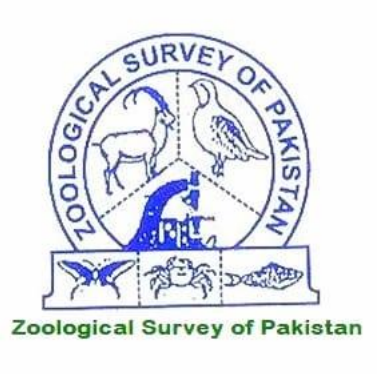
# RECORDS

## ZOOLOGICAL SURVEY OF PAKISTAN

Volume XI

1988




**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.**

© **All Rights Reserved**

## EDITORIAL BOARD

| | | | |
|---|---|---|---|
| Muhammad Farooq Ahmed | Chairman | Manzoor Ahmed | Member |
| Muzammil Ahmed | Member | M. Ramzan Mirza | " |
| Nasim Akhtar | " | Syed Ali Ghalib | " |
| Jameel Ahmed | " | Khan Mohammad Khan | " |

RECORDS

ZOOLOGICAL SURVEY DEPARTMENT

Volume XI - 1988

## CONTENTS


| S. No. | | Page No. |
|---|---|---|
| 1. | Fahmida Iffat:<br>Marine Snakes of Pakistan | 1 |
| 2. | S. I. Karim and S. Iftikhar Ahmed:<br>Raptors of lower Sind | 57 |
| 3. | Mohammad Akram:<br>On the sub-family Procamallaninae Yeh, 1960. Part I. Systematic studies on the genus Procamallanus (Baylis, 1923) with note on the genus Platocamallanus Bilqees and Akram, 1982 (Nematoda, Camallanidae) | 70 |
| 4. | Ishrat Ara Huda and Arshad Munir:<br>Zooplankton abundance in the coastal waters from Ibrahim Hydari to Bakran Sind coast of Pakistan | 86 |
| 5. | Zakia Khanum and Manzoor Ahmed:<br>Birds of Karachi University Campus, Karachi Sind | 104 |
| 6. | Zakia Khanum and Manzoor Ahmed:<br>True identification of aquatic birds in captivity in the Zoological Garden, Karachi | 108 |
| 7. | Mohammad Sadiq Niazi and Mirza Mohammad Azam:<br>Population status of Indus Dolphin in the River Indus above Sind. | 111 |
| 8. | Mohammad Farooq Ahmed:<br>Wildlife Estimation Techniques | 115 |

Records zool. Sur. of Pak. Vol. XI, 1988.

# MARINE SNAKES OF PAKISTAN

By

Fahmida Iffat
Marine Biological Research Laboratory,
Zoological Survey Department, Karachi

## ABSTRACT

All Marine snakes belong to a single family, Hydrophidae. There are in all 55 species which have so far been recorded from all over the world. Out of these 55 species, only 14 species, comprising 7 genera, have been recorded from the Sind and Baluchistan coasts of Pakistan. All the sea snakes are poisonous and are neurotoxic.

The present paper deals with the general characters, distribution, status and variations of the species found in Pakistan. The collection data and morphometric observation are summarised in tabular form.

## INTRODUCTION

All Pakistan marine snakes belong to the sub family Hydrophiinae, family Hydrophidae and inhabit sea water, tidal creeks, rocky coasts and sandy beaches.

Some eminent workers have done work on marine snakes of Pakistan. Among them are Boulenger (1883-91), Murray (1884-92), Smith (1931-43), Minton (1962-66), Mertens (1969-71) and Khurshiduddin (1968) who gave an account of the sea snakes from this area.

Khurshiduddin (1968) described 9 species belonging to six genera and Ghalib et al (1976) listed 12 species of marine snakes in their checklist of 'Reptiles of Pakistan'. Lately, Khan (1982) described 14 species of marine sankes in his "Annotated checklist and key to the reptiles of Pakistan."

Of 55 species of the sea snakes distributed in the world, 14 have been recorded from the coasts of Pakistan. Twelve species are present in the collections of Zoological Survey Department. Two species, namely *Hydrophis faciatus faciatus* (Schneider) and *Astrotia stokesi* (Grey), have not been collected or observed in Pakistan since their original records. Another species which also seems to be very rare, is *Hydrophis ornatus ornatus* (Grey). It was recorded by Smith (1926) from Muscat and later a juvenile specimen was collected by Mertens (1969) from the coast of Astola Island near Karachi. The Zoological Survey Department Collected one specimen of this species from The mangrove swamp near Sandspit, Karachi in 1983.

All the sea snakes are poisonous. They have a poison apparatus similar to that of elapids, having fixed fangs at the anterior end of the upper jaws. Their extremely potent venom is used mainly to obtain food, rarely for defensive purposes. No instance of any

casualty regarding marine snake bite has been recorded in our coastal areas. Neurotoxins predominate in the venom of these snakes. The poison, therefore, affects the nervous system and may cause weakness and paralysis which may extend to the muscles of the heart and those connected with the respiratory system.

The poison of *Enhydrina schistosa* (Daudin) has been proved by many workers to be more fatal than that of cobra. Russell and Cantor ascertained that the sea snakes form the most poisonous group in the whole order. Rayer mentioned a case in which a fisherman died in an hour and a quarter. He also made experiments in India with live specimens of *Hydrophis* and found that fowls succumbed to their bite in a few minutes. Deaths have been reported from Europe by the bite of *Pelamydrus platurus* also.

In almost all the sea snakes, the posterior part of the body is much thicker than their anterior part. Mostly the abdomen is two to three times larger in diameter than the head and neck. In the genus *Microcephalophis* (small headed), the abdomen is five times thicker than the fore part of the body. These species are remarkable for their small heads and slender fore-bodies.

Sea snakes feed entirely upon fishes, prawns and mainly eels, probably because of their elongated shape which might be easy for a snake to swallow. They kill their prey by venom. They are diurnal in their habits. All the Pakistan species are viviparous (Live-bearing). The number of their young ranging from 2 to 18 at a time, produced during March and April. They are more brightly coloured than the adults. Females grow to a larger size than males.

Sea snakes are distinguished from land snakes in having the following characters :

(i) The flattened fin-like tail which helps in swimming.

(ii) Body is flattened from side to side, accompanied by loss of the widened ventral plates. These ventral shields are well developed only in the few species that come ashore to breed.

(iii) Their nostrils are directed upwards and can be closed tightly to exclude the water.

## MATERIAL AND METHOD

### MATERIAL

The studies were based on material consisting of 111 specimens preserved in formalin (71 were already present in the old departmental collections and 40 specimens were collected during the course of the present studies). The freshly caught specimens were examined thoroughly and carefully for morphometric studies and then preserved first internally by injecting 10% formalin solution and then externally by keeping them in 5% formalin solution in jars.

METHODOLOGY :

The methodology used during the present work involves the following three principal studies :–

(i) OBSERVATIONS :

Freshly collected specimens were observed for the study of morphology on the the spot in respect to their colour and number of scales in various parts of the body.

(ii) MEASUREMENTS :

Total snout-vent and tail lengths were taken in millimeters for the sake of maximum accuracy.

(iii) IDENTIFICATION :

For identification of species, number of scales in the regions of the pre-ocular, post-ocular, supra-labial, infra-labial, temporal, sub-lingual, neck, mid-body above vent and ventrals (belly scales), were counted using a magnifying glass. The colour pattern, number of body bands and measurements of various parts of the body were also taken into account.

All the morphometric measurements were compared with the work done by previous authors. Tables indicating observation on the above identification characters have been prepared in respect of each species for study at a glance.

## SYSTEMATIC ACCOUNT

FAMILY: HYDROPHIDAE
SUBFAMILY: HYDROPHIINAE
GENUS: *Hydrophis* Latrelle

1; *Hydrophis cyanocinctus* Daudin (Plate - 1)
(Annulated Sea Snake)

### GENERAL CHARACTERS:

Head broad, slightly depressed, snout rather long; rostral wider than high; frontal longer than broad; one preocular; 1–2 postoculars; 1–2 anterior and 2–4 posterior temporals; 7–8 supralabials; 9–10 infralabials; body cylindrical anteriorly and compressed in the posterior three-fifths; scale imbricate with rounded or blunt tip on the thick part of the body; 25–35 scale rows on neck; 37–48 on midbody; ventrals 281–390 distinct, twice size of adjacent scales anteriorly and smaller posteriorly, ground color dirty white pale greenish, yellow, tail darker than body, head olive, reddish, dull yellow, chin and throat drak gray; head in young blackish; 41–70 sooty cross bands on body and 6–9 on tail; bands widest on mid-dorsum, narrower on sides, bands wider than interspaces between them; 3–6 enlarged preanal scales.

### VARIATION

The length of specimens according to previous workers, ranged from 1185 mm, to 1885 mm while the material present in our collection ranges from 870 mm to 1180 mm

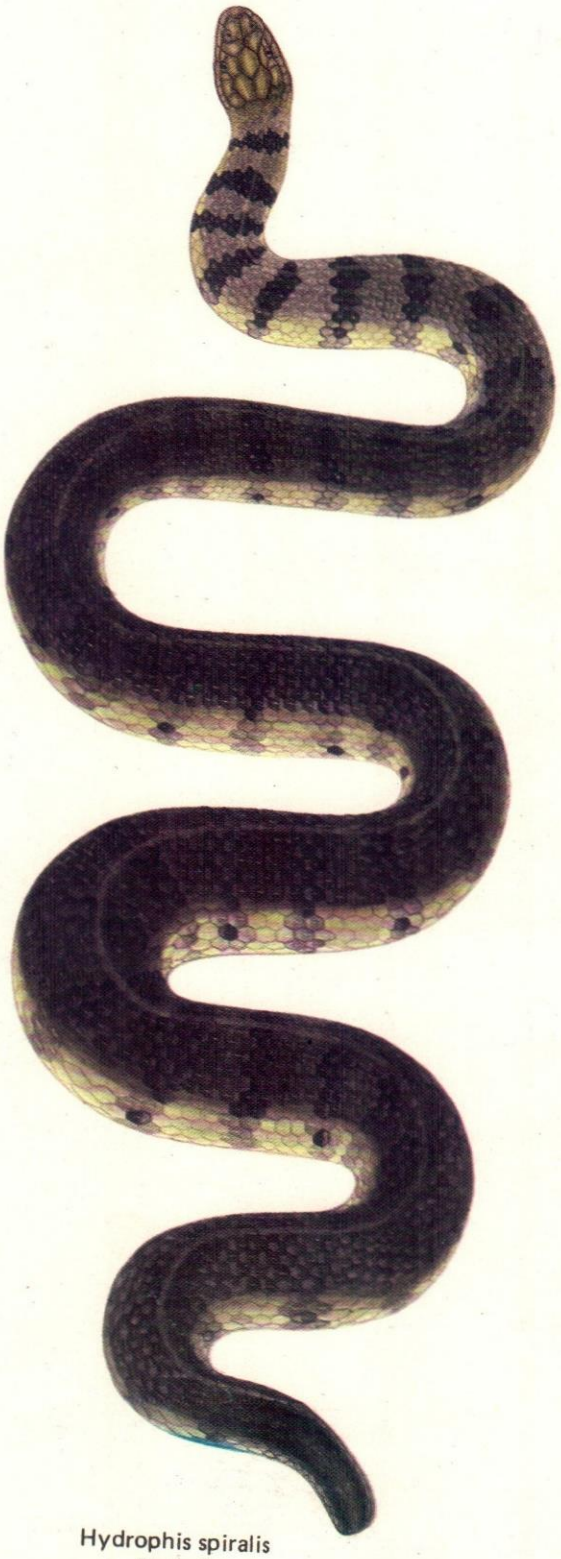
### HABITAT AND DISTRIBUTION

It inhabits creeks containing shallow water, muddy bottom and mangroves. It extends from the Persian Gulf to the Idzu Sea of Japan, southward to Sri Lanka and the islands of Indonesia.

### STATUS :

Common :

Hydrophis cyanocinctus
Plate 1



Hydrophis spiralis
Plate 2

2. *Hydrophis spiralis* Shaw (Plate - 2)
(Yellow Sea Snake)

**GENERAL CHARACTERS :**

Head moderately large and broad; snout rather long, rostral broader than deep; one precocular; 1–2 postoculars; one anterior and two posterior temporals ; 7 supra and 9 infralabials; 2 well-developed pairs of sublinguals; body elongate, cylindrical and robust anteriorly, moderately compressed and robust posteriorly, scales imbricate, smooth on the anterior part of body and weakly keeled on the posterior part; 35–39 scale rows on midbody, 25–29 on neck, 266–368 ventrals; ground dorsal color golden yellow to yellowish green, ventral surface pinkish, scale margined with black, tail with black patch near tip, head yellow, in young blackish with yellow mark; body with 34–70 black annuli, widest in vertebral region, narrower on flanks and ventrally, bands narrower than interspace between them.

**VARIATION**

51 cross bands were observed encircling the body, whereas Minton (1966) observed 44–48 and Smith (1943) 46–54.

**HABITAT AND DISTRIBUTION**

It inhabits pelagic waters away from the coast-line and it avoids creeks. It extends from the Persian Gulf, around the coasts of India to Celebes and Philippines.

STATUS:

Less Common :

Hydrophis lapemoides
Plate 3

3. *Hydrophis lapemoides (Gray)* (Plate - 3)
(Persian Gulf Sea Snake)

## GENERAL CHARACTERS :

9–10 maxillary teeth; head rather small: rostral slightly broader than deep; one pre and 2–3 post oculars; diameter of eye equal to its distance from the mouth. 2–3 anterior temporals; 2–3 posterior temporals; 7–8 supralabials; 8 infralabials; 2 pairs of well developed sublinguals; body elongate, slender anteriorly; scale keeled hexagonal or quadrangular on the thickest part of the body and juxtaposed; feebly imbricate on neck; scale rows 29–35 on neck 43–51 on midbody, ventrals 314–372, twice as broad as adjacent scales; 5 preanals; ground color pale grey, shading to white and sides and ventrally head olive, with dull yellow curved mark; 36–45 greenish or blackish bands on body and 6–7 on tail, bands are wider than their interspaces in vertebral region but narrow on sides.

