field with out any harmful effects. Their efficacy may be increased by using several stabilizing agents and synergistic after treatment with MATCH (IGR) morphological abnormalities and percent of emergence were also noted. In the above mentioned concentrations the percent of emergence was reported to be 3%, 2%, 1% and 1% respectively.

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FISH FAUNA OF SWAT AND BUNAIR VALLEYS, N.W.F.P.

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ABSTRACT —The river Swat originates from Swat Kohistan and drains almost whole of the Swat valley. Its water is clear, shallow and torrential and supports fish fauna of High Asian and South Asian forms. The last report about fish fauna of Swat was presented by Mirza (1973). Since then many changes in distribution and species composition were anticipated. In present studies, twenty species of fresh water fishes are reported including two exotic species and seven new records.

KEY WORDS : Fish fauna, Systematics, Swat.

INTRODUCTION :

The river Swat originates from Swat Kohistan and drains almost whole of the Swat valley along with many other streams joining the main branch. In its way, it receives the Punjkora River before joining the river Kabul in Mardan district. At its backwaters, the area possesses high altitude with ample vegetation cover receiving heavy snow. Consequently water is very cool, clear, shallow and torrential. This characteristic has imparted the river with a peculiar combination of fish fauna having High-Asian forms in the upper reaches and mainly South Asian component towards South.

A preliminary survey of Swat was conducted by Hussain and Shah (1960). They reported six species from this river viz., *Schizothorax curvifrons, S. esocinus, S. longipinnus, S. planifrons, S. progastus and S. nasus.* Subsequently, Ahmad & Mirza (1963), Ahmad (1969) and Mirza (1973) reported twelve other species from the area as *Schizothorax plagiostomus, S. labiatus, Glyptosternum reticulatum, Noemacheilus choprai, N. naseeri, N. alepidota, N. griffithi naziri, Barilius vagra, Puntius ticto, Crossocheilus latius, Channa gachua and Salmo trulta fario.* They however, did not report any of the six species recorded by Hussain and Shah (1968) from this river. In addition to this, there are few relevant reports on fishes of the neighboring areas by various ichthyologist like Ahmad (1965), Ahmad and Mirza (1963a), Ahmad and Mirza (1963b), Hussain (1965), Mirza (1968), Mirza (1975), Mirza and Hameed (1975).

The last report about the fish fauna of Swat in particular was presented by Mirza (1973), which also included the fishes of adjoining areas. Since then many ecological changes associated with the changes in faunal distribution and species composition were anticipated. Moreover scientific names of many species reported from Swat e.i. *Barilius vagra, Noemacheilus choprai, N. naseeri, N. griffithi naziri, Schizothoraichths labiatus, S. esocinus* have been changed since the publication of this report. Furthermore, some species viz., *Noemacheilus naseeri, N. alepidotus alepidotus, N. griffithi naziri, and N. stenurus choprai* were claimed endemic to Swat valley (Mirza, 1973). All these four species have now been recorded from various localities of Hazara division, Azad Kashmir and Northern areas. In addition to it, fish fauna of North-eastern part of Swat drained by the river Indus has never been explored and reported before.

Swat area, in its lower reaches, has been famous for the Mahaseer fisheries. This fish is excellently thriving in the area and is considered one of the major food and sport fish not only in this area but all over the world. This fish is a potential biological resource of the area and could be exploited for eco-tourism in future. The population of this fish is, however, declining in most parts of the country. The main reasons for its decline are the destruction of the breeding grounds due to pollution and other human activities and overexploitation. The snow carps are another resource that could also be utilized for enhancing the fish production in the area.

RESULTS AND SYSTEMATIC ACCOUNT :

All the fish fauna of Swat belong to class Teleostomi, Subclass Actinopterygii, Infraclass Teleostei and Chort Euteleostei. Apart from already reported fish fauna, seven new recods from Swat viz., *Schizopyge esocinus, Garra gotyla, Puntius spohore, P. chola, Tor putitora, Labeo dero* and *Mastacembelus armatus* and five from Bunair viz., *Schizothorax plagiostomus, Channa gachua, Crossocheilus latius, Schistura alepidota* and *Puntius sophore* have been reported during the present studies.

ORDER : SALMONIFORMES
FAMILY : SALMONIDAE

1. *Salmo trutta, fario*

This famous brown trout is an exotic fish and is artificially being propagated in upper parts of Swat valley.

2. *Oncorhynchus mykiss*

This rainbow trout is also exotic one and successfully breeding in hatcheries in the area.

ORDER : CYPRINIFORMES
FAMILY : CYPRINIDAE

3. *Barilius Pakistanicus*

This fish is widely distributed in lower parts of the river Swat up to Mingora, Ronyal and Fazagut.

4. *Labeo dero*

Various specimens of this fish were collected form a side stream of the river near fishing hut near Chakdara.

5. *Crossocheilus latius*

The fish is abundant in lower Swat area and in Bunair valley. Its was collected from Mingora, Fazagut and Manglore areas.

6. *Tor putitora*

This fish is also abundant in lower Swat and in Bunair valley. Its distribution has been recorded up to Mingora.

7. *Puntius ticto*

Various specimens of this fish were collected from Mingora.

8. *Puntius sophore*

Few specimens of this fish were collected from a side stream near Barikot.

9. *Puntius chola*

The fish was recorded from a side stream near fishing hut.

10. *Garra gotyla*

A lot of specimens of this fish were collected from the river near Mingora bridge.

11. *Racoma labiata*

This fish is not much common in the Swat valley. Only a few specimens were collected from Mingora.

12. *Schizothorax plagiostomus*

This snow trout is very common in the river Swat and Daggar nullah in Bunair valley.

13. *Schizopyge esocinus.*

It is a very rare fish. A single specimen was collected upstream the Mingora bridge.

FAMILY COBITIDAE

14. *Triplophysa choprai*

This is a very common fish in snow fed cold waters of upper parts of the river Swat and was not recorded bellow Bahrain.

15. *Schistura naziri*

This fish was considered endemic to Swat valley but now is recoreded from various other areas. Various specimens were collected from a small stream at Ronyal.

16. *Schistura naseeri*

This fish is quiet common in the river Swat, Hazara and Azad Kashmir.

17. *Schistura alepidota*

This hill stream loach is quiet common in the river Swat and adjoining area.

ORDER : SILURIFORMES
FAMILY : SISORIDAE

18. *Glyptosternum reticulatum*

The fish is found in upper parts of the river Swat and a few specimens were collected from Behrain.

ORDER : CHANNIFORMES
FAMILY : CHANNIDAE

19. *Channa gachua*

The fish is distributed in lower parts of the river Swat. Few specimens were collected from Barikot area.

ORDER : SYNBRANCHIFORMES
FAMILY : MASTACEMBELIDAE

20. *Mastacembelus armatus*

The fish is found in lower Swat areas. Few specimens were collected from Barikot area.

DISCUSSION:

Among the fish fauna of Swat, two species, Salmo trutta fario and Oncorhynchus mykiss are exotic. The indigenous fauna can be divided in to two categories, e.i. resident fish fauna and migrant fish fauna. The migrant fish fauna is present in lower parts of the river in Mardan and Peshawar districts and during summer season, travel upstream to variable distances. These species include *labeo dero, Tor putitora, Puntius ticto, Puntius sophore, Puntius chola, Garra gotyla, and Mastacembelus armatus.* The resident fish fauna includes, *Salmo trutta fario, Oncorhynchus mykiss, Barilius pakistanicus, Crossocheilus latius, Racoma labiata, Schizopyge esocinus, Schizothorasx plagiostomus, Triplophysa choprai, Schistura naziri, Schistura nasseri, Schistura alepidota and Glyptosternum reticulatum.* All the migrant fish fauna found in Swat is South Asian in origin and has been intruded upstream to variable extent depending upon the individual species and the season. Among resident fish fauna only two species, *Barilius pakistanicus and Crossocheihus latius* are South Asian in origin while rest are High Asian and are distributed in high altitude waters.

Although all the species found in Swat valley are an integral part of the aquatic ecosystem, yet eight species viz., *Salmo trutta fario, Oncorhynchus mykiss, Schizothoras plagiostomus, Schizpyge esocinus, Racoma labiata, Top putitora, Labeo dero,* and *Mastacemebelus armatus* are economically import as food fishes. Among these, the first two species are being commercially exploited while the other species have potential for future exploitation. The migrant fishes migrate upstream mostly during the monsoon and this niche remains empty for most of the time of the year. This niche can be occupied by introducing common carp, *Cyprius carpio,* in lower Swat area. This has a very wide rang of temperature tolerance and is suitable to occupy the intermediate zone between cold water upstream and comparatively warm water downstream.

Tor putitora, mahaseer is an important game fish and is very well adapted in lower reaches of this river. Its population can be enhanced by protecting its breeding grounds and establishing rearing ponds for its fries collected from wild. Among the snow trouts, *Schizothorax plagiostomus* (Swati) is very common in whole of this river and is under high fishing pressure throughout the valley. Its fingerlings and fries are very common in small streams. The fish can be commercialized by establishing its rearing ponds along the river Swat where fish can be fattened by providing semi controlled conditions in the form of food. The other two snow trouts, *Racoma, labiata and Schizopyge esocinus* are less common or rare in this reiver. The population of these species can be enhanced by rearing these species along with the *S. plagiostomus.*

The alpuri area in Swat is drained by various nullas which ultimately form a big stream that falls into the Indus at Besham. The water of this stream is also suitable for trout culture. Establishment of trout hatchery at Alpuri can be useful to utilize the potential of this water body and also manage the local snow trouts in this area.

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HOME RANGE AND GROWTH RATE OF FRINGE-TOED SAND LIZARD (*ACANTHODACTYLUS CANTORIS CANTORIS*) AT HAWKSBAY AREA, KARACHI.

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ABSTRACT :— Hawksbay area is an important breeding ground of Fringe-Toed sand lizard *(Acunthodoctylus Cantoris Cantoris)*. This work was intended to study the habitat, home range and growth of the species. The study was based on 48 visits. During the whole study period 240 specimens of *Acanthodactylus Cantoris Cuntoris* were captured to find its home range and growth rate. The recaptured specimens were also examined from time to time.

KEY WORDS : Reptiles, Lacertidae, Sindh, Pakistan, ecology & biology.

Introduction : This study of the family Lacertidae has not been done by any research worker previously. In July, 1998 I initiated the study of the common Indian Fringe-Toed sand lizard *(Acanthodactylus Cantoris Cantoris)* at hawksbay, Karachi, Sindh. This study was continued up to June 2000. The results of two years of the work are reported here as final result.

Material and Methods : The entire study was restricted to Hawkesbay area on N-W side along the sea-shore (a distance about two Kilometer). The study area was purely sandy with scattered xerophytic habitat in which grass and Acacia species were dominant.

All specimens were captured by myself and the staff of the Department who walked along the edge of plants and captured the individuals by hands. Each captured location was later checked, photographed and notes were made on local habitat, with temperature from the exact places where Indian Fringe-Toed sand lizard were first seen. The anal temperatures of the specimens were also taken by electronic thermometer in the field immediately after captured. Few specimens were taken for the study in the laboratory of the Zoological Survey Department, Karachi, Sample of the insects were also taken from the study area in each visit. Sex of each lizard was determined utilizing the presence of the male reproductive organ or not. This organ can only be readily seen when the specimens are captured.

Each specimen was also measured - both the total length and specially the snout to vent length. Measurements were taken by measuring tape. Each specimen was weighed by spring balance, to the nearest gram. A note was made whether the specimen was shedding its skin or not. The time of the day, each lizard caught, also noted. All lizards were permanently marked by a toe clipping method that would allow identification of individuals animals at some future time. This was important for information on both movements of individuals animals, and for future data on growth. Almost all lizards so handled were released in their home area within a maximum of half an hour after initial capture.

The study area was visited twice in a month, for a total 24 times in a year. The crew consisted of three persons who performed all the measurement etc, needed on the specimens captured in the field and also obtained considerable information regarding the seasonal abundance of insects on the sand dunes as well as under the bushes of the study area. These data help to find out comparisons of the type to obtain seasonal variations. Usual arrival time at the side was 8:00 A.M. and the work was generally finished by 6.00 P.M. (7 Hours).

Results and Discussion : The following tentative results are based on 48 visits or a total man hours efforts of 336 Hrs. 240 specimens were captured with 52 specimens recaptured recorded in two years (about 22%). These individuals were found on the side almost every time we visited the area, and their exact location and exact position was plotted and noted each time.

Time of Capture : Information from the site show that individuals wake as early as 7.00 A.M. However our records do show that the peak activity period during March-October at hawkesbay area is at 9-10 hrs. Though there is a slow and even build up in activity from the morning to this maximum period, there is a sharp drop between 11 hrs. to 16 hrs. that can correlated with the rapidly ambient temperatures close to the ground surface at this time of the day. Thus high noon and after noon temperatures result in significantly reduced activity.

