ISSN 0375-152X

RECORDS

ZOOLOGICAL SURVEY OF PAKISTAN

ZOOLOGICAL SURVEY
OF PAKISTAN

Volume XV

Zoological Survey Department
Government of Pakistan
Karachi, Pakistan
2004

Zoological Survey of Pakistan

This File is converted into PDF format on the burgeoning demand of online readers and it is made possible by the efforts of Director (Altaf Hussain Khuhro), Zoological Survey of Pakistan (ZSP), Ministry of Climate Change & Environmental Coordination, Government of Pakistan.

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

RECORDS

ZOOLOGICAL SURVEY

OF

PAKISTAN

Volume XV

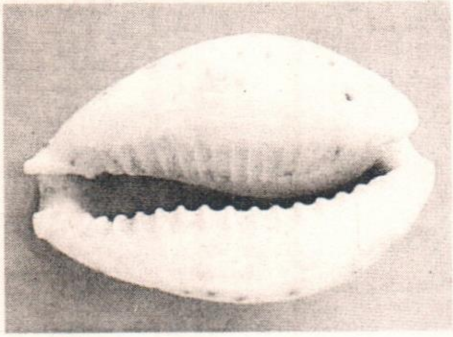
Edited and Published

By

Director
Zoological Survey of Pakistan, Government of Pakistan
Block 61, Pakistan Secretariat, Shahrah-e-Iraq
Karachi 74200, Pakistan

March 2004

Citation: *Rec. Zool. Surv. Pakistan*



Cover : *Cypraea turdus*. A common cowry of Pakistan coast. A paper entitled "Record of Juvenile Stages of *Cypraea turdus* Lamarck 1810 from Karachi Coast" by Fahmida Iffat on Page No.52.

RECORDS ZOOLOGICAL SURVEY OF PAKISTAN

Table of Contents

Volume 15 2004

Rec. Zool. Surv. Pakistan Vol. XV. PP. 1-6, 2004.

On the Distribution of Punjab Urial (*Ovis vignei punjabiensis*)

Ghulam Ali Awan, Tahira Ahmad, Salman Ashraf

Environmental Biology. Department of Biological Sciences. Quaid-i-Azam University. Islamabad 45320. Pakistan (GAA & TA) and GIS lab WWF-Pakistan. P. O. Box 5180. Lahore. Pakistan (SA)

Abstract

The Punjab urial (*Ovis vignei punjabiensis*) is endemic to northern Punjab. Pakistan and is currently classified as endangered in the IUCN (2003) Red Data Book for mammals. The aim of this study was to describe the current distribution of Punjab urial in Salt and Kala Chitta Ranges. This animal once occupied mountainous terrain throughout northern Punjab. however. due to a combination of un-sustainable subsistence and recreational hunting. lamb capture. habitat alteration and disease its population has greatly been reduced to an estimated total of about 1,000 heads inhabiting less than one-third of their original range.

Keywords: Punjab urial. *Ovis vignei punjabiensis*. Kala Chitta. Salt Range. distribution.

Introduction

The Punjab urial (*Ovis vignei punjabiensis*) is endemic to northern Punjab. Pakistan and is currently classified as endangered (IUCN. 2003). Apart from its trophy value in sport hunting. it is also traditionally prized as a pet by animal collectors. The Punjab urial is the principal mammalian game species of the scrub forest in Salt and Kala Chitta Ranges (Aleem 1977. Mirza *et al.* 1980. Chaudhry *et al.* 1988). In the Salt Range and the low hill tracts in southern NWFP it is typically associated with lower rounded stony hills sparsely covered with wild olive (*Olea ferruginea*) and phulai (*Acacia modesta*) (Roberts 1997). The distribution of the subspecies in Pakistan is between the Indus and Jhelum rivers at elevations of 250 -1,500 m. The taxonomic status of the urial population living along the west (right) bank of the Indus River is uncertain (Schaller and Mirza 1974. Frisina *et al.* 2001).

The first documented record of Punjab urial in Salt Range occurred in 1621. by emperor Noor-ud-Din Muhammad Jehangir. who hunted urial near the River Jhelum (Quddussi 1970). Punjab urial is known to have a restricted distribution range and found only in the Salt and Kala Chitta Mountain Ranges and is confined by a coniferous forest belt in the north the Jhelum River in the east and south and Indus River in the west (Schaller and Mirza 1974. Schaller 1977). Schaller (1977) suggested that the animal must have immigrated from the west. a herd perhaps crossing the Indus at a time when landslides temporarily dammed the river in the mountains. It formerly was distributed throughout these mountains. but it underwent a substantial decline in the twentieth century. By the early 2000s the greatest concentration occurred within the Salt Range. mainly at Kalabagh in the western extremity near the River Indus.

There is no way to know precisely the historic population size. Reports from expeditions. naturalists. and hunters to the region in the early 1900s (Lydekker 1913. Burton 1920. Stockley 1922. Mounfort 1969) suggest that urials were once plentiful in the mountains of northern Punjab. but no figure has ever been given. Schaller (1977) gave quantitative figure and depicted that the world population of this subspecies may not exceed 2,000 animals. Mirza et al (1980) estimated 2,157 animals in the total range. Currently the Kalabagh Game Reserve supporting almost 50% population of the Punjab urial. Few assessments of Punjab urial status have been conducted. With the exception of observations made by Mountfort (1969). Schaller and Mirza (1974). Schaller (1977). Chaudhry *et al* (1988) and Mirza *et al.* (1980). virtually nothing is known about this species (Edge and Olson-Edge 1987).

For the effective management of a species or population. Rubin *et al.* (1998) stressed for the need of accurate knowledge of its spatial distribution. With this aim. present study to describe the current distribution of Punjab urial in Salt and Kala Chitta Ranges was conducted.

Materials and Methods

The Salt Range area was surveyed twice per year in April and December from 1999 to 2001 to obtain data on urial distribution and abundance. All surveys were conducted on foot and urial observations were made from ridges and in ravines in the early morning and evening. using high magnification spotting scopes and binoculars. When an urial herd was located the number of individuals was counted. Presence or absence of urial was confirmed from direct (sightings) or indirect (pellets and foot prints) evidences. The distribution study in Kala Chitta Range was based on short surveys (one week for the whole range) conducted at three locations. Locations of the evidences or sightings were recorded with the help of a GPS. In addition. the above-mentioned two methods were employed to collect information about urial distribution.

Published data and official reports were reviewed to summarize the distribution of Punjab urial. Questionnaires were sent to district wildlife officers of the Salt and Kala Chitta ranges and to hunting associations. Sixty five professional hunters. about one hundred livestock shepherds (aged approximately 45 years and older) were interviewed from 1999 to 2001 to gather anecdotal information on urial distribution and status.

Areas of suitable habitat for urial were identified using a geo-rectified September 2001 landsat-7 image of the study area and then surveyed to record presence or absence of urial. The Punjab urial range was determined by plotting all sightings from the literature and those collected by this study during 1999 -- 2001. The probable distribution of Punjab urial was plotted based on locations and geographic features that were considered barriers to dispersal (e.g. Indus River). Because Schaller and Mirza (1974) suggested that the taxonomic status of urial living along the west bank of the Indus River is uncertain. this estimated distribution should be viewed as conservative.

The position of all evidences of presence of the animal were recorded using Garmin III GPS receivers. These locations (waypoints) were later converted into geographic information system (GIS) as shape files. and were displayed over Landsat-7 satellite data using ESRI's ArcView ver. 3.1 software with Image Analysis module. A five kilometer buffer was established around each waypoint. Using visual interpretation from Landsat-7 data. these buffer regions were further modified by excluding clearly unsuitable habitat such as flat plains and agricultural land. Thus. 13 populations were mapped in the Salt Range and their ranges were calculated using GIS.

Results

During this investigation 867 direct observations of urial were made. These observations revealed that the distribution of urial was not continuous in the Salt and Kala Chitta Ranges. Observed discontinuities resulted in the fifteen small. scattered populations in the range of distribution of this subspecies (Fig 1): (1) Bagh Nelab area. (2) Akhori. (3) Kalabagh Game Reserve. (4) K. garden and Thoa. (5) Sodhi Wildlife Sanctuary. (6) R. Wasnal. (7) Nillawahan. (8) Sardi and M2. (9) Chhumbi Surla Wildlife Sanctuary. (10) Gharibwal. (11) Jalalpur Sharif Wildlife Sanctuary. (12) Tilla. (13) Nilli and Phadial. (14) Taraki. (15) Lehri and (16) Makhad Sharif on River Indus. with major concentration in the Kalabagh Game Reserve. Only one population has more than 300 animals and only 2 populations have ≥80 animals. Currently urial occupy an estimated 1.265 km² in the Salt Range. supporting about 80% (860) urial population.

Distribution of Punjab Urial

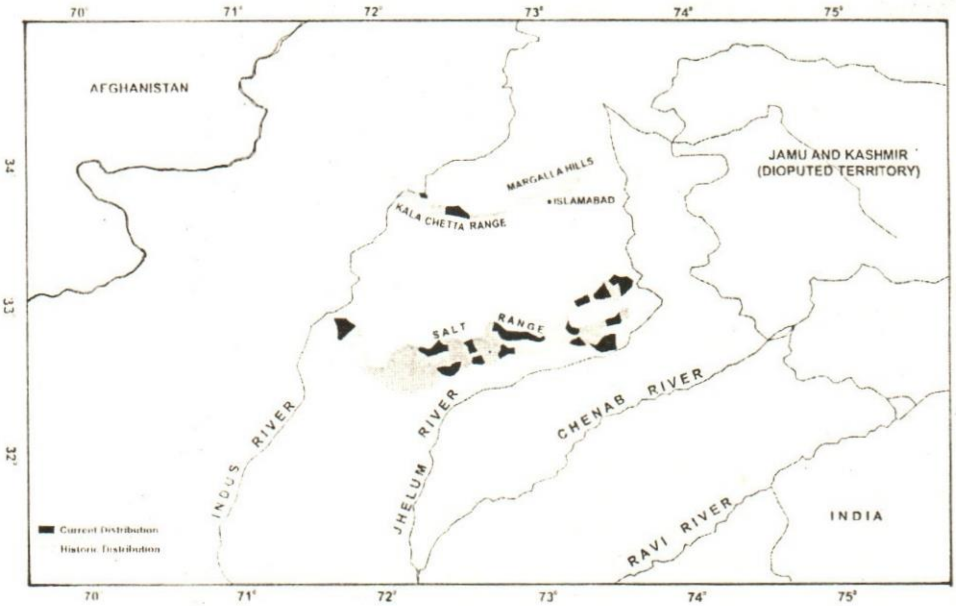


Fig. 1. Total estimated distribution of Punjab urial (*Ovis vignei punjabiensis*) based on the results of field surveys conducted in 1999 – 2002.

Figure 1 illustrates the current estimated range and the historical distribution of Punjab urial at the beginning of the twentieth century. Punjab urial were mostly observed at sites with in low hills or on undulating ground deeply intersected with narrow gullies and ravines, knife edges or ridges of red marl, against which their foxy red coats are hardly visible, except at close quarters.

Historically the range of distribution of Punjab urial included the Margalla Hills Range, Kala Chitta Range, Khair-i- Murat Range and Salt Range (Table I). Our review of all historical evidence of presence suggests that a minimum of two populations of Punjab urial have been extirpated (Table II).

Table I. Historic Range of the Punjab urial.

Locality	**Approximate Area (km²)**
Margalla Hills Range	436.86
Kala Chitta Range	321.65
Kheri Murat Hills	50.40
Salt Range	4334.40
Total Range	**5143.31**

Table II. Punjab urial populations lost in Pakistan since 1935.

Population lost (evidence of loss)	Evidence of existence
Margalla Hills. IUCN (1992). Present study	Burton (1920). GOP (1968). Roberts (1966)
Kheri Murat Hills. Roberts (1997). Present study	GOP (1968). Roberts (1966)

The Salt Range constitutes almost 84% of Punjab urial historic range. but the area used by urials within the Salt Range has declined by about 70% from the historic range. Over the entire range of distribution. we estimate a decline of 73% in area of occupancy.

Discussion

This investigation yielded a decline of more than 70% in the range of distribution and of almost 50% in numbers. This calculated high rate of decrease in range is mostly due to the fact that the large valleys amounting to approximately 1.000 km² were once freely used by urial for inter mountain movements but are now occupied by relatively dense human populations and have largely been converted to agricultural use. Human settlement in the valleys has rendered most of them unsuitable as urial habitat. Many authors (Geist 1971. Bleich *et al.* 1990) highlighted the importance of availability of areas within mountain ranges for long- term survival of mountain sheep. The decline in distribution apparently accelerated with increasing fragmentation of the surviving urial population due to more extensive cultivation. construction of new roads and other human development within the urial range.

This investigation concluded that urial in the Salt and Kala Chitta Ranges exhibited a fragmented distribution and that ≥15 populations existed as a result of this fragmentation. These populations have been forced in to the most isolated portions as isolated remnant populations of questionable viability. separated from former ranges by highways. fences and residential areas. Berger (1990) and Krausman *et al.* (1999) suggested that mountain sheep populations fewer than 50 individuals may be susceptible to extinction. Rubin *et al.* (1998) suggested for bighorn sheep that fragmentation is typically seen as detrimental to population viability in the long run. but a certain degree of fragmentation is an inherent component of population structure.

According to Hess *et al.* (1997) Punjab urial are found as small scattered populations throughout the Kala Chitta and Salt Range. Several factors increase in poaching. grazing pressure. natural resources exploitation. pet trade (Awan 2001) construction of roads and use of off- road vehicles. the loss of habitat to urban development and agriculture coupled with reduced law enforcement and major social changes has resulted in reduction in number and range. Similar factors were identified by Valdez *et al.* (1995) in reduction in numbers and range of wildlife in Mongolia.

Over the last decades. intermountain valleys and foothill areas reduced in Pakistan due to urban development and agriculture and this process is still going on. This may have serious consequences on populations of urial as well as on entire ecosystem in Salt Range.

References

Aleem. A.. 1977. Punjab urial in Chak Jabbi area- Kala Chitta Range. Pakistan J. For..27: 130-138.

Awan. G. A.. 2001. Pet trade threatened endangered urial. Caprinae. Newsletter. IUCN. Caprinae Specialist Group (CSG). Canada.

Berger. J.. 1990. Persistence of different sized populations: an empirical assessment of rapid extinctions in bighorn sheep. Cons. Biol. 4: 91-98

Bleich. V. C.. Wehausen J. D. and Holl. S. A.. 1990. Desert-dwelling mountain sheep: conservation implications of a naturally fragmented distribution. Cons.. Biol. 4: 383-390.

Burton. R. W.. 1920. A few days after urial of the Punjab. J.. Bomb. Nat. Hist. Soc.. 30: 838-845.

Chaudhry. A. A... Umeed. K. and Chaudhry. S. A.. 1988. Urial population in the Punjab. Proc. 8th Pakistan Conger. Zool.. 8:201-204.

Douglas. C. L. and Lesilie. D. M.. 1999. Management of bighorn sheep. In: Mountain sheep of North America (eds. Valdez. R.. and Krausman. P. R.). University of Arizona Press Tucson Pp. 78- 138.

Edge. W. D And Oslon-Edge. S. L. 1987. Ecology of wild goats and urial in Khirthar National Park. Pakistan. Final report. Montana Cooperative Wildlife Research Unit. University of Montana USA.

Geist. V. 1971. Mountain sheep: A Study in Behaviour and Evolution.. University of Chicago Press. Chicago.

Government of Pakistan. 1968. A Guide to West Pakistan Hunting. West Pakistan Forest Department.

Frisina. M. R.. Woodford. M.. and Awan. G. A.. 2001. Status of the Punjab urial (*Ovis vignei punjabiensis*) Population in the Kalabagh. Salt Range of Punjab Province. Pakistan. United States Fish and Wildlife Service Division of International Conservation and WWF-Pakistan.

Hess. R. K.. Bollman. K.. Rasool. G.. Chaudhry. A. A.. Virk A. T. and Ahmad. A.. 1997. Indo-Himalayan Region. 8.5 Pakistan. In: Wild sheep and goats and their relatives. (ed. Shackleton D. M.) IUCN/SSC Caprinae Specialist Group. Gland Switzerland. Pp. 239-260

IUCN. 1992. Margalla Hills National Park Management Plan. for Government of Pakistan. IUCN

IUCN. 2003. Red Data Book For Mammals. IUCN: Gland Switzerland.

Krausman. P. R.. Valdez. R. and Bissonette. J. A.. 1996. Bighorn Sheep and Livestock. In: Rangeland Wildlife. (ed Krausman. P. R.) Society for Range Manage. Denver. Colarado. Pp. 237-243.

Lydekker. R. 1913. Catalogue of the Ungulate Mammals in the British Museum. Vol. 1. British Museum. London.

Mirza. Z. B.. Aslam. M.. Asghar. M.. and. Mehal. A. Q.. 1980. Distribution. status. habitat and food of the urial in the Punjab. J. Bomb. Nat. Hist. Soc. 76: 423 - 430.

Mountfort. G.. 1969.The Vanishing Jungle. Collins. London.

Quddussi. E. 1970. Tauzik-i-Jehangiri. Majlasia tarraki Adab. Lahore.

Roberts. T. J. 1966. A note on the urial. J. Bomb. Nat. Hist. Society. 63: 743-746.

Roberts. T. J. 1997. The Mammals of Pakistan. Oxford University Press. Karachi.

Rubin. E. S.. Boyce. W. M.. Jorgensen. M. C.. Torres. S. G.. Hayes. C. L.. O'brien. C. S.. and Jessup. D. A.. 1998. Distribution and abundance of bighorn sheep in the Peninsular Ranges. Calif. Wildl. Soc. Bull. 26:539-551.

Schaller. G. B. 1977. Mountain Monarchs-Wild Sheep and Goats of the Himalaya. University of Chicago Press. Chicago

Schaller. G. B.. and Mirza. Z. B.. 1974. On the behaviour of Punjab urial *(Ovis orientalis punjabiensis)*. In: The Behaviour of Ungulates and its Relation to Management Vol. 1 (eds..???????). IUCN. Morges. Switzerland Pp. 306-312.