## VARIATION

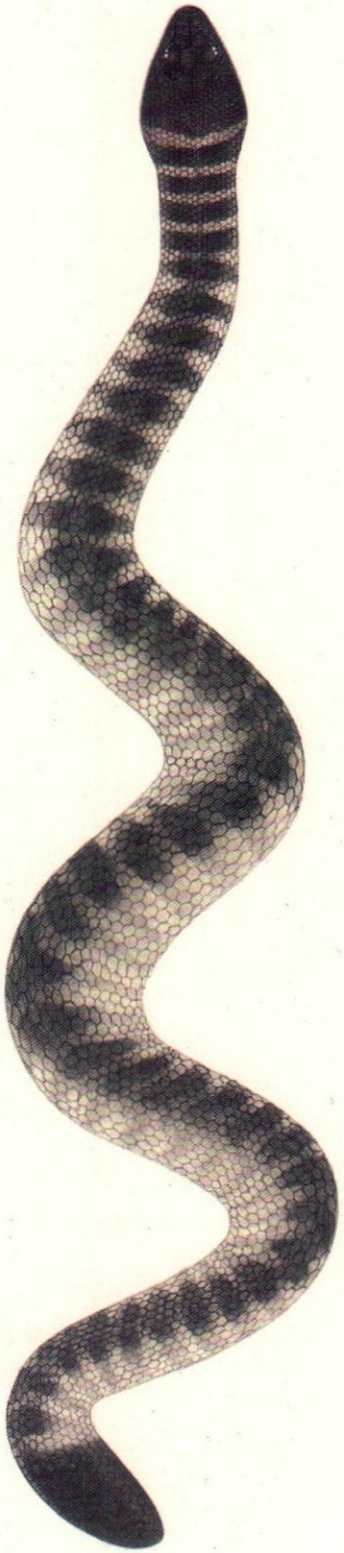
Minton (1966) recorded 36–44 bands on the body, Smith (1943) counted 33–43 bands, but our observation of the collected species shows 44–62 bands throughout the body. Minton (1966) recorded the maximum length to be 949 mm, while total lengths of our specimens ranged from 800 mm to 1040 mm.

## HABITAT AND DISTRIBUTION

It inhabits pelagic waters extending from the Persian Gulf and along the Indian coasts to Orissa and Sri Lanka.

## STATUS:

Less Common :



Hydrophis caerulescens caerulescens
Plate 4

4. *Hydrophis caerulescens caerulescens* (G. Shaw) (Plate - 4)
(Many toothed Sea Snake)

## GENERAL CHARACTERS :

Head small rather elongate; rostral broader than deep; one preocular; one postocular two anterior temporals; four posterior temporals; 7–8 supralabials; 9 infralabials; posterior chin shield smaller; cuneate one between the 3rd and 4th infralabials; scales longer than broad and imbricate or subimbricate on the slender anterior part of body as broad as long, hexagonal or quadrangular feebly imbricate or juxtaposed on the compressed posterior part with a short keel, scales are very rough, especially in old males; 31–43 scale rows on neck. 38–54 on midbody, 253–334 ventrals, not much larger than adjacent scales; color bluish or grayish blue dorsally, ventral surface yellow, head black, body with 35–58 deep bluish black bands, these bands are broader than the interspaces between them at vertebral region.

## VARIATION

1. 57 bluish gray bands counted in our specimen, whereas Minton (1966) observed only 38.

2. Total length of our specimen is 1190 mm while Mintion (1966) measured the maximum length to be 754 mm.

## HABITAT AND DISTRIBUTION

It inhabits muddy creeks with mangrove swamps and is recorded from the Java, Borneo and Chinese coasts.

## STATUS :

Rare :

Hydrophis ornatus ornatus
Plate 5

5. *Hydrophis ornatus ornatus* (Gray) (Plate - 5)
(Cochin Banded Sea Snake)

GENERAL CHARACTERS :

Head elongate slightly depressed; rostral broader than deep; frontal rather longer than broad; preocular one and postecular 2–3; 9 supralabials; 2 anterior temporals; 13 infralabials, the anterior pair or chin shield well developed and incontact with one another; the posterior pair ill developed and separated by scales; body robust, not markedly elongate, the great diameter posteriorly being about twice that of neck; 28–39 scale rows on neck in males, 32–45 in females; 33–45 on midbody in males. 39–55 in females, posterior scales more or less hexagonal, as broad as or broader than long subimbricate or juxtaposed, with a central tubercle or short keel; ventral distinct throughout, about twice as broad as the adjacent scales anteriorly, narrower posteriorly, 209–260 in males, 236–312 in females; color pale greyish or olivaceous, above with broad dark bars or rhomboidal spots separated by narrow inter-spaces; below yellowish or whitish; head olivaceous, 45 or 46 cross bands.

VARIATION

It is a new record from Karachi coast. Previously it was recorded from Astola Island by Mertens (1969).

1. 48 neck scales were observed in our specimen whereas Smith (1943) reported 28–45 neck scales.

2. Total length of our specimen is 1822 mm, while Smith (1943) reported 1065 mm to be the maximum length.

HABITAT AND DISTRIBUTION

It has been recorded from the Persian Gulf to China, Australia.

STATUS:

Rare :

Hydrophis mamillaris
Plate 6

6. *Hydrophis mamillaris* (Daudin) (Plate - 6)
(Bombay Sea Snake)

GENERAL CHARACTERS :

7 maxillary teeth; head small, elongate not depressed; neck slender and elongated; rostral wider than high; frontal longer than broad; one preocular; 1–2 postoculars ; 2 anterior temporals; 3 posterior temporals; 7–8 supralabials ; 9–10 infralabials; posterior pair of chin shield a little larger than anterior pair; body slender and cylindrical in its anterior two-fifth; compressed and rather heavy in the posterior three-fifth; anterior scales longer than broad feebly imbricate, posterior scales juxtaposed with a ground accentric tubercle or short keel, hexagonal or quadrangular on the thickest part of the body; 25–29 scale rows on neck, 31–40 on midbody, 302–390 ventrals distinct throughtout bicarinate, not twice as broad as the adjacent dorsal scales; 4–6 preanals ; ground color yellowish or grayish with 40–57 broad black bands, wider dorsally than interspaces narrower on sides, tail black with 1–6 light lateral bars, head, chin and throat black.

VARIATION

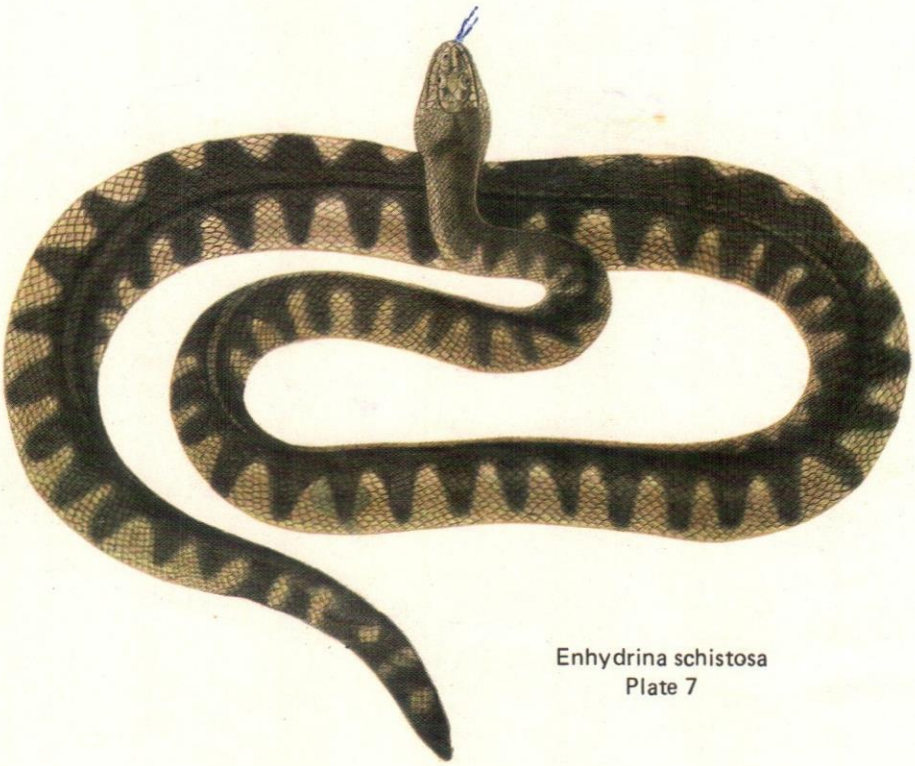
1. 40 to 55 body bands were observed in our specimen, while Minton (1966) observed 42–57 bands.
2. The bands in our specimens are black and dark brown, while Minton (1966) observed only black.

HABITAT AND DISTRIBUTION

It inhabits sandy and muddy beaches. It was recorded from the western and eastern coasts of the Indian Peninsula.

STATUS :

Rare :



Enhydrina schistosa
Plate 7

7. *Hydrophis faciatus faciatus* (Schneider)
(Small headed Banded Sea Snake)

GENERAL CHARACTERS :

This is a rare species. Preuious record show that it inhabits shallow sandy tidal pools near rocky points. Murray (1884) and Smith (1943) recorded this species from Sind (Karachi). No subsequent worker has been able to record it from Pakistan.

DISTRIBUTION AND STATUS

Very rare on Pakistan coasts but it is quite common on the eastern coasts of the Indian Peninsula, Gulf of Bengal. This species has also been recorded from Burma and the Straits of Malacca. Murray (1886) recorded Aturia *lindsavi* and *H. chloris* (synonyms) from Karachi coast.

8. *Enhydrina schistosa* (Daudin) (Plate - 7)
(Beaked Sea Snake)

GENERAL CHARACTERS :

Mental shield elongate and concealed in cleft; tip of rostral decurved and pointed; head large, moderately long, little depressed; eye with dull greenish iris; one preocular; 1–2 postoculars; 1–2 anterior temporals; 3–4 posterior temporals. 7–9 supralabials. 8–10 infralabials; body elongate, stout and laterally compressed; scales subimbricate, with short central keel; 51–59 rows at midbody in males and 53–63 in females, 53–40 on neck; ventrals very small 239–359, 2–6 preanals; color dirty white to pale greenish gray; head greenish, tail black; body with 40–50 olive to blackish cross bands, distinct on posterior half of body.

VARIATION

1. Body bands 42–51 in our specimens while Minton (1966) reported 42–50.
2. Range in total length 470 mm to 1200 mm in our specimens while Mintor (1966) observed 859 mm. to 1162 mm specimens.
3. Range in total length 728 mm to 1210 mm in our specimens while Minton (1966) observed 859 mm. to 1162 long specimens.

HABITAT AND DISTIBUTION

It inhabits moderately shallow water with a sandy bottom but has been encountered where the bottom is sandy or rocky. It was seen in offshore waters during calm seas from November through February, and enters tidal creeks during monsoon. Recorded from the Gulf of Oman and the Seychelles eastward to the coast of southern Vietnam and Australia. Specimens of this species have been collected by Zoological Survey Department from Sind and Baluchistan coasts.

STATUS :

Common :

Lapemis curtus
Plate 8

9. *Lapemis curtus* (Shaw) (Plate - 8)
(Short Sea Snake)

GENERAL CHARACTERS :

Small stout snake; head massive, depressed with strong jaws; snout rounded; eye with dull greenish iris; rostral wider than high and trifid; preocular and postocular single; parietals divided into three or four parts .6–7 supralabials; 9 infralabials; body cylindrical anteriorly, strongly depressed posteriorly; ventrals larger anterior than posterior, fewer than 200; ground color pale olive, shading to white or pale yellow on sides; 45–55 black or drak olive cross bars often alternating to form a zigzig band, top of head dark gray or olive, distal half of tail black.

VARIATION

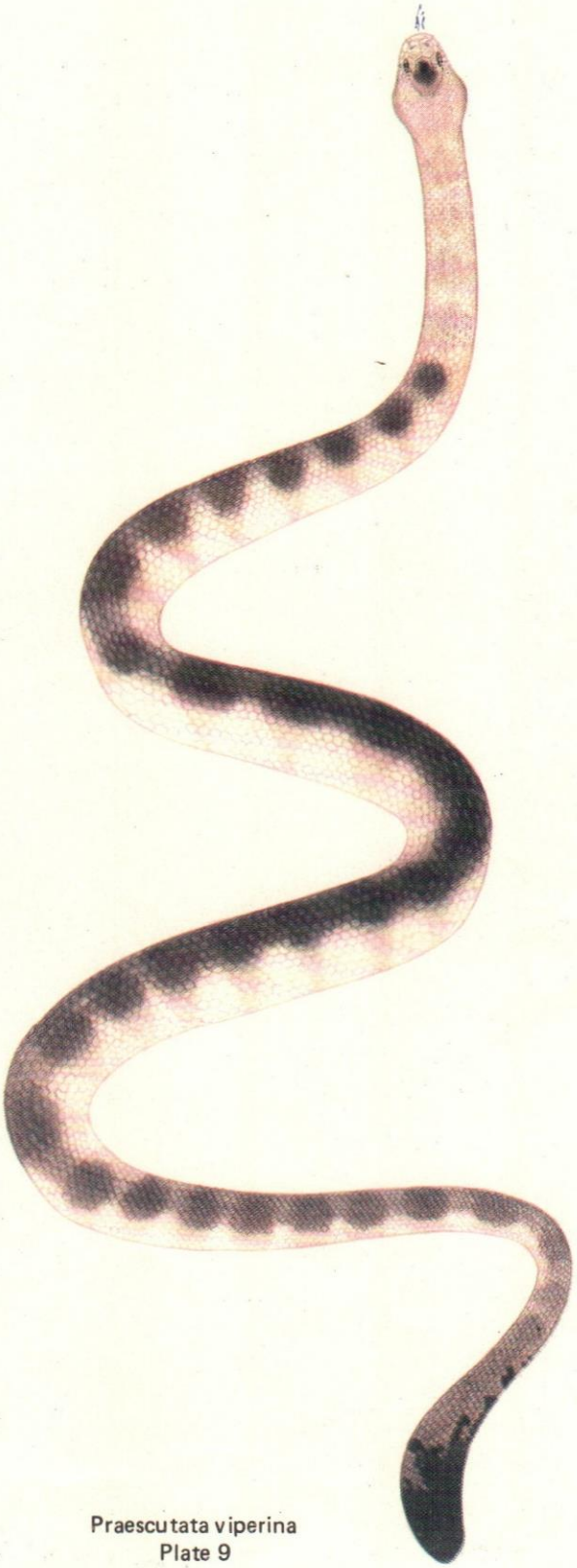
1. Parietal shield broken into 5–9 pieces in our specimens, while Minton (1966) reported 5–6 pieces.
2. Neck scales 30–36 in our specimens, while Smith (1943) observed 28–35 neck scales.
3. Range in midbody scales as observed by me 32–44 while Smith (1943) observed 33–43 midbody scales.
4. Range in ventral plates is 145–190, whereas Smith (1943) records 154–194 and Minton (1966) counted 165–180.
5. Snout vent length as measured by me is 730 mm to 900 mm, whereas previous record list 676 mm to 850 mm.
6. Range in Tail length as measured by me is 60 mm to 95 mm, whereas previous records list 51 mm to 85 mm.