There is some evidence in my data that there is also a slight peak in the late after noon (probably at about 1700 hrs.) for our records show the possibility of increased activity at that time-after the heat of the day has passed. The histogram (Fig. 1) provides the data currently available for activity period of the Hawkesbay individual.

Sex Ratio : My result shows that there is a balanced ratio of 1:1 for males and females. Out of 240 specimens there are 118 males and 122 females providing a calculate ratio of 1:1.03 or 1:1.

Overall Size Range : The parameter selected for determining size is the snout to vent length (SVL). The reason for using this measurement rather than snout to tail is that the tail tips are often missing in adults specially females. Thus the measurement SVL is much more accurate and can be obtained from every individual regardless of injuries or losses. The average size of all individuals at Hawkesbay is 65.5 mm (N-240), with males significantly larger than females (average male SVL 67.3 $\pm$ 3.3 mm. average female SVL 3.9 $\pm$ 3.3 mm). The frequency distribution curves for SVL for both the sexes are normal, suggesting no abnormal predation at any size in these class size of the two sexes at Hawkesbay. The study also shows that males obtained a greater SVL than adult females and the females will only breed with large male able to manipulate the females during courtship. Thus large size in male is apparently adaptive and important in breeding.

Weight : Overall range in total weight at Hawkesbay is 6.0-10.5 gms. The average weight is 7.4 gms (N=240). As expected, males are heavier than females (average male weight 7.4 $\pm$ 1.1 gm; average female weight 6.0 $\pm$ 0.9 gm). These weights are equivalent to what would be expected in animals of similar length in other habitats, so that the Hawkesbay population is normal in respect of length/weight ratios.

Density : The total distance included in the study at Hawkesbay is 2km. along the border of the sea shore, in which 240 individuals have been taken. As sufficient data are available in the study area so more sophisticated analysis method has been applied. It is concluded that there are 40 Indian Fringe-Toed Sand Lizards (adult) for every 0.125 km. Since adult Indian Fringe-Toed Sand Lizards studied in other areas have a normal activity range of about 35-40m. However the density at Hawkesbay is greater than most other areas studied probably because of high food density.

Growth : 54 (22%) adult in individuals were recaptured so far during the study at Hawkesbay. The growth is recorded at least after every month of first time captured. The growth of each recaptured individuals was found to be increased from 5-6 mm. (SVL) in its original length in one month or about 1/6mm or 0.16 mm per day which is the normal growth of a lizard provided the food resources is high. The growth variation in different seasons of the year has been calculated which is different due to utilization of fat during hibernation period. In the same way the weight of each recaptured individuals was found to be increased from 0.2-0.3 gm. per month i.e. in 30 days or about 0.01 gm per day. For adults the growth in length, compared to increase in weight ratio is about 0.06gm/mm. which is approximately what has been described in adults of other lizard species of similar body proportions.

My future study regarding the food and feeding habits of this species at the study site will add more valuable information regarding the reason of growth. The comparative nutritional and caloric values of different insects found in the gut contents of this species helped to get the best conclusion about the growth of this species in different period (dry and the wet seasons) of the year.

Annual Movement Patterns : Data from Hawkesbay clearly shows that Indian Fringe-Toed Sand Lizards may be moving about during almost every month of the year. However, it is clear that December and January show least movement of these lizards in the field than all the months sampled so far.

During December and January, some individuals were found in borrows; a few were seen moving about over the surface; some were seen basking in the sun next to their borrows. However during the trips of the middle of December through the end of month, and again from the middle of January through the first week in February very few lizards were seen or found at all. It is anticipated that activity begins to increase again during the last half of February and specially during the month of monsoon (July-August), when breeding, egg laying and abundant food all contribute to a high sighting ratio.

Fortnightly to Monthly Movement Patterns : These records are based on recaptures of marked animals. It has been observed that the most Indian Fringe-Toed Sand Lizards remain in more or less certain areas and not wandering over the entire area. Farther analysis of this preliminary information suggests that males move significantly farther than females. This may be related to their generally greater size or to their sex.

Average home range of females is significantly smaller than that of males (females average 12m; males 25m). This variation of averages of both groups suggests that males are more variable in the size of their home ranges than females. However, the present data shows that home range of the males is significantly larger than expected on the basis of the lizard size, and this is undoubtedly related to the tendency for adult males to wander

farther than females at all times of the year and under all conditions.

Considerably more work on comparative movements of males and females has been conducted on the information of body temperatures of the lizards. The comparison between body temperatures of both sexes establishes that males, in their greater wandering, are thus subjected to greater fluctuation in body temperatures and females, perhaps because of their contained eggs, tend to avoid as great temperature extremes.

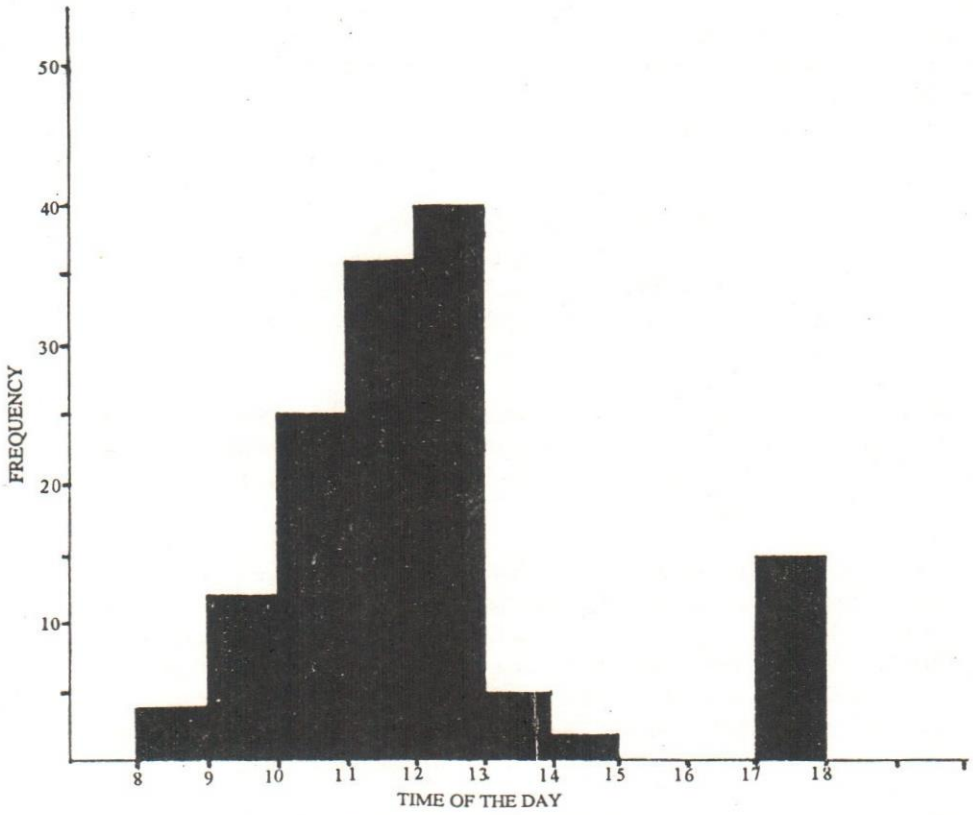

Fig. 1. Histogram showing activity period.

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WILDLIFE OF CHILTAN HAZARGANJI NATIONAL PARK, BALOCHISTAN

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ABSTRACT: The present study deals with the general investigation of vertebrate wildlife in the precipitous slopes, ravines, watershed drains and the gorges of Chiltan and Hazarganji mountains declared in 1980 as protected, the Chiltan-Hazarganji National Park came into existence primarily with the object for the protection of Chiltan Wild Goat, *Capra aegagrus chialtanensis* known as an indigenous species. The present preliminary investigation in the premises of the Chiltan Wild Goat, *Capra aegagrus chialtanensis*, formulates the general wildlife structure with 18 other mammals, including 74 species of birds, and 17 of the reptiles and 2 species of amphibians, recorded in distinctive seasons conducting thorough surveys round the year from 1997 to 1998 in variable environmental conditions. Wildlife fauna checklists are prepared with some or more featuring the ecological information individually on each species. The important diverse flora of the park has been discussed in detail and a checklist for the recorded species is added.

KEYWORDS: Balochistan, Pakistan, Chiltan Wild Goat, Hazarganji, National Park, Quetta.

INTRODUCTION:

In Pakistan, the area of an outstanding scenic excellence of natural beauty and landscape where fauna and flora are protected and preserved in natural state in access to recreation, education and scientific research is provided in the interest of people who do not conflict with the main objectives of the protected land is known as a national park. In such area, activities of hunting, clearing of vegetation and land for cultivation, mining or permitting to create any kind of pollution is restricted. Chiltan-Hazarganji National Park is one of the fourteen declared national parks in the country falls in the IUCN-Category V contributes a big share of land in the national parks of Pakistan which cover a total area of 2,753,375 hactares.

In the past only few studies, which exist the dynamics of rodents carried out by Vertebrate Pest Research Institute, University of Karachi. The status of the Chiltan Wild Goat, *Capra aegagrus Chialtanensis* population was initially assessed by Schaller and Mirza (1971) and later by Mirza (1975). Between 1979 to 1990, nearly annual surveys were carried out by the Wildlife Specialists, Pakistan Forest Institute (Forest Department Records). Thereafter followed a period when no surveys were conducted until the present investigation of Chiltan Markhor, *Capra aegagrus chialtanensis* initiated in 1997. Combined of vertebrate wildlife, only 33 species recorded (Ashiq, 1989) in so big varied topographical area of the park and a baseline study on vertebrate wildlife carried out by Shafique etal (1997) recorded more or less 90 vertebrate species, report submitted to WWF-Pakistan. The study of the flora, in the late eighties and early nineties of the past century, staff and students of the Pakistan Forest Institute carried out on the area's watershed properties (Forest Departmental Files), only some of which was completed, however. Vegetation comprises a great interest of which more than 225 species have been identified.

In view of the paucity of information and lack of published details about the wild life of Chiltan-Hazarganji National Park, it was considered imperative to investigate in detail about the vertebrate wildlife of the protected Chiltan-Hazarganji National Park.

Some 21 km. in the south-west of Quetta, Chiltan Hazarganji National Park is located at (29°–59′ to 30°–7′N, 66°–24′ to 66°–54′E) tehsils Quetta and Mastung of the districts Quetta and Kalat, Balochistan province, Pakistan. Hazarganji literally means "Of a Thousand Treasure". In the folds of this mountain, legend has it, that there are over a thousand buried treasures, reminder of the passage of great armies down the corridors of history.

Access to the park is either from the Quetta-Kalat/Karachi main RCD highway only a few kilometers from the Sariab junction or the western entry from the Quetta-Nank road and northern access to the park is via Karkhasa, at the southern limits of the Quetta city.

Quetta, the provincial headquarter of Balochistan is lying at the mouth of Bolan Pass, is encircled by great walls of the higher rocky mountainous ranges erected by many giants known as Takatu, Murdar, Zarghun and Chiltan. Naturally these imposing ranges-constitute and carve a fort like nest in which the city is developing at an altitude about 1692 meters. These emphatic surrounding mountains affect directly on all forms of life and environmental conditions of the region as winter is extremely cold and dry, while summers are hot and receive little precipitation. Often sudden change in the weather is amazing, as the climatic data indicate the monsoon comparatively does not influence very much on the region.