Stockley. C. H. 1922. Notes on oorial. J. Bomb. Nat. Hist. Soc. 28: 1126-1128.

Valdez. R.. Frisina. M. R. and Buyandelger. U.. 1995. Wildlife conservation and management in Mongolia. Wildl. Soc. Bull. 23: 640-645.

Rec. Zool. Surv. Pakistan Vol. XV. PP. 7-15, 2004.

Avifaunal Diversity of Hingol National Park

Mirza Muhammad Azam
Zoological Survey Department. Karachi

Abstract

Hingol National Park is one of the largest protected areas having a blend of versatile habitats. Biodiversity of the park was studied during 1999 to 2002. Present paper deals with the avifauna of the park. A total of 105 species belonging to 68 genera. 37 families and 14 orders were recorded from the area. Status and habitat preferences of the species were also studies.

Keyword: Hingol National Park. avifauna. *Falco concolar,*

Introduction

Owing to its biodiversity and versatile habitat types. Hingol National Park may be considered as one of the most important protected areas of Pakistan. It is the only national park of the country which is represented by most diversified habitats i.e. coastline. river. estuary. riverine forest. scrub. hills and desert. The park. thus have well diversified fauna of marine. freshwater and terrestrial ecosystem. The park is characterized in having some vulnerable and rare species of vertebrates such as Sindh wild goat (*Capra aegagrus*). urial (*Ovis vignei*). Indian gazelle (*Gazella bennettii*). marsh crocodile (*Crocodylus palustris*). mahsheer (*Tor putitora*). flamingo (*Phoenicopterus rubber*). wintering Dalmatian pelican (*Pelicanus sp.*) etc. The park has the potential to be developed as Tourist Spots because of its beautiful coast. sacred shrines and mud volcanoes.

Hingol National Park is situated 250 km to the northwest of Karachi in Balochistan province. It is spread over 6,000 square km (619,049 hectares). It extends over 3 districts viz. Lasbella. Gwadar and Awaran. It was designated as a national park in 1988. The park has long stretch along the coastline on its southern boundary. Most of the areas of the park are hilly with valleys some of which have a few agriculture fields. In the southern parts of the park there is a desert between seacoast and hills. The different habitat types of the National Park include:

Coastline: Arabian Sea. including the area bordering national park. is known to be highly productive. A large diversity of invertebrates and vertebrates is found at coastal area. Breeding of green turtle is reported from the coastline. A variety of water birds occurs at the coast line.

River: River Hingol traverse from north to south through the park before falling in the Arabian Sea at Poti Bundar. Marsh crocodile. golden mahseer and a diversity of waterbirds and other fishes are known to be occurring at the river.

Estuarine area: Estuarine area of the River Hingol. though very small in size. supports a variety of wintering and resident waterfowl and fish species.

(Riverine Flood Plain: There is a large area along the river bank which gets inundated during rains which is followed by flashflood. The riverine floodplains are thickly covered by vegetation such as *Tamarix spp.* and *Acacia spp.* The forest provides shelter to a number of wildlife species specially mammals. The important among them are Indian gazelles. jackals. fox. hares. porcupines and hedgehogs. A variety of bird species also occur in the floodplains.

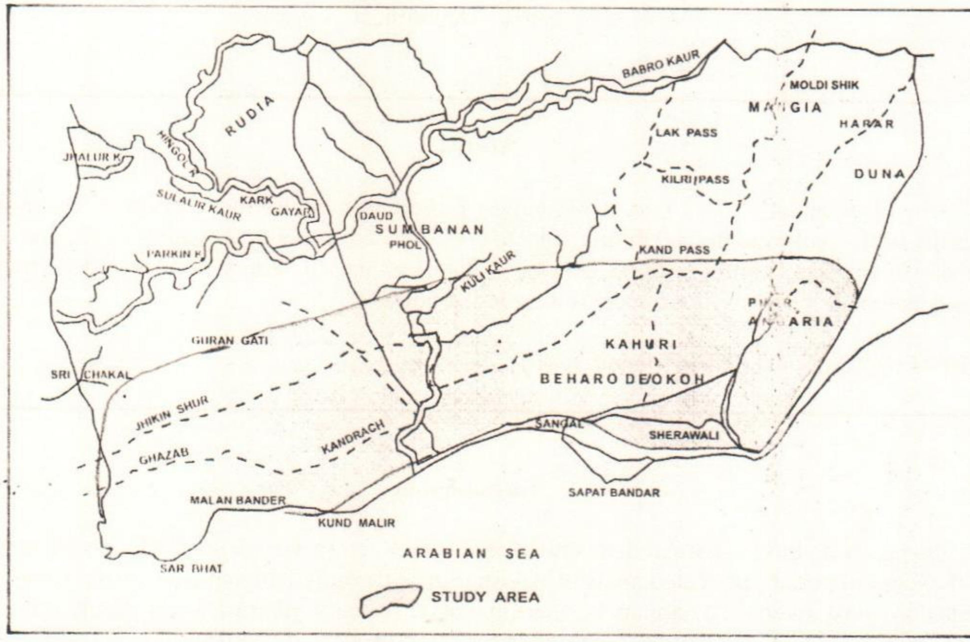


Fig. 1. Hingol National Park

Hills and Rocky slopes: A major part of the national park is hilly which support sparse vegetation of *Salvadora oleoides, Capparis aphylla, Euphorbia* etc. especially on slopes. A large variety of wildlife including mammals. birds and reptiles occur in these hills.

Valleys: There are a number of plain valleys between hills in the national park. In some of these valleys there are some agriculture fields whereas most of the area is partially barren. Trees of *Acacia spp.* and *Ziziphus spp.* are common in these valleys. Indian gazelle is known to occur in some of these valleys.

Desert with Sand Dunes: Adjacent to coastline there is large desert with prominent sand dunes. These sand dunes may be categorized as stable or fixed sand dunes (connected with the upper margin of the beach there are large fixed sand dunes). unstable mobile sand dunes (adjacent to the fixed sand dunes is a vast area occupied by mobile sand dunes) and salt bushes covered dunes (following mobile sand dunes vast area of land is occupied by salt bush covering small dunes). Salt bushes include *Sueda fruiticosa* and *Salsola spp.* and are quite common in the area. The desert area is observed to a well diversified bioata including reptiles. small mammals and birds etc. Indian gazelles are found in the sand dunes. Occurrence of houbara bustard in winter is reported from the dune areas.

A number of workers have contributed in the studies of avifauna of Balochistan province. Meinertzhagen (1914. 1920) have described bird from Quetta. Robert (1990. 1991) in their monumental work on the birds of Pakistan also covered avifauna of the area. Ticehurst (1926.1927) have studied the bird fauna of Balochistan including some specimens from River Hingol valleys. Ahmed *et al* (1997) conducted studies on the waterfowls of Mekran coast and recorded 70 species from the area. Ghalib and Hasnain (1995) studied avifauna of the mangroves of Balochistan coast and listed 83 species.

Considering importance of the park, a study was conducted to assess its biodiversity and study ecology of the park. The present paper which is part of this study deals with avifauna of the area.

Material and Methods

During present surveys southern part of the national park was studied. Areas adjacent to Agor, Poti Bundar, Sapat, Hinglaj, Kund Malir, Ras Malan and Buzi Pass were surveyed during the study. The study area was visited in different seasons including summer, winter and spring during 1999 to 2002. Binoculars and spotting scope were used for identification of birds in the field. Identification of the birds were made by using different field guides including Heinzel *et al*. (1972) and King *et al* (1972). Population of waterfowl was counted by direct observations whereas abundance of terrestrial species was studied by transect method.

Results and Discussions

During studies 108 species belonging to 68 genera 37 families and 14 orders were recorded from the area(Table-I). The avifauna fauna was observed to be a combination of avian species found in different habitat types including coast, freshwater wetlands, desert and hills.

Waterfowl have higher concentration at estuarine area. Charadriiformes were found with abundance while only 3 species of Anatides were seen in very small numbers. Charadriiformes are also abundant at Ras Malan and adjacent areas. Species of gulls and terns commonly occurring in the area include *Larus ridibundus, Larus genei, Larus argentatus, Larus fuscus, Gelochelidan nilotica, Sterna caspica, Sterna albifrons* and *Chiledonias hybridius*. Among waders, *Numenius arquata, Tringa totanus, Tringa nebularia, Tringa ochoropus* and *Tringa glareola* were observed to be common. Terrestrial species such as *Nectarina asiatica, Stroptepelia spp.* and warblers were common in valleys while larks and shrikes are relatively more numerous in desert area.

A number of rare species were found occurring in the area of the park. These include *Esacus recurvirostris, Ciconia ciconia, Ciconia nigra, Pelecanis crispus, Pelecanus onocratolus, Pluvialus dominca, Phoencepterus rubes, Falco conceles* and *Tadorna tadorna*. Occurrence of *Pelecanis crispus, Pelecanus oncrotalus* and *Phoenochpteus raber* in substantially large number was noticeable in the area. A small population of *Esacus recurvirostris* was found to be resident of the area usually along the margins of the rivers

Occurrence of *Falco concoar* is also notable. According to Roberts (1990) this species occurs as a summer breeder along the Mekran coast probably at Ormara and westwards. The species was neither recorded by Christison (1943) in northern Balochistan nor by Ghalib and Hasnain (1999) from Cape Monze. During present study it was recoded in the park which indicates its possible eastern occurrence range. *Ciconia ciconia* had been recorded from northern Balochistan (Meinertzhagen, 1920), lower Sind (Ticehaurst, 1923) and Punjab (Azam, 1994) but it was not recorded previously from southern Balochistan. During present studies a solitary bird was seen in March, 2000 at Hingol River. *Ciconia nigra* which is also an extremely rare species was also observed at Hingol river in March 2000. Occurrence of *Pluvalis domainica* was also noteworthy as the species has been recorded mainly from Karachi and Thatta districts in past.

According to Roberts (1991) *Nectarinia asiatica* is largely absent from Balochistan. Contrary to this during present studies this was observed to be one of the common species found in the valleys of the park.

TABLE-I. Checklist of birds of Hingol National Park.

	SPECIES	COMMON NAME	RESIDENCE	STATUS
ORDER	PODICIPEDIFORMES			
FAMILY	PODICIPEDIDAE			
	Podiceps nigricollis	Black-necked Grebe	Winter visitor	Rare
ORDER	PELECANIFORMES			
FAMILY	PHALACROCARACIDAE			
	Phalacrocorax carbo	Great Cormorant	Resident	Rare
	P. niger	Little Cormorant	Resident	Common
FAMILY	PELECANIDAE			
	Pelecanus onocrotalus	White or Rosy Pelican	Winter visitor	Common
	Pelecanus crispus	Dalmatian Pelican	Winter visitor	Rare
ORDER	CICONIFORMES			
FAMILY	ARDEIDAE			
	Ardeola grayii	Pond Heron	Resident.	Common
	Bubulcus ibis	Cattle Egret	Resident	Rare
	Egretta gularis	Reef Heron	Resident	Rare
	Egretta garzetta	Little Egret	Resident	Common
	Egretta intermedia	Intermediate Egret	Resident	Common
	Egretta alba	Large Egret	Resident	Common
	Ardea cinerea	Grey Heron	Winter visitor	Common
	Ardea purpurea	Purple Heron	Resident	Common
FAMILY	CICONIIDAE			
	Ciconia nigra	Black Stork	Winter visitor	Straggler
	Ciconia ciconia	White Stork	Winter visitor	Straggler
FAMILY	THRESKIORNITHIDAE			
	Platalea leucoria	Spoonbill	Winter visitor	Common
ORDER	PHOENICOPTERIFORMEA			
FAMILY	PHOENICOPTERIDAE			
	Phoenicopterus roseus	Greater Flamingo	Resident	Common

Avifauna of Hingol National Park.

ORDER	ANSERIFORMES			
FAMILY	ANATIDAE			
	Tadorna ferruginea	Shelduck	Winter visitor	Rare
	Anas crecca	Common Teal	Winter visitor	Rare
	Anas clypeata	Shoveller	Winter visitor	Rare
ORDER	ACCIPITERIFORMES			
FAMILY	ACCIPITRIDAE			
	Haliaeetus leucoryphus	Ring-tailed Fish Eagle	Resident	Rare
	Aquila heliaca	Imperial Eagle	Winter visitor	Rare
	Accipiter badius	Sparrow Hawk	Resident	Rare
	Circus aeruginosus	Marsh Harrier	Winter visitor	Rare
	Neophron persnopterus	Egyptian Vulture	Resident	Rare
FAMILY	PANDIONIDAE			
	Pandion haliaetus	Osprey	Winter visitor	Rare
ORDER	FALCONIFORMES			
FAMILY	FALCONIDAE			
	Falco tinnunculus	Eurasian Kestrel	Resident	Rare
	Falco concolor	Sooty Falcon	Resident	Rare
	Falco jugger	Lagger Falcon	Resident	Rare
ORDER	GALLIFORMES			
FAMILY	PHASIANIDAE			
	Francolinus pondicerianus	Grey Partridge	Resident	Common
	Ammoperdix griseogularis	See See Partridge	Resident	Common
ORDER	GRUIFORMES			
FAMILY	RALLIDAE			
	Fulica atra	Coot	Winter. visitor	Common
ORDER	CHARADRIIFORMES			
FAMILY	HAEMATOPODIDAE			
	Haematopus ostralegus	Oystercatcher	Resident	Rare
FAMILY	RECURVIROSTRIDAE			
	Himantopus himantopus	Black winged Stilt	Resident	Common
	Recurvirostra avocetta	Avocet	Winter visitor	Rare
FAMILY	DROMADIDAE			
	Dromas ardeola	Crab Plover	Wintr visitor. rare	Rare
FAMILY	BURHINIDAE			
	Esacus recurvirostris	Stone Plover	Resident. rare	Rare

FAMILY CHARADRIIDAE

Charadrius dubius	Little Ringed Plover	Winter visitor	Common
C. hiaticula	Common Ringed Plover	Winter visitor	Common
C. alexandrinus	Kentish Plover	Winter visitor	Rare
Pluvialis apricaria	Golden Plover	Winter visitor	Occasional
Pluvialis Squaturola	Grey Plover	Winter visitor	Occasional
Hoplopterus malabaricus	Yellow wattled Lapwing	Resident	Rare
H. indicus	Red-wattled Lapwing	Winter visitor	Common
Chettusia gregaria	Sociable Plover		Occasional
Chettusia leucura	White-tailed Lapwing		Common

FAMILY SCOLOPACIDAE

Calidris minuta	Little Stint	Winter visitor	Common
C. temminckii	Temminck's Stint	Winter visitor	Rare
C. alpina	Dunlin	Winter visitor	Common
Limicola falcinellus	Broad billed Sandpiper	Winter visitor	Rare
Gallinago	Common Snipe	Winter visitor	Rare
Limosa lappanica	Bar-tailed Godwit	Winter visitor	Common
Numenius phaeopus	Whimbrel	Winter visitor	Common
N. arquata	Eurasian Curlew	Winter visitor	Rare
Tringa totanus	Redshank	Winter visitor	Rare
Tringa stagnatilis	Marsh Sandpiper	Winter visitor	Common
T. nebularia	Common Green Shank	Winter visitor	Common
T. ochropus	Green Sandpiper		
T. glareola	Yellow Wood Sandpiper	Winter visitor	Rare
Xenus cinereus	Terek Sandpiper		
Actitis hypoleucos	Common Sandpipers	Winter visitor	Common

FAMILY LARIDAE

Larus ricdibundus	Common Black-headed Gull	Winter visitor.	Common
Larus brunnicephalus	Brown headed Gull	Winter visitor	Common
Larus genei	Slender billed Gull	Resident	Common
Larus argentatus	Herring Gull	Winter Visitor	Common
Larus fuscus	Black-backed Gull	Winter Visitor	Common

FAMILY STERNIDAE

Gelochelidon nilotica	Gull-billed Tern	Resident	Common
Sterna caspia	Caspian Tern	Resident	Common
Sterna sandvicensis	Sandwich Tern	Resident	Common
Sterna hirundo	Common Tern	Winter visitor	Common
Sterna albifrons	Little Tern	Resident	Common
Chlidonias hybridus	Whiskered Tern	Resident	Common

ORDER PTEROCLIDIFORMES
FAMILY PTEROCLIDIDAE

Pterocles exustus	Chestnut bellied Sandgrouse	Resident	Rare
Pterocles orientalis	Imperial Sandgrouse	Resident	Rare

ORDER COLUMBIFORMES
FAMILY COLUMBIDAE

Streptopelia decaocto	Collared Dove	Resident	Common
Streptopelia senegalensis	Little Brown Dove	Resident	Common

ORDER CAPRIMULGIFORMES
FAMILY CAPRIMULGIDAE

Caprimulgus aegyptius	Egyptian Nightjar	Resident	Common

ORDER CORACIIFORMES
FAMILY ALCEDINIDAE

Halcyon smyrnensis	White-throated Kingfisher	Resident	Common
Alcedo atthis	Small Blue Kingfisher	Resident	Common

FAMILY MEROPIDAE

Merops orientalis	Little Green Bee-eater	Resident	Common
M. superciliosus	Blue-cheeked Bee-eater	Resident	Common

FAMILY CORACIIDAE

Coracias bengalensis	Indian Roller	Resident	Rare

FAMILY UPUPIDAE

Upupa epops	Hoopoe	Winter visitor	Rare

ORDER PASSERIFORMES
FAMILY ALAUDIDAE

Eremopterix grisea	Ashy crowned Finch Lark	Resident	Commom
Galerida cristata	Crested Lark	Resident	Common
Ammomanes deserti	Desert Lark	Resident	Uncommon

FAMILY HIRUNDINIDAE

Riparia riparia	Collared Sand Martin	Winter visitor	Common

FAMILY MOTACILLEDAE

Motacilla cineria	Grey Wagtail	Winter visitor	Common
M. alba	White Wagtail	Winter visitor	Common

FAMILY PYCNONOTIDAE

Pycnonotus leucogenys	White-cheeked Bulbul	Resident	Common
P. cafer	Red vented Bulbul	Resident	Rare

FAMILY	TURDIDAE			
	Saxicola tarquata	Collard Bush Chat	Resident	Rare
	Oenanthe isabellina	Isabellin Wheatear	Winter visitor	Rare
	Oenanthe deserti	Desert Wheatear	Winter visitor	Rare
	Oenanthe monacha	Hooded Wheatear	Resident	Rare
	Saxicoloides fulicata	Indian Robin	Resident	Common
FAMILY	SYLVIIDAE			
	Prinia buchanani	Wren Warbler	Resident	Common
	Orthotomus sutorius	Common Tailor Burei	Resident	Rare
	Sylvia nana	Desert Warbler	Winter visitor	Common
	Sylvia curruca	Lesser White throat	Resident	Rare
FAMILY	NECTARINIDAE			
	Nectarinia asiatica	Purple Sunbird	Resident	Common
FAMILY	LANIIDAE			
	Lanius vittatus	Bay-backed Shrike	Resident	Common
	Lanius excubitor	Grey Shrike	Resident	Common
FAMILY	STURNIDAE			
	Acridotheris iristic	Indian Myna	Resident	Common
FAMILY	PASSERIDAE			
	Passer domesticus	House Sparrow	Resident	Common

References

Azam, M.M., 1994 The Birds of the Salt Range. Rec. Zool. Surv. Pakistan 12: 63-95.