HABITAT AND DISTRIBUTION

It inhabits the rocky coast from the Persian Gulf to Sri-Lanka and along the eastern coast of India to Madras.

STATUS:

Common :



Praescutata viperina
Plate 9

10. *Praescutata viperina* (Schmidt) (Plate - 9)
(Viperine Sea Snake)

**GENERAL CHARACTERS :**

Head short, wide, depressed, snout very broadly rounded; rostral trifid; 1–2 preoculars; 2–1, postoculars; 2 anterior temporals and 3–4 posterior; 6–7 supralabials, 3rd and 4th touching eye; 7–8 infralabials; body cylindrical anteriorly and compressed posteriorly; ventrals 225 or more, anterior one half of width of body; scales juxtaposed, smooth or with short central keel, at midbody 38–47 scale rows; ground color pale peach to greenish white, with series of 25–32 rhomboid dorsal blotches fused along midline and black to dark green in color; head dark.

**VARIATION**

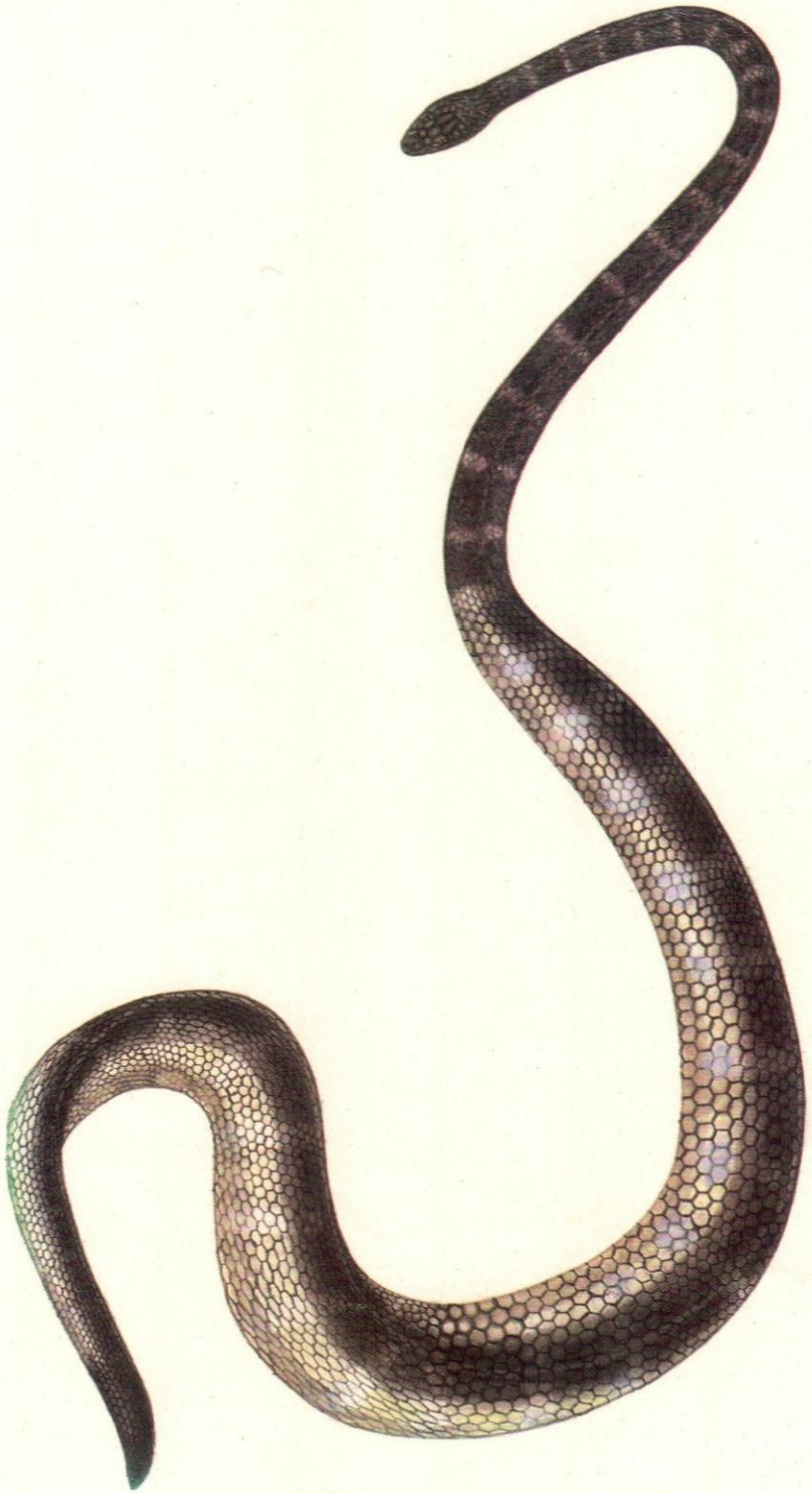
Scale rows at midbody in our meterial range from 44–51 while Smith (1943) recorded 37–50 and Minton (1966) 38–47.

**HABITAT AND DISTRIBUTION**

It inhabits the coastal waters and creeks from the Persian Gulf around the coast of India to southern China and the northern coast of Borneo and Java.

STATUS :

Less Common :



Microcephalophis gracilis gracilis
Plate 10

11. *Microcephalophis gracilis gracilis* (Shaw) (Plate - 10)
(Common Small Headed Sea Snake)

GENERAL CHARACTERS:

4–6 maxillary teeth; head very small, elongated not depressed; snout long sub-conical, slightly produced downward; rostral large higher than wide; frontal longer than broad; one preocular; one postocular; one temporal; 5–6 supralabials, 2nd in contact with prefrontal; 6–7 infralabials; body long very slender anteriorly, much compressed posteriorly; its greatest diameter being 4–5 times that of the neck; anterior scales smooth, elongate, imbricate, posterior scales juxtaposed, hexagonal, broader than long, with small tubercles, 17-23 scales rows on neck, 29–43 on midbody; ventrals larger than adjoining scales on anterior third of body; completely divided posteriorly by a median furrow and with heavy tubercles, head chin, throat black to dark olive, posterior part pale yellow to greenish, white or pale yellow spots on side of neck or with light cross bands, young black with a series of whitish dorsal bands or oval lateral spots on the slender part of the body and more or less complete; 40–60 bands posteriorly, with age the markings lose definition and the adult is usually greyish above, paler below, with the bars or bands indistinctly marked, particularly on the thickest part of the body.

VARIATION

Scales on neck were 21, whereas Smith (1943) recorded 17–19 and Minton (1966) 18–19.

HABITAT AND DISTRIBUTION

It inhabits shallow water with muddy or sandy bottoms and mangrove swamps. It has been recorded from the Persian Gulf to the coast of India, thence to Hongkong. Borneo and northern Australia.

STATUS :

Rare :

12. *Microcephalophis cantoris* (Gunther)
(Cantor's small Headed Sea Snake)

GENERAL CHARACTERS :

Head small narrow not depressed; snout long, bent down ward anteriorly, subconical; eye very small; rostral higher than broad, preocular one; postocular one; a large anterior temporal, followed by an equally large or even larger shield posteriorly; 6 supralabilas, 2nd not touching prefrontal; 7–8 infralabials; two pairs of well developed chin shields; body very thin and cylindrical anteriorly and compressed posteriorly; ventrals at midbody divided and difficult to distinguish from adjacent scales and 393–404; scales smooth, imbricate and longer than broad anteriorly, juxtaposed, henagonal with small tubercles posteriorly; 40–43 scale rows on midbody, 23 on neck, 33–41 just anterior to vent; anterior half of body light olive to yellow above, paler below, posterior half of body dark olive above, yellowish laterally; body with 49–61 gray to black bars.

VARIATION

Total lengths of our specimens were 1335 mm to 1520 mm while Minton (1943) reported the range in length to be 1155 mm to 1392 mm.

HABITAT AND DISTRIBUTION

It inhabits shallow waters with muddy or sandy bottoms. It extends along the Indian coast upto Orissa and Chittagong.

STATUS :

13. *Pelamydrus platurus* (Linnaeus) (Plate - 11)
(Pelagic Sea Snake)

**GENERAL CHARACTERS :**

6–9 maxillary teeth; head long, narrow and flat; snout blunt, one preocular; 2–3 postoculars; 2–3 anterior temporals, 2–4 posterior temporals, a subocular; 6–8 supralabials, 9–13 infralabials; 3 subequal pairs of chin shields separated from one another; body strongly compressed laterally; scale smooth, juxtaposed; quadrangular, 47–63 rows at midbody; ventrals at midbody divided and difficult to distinguish from adjacent scales that accurate count is impossible; ground color lemon yellow to cream, paller ventrally; tail with black and white bars or vermicular markings, a brown or pale dorsal stripe 10–19 scales rows wide, extending length of body.

**VARIATION**

1. The dorsal stripe in our specimens are always dark brown in color while Smith (1943) observed pale, dark amber to tan and black dorsal stripes.

2. Total length as measured in our specimens ranges from 535 mm to 730 mm while Smith (1943) reported 720 mm to 880 mm and Minton (1966) reported 485 mm to 631 mm.

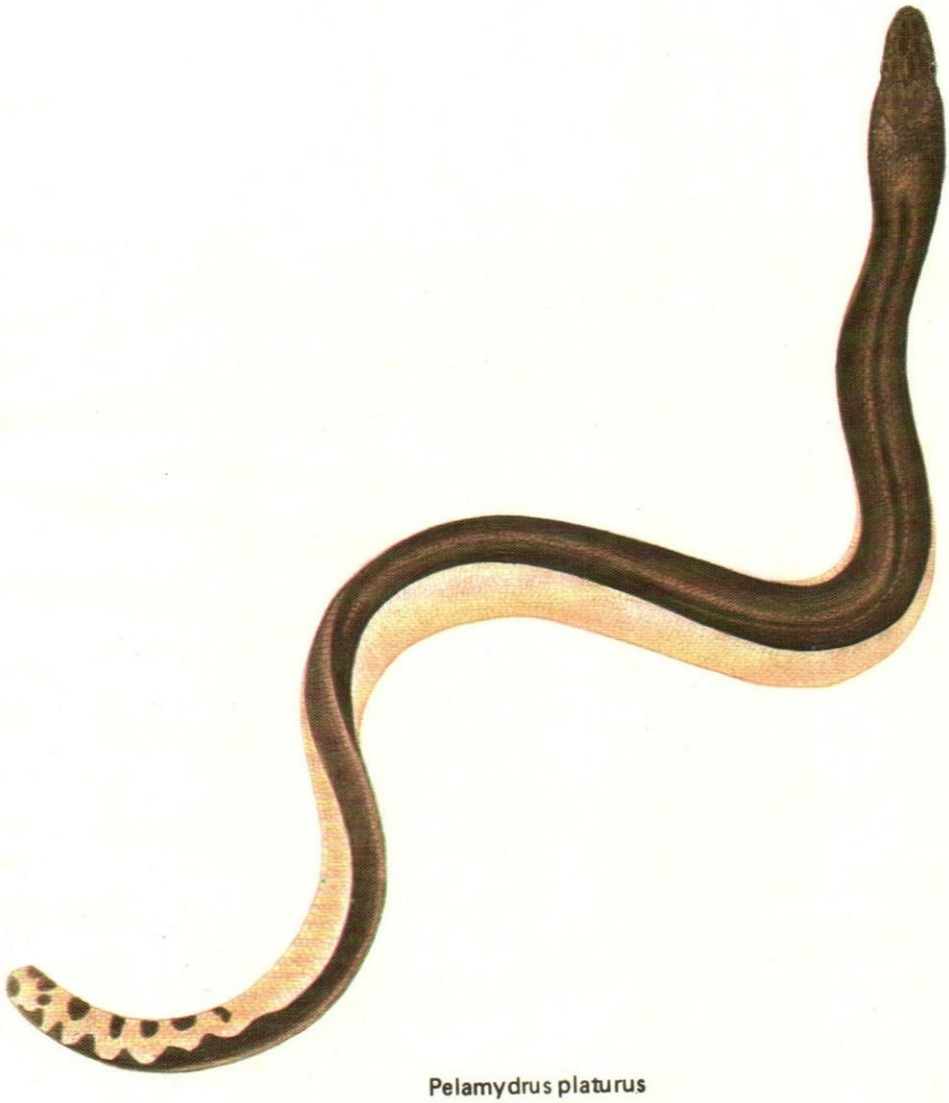
3. Tail length as measured by us is 66 mm to 75 mm, while Smith (1943) reported 80 mm to 90 mm.

**HABITAT AND DISTRIBUTION**

It inhabits pelagic waters but may come ashore. It has been met with hundreds of miles from land and is found only in open sea water and does not frequent the mouth of rivers. It extends from the Persian Gulf to the cape of Good Hope to New-Zealand. In American waters it extends from the Gulf of California to the coast of Ecuador.