BOUNDARIES:

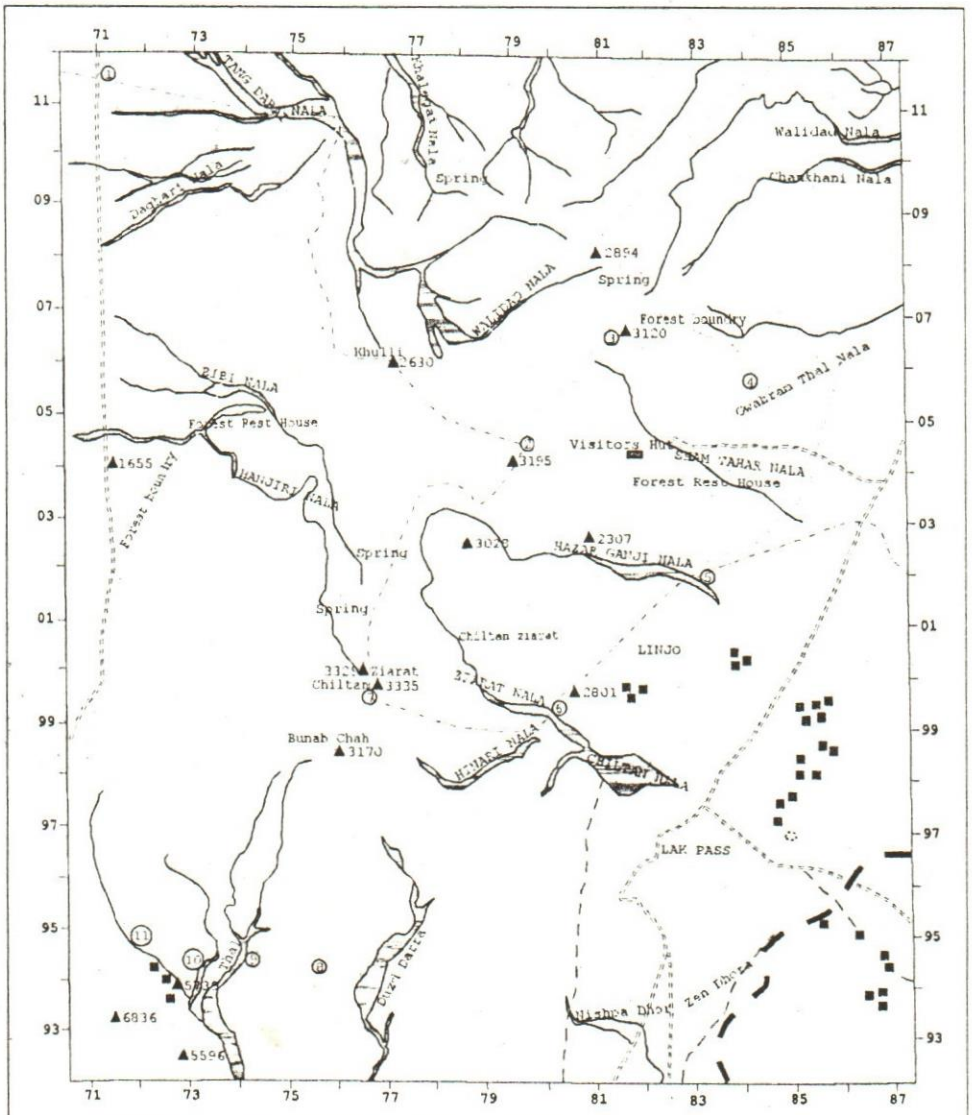
The boundaries of the park are shown in the map. The current boundaries of the Park on Survey of Pakistan Map Sheet Nos. 34 J/16 and 34 K/13 are as follows:

North: From a point grid reference (GR) 736092, then follows a ridge in an eastern direction and meets the southern boundary of Karkhasa State Forest at a point GR 859133. It then runs along the southern boundary of Chiltan reserve forest to a point GR 857122.

East: From a point GR 857122, the boundary runs along the foot of the mountain forming a boundary with the proposed site of the Agriculture College to a point GR 881080. It turns to a southern direction till it meets Chiltan plantation (Mian Gundi). From this point, the line runs straight and meets a point GR 861030.

South: The boundary starting from GR 861030 follows the district boundary of Quetta and Kalat districts up to point GR 798985. After crossing Ziarat Nala, it runs in a south westerly direction along the main Chiltan ridge to the mouth of Thal Nala GR 740943, from where it follows a foot path to a point GR 720948.

West: Starting from GR 720948 it proceeds to the north in a straight line crossing through GR718980, 720060, 710102 and ends at a point 736092

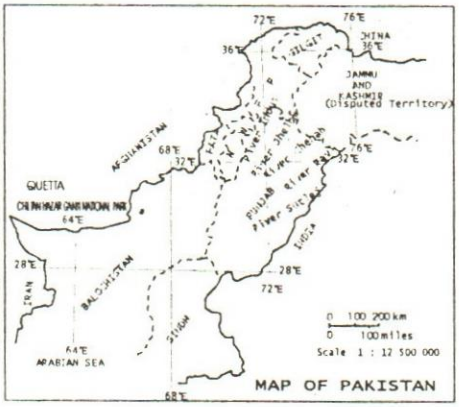


LEGEND

- Habitation .....
- Road .....
- Track .....
- Railway Line .....
- Nala.....
- Distt/Division Boundary .....
- Grid References Showing
- National Park Boundary ...
- Cultivation Boundary .....
- Triangulated/Spot Height .....
- Forest Boundary .....
- Spring .....

Scale 1: 25000

Map of Chiltan Hazar Ganji National Park



STUDY SITE:

The park is spread over an area of 15555 hectares with an altitude ranging from 1655 to 3335 meters. It is divided by Ziarat Nala into two main divisions, Chiltan and Hazarganji. In the southwest is Chiltan which is situated in district Kalat participating an area of 10386 hectares, while an area of 5191 hectares belong to Hazarganji, district Quetta that lies in the northeast. Hazarganji was originally declared as a state forest during the British Empire in 1890 and Chiltan a protected forest in 1964. Despite a dry biotope, the site is rich with faunal and floral diversity. It has an admixture of shrubs, herbs and a number of trees which provide shelter and food for wild animals.

The area is rugged and mountainous with precipitous slopes divided by deep ravines, gullies and valleys. The main axis of the mountain range is north-north-east and south-south-west with a marked divide (Ziarat Nullah) between the Chiltan area to the south-west and Hazarganji range to the north-east. To the east and west of the park are gently sloping outwash plains of the Quetta and Nank valleys respectively.

The drainage system of the park is closely related to the north/south orientation of the main ridges. East facing slopes drain easterly, west facing slopes westerly and north and south slopes north and south respectively. The eastern drainage is generally of short, very steep, narrow gullies with precipitous sides (Sham Tahar Nala, Kangri Nala). Ziarat Nullah is the exception, being long but very deeply incised and narrow, practically bisecting Chiltan from Hazarganji. Drainage in the west tends to be of a more moderate gradient, longer, broader valleys but still with some deeply incised gullies (Bibi Nala, Hinjiri Nala).The northern drainage leading to Karkhasa and Walidad Nala tends to be of much wider and gently sloping while the south is both a combination of steep gullies broadening to (Thal) wide, flat outwash plains.

During our previous survey in early May the park was looking almost lush green except the higher barren elevations where dwarf trees of Juniper, *Juniperus macropoda* were distantly scattered on steep hill valleys with pistachio, *Pistachia khinjuk*. Middle and lower slopes as well as outer water shed plains were fully covered with wild flora likely due to the unusual heavy rainfall few weeks ago, which had not been experienced in the previous two decades, particularly in the same season. The temperature was remarkedly low ranging from 6°C to 17°C recorded at an altitude of 2000 meters, providing an ideal and charming environment to visiting the avifauna. Some beautiful colored butterflies and moths were adding in the natural beauty of the park.

During the late summer and autumn surveys the vegetation of the park was almost dried up and washed out from the seen which once splashing with colors of wild flowers in the last spring. It was extremely hot and temperature ranged from 17^0C to 42^0C in July and August. Not only a large number of herbaceous species but most of the bushes had been absent and suppressed of their habitats because of the sever dryness and warmness of the weather.

CLIMATE:

The climate of the park may be defined as being of a continental semi-arid Mediterranean type with an average rainfall of 240 mm annually which largely falls in winter. The major source of precipitation is from the passage of eastward traveling low pressure disturbances in December to March (peaking in January and February) which originates in the Mediterranean (Quetta Met. Office Rec. & Pers. Obs.).

On the higher peaks, rain which falls as snow remains from December until the end of March. Occasionally, the park experiences some summer monsoonal rain; when the discontinuity of the Suleiman and Kirthar mountains in the Bolan Pass area permits monsoonal currents to penetrate to more westerly areas. It has high air temperatures in summer (> 40°C) and has very cold winters (< -12°C) in which the severity of the cold is exacerbated by elevation. The average relative humidity in winter is about 30-40% and in summer about 20-30% (Met Office & Pers. Records).

GEOLOGY:

The area of the park where situated in Balochistan was originated in the early Palaeozoic and gradually filled up with a thick mass of sediments, mostly of marine nature. Rugged rocky ridges emerged separated by deep and narrow valleys. The main mountain ridges of the park comprise sedimentary rocks ranging in age from Jurassic to Pleistocene and are bordered by Sub-Recent to Recent fan, terrace and silt deposits. The Chiltan Limestone constituted the main mountain formations with younger Cretaceous formations forming the northern part of park where it adjoins Karkhasa. The limestone areas are characterized by deep slopes and a high percentage of rock outcrops and bare rocks (Rehman 1975).

Gravely piedmont fans and aprons from the main part of the flatter areas of the park have developed and contain a high percentage of gravels and stones that particularly in the Chiltan area, and also a number of fault lines occur in the park including a major one – Chiltan fault - a strike slip fault passing along the eastern foothills. These are associated with the steeper and more precipitous slopes. Soils on the steep mountain slopes are skeletal to non existent. However, where they do occur, on precipitous slopes or in rock crevices, they are usually dominated by shales. The piedmont fans and aprons at the base of the mountains are generally gravely or sandy loams, somewhat excessively drained. The soils are brown to dark brown, shallow to moderately deep underlain by consolidated conglomerate beds, calcareous, porous, highly permeable but having low water holding capacity. Rock fragments are present on the surface as well as in the subsoil.

METHODOLOGY:

Sightings through glossing by using binoculars (8 X 40, and 7 X 35 Pentax, Japan) and telescopes (15x 60x Swift Japan) to identify the fauna at the spot and their further confirmation made by teleing the features with colorful pictorial guides of Ali, *et al* (1983), Heinzel etal (1977), Perrins and Attenborough (1987), Roberts (1991, 1992) and other existing literature. Passerines were live trapped installing mist nets of

fine nylon mesh (50 or 70 denier) thread consisting of 24 to 36 mm. squares fitted on a string frame that divides the net into panels, installed either with the support of poles of bamboo or with the trunks of the trees knowing that, those were the flyway of the particular birds. After the close identification, birds were released at their original place. Many of the species of birds, mammals and reptiles & amphibians were photographed in their natural habitat and later identified on their distinctive morphological characteristics.

The scheme of methods for the collection of mammals and further study followed, adopted by many authors (Burton; 1915 and 1918, Anderson; 1965, Beg and Khan; 1975 and Nagorson; 1980) in the past. Small mammals were caught in live traps (Tomahawk and Sherman live traps) putting sardine with vegetable oil, fresh chicken pieces and fish, chopped nuts in butter, grains and seeds, vegetable and fruits and porridge etc. to invite the animals. A detailed data such as documentation of the categories for sex, measurements, weights and other features noted down largely to be useful for the certain identification.

Few reptiles and amphibians which were doubtful to mislead their identity caught using local instruments and few of them by hand.

After making confirmation and surety of their identification with the existing records, animals were released providing them sufficient food. For example Hedgehogs, Stone Marten fed on the fresh chicken pieces and many Rodents were provided grains which they ate without any hesitation and delay.

RESULTS AND DISCUSSION:

A. MAMMALS OF THE PARK

Mammalian fauna of the park is adopted to more arid and rugged conditions, and warm climate particularly those that have Mediterranean affinities, these are Stone Marten, *Martes foina* Grey Hamster, *Cricetulus migratorius* Libyan Jird, *Meriones libycus* Sundevall's Jird, *M. crasus* Persian Jird, *M. persicus* Balochistan Hamster, *Calomyscus baluchi* have well adopted to the conditions.

Several decades ago, before indiscriminate hunting destroyed all the herds, urial *(Ovis vignei blanfordi)* used to inhabit the area to the north of where the Park is now situated (Roberts, 1977). Today, there are no urial present though Shafiq (1984) reported that a few were still surviving on the western slopes in the early eighties. During the December 1996 wild goat survey a single wolf *(Canis lupis)* was seen by one of the survey teams above Ziarat nala. Many sightings of wolf footprints have also been recorded during our field work; the species is listed as vulnerable in Groombridge (1988).

Common Red Foxes *(Vulpes vulpes griffithi* Linnaeus) have been seen on a number of occasions throughout the field work and Asian Jackals – *Canis aureus* Linnaeus – are common in the Park, but generally only seen at night.

The population of the Indian Crested Porcupine *(Hystrix indica* Kerr) is thought to be considerable as evidenced by the large number of droppings and territorial marking points present in all the lower valleys to the middle layer of the Park. This large population of porcupine suggests that the population of the wolf and jackal; the larger predators in the Park are very low in numbers but there is a good combination of carnivores and herbivores – predator and prey.

Cape Hares -*Lepus capensis* Linnaeus -are present commonly in the park as a useful source of food for many carnivores.