Chirstison, A.F.P., 1940 Handbook of Birds of Northern Balochistan D.H.O.Press, Quetta.

Chistison, A.F.P., 1942 Some additional notes on the distribution of the avifauna of northern Balochistan. J. Bomb. Nat. Hist. Soc. 43: 478-487.

Ghalib, S.A. and Hasnain, S.A. 1996 Avifauna of the mangroves of Balochistan. In: Biodiversity of Pakistan (Mufti, S. A., Wood, C. A. and Hasan, S. A., eds.). Pakistan Museum of Natural History, Islamabad and Florida Museum of Natatural History, Florida Pp 423-428.

Ghalib, S.A. and Hasnain, S.A. 1997 Observation on the birds of Cape Monze (mouth of Hub River and Sonehri Area), Karachi. Pakistan J. Zool. 29: 287-291

Heinzel, H., Fitter, R., and Parslow, J., 1972. The Birds of Britian and Europe with North Africa and Middle East. Collins, London

King. B., Woodcock. M. T., and Passlow. J., 1972 A Field Guide to the Birds of Southeast Asia. Collins. London

Meinerlzhagen. R., 1914 The Birds Nesting at Quetta. J. Bomb. Nat. Hist. Soc. 23: 362-366.

Meinerlzhagen. R., 1920 The birds of Quetta. Ibis. 132-195.

Roberts. T.J., 1990. The Birds of Pakistan. Vol. 1. Non-Passiriformes Oxford University Press. Karachi.

Roberts. T.J., 1991. The Birds of Pakistan. Vol. 2. Passiriformes Oxford University Press. Karachi.

Ticehurst. C.B., 1923 The Birds of Sind. Ibis. 5:235-275.

Ticehurst. C.B. 1926., The birds of British Baluchistan. Part 1. J. Bomb. Nat. Hist. Soc. 31: 681-711.

Ticehurst. C.B. 1927a., The birds of British Baluchistan. Part 2. J. Bomb. Nat. Hist. Soc. 31: 862-881.

Ticehurst. C.B. 1927b., The birds of British Baluchistan. Part 1. J. Bomb. Nat. Hist. Soc. 32: 64-97.

Rec. Zool. Surv. Pakistan Vol. XV. PP. 16-21, 2004.

Some Observations on the Status of Birds and Fishes in the Nurruri Wetland, Badin, Sindh

Hamid Iqbal Javed and Abrarul Hasan
Zoological Survey Department
Karachi

Abstract

Nurruri wetland which is a Ramsar site is an important wetland and provide excellent habitat to a wide variety of birds and fishes. However. their population is dependent on the availability of freshwater which in some areas have completely been stopped. The paper describes changes in the population of migratory and resident birds observed due to changes in water regime in this important wetland of lower Sindh.

Keywords: Nurruri wetland. bird. fish fauna. scarcity of water.

Introduction

Nurruri is a coastal wetland which is located at 30 km south of Golarchi. District Badin in lower Sindh (Fig. 1). There is a large village i.e. Ahmad Rajo located on the north side of Nurruri wetland. The other important villages of the area are Goth Mehar. Bhugra. Memon Goth and Goth Amir Jamali. The reported area under water is estimated about 2.540 hectares. The lagoon was considered as an important wetland and declared a Ramsar wetland site. The Nurriri wetland is a combination of brackish coastal and inland lagoons and mudflats (www.wetlands.org).

It used to support an appreciable number of some important species particularly lesser flamingo (*Phoeniconaias minor*) and Dalmatian pelican (*Pelicanus crispus*). Surveys conducted between 1972 and 1990 revealed an average of 50.000 birds in any given year. with a highest recorded total of 114.700 birds in one season (www.wetlands.org). These birds are mainly species such as storks. snipes. crested terns. ducks and gulls. Because of severe drought in lower Sindh and cyclone in 1999 the water regime is completely changed in this lagoon. In addition. the freshwater supply to lagoon was completely stopped after the modification and deepening of Puleli/Guni outfall drain. This outfall drain which used to supply water to Nurruri wetland starts from Tando Mohammad Khan and carries drainage water into the sea. The other outfall drain Karo-Ghargro has also lost its importance due to the shortage of fresh water and sea water intrusion. Thus. the freshwater supply to the wetland through these two main sources has practically stopped. Nurruri wetland. thus. was a combination of several small pools fed by rain and drains which is now severely affected due to shortage of freshwater. Nurri lagoon is connected with Jubho. Pateji and Chobri wetlands: all are inter-connected and ultimately drain into a tidal link. (www.wetlands.org).

Prior to the stoppage of freshwater. this wetland was a refuge for migratory birds and breeding point for important resident species. Breeding of black winged stilts (*Himantopus himantopus*). little tern (*Sterna albifrons*). whiskered tern (*Chlidonais hybrida*). red wattled lapwing (*Vanellus indicus*). weaver bird (*Plucens manyar*). common mynah (*Acridotheres tristis*). bank mynah (*Acridotheres gingianus*). drongo (*Dicrurus adsimilis*). common blue kingfisher (*Alcedo atthis*). piedking fisher (*Ceryle rudis*). white breasted kingfisher (*Halcyon smyrnensis*). house crow (*Corvus splendens*) and sparrows were noted in the area in the previous studies (Ghalib *et al.*1999).

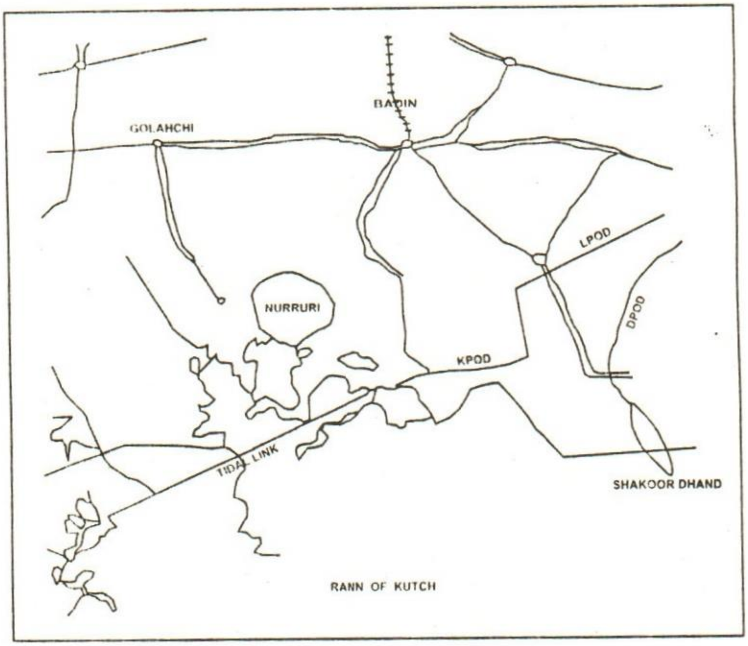


Fig. 1. Nurrari wetland

Materials and Methods

Sighting of birds were made through binoculars (8 x 40 and 7 x 35 mm) and telescope (15 x 60 x Swift Japan) and their further confirmation made following Heinzel *et al* (1977). Perrins and Attenborough (1987) and Roberts (1991. 1992). Fishes were collected by using cast net and gillnets. Also fishes caught by fishermen were also examined. Bianchi (1985) was used for identification of major species.

Results and Discussion

During the survey. several shallow pools of less than one feet depth were observed in the month of October. The salinity of these small pools was found to be less 2 o/oo. During November and again in December. these shallow pools were mostly drained out and are now dried. Most of the area of wetland is totally dried. Major vegetation includes salt bushes such as *Suaeda fruiticosa*, *Tamarix spp.* and *Salvadora spp.* In some areas clumps of *Typha* are also present. The appearance of salt bushes clearly indicates the scarcity of fresh water in the area.

Table-I present a list of species which were observed/recorded from Nurruri wetland during 1970's and 1990's. The Table also includes species presently found in the remaining portion of the wetlands and also in dry part of the wetland. During the present surveys it was noticed that the bird fauna which was found from Nurruri wetland in the area where Phuleli/Gunni Outfall Drain fall into the sea. is mostly inhabited by coastal birds. Table-I also enlists the birds observed in the dry area of Nurruri wetland.

The birds like painted stork and white pelican which were observed in survey done November and in December. However. the birds like common teal which was recorded in the first week of October was not found during the surveys of November or December. The birds like great crested grebe (*Podiceps nigricollis*). great white pelican (*Pelecanus oncrotalus*). Dalmatian pelican (*Pelecanus crispus*). white spoonbill (*Platalea leucordia*), greater flamingo (*Phoenicopterus rubber*), lesser flamingo (*Phoeniconaias minor*), common shelduck (*Tadorna tadorna*), wigeon (*Anas Penelope*), gadwall (*Anas strepera*), common teal (*Anas crecca*), mallard (*Anas phtyrhynchos*), northern pintail (*Anas acuta*), common pochard (*Aythya ferina*), tufted duck (*Anas fuligula*), and common coot (*Fulica atra*) which were in continuous recorded previously were not observed or found in very small number.

The complete disappearance of some birds or decline in numbers other is mainly due to scarcity of freshwater in the wetland. The deepening of Phuleli/Gunni outfall drain and severe drought in Sindh have deteriorated the water regime in this Ramsar site. Since the seawater has intruded in parts of the wetland their coastal species such as gulls and terns have appeared insubstantial numbers. The dry portion of the Nurruri were observed to be inhabited by reasonably large population of black partridges, babblers and prinias.

In October, the fish fauna of the small water pools in the Nurruri wetland was observed to be consisting of freshwater species such as *Labeo boga, Mystus gulio, Glossogobius giuris, Channa punctata* and *Oreochromis mossambica*. The fishes in the area where Phuleli/Gunni Outfall Drain enters into the sea were mostly coastal fishes such as *Nematalosa nasus, Sardinella longiceps, Sardinella sindensis, Strongylura strongylura, Cociella crocodile, Terapon jarbua, Sillago sihama, Leiognathus splendens, Pomadasys commersonni, Pomadasys maculatum, Acanthopagrus latus, Johnieops aneus, Scatophagus argus, Liza macrolepis, Liza parsia, Liza subviridis* and *Liza vaigiensis*.

Fishermen of the Nurruri area reported that several species of freshwater fishes were abundant in the wetland when freshwater was dominating in the wetland and provided livelihood to them but with the draining of the wetland and intrusion of seawater the wetlands is now inhabited by low priced marine species.

In Nurruri wetland area, porcupine (*Hystrix indica*), Asiatic jackal (*Canis aureus*) and red fox (*Vulpes vulpes pusilla*), Indian gerbill (*Tatera indica*), house mouse (*Mus musculus*), Balochistan gerbill (*Gerbillus nanus*) and five striped palm squirrel (*Funambulus pennanti*) were observed. Two species of reptiles i.e. keelback snake (*Xenochorophis piscatgor*) and Indian flapshell turtle (*Lissemys punctata punctata*) were collected during the recent surveys.

Table-I. Bird species found in Nurruri Wetland

Species	Recorded/ Reported in 1970's-1990's	Observed in Surveys in			
		October 2003	November 2003	December 2003 In Dry/Semi Dry Areas	Dec. 2003 Near Sea Intrusion Area
White Pelican (*Pelecanus oncrotalus*)	+		+		+
Dalmatian Pelican (*Pelecanus crispus*)	+				
Great Cormorant (*Phalacrocorax carbo*)	+			+	
Little Cormorant (*Halietor niger*)	+	+	+		+
Little Egret (*Egretta garzetta*)	+	+	+		+
Cattle Egret (*Bubuleus ibis*)				+	
Intermediate Egret (*Egretta intermedia*)	+		+		
Large Egret (*Egretta alba*)	+	+	+		+
Grey Heron (*Ardea cineria*)	+	+	+	+	+
Purple Heron (*Ardea purpurea*)	+	+	+		+
Pond Heron (*Ardea grayii*)			+		

Painted Stork (*Mycteria leucocephala*)	+		+		+
White Stork (*Ciconia ciconia*)	+				
Glossy Ibis (*Plegadis falcinellus*)	+				
White Spoonbill (*Platalea leucorodia*)	+				
Greater Flamingo (*Phoenicopterus rubber*)	+				+
Lesser Flamingo (*Phoeniconaias minor*)	+				
Common Shelduck (*Tadorna tadorna*)	+				
Wigeon (*Anas Penelope*)	+				
Gadwall (*Anas strepera*)	+				
Common Teal (*Anas crecca*)	+	+			
Mallard (*Anas platyrhynchos*)	+				
Northern Pintail (*Anas acuta*)	+				
Garganey (*Anas querquedula*)	+				
Northern Shoveler (*Anas clypeata*)	+				
Common Pochard (*Aythya ferina*)	+				
Tufted Duck (*Aythya fuligula*)	+				
Black Shouldered Kite (*Elanus caeruleus*)	+			+	
Brahminy Kite (*Haliastur indus*)	+				
Black Kite (*Milvus migrans*)	+				
Marsh Harrier (*Circus aeruginosus*)	+			+	
Steppe Eagle (*Aquila rapax ripalensis*)	+				
Imperial Eagle (*Aquila heliaca*)	+				
Greater Spotted Eagle (*Aquila clanga*)	+				
Osprey (*Pandion haliaetus*)	+				
Common Crane (*Grus grus*)	+	+			
Black-winged Stilt (*Himantopus himantopus*)	+	+	+		
Avocet (*Recurvirostra avosetta*)	+				
White-tailed Lapwing (*Vanellus leucurvus*)	+				
Red wattle Lapwing (*Vanellus indicus*)	+	+	+	+	+
Little ringed Plover (*Charadrius dubius*)	+				
Kentish Plover (*Charadrius alexandrinus*)	+	+	+		+
Grey Plover (*Pluvialis squatarola*)	+				
Black-tailed Gadwit (*Limosa limosa*)	+	+	+		
Curlew (*Numenius arquata*)	+	+	+		+
Whimbrel (*Numenius phoeopus*)	+				
Ruff (*Philomachus pugnax*)	+				
Common Red Shank ((*Tringa totanus*)	+	+			+
Green Shank (*Tringa nebularia*)	+		+		+
Marsh Sandpiper (*Tringa stagnatilis*)	+				
Green Sandpiper (*Tringa ocropus*)	+	+	+		+
Common Sandpiper (*Actitis hypoleucos*)	+				
Little Stint (*Calidris minuta*)	+	+	+		+
Terek Sandpiper (*Xenus cinereus*)	+	+	+		
Herring Gull (*Larus argentatus*)	+				+
Lesser Black-backed Gull (*Larus fuscus*)	+				+
Black headed Gull (*Larus ridibundus*)	+	+			+
Whiskered Tern (*Chlidonais hybrida*)	+				
Caspian Tern (*Hydroprogne caspia*)	+	+			+
Gull billed Tern (*Gelochelidon nilotica*)	+				
Sandwich Tern (*Thalasseus sandvicensis*)	+				

Little Tern (*Sterna albifrons*)	+	+	+		+
Common Tern (*Sterna hirundo*)	+				
White breasted Kingfisher (*Halcyon smyrnensis*)	+			+	
Pied Kingfisher (*Ceryle rudis*)	+			+	
Common Blue Kingfisher (*Alcedo atthis*)	+				
Black Partridge (*Francolinus francolinus*)				+	
Indian Collared Dove (*Streptopelia decaocta*)				+	
Indian Koel (*Eudynamys scolopacea*)				+	
Crow Pheasant (*Centropus sinenus*)				+	
Little Green Bee-eater (*Merops orientalis*)				+	
Crag Martin (*Hirundo rupestris*)				+	
House Martin (*Delichon urbica*)				+	
Pied Wagtail (*Motacilla alba*)				+	
White cheeked Bulbul (*Pycnonotus leucogenys*)				+	
Common Babbler (*Turdoides caudatus*)				+	
Jungle Babbler (*Turdoides striatus*)				+	
Chiff-chaff (*Phylloscopus collybitus*)				+	
Tailor Bird (*Orthotomus sutorius*)				+	
Indian Graceful Prinia (*Prinia gracilis*)				+	
Purple Sunbird (*Nectarinia asiatica*)				+	
House Sparrow (*Passer domesticus*)				+	
Common Mynah (*Acridotheres tristis*)				+	
Black Drongo (*Dicrurus macrocercus*)				+	
House Crow (*Corvus splendens*)				+	
Total :	64	19	19	27	20

The major reason for drying of this wet land is due to reduction in drain water supply through Phuleli/Gunni Karo-Gangro Outfall Drain. Intrusion of seawater in the wetland because of digging and deepening of the Phuleli/Gunni Outfall Drain is another reason for change in water regime in the wetland which is now turning into a hypersaline lagoon. Changes in bird fauna clearly indicates that this freshwater wetland has now converted into a coastal lagoon. Presently those species which were common in mangroves of Sindh (Hasan, 1994, 1996) are dominating in the Nurruri wetland. In order to restore the conditions prevailing in this wetland, there is a need to take immediate actions which may include supply for freshwater through Gunni Phuleli Outfall and construction of weir to stop intrusion of seawater in the wetland. Restoration of the wetland will not only help in achieving near original biodiversity in the wetland but will also help in improving socio-economic conditions of the communities in the area which were previously dependent on wetland.