**STATUS:**

Less Common :



Pelamydrus platurus
Plate 11

14. *Astrotia Stokesi* (Gray)
(Large Headed Sea Snake)

**GENERAL CHARACTERS :**

Head large markedly depressed, snout rather long, eye moderate. The diameter of neck being more than half the greatest diameter of the body. Rostral as deep as broad, frontal entire longer than broad, pre and postocular 1–2; temporal not developed, replace a small scale, upper labials 8–11, 4th 6th touching the eye, lower labisls variable, scales rows on neck 37 to 47 on midbody 47 to 59 ventrals 226 to 286. The color of head is dark olivaceous to yellowish; body yellowish or pale brown, with broad black or dark brown bands, which are 32 to 36 in numbers, No specimen has been collected from Pakistan by Zoological Survey Department.

**HABITAT AND DISTRIBUTION**

Murray (1887) recorded Hydrophis guttata (synonym) from north coasts of Australia along the Malayan and Indian coast to Makran.

## REFERENCES


| | | |
|---|---|---|
| Boulenger, G. A. | 1890 | The Fauna of British India including Ceylon and Burma. Reptilia and Batrachia. London, xviii + 541 pp., figs. |
| | 1912 | A vertebrate fauna of the Malay Peninsula. Reptilia and Batrachia, London. Malay States Govt., Press. pp. 179-197. |
| Clifford, H. Pope. | 1956 | The Repitle World. Routledge, 8 Kegan Paul Ltd., London. |
| Daniel, C. J. | 1983 | The Book of Indian Reptiles. Bombay Natural History Society. |
| Ghalib, S.A. et al. | 1976 | A checklist of the Reptiles of Pakistan. Rec. Zool. Sur. of Pakistan. Vol, VIII, No. 1 & 2. |
| Hora, S. L. and Chopra, B. | 1923 | Reptilia and Batrachia of the Salt Range, Punjab. Rec. Indian Mus. |
| Hvass, Hans. | 1984 | Reptiles and Amphibians of the world. Eyre Methuen, London. |
| Karal P. Schmidt & D. Dwight Davis. | 1944 | Field Book of Snakes. G.P. Putnam's Sons., New York. |
| Khan, M. S. | 1982 | An annotated checklist and key to the reptiles of Pakistan Part III: Serpentes (Ophidia). Biologia 28, No. 2:215–254. |
| Khurshiduddin, S. | 1968 | On a collection of Sea Snakes in the Zoological Surevy Depatment. Agri. Pak. Vol. 19(2) : 201-212. |
| Minton , S. A. | 1962 | An annotated key to the Amphibians and Reptiles of Sind and Lasbela, West Pakistan. Amer. Mus. Novitates No. 2081: 1–60. |
| | 1966 | A contribution to the Herpetology of West Pakistan Bull. Amer. Mus. Nat. Hist. Vol. 134: 27–184. |
| | 1980 | Venomous Reptiles. Charles Seribner's Sons, New York. |
| Murray, J. A. | 1884 | The Vertebrate Zoology of Sind. Bombay, xiv + 424 pp., pls. 1–6. |
| | 1887 | Descriptions of three new species of *Hydrophis* from the Bombay Harhour and the Mekran coast. Jour. Bombay Nat. Hist. Soc., Vol. 2, pp. 32–35, 1 P1. |

| | | |
|---|---|---|
| Parker, H. W. and Grandison, A. G. C. | 1977 | Snakes – a natural history, – Second Edition, British Museum (Natural History), London, pp. 87–89. |
| Raymond, L.D. | 1933 | Reptiles of the world. The Bodlet Head Ltd., Hohnlane, London. |
| Siddiqi, M.S.U. | 1969 | Fauna of Pakistan. Agriculture Research Council, Government of Pakistan, Karachi. |
| Smith Malcolm A. | 1926 | A monograph of the Sea-snakes (Hydrophiidae). London, xvii + 130 pp. figs. 1–35 , pls. 1–2. |
| | 1943 | The fauna of British India including Ceylon and Burma. Vol. 3, serpentes. xii + 583 , pp., figs., map. |
| Tony Phelps. | 1984 | Poisonous Snakes. Blanford Press. |
| Wall, F. | 1921 | Ophidia Taprobanica or the Snakes of Ceylon. Colombo, xxii + 581 pp. figs. 1–98. |

| Name of species (Common Name) | S. No. | Date of collection | Registration No. | Locality | Length (mm) Snout Vent | Tail | Scales Neck | Mid Body | Ventrals | Temporals Ant. | Post. | Oculars Pre | Post | Body Band |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| *Hydrophis cyanocinctus* (Daudin) | 1 | 1950 | 1950/11/18 | Patiani Creek (Karachi Coast) | 1060 | 120 | 33 | 40 | 339 | 1 | 2 | 1 | 2 | 62 |
| (Annulated Sea Snake) | 2. | 1965 | 1965/RMS/549/575 | Pasni (Makran Coast. | 1040 | 90 | 31 | 38 | 378 | 1 | 2 | 1 | 2 | 60 |
| | 3. | 1966 | 1966/579/579/632 | Shimal Bunder (Makran Coast) | 1032 | 98 | 31 | 42 | 345 | 1 | 3 | 1 | 2 | 60 |
| | 4. | 15-05-1967 | 1967/RMS/36 | Patiani Creek | 1035 | 95 | 29 | 40 | 352 | 2 | 2 | 1 | 1 | 63 |
| | 5. | 1974 | 1974/RMS/37 | " | 1050 | 110 | 31 | 39 | 375 | 1 | 3 | 1 | 1 | 52 |
| | 6. | 14-03-1981 | PSFR/273 | Karachi Coast | 977 | 90 | 32 | 40 | 351 | 1 | 3 | 1 | 2 | 52 |
| | 7. | 01-02-1983 | 1983/RMS/38 | Sonmiani (Lasbella Distt.) | 805 | 65 | 31 | 44 | 338 | 2 | 2 | 1 | 2 | 48 |
| | 8. | 01-02-1983 | 1983/RMS/39 | " | 955 | 85 | 30 | 54 | 378 | 1 | 3 | 1 | 2 | 45 |
| | 9. | 02-02-1987 | 1987/RMS/63 | Sonmiani (Lasbella Distt.) | 1050 | 110 | 32 | 41 | 336 | 1 | 2 | 1 | 2 | 61 |
| | 10. | " | 1987/RMS/64 | " | 1045 | 90 | 31 | 39 | 364 | 1 | 2 | 1 | 2 | 60 |
| | 11. | " | 1987/RMS/65 | " | 1035 | 95 | 31 | 38 | 345 | 2 | 2 | 1 | 1 | 59 |
| | 12. | 19-11-1987 | 1987/RMS/96 | Patiani Creek | 1030 | 95 | 29 | 42 | 351 | 1 | 2 | 1 | 1 | 48 |
| | 13. | " | 1987/RMS/97 | " | 1045 | 105 | 32 | 48 | 356 | 1 | 2 | 1 | 2 | 54 |
| | 14. | 06-12-1987 | 1987/RMS/99 | Korangi Creek | 987 | 90 | 30 | 46 | 342 | 2 | 2 | 1 | 2 | 56 |
| *H. spiralis* (Shaw) | 15. | 1964 | 1964/RMS/587 | Karachi Coast | 1145 | 120 | 29 | 38 | – | – | – | 1 | 1 | – |
| (Yellow Sea Snake) | 16. | 06-12-1983 | 1983/RMS/50 | Fish Harbour (Karachi Coast) | 1500 | 145 | 31 | 33 | 328 | 1 | 3 | 1 | 1 | 51 |
| *H. lepemoides* (Gray) (Persian Gulf Sea Snake) | 17. | 1966 | 1966/579/641 | Shimal Bunder (Mekran Coast) | 725 | 75 | 33 | 48 | 302 | 1 | 2 | - | – | 46 |
| | 18. | 22-03-1984 | 1984/RMS/60 | Sonmiani (Lasbella Distt.) | 905 | 90 | 28 | 46 | 313 | 2 | 3 | 1 | 2 | 44 |
| | 19. | " | 1984/RMS/61 | " | 945 | 80 | 28 | 51 | 316 | 2 | 3 | 1 | 2 | 47 |

| Name of species (Common Name) | S. No. | Date of collection | Registration No. | Locality | Length (mm) Snout Vent | Tail | Scales Neck | Mid Body | Ventrals | Temporals Ant. | Post. | Oculars Pre | Post | Body Band |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | 20 | 23-02-1984 | 1984/RMS/62 | Sonmiani (Lasbella Distt.) | 810 | 80 | 28 | 43 | 311 | 2 | 2 | 1 | 2 | 62 |
| | 21. | 02-02-1987 | 1987/RMS/65 | " | 950 | 90 | 29 | 48 | 312 | 1 | 2 | 1 | 2 | 45 |
| | 22. | " | 1987/RMS/66 | " | 890 | 85 | 32 | 46 | 306 | 2 | 3 | 1 | 2 | 46 |
| | 23. | " | 1987/RMS/6, | " | 855 | 85 | 31 | 47 | 310 | 2 | 3 | 1 | 3 | 48 |
| *H. caerulescans caerulescans* (Many toothed Sea Snake) | 24. | 04-12-1983 | 1983/RMS/43 | Fish Harbour (Karachi Coast) | 1075 | 115 | 32 | 40 | 280 | 2 | 3 | 1 | 1 | 57 |
| *H. ornatus ornatus* (Cochin banded Sea Snake) | 25. | 26-09-1983 | 1983/RMS/42 | Sandspit (Karachi Coast) | 1635 | 187 | 48 | 65 | 286 | 2 | 3 | 1 | 2 | 45 |
| *H. mamillaris* (Daudin) (Bombay Sea Snake) | 26. | 1950 | 1950/13/20 | Karachi Coast | 610 | 65 | 25 | 39 | 336 | – | – | 1 | 1 | 40 |
| | 27. | 02-02-1987 | 1987/RMS/68 | Sonmiani (Lasbella Distt. | 1055 | 85 | 31 | 40 | 365 | 2 | 3 | 1 | 2 | 55 |
| *Enhydriina schistosa* (Daudin) | 28. | 1954 | 1954/143/218 | Karachi Coast | 860 | 115 | 52 | 60 | 310 | 2 | 3 | 1 | 2 | – |
| (Beaked Sea Snake) | 29. | 1955 | 1955/213/298 | Keamari Karachi | 932 | 133 | 52 | 55 | 335 | 2 | 3 | 1 | 2 | – |
| | 30. | 1958 | 1958/592/645 | " | 298 | 39 | 49 | 57 | 330 | 2 | 3 | 1 | 2 | 45 |
| | 31. | 1958 | 1958/264/368 | Makran Coast | 980 | 120 | 50 | 63 | 310 | 2 | 4 | 1 | 1 | – |
| | 32. | " | 1958/264/369 | " | 928 | 115 | 50 | 57 | 325 | 1 | 4 | 1 | 1 | 50 |
| | 33. | " | 1958/259/373 | Gwadar (Makran) | 422 | 48 | 50 | 64 | 349 | 2 | 3 | 1 | 1 | 51 |
| | 34. | " | 1958/260/374 | " | 426 | 59 | 49 | 60 | – | – | – | – | 2 | – |
| | 35. | 1964 | 1964/539/563 | Manora (Karachi Coast) | 802 | 98 | 49 | 57 | 305 | 2 | 3 | 1 | 2 | – |
| | 36. | 1965 | 1965/570/622 | Karachi Coast | 990 | 120 | 54 | 60 | 309 | 1 | 3 | – | ! | – |
| | 37. | " | 1965/572/624 | Makran Coast | 901 | 129 | 52 | 56 | 355 | 1 | 3 | 1 | 1 | – |
| | 38. | " | 1965/576/628 | Ormara | 1090 | 110 | 51 | 60 | 331 | 2 | 3 | 1 | 1 | – |
| | 39. | " | 1965/547/873 | Makran Coast | 903 | 117 | 53 | 58 | 335 | 2 | 4 | 1 | 1 | – |

| Name of species (Common Name) | S. No. | Date of collection | Registration No. | Locality | Length (mm) Snout | Vent | Tail | Scales Neck | Mid Body | Ventrals | Temporals Ant. | Post. | Oculars Pre | Post | Body Band |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | 40. | 1965 | 1965/576/627 | Astola | 860 | 120 | 50 | 56 | 311 | 2 | 3 | 1 | 2 | – |
| | 41. | 1966 | 1966/580/633 | Korangi (Karachi. | 643 | 85 | 50 | 60 | 336 | 2 | 3 | 1 | 2 | – |
| | 42. | " | 1966/580/640 | " | 652 | 78 | 50 | 62 | 348 | 2 | 3 | 1 | 1 | – |
| | 43. | " | 1966/589/649 | Karachi Coast | 832 | 98 | 50 | 59 | – | – | – | 1 | 1 | – |
| | 44. | " | 1966/590/645 | " | 885 | 135 | 48 | 54 | – | – | – | 1 | 2 | – |
| | 45. | " | 1966/591/646 | Mekran Coast | 835 | 125 | 50 | 50 | – | – | – | 1 | 1 | – |
| | 46. | 12-01-1981 | PSFR/154 | Manora (Karachi | 615 | 85 | 48 | 39 | – | – | – | 1 | 1 | – |
| | 47. | 22-01-1981 | PSFR/178 | Korangi(Karachi) | 830 | 99 | 48 | 58 | – | – | – | 1 | 1 | – |
| | 48. | 26-01-1981 | PSFR/184 | " | 735 | 122 | 49 | 58 | – | – | – | 1 | 1 | – |
| | 49. | 05-03-1981 | PSFR/241 | Karachi Coast | 785 | 115 | 48 | 58 | – | – | – | 1 | 2 | – |
| | 50 | 15-03-1981 | PSFR/279 | Manora (Karachi) | 810 | 96 | 49 | 59 | – | – | – | 1 | 1 | – |
| | 51. | 01-02-1984 | 1984/RMS/53 | Sonmiani (Lasbella Distt). | 840 | 110 | 51 | 62 | 313 | 1 | 2 | 1 | 1 | 42 |
| | 52. | 06-03-1985 | FMSB-2-1. | Rehri Creek Karachi. | 830 | 110 | 48 | 59 | – | 1 | 2 | 1 | 1 | – |
| | 53. | 16-04-1985 | FMSB-2-2 | Port Qasim | 615 | 70 | 48 | 60 | – | 1 | 2 | 1 | 1 | – |
| | 54. | " | FMSB -2-2 | " | 625 | 87 | 50 | 53 | – | 1 | 2 | 1 | 1 | – |
| | 55. | 07-10-1987 | 1987/RMS/93 | Korangi Creek | 685 | 75 | 48 | 54 | 366 | 2 | 4 | 1 | 1 | 45 |
| | 56. | " | 1987/RMS/94 | " | 655 | 78 | 48 | 64 | 336 | 2 | 3 | 1 | 2 | 50 |
| | 57. | " | 1987/RMS/95 | " | 842 | 95 | 49 | 52 | 309 | 1 | 3 | 1 | 1 | 51 |
| | 58. | 6-12-87 | 1987/RMS/100 | " | 834 | 99 | 46 | 53 | 305 | 2 | 4 | 1 | 1 | 46 |
| | 59. | " | 1987/RMS/101 | " | 735 | 110 | 48 | 51 | 355 | 2 | 3 | 1 | 2 | 49 |
| | 60. | " | 1987/RMS/102 | " | 855 | 105 | 49 | 59 | 343 | 1 | 3 | 1 | 2 | 48 |
| *Lapemis curtus* (Shaw) | 61. | 1965 | 1965/577/624 | Mekran Coast | 815 | 75 | 32 | 37 | 190 | – | – | 1 | 1 | – |
| (Short Sea Snake). | 62. | 01-02-1983 | 1983/RMS/40 | Sonmiani (Las- | 840 | 65 | 36 | 32 | 163 | – | – | 1 | 1 | 51 |