A well balanced eco-system has been noticed maintained by the general wildlife of the park. Small herbivores are preyed frequently by the carnivores to keep a check and balance on their population, because some species of rodents are much commoner as the Balochistan Hamster, *Calomyscus baluchi* is only a species which compare its population with all the present other rodents in the park. Both the Lagomorphs; Cape Hare, *Lepus capensis* and Afghan Pika, *Ochotona rufescence* are at the risk of predation in the presence of Red Fox, *vulpes griffithi* and Stone Marten, *Martes foina* as well as the Indian Jackal, *Canis lupus* may have the opportunities. In this race of predator and prey the observations conclude that the bigger and stronger have the more access to the higher altitude and the weaker and smaller generally to the lower and easy tracks. A list of mammals is given with detailed characteristics (See table 1).

During this exploration of wildlife, cats were not observed although their presence is sure. Some records in the past have been found that the Jungle cat, *Felis chaus* and Desert Cat, *Felis constantina* were present in the park area.

B. AVIFAUNA

The avifauna of Balochistan Province is almost entirely Palaearctic and this is generally the case for the majority of bird species found in Hazar Ganji-Chiltan National Park. Strictly Indian or Oriental forms are few and largely restricted to the coastal areas of Balochistan and to the Sibi and Las Bela Plains (Ticehurst, 1926). The Thar and Cholistan deserts and their extensions, appear to have limited the spread of many of the Indian bird species westward to the Indus. Many of those that do occur in the Indus valley have not penetrated further west onto the Balochistan plateau, across the Kirthar Range and associated hills. In addition, a significant proportion of Central Asian and Himalayan forms penetrate in diminishing numbers southwards along the mountain chains of the Afghanistan-Pakistan borderlands and have reached the uplands of north and north-eastern Balochistan. Ticehurst (1926) reports that this group includes a dozen or so species, some limited as breeding species in Balochistan, to the juniper forest of Ziarat and northern areas, some extending to the juniper scrub of lower elevations, and a few reaching the Kalat hills to the south of the Park.

Some 360 species have been recorded for Balochistan with a large proportion of these being passage migrants and winter visitors (Zakia & Ahmed; 1980, Roberts; 1991-92 and Ali; 1983). These include most of the waders and seabirds which are not normally found in the Park; however, there appear to be no bird species endemic to Balochistan.

A list of the species recorded during the successive visits of the study period of one year is given in Table –2.

Although none of the species is regarded as threatened under the IUCN definition or listed under Wildlife Acts of the Government of Pakistan or Provincial Government of Balochistan, species of interest are:

Scaly-bellied Green Woodpecker, *Picus squamatus*, Picidae. In Balochistan, this species tends to be restricted to small resident populations only.

Alpine or Yellow-billed Chough, *Pyrrhocorax graculus*, Corvidae. The population of this chough in Balochistan is very small and scattered being confined to small flocks on the highest ridges of the Chiltan and Murdar ranges and in Zhargun, Takhatu and Kalifat.

Wall Creeper, *Tichodroma muraria*, Sittidae. Roberts (1992) indicates that this species is more commonly found in northern areas of Pakistan. It is only a winter visitor to Balochistan and not very common. However, a pair were seen below Sham Taha in autumn 1997 probably in migratory passage.

Himalayan Red-mantled Rosefinch -*Carpodacus rhodochlamys*, Fringillidae, Carduelinae. This finch is rather restricted in its world distribution, being confined to the highland mountain plateau region of central Asia, and the north- western regions of the great Himalayan mountain chain, not extending as far eastwards as other *Carpodacus spp*.

Eagles, during autumn and early winter mornings, were regularly seen perched on strategic positions with commanding views e.g. above Sham Taha and above Thai. A Golden eagle *(Aquila chrysaetos*, Accipitridae) nest is present in Kuchak Kat above Bunap -a huge platform of sticks built on the top of a juniper. The other bird was seen carrying a rodent at mid-day flying a lower flight near Hazarganji nala. Many other raptors visit through the Park using a migratory route to the lower deserts of Balochistan in the winter but a pair of the Sparrow Hawk continued its stay all the year in the Chiltan side.

Chukar *(Alectoris chukor* -Phasianidae) and Seesee partridges *(Ammoperdix griseogularis* -Phasianidae) are both relatively abundant in the Park, the former on the eastern side (Kangri nala, Hazar Ganji) and the latter to the west (Bibi nala).

The Forest Department has previously provided watering points for these birds and has recently (early 1997) renovated a number of them.

C. REPTILES/AMPHIBIANS

These have been previously reported and seen during the course of the fieldwork of the present study, with many others included in the list (see table 3).

- Afghan Tortoise -*Testudo horsfieldi*- Testudinidae
- Agama lizards -Agamidae
- Indian Sand Boa -*Eryx johni* -Boidae
- Baloch Mountain Frog -*Rana sternosignata* -four specimens seen in the Chakul above Bunap in April. Eggs also noted.

More work/study needs out on these species and reptiles in the Park to be carried generally.

For the study of reptiles and amphibians, collections were made in the day and night. Some areas of Chiltan and Hazarganji provide excellent habitat for lizards. For example Hazarganji nala, Hanjiri nala, Bibi nala and Linjo hills are particular places (See table 3 with detailed features).

D. INVERTEBRATES

Similarly to the information on reptiles, data on insects within the Park is very limited. Very little serious study has been carried out in the area by entomologists; little has been documented and it is likely that there will be difficulties with the taxonomy. More work/study is needed on this aspect of the Park's fauna. However, evidence from sites of a similar nature elsewhere suggests it is likely that the Park supports several thousand species of insects, with the majority being beetles, true flies, moths, ants, bees and wasps (Hornby, 1996).

Various butterflies (Lepidoptera) and dragonflies (Odonata) have been seen in the Park but not identified. Toot Chakul on the western side of the Park where there is permanent water is a particularly interesting site for butterflies. Recent studies in Balochistan suggest that there may well be a number of interesting insect species present in the province which have not been recorded. For example, a species of swallow-tail butterfly was observed much further south than had been previously recorded, and the authors also have collected Scorpion species abundantly sheltering under the loose stones in the drain out plains as well in the rock crevices and incised gullies ranging from the lower limits upto 2500 meters altitude.

E. FLORA OF THE PARK

Extremely rugged and dry, deeply incised topography, steeply rocked and knife edged ridges drop over 500m. into valleys that receives little precipitation but the floral richness of the area is very high. There are more than 225 species of combined vegetation consists on many plants, shrubs and herbs have so far been recorded. Some popular plant species are well known to the locals are commonly growing in the park area like juniper, *Juniperus macropoda*, on the precipitous slopes and high ridges with pistachio, *Pistacia khinjuk*, *P. cabulica* and wild ash, *Fraxinus xanthoxyloides* constitute open canopy. Some other common plant species wild cherry, *Prunus eburnea* wild olive, *Olea cuspidata*, wild fig, *Ficus carica* barberry, *Berberis baluchistanica*, makhi, *Caragana ambigna, Spp. Perovskia abrotanoides, Haloxylon griffithi, Sophora molia, Convolvulus spinosus* are inhabited in the middle story which produce favorite wild fruits to the wild fauna of the park as well as shelter and nesting requirements. The broader valleys and gentler slopes of the park are vegetated with *Capparis decidua, Artemisia scoparia, A. maritima, A. quettensis, E. ciliata, E. procera* and understory growth consists on various grasses and herbs like *Chrysopogon aucheri, Cymbopogon jwarancusa, Stipa arabica, cynodon dactylon, Pennisetum orientale, Lactuca viminea, Gentiana oliveri, Thymus serpyllum, Erianthus munja, Nepeta bracteata and Saccharum ciliare* which cover the maximum of the vegetation.

Medicinal herbs and shrubs *Ephedra intermedia, E. gerardiana, E. nebrodensis, E. procera, Artemisia scoparia, A. maritima, A. quettensis, Mentha longifolia, Rosa moschata, Peganum hermala, Capparis decidua, Ocimum sanctum, Sonchus asper, Anagallis arvensis, Capsella bursa, Perovskia atriplicifolia, Nepeta bracteata* are found commonly in the park and are collected by the locals not only to use for the remedy against different indications but also as a forage for their livestock. The site is known as a

home of piece due to its physical characteristics, for a large distinctive variety of reptilian fauna that is well adjusted by using and being produced favorable environment in which a large variety of refuge and feeds are available to this crawling creature as well as to the rodents of many forms. Colors of the wild flowers, one can't imagine unless the site is properly visited through its difficult terrain to the upper limits. It looks fairly a wild park when it is visited thoroughly through all its narrow ravines and deep gullies to its emerging points. The abundance and diversity of the wild floral species can be seen accordingly with the variation in altitude which exhibit different types of habitats for the distinctive fauna of the park.

It is an important site for many endemic species of Balochistan flora including *Artemisia quettensis* , *Ampelopsis vitifolia* ssp. *Hazarganjiensis*. A checklist of flora is given in table 4.

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Systematic List of Mammals:

Table - 1

S.No.	Species	Elevation	Location	Remarks
Order: Insectivora				
Family: Erinaceidae				
1.	*Hemiechinus megalotis* Afghan Hedgehog	2050 m.	Hazarganji in the west of rest house.	It ate chicken pieces when kept for the night in the room. (captivity)
2.	*Hemiechinus hypomelas hypomelas* Migratory Hedgehog	1750 m.	Trapped in Chiltan near dam.	Grassland bushes in stony outwash.
Order: Carnivora				
Family: Canidae				
3.	*Canis lupus* Indian Wolf	2350 m.	Bonap area.	Foot marks observed with faecal pellets.
4.	*Canis aureus* Asiatic Jackal	2250 m.	Top of the Hinjiri nala.	Calls were heard in the night in summer at many times.
5.	*Vulpes vulpes griffithi* Common Red Fox	1800 m.	i) Chiltan, near dam.	Near dam, its burrow was seen where it bred (Personal observation) Several times mother fox was seen with 4 cubs in April, 1997.
		1680 m.	ii) Killed specimen was seen on the metalled road in the west of Chiltan.	Searching for food near dam, Chiltan. Photograph taken
		2250 m.	iii) Bibi, Ziarat	Female searching for food in the evening.
Family: Mustellidae				
Sub-Family:Mustellinae				
6.	*Martes foina* Stone Marten or Beech Marten.	1980 m.	Rest House Hazarganji	Male trapped. It fed on chicken pieces.
		2200 m.	Shamtahar nala.	Sardine in vegetable oil was used as bait, female caught.
7.	*Vormela peregusna* Marbled Polecat	1700 m.	Thal, Chiltan.	Sandy Stony deserts.
Family: Hyaenidae				
8.	*Hyaena hyaena* Striped Hyaena	2300m.	Thal area	Observed in the evening at sunset.
Family: Felidae				
9.	*Panthera pardus saxicolor* Common Leopard	2300-2600 m.	Thal and Bonap	Foot tracks observed.

Order:	Artiodactyla			
Family:	Bovidae			
Sub-Family:	Caprinae			
10.	*Capra aegagrus chialtanensis* Chiltan Markhor	2000 m. 2900 m.	Near Khulli Chiltan	Glossed eleven females with one kid in the evening grazing on steep grassy slopes.
		2400 m.	Koolri, Chiltan	Observed very closely seven females with three kids resting in the mid-day, so as many observations at many places in the park.
Order:	Lagomorpha			
Family:	Leporidae			
11..	*Lepus capensis* Cape Hare	1750 m.	In the South East of Chiltan Forest Rest House.	Observed, a single male specimen in the mid-day when it ran from under a bush.
		1800 m.	Chiltan, near dam.	One pair ran from the bushes *Saccharum spp* in the mid-day.
Family:	Ochotonidae			
12.	*Ochotona rufescence* Afghan Pika	2000 m.	Chiltan under the boulders and the rock crevices.	Commonly observed.
		2100 m.	Side hills of Shamtahar nala	In the precipitous slopes.
Order:	Rodentia			
Family:	Hystricidae			
13.	*Hystrix indica* Indian Crested Porcupine	1800-2500 m.	Chiltan, near Bibi Ziarat area.	Single specimen observed in Chiltan. Observed scratching by this animal to expose out the roots of the herbs for feeding commonly on the lower hill slopes and also middle slopes of the park.
Family:	Muridae			
14.	*Mus musculus* House Mouse	1800-2000 m.	Hazarganji, near Rest House & Pumping Station & Chiltan, near dam	Specimens trapped and identified, later confirmed by Dr. Charles A. Woods (curator FMNH-Gainesville).
		2050 m.	Hazarganji	Trapped
		1800m.	Chiltan	Trapped

Family:	Cricetidae			
15.	*Cricetulus migratorius* Grey Hamster	1900-2100 m.	Chiltan on gentle slopes of the hills in green vegetation	
		2100 m.	Hazarganji	Observed
16.	*Calomyscus baluchi* Baluchistan Hamster	1700-2500 m.	Hazarganji and Chiltan, common every where in the stony habitats	The species name has been revised rather than *bailwardi*.(pers. communication with Dr. Charles A. Woods. and identified by him).
		1800-2550 m.	Hazarganji, Chiltan, Bonap area.	Specimens trapped commonly.
17.	*Meriones crasus* Sundevall's Jird	1700 m.	Linjo hills, near cultivation tracts.	From sandy desert, caught and identified.
18.	*Meriones persicus* Persian Jird	1900-2400 m.	Hazarganji and Chiltan in the shrubs and herbs on hill slopes and stone walls.	Trapped and identified.
19.	*Meriones libycus* Libian Jird	1700-1825 m.	Hazarganji, Linjo hills area Chiltan, near rest house.	Trapped and identified, one juvenile male was caught with her mother from Chiltan.