References

Bianchi, G. 1985. Field guide to the commercial marine and brackish water species of Pakistan. FAO species identification sheets for fisheries purposes. Food and agricultural Organization of the United Nations.

Galib, S.A., Hasnian, S. A., Razzaq, A. 1999.. Avifauna of tidal link, Badin, Sindh. Proc. of seminar on aquatic biodiversity of Pakistan. MRC and Zoology Department Department University of Karachi.37-46.

Hasan, A. 1994. The birds of Sindh mangroves. Rec. Zool. Surv. Pakistan. 12: 98 – 105.

Hasan. A. 1996. Biodiversity of bird fauna in mangrove areas of Sindh. In: Proc. of the UNESCO Workshop on Coastal Aquaculture (Q.B. Kazmi ed.) Pp. 21 – 26.

Heinzel.H. Fitter. R.S.A. and Parslow. J. 1987. The Birds of Britain and Europe with North Africa and Middle East. William Collins and Sons. London.

Perrins. C. and Attenborough. D 1987. Birds of Britain and Europe. William Collins and Sons Ltd. London.

Roberts. T.J.. 1990. The Birds of Pakistan. Vol. 1. Non-Passiriformes Oxford University Press. Karachi.

Roberts. T.J.. 1991. The Birds of Pakistan. Vol. 2. Passiriformes Oxford University Press, Karachi.

Rec. Zool. Surv. Pakistan Vol. XV. PP. 22-30, 2004.

Status of marsh Crocodile (*Crocodylus palustris*) in Sindh

Hamid Iqbal Javed and Hafizur Rehman

Zoological Survey of Pakistan, Karachi

Abstract

The Sindh province is known to have ideal habitat for crocodile. All the important wetlands including rivers lakes and canals were surveyed from September 2001 to March 2003. Out of three species of crocodiles already known from Indian subcontinent, only one species i.e. *Crocodylus palustris* was recorded during the present study. Gavial has been completely wiped out from its habitat and population of marsh crocodile has also been declining due to habitat fragmentation, drought, poaching and population pressure etc.

Keywords – Marsh crocodile, *Crocodylus palustris*, status, Sindh.

Introduction

Sindh province is the second largest province of Pakistan in terms of population and third in terms of area. It boundaries on eastern side India on northern side with Punjab, on western, side with Balochistan and southern side with Arabian Sea. It is situated on latitude 23° 35′N and 28° 30′N and 66° 42′ and 71° 10′E longitude. It consists of wetlands including rivers, streams, lakes, ponds and estuaries. Some of the important wetlands are Nara Game Reserve, Deh Akro II Game Sanctuary, Chotiari Reservoir and Haleji Lake. Some other places of captive breeding of crocodiles is being done are Khar Center, Karachi Zoo and Samzoo Park.

Out of three species of crocodilian known from Indian subcontinent, only one species i.e. mugger or marsh crocodile (*Crocodylus palustris*) is known from in Pakistan (Ahmad, 1986; Ghalib *et al*, 1981; Khan and Mirza, 1976). Mugger is successful ecologically, as it has adopted a wide habitat range from rivers to ponds, marshes and lakes. Marsh crocodile were extremely common in their former wide range from Dasht in the extreme west of Pakistan to Assam in north eastern India and also in Sri Lanka. *Crocodylus palustris* was widely distributed in Sindh including in Nara Canal till the start of twentieth century. With the construction of dams on Indus and diversion of water for agriculture and increase of human population, the habitat for this species got greatly disturbed and reduced which resulted in marked decline in its population. Although protective legislations have been enacted in Pakistan which provides for complete protection to the crocodile but persecution of crocodile is still reported to be continuing. The species is regarded as endangered, exterminated in most of its range, rare in Iran and near extinction in Pakistan (Webb *et al*, 1978). It is listed in IUCN Red Data Book and is included in Appendix I of CITES (IUCN, 1984)

Sindh Province shares its boundaries on northern side with Balochistan and Punjab, towards East with Rajasthan, India, toward south with Rann of Kutch and Arabian Sea and toward west it touches with Lasbella and Kalat Districts of Balochistan. Total area is about 1,40,915 Sq km. Soil is alluvial near river Indus and the rest is barren mostly desert and consists of mountain ranges including Kirthar, Kohistan Laki range, and Ganjo ranges. Riverine forests are present along the banks of Indus extends southwards from Ghotki to the Indus Delta. Irrigation system in Sindh is totally dependent on the Indus. Guddu, Sukkher and Kotri are the main barrages constructed to cope with the demand for water to support intensified agriculture practices in Sindh. Many lakes and wetlands are also recharged due to the Indus. These wetlands support a diversified faunal life.

The crocodile surveys were conducted from August 2001 to March 2003 in the Province of Sindh for the assessment of the status of marsh crocodile (Fig. 1). Main emphasis was given to Chotiari Reservoir and Nara Canal situated in Nara Game Reserve, Deh Aukro II Wildlife Sanctuary situated in Nawabshah District, Haleji Lake Wildlife Sanctuary located in Thatta District Khar Centre in Kirthar National Park and Mangoopir Shrine at Mangopir Karachi.

Chotiari Reservoir: This important wetland is located District Sanghar and comprises of two large water bodies viz., Makhi Dhand and Baqar Dhand. These two dhands are made up of many small dhands. The dominant floral species recorded in the area are *Typha latifalia*, *Typha angustata*, *Phragmites harka*, *Arundo donax*, *Nelumblum nuliferum* and *Paspalum distichum*. Other submerged and pertly submerged plant species are *Hydrilla verticillata*, *Nymphaea lotus*, *Polygonum hydropiper*, *Utricularia lotus* and *Neoumbium nuciferum*. At the edge of wetland *Desmostachya bipinnata*, *Prosopis spicigera* and *Acacia nilotica* are common.

Nara Game Reserve: This game reserve which is located in Tehsil Nara, District Khairpur has an area of 109,966 ha. This area was surveyed from 16-01-2002 to 31-01-2002. Nara Game Reserve has irrigation canals, open waters, marshes, and dhands which have been developed due to seepage of water from Nara Canal. Flora of the canal, wetland and dhands consists of *Typha latifolia*, *Typha angustata*, *Paspalum distichum*, *Hydrilla verticillata*, *Nymphaea lotus*, *Polygonum hydropiper*, *Utricularia lotus*, *Neltimbiulu nuciferum*, *Desmostachya bipinnata*, *Prosopis cineraia* and *Acacia nilotica*. These wetlands are surrounded by sand dunes which provides breeding ground to marsh crocodiles.

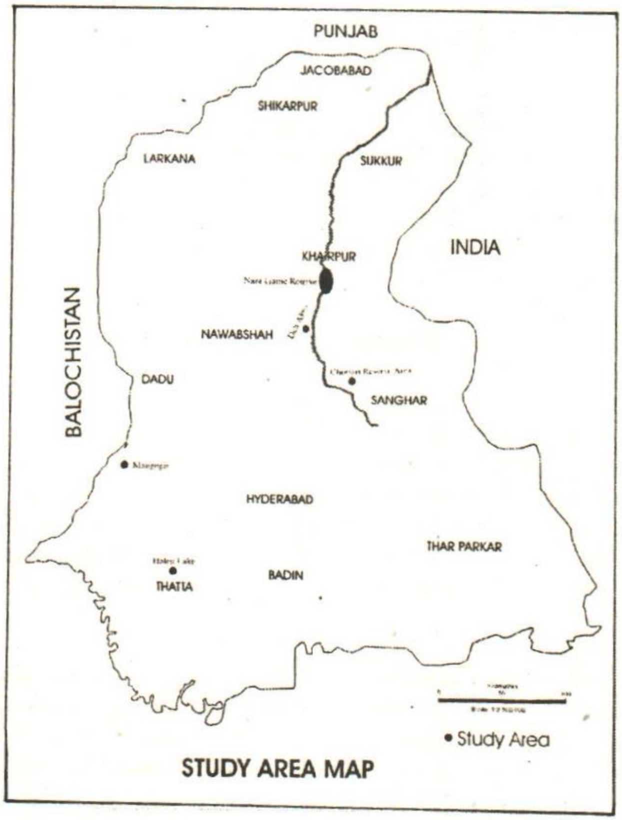


Fig. 1. Map of Sindh showing areas of study.

Deh Akro Wildlife Sanctuary: This sanctuary is located in District Nawabshah and consists of a complex of more than 29 lakes/ponds of various sizes separated by sand dunes. On the right bank of Nara canal these wetlands were created because of seepage during 40 years ago. Recently on left side of the canal construction of Chotiari Dam and the long dry spell has lowered the water table of wetlands and resulted in drying of many wetlands and increase in salinity in the others. This wetland complex is supporting a fair population of crocodiles and was surveyed from 23-03-2003 to 27-03-2003. Important flora of Deh Akro is *Acacia nilotica, Accacia senegol, Prosopris cineraria, Tamarix spp., Salvadora persica, Capparis deciduas, Zizyphus nummularia, Calligonum polygonoides* and *Saccharum bengalenses* etc.

Haleji Lake Wildlife Sanctuary: This lake is located in District Thatta, have an area of 6.58 km^2. The lake has been declared is Wildlife Sanctuary and is also a Ramsar site. Crocodiles were introduced in the lake in 1972-73. Sindh Wildlife Department started captive breeding at Haleji in 1992 which is continuing with success.

Manghopir. This shrine of Manghopir is located about 18 km from Karachi. It stands on a low hill to the left of the road besides two hot sulfur springs. A small water tank having size about 10X25 yards supports a population of crocodile.

Material and Methods

To determine the existence of marsh crocodiles direct and indirect methods were used. In the direct method sightings while basking or swimming or by spotlighting/night observation. Latter method is applied for catching reflection of eyes of crocodiles. Observations were made at night at Chotiari Reservoir area in August 2001. Basking method of locating crocodiles is the most suitable only during winter season when the temperature of water of the lake drops. Due to cooler weather and cold water crocodiles which are cold blooded reptile water come outside the lake to bask in the sunshine and to keep themselves warm Thus the counting of crocodiles becomes very easy in a particular area during this season. In summer, however, this method cannot be used effectively because crocodiles seldom gets outside water. In the indirect method, presence of signs like fecal pallets, den or tunnels are noted or information from difference sources such as local people, game watchers, game inspector and fishermen etc. were collected.

Results and Discussion

The results of the survey is presented in Table-I which enlists the information gathered from all water bodies. Table-II summarizes the data collected from various areas of Sindh. Although in some cases by fishermen, local villagers and even in some cases game watchers etc. reports very high concentration of marsh crocodile, however, care evaluation of such information reveals very limited numbers. In any case data of marsh crocodile mentioned in this paper may not be considered as census of the population of marsh crocodile rather it indicates best possible estimate of the marsh crocodile population made through filed surveys. Further detailed studies may help in strengthening knowledge about the marsh crocodile in Sindh.

The five year long drought spell in southern Pakistan has further deteriorated the situation of wetlands in the province. According to the survey results the major population of crocodile is concentrated in Sanghar, Khairpur and Nawabshah Districts. Any ecological change in the habitat will effect the intact population marsh crocodile. Increase in population and intensification of agricultural practices, construction of dams and diversion of water channels for irrigation purpose are considered to be major reasons for shrinkage of the population of marsh crocodile. However, it may be noted that marsh crocodile is surviving in limited area in Sindh and a few places along coastal areas Balochistan and further degradation in its habitat may lead to extinction of marsh crocodile in Pakistan. Although attempts of captive breeding is successfully done in Haleji. Khar Canter and Shamzoo Park but it requires protection of the habitat of the marsh crocodile to ensure its survival in nature.

TABLE-1. Status of Marsh Crocodile in Sindh

Chotiari Game Reserve. (District Sanghar)

S.No.	Date	Name of the Dhand. Wetland. Lake. Canal	Approximate Crocodile population (According to interviews)	Crocodiles seen.	Remarks
1	16-08-01	Makhi Dhand	5	----	Fresh fecal pellets and fresh tract were observed.
2	17-08-01	Cut Dhand	2	2	
3	17-08-01	Khorro & Jadpur Dhand	2	2	
4	18-08-01	Dhands near Abdul Karim Goth	25	----	The Mallahs of Goath informed that about 50 crocodiles are surviving in the area.
5	19-08-01	Sueri Bhit	15	2	Three nests were observed in the area. But fisherman reports more then 25 crocodile.
6	20-08-01	Baqar Dhand	----	----	According to fisherman population in the area was wiped out because people kill them from time to time because they eat fish.
7	21-08-01	Akanwari	15	2	A local person informed that he has seen two crocodile here.
8	22-08-01	Meena Dhand	4	----	A local person informed that he has seen four crocodile here.
9	24-08-01	Wagu Wala Dhand	15	----	Information from fisherman.
10	26-08-01	Chandanwala Dhand	3	3	Directly seen.
11	27-08-01	Namwali Dhand	5	5	Directly seen.
12	28-08-01	Surri Dhand	10	4	A local person informed that he has seen four crocodile here.
		Total:	**89**	**20**	

Status of Marsh Crocodile in Sindh.

Nara Game Reserve Area.(District Khairpur)

S.No.	Date	Name of the Dhand. Wetland, Lake. Canal	Approxi-mate Crocodile population	Crocodiles seen.	Remarks
1	17-01-2002	Kathore Dhand – I	----	----	No information/ none observed
2		Kathore Dhand – II Near Sawoan	----	----	No information/ none observed
3	17-01-2002	Taj Minor (Kathore Chennel)	----	----	No information/ none observed
4	19-01-2002	Nagiopir Dhand	3	2	3 crocodiles were reported by villagers out of three. two were seen directly basking.
5	19-01-2002	Khario Dhand	----	----	No information/ none observed
7	19-01-2002	Sumabhi Dhand	----	----	No information/ none observed
8	19-01-2002	Akhero Dhand	5	1	Only one crocodile was seen directly.
9		Wichanowaro Village	----	----	No information/ none observed
10	20-01-2002	Adkau	----	----	No information/ none observed
11	20-01-2002	Gunja Dhand – I	----	----	No information/ none observed
12		Gunja Dhand – II	----	----	No information/ none observed
13	21-01-2002	Keni Dhand	----	----	No information/ none observed
14	22-01-2002	Sawan Wetland–3	----	----	No information/ none observed
15	22-01-2002	Phario Dhand	----	----	No information/ none observed
16		Puno Dhand	----	----	No information/ none observed
17	23-01-2002	Tooty Dhand (Goth Baloch Khan)	4	1	Information from local staff but only one was seen.
18	24-01-2002	Sahore Dhand	----	----	No information/ none observed
19	24-01-2002	Jamalaho Dhand	----	----	No information/ none observed
20	24-01-2002	Akhanwari Dhand (Goth Allah Bukhs)	----	----	No information/ none observed
21	24-01-2002	Shaho Dhand	----	----	No information/ none observed

22	24-01-2002	Khakhro Dhand	----	----	No information/ none observed
23	24-01-2002	Sodapir Dhand	----	----	No information/ none observed
24	25-01-2002	Dolaho Dhand	----	----	No information/ none observed
25	25-01-2002	Sadro Dhand	----	----	No information/ none observed
26	25-01-2002	Lalri Dhand	----	----	No information/ none observed
27	25-01-2002	Putkan Dhand	----	----	No information/ none observed
28	25-01-2002	Khurandh Dhand	----	----	No information/ none observed
29	25-01-2002	Bearwari Dhand	10	----	Information collected from local staff.
30	25-01-2002	Gumbat RD	----	----	No information/ none observed
31	26-01-2002	Mangirko Dhand	----	----	No information/ none observed
32	26-01-2002	Barej Dhand	----	----	No information/ none observed
33	26-01-2002	Jagir Dhand	----	----	No information/ none observed
34	26-01-2002	Sim Dhand	----	----	No information/ none observed
35	26-01-2002	Kharari Dhand	----	----	No information/ none observed
36	26-01-2002	Jahari Dhand	7	1	Information from local staff.
37	26-01-2002	Dangiwari Dhand	----	----	No information/ none observed
38	27-01-2002	Kherchand Dhand	----	----	No information/ none observed
39	27-01-2002	Sodra Dhand	----	----	No information/ none observed
40	27-01-2002	Dobhanwari Dhand	----	----	No information/ none observed
41	28-01-2002	Pir Dino Village (North of Nara canal)	----	----	No information/ none observed
42	28-01-2002	Chirakh Dhand (Pir Dina Village or Goth East of Nara)	----	----	No information/ none observed
43	29-01-2002	Western side of Nara Canal. Purana Pitan. Tasal is Head Jamrao	140	15	Scanning the area by formulating three parties from Purana Pitan to Head Jamro and

					seen 15 crocodiles whereas local wildlife staff is of the view that population of marsh crocodile in the area is about 500.
44		Goth Saida Sharif	13	3	One large crocodile (nearly 6 ft. in length) and small one were also seen.
45		Choti Dhand West of Nara	8	----	Information from local people.
46		Karan Dhand Thatho Goth West of Nara	5	----	Information from local people.
47		Deso Dhand Thatho Goth	3	----	Information from local fishermen
		Total:	**198**	**23**	

Deh Akro (District Nawabshah)

S.No.	Date	Habitat	Approximate Crocodile population	Crocodile population seen.	Remarks
1	23-03-03	Chaach	----	----	No information/ none observed
2	23-03-03	Khanwarwo	----	----	Completely dried. Two years back there were 12 crocodile as reported by game watcher.
3 4 5 6	24-03-03	Rakhi Pakhanwari Shanwaryo Phullanwala	----	----	All completely dried.
7	24-03-03	Kandanwari	----	----	In 94-95, 20-25 were observed. Now totally absent.
8	24-03-03	Paniwaro	----	----	No information/ none observed
9	24-03-03	Bolan	15	----	Reported by game staff.
10	25-03-03	Khurandwari	20	----	Reported by Watcher/Assistant Warden Wildlife.
11	25-03-03	Gurju	----	----	No information/ none observed

12	25-03-03	Karonaro	15	----	Game staff observation.
13	26-03-03	Shoory	----	----	No information/ none observed
14	26-03-03	Kinro	----	----	No information/ none observed
15	26-03-03	Wasoo	25	3	Reported by local Game staff.
16	27-03-03	Kundo	----	----	No information/ none observed
17	27-03-03	Dragan	----	----	No information/ none observed
18	27-03-03	Chaccha	12	2	Watcher seen 2 in Dec. 2002.
19	27-03-03	Murakho	----	----	No information/ none observed
20	27-03-03	Looankhan	----	----	Complete dry.
21	27-03-03	Sanahryee	----	----	No information/ none observed
22	27-03-03	Kari	6	1	1 seen in Dec. by Watcher.
		Total:	**93**	**6**	

Haleji Lake (District Thatta)

S. No.	Date	Habitat	Approximate Crocodile population	Crocodiles seen.	Remarks
1	March 2003	Haleji lake	100	20	Reported by local people.
2	21-03-2002	Manghopir	----	95	Visited and counted.