| Name of species (Common Name) | S. No. | Date of collection | Registration No. | Locality | Length (mm) Snout Vent | Tail | Scales Neck | Mid Body | Ventrals | Temporals Ant. | Post. | Oculars Pre | Post | Body Band |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | 63. | 01-02-1983 | 1983/RMS/41 | Sonmiani (lasbella Distt). | 730 | 60 | 30 | 33 | 145 | 1 | 3 | 1 | 1 | 53 |
| | 64. | 04-12-1983 | 1983/RMS/46 | Fish Harbour Karachi. | 850 | 95 | 32 | 32 | 152 | 1 | 2 | 1 | 2 | 51 |
| | 65. | " | 1983/RMS/47 | " | 825 | 85 | 35 | 36 | 178 | 2 | 2 | 1 | 1 | 47 |
| | 66. | " | 1983/RMS/48 | " | 735 | 70 | 32 | 36 | 154 | 2 | 3 | 1 | 1 | 48 |
| | 67. | " | 1983/RMS/49 | " | | | | | | | | | | |
| | 68. | 06-12-1983 | 1983/RMS/50 | " | 825 | 80 | 32 | 36 | 170 | 1 | 2 | 1 | 1 | 50 |
| | 69. | 02-02-1984 | 1984/RMS/54 | Sonmiani Area (Lasbella Distt.) | 790 | 75 | 32 | 36 | 172 | 1 | 2 | 1 | 1 | 50 |
| | 70. | " | 1984/RMS/55 | " | 900 | 90 | 35 | 40 | 177 | 1 | 3 | 1 | 1 | 51 |
| | 71. | " | 1984/RMS/56 | " | 770 | 65 | 34 | 42 | 164 | 1 | 2 | 1 | 1 | 50 |
| | 72. | " | 1984/RMS/57 | " | 700 | 85 | 30 | 36 | 160 | 1 | 3 | 1 | 1 | 55 |
| | 73. | " | 1984/RMS/58 | " | 775 | 70 | 30 | 37 | 161 | 1 | 2 | 1 | 1 | 54 |
| | 74. | " | 1984/RMS/59 | " | 778 | 72 | 34 | 40 | 160 | 1 | 3 | 1 | 1 | 52 |
| | 75. | 02-02-1987 | 1987/RMS/71 | " | 775 | 75 | 32 | 40 | 176 | 1 | 2 | – | – | 50 |
| | 76. | " | 1987/RMS/72 | " | 785 | 70 | 30 | 42 | 172 | 1 | 3 | – | – | 51 |
| | 77. | " | 1987/RMS/73 | " | 885 | 88 | 33 | 44 | 165 | 1 | 1 | – | – | 50 |
| | 78. | " | 1987/RMS/74 | " | 775 | 91 | 30 | 40 | 165 | 1 | 2 | – | – | 45 |
| | 79. | " | 1987/RMS/75 | " | 800 | 87 | 32 | 35 | 177 | 1 | 3 | – | – | 47 |
| | 80. | " | 1987/RMS/76 | " | 885 | 80 | 33 | 35 | 162 | 2 | 2 | – | – | 50 |
| | 81. | 12-03-1987 | 1987/RMS/77 | Fish Harbour | 895 | 75 | 30 | 35 | 161 | 1 | 3 | – | – | 50 |
| | 82. | " | 1987/RMS/78 | " | 795 | 82 | 35 | 42 | 160 | 1 | 2 | – | – | 55 |
| | 83. | " | 1987/RMS/79 | " | 655 | 92 | 33 | 36 | 165 | 1 | 2 | – | – | 52 |
| | 84. | " | 1987/RMS/80 | " | 880 | 90 | 31 | 36 | 163 | 1 | 2 | 1 | 1 | 47 |
| | 85. | " | 1987/RMS/81 | " | 890 | 95 | 33 | 40 | 162 | 1 | 3 | 1 | 1 | 47 |
| | 86. | " | 1987/RMS/82 | " | 885 | 85 | 33 | 42 | 175 | 1 | 3 | 1 | 2 | 45 |

| Name of species (Common Name) | S. No. | Date of collection | Registration No. | Locality | Length (mm) Snout | Vent | Tail | Scales Neck | Mid Body | Ven-trals | Temporals Ant. | Post. | Oculars Pre | Post | Body Band |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | 87. | 12-03-1987 | 1987/RMS/83 | Fish Harbour | 775 | | 94 | 32 | 35 | 178 | 1 | 2 | 1 | 2 | 50 |
| | 88. | | 1987/RMS/84 | " | 690 | | 71 | 31 | 35 | 175 | 1 | 2 | 1 | 1 | 51 |
| | 89. | " | 1987/RMS/85 | " | 900 | | 69 | 31 | 34 | 170 | 2 | 2 | 1 | 1 | 50 |
| | 90. | " | 1987/RMS/86 | " | 880 | | 71 | 32 | 36 | 171 | 2 | 2 | 1 | 1 | 52 |
| | 91. | " | 1987/RMS/87 | " | 810 | | 80 | 32 | 37 | 164 | 1 | 2 | 2 | 2 | 50 |
| *Praescutata vinerina* (Schmidt) | 92. | 1965 | 1965/524/626 | Pasni (Mekran Coast) | 810 | | 90 | 32 | 48 | – | – | – | 2 | 3 | – |
| (Viperine Sea Snake) | 93. | 1966 | 1966/526/643 | Karachi Coast | 613 | | 62 | 31 | 44 | – | – | – | 1 | 2 | – |
| | 94. | 04-12-1983 | 1983/RMS/44 | Fish Harbour Karachi Coast) | 710 | | 74 | 33 | 51 | 260 | 3 | 4 | 2 | 2 | – |
| | 95. | 02-02-1987 | 1987/RMS/69 | Sonmiani (Las-bella Distt.) | 815 | | 90 | 31 | 50 | 255 | 3 | 4 | 1 | 2 | 25 |
| | 96. | " | 1987/RMS/70 | " | 620 | | 85 | 31 | 44 | 260 | 3 | 3 | 1 | 1 | 31 |
| | 97. | " | 1987/RMS/88 | Fish Harbour (Karachi Coast) | 715 | | 75 | 32 | 48 | 256 | 2 | 2 | 1 | 2 | – |
| | 98. | " | 1987/RMS/89 | " | 710 | | 73 | 31 | 45 | 265 | 3 | 2 | 2 | 1 | – |
| | 99. | " | 1987/RMS/90 | " | 820 | | 80 | 31 | 48 | 248 | 2 | 4 | 1 | 1 | – |
| | 100. | " | 1987/RMS/91 | " | 705 | | 80 | 32 | 44 | 258 | 3 | 3 | 1 | 2 | 28 |
| | 101. | " | 1987/RMS/92 | " | 695 | | 85 | 33 | 51 | 254 | 3 | 3 | 2 | 2 | – |
| *Microcephalophis gracilis gracilis* (Shaw) (Common Small Headed Sea Snake). | 102. | 04-12-1983 | 1983/RMS/45 | " | 860 | | 70 | 21 | 33 | 252 | 3 | 3 | 1 | 1 | – |
| | 103. | 1963 | 1963/506/528 | Karachi Coast | 1380 | | 140 | 23 | 41 | – | – | – | 1 | | 41 |
| *M. cantoris* (Gunther) (Cantor's Small Headed Sea Snake). | 104. | " | 1963/506/529 | " | 1210 | | 125 | 24 | 41 | – | – | – | 1 | 2 | 41 |

| Name of species (Common Name) | S. No. | Date of collection | Registration No. | Locality | Length (mm) Snout Vent | Tail | Scales Neck | Mid Body | Ventrals | Temporals Ant. | Post. | Oculars Pre | Post | Tail Band |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| *Pelamydrus platurus* (Linnaeus) | 105. | 1950 | 1950/12/19 | Patiani (Karachi) 655 | 75 | – | 50 | – | 1 | 1 | 1 | 1 | – |
| (Pelagic Sea Snake) | 106. | 1958 | 1958/269/373 | Gwadar (Mekran) 544 | 66 | – | 50 | – | – | – | 1 | 2 | – |
| | 107. | 1965 | 1965/573/625 | Pasni (Mekran) 479 | 56 | – | 50 | – | – | – | 1 | 2 | – |
| | 108. | 1965 | 1965/571/623 | Karachi 569 | 71 | – | 50 | – | – | – | 1 | 2 | – |
| | 109 | 1965 | 1965/RMS/26 | Light House (Karachi) 550 | 74 | 44 | 52 | 312 | 1 | 2 | 1 | 2 | – |
| | 110. | 17-01-1981 | PSFR/167 | Patiani Creek (Karachi) 505 | 69 | 43 | 51 | 315 | 1 | 2 | 1 | 2 | – |
| | 111. | 19-11-1987 | 1987/RMS/98 | " 652 | 70 | 43 | 52 | 310 | 1 | 2 | 1 | 2 | 5 |

## ACKNOWLEDGEMENT

The authoress expresses her deep gratitude to Mr. Hafizur Rahman, Senior Wildlife Preservation Officer, for his valuable help and guidance during the course of present studies. Her thanks are also due to Mr. Jameel Ahmad, Principal Research Officer, Marine Fisheries Department for providing some of the research material used during the studies. She is also thankful to Professor Dr. Walter Auffenberg, a distinguished Herpetologist and Curator, Florida State Museum, University of Florida, for going through the manuscript and making useful suggestions.

Records Zool. Sur. of Pak. Vol. XI, 1988.

# RAPTORS OF LOWER SIND

S. I. Karim & S. Iftikhar Ahmed
Zoological Survey Department, Karachi

Population, status, distribution and breeding of raptors were studied between January, 1981 - December, 1986 in four districts of lower Sind. Raptors population were assessed by using a variant of line transect method commonly known as roadside census. Of the four districts Thatta was found to exhibit rich and varied raptorial population. The study proves that majority of raptors either use man made habitat or are found around water bodies such as lakes, jheels, dhands, etc. The study also suggests that raptors have shrinked greatly in their former distribution.

## INTRODUCTION AND OBJECTIVES

Raptors are cosmopolitan in distribution. They occur in every possible habitat from man made towns & villages and their environs to the forests, moorland, mountains marshes, woodlands, steppes, plains, etc. Some of them have remarkably adapted tc certain environments quite different from their own.

The main objective of the study was to assess population, distribution and breeding evidence of raptors in lower Sind.

## STUDY AREA

This study was conducted between January 1981 to December 1986 on four districts of lower Sind facing the Arabian Sea.

The four districts of lower Sind have approximately an area of fifty six thousand three hundred and fourteen (56314Sq. Kms) Square Kilometers. The rainfall varies from 125 mm. to 150 mm. annually. Two of the four districts have forest spreading over 54278 hectare. While Badin is purely a paddy growing district, Karachi has neither forest nor any cultivated area to grow crops.

The forest plants include *Dalbergia sisso* (Tail), *Tecoma undulata* (Tek Wood Tree) *Melia azardirachta* (Nim), *Ficus religiosa* (Peepul), *Zizyphus jujuba* (ber), *Capparis aphylla* (Kirar), two species of tamarisk namely *T. orientalis* (The Jhao), and *T. indica* (The Lai), Babul *(Acacia arabica),* Bahan (Populus and Euophorbia species), Kandi *(Prosopis spicigera)* Date plam, Oleander and Tamarind. The grasses include Chabbar Chibbar & Karach .

The southern part of these districts are inundated by creeks and mudflats where managrove plants grow abundantly.

Some of the lakes (Haleji lake, Hudero, Kinjher) of International importance also occur in lower Sind (Thatta).

MAP OF LOWER SIND SHOWING STUDY AREA

## MATERIALS AND METHODS

A frequently used variant of the transect or quadrate method namely the roadside census was employed to estimated the population. In this method the observer travels along roads and count the number of individuals seen. The number thus obtained is then related to the number of Kilometers travelled.

Nine localities in Karachi, seven in Thatta, three in Badin and four in Tharparkar were visited at regular intervals. Each time the numbers and frequencies of raptors observed were counted.

Water bodies such as jheels & their vicinity were given special attention.

## RESULTS AND DISCUSSION

### DISTRIBUTION :

Thirty four species of raptors were observed by us at different localities during our study period. Of these 19 species were reported from Karachi, 29 from Thatta, 14 from Badin and 10 from Tharparkar.