Systematic List of birds:

Table-2

S.No.	Species	Elevation	Location	Remarks
Family:	Accipitridae			
1.	*Milvus migrans migrans* Black Kite	1700 - 1925 m.	Chiltan near Kulri nala.	Glossed in autumn.
2.	*Milvus migrans govinda* Pariah Kite	1700 - 1925 m.	Chiltan near Kulri nala.	Rarely may be observed.
3.	*Accipiter nisus* Sparrow Hawk	1800 - 1900 m.	Chiltan	
		2000 m.	Hazarganji near rest house.	Observed in every field trip attacking on small birds, photographed
4.	*Aquila chrysaetos dephanea* Golden Eagle	1900-2400 m.	Hazarganji Shamtahar area.	Seen flying over with prey, (Rat) holding in the claws, nesting seen on the juniper, *Juniperus excelsa* at about 2800 m.
5.	*Aegypius monachus* Black Vulture	1900 m.	Hazarganji near Linjo hills.	Single bird in fall seasons.
6.	*Gypaetus barbatus* Bearded Vulture	Flying too high. 2200 m.	Hazarganji	Single bird in fall seasons glossed with binocular.
Family:	Falconidae			
7.	*Falco peregrinus* Peregrine Falcons	2000 m.	Chiltan	Seen one pair flying to the west from the park area in the mid-day in the summer.
Family:	Phasianidae			
8.	*Ammoperdix griseogularis* See See Partridge	1800-1850 m. 2000 m.	Chiltan, Bibi nala.	Common in Chiltan area, breeds in the park.
9.	*Alectrois chukor* Chukar Partridge	1750 - 2150 m.	Hazarganji, Kangri nala	Common in the park at lower to middle elevations, breeding commonly, photographed
		1850 - 2600 m.	Hazarganji, Chiltan.	Common in Hazarganji & Chiltan.
10.	*Columba livia neglecta* Blue Rock Pigeon	1950 m.	Hazarganji, Bibi nala & Hinjiri nala.	Breeding in the holes of rocky cliff walls of nullahs.
		1900 - 2100 m.	Chiltan, Nulli nala	Flocks seen near Linjo hills.
11.	*Columba palumbus casiotis* Wood Pigeon	2600 m.	Hazarganji nala.	In deep gullies associated with.
12.	*Streptopelia turtur* Turtle Dove	2100 m.	Hazarganji nala	Very rare.

13.	*Strptopelia decaocto* Collared Dove	2000 m.	Hazarganji nala	Rare bird.
14.	*Streptopelia senegalensis* Little Brown Dove	1980 m.	Hazarganji near Rest House	Rare bird.
15.	*Strix aluco* Himalayan Wood Owl	1850m.	Chiltan, Bibi nala	Female incubating six eggs in a nest hole of rock cliff of nullah. Photographed.
Family:	Caprimulgidae			
16.	*Caprimulgus europaeus* European Nightjar	1800 m.	Chiltan near Dam.	Commonly seen in Chiltan area.
		2000 - 2500 m.	Chiltan, Koolri nala.	
Family:	Meropidae			
17.	*Merops apiaster* European Bee-eater	1725 m.	Chiltan (on the fence) Forest boundary.	Many photographs taken in Summer. (migratory route)
		2000 m.	Hazarganji near rest house	
18.	*Merops orientalis* Little Green Bee-eater	2000 - 2200 m.	Hazarganji	(migratory route)
Family:	Coraciidae			
19.	*Coracias garrulus* Common Roller	2000 m.	Hazarganji near rest house.	(migratory route)
Family:	Upupidae			
20.	*Upupa epops epops* Hoopoe	1760 m.	Chiltan in the stream bed.	Single specimen was seen flying into the stream basin.
		2000 m.	Hazarganji near rest house.	Single specimen was observed.
Family:	Alaudidae			
21.	*Mirafa javanica* Singing Bush Lark	1780 m.	Chiltan, in the south east of forest rest house.	Often seen in the bushes.
		2000 m.	Hazarganji	Outwash drain with bush habitat
22.	*Calandrella acutirostris* Hume's short-toed Lark	1600 m.	Chiltan, near rest house.	Bushy habitat, open plains.
23.	*Calandrella rufescens persica* Lesser short-toed Lark	1775 m.	Chiltan, near rest house & Kulri nala.	Bushy habitat, open plains.
24.	*Melanocorypha bimaculata* Eastern Calandra Lark	1700-1900 m.	Hazarganji, Chiltan.	Bushy habitat, open plains.
25.	*Galerida cristata magna* Baluchistan Crested Lark	1700-1900 m.	Hazarganji, Chiltan open areas.	Hazarganji & Chiltan in open country.

26.	*Galeria cristata chendoolas* Indian crested Lark	1800-1900 m.	Chiltan near rest house & Hinjiri nala.	Very common bird.
Family:	Hirundinidae			
27.	*Hirundo rustica* Common Swallow	1780-1900 m.	Chiltan, near dam and in the nullahs.	Often seen flying.
		2600 m.	Chiltan, Koolri nala.	Common in the park.
28.	*H. obsoleta* Pale Crag Martin	2000 m.	Cliffs of Chiltan	Rarely seen.
29.	*Hirundo rupestris* Crag Martin	1760 m.	Chiltan, forest rest house.	Were making nest in the corner of ceiling of Veranda in May.
		1800-2600 m.	Chiltan, Koolri nala and Hazarganji.	Commonly breeds, flushed.
30.	*Delichon urbica* European House Martin	1800 m.	Hazarganji, near museum.	Commonly seen at lower altitudes.
Family:	Picidae			
31.	*Picus squamatus* Scally-bellied Woodpecker	1800-2000 m.	Hazarganji	Rarely seen east facing valleys in the tree line.
Family:	Prunellidae			
32.	*Prunella atrogularis* Black-throated Accentor	2400-2700 m.	Chiltan and Bonap area	Near springs.
Family:	Motacilliade			
33.	*Anthus novaeseelandiae* Richard's Pipit	1770 m.	Chiltan, rest house.	Bushy and grassy grounds
34.	*Anthus cervinus* Redthroated Pipit	1760 m.	Chiltan near rest house.	Bushy and grassy grounds.
35.	*Anthus spinoletta* Rock Pipit	1750 - 2000 m.	Hazarganji nala & Chiltan, near rest house.	Bushy and grassy grounds.
36.	*Anthus pratensis* Meadow Pipit	1750 m.	Chiltan, near rest house.	Grassland desert.
37.	*Anthus similis* Long-billed Pipit	1700 - 2000 m.	Chiltan, Hazarganji	Grassland desert.
Family:	Pycnonotidae			
38.	*Pycnonotus leucogenys* White-cheeked Bulbul	1600-2000 m.	Hazarganji & Chiltan valleys on *salvadora sp.*	Open scrub & surrounding valleys
39.	*Pycnonotus cafer* Red-vented Bulbul	2000 m.	Hazarganji near rest house.	Open scrub & lower valleys.
Family:	Lanidae			
40.	*Lanius vittatus nargianus* Bay-backed Shrike	1800 m.	Hazarganji near rest house.	Commonly seen.
41.	*Lanius excubitor lahtora* Great Grey Shrike	1800-2100 m.	Hazarganji	Commonly seen..
42.	*Lanius minor* Lesser Grey Shrike	1800-2100 m.	Hazarganji	Commonly seen.

43.	*Lanius collurio collurio* Red-backed Shrike	1800 m.	Hazarganji near rest house.	Commonly seen.
Family:	Muscicapidae			
44.	*Phoenicurus ochruros* Black Redstart	2500m.	Hazarganji (Rocky Nullahs)	Probably breeds in the park nullahs.
45.	*Saxicola caprata* Pied Bush Chat	1780 m.	Chiltan, near rest house.	Bushy habitat in rock valleys.
46.	*Saxicola ferrea* Grey Bush Chat	1900 m.	Hazarganji nala.	Bushy and stony habitat.
47.	*Oenanthe alboniger* Hume's Chat	1860 - 2100 m.	Hazarganji Chiltan.	Often seen along steep hills and rock walls of the nullahs. Chicks were present in the crevice nest of steep hill, photographed.
48.	*O. picata* Pied Chat	1760 - 2000 m.	Chiltan and Hazarganji.	Stony bush lands.
49.	*O. deserti* Desert Wheatear	1680m	Chiltan valley.	Migratory passage (Straggler bird).
50.	*Cettia cetti* Cetti's Warbler	1780 m.	Chiltan, near rest house.	Floodplains with green bushes.
51.	*Acrocephala scirpaceus* Reed Warbler	1700 m.	Chiltan, Hinjiri nala.	Outwash with green bushes.
52.	*Hippolais caligata* Booted Warbler	2000 m.	Hazarganji	Outwash basins of grasslands.
53.	*Hippolais languida* Upcher's Warbler	2000 m.	Hazarganji	Outwash basins of grasslands.
54.	*Sylvia hortensis* Orphean Warbler	1860 m.	Chiltan	Outwash basins of grasslands.
55.	*Sylvia curraca* Lesser White-throat	1800 m.	Chiltan, near rest house.	Associated with bushes.
Family:	Turdidae			
56.	*Monticola solitarius* Blue Rock Thrush	2300-2600 m.	Hazarganji nala.	Rocky bush area.
Family:	Sittidae			
57.	*Sitta tephronota* Rock Nuthatch	1800-2100 m.	(i)Hazarganji, near rest house (ii) Chiltan, near dam.	Rocky habitat. Breeds in summer, Bird photographed.
58.	*Sitta europaea cashmirensis* European Nuthatch	2200 m.	Chiltan, Bibi Ziarat area.	Seen on the dwarf trees.
Family:	Tichodromadidae			
59.	*Tichodroma muraria* Wallcreeper	2400 m.	Shamtahar nala, Ziarat nala.	Rocky steep walls of nullahs, Shamtahar nala.

Family:	Emberizidae			
60.	*Emberiza leucocephala* Pine Bunting	1800 m.	Chiltan	Seen near Koolri, near water reservoir.
61.	*Emberiza buchanani* Grey-necked Bunting	1800 m.	Chiltan	Seen near Koolri, near water reservoir.
62.	*Emberiza stewarti* White-capped Bunting	2600 m.	Chiltan, Bonap.	Seen near spring
Family:	Fringillidae			
63.	*Carpodacus erythrinus* Common Rosefinch	1800 m.	Hazarganji	Seen feeding on the mulberry in May.
64.	*C.Rhodochrous* Pink-browed Rosefinch	2800 m.	Bonap, Chiltan.	Seen near spring.
65.	*A. rhodochlamys grandis* Red-mantled Rosefinch	2800 m.	Bonap, Chiltan.	Seen near spring.
66.	*C.puniceus* Red-breasted Rosefinch	2800m.	Bonap, Chiltan	Seen near spring.
67.	*Carduelis carduelis* Eurasian Goldfinch	2800 m.	Bonap, Chiltan.	Seen near spring.
68.	*Mycerobas melanozanthos* Spot-winged Grossbeak	2800m.	Bonap, Chiltan	Seen near spring.
Family:	Ploceidae			
69.	*Passer domesticus bactrianus* Migratory House Sparrow	1800 m.	Hazarganji, near pumping station.	During the summer trip.
		1980 m.	Hazarganji near rest house.	During the summer trip.
70.	*P. domesticus indicus* Indian House Sparrow	1690m.	Hazarganji & Chiltan	Lower plains
71.	*P. montanus dilutus* Afghan Tree Sparrow	1750-2200 m.	Chiltan, Hazarganji	Gentle slopes with tree line.
72.	*P. petronia intermedia* Rock Sparrow	2000 m.	Chiltan, Hazarganji rest house.	Arid desert with bushes.
Family:	Sturnidae			
73.	*Sturnus roseus* Rosy Pastor	1750-2000 m.	Hazarganji & Chiltan.	One killed specimen found in Hazarganji near Rest House (many observed in the wild).
74.	*Pyrrhocorax graculus digitatus* Alpine Chough	2000-2800 m.	Chiltan, Bibi nala (in the holes of rocky walls) and along the steep hills.	Some times in small flocks, pairs or single.
		2700 m.	Chiltan, Hinjiri nala & Koolri top.	