TABLE-II. Consolidated Result

Site	Name of Lake/Canal/Area	Estimated	Seen
Nara Canal	Nara Canal Mansher of Nara	198	23
Chotiari	Reservoir	89	20
Deh Akro	A complex of wetlands	93	6
Haleji	Haleji Wildlife Sanctuary	100	20
Manghopir	Shrine	----	95
	Total:	**480**	**164**

Acknowledgment

The authors are thankful to WWF Pakistan for providing financial assistance for this survey. They are grateful to Mr. Husnain Bux Baghat, Conservator, Sindh Wildlife and to Mr. Ghulam Rasool Channa, Deputy Conservator, Sukkur for providing staff and other assistance during field surveys.

References

Ahmad, A., 1986. The distribution and population of Crocodiles in the Province of Sindh and Balochistan (Pakistan). J. Bombay Nat. His. Soc., 83:220-223.

Ghalib, S.A., Rahman, H., Iffat, F. and Hasnain, S.A., 1981. A checklist of the reptiles of Pakistan. Rec. Zool. Surv. Pakistan 8: 37-59.

Groombridge, E.C., 1982. The IUCN Amphibia – Reptilia Red Data Book Part I. Testudina, Crocodylia, Rhynchocephalia. IUCN, Gland.

Khan, M.S. And Mirza, M.R., 1976. An annotated checklist and key to the Reptiles of Pakistan. Part-I: Chelonia and Crocodilian. Biologia. 22: 211-221.

Webb, G. J., 1978. The status conservation and management of world crocodilians. Report prepared by Australian National Parks and Wildlife Service.

Rec. Zool. Surv. Pakistan Vol. XV. PP. 31-33, 2004.

Revised Checklist of Amphibians of Pakistan

Hafizur Rahman and Hamid Iqbal Javed
Zoological Survey Department. Karachi.

Abstract

A revised checklist for the presence and information of amphibians of Pakistan has been compiled. In all 24 taxa belonging to 9 genera and 3 families are recorded from Pakistan.

Keywords: Checklist. Amphibian. Pakistan.

Introduction

After thorough survey and research of amphibian fauna of Pakistan an upto date information of the species has been described in the form of checklist. This study is based on the previous and recent research and contribution on amphibian fauna of subcontinent. Auffenberg and Rahman (1997). Boulenger (1890). Horan d Chopra (1923). Iffat (1994). Khan (1968. 1972. 1976. 1979. 1987. 1989. 1997. 2000). Minton (1966) and Smith (1931. 1935. 1943). have reported the species of amphibian fauna of Pakistan..

The area of Pakistan has mixed and suitable habitat for the diversity of amphibian fauna. Minton (1966) recorded only 8 species of amphibians from Pakistan while in this revised checklist 24 taxa of amphibians are recorded from Pakistan.

In this checklist three families. Bofonidae. Microhylidae and Ranidae. nine genera. *Bufo*, *Microhyla*, *Uperodon*, *Euphlyctis*, *Holobrachus*, *Limnonectes*, *Nanorana*, *Paa* and *Tomopterna* and 24 taxa (species and subspecies) of amphibians are recorded (Table-I).

Table- I. A Checklist of amphibians af Pakistan

Family: BUFONIDAE		
Genus: *Bufo*		
1	*Bufo himalayanus*	Himalayan Toad
2	*Bufo melanostictus hazarensis*	Common Asian Toad
3	*Bufo olivaceus*	Mekkran Toad
4	*Bufo latastii*	Lataste's Toad
5	*Bufo pseudoraddei baturae*	
6	*Bufo pseudoraddei pseudoraddei*	
7	*Bufo siachinensis*	Siachin's Glacier Toad
8	*Bufo stomaticus*	Marbled Toad
9	*Bufo surdus*	Balochistan Toad
10	*Bufo viridis zugmayeri*	Zagmayer's Toad
Family: MICROHYLIDAE		
Genus: *Microhyla*		
11	*Microhyla ornate*	Ornate Narrow-mouth Toad

Genus: Uperodon
12 *Uperodon systoma*

Family: RANIDAE
Genus: *Euphlyctis*

13	*Euphlyctis cyanophlictis cyanophlictis*	Skittering Frog
14	*Euphlyctis cyanophlictis microspinulata*	Skittering Frog
15	*Euphlytis cyanophlyctis seistanica*	Skittering Frog

Genus: *Holobatrachus*

16	*Holobatrachus tigerinus*	Tiger Frog

Genus: *Limnonectes*

17	*Limnonectes limnocharis*	
18	*Limnonectes syhadrensis*	Peninsular Cricket Frog

Genus: *Nanorana*

19	*Nanorana pleskei*	Pleske's Frog

Genus: *Paa*

20	*Paa barmoachensis*	
21	*Paa hazarensis*	Hazara Frog
22	*Paa sternosignata*	Baloch Mountain Frog
23	*Paa vicina*	Muree Hills Frog

Genus: *Tomopterna*

24	*Tomopterna breviceps*	Indian Burrowing Frog

References

Auffenberg, W and Rahman, H. 1997 Geographic variations in *Bufo stomaticus*, with remarks on *Bufo olivaceus*. In: Biodiversity of Pakistan (Mufti, S. A., Wood, C. A. and Hasan, S. A., eds.), Pakistan Museum of Natural History, Islamabad and Florida Museum of Natatural History. Florida Pp 351-372.

Boulenger, G. A., 1890. The Fauna of British India including Ceylon and Burma. Reptilia and Batrachia. London

Dubois, A. and Khan, M.S. 1979 A new species of frog (Genus *Rana*, Sub genus *Paa*) from northern Pakistan. (Amphibia, Anura) J. Herpetol., 13:403-410.

Hora, S. L., and Chopra, B., 1923. Reptilia and Batrachia of Salt Range, Punjab. Rec. Ind. Mus. 25: 369-376.

Iffat, F., 1994. Notes on the collection of amphibians in the Zoological Survey Department. Rec. Zool. Surv. Pakistan 12: 120-124.

Khan, M. S., 1968. Amphibian fauna of District Jhang, with notes on habits. Pakistan J. Sci. 20: 227-233.

Khan, M. S., 1972. The commonest toad of West Pakistan and a note on *Bufo melanostictus* Schnider. Biologia 18: 131-133.

Khan. M. S.. 1978. An annotated checklist and key to amphibians of Pakistan. Biologia 22: 200-210.

Khan. M. S.. 1987. A field guide to the identification of herpetology of Pakistan Part. 1 Amphibia. Biological Society of Pakistan Mongr. 14:

Khan. M.S. 1997a. A new toad from the foot of Siachin Glacier. Baltistan. northeastern Pakistan. Pakistan J. Zool.. 29:43-48.

Khan. M.S. 1997b. A new subspecies of common skittering frog *Euphlyctis cyanophlyctis* (Schneider. 1799) from Balochistan. Pakistan. Pakistan J. Zool.. 29:107-112.

Khan. M.S. 2001b. Notes on cranial ridged toads of Pakistan. with description of a new subspecies (Amphibia: Bufonidae) Pakistan J. Zool.. 33(4):293-298.

Khan. M. S.. 2003. Uptodate checklist of amphibians and reptiles of Pakistan. J. Nat. Hist. Wildl. 2: 11-17.

Khan. M.S.. and Tasnim. R. 1989 A new frog of the genus Rana. subgenus Paa. from southwestern Azad Kashmir. J. Herpetol.. 23:419-423.

Minton. S. A. Jr.. 1962. An annotated key to the amphibias and reptiles of Sindh and Lasbella. West Pakistan. Am. Mus. Novi. No. 2091p

Minton. S. A. Jr.. 1966. A contribution of the herpetology of West Pakistan. Bull. Am. Mus. Nat. Hist. 134: 51-58.

Murray. J. A.. 1885. A new frog (*Rana sternosignate*) from Sindh. Ann. Mag. Nat. Hist. Ser. 5. 16: 120-121.

Schmidtler. J.J. & J.F. Schmidtler. 1969 Uber *Bufo surdus*; mit einem Schlussel and Anmerkungen Zu den ubrigen Kroten Irans und West-Pakistans. Salamandra. 5:113-123.

Smith. M.. A. 1931 The Fauna of British India. including Ceylon and Burma. Reptilia and Amphibia. Vol.I: Lorecata Testudines. Taylor and Francis Ltd. London.

Smith. M.. A. 1935 The Fauna of British India. including Ceylon and Burma. Reptilia and Amphibia. Vol.II: Sauria. Taylor and Francis Ltd. London.

Stock. M.. Schmid. M.. Steilein. C. & Grosse. W.R. 1999 Mosaicism in Somatic triploid specimens of the *Bufo viridis* complex in the Karakoram with examination of calls. morphology and taxonomic conclusions. Ital. J. Zool.. 66:215-232.

Rec. Zool. Surv. Pakistan Vol. XV. PP. 34-41, 2004.

Some Observations on the Morphometry of Kelee Shad *Hilsa Kelee* (Pisces: Clupeidae) from Pakistan Coast

Mohammad Moazzam, Syed Ajazuddin and Ziaullah

Marine Fisheries Department. Government of Pakistan. Fish Harbour. West Wharf. Karachi. 74900. Pakistan (MM.Z) and Adamji Government Science College. Karachi. Pakistan (SA)

Abstract

Various parameters of morphometry of kelee shad *Hilsa kelee* was studied which indicates a strong relationship between total length and other parameters. The results obtained suggest that smaller sized specimens which local consider being different species are juveniles of *Hilsa kelee*. The paper also gives a brief account of fishery of kelee shad in Pakistan.

Keywords: Kelee shad. *Hilsa kelee*, morphometry. fishery

Introduction

Clupeiform fishes contribute substantially to the marine fish catch of Pakistan. Of a total of 499.159 m. tons and 430.579 m. tons of marine fish landings. clupeoids such as sardinellas. thryssas. anchovies. shads and wolf herrings contributed 166.509 and 74.983 m tons in 1993 and 1999 respectively (Anonymous. 2001). Kelee shad *Hilsa kelee* is an important clupeoid which is commercially harvested all along the Pakistan coast. Although separate statistics for this shad is not recorded but it is estimated that its annual contribution alone accounted for more than 15.000 m. tons. This species is economically important as it is not only consumed as food locally but also is used for production of fish meal.

Hilsa kelee is widely distributed in the Indo-Pacific area south to Durban to East African Coast. Gulf of Aden. Oman. Iran. Pakistan. India. Bangladesh. Myanmar. Thailand. Malaysia. Indonesia. Kampuchea. Vietnam. Hong Kong. Taiwan and Papua New Guinea (Whitehead. 1985). (Day (1878) was probably first to report this species from Sindh coast whereas Zugmeyer (1913) reported this species from Balochistan. This pelagic species is found in shallow coastal waters upto a depth of about 10 m also known to enter estuaries (Whitehead. 1985). This species is capable of tolerating quite low salinities upto 7 $^{0}/_{00}$. Ahmad *et al* (1975) and Niazi and Moazzam (1999) have studied the fish fauna of Leth Nullah. its estuary and associated marine environment and found this species to be inhabitant predominantly of marine side of the estuary. According to Niazi (1976) this species is mainly caught in the summer months in Sindh creeks whereas young fishes are caught during winter months in creeks and brackish water channels in the area.

Kelee shad is mainly harvested with various types of castnets. gillnets. seines and estuarine set bag nets. However. drift gillnets ('Rach') and bottom set gillnet ('Thukri') are main fishing gears. Principal fishing grounds of this species are located along the entire coastline of Sindh and Balochistan especially in Indus creek areas. Bundewari. Sonmiani Bay. Miani Hor. Ormara (West Bay). Pasni Bay. Ras Shahid. Kappar. Sur and Gwader (East Bay) and Gwater Bay. However. Kapper and Sur located between Pasni and Gwader are the main fishing center for these species. This species is caught throughout the year especially during September to November and March to May with maxima in March. No data on its seasonal landings is available except for landing data of Balochistan coast for the year 1983 (Fig. 1). Small quantities of this fish is wet salted and sent to hinterland area in Balochistan whereas bulk of the catch is sun-dried. cooked and then again sun-dried and pulverized to form meal which is used in poultry industry.

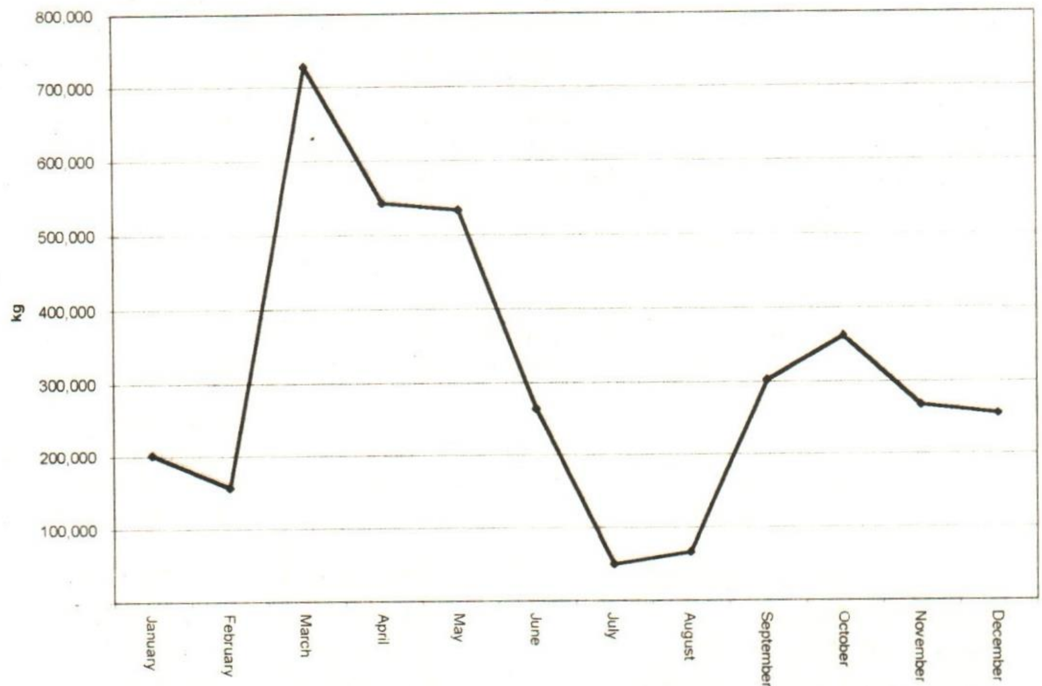


Fig. 1. Landings of *Hilsa kelee* along Balochistan coast during 1983 (source: Directorate of Fisheries. Government of Balochistan Pasni)

Kelee shad is locally known as 'Palli' in Sindh and 'Kolgar' in Balochistan. Juveniles and sub-adult are known as 'Bar-rag' in Balochistan. Fishermen of Balochistan are well known for their excellent folk taxonomy of the marine fishes. They generally regard 'Bar-rag' and 'Kolgar' as two separate categories. In order to verify that these two categories belong to one species i.e. *Hilsa kelee* this study on morphometry was started and it deals with study of various morphometric parameters of juveniles and adults. Information about various aspects of biology of Hilsa kelee is limited to the work of Babu Rao (1964) and Reintjes (1974). Froese and Pauly (2003) has given a summary of information on this species including some information on morphometry obtained from a figure given in Whitehead (1985) and a photograph published by Gloerfelt-Tarp and Kailola (1984).

Materials and Methods

Samples of kelee shad were collected from the commercial fish landings at various places along the coast of Pakistan in intermittently in 1984 and again in 1995-1996. Various parameters listed in Table-I were measured to the nearest millimeter. Since statistically insignificant differences were noted among various fishing centers and during different periods. therefore. data was pooled together. Statistical analysis of the data was carried out using Lotus 123 and graphs were plotted using Microsoft Excel.

Results and Discussion

A total of 322 specimens of kelee shad *Hilsa kelee* were analyzed for various parameters. Although no previous work on the relationship between such parameters of *Hilsa kelee* was available except Froese and Pauly (2003) who gave data of relationship between various parameters based on measurements made from a picture and a figure available in their record (Table-I). A comparison of the results from Pakistan with their results indicates almost similar relationship between various parameters, however, in case of pre-dorsal, pre-pectoral, dorsal fin and anal fin lengths the percentages are comparatively higher than those reported by Froese and Pauly (2003).