Table-I gives a list of raptors seen at different localities in lower Sind.

## DISTRIBUTION OF RAPTORS IN LOWER SIND

Karachi = I, Thatta = II, Badin = III,
Tharparka = IV,
Present = +, Absent = –
Alm = Altiudional migrant, Br. = Breeding
C= Common, Lm= Local migrant, M = migrant,
O = occasional, R = Rare, W. V. = Winter visitor,
U = uncommon.

| S. No. | Name of species. | Status | I | II | III | IV |
|---|---|---|---|---|---|---|
| 1. | *Elanus caerulus vociferus* (Black Winged Kite) | C.R. | + | + | + | – |
| 2. | *Pernis ptilorynchus ruficollis* (Crested Honey Buzzard) | R. | + | – | – | – |
| 3. | *Milvus migrans migrans* (Black Kite) | W.V. | + | + | + | – |
| 4. | *M. m. govinda* (Pariah Kite) | C.R. Br. | + | + | + | + |
| 5. | *Haliastur i. indus* (Brahminy Kite) | R.Br. L. M. | + | + | + | + |
| 6. | *Accipiter badius cenchroides* (Asian Shikra) | W.V. | – | + | – | – |
| 7. | *Accipiter genitalis schevedowi* (Ghoshawk) | W.V. | + | – | – | – |
| 8. | *Butastur teesa teesa* (White Eyed Buzzard) | R. | + | + | + | – |
| 9. | *Buteo rufinus rufinus* (Longlegged Buzzard) | R. Br. W.V. | + | + | + | – |
| 10. | *Buteo b. vulpinus* (Common Buzzard) | W.V. | – | + | – | – |
| 11. | *Aquila heliaca heliaca* (Imperial Eagle) | W.V. | + | + | – | – |
| 12. | *Aquila rapax vindhiana* (Tawny Eagle) | R. | + | + | + | + |

| S. No. | Name of species. | Status | I | II | III | IV |
|---|---|---|---|---|---|---|
| 13. | *Aquila nipalensis nipalensis* (Steppe Eagle) | C.W.V. | – | + | – | + |
| 14. | *Aquila clanga* (Greater Spotted Eagle) | R. Br. | – | + | – | + |
| 15. | *Aquila chrysaetos daphnae* (Golden Eagle) | W.V. | + | – | – | – |
| 16. | *Haliaeetus albicilla* (White tailed Sea Eagle) | R.R.W.V. | – | + | – | – |
| 17. | *Haliaeetus leucoryphus* (Pallas's Fishing Eagle) | R.M. | – | + | + | – |
| 18. | *Hieraaetus fasciatus fasciatus* (Bonellis Eagle) | W.V. | + | + | – | + |
| 19. | *Gyps fulvus fulvescens* (Griffon Vulture) | C.R. | – | + | – | + |
| 20. | *Gyps indicus jonesi* (Longbilled Vulture) | R. | – | † | + | – |
| 21. | *Gyps bengalensis* (White backed Vulture) | C.R. Br. | – | + | + | + |
| 22. | *Aegypius monachus* (King Vulture) | R. Br. | – | + | – | – |
| 23. | *Neophron percnopterus percnopterus* (Egyptian Vulture) | R. Alm. | – | + | – | + |
| 24. | *Circus macrourus* (Pale Harrier) | C.W.V. | – | + | – | – |
| 25. | *Circus aeruginosus aeruginosus* (Marsh Harrier) | W. V. | | + | – | – |
| 26. | *Circaetus gallicus gallicus* (Short Toed Eagle) | R. | | + | – | – |
| 27. | *Pandion haliaetus* (Osprey) | W. V. | + | + | + | + |

| S. No | Name of species. | Status | I | II | III | IV |
|---|---|---|---|---|---|---|
| 28 | *Falco peregrinus peregrinator* (Shaheen Falcon) | R. Br. | + | + | + | – |
| 29. | *Falco chicquera chicquera* (Redheaded Merlin) | R. Br. | + | + | + | – |
| 30, | *Falco tinnunculus tinnunculus* (Kestrel) | R. Br. | + | + | + | – |
| 31. | *Circus pygargus* (Montagus Harrier) | W.V. | + | – | – | – |
| 32. | *Spilornis cheela cheela* (Crested Serpent Eagle) | W. V. | + | + | – | – |
| 33. | *Falco biarmicus juggur* (Luggar Falcon) | R. & Lm. | + | – | – | – |
| 34. | *Falco columbarius insignis* (Merlin) | W. V.(Scarece) | + | + | – | – |

**POPULATION STUDY :**

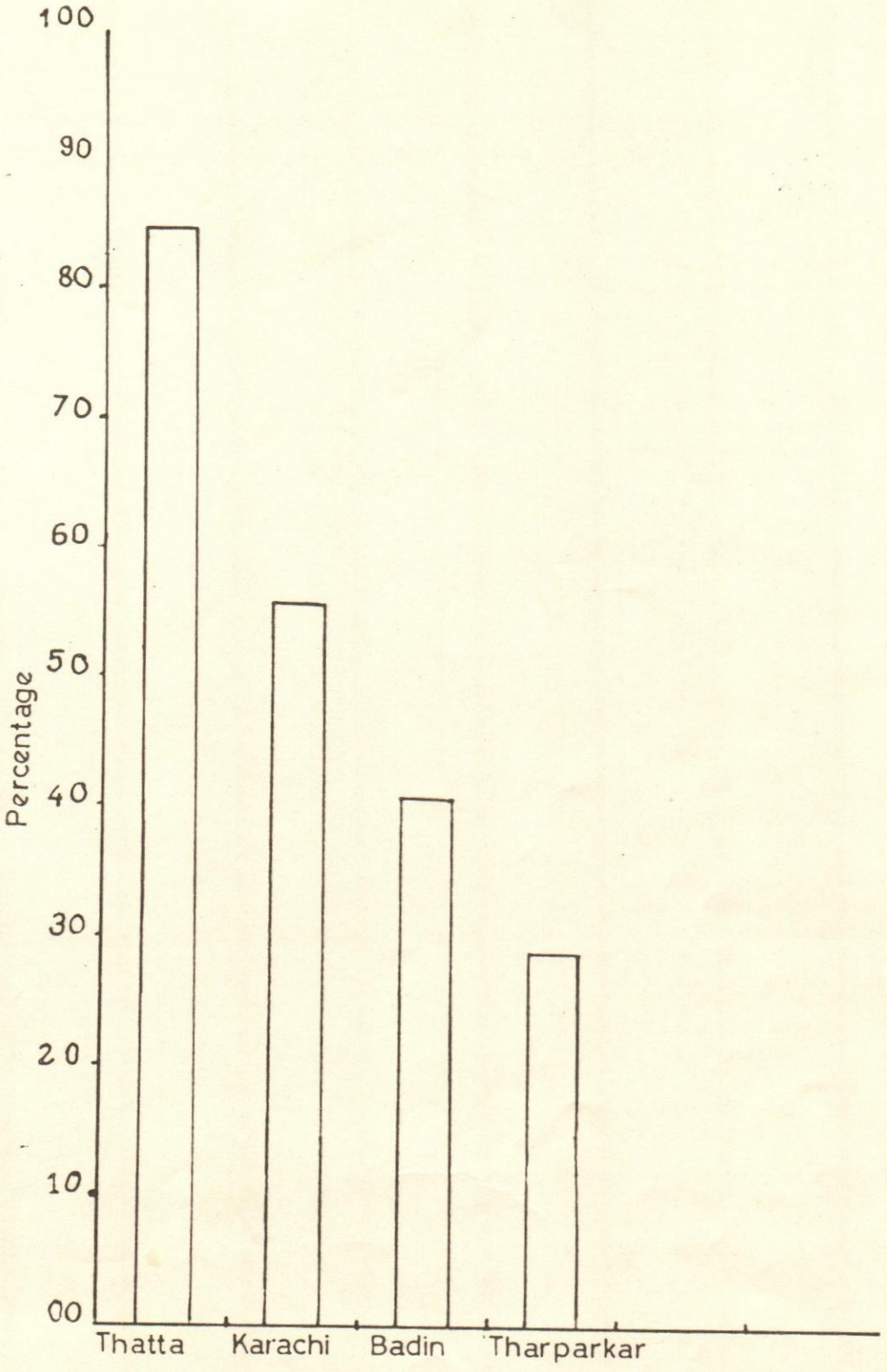
Raptors being strong fliers enjoy the privilege of being present every where whether it is their own habitat or entirely different from where they occur. Among the four districts of the lower Sind Thatta appears very rich in having raptorial population as it shows approximately 85.29% followed by Karachi 55.88% Badin 41.17% and Tharparkar 29.41 % (Graph-I). A possible explanation is that Thatta shows quite diverse type of habitat starting from man made environment to the naturally occuring jheels, marshland, salt lakes, estuaries small hills, forest, cropland, etc. and as such Thatta receive millions of migrating birds every year which constitute food of raptors whereas in other districts such diverse type of habitat does not occur (Table-I).

Table - 11 gives a yearwise list of population of raptors observed during the period of study.

A YEARWISE TABULATED LIST OF POPULATION COUNT OF RAPTORS OF LOWER SIND.

| S. No. | Name of Species | 1981 | 1982 | 1983 | 1984 | 1985 | 1986 |
|---|---|---|---|---|---|---|---|
| 1. | *Elanus caeruleus vociferus* (Black Winged Kite) | 230 | 150 | 250 | 120 | 125 | 192 |
| 2. | *Milvus migrans migrans* (Black Kite) | 2 | 5 | 1 | – | – | 1 |
| 3. | *M. m. govinda* (Pariah Kite) | 4095 | 7545 | 8630 | 9780 | 9821 | 8110 |
| 4. | *Haliastur indus indus* (Brahminy Kite) | 70 | 40 | 60 | 35 | 20 | 15 |
| 5. | *Accipiter badius cenchroides* (Central Asian Shikra) | 12 | 15 | 10 | 5 | 7 | 10 |
| 6. | *Butastur teesa* (White Eyed Buzzard) | 250 | 130 | 92 | 159 | 122 | 232 |
| 7. | *Pernis ptilorynchus ruficollis* (Crested Honey Buzzard) | 4 | 2 | 3 | 5 | 7 | 3 |
| 8. | *Buteo rufinus rufinus* (Longlegged Buzzard) | 1 | – | 2 | 1 | 2 | 5 |
| 9. | *Buteo buteo vulpinus* Common Buzzard) | – | – | – | – | 3 | – |
| 10. | *Aquila heliaca heliaca* (Imperial Eagle) | 15 | 10 | 15 | 25 | 8 | 10 |
| 11. | *Aquila rapax vindhiana* (Tawny Eagle) | 135 | 156 | 180 | 181 | 132 | 156 |
| 12. | *Aquila nipalensis nipalensis* (Steppe Eagle) | | | | | | |
| 13. | *Aquila clanga* (Greater Spotted Eagle) | 35 | 40 | 55 | 39 | 50 | 45 |
| 14. | *Haliaetus albicilla* (White tailed Sea Eagle) | 3 | 2 | 8 | 6 | 5 | 4 |
| 15. | *Haliaetus leucoryphus* (Pallas's Fishing Eagle) | *3* | *2* | *2* | *3* | *4* | *4* |
| 16. | *Hieraeetus fasciatus fasciatus* (Bonelli's Eagle) | 2 | 4 | 3 | 5 | 4 | 6 |
| 17 | *Gyps fulvus fulvescens* (Griffon Vulture) | 52 | 34 | 45 | 61 | 20 | 35 |

| S. No. | Name of Species | 1981 | 1982 | 1983 | 1984 | 1985 | 1986 |
|---|---|---|---|---|---|---|---|
| 18. | *Gyps indicus jonesi* (Longbilled Vulture) | 25 | 30 | 45 | 20 | 46 | 50 |
| 19. | *Gyps bengalensis* (White backed Vulture) | 220 | 250 | 190 | 175 | 320 | 240 |
| 20. | *Aegypius monachus* (King Vulture) | 2 | 1 | 3 | – | 2 | 2 |
| 21. | *Neophron percnopterus percnopterus* (Egyptian Vulture) | 45 | 39 | 30 | 25 | 41 | 33 |
| 22. | *Circus macrourus* (Pale Harrier) | 3 | 2 | 5 | 6 | 4 | 3 |
| 23. | *Circus aeruginosus aeruginosus* (Marsh Harrier) | 4 | 8 | 5 | 10 | 12 | 13 |
| 24. | *Circus pygargus* (Montaguis Harrier) | 1 | – | – | 2 | – | – |
| 25. | *Circaetus gallicus gallicus* (Short Toed Eagle) | 3 | 2 | 4 | 2 | 3 | 4 |
| 26. | *Pandion haliaetus* (Osprey) | 58 | 78 | 91 | 63 | 55 | 46 |
| 27. | *Falco chicquera chicquera* (Redheaded Merlin) | 29 | 41 | 31 | 20 | 18 | 16 |
| 28. | *Falco tinnunculus tinnunculus* (Kestrel) | 35 | 21 | 19 | 21 | 32 | 42 |
| 29. | *Falco peregrinus peregrinator* (Shaheen Falcon) | 3 | 5 | 2 | 1 | 4 | 2 |
| 30. | *Aquila chrysaetus daphnae* (Golden Eagle) | 1 | – | – | – | – | 2 |
| 31. | *Spilornis cheela cheela* (Crested Serpent Eagle) | 1 | – | – | 1 | – | 1 |
| 32. | *Falco biarmicus Juggar* (Laggar Falcon) | 3 | 2 | 1 | 2 | 3 | 4 |
| 33. | *Falco columbarius insignis* (Merlin). | 1 | 1 | – | – | 1 | 1 |
| 34. | *Hieraeetus pennatus* (Booted Hawk Eagle) | 1 | 1 | 2 | 1 | 3 | 1 |




POPULATION OF RAPTORS SHOWN IN PERCENTAGE

## BREEDING EVIDENCE

Very little information is available on the breeding of raptors within our territorial limits. Ghalib et. al. (Rec. Zool. Sur. Pak. Vol. X, Number 1 & 2, Pp. 27–29) throw some light on the breeding of raptors.