Systematic List of Reptiles and Amphibians:

Table-3

S.No.	Species	Elevation	Location	Remarks
Family:	Testudinidae			
1.	*Testudo horsfieldi* Afghan Tortoise	1700-2100 m.	Chiltan & Hazarganji	Often seen during spring, summer and in autumn.
Family:	Gekkonidae			
2.	*Cyrtodactylus watsoni* Quetta Rock Gecko	2100-2200 m.	Hinjiri nala.	Rocky habitat.
3.	*Tropiocolotes depressus* Mountain Dwarf Gecko	2050-2100 m.	Hinjiri nala.	Rocky habitat.
Family:	Agamidae			
4.	*Stellio nupta fusca* Yellow-headed Agama	1850-2150 m.	Hazarganji and Chiltan in the rocky crevices.	Commonly seen in summer.
5.	*Stellio caucasica* Northern Rock Agama	1850 m.	Hazarganji down to Linjo area, in the crevices of rocks.	Commonly seen in summer.
		1800-1900 m.	Chiltan, Bibi nala.	Commonly seen in summer.
6.	*Stellio agilis* Brilliant Agama	1700 m.	Chiltan, in the west of forest rest house near boundary fence in dry open stony pene plain.	Rarely seen.
		1800-2000 m.	Chiltan, Bibi nala.	
7.	*Stellio megalonyx* Afghan Ground Agama	1800-1900 m.	Chiltan, Bibi nala.	Caught and identified.
Family:	Lacertidae			
8.	*Eremias velox persica* Persian Steppe Lacerta	2050-2150 m.	Hazarganji	Burrowing in habit under the bushes of sandy stony gentle slopes.
9.	*Eremias guttulata watsonana* Long-tailed Desert Lacerta	1900 m.	Hazarganji, near rest house.	Burrowing in habit under the bushes of sandy stony gentle slopes.
		2000 m.	Hazarganji	Out wash basins with bushes.
Family:	Scincidae			
10.	*Ablepharus pannonicus* Mediterranean Dwarf Skink	2000-2100 m.	Hazarganji	Rocky beds, out wash plains with bushes.

Family:	Colubridae			
11.	*Coluber rhodorachis ladacensis* Cliff Racer	2100-2150 m.	Shamtahar nala	Seen in cliffs of rocky walls.
12.	*Eirenis persica walteri* Dark-headed Dwarf Racer	2000-2100 m	Hazarganji rest house area.	Rocky habitat.
13.	*Lycodon striatus bicolor* Golden Spotted Wolf Snake	2100-2150 m.	Hazarganji nala.	Stony desert.
14.	*Ptyas mucasus* Dhaman	2000-2050 m.	Chiltan, Toot nala near spring.	Rocky boulder.
Family:	Elapidae			
15.	*Naja naja naja* Indian Cobra	2150 m.	Hazarganji, near Hazarganji nala.	Specimen caught from a bush about eight feet from the ground.
Family:	Viperidae			
16.	*Vipera labetina obtusa* Levantine Vipera	1850 m.	Night collection Hazarganji, near museum.	Specimen caught from floodplains.
Family:	Boidae			
17.	*Eryx johni* Indian Sand Boa	1700 m.	Near Linjo hills.	Sandy desert.
Family:	Ranidae			
18.	*Rana sternosignata* Baluch Mountain Frog	2750 m.	Bonap hills	Breeding ground.
Family:	Bufonidae			
19.	*Bufo viridis* European Green Toad	2250-2300 m.	Hazarganji	Specimen caught.
		1800-1900 m.	Hazarganji, near museum.	Gentle slopes of bushes.

Checklist of Flora:

Table- 4

PTERIDOPHYTA		
FAMILY: PTERIDACEAE		
	Adiantum sp.	
GYMNOSPERMAE		
EPHEDRALES		
	1. *Ephedra ciliata*	Fisch. & Mey.
	2. *E. gerardiana*	Wall. ex Stapf
	3. *E. intermedia*	Stapf
	4. *E. nebrodensis*	Tineo
	5. *E. procera*	Fisch. & Mey.
CONIFERALES		
FAMILY: CUPRESSACEAE		
	Juniperus macropoda	Hk. f.
MONOCOTYLEDONAE		
1. FAMILY: POACEAE		
	1. *Aegilops tauschii*	Cosson
	2. *Avena fatua*	Linn.
	3. *Avena sp.*	
	4. *Boissiera squarrosa*	Soland (Nevski)
	5. *Bromus tectorum*	Linn.
	6. *Chrysopogon aucheri*	(Boiss.) Stapf.
	7. *Cymbopogon jwarancusa*	(Jones) Schult.
	8. *Cynodon dectylon*	(Linn.) Pers.
	9. *Eragrostis poaeoides*	P. Beauv.
	10. *Erianthus munja*	(Roxb.) Jesw.
	11. *Henrardia persica*	(Boiss.) C. E. Hubb.
	12. *Hordeum murinum*	Linn.
	13. *Hymenocrater sessilifolius*	Bth.
	14. *Melica persica*	Kunth
	15. *Parapholis incurva*	(Linn.) C. E. Hubb.
	16. *Pennisetum orientale*	L. C. Rich.
	17. *Piptatherum vicarium*	
	18. *Poa sp.*	Anderss.
	19. *Saccharum ciliare*	
	20. *S. griffithii*	Nees
	21. *Schismus arabicus*	(Schreb.)
	22. *Taeniatherum crinitum*	Desf
	23. *Tetrapogon villosus*	(Lamk. & DC.) Link
	24. *Vulpia sp.*	

DICOTYLEDONAE

1. FAMILY: MORACEAE

1.	*Ficus carica*	Linn.

2. FAMILY: URTICACEAE

2.	*Forsskalea tenacissima*	(Moq.) Bunge ex. Boiss.

3. FAMILY: CHENOPODIACEAE

3.	*Haloxylon griffithi*	Linn.

4. FAMILY: AMARANTHACEAE

4.	*Amaranthus hybridus*	Roxb

5. FAMILY: CARYOPHYLLACEAE

5.	*Silene indica*	Fenzl ex Boiss.
6.	*Stellaria kotschyana*	Ahrendt

6. FAMILY: BERBERIDACEAE

7.	*Berberis baluchistanica*	(Forssk.) Edgew.

7. FAMILY: CAPPARIDACEAE

8.	*Capparis decidua*	Staph

8. FAMILY: CRUCIFERAE

9.	*Alyssum desertorum*	(Linn.) Medic.
10.	*Capsella bursa*	(Willd.) DC.
11.	*Leptaleum filifolium*	

9. FAMILY: ROSACEAE

12.	*Prunus eburnea*	J. Herrm.
13.	*Rosa moschata*	Stocks.

10. FAMILY: PAPILIONOIDEAE

14.	*Caragana ulicina*	Stocks.
15.	*Caragana ambigna*	Boiss.
16.	*Ebenus stellata*	(Linn.) Desv.
17.	*Onobrychis cornuta*	Stocks ex Boiss.
18.	*Onobrychis taverniaefolia*	T. Anders.

11. FAMILY: ZYGOPHYLLACEAE

19.	*Fagonia cretica*	Linn.
20.	*Peganum hermala*	Stocks

12. FAMILY: ANACARDIACEAE

21.	*Pistacia khinjuk,*	Stocks
22.	*P. cabulica*	Linn.

13. FAMILY: FRANKENIACEAE

23.	*Frankenia pulverulenta*	(Linn.) Jacq.

14. FAMILY: SAPINDACEAE

24.	*Dodonaea viscosa*	Schreb.

15. FAMILY: THYMELEACEAE

25.	*Dephne oleoides*	(Wik.) C. A. Mey.
26.	*Stellera lessertii*	Boiss.

16. FAMILY: UMBELLIFERAE

27.	*Ferula oopoda*	Boiss.
28.	*F. ovina*	Edgew
29.	*Psammogeton biternatum*	Linn.
30.	*Ferula costata*	Linn.

17. FAMILY: PRIMULACEAE

31.	*Anagallis arvensis*	DC.
32.	*Polygala chinensis*	(Aitch. & Hemsl.)
33.	*Polygala erioptera*	(Wall. ex G. Don) DC

18. FAMILY: PLUMBAGINACEAE

34.	*Limonium griffithii*	Wall. ex DC.

19. FAMILY: OLEACEAE

35.	*Fraxinus xanthoxyloides*	Dcne.
36.	*Olea cuspidata*	Griseb

20. FAMILY: SALVADORACEAE

37.	*Salvadora oleoides*	Burm.

21. FAMILY: GENTIANACEAE

38.	*Gentiana oliveri*	Linn.

22. FAMILY: CONVOLULACEAE

39.	*Convolvulus spinosus*	Wall. ex Benth.

23. FAMILY: BORAGINACEAE

40.	*Asperugo procumbens*	Decne.
41.	*Cynoglossum glochidiatum*	Bunge
42.	*Eritrichium strictum*	Ledeb.
43.	*Heliotropium s cabulicum*	Linn.
44.	*H. dasycarpum*	Clarke
45.	*H. europaeum*	(Willd.) G. Don
46.	*Myosotis caespitosa*	Clarke
47.	*M.refracta*	Boiss
48.	*Nonnea caspica*	Stocks
49.	*Onosma hispidum*	Kar. & Kir.
50.	*Paracaryum asperum*	(Sm.) G. Don
51.	*Rochelia stellulata*	Rech. F.
52.	*Tecoma undulata*	Bth.

24. FAMILY: LABIATAE

53.	*Eremostachys edelbergii*	(Bth.) Bth.
54.	*E. thyrsiflora*	Linn.
55.	*Lallemantia royleana*	Linn.
56.	*Lamium amplexicaule*	(Linn.) Huds.

	57.	*Marrubium vulgare*	Bioss
	58.	*Mentha longifolia*	Bth.
	59.	*Nepeta bracteata*	Linn.
	60.	*Nepeta glomerulosa*	Karel
	61.	*Ocimum sanctum*	Bth.
	62.	*Perovskia abrotanoides*	Hk. f.
	63.	*P. atriplicifolia*	Wall. ex Bth.
	64.	*Phlomis stewartii*	Bth.
	65.	*Plectranthus rugosus*	Boiss.
	66.	*Salvia cabulica*	Boiss.
	67.	*Scutellaria stocksii*	Linn.
	68.	*Teucrium stocksianum*	Boiss.
	69.	*Thymus serpyllum*	Linn.
	70.	*Zataria multiflora*	Linn.
	71.	*Ziziphora tenuior*	Linn.
25. FAMILY: SCROPHULARIACEAE			
	72.	*Verbascum thapsus*	Linn.
	73.	*Veronica anagallis*	Jaub. & Spach
	74.	*V. biloba*	Linn.
26. FAMILY: RUBIACEAE			
	75.	*Gaillonia eriantha*	F. & M.
	76.	*Galium aparine*	Linn.
27. FAMILY: VALERIANACEAE			
	77.	*Valerianella oxyrrhyncha*	Aitch.
28. FAMILY: PLANTAGINACEAE			
	78.	*Plantago lanceolata*	Forssk.
	79.	*P. major*	Bioss
	80.	*P. ovata*	D. Dietr.
29. FAMILY: CAMPANULACEAE			
	81.	*Campanula leucoclada*	Coult.
30. FAMILY: DIPSACACEAE			
	82.	*Scabiosa cana*	(Boiss.) O. Kertz,
	83.	*Scabiosa olivieri*	(Linn.) F. W. Schmidt
31. FAMILY: COMPOSITAE			
	84.	*Hertia intermedia*	(Roxb.) Ramayya & Rajagopal
	85.	*Lactuca viminea*	(Vent.) Boiss.
	86.	*Launaea procumbens*	Bunge
	87.	*Pulicaria gnaphalodes*	DC.
	88.	*Scorzonera hemilasia*	(Linn.) Hill
	89.	*Scorzonera virgata*	
	90.	*Sonchus asper*	

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STATUS AND ECOLOGY OF CHILTAN WILD GOAT, *CAPRA AEGAGRUS CHIALTANENSIS* (CAPRINAE)

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ABSTRACT: A massif rock peak 3335 meters above the sea level and its allied edged-ridges that rise out in all directions to the arid plains lies in the south-west of Quetta, Balochistan, is the original home of the Chiltan Wild Goat (*Capra aegagrus chialtanensis*) declared in 1980 as protected, the Chiltan-Hazarganji National Park came into existence primarily with the object for the protection of this indigenous species. The present exploration of the Chiltan Wild Goat (*Capra aegagrus chialtanensis*) indicated the population that above 400 animals of this species are surviving (globally) in Chiltan- Hazarganji National Park, the only refuge known in Pakistan. The factors involving in suppression of population, habitat and its distribution in the area located out. In the habitat of this goat some 18 other mammals, including 74 species of birds, and 17 of the reptiles and 2 species of amphibians recorded during this study in distinctive seasons conducting thorough surveys round the year from 1997 to 1998 in variable environmental conditions. The important species of vegetation on which the wild goat rely have also been recorded in addition to a major part of flora that exist in the park play an animated role to maintain the eco-system and to develop the condition of Chiltan Wild Goat (*Capra aegagrus chialtanensis*) habitat.