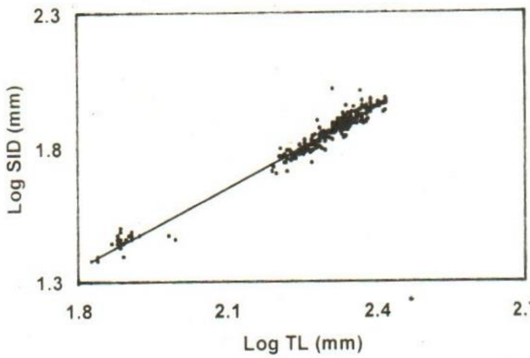
Table-I. Various morphometric parameters observed in kelee shad *Hilsa kelee* from Pakistan and its comparison with results of Froese and Pauly (2003)

PARAMETERS	FAO PICTURE**	GLOERFELT-TARP & KAILOLA (1984) PICTURE**	PRESENT STUDY
Snout to insertion of dorsal (SID)	34.2 % TL	35.2 % TL	49.0 % TL
Length of dorsal (LD)	11.8 % TL*	13.5 % TL*	16.5 % TL
Snout to end of dorsal (SED)	47.36 % TL*	49.3 %TL*	38.8 % TL
Snout to insertion of ventral (SIV)	40.13 % TL*	44.78 % TL*	41.9 % TL
Snout to insertion of anal (SIA)	57.9 % TL	61.5 % TL	55.5 % TL
Length of anal fin (LA)	12.5 % TL*	16.4 % TL*	21.9 % TL
Snout to end of anal (SEA)	69.1 % TL*	74.6 % TL*	57.9 % TL
Snout to insertion of pectoral (SIP)	22.1 % TL	22.8 % TL	33.1 % TL
Head length (HL)	24.0 % TL	23.8 % TL	23.7 % TL
Pre-orbitary distance (POD)	25.9 % HL	22.0 % HL	26.6 % HL
Post-orbitary distance (PsOD)	48.7 % HL*	53.1 % HL*	52.2 % HL
Diameter of eye (DE)	27.3 % HL	27.6 % HL	24.4 % HL
Interocular distance (IOD)	-	-	6.7 % TL
Greatest depth (GD)	29.0 % TL	32.7 % TL	31.2 % TL
Maximum thickness (MT)	-	-	11.1 % TL
Inter-nasal distance (IND)	-	-	3.3 % TL

** From Froese and Pauly (2003)

* Calculated from pictures given in Froese and Pauly (2003)

In some previous studies on morphometry of fishes from Pakistan such as Hoda (1979), Hussain and Hasan (1975), Naeem *et al* (2000), Qureshi and Hoda (1995), Sheri and Jafri (1977, 1978), Sheri and Janjua (1991) and Sheri and Saied (1976, 1977a, 1977b) it was observed that various morphometric parameters have a exponential relationship of the general form $Y = aX^b$. When such data is transformed into logarithmic form, a liner relationship fitting the formula $Log_{10}Y = Log_{10}a + bLog_{10}X$ is obtained. The data of *Hilsa kelee* was, thus, transformed in logarithmic form and analysis of coefficient of correlation and regression equation was obtained (Fig. 2-15). Regression analyses were made between total length (TL) with all other parameters mentioned in Table-I.



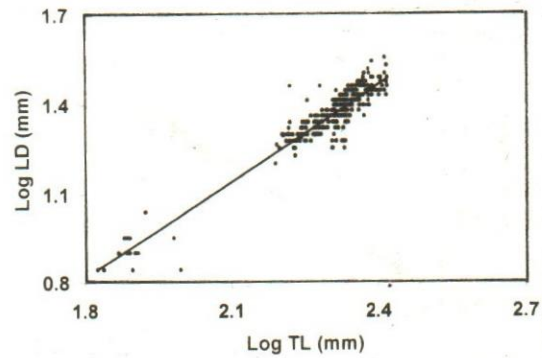
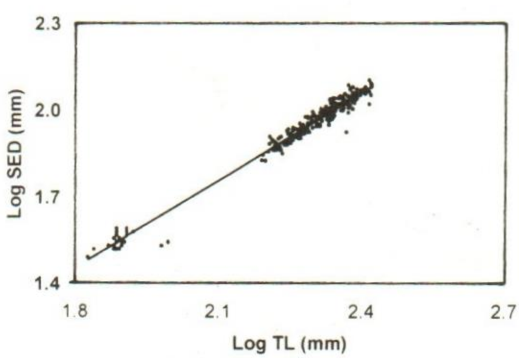


Fig. 2. Relationship between log TL and log SID
Fig. 3. Relationship between log TL and log LD



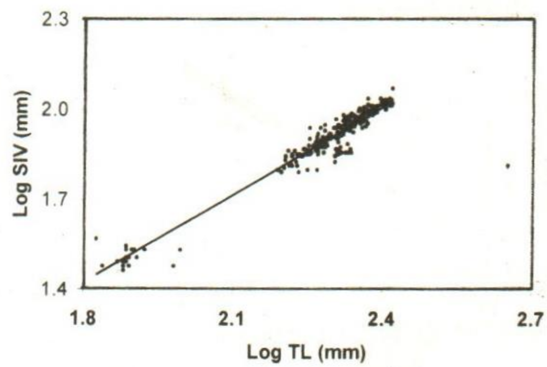
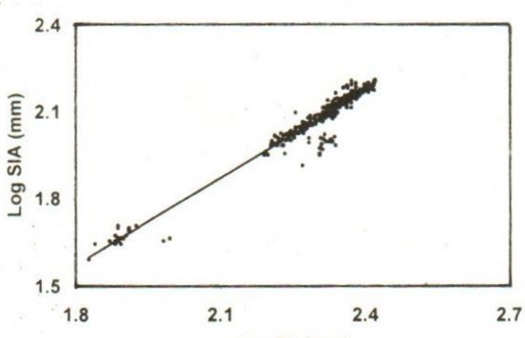


Fig. 4. Relationship between log TL and log SED
Fig. 5. Relationship between log TL and log SIV



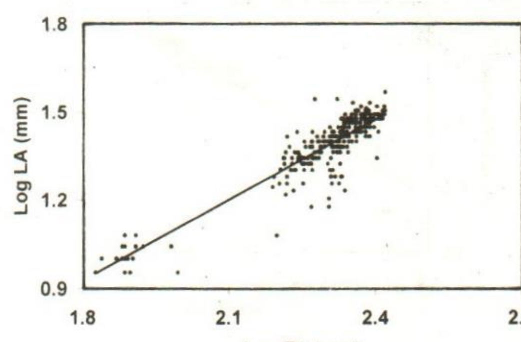
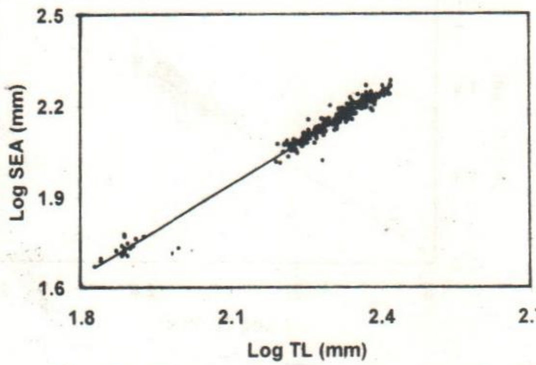


Fig. 6. Relationship between log TL and log SIA
Fig. 7. Relationship between log TL and log LA



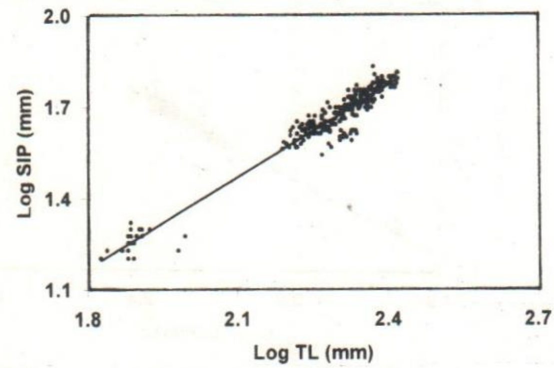
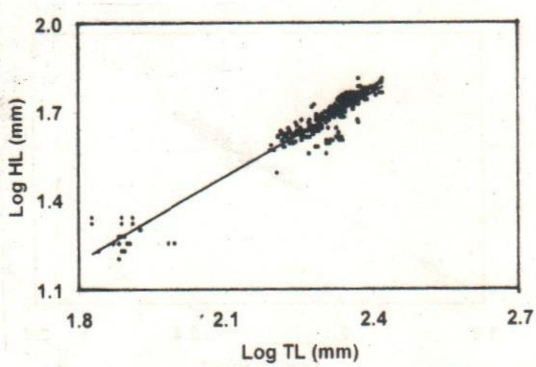


Fig. 8. Relationship between log TL and log SEA
Fig. 9. Relationship between log TL and log SIP



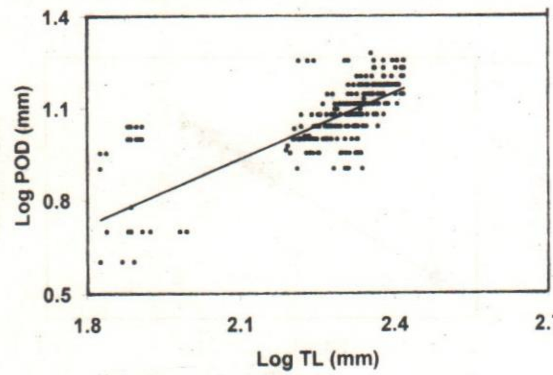
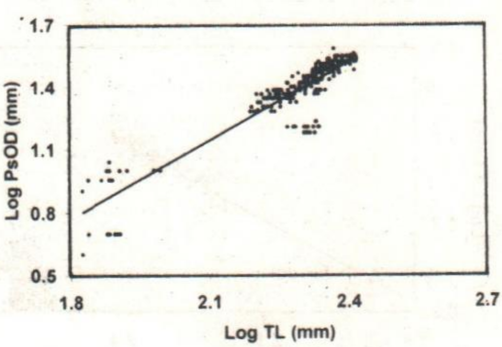


Fig. 10. Relationship between log TL and log HL
Fig. 11. Relationship between log TL and log POD



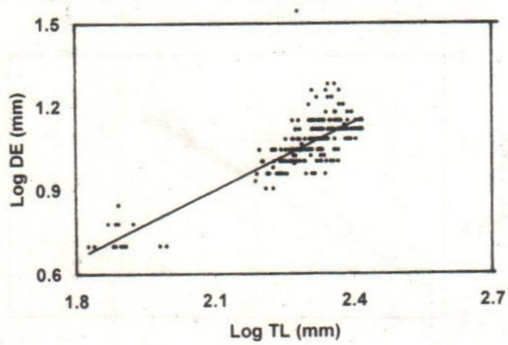
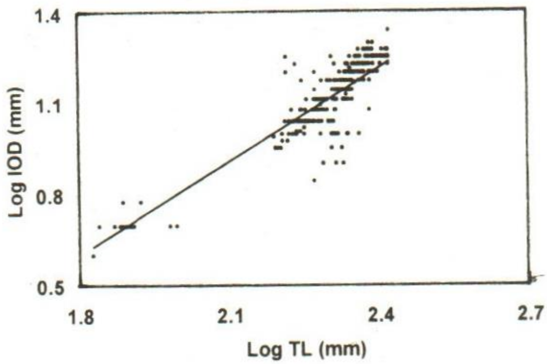


Fig. 12. Relationship between log TL and log PsOD
Fig. 13. Relationship between log TL and log DE



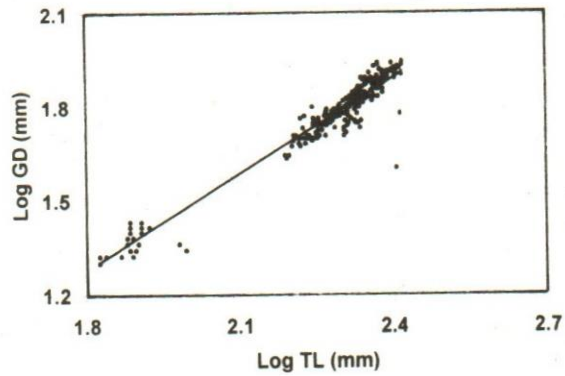
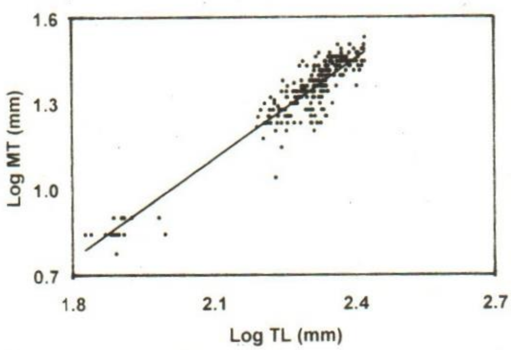


Fig. 14. Relationship between log TL and log IOD
Fig. 15. Relationship between log TL and log GD



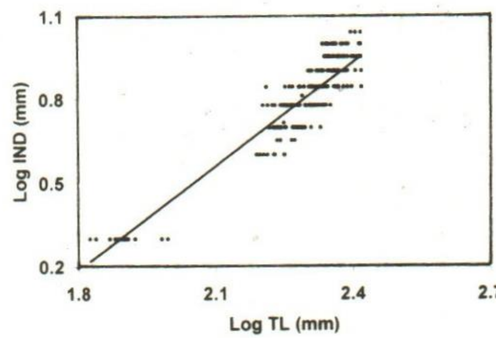


Fig. 16. Relationship between log TL and log MT
Fig. 17. Relationship between log TL and log IND

The results of regression and coefficient of correlation revealed that various parameters have positive correlation with the total length of the fish. In almost all cases the values of coefficient of correlation (r^2) is higher than 0.624 (Table-II). Such relationship is highest between total length (TL) with pre-anal length (SIA) i.e. 0.948. Strong correlation was also found between total length and all other parameters except in case of pre-orbital distance (POD). Fig. 2 to Fig. 15 also depict such positive correlation between total length and other parameters which is indicated by trend lines.

Fig. 2 to Fig. 15 also show two separate group of *Hilsa kelee* i.e. the small sized juveniles well separated from adult size category in all graphs. In almost all cases the relationship between various parameters fits the regression equation on both groups (juveniles and adults) and thus data of both group lies on same trend lines in the graphs. This also tends to suggest that the small sized specimens (locally called 'bar-rag') belonged to same species and local believe of them being a separate species is not correct.

Table-II. Regression equation, standard errors and coefficient of correlation between total length and other morphometric parameters of *Hilsa kelee*.

REGRESSION EQUATION	SE (b)	SE (a)	r^2
Log SID = -0.384 + 0.974 Log TL	0.051	0.014	0.935
Log LD = -1.088 + 1.063 Log TL	0.061	0.017	0.923
Log SED = -0.307 + 0.985 Log TL	0.055	0.015	0.928
Log SIV = -0.277 + 0.951 Log TL	0.051	0.015	0.931
Log SIA = -0.141 + 0.962 Log TL	0.045	0.013	0.948
Log LA = -0.626 + 0.871 Log TL	0.061	0.017	0.888
Log SEA = -0.114 + 0.981 Log TL	0.055	0.015	0.926
Log SIP = -0.570 + 0.974 Log TL	0.053	0.015	0.931
Log HL = -0.489 + 0.939 Log TL	0.049	0.014	0.935
Log POD = -0.531 + 0.698 Log TL	0.011	0.030	0.624
Log PsOD = -1.366 + 1.197 Log TL	0.096	0.027	0.861
Log DE = -0.702 + 0.762 Log TL	0.063	0.018	0.853
Log IOD = -1.191 + 1.002 Log TL	0.093	0.026	0.819
Log GD = -0.577 + 1.028 Log TL	0.054	0.015	0.935
Log MT = -1.400 + 1.189 Log TL	0.067	0.019	0.925
Log IND = -2.002 + 1.189 Log TL	0.073	0.021	0.916

Acknowledgment

The authors are thankful to Mr. Liaquat Haroon and Mr. Mohammad Iqbal, Senior Research Assistants and Mr. Dildar Shaft, Museum Curator of Marine Fisheries Department for their help in collection of data.

References

Ahmad, M.F., Niazi, M. S., and Khan, S. A., 1984. Fishes of Leth Nullah, a brackish channel near Mirpur Sakro, Distt. Thatta (Sind). Rec. zool. Surv. Pakistan 10: 1-24.

Anonymous, 2002. Handbook of Fisheries Statistics of Pakistan. Vol 18. Marine Fisheries Department, Government of Pakistan, Karachi

Babu Rao, M., 1964. Some observations on the biology of *Hilsa kanagurta* (Bleeker) (Fam. Clupeidae). Ichthyologica, Kanpur 3: 63-76.

Day, F. 1878. The fishes of India; being a natural history of the fishes known to inhabit the seas and fresh waters of India, Burma, and Ceylon. Fishes India 553-779.

Froese,R. And D. Pauly. Editors. 2003. FishBase. World Wide Web electronic publication. www.fishbase.org.

Hoda. S. M. S.. 1979. On some morphometrics of anchovies *Thryssa mystax* and *T. dussimieri* from the Pakistan coast. Aquat. Biol. 4: 183-189.

Gloerfelt-Tarp. T. and P.J. Kailola. 1984. Trawled fishes of southern Indonesia and northwestern Australia.. Australian Development Assistance Bureau. Australia. Directorate General of Fishes. Indonesia. and German Agency for Technical Cooperation. Federal Republic of Germany. 407 p.

Hussain. M.. and Hasan. S. Z.. 1975. A morphometric study of *Otolithus argenteus* Cuv. & Val. (Family Sciaenidae). Agric. Pakistan 26: 369-375.

Naeem. M., A.. Salam. A.. and Bhatti. M. N.. 2000. Morphometric studies of fresh water rainbow trout *Oncorhynchus mykiss* in relation to body size. Pakistan J. Fish. 1: 55-61.