Since all the eggs were collected from Punjab & its adjoining areas in early years of 1900 century it needs a review. Study on the breeding evidence of raptors in lower Sind is still in infancy stage. According to present information collected on the breeding it can be stated that Brahminy Kite and Pariah Kite breed in lower Sind. While Brahminy Kite breeds in the vicinity of coastal area, Pariah Kite breeds all over Sind around towns, villages, and other human hutments. Longlegged Buzzard, Greater Spotted Eagle, Tawny Eagle, Whitebacked Vulture, King Vulture, Lammergrier, Shaheen, Merlin & Kestrel are also said to breed in Sind but a review of the same is needed as there has been tremondous change in the ecology of the country.

## ACKNOWLEDGEMENT

We are grateful to Mr. Mohammad Farooq Ahmad, Director, Zoological Survey Department for providing us guidance and encouragment during the work.

## BIBLOGRAPHY

1. Ali, S. & Ripley, S.D. (1968-72); Handbook of Birds of India and Pakistan. 2nd Vol. Oxford University Press, Bombay.
2. Baker, E.C. Stuart (1922-31) : Fauna of the British India Birds 8 Vols. Taylor and Francis, London.
3. Baker, E. C. Stuart (1932-35) : The Nidification of Birds of Indian Empire 4 (Pandionidae & Podocipidae). Taylor and Francis, London.
4. Blanford, W. T. (1895-98): The Fauna of Brithsh India, Ceylon and Burma. 3rd & 4th Vols. Taylor & Francis, London.
5. Brown, L. (1976) : Birds of Prey, their biology and ecology, Hamlyn, London.
6. Ghailb et al. (1984). Notes on Waites' collection of birds eggs in the Zoological Survey Department. Rec. Zool. Sur. Pak. X(1 and 2) : 25–56.
7. Humes, A. U. & Oates, Eugene (1889-90); Nest and Eggs of Indian Birds. 3 vol. 2nd ed. R. H. Porter, London.
8. Karim, S. I. (1984). A Note on the Birds of Prey of Haleji Lake and its surrounding areas. Rec. Zool. Sur. Pak. X (1 and 2): 75–82.
9. Khanum, Z. and Qadri, M. A. H. (1972): Fresh Record of some birds in West Pakistan Pakistan Journal of Zoology 4 (2): 219–221.
10. Khanum, Z. M. F. Ahmad & M. Ahmad (1980). A checklist of the Birds of Pakistan with illustrated keys to their identification. Rec. Zool Sur. Pak. 9 (1 and 2).
11. Oates, E.W. (1889-90), Nidification of the Birds of Indian Empire 2 vols. Taylor and Francis, London.
12. Ripley, S. D. (1982), A synopsis of the Birds of India & Pakistan. IInd edition B. N. H. S.
13. Ticehurst (1923): The birds of Sind. Ibis 5 (2) : 253-261.

Records zool. Sur. of Pak. Vol. XI, 1988.

# ON THE SUB-FAMILY PROCAMALLANINAE YEH,. 1960. PART I. SYSTEMATIC STUDIES ON THE GENUS *PROCAMALLANUS* (BAYLIS, 1923) WITH NOTE ON THE GENUS *PLATOCAMALLANUS* BILQEES AND AKRAM, 1982 (NEMATODA, CAMALLANIDAE)

By

Mohammad Akram
Zoological Survey Department, Karachi.

*Abstract :- This paper, the fifth in a series on the family Camallanidae Railliet and Henry, 1915 deals with the systematics of the genera Procamallanus (Baylis, 1923) Bilqees and Akram, 1982 and Platocamallanus Bilqees and Akram, 1982 reveals that approximately 50% of the nominal species in each genus, may be regarded as valid.*

## INTRODUCTION

This paper on the sub-family Procamallaninae Yeh, 1960 discusses the taxonomy of the genera *Procamallanus* (Baylis, 1923) Bilqees and Akram, 1982 and *Platocamallanus* Bilqees and Akram, 1982. The systematics of these and of related genera has been a matter of contension and confusion. This is because there are large numbers of morphologically similar taxa, often differing in a single criterion, which tends to grade into another. In order to provide some degree in this group, original literature on a world wide basis have been studied. It is, however, difficult to solve all the problems, without studying the type specimens, in a single work.

The aim of this paper is to differentiate and define the species more adequately. Taxonomic discussions are based on the comparative studies of the morphometric data. Only 50% of the species fall into well defined frame while the rest could hardly be distinguished from the related forms.

## MATERIAL AND METHOD

The source of this study is the original literature of the nominal species, which could not become available in case of *P. leaviconchus* (Wedl, 1962) and *P. (p) paraccuratus* Pinto; Fabio; Noronha and Rolas, 1976. Therefore, the description of Baylis (1923) used for the type species and latter species dropped from consideration. All measurements are in millimeters, unless otherwise stated; and if calculated from the drawing then marked with an asterisk.

Genus *Procamallanus* (Baylis, 1923) Bilqees & Akram, 1982.

(Fig- 1)

Synoymy *Procamallanus* (Baylis, 1923) Olsen, 1952 (in part); Thelazo Pearse, 1933.

## Historical review

Baylis (1923) establsihed the genus *Procamallanus* on the basis of the shape of uninterrupted chitinous buccal cavity forming a ' buccal capsule'. Olsen (1952) separated those species from this genus with 'spiral thickenings' on the wall of the capsule into *Spirocamallanus,* a new genus. Recently, Bilqees and Akram (1982) established the genus *Platocamallanus* for such procamallanids bearing chitinous plates along the anterior margin of the buccal capsule with leaf crowns.

Ali (1957; 1960) divided Procamallanus sensu stricto on number, relative size and nature of the spicule into sub-genera suppressed by Campana-Rouget (1961) while Petter (1979) divided *Procamallanus* of Olsen into sub-genera on number of the precloacal caudal papillae on male tail, not accepted by Bilqees and Akram (1982).

## Morphological findings

A comparative study of the hitherto described species in the genus Procamallanus Baylis discloses that the nature of the inner surface of the wall of the buccal capsule perheps provides the only valid base for the division or addition of the genus than does any other character like spicule or caudal papillae on male tail because the buccal capsule (i) is heavily sclerotized, more constant and least variable (ii) invariably present in either sex distinguishing male or female of a species (iii) readily exposed for the study, minimising the significance of the number of specimens and (iv) species with a particular kind of capsule may resemble with any one but in its own group, at least in the fish Procamallanids.

On the contrary, spicule and caudal papillae are greatly variable in size and number hence may be used where-ever range of variations are known which if not overlapping with other species, even then serve to determine only the male of a species; finally, the shape of spicule tip must be studied out of specimens, body and the distribution of caudal papillae in ventral position of male tail therefore single or even few males may not serve the purpose. In addition, weak chitinization of spicule interpretational veriability regarding the position of caudal papillae viz. preanal, adanal, perianal, circumanal and postanal, are significant set backs in the utilization of these criteria at any level.

It is, however, worth pointing that spicule and caudal papillae very often serve to separate males of different species.

## Nominal species

To date, the genus *Procamallanus* (Baylis, 1923) Bilqees and Akram, 1982 possesses 34 species, the world over :

1. *Procamallanus leaviconchus* (Wedl, 1862), Baylis 1923 (type species); 2. *P. annulatus* Yamaguti, 1955; 3. *P. armatus* Campana-Rouget and Therazien, 1965; 4. *P. aspiculus* Khera, 1955; 5. *P. brevis* Kung, 1948; 6. *P. bilaspurensis* Gupta and Duggal, 1973. 7. *P. chakravartyi* (Chakravarty; Majumdar and Sain, 1961) Fernando and Furtado, 1963; 8. *P. clarias* Ali, 1957; 9 . *P. confusus* Fernando and Furtado, 1963; 10. P. *daccai* Gupta, 1959; 11. *P. devendri* Sinha and Sahay, 1966; 12. *P. elatensis* Fusco and Overstreet, 1979. 13. *P. fukiensis* Wang and Ling, 1975; 14. *P. glossogobii* (Pearse, 1933) Southwell

and Kirshner, 1937; 15. *P. guptae* Arya, 1978; 16. *P. heteropnustus* Ali, 1957; 17. P. *hindensis* Lal, 1965; 18. *P. karachii* Rehana and Bilqees, 1979 .19. *P. khatibi* Naidu and Murhar, 1980; 20. *P. lonis* Yamaguti, 1941; 21. *P. magurii* Lal, 1965; 22. *P. malacensis* Fernando and Furtado, 1963; 23. *P. muelleri* Agrawal, 1966; 24. *P. ottuei* Verma and Verma, 1971; 25. *P. parvulus* Furtado and Tan, 1973; 26. *P. peraccuratus* Pinto; Fabio; Nornha and Rolas, 1976. 27. *P. planoratus* Kulkarni, 1935; 28. *P. ramteki* Nadidu and Murhar, 1980. 29. *P. sigani* Yamaguti, 1955; 30. *P. siluri* Osmanov, 1964 . 31. *P. slomei* Southwell and Kirshner, 1937; 32. *P. spheroconchus* Tornquist, 1931; 33. *P. spiculo-gubernaculus* Agrawal, 1958 and 34. *P. sprenti* Bashirullah and Hafizuddin, 1974.

**Host**

These species are basically parasitic in fishes, 94.1%, predominantly in freshwater fishes, 80.0%, less commonly in marine fishes, 14.7% and only rearely in amphibians, 5.8%. The most common among freshwater hosts are catfishes while among marine, siganids. The procamallanids are distributed in 16 genera of fishes, excluding that for *P. siluri,* hence approximately 2 nematodes share a common host genus or 1 species of parasite has only 0.51 host genus; and the same applies to host species because these are not determined for the genera *Batrachus* Schneider, *Serranus* Cuvier and *Siganus* Forskal. The largest number, 29% procamallanids are harboured by the *Heteropneustus fossilis* (Bloch) (Family Heteropneustidae); next number, 16.1% by the Clarias *batrachus* (Linnaeus) (family Clariidae); still next, 9.6% by *Siganus* species (family Siganidae); then 6.4% by *Saccobranchus fossilis* (Bloch) (family Siluridae) and least, only 3.2% by each of the remaining genera.

The genera in amphibians are *Xenopus laevis* (family Pipidae) and *Bufo* species (fmaily Bufonidae), each with 50% of procamallanids.

These nematodes perhaps originated as parasites of catfishes and being confined only to lower vertebrates, this group may become established before the evolution of reptiles.

**Habitat**

The usual locations inside hosts are intestine with nearly 2/3, Procamallanids, then stomach with about 1/3, of them while only 1 species obtained from the swim bladder of the fish.

**Distribution**

The members of the *Procamallanus* are restricted to Asia (82.3%) and Africa (14.7%) and only an atypical species occurs in S. America (2.9%). These procamallanids are dominated in the tropical Asia (70.5%) extending down in Southeast upto Indonesia and in the North upto Jordan then across the Red Sea in North Africa (5.8%) down to South Africa (8.8%) including the species from amphibians. The procamallanids of temperate Asia (11.7%) are confined in the West to China and USSR and in the Far East to Japan.

It seems much probable that procamallanids originated in the tropical Asia and owing to the primitive nature could not become established in different parts of the world.

Discussion

At present only 18 species in the genus Procamallanus (Baylis, 1923) Bilqees and Akram, 1982 are considered valid. The African species, 3 in fishes and 2 in amphibians are quite distinctive but among 28 Asiatic procamallanids, 10 species are regarded as synonyms.

The following species are synonymised: *P. aspiculus* with *S. bagraii* (Karve and Naik, 1951) by Campana-Rouget (1961), not accepted by Agrawal (1966) ; *P, clarias* with *P. heteropneustus* by Agrawal (1966); *P. mathurai; P. confusus* and *P. chakravartyi* with *P. daccai* by Sood (1967) ; *P. confusus* with *P. spiculogubernaculus* by Sahay; Sinha and Singh (1970); *P. devendri; P. hindensis* and *P. magurii* with *P. daccai* by Akram (1975) and *P. daccai; P. hindensis; P. magurii; P. devendri; P. ottuei and P. sprenti with P. spiculogubernaculus* by De and Moravec (1980).

Skryabina (1969) synonymised *P. siluri* with *P. fulvidraconis Li,* 1935 though the wall of the buccal capsule is completely smooth, without sprials, while Moravec and Amin (1978) regarded this species as valid. It shares the size of the larger spicule with *P. laeviconchus* and that of smaller with *P. heteropneustus.* It is not a valid species because indistinctive from those species with which its synonymity, at present, is difficult to establish owing to its brief description.

*P. parvulus* has been differentiated from the related forms with smooth buccal capsule and unequal spicules, by its small body size and larger number of caudal papillae on male tail. The male, 1.5 – 1.7mm and female, 1.9–2.5 mm in length and caudal papillae, 12 pairs, are not uncommon in procamallanids. It, in fact, shows no structrual or morphometerical difference from *P. malacensis,* reported from closely related host in the same region. It is, therefore, regarded as its synonym.

*P. fukiensis* from *Parasilurus* asotus (Linnaeus) from China has only relatively larger tail in the female, 0.09 - 0.15 mm than in *P. malacensis,* 0.064 mm. Hence, the former species is supposed to be the synonym of the latter.

The number and distribution of the caudal papillae on male tail are not taken into consideration because the size of variation could hardly be ascertained by the single male, often neither clearly mentioned categorically, nor figured properly in the ventral view of the tail *viz. P. malacensis.*

It is difficult to distinguish *P. bilaspurensis* from perciforms in India from *P. laeviconchus* from siluriforms in Egypt simply by the smaller left spicule, 0.028 - 0.031 mm against, 0.05 mm; due to its most characters overlapping with those of the type species, P. bilaspurensis is considered as its synonym.

Finally, *P. karachii* with single and briefly described female, can hardly be separated by a small projection at the end of sharply conicial tail which appears to be very much like that in *P. heteropneustus,* with which this species falls as a synonym.

Now a study of the type specimens may solve further problems of the procamallanid's taxon because many species are described very briefly or incompletely with insufficient illustrations.