KEYWORDS: Balochistan, Chiltan Wild Goat, Hazarganji, National Park, Quetta.

INTRODUCTION:

Wild goats are distributed in the arid rocky mountainous regions of North Africa, the Middle East and south-west Asia (Corbet and Hill, 1992). In Pakistan, there are three distinct species splitting Wild Goat (*Capra aegagrus*) into two sub-races, Markhor (*Capra falconeri*) into 4 extent identifiable subspecies (Nowak, 1991) and Himalayan Ibex (*Capra ibex sibirica*) distributed in the different eco-zones (Roberts, 1997) of which the under debate species Chiltan Wild Goat (*Capra aegagrus chialtanensis*) is the main focus of this study.

In the past only few studies, which exist the population dynamics of rodents with special reference to the vertebrate pests of agriculture carried out by Vertebrate Pest Research Institute, University of Karachi. Lydekker (1913) examined the horns in British Museum devoted by Appleton (1812) which presented by a local hunter from Quetta, identified as a new species, the Chiltan Markhor (*Capra falconeri chialtanensis*) quoted in Schaller (1977). The status of the Chiltan Wild Goat (*Capra aegagrus Chialtanensis*) population was initially assessed by Schaller and Mirza (1971) and later by Mirza (1975). Between 1979 to 1990, nearly annual surveys were carried out by the Wildlife Specialists, Pakistan Forest Institute (Forest Department Records). Thereafter followed a period when no surveys were conducted until the present investigation of Chiltan Markhor (*Capra aegagrus chialtanensis*) initiated in 1997. Combined of vertebrate wildlife, only 33 species recorded in (Ashiq, 1989) the park area. Shafique and Arain (1997) worked out the general vertebrate wildlife structure and noted about 90 species in

the park. The study of the flora, in the late eighties and early nineties, staff and students of the Pakistan Forest Institute carried out on the area's watershed properties (Forest Departmental Files), only some of which was completed, however. Vegetation comprises a great interest of which more than 225 species have been identified.

The Park is most important as the last remaining refuge of the Chiltan Wild Goat (*Capra aegagrus chialtanensis*) declared as endangered species, and the wolf (*Canis lupis*) Afghan Fox (*Vulpes cana*) Marbled Pole Cat (*Vormela peregusna*) Striped Hyaena (*Hyaena hyaena*) and Common Leopard (*Panthera pardus saxicolor*) are the other prime animals of great interest and are badly exploited largely because of their valued fir and have some entered or reached near to be declared as Vulnerable or endangered in the Red Data Book. Likewise, it is an important habitat for many endemic species of the Balochistan flora including *Artemisia quettensis, Ampelopsis vitifolia* ssp. *hazarganjiensis.*

Probably of less direct and apparent value are the watershed aspects of the park. In terms of value to the people of Quetta, Nank and Mastung, the watershed properties are of greatest significance and importance, both now and in the long-term. These properties have not been recognized in the past to the detriment of the Park and the people who live around it.

Scientific investigation of the fauna and flora of Balochistan dates from the latter part of the nineteenth century. The vicinity of Quetta in particular (part of "British Balochistan") received attention during the colonial period and few have left some indelible publications (Blanford; 1891, Sterndale; 1884, Jerdon; 1874), some military officers, civil servants and others crossed passes as Darrah (1898) hopping for trophy but the one Stockley (1928) who reported that some straight-horned goat-like animal is present there. What seems somewhat surprising, however, is that there does not seem to have been a comprehensive study of the flora or fauna of the Chiltan-Hazarganji area despite its earlier association with the British, its notification as a state forest or its more recent notification as a national park.

More surprising is an apparent lack of any intensive investigation of the Chiltan Wild Goat (*Capra aegagrus chialtanensis*) apart from the (approximately) annual census of the species conducted in the 1980s. Various one-off investigations have been reported (Forest Deptt. of Balochistan) but these do not constitute a comprehensive study of the biology or habits of the species. Various local and international scientists have visited the Park over the years (e.g. Dr Craig Knowles, January, 1986), or have tried to arrange more comprehensive studies (e.g. Dr. Dan Edge: 1989, studied the biology and behavior of the Sindh Ibex (*Capra aegagrus blythi*) but these have either come to nothing or have only produced incomplete reports, short notes or comments - no formal publications or concrete pieces of work (Forest Department files).

Within the time and resource constraints of this current study of the Park, wherever possible, in-depth, studies of the flora and fauna have been conducted with special reference to the Chiltan Wild Goat (*Capra aegagrus chialtanensis*). *Detailed information regarding the location and boundries of the study site, climate, geology and map of the study area is given in Shafique & Arain (2002).*

METHODOLOGY:

Glossing of the animals was mostly confined to early morning and late evening by using binoculars and telescopes, however some potential areas were also searched out in the mid-day for the population census of Chiltan Wild Goat (*Capra aegagrus chialtanensis*). Help of the foot prints were also considered to be the presence of this wild goat nearby in the vicinity. The team member (guides and watchers) often stayed with the author at nights in the habitat area so that they could start to take sightings early in the morning. The team members often split into two groups to avoid the double counting of the species. A regular trekking schedule with sighting of animals was followed and practiced repeatedly for many days in the divided area to make maximum accuracy of counting. Habitat conditions were observed and photographs of certain rich high pastures were taken. Maximum plant species were collected in the habitat of the wild goat and later identified.

The study site was naturally bisected by a great Chiltan nala into two main divisions then further these were sub-divided into many small divisions by other nullahs and deep narrow gullies which divided the population of the wild animal at some places and greatly assisted to count down the whole. Many of the measures were taken to avoid counting of the overlapping numbers.

RESULTS AND DISCUSSION:

Chiltan Wild Goat (*Capra aegagrus chialtanensis*) (previously known – Chiltan Markhor) was first described as a distinct subspecies–(*Capra falconeri chialtanensis*) by Lydekker in 1913. Other authors thought it anomalous quoted in Roberts (1977) and Schaller (1977), suggested Epstein, (1972) it may be a hybrid between the Straight Horned Markhor (*Capra falconeri jerdoni*) and the wild goat or a markhor and a domestic goat. Schaller and Khan (1975) and Schaller (1977) however, having studied populations of the various species and based on horn morphology, concluded that *C. falconeri chialtanensis* is a *C. aegagrus* which does not merit sub-specific status because intermediate forms exist between it and typical wild goats.

Since these studies, there appears to have been no further work on the taxonomy of Chiltan Wild Goat (*Capra aegagrus chialtanensis*). It is suggested that the only way this issue may be resolved, the phylogenetic relationship will be to carry out DNA analysis of the animal. This would involve the testing of Chiltan Wild Goat (*Capra aegagrus*

chialtanensis) as well as wild and domestic goat and markhor from other parts of Pakistan; for example *C.f. cashmeriensis, C.f. falconeri, C.f. megaceros, C.f. jerdoni,* and possibly from further extra range-field (e.g. *C.f. heptneri* from Uzbekistan). Therefore, the authors have adopted the scheme of study following Schaller (1975) and on their own observation of the species, agreed that its close affinity is more to a goat than a markhor.

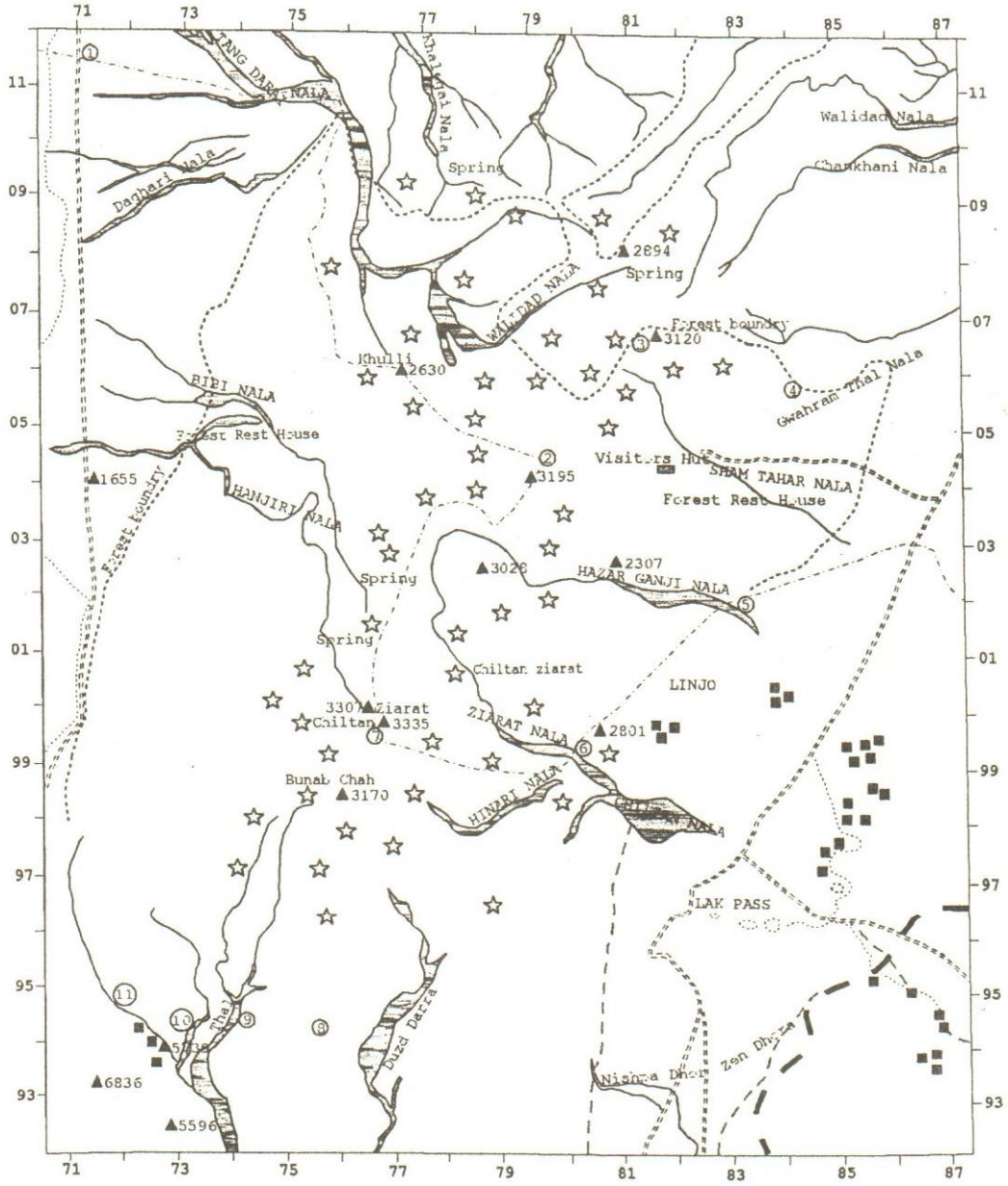
DISTRIBUTION:

Up until the late seventies, it was thought that Chiltan Wild Goat (*Capra aegagrus chialtanensis*) were confined to three populations on three hill ranges of which the greater part survived on the Chiltan range with very small numbers on Murdar to the north-east and Koh-i-Maran to the south. It is now probably true to say that Chiltan Wild Goat survives in the area of Hazar Ganji-Chiltan National Park and its close surrounds in the south-east. The animals on the other two mountain ranges have either been hunted out or are so few in number as to be non viable populations. Distribution of the animal is shown in the map.