Niazi. M. S.. 1976. Fishes of Sind Creeks-1. Order-Clupeiformes. Rec. Zool. Surv. Pakistan 8: 1-16.

Niazi. M. S.. and Moazzam. M.. 1999. Spatial variations in the fish faunal composition in the Indus estuarine area. In: Proceddings of the National Seminar on Mangrove Ecosystem Dynsmics of the Indus Delta. (Annonymous ed) Sindh Forest and Wildlife Department & The World Bank. Karachi. Pp. 170-180.

Qureshi. N. and Hoda. S. M. S.. 1995. Studies on some morphometrics. relative growth and length-weight relationship in *Valamugil cunnesius* and *Liza klunzingeri* Day from Karachi coast. Kar. Univ. J. Sci. 23: 191-214.

Reintjes. J. W. 1974. Five-spot herring *Hilsa kelee* and other marine clupeoid resources of South India J. Mar. Biol. Assoc. India 16: 523-527.

Salam. A.. And Janjua. M. Y.. 1991. Morphometic studies in relation to body size of farmed rohu *Labeo rohita*, a culturable major carp from Multan. J. Res. (Sci.). B. Z. Univ. 3: 59-63.

Sheri. A. N.. and Jafri. A. H. .1977. Morphometric studies of common fishes of Punjab. Part-I (*Labeo calbasu*). Family Cyprinidae. Bull. Hydrobiol. Res. Gordon College 1: 373-385.

Sheri. A. N.. and Jafri. A. H.. 1978. Morphometric studies of common fishes of Punjab (*Cirrhina reba*. Family Cyprinidae). Bull. Hydrobiol. Res. Gordon College 1: 445-455.

Sheri. A. N.. and Saied. T.. 1976. Morphometric studies of some important fishes of District Jhang. Part-I. (Family. Cyrinidae). Bull. Hydrobiol. Res. Gordon College 1: 205-218.

Sheri. A. N.. and Saied. T.. 1977a. Morphometric studies of some important fishes of District Jhang. Part-II. (Family.Siluridae and Schilbeidae). Bull. Hydrobiol. Res. Gordon College 1: 328-337.

Sheri. A. N.. and Saied. T.. 1977a. Morphometric studies of some important fishes of District Jhang, Part-III. (Family. Clupeidae. Bagridae and Channidae). Bull. Hydrobiol. Res. Gordon College 1: 363-372.

Whitehead. P.J.P.. 1985. FAO species catalogue. Vol. 7. Clupeoid fishes of the world. An annotated and illustrated catalogue of the herrings. sardines. pilchards. sprats. shads. anchovies and wolf-herrings. Part 1 - Chirocentridae. Clupeidae and Pristigasteridae. FAO Fish. Synop. (125) Vol. 7. Pt. 1:303 p.

Zugmayer. E. 1913. Die Fische von Balutschistan. Abh. Akad. Wiss. Munchen 26: 1-35

Rec. Zool. Surv. Pakistan Vol. XV. PP. 42-44, 2004.

Status of Golden Mahseer (Pisces: Cyprinidae) of the Indus River System

Muhammad Ramzan Mirza

Department of Zoology. Government College University Lahore. Pakistan

Abstract

There are only two valid species of mahseer ocuuring in Pakistan the Zhobi mahseer and the golden mahseer. Although a number of names are in use for these two species. however. the correct name of the Zhobi mahseer is *Naziritor zhobensis* (Mirza) whereas the golden mahseer of the Indus River system may be called *Tor macrolepis* (Heckel) instead of *Tor putitora* (Hamilton) which is commonly used in literature on the fishes of the Indus river system. *Tor putitora* (Hemilton) is found in the Ganges-Brahmaputra River systems and not in the Indus River system.

Key word: Mahseer. Indus river system. *Tor putitora*. *T. macrolepis*. *Naziritor zhobensis*

Introduction

There are only two species of mahseer known to occur in the Indus river system in Pakistan. The Zhobi mahseer which is correctly known as *Naziritor zhobensis* (Mirza) is restricted to the River Zhob. Kundar. Gomal. Shahur. Tochi. Kurram. Kabul and their tributaries in Balochistan and NWFP. This species is not recorded from the Punjab. Sindh. Kashmir or India. thus. endemic to Pakistan (Balochistan and NWFP). The second species of the Indus River system is the golden mahseer. Its correct scientific name is *Tor macrolepis* (Heckel). Heckel (1838) described this species as *Labeobarbus macrolepis* from Kashmir. It was accepted as *Barbus macrolepis* (Heckel) by early ichthyologists (Valenciennes. 1841. 1842 and Gunther. 1868). Day (1871) included it doubtfully in the synonymy of *Barbus tor*. However. this species was merged into the synonymy of Tor putitora (Hamilton) by Silas (1960). Since then it has been treated as *Tor putitora* by various ichthyologists in Pakistan and India. It was pointed out by Mirza and Awan (1976) that the golden mahseer of the Salt Range was subspecifically distinct from *Tor putitora* (Hamilton). Mirza and Bhatti (1996). thus. referred the Indus golden mahseer as *Tor putitora macrolepis* (Heckel). It has been gradually realized that the golden mahseer of the Indus river system should be named as *Tor macrolepis* (Heckel).

To test this proposal the morphometric measurements of 142 specimens of the golden mahseer collected from Pakistan and Azad Kashmir were analyzed. The criterion used to separate *Tor putitora*. *Tor tor* and *Tor mosal* is based on head length/body depth ratios (Hora. 1939). According to him if the head length is greater than body depth the specimen is identified as *Tor putitora* (Hamilton). If the body depth is greater than head length the mahseer specimen is identified as *Tor tor* (Hamilton). and if the head length and body depth are equal. the golden mahseer is identified as *Tor mosal* (Hamilton). Unfortunately. this criterion does not work in the case of the golden mahseer of the Indus River system as in the young specimens the head length is usually equal to the body depth. in the male specimens. the head length is usually greater than body depth and in the mature female specimens the body depth is mostly greater than the head length. This was the reason that three species of the golden mahseer in Pakistan were recognized (Mirza. 1975. 1980). However. it was soon realized that there was only one species of golden mahseer in the Indus river system (Mirza. 1990). Rainboth (1991) pointed out that *Tor putitora* (Hamilton) is restricted to Ganges-Brahmaputra River system. Mirza and Bhatti (1996) recognized the Indus golden mahseer as a distinct subspecies. viz. *Tor putitora macrolepis* (Heckel. 1838).

Javed (1985) studied 142 specimens of golden mahseer collected from various water bodies in Pakistan and Azad Kashmir. In 40 specimens the head length and body depth were equal, in 11 specimens the head length was lesser than body depth, in 91 specimens, the head length was greater than body depth. This means that there were about 64% specimens approaching *Tor putitora* (Hamilton), 28% specimens approaching *Tor mosal* (Hamilton) and only 8% specimens were approaching *Tor tor* (Hamilton). There was overlapping of characters in all the specimens. It was realized that the body depth was greater or equal in female specimens and that head was longer than body depth in male specimens. In immature specimens, the head length and body depth were almost equal. In colour pattern there is no clear cut distinction. It is variable according to the habitat.

It is, therefore, concluded that the species of golden mahseer found in the Indus river system is different from those found in the other river systems of South Asian subcontinent. Since the name *Labeobarbus macrolepis* Heckel is available for this species, the correct scientific name for the Indus golden mahseer is *Tor macrolepis* (Heckel). Thus the literature published on *Tor putitora* in Pakistan is really on *Tor macrolepis* and not on *T. putitora* (Subhan and Hafeez, 1993, 1994, 1998). The same is the case about the literature published on the golden mahseer of the rivers and reservoirs of the Indus River system in India (Johal *et al.*, 1999, 2000).

References

Day, F., 1871. Monograph of Indian Cyprinidae. Part-I. J. Roy Asiat. Soc. Bangal, 40:95-143.

Gunther, A., 1868. The Catalogue of Fishes in The British Museum. Vol 7.

Heckel, J., 1838. Fische aus Caschmir. Wien.

Hora, S.L., 1939. The game fishes of India, VIII: Mahseers or the large scaled barbels of India I. Putitor mahseer, *Barbus (Tor) putitora* (Hamilton). J. Bomb., nat. Hist. Soc., 41:272-285.

Javed, M.N., 1985. A contribution to the fishes of the genus *Tor* Gray (Pisces, Cyprinidae) from Pakistan and Azad Kashmir. M.Sc. Thesis Government College, Lahore.

Johal, M.S. Tandon, K.K. and Sandhu, G.S., 1999. Age and growth of an endangered cold-water fish-golden mahseer, *Tor putitora* (Hamilton) from Gobindsagar, Himachal Pardesh, India. Ichthyology, 59-73.

Johal, M.S. Tandon, K.K. and Sandhu, G.S., 2000. Maturity, Fecundity and sex-ratio of an endangered coldwater fish, golden mahseer, Tor putitora (Ham.) from Gobindsagar (H.P.), India. In: Coldwater Aquaculture and Fisheries (eds. .Singh, H. R. and Larka, W. S., Pp 265-278.

Mirza, M.R., 1975. Freshwater fishes and zoogeography of Pakistan. Bijdr. Dierk., 45:143-180.

Mirza, M.R., 1930. The systematics and zoogeography of the freshwater fishes of Pakistan and Azad Kashmir. Proc. Pakistan Congr. Zoology, 1:1-41.

Mirza, M.R., 1990. Freshwater fishes in Pakistan. Urdu Science Board, Lahore (in Urdu).

Mirza. M.R. and Awan. M.I.. 1976. Fishes of Sun-Sakesar Valley. Punjab. Pakistan. with the description of a new subspecies. Biologia. 22:27-49.

Mirza. M.R.. nd Bhatti. M.N.. 1996. Systematics and Biology of the Golden Mahseer of the Indus River system. Biologia. 42:31-35.

Rainboth. W.J.. 1991: Cyprinids of South East Asia. pp. 156-210. In: Cyprinid Fishes. (eds. Winfield. I. J. and Nelson. J.S.)London: Chapman. & Hall.

Silas. E.G.. 1960. Fishes from the Kashmir Valley. J. Bomb. Nat. Hist. Soc. 51:66-77.

Subhan. F. and Hafeez. M.A.. 1993. Fecundity of mahseer *Tor putitora* (Hamilton) in Rawal Lake. Biologia 39:69-76.

Subhan. F. and Hafeez.. M.A.. 1994. Food and feeding habits of putitora mahseer *Tor putitora* (Halmilton) in Rawal Lake. Islamabad. Proc. 1st Symp. Fish & Fisheries. Pakistan (1991):1-13.

Subhan. F. and Hafeez. M.A.. 1998. Gonadal maturation and breeding biology of the putitora mahseer. *Tor putitora* (Hamilton) (Teleostei) from Rawal Lake. Islamabad. Pakistan J. Zool.. 40:341-353.

Valenceinnes. A.. 1841. Histoire Nanturelle aus poissens. vols. 15. Paris.

Valenceinnes. A.. 1842. Histoire Nanturelle aus poissens. vols. 16. Paris

A Checklist of Freshwater Fishes of Nara Game Reserve

Saadat Ali Khan
Zoological Survey Department, Karachi

Abstract

During survey of fishes of Nara Game Reserve 37 species of fishes belonging to 8 orders 14 families and 25 genera are recorded.

Keywords: Nara Game Reserve, freshwater fish fauna, checklist, over-exploitation

Introduction

Although a number of studies have been carried out on the freshwater fish fauna of Sindh Province (Ahmad, 1963a-e; Ahmed and Khan, 1974; Ahmed *et al*, 1976, 1984; Hussain, 1973; Jafri *et al*, 2000; Khan, 1946; Niazi and Moazzam, 1999; Siddiqui *et al*, 1976; Sufi, 1946 etc.) but no work has been done on the fauna of Nara Canal and associated ecosystem except Khan (1962) who studied the fish fauna of Nara Canal. A total of 8 species were reported by him from the Nara Canal and associated 'Dhands'.

Nara Canal starts from Sukkur Barrage and ends up in the tidal creek of Indus. The part of the Nara Canal and associated 'dhands' (ponds, lakes and marshes) with the limit of District Khairpur have been declared as Nara Game Reserve since 20th December, 1972. This game reserve has an area of 109,966 hectre. Nara Canal in the game reserve area is important fishing zone supporting a variety of fishes. There are marshes on either side of the canal. These have light or dense reed vegetation at margin which are known for dense population of fishes. The marshes directly connected with canal were known to have more fish varieties. There is a series of lakes in the depression between sand dune. They are mainly fed by seepage or directly from Nara. Some of these lakes have diversified fish population. Present paper enlists species of freshwater fishes found in the Nara Game Reserve.

Materials and Methods

For collection of fish different types of nets including castnets, fixed nets, gillnets and dip nets were used during present study of fish fauna of Nara Game Reserve. Fixed nets are rectangular nets made of cotton, nylon. These nets are usually fixed by wooden poles or bamboos. They are of varying mesh size, used in both streams as well as in stagnant water.

Results and Discussions

During present survey of fishes of Nara Game Reserve 37 species of fishes belonging to 8 orders 14 families and 25 genera are recorded which are listed in Table-I. Almost all the species recorded from Nara Game Reserves are known from Province of Sindh, however, with the exception of *Catla catla, Labeo calbasu, Labeo rohita, Labeo gonius, Cirrhinus mrigala, Puntius sophore, Notopterus chitala, Notopterus notopterus* and *Wallagu attu* which were recorded by Khan (1962) all the species are new records from the area.

Table-I. Checklist of freshwater fishes from Nara Game Reserve

Scientific Names	Local names
ORDER: Clupeiformes	
FAMILY: Clupeidae	
Gadusia chapra	Palora – Palli
ORDER: Osteoglossiformes	
FAMILY: Notopteridae	
Notopterus notopterus	Gandani
Notopterus chitala	Gandan
ORDER: Cypriniformes	
FAMILY: Cyprinidae	
Securicola gora	Palri – Dachi
Salmostoma bacaila	Chal – Dahi
Chela laubca	Dannahrah
Chela cachius	Makhni
Aspidoparis morar	Chal
Labeo rohita	Rohu – Dambra
Labeo calbasu	Dahi
Labeo gonius	Seereba
Catla catla	Thaila
Cirrhinus mrigala	Morakha
Cirrhinus reba	Sunni
Puntius sophore	Popri – Pottiah
Puntius ticto	Chidu
Puntius conchonius	Chidu
Osteobrama cotio	Dhambra
ORDER: Siluriformes	
FAMILY: Bagridae	
Aorichthys aor	Singharee
Mystus cavasius	Tengarah
Mystus bleekeri	Tengra
Rita rita	Khagga
FAMILY: Siluridae	
Wallago attu	Potki – Jerki
Ompok bimaculatus	Malirah – Dimmon
FAMILY: Heteropneustidae	
Heteropneusteis fossilis	Singhi

FAMLY:	Schilbeidae	
	Eutropiichthys vacha	Dongna
FAMILY:	Sisoridae	
	Bagarius bagarius	Faugi Khagga
ORDER:	Beloniformes	
FAMILY:	Balonidae	
	Xenentodon cancila	Kenga
ORDER:	Channiformes	
FAMILY:	Channidae	
	Channa marulius	Chitra
	Channa striatus	Daula
	Channa punctatus	
ORDER:	Perciformes	
FAMILY:	Chandidae	
	Chanda nama	Makhni
	Chanda ranga	Shisha
ORDER:	Perciformes	
FAMILY:	Gobiidae	
	Glossogobius giuris	Golo
FAMILY:	Osphronemidae	
	Colisa fasciata	Kangee
	Colisa lalia	Choti kangi
FAMILY:	Cichlidae	
	Oreochromis mossambica	Talpo

In the canal, *Netopterus notopterus*, *Lakeo rohita*, *Cirrhinus mrigala*, *Catla catla*, *Rita rita*, *Wallago attu*, *Labeo gonius* and *Bagarious bagarious* were commonly found while *Channa marulius*, *Channa punctatus*, *Labeo calbasu* were rarely captured. In the marshes *Notopterus notopterus*, *Cirrhinus mrigala*, *Cirrhinus reba*, *Labeo rohita*, *Catla catla*, *Puntius sophore*, *Channa punctatus*, *Channa striatus*, *Ompok bimaculatus*, *Xenentodon cancila* and *Oreochromis mossambica* were found commonly while *Heteropneustes fossilis*, *Eutropiichthus vacha*, *Puntius ticto*, *Notopterus chitala*, *Mystus cavasius*, *Mystus bleekeri*, *Rita rita*, *Gadusia chapra* and *Aspidoparia morar* were rarely found. The ornamental fishes *Puntius conchonius*, *Colisa lalia*, *Colisa fasciata*, *Chanda nama* and *Chanda ranga* are also found in marshes. In the lakes connected to the canal major carp were common while in the isolated lakes these were rarely found. In these *Chauna punctatus*, *Notopterus notoptreus*, *Labeo gonious* and *Wallago attu* were rarely found.

The population of the fish in Nara Game reserve is threatened because of over-exploitation, changes in salinity regime and eutrophication etc. Commercial exploitation of fishes is increasing unabated resulting in declining catches of lucrative species. In addition population of non-target species specially juveniles are threatened due to over-exploitation. Some of the lakes have high salinity level due to which they are not able to support fish population. Growth of excessive vegetation is reported in some parts of the Nara Game Reserves which causes negative impact on ecology of marshes. In addition, decomposition of vegetation produces toxic elements which may fatal for fishes or may affect their growth.

References

Ahmad, N., 1963a. Fishery Gazetteer of District Hyderabad. Govt. Printing West Pakistan, Lahore: 1-4.

Ahmad, N., 1963b. Fishery Gazetteer of District Khairpur. Govt. Printing West Pakistan, Lahore: 1-2.

Ahmad, N., 1963c. Fishery Gazetteer of District Larakana. Govt. Printing West Pakistan, Lahore: 1-4.

Ahmad, N., 1963d. Fishery Gazetteer of District Sanghar. Govt. Printing West Pakistan, Lahore: 1-3.