POPULATION:

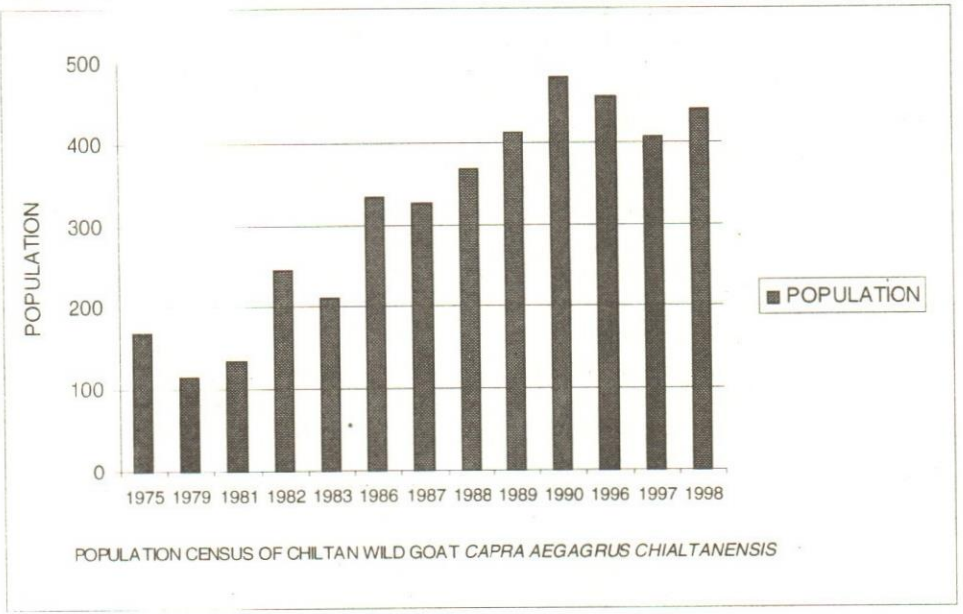
Population data recorded in previous years and during the present study 1997 to 1998 shown in the table.

Year	Young	Yearling	Adult Male	Adult Female	Total
1975	57	15	22	74	168
1979	22	10	42	41	115
1981	42	20	28	45	135
1982	66	20	63	96	245
1983	82	17	26	85	210
1986	63	42	97	131	333
1987	67	39	66	124	326
1988	112	30	74	151	367
1989	139	44	88	141	412
1990	136	0	147	196	480
1996	0	120	122	213	455
1997	15	31	102	207	405
1998	64	39	107	229	439



☆ DISTRIBUTION OF CHILTAN WILD GOAT *CAPRA AEGAGRUS CHIALTANENSIS* IS SHWON IN THE MAP

MAP OF CHILTAN HAZARGANJI NATIONAL PARK



The table is showing a gradual increase in the numbers since 1979 to 1990, then after it looks a stability of the population from 1996 to 1998. There may be some misleading counts or the factors which affected the animal largely because of hunting, habitat destruction, disturbance and predation. For the last two decades natural environmental variation and the more man-demand of water have concluded that the level of ground water have been descending by 1meter/year which may have some adverse factors on the area and one of the causes in detriment of the population of this wild goat.

HABITAT:

The wild goat appears fairly well adjusted to the dry and arid mountain conditions of the Park. They generally inhabit the most precipitous slopes of the Hazarganji and Chiltan areas. Here there are rocky cliffs with numerous deep and narrow gullies in which they are able to rest during daylight hours. The undulating terrain of its habitat is extremely difficult to cross. The older, male goats tend to keep to the highest and most precipitous cliffs of the range. When wild goat climbs up and down the slopes, its wonderful agility of jumping and amazing sense of balance is un-believable even on the steepest slopes. It can make a standing glide upto five feet on a steep surface and 13-18 feet dropping down almost wholly a vertical rock without any injury. This animal is gregarious congregating to graze in the early morning and late afternoon.

These upper slopes are poorly vegetated with only a scattering of juniper (*Juniperus macropoda*) and wild pistachio (*Pistacia khinjuk*) and with some under-growth of few

grass species. The goat tend to descend to lower altitudes to feed when the food availability is scarce, and covered with snow or dried up, and are then found on the gentler slopes or in valley bottoms where more vegetation is present in the form of few plants; wild ash (*Fraxinus xanthoxyloides*), wild cherry (*Prunus eburnean*) and wild olive (*Olea cuspidata*) shrubs; barberry (*Berberis baluchitanicus*), makhi (*Caragana ambigua*), wild rose (*Rosa moschata*) Karir (*Capparis decidua*) and *Haloxylon griffithi*, herbs and grasses, *Artemisia sps., Ephedra sps., Peganum hermala, Mentha longifolia, Ocimum sanctum, Adiantum spp, Anagallis arvensis, Chrysopogon aucheri, Cymbopogon jwarancusa, Stipa arabica, Thymus serpyllum Erianthus munja Nepeta bracteata, Saccharum ciliare Lactuca viminea, Gentiana oliveri, Sonchus asper, Capparis deciduas, Adiantum spp., Cynodon dactylon, Poa spp, Lallemantia royleana Plectranthus rugosus, Hertia intermedia, Launaea procumbens, Pulicaria gnaphalodes, Scorzonera spp., Tetrapogon villosus, Schismus arabicus, Parapholis incurva, Hymenocrater sessilifolius, Eragrostis poaeoides and Henrardia persica* are largely available as a seasonal foods.

During the rut and the colder winter months the goat usually tend to be found on the lower slopes rather than the higher cliffs and ridge tops. In a particularly cold period observed in December 1997 to March, 1998 with strong westerly winds, very few goats were seen at higher altitudes tended to be in the gullies around 2,000 to 2,400 meters when snow is on the ground in the early months of the year, the goats are forced to the lower altitudes.

The other vegetation which play a key role in the eco-system of the study site and direct or indirect benefit the Chiltan Wild Goat (*Capra aegagrus chialtanensis*) was recorded and given as follows.

Aegilops tauschii, Alyssum desertorum, Amaranthus hybridus, Anagallis arvensis, Artemisia quettensis, A. maritima, A. scoparia, Asperugo procumbens, Avena fatua, Avena sp., , Boissiera squarrosa, Bromus tectorum, Calendula arvensis, Campanula leucoclada, Capsella bursa, Caragana ulicina, Caragana ambigna, Centaurea iberica, Centaurea pergamacea, Chrysopogon aucheri, Convolvulus spinosus, Conyza bonariensis, Cynoglossum glochidiatum, Dephne oleoides, Dodonaea viscosa, Ebenus stellata, Ephedra ciliata, E. gerardiana, E. intermedia, E. nebrodensis, E. procera, Eragrostis poaeoides, Eremostachys edelbergii, Eremostachys thyrsiflora, Erianthus munja, Eritrichium strictum, Fagonia cretica, Ferdia costala, Ferula oopoda, Ferula ovina, Ficus carica, Forsskalea tenacissima, Frankenia pulverulenta, , Gaillonia eriantha, Galium aparine, Gentiana oliveri, Gnaphalium luteo-album, Haloxylon griffithi, Heliotropium cabulicum, Heliotropium dasycarpum, Heliotropium europaeum, Henrardia persica, Hertia intermedia, Hordeum murinum, Lamium amplexicaule, Launaea procumbens, Leptaleum filifolium, Limonium griffithii, Marrubium vulgare, Melica persica, Myosotis caespitosa, Myosotis refracta, Nepeta bracteata, Nepeta glomerulosa, Nonnea caspica, Onobrychis cornuta, Onobrychis taverniaefolia, Onosma hispidum, Paracaryum asperum, Parapholis incurva, Pennisetum orientale, Perovskia abrotanoides, Perovskia atriplicifolia, Phlomis stewartii, Piptatherum vicarium, Plantago lanceolata, Plantago major, P. cabulica, Plantago ovata, Plectranthus rugosus,

Polygala chinensis, Polygala erioptera, Psammogeton biternatum, Pulicaria gnaphalodes, Rochelia stellulata, Salvadora oleoides, Salvia cabulica, Scabiosa cana, Scabiosa olivieri, Scorzonera hemilasia, Scorzonera virgata, Scutellaria stocksii, Silene indica, Solanum surattense, , Sophora molia, Spiraea boissieri, Stachys parviflora, Stellaria kotschyana, Stellera lessertii, Stipa arabica, Taeniatherum crinitum, Tecoma undulata, Tetrapogon villosus, Teucrium stocksianum, Thymus serpyllum, Valerianella oxyrrhyncha, Verbascum thapsus, Veronica anagallis, Veronica biloba, Vulpia sp., Zataria multiflora, Ziziphora tenuior.

SATUS OF CHILTAN WILD GOAT, *Capra aegagrus(falconeri) chialtanensis* Lydekker, 1913

The world population status of Chiltan Wild Goat (*Capra aegagrus Chialtanensis*) according to the IUCN Red Data Book was "vulnerable" (V) (Anon., 1988). That is, taxa believed and moved into the "endangered" category due to having a limited habitat and decreasing gradually its population.

Initial surveys of the status of Chiltan wild Goat (*Capra aegagrus chialtanensis*) were made in the early 1970s. In the absence of authentic data, C.M. Anderson (Dawn, Karachi, 8 August, 1970) guessed the population to be around 500. In November 1970, following some field work, Schaller and Mirza (1970) estimated the population of the Chiltan area at two hundred (107 animals were actually seen). Mirza (1975) did a follow up count over a fifteen day period in 1975 and counted 168 animals. He found that most animals were confined to the southern area of the range and that the adult males kept above 2,800 m in the most difficult terrain.

From 1980 to 1990 the goat surveys have normally been undertaken by untrained staff on foot walking in the Park or recorded from visual vantage points. They are not based on a sampling programme that will withstand statistical analysis, nor have aerial surveys been undertaken. The trend between 1979 and 1990, however, indicates that the goat population was increasing.

During various reconnaissance visits within the Park during the period of field work, bodies of two young goats were found in Ziarat nala (in October 1996) -presumably having fallen from the cliffs above. The body of an adult goat was found in Waisanghe in December 1996. It appears to have been shot.

POACHING:

Despite the fact that the National Park is an area in which no hunting should occur, it is a fact that it does still happen and the authors have evidenced the invaders entering with the guns in the certain habitat (Khulli area where the rich population was counted by the authors) from Chiltan side. The authors when staying at Chiltan, Forest Rest House during the field work in December, 1997, heard a shot fired in Bonap area at night, later

the signs shooting of a wild goat found spreading with blood on the surface. Everything was cleared from the spot as the information received that the poachers dropped the rescues at inaccessible ditch after separating the useful flesh. During 1992/93, the Marri tribe was accused of poaching Chiltan Wild Goat (*Capra aegagrus Chialtanensis*) within the Park (IUCN, 1993). In October 1996, a hunting incident was reported in the Daghari/Nali area in the west of the Park. In November 1996, it was alleged that four goats were shot in the Koh-i-Surkho area and one east of Lak Pass by hunters from Mastung. In this case, the goats were outside the Park boundaries, but they were almost certainly part of the population using the Park as its main refuge.

OTHER MAMMALS:

History indicates that several decades ago, before indiscriminate hunting destroyed all the herds, urial *(Ovis vignei blanfordi)* used to inhabit the area to the north of where the Park is now situated (Roberts, 1977). Today, there are no urial present though Shafiq (1984) reported that a few were still surviving on the western slopes in the early eighties. During the December 1996 wild goat survey a single wolf *(Canis lupis)* was seen by one of the survey teams above Ziarat nala. Many sightings of wolf footprints have also been recorded during our field work; the species is listed as vulnerable in Groombridge (1988).

Common Red Foxes *(Vulpes vulpes griffithi* Linnaeus) have been seen on a number of occasions throughout the field work; a den was also located where the fox bred and seen with its cubs near the dam, Chiltan, Asian Jackal (*Canis aureus* Linnaeus) – are common in the Park, but generally only seen at night. Striped Hyaena (*Hyaena hyaena* Linnaeus) – are also present on the south-west of the park on spreading and flattening slopes but may be few families.

Likewise, the population of the Indian Crested Porcupine (*Hystrix indica* Kerr) is thought to be considerable as evidenced by the large number of droppings and territorial marking points present in all the lower valleys to the middle layer of the park. This large population of porcupine suggests that the population of the wolf and jackal; the larger predators in the park are very low in numbers but there is a good combination of carnivores and herbivores – predator and prey.

Cape Hares (*Lepus capensis* Linnaeus) are presently common in the park as a useful source of food for many carnivores.

Some important mammals recorded in the habitat of Chiltan Wild Goat (*Capra Aegagrus chialtanensis*).

Migratory Hedgehog – *Hemiechinus hypomelas hypomelas* Brandt

- Afghan Hedgehog –*H. megalotis* Blyth
- Beech or Stone Marten -*Martes foina* Erxleben.
- Indian Wolf – *Canis lupus pallipes* Sykes
- Asiatic Jackal – *Canis aureus* Linnaeus

- Marbled Pole-cat -*Vormela peregusna alpherakii* Birula
- Libyan Jird -*M. libycus* Lichtenstein
- Striped Hyaena -*Hyaena hyaena* Linnaeus
- Afghan Pika or Collared Pika -*Ochotona rufescens* Gray
- Long-tailed Hamster -*Calomyscus baluchi* syn. *C. bailwardi* Thomas
- Persian Jird -*Meriones persicus* Blandford
- Sundevall's Jird or Swinhoe's Jird -*M. crassus* Sundevall

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