Ahmad, N., 1963e. Fishery Gazetteer of District Sukkur. Govt. Printing West Pakistan, Lahore: 1-3.

Ahmed, M. F. and Khan, S. A., 1974. A checklist of the freshwater fishes of Sindh, Pakistan. Biologia, 20: 119-131.

Ahmed, M. F. Khan, S. A. and Mirza M. R., 1976. A checklist of the Freshwater Fishes of the Indus Plain, Pakistan. Biologia, 22: 229-259.

Ahmed, M.F. M.S. Niazi and S. A. Khan, 1984. Fishes of Leth Nullah, a brackish channel near Mirpur Sakro, Distt. Thatta (Sind). Rec. zool. Surv. Pakistan 10: 1-24.

Hussain, Z., 1973. Fish and Fisheries of Lower Indus basin Agric. Pakistan., 24: 297-322.

Jafri, S. I. H., Ali, S. S., Mahar, M. A., Hussain, S. M. and Khatoon, Z., 2000. Fisheries potential of tidal link lakes (District Badin) of Sindh Coast (Northern Arabian Sea). Pakistan J. Zool. 32: 301-306.

Khan, H., 1946. A fishery survey of the River Indus. J. Bomb. Nat. Hist. Soc., 46: 529-535.

Khan, M. Y., 1962. Fisheries potentials of the eastern Nara and its connected dhands. Agric. Pakistan 13: 410-426.

Niazi, M. S., and Moazzam, M. 1999. Spatial variations in the fish faunal composition in the Indus estuarine area. In: "Proceddings of the National Seminar on Mangrove Ecosystem Dynsmics of the Indus Delta (Annonymous ed.) Sindh Forest and Wildlife Department and the World Bank, Karachi. Pp. 170-180.

Siddiqui, P. A., Baqai, I. U. and Iqbal, M. 1973. Checklist of the fishes of Kinjhar (Kalri) lake with notes an environmental condition and fisheries potential Agric. Pakistan 24: 201-220.

Sufi, S. M. K. 1956. Fish fauna of Kinjhar Lake with an accounts employed by the Local fisheries. Agric. Pakistan, 8:208-229.

Rec. Zool. Surv. Pakistan Vol. XV. PP. 49-51, 2004.

A Note on the Occurrence of *Sacura boulengeri* (Pisces: Serrinidae) along Pakistan Coast

Mohammad Moazzam and Hamid Badar Osmany
Marine Fisheries Department
Government of Pakistan
Karachi

Abstract

Sacura boulengeri (Heemstra) was recorded for the first time from the coast of Pakistan. This anthiaine species, which is endemic in the north Arabian Sea, is known through five male specimens collected from the Gulf of Oman. Present paper extends its distribution to further north to the coast of Pakistan.

Keywords: *Sacura boulengeri*, Pakistan coast, anthiine

Introduction

Genus *Sacura* was established by Jordan and Richardson (1910).to accommodate *Anthias margaritaceus*, which was described by Hilgenclorf (1879) from Japan. Later on Heemstra and Randall (1979) assigned *Anthias formosus*, Boulenger, 1889 to *Sacura boulengeri*. Two. more species i.e. *Sacura parva* and *Sacura speciosa* were described from Timor Sea and Mamdano Bay, Celebes Indonesia respectively by Heemstra and Randall (1979).

Boulenger (1989,1895) described *Anthias formusa* from Muscat Oman. Since this name was preoccupied by *Anthias formusa* described by Bloch (1792) from Antilles, therefore the former was renamed as *Anthias boulengeri* by Heemstra (1973). Heemstra and Randall (1979) assigned *Anthias boulengeri* to genus *Sacura*. Genus *Sacura* could be distinguished from genus *Anthias* is having deeper body, longer head .different shape of dorsal and anal fins and in having fewer caudal fin rays.

In April 1999, a specimen of *Sacura boulengeri* was collected from of Sindh coast (23° 56' N 66° 31' E (90m) during commercial trawl fishing. The specimen was found to be a male having a total length of 17 cm.

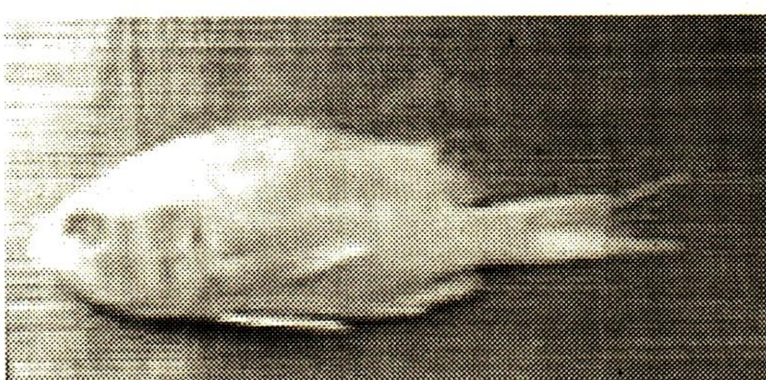


Fig. 1. *Sacura boulengeri* (Heemstra, 1973).

Synonyms:

Anthias formosus Boulenger 1889. .p. 238 (holotype from Mascat Oman); Boulenger. 1895. p 322. 326. pl.14.
Anthias boulengeri Heemstra. 1973. p. 206. fig 2.
Sacura boulengeri. Heemstra and Randall. 1979. p. 3-4. pl .1.

Remarks:

The specimen from Pakistan comes in confirmation with the description given by Boulenger (1889.1895). Heemstra (1973) and Heemstra and Randal (1979). Measurements are given in Table-I which indicates that various parameters of specimens from Sindh Coast fall within the range of percentages given in Heemstra and Randall (1979). This species is known from 5 specimen. all of them male (Heemstra and Randal 1979). therefore the present specimen is 6^{th} specimen of the species. This specimen is also a male. therefore. the female of this species is hitherto unknown. This anthiine species. which is endemic in the north Arabian Sea. was known from the Gulf of Oman (Heemstra and Randall. 1979; Randall. 1995). Present paper extends its distribution to further north into offshore waters of Pakistan.

Table –I Measurements of *Sacura boulengeri* from Pakistan in present of slandered length (SL) or head length (HL)

Measurements	Specimen from Pakistan	After Heemstra and Randall. 1979
Greater body depth(SL%)	41.67	41-43
Head length(SL%)	39.17	42-43
Pectoral fin length(SL%)	29.17	29-32
Pelvic fin length (SL%)	28.34	25-29
Caudal peduncle length (SL%)	20.84	20-22
Caudal peduncle depth(SL%)	12.50	12-14
First dorsal spine length (SL%)	5.84	6.4-7.3
Second dorsal spine length (SL%)	7.50	9.7-11
Third dorsal spine length (SL%)	5.50	52-66
Fourth dorsal spine length (SL%)	14.17	13-15
Third dorsal soft ray length (SL%)	47.50	50-52
Anal fin length (SL%)	32.50	33-36
First Anal spine length (SL%)	7.50	7.6-8.0
Second Anal spine length (SL%)	15.00	14-17
Second anal soft ray length (SL%)	25.00	26-29
Pelvic fin spine (SL%)	15.00	15-18
Snout lengt		

Sacura boulengeri can be distinguished from other species of *Sacura* in having 14 dorsal fin rays (15-18 in other species). more (30-35) gill rakers (22-29 in other species) and in having head length greater than body length (body length greater than head length in all other species)

Genus *Sacura* is known through only a few species and unknown as much of its ecology and biology are not fully understood. Okada (1965) and Suzuki *et al* (1974) studied sex reversal and ecology of *Sacura margaritacea* respectively. Such information about other species is totally lacking.

References

Bloch. M. E. 1792 Bloch. M. E.. 1792. Naturgeschichte der ausländischen Fische. Berlin. vol. 6: 126 p.

Boulenger. G. A.1889. Second account of the fishes obtained by Surgeon-Major A. S. G. Jayakar at Muscat. east coast of Arabia. Proc. Zool. Soc. Lond.. 1889 (pt 2). 236-246.

Boulenger. G. A.1895. Catalogue of the fishes in the British Museum. Catalogue of the perciform fishes in the British Museum. Second edition 1: 1-394.

Heemstra. P.C.. 1973. *Anthias conspicuus sp. nova* (Perciformes: Serranidae) from the Indian Ocean. with comments on related species. Copeia (1973): 200-210

Heemstra. P. C and Randall. J.E. 1979. Heemstra. P.C. and Randall. J.E. 1979. A revision of the anthiine fish genus *Sacura* (Perciformes: Serranidae) with descriptions of two new species. J.L.B. Smith Inst. Ichthyol. Spec. Publ. 20:12 p.

Hilgendorf. F.. 1879. Einige Beiträge zur Ichthyologie Japan's. Sitzungsber. Ges. Naturf. Freunde Berlin. (1879) 78-81.

Jordan. D. S and Richardson R. E.. 1910. A review of the Serranidae or sea bass of Japan. Proc. U. S. Natl. Mus..37: 421-474.

Okada. Y. K.. 1965. Sex reversal in the serranid fish . *Sacura margaritacea*. Proc.Jap Acd. 41: 737-745.

Randall. J. E.. 1995. Coastal fishes of Oman. University of Hawaii Press. Honolulu. Hawaii. 439 p.

Suzuki. K.. Kobayashi. K.. Hioki. S.. and Sakamoto. T.. 1974. Ecological studies of the anthiine fish *Sacura margaritacea* in Suruga Bay. Jap. J. Ichthy. 21: 21-33.

Rec. Zool. Surv. Pakistan Vol. XV. PP. 52-56, 2004.

Record of Juvenile Stages of *Cypraea turdus* Lamarck 1810 from Karachi Coast

Fahmida Iffat

Zoological Survey Department. Karachi

Abstract

Eight sequential growth stages of *Cypraea turdus Lamarck,* from juvenile to the adult have been described from Karachi coast. The transformation of juvenile into the subadult and adult stage along with the radical changes that occur in the shape of the shell during the course of growth. have been discussed.

Keywords: Growth stages. *Cypraea turdus*

Introduction

In January 2003. juvenile and adult stages of *Cypraea turdus* (Lmarack. 1810) were collected from Buleji. Karachi coast. Khan and Dastagir (1970) and Tirmizi and Zehra (1984) have previously reported this species from Pakistan coast. Barkati and Ahmad (1984) have described the spawn and early larval development of *Cypraea turdus* and *C. arabica*. Perveen, (1988) studied reproductive biology and larval development of some common molluscs from Pakistan coast including study of early development of Cypraca trudus i.e. from its egg to the veliger larva stage. However. no work seems to have been done on the growth phases of *Cypraea* species from Pakistan coast.

Growth phases of *Cypraea zebra* was studied by Abbot (1968) Hornell (1955) described the stages through which a cowry changes in shape and colour from immature to perfect shell. Ray (1951) and Rao (2003) described changes at different growth phases in cowries.

Materials and Methods

Specimens of *Cypraea turdus* were collected from Buleji coast (24° 54' N. 66° 48' E). Karachi. The specimens were preserved in 5% formaldehyde after narcotization. Measurements of the shells (length and breadth) were taken with the help of vernier caliper.

Results

On the basis of morphological characters the individuals were identified as juvenile of *Cypraea. turdus* (Lamarck. 1810) and ranked into 6 stages (Stage 1-6). One specimen (stage-6), which had assumed the shape of adult *Cypraea,* was ranked as a sub adult *C. turdus.* One advanced sub-adult (stage-7) and one adult of *C. turdus* (stage-8) were obtained from the previous collections of Zoological Survey Department from the same area. The study. therefore. covers a total of 8 specimen: five of them were juvenile. one sub-adult. one advanced sub-adult and one was ranked as adult (Table-I).

Table I. Measurements (in mm) of growth stages of *Cypraea turdus*.

Stages	Juvenile					Sub-adult	Advanced Sub-Adult	Adult
	1	2	3	4	5	6	7	8
Length	16.7	23.2	26.4	27.0	29.6	30.2	32.2	40.0
Breadth	11.4	13.6	14.2	17.9	20.0	20.58	22	29.3

Juvenile Stage 1 (Fig. 1)

The body whorl is elongate having a narrow aperture. The outer lip is sharp, thin and fragile. The spire is depressed but the pointed apex can be felt with finger tip.

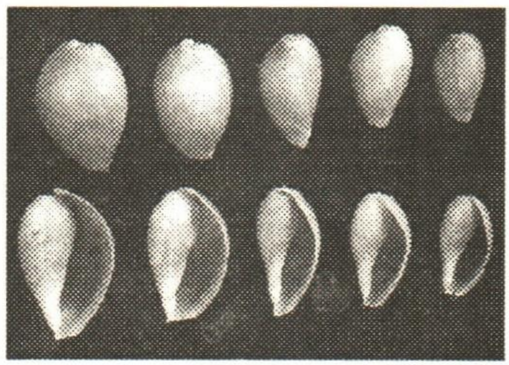


Fig. 1. Growth stages of *Cypraea turdus*: .Juvenile stages.

Juvenile Stages 2 & 3 (Fig. 1)

The aperture is moderately broad. The apex is pointed and can be felt with finger tip. The spire is depressed. The outer-lip is thin and fragile showing sign of turning in towards the columella. The gradual increment in length and breadth seems to occur at these stages.

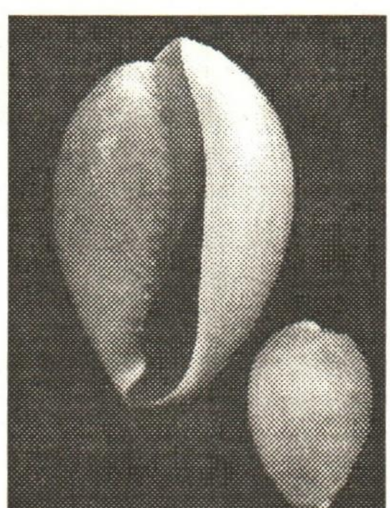


Fig. 2. Growth stages of *Cypraea turdus*: .Sub Adult stages.

Acknowledgment

The author gratefully appreciates the support, encouragement and guidance of Mr. Hamid Iqbal Javed Director Zoological Survey Department. Thanks are also due to Mr. Abrar ul Hassan for his cooperation during the field and laboratory work.

References

Abbot, R. T., 1968. A Guide to field identification Seashells of North America. Golden Press. New York

Barkati, S. and Ahmad, M., 1984. Egg masses and larvae of two species of *Cypraea* (Mollusca: Gastropoda) from the coast of Karachi. Pakistan J. Sci. Indust. Res. 27: 229-232.

Hornell, J. ,1951. The study of Indian Molluscs. Part 1. J.Bomb. Nat. Hist. Soc. 48: 321 – 322.

Khan, M. D., and Dastagir, S. G., 1971. On the Mollusca, gastropods of Pakistan. Rec. Zool. Surv. Pak 2:17–129.

Kira, T., 1962. Shells of the Western Pacific in Color. Vol .1. Hoikusha Publishing Co. Ltd., Japan.

Oliver, A. P. H., 1975. The Hamlyn Guide to Shells of the World. Hamlyn Publishing Group Limited

Perveen, R. 1988.Studies on the Reproductive Biology and Larval development of Some Common Molluscs from Pakistan Coast. M.Phil Thesis. Center of Excellence in Marine Biology. University of Karachi.

Rao, N. V. S. 2003. Indian Seashells (Part I). Zoological Survey of India. Kolkata.

Ray, H. C., 1951. Cowries (Mollusca, Gastropoda, Fam. Cypraeidae). J. Bomb. Nat. Hist. Soc., 49: 663-669..

Schilder, F.A. and Shilder, M. 1939.Prodrome of a monograph on living Cypraeidae. Pro. Malac. Soc. Lond. 23: 119 – 231.

Tirmizi M. N. and Zehra I., 1984. Marine Fauna of Pakistan 2. Molluscs Gastropoda. University Grants Commission. Islamabad

RECORDS ZOOLOGICAL SURVEY OF PAKISTAN

INSTRUCTION TO AUTHORS

The Records Zoological Survey of Pakistan publishes articles with in the Whole field of animal's life. Generally these articles will be in or related to biodiversity of the country.

Articles should be sent to the Editor, Records Zoological Survey of Pakistan. Articles will be considered for publication if they make an original contribution and are not published elsewhere.

All articles submitted for publication will be reviewed by refer. Submit two copies of the articles double space throughout, and print on one side only. Each copy of Typescript should be complete, including Title Page, Abstract, Text, References, Acknowledgements, Tables and Legends.

The following format may be used for the purpose.

TITLES:

* Title of the article.
* Author's Name.
  Institution/department to which the work should be attributed with complete address.

ABSTRACT:

An abstract should carry a summary of not more than 150 words. It should embody the pm-pose of the study, basic procedures, main finding and the principal conclusions. Suggest key words at the end of abstract.

TEXT:

It should be subdivided into: Introduction, Material and Methods, Results and Discussion.

TABLES:

Should be Separate from the text and numbered and with explanatory caption.

REFERENCE:

Reference with in the text should be cited by the author's name followed by the year e.g. (Imtiaz, 1990). When two authors, e.g. (Imtiaz and Iftikhar, 2004). In case of three or more than three author's the reference should be cited as e.g. (Iftikhar, et al. 1995). All reference should be arranged alphabetically.

Request

In order to enrich the "***National Zoological Collections***" and to update information on the occurrence and distribution of animal species in Pakistan Scientists and researchers working on animal taxonomy/systematic are requested to deposit their identified specimens to the Zoological Survey Department, Government of Pakistan, at the following address:

ZOOLOGICAL SURVEY DEPARTMENT
BLOCK 61, PAKISTAN SECRETARIAT
SHAHRAH-E-IRAQ, KARACHI-74200.
Tele 021-9203334
E-mail zsd6167@multi.net.pk

These specimens will be registered and their data will be computerized.

HAMID IQBAL JAVED
Director,
Zoological Survey Department

PCPPK Litho/1080/2004/Zoological. 25-3-2004 200 Books.

RECORDS ZOOLOGICAL SURVEY OF PAKISTAN

Table of Contents

Volume 15 2004