*P. sigani* very closely resembles with *P. spheroconchus* differing by the number of the preanal caudal papillae on male tail as pointed out by Yamaguti (1935) in addition to spiny tail and absence of the vulval lip in female. Untill the study of the type material, these species are considered distinct.

*P. lonis* has been differntiated by Yamaguti (1941) from the most closely related *P. sigani* chiefly in the shape of the buccal capsule, mentioned for neither species, and the size, elongated in *P. lonis,* almost rounded in the female but variable from elongated to globular in the male of *P. sigani* according to the metrical data. In fact, *P. lonis* differs by possessing sharply pointed spicules in male and much smaller tail in female.

At present, *P. heteropneustus* is regarded as a valid species, since, bears much smaller right spicule (0.073) mm in male and tail (0.03) mm in famale, with smooth and rounded tip against those in *P. laeviconchus* but an examination of the orginal material may provide better distinction.

On the contrary, a study of the original specimens of *P. malacensis* may prove this species conspecific with *P. laeviconchus,* Since, among the species with unequal spicules and 7–9 pairs of preanal caudal papillae on male tail, *P. malacensis* shows affinity with *P. laeviconchus and P. heteropenustus* from which becomes separated by the absence of the cuticular ledge anterior to basal ring and vulval lip on female.

The synonymity of *P. siluri with P. laeviconchus or P. heteropneustus* is subjected to the re-examination of its type material.

And lastly, only the male of P. elatensis may be distinguished from that of P. annulatus by the rounded tips of the spicules and smaller size of the gubernaculum while the females seems to be morphometrically indistinguishable.

Then, the redescriptions of *P. clarias* by Fernando and Furtado (1963) is more close to *P. laeviconchus* by the size of the right spicule, number and arrangement of the caudal papillae and by the size and nature of the female tail, though without vulval lip; and that of Ha Ky (1971) with very large tails, 0.34 mm. in male and 0.10–1.1 mm in female, involves greater similarity, again, with the type species.

The account of the specimens given by Khan and Zaidi (1969) without spirals on the buccal capsule, can never be that of *P. viviparus.* Owing to the description of the female, its specific assignment is difficult.

Finally, Sood (1967) in its redescription of *P. daccai* pointed out its difference by fewer caudal papillae on male tail which must be checked by its male tail as the text or the ventral or lateral views of the tail do not tally either in the number or in arrangement.

Moravec (1974) redescribed *P. laeviconchus* with much larger left spicule, 0.078 mm length and oviparous female smaller than the male.

In addition, account of 3 unidentified females are given by Mawson (1957) recovered from *Sigmanus nebulosus* in Australia, resembling with *P. lonis* and *P. annulatus;* by Fernando and Furtado (1963) obtained from *Wallago attu* in Ceylon, very close to *P. laeviconchus* and by Petter (1978) found in *Ompok* species in Malaysia, showing affinity with P. heteropneustus, while Vuylsteke (1964) reported a female from 'fish' in Africa in bad condition.

## Conclusion

It may be concluded that the nature of the inner surface of the wall of the capsule is most constant hence its variability *viz.* without markings, with chitinous plates bearing leaf crowns etc. may be well used in the establishment of a taxon.

But certain cuticular structures like one or two ledges anterior to basal ring *e.g. P. laeviconchus; P. armatus* etc., club shaped structures next to chitinous ring *e.g. P. lonis;* semi lunar cuticular platform with two projections showing the shape of Golf clubs *e.g. P. aspiculus* may be involved in differentiation, in addition, at specific level.

The length of the spicule and distributional pattern of the caudal papillae on male tail may be utilized in the specific determination, only if the size of variation in each case, is known.

The shape of the spicule must be studied out side body of the specimen. And the arrangement of the caudal papillae ought to be examined and illustrated in the ventral view of the male tail.

The size and shape of tail appear to be better substitutes of the spicule and caudal papillae as serve to distinguish either sex of a species rather than male alone. The length of the buccal capusule in relation to that of the body may be used supplementarily.

Species with common host and locality may resemble or differ vastly from each other.

The procamallanid seems to be originated as parasites of the cat fishes in the tropical Asia and its absence from higher vertebrate groups and limitation to Asian and African parts, reveals its primitive nature and low adaptibility.

## Key to the species

Of the size, shape and nature of tail, only the first and last characters in male and female are used in the key to the species to the possible extent because not available for both sexes in many species.

In addition, length of the buccal capsule in relation to body in both sexes may be distinctive and at least serves to separate the procamallanids of amphibians from those of fishes.

The key does not include *P. peraccuratus* Pin to *et al* , 1976 due to unavailability of its literature.

1–(8) Male tail larger in size than tail in female.

2–(5) Ratio of length of buccal capsule with body, 1:19–21.

3–(4) Male with single spicule and 12 pairs of caudal papillae.

Famale tail with 8–10 spines; vulva, preequatorial.

*P. slomei*

4–(3) Male with paired spicules and 16–17 pairs of caudal papillae.

Female tail with 5–7 spines; vulua, postequatorial.

*P. brevis*

5–(2) Ratio of length of buccal capsule with body, 1:44–260.

6–(7) Male tail, *0.046 mm long; spicules, 0.073 mm and 0.043 mm long; caudal papillae 13 pairs.

Female tail 0.038 mm long, simple; vulval lips, distinct.

*P. heteropneustus*

7–(6) Male tail, 0.13–0.22 mm long; spicules, equal, 1.4 mm long; caudal papillae, 15–18 pairs.

Female tail, 0.10 –0.15 mm long, bifid.

*P. muelleri*

8–(1) Male tail equal to smaller in size than tail in female.

9–(12) Difference in size of tail in male and female, less than 0.037 mm.

10–(11) Male with paired spicules and 11 pairs of caudal papillae.

Female tail *0.064 mm. long, trifid, vulva dividing body at ratio, 1:1.25.

*P. malacensis*

11–(10) Male with single spicule and 7 pairs of caudal papillae.

Female tail 0.04 mm. long, simple; vulva dividing body at ratio 1:1.8–2.0.

*P. khatibi*

12–(9) Male tail, 0.10–0.15 mm. long; female tail, 0.10–0.18 mm. long.

13–(16) Male tail, 0.09–0.10 mm long .female tail, 0.15–0.18 mm long.

Ratio in size of tail in male and female, 1:0.05–0.08.

14–(15) Male, 13.6–14.7 mm long; spicules, paired; caudal papillae, 9 pairs.

Female, 23.8–26.6 long; tail tip, simple; vagina, posteriad.

*P. lonis*

15–(14) Male, 5.6 mm long; spicule single, caudal papillae, 14–15 pairs.

Female, 8.8–13.2 mm long; tail tip, trifid; vagina, anteriad.

*P. armatus*

16–(13) Male tail, 0.015–*0.04 mm long; female tail, 0.10–0.15 mm long.

Ratio in size of tail in male and female, 1: 0.06–0.11.

17–(18) Buccal capsule globular with semi-lunar cuticular platform.

Male, 4.8 mm long; tail, 0.15 long; no spicule or gubernaculum.

Female, unknown.

*P. aspiculus*

18–(17) Buccal capsule elongated without cuticular platfrom.

19–(22) Male with equal spicules.

Female tail, simple.

20–(21) Male 3.85 mm long; spicules, 0.12 mm long; preanal caudal papillae, 7 pairs.

Female tail, 0.11 mm long anterior vulval lip, 0.02 mm in size.

*P. planoratus*

21–(20) Male, 2.69 mm long; spicules, *0.375 mm long; preanalcaudal papillae, 3 pairs.

Female tail, *0.135 mm long; anterior vulval lip, 0.06 mm in size.

P. ramteki

22–(19) Male with single or unequal spicules.

Female tail, bifid or trifid.

23–(24) Male 2.9 mm. long; spicule, paired, right, 0.45 mm long; preanal caudal papillae 6 pairs.

Famele, 3.1 mm long; tail, 0.13 long; bifid.

*P. glossogobii*

24–(23) Male, 3.6 mm long; female, 4.8–15.0 mm long.

25–(26) Male with Paired spicules, right, , 0.15 mm long; gubernaculum, absent; caudal papillae 14–15 pairs.

Female, 15.0 mm long; tail, 0.15 mm long ,trifid.

*P. laeviconchus*

26–(25) Male with single spicule, 0.344 mm long; gubernaculum present.

Female, 4.8 mm long; tail , 0.10 mm long, bifid.

*P. spiculogubernaculus*

27–(28) Male with 7 pairs of caudal papillae; spicules, 0.32 mm and 0.133 mm long.

Female tail, bifid, 0.23–0.31 mm long; vulva dividing body at ratio, 1 : 2.5-2.6.

P. spheroconchus

28–(27) Male with 3–4 pairs of preanal caudal papillae.

Female tail, simple, no process.

29–(32) Difference in size of tail in male and female, 0.075–0.12.

30–(31) Male, 10–20 mm long; tail, 0.24–0.03 mm long; spicules, 0.37–0.42 mm and 0.21–0.25 mm long; gubernaculum, 0.14–0.15 mm long; postanal caudal papillae, 5 pairs.

Female, 28–43 mm long .tail, 0.35–0.42 mm long; larvae, 0.51–0.58 mm long

*P. annulatus*

31–(30) Male, 7.5 mm long; tail, *0.135 mm long; no spicule or gubernaculum ;postanal caudal papillae 1 pair.

Female, 8.0 mm long; tail 0.21 long;larvae, 0.07–0.09 mm long.

*P. guptae*

32–(29) Difference in size of tail in male and female, 0.15–0.18 * mm.

33–(34) Buccal capsule without ledge.

Male without gubernaculum; spicules, 0.4 mm and 0.12–0.15 mm long.

Female with vulval lips, 0.06 mm and 0.03 mm broad.

*P. sigani*

34–(33) Buccal capsule with a ledge anterior to basal ring.

Male with guberanculum, 0.04–0.63 mm long; spicules, 0.42–0.48 mm and 0.138–0.195 mm. long.

Female without vulval lip.

*P. elatensis*

Genus : Platocamallanus Bilqees and Akram, 1982.

Fig. 2.

Bilqees and Akram (1982) separated those species with chitinous plates along the anterior margin of the buccal capsule bearing leaf crown into Platocamallanus, a new genus (syn. Procamallanus Baylis 1923 in part).

The genus, at present, received only 4 species :

1. *Platocamallanus mehrii* (Agarwal, 1930) (type species); 2. *P. attui* (Pande; Bhatia and Rai, 1963); 3. *P. cancilus* (Bashirullah and Hafizuddin, 1974); and *4. P. wallagus* (Rehman and Bilqees, 1973).

The hosts of these species are only freshwater fishes, *Wallago attu* (Bl. and Schn.) (family Siluridea) with 75% platocamallanids and *Xenentodon cancila* (Ham.) (family Belenidae) with only 25%.

More commonly, nearly 2/3, of these nematodes are inhabitant of the body cavity and the swim bladder and less often, about 1/3, inhabit the intestine.

These parasites are distributed only in the tropical Asia, and so far reported from India, Pakistan and Bangladesh.

Rehana and Bilqees (1973) described *P. wallagus,* a new species with only the male, latter (1979) added the description of the female and redescribed the male. In the original description, there are 4 chitinous plates along the anterior margin of the buccal capsule; very unequal and dissimilar spicules; 8 pairs of preanal 1 pair of adanal and 4 pairs of postanal caudal papillae and no gubernaculum on male tail. The latter account discloses 6 chitinous plates on the buccal capsule; unequal and dissimilar spicules 15 pairs of preanal, 3 pairs of adanal and 8 pairs of postanal caudal papillae and a gubernaculum on male tail.

Now, the number of the chitinous plates, not clearly drawn in any figure of the buccal capsule, appear to be 4 in the male and 6 in the female. The larger spicule, in the original illustrations, according to the posterior end of the male in the lateral view, measures 0.066 mm in length, from that of spicule enlarged, 1.25 mm and 0.31 mm in length and gubernaculum? 0.15 mm in lenght; whereas the caudal end of the male in the lateral view in the redescription shows the larger spicule, 0.32 mm and tail, 0.066 mm in length. The structure referred to, is doubtful, as gubernaculum. The number and arrangement of the adanal and postanal caudal papillae are not apparent by figures of the male tail. The size of the male tail, in the lateral views, in the original drawing, seems to be 0.041 mm and that in the redscription, 0.135 mm in length; the size of the female tail as per illustration calculates, 0.10 mm in length.

Since, *P. wallagus* very closely resembles with *P. attui,* hence supposed to be its synonym.

*P. cancilus,* based on female alone, regarded synonymous with *P. mehrii* because shares most of the morphometric characters with the type species but with somewhat smaller tail.

The redescription of *P. mehrii* given by Karve (1941) with dissimilar spicules, a feature of *P. attui,* with which the number of the caudal papillae are close too, therefore, Karve's specimens are considered as *P. attui.*

*Khera (1955) gave a redescription of* P. mehrii on single female and Sood (1967) that of *P. attui* on 5 males and 3 females. These accounts differ to some extent from the original text of each species.

It may be concluded that the genus *Platocamallanus* has only 2 species viz *P. mehrii (syn. P. cancilus)* and *P. attui (syn. P. wallagus)* differing mainly be the relative size of the spicules. The descriptions of either species are incomplete, therefore, a study of the type specimens may prove the latter species conspecific with the type species.

These species may be sparated as follows :

1–(2) Male with equal spicules, 0.255 mm long; 11 pairs of caudal papillae.

Female with dorsal and ventral swellings in vulvar region.

*P. mehrii*

2–(1) Male with unequal spicules, 0.27–0.28 mm and 0.10–017 mm long ; 15 pairs of caudal papillae.

Female (immature) without Swelling in vulvar region; tail tip, trified.

*P. attui*

## ACKNOWLEDGEMENT

I wish to thank Mr. Mohammad Farooq Ahmad, Director, Zoological Survey Department for providing necessary facilities.

## REFERENCES

Agarwal, M.P. 1930– A new nematode *Procamallanus mehrii* n. sp. from a local siluriod *fish-Wallago attu.* Allahabad Unvi. Studies, 6(2), Sci. Sect., 59–64.

Ali, S. M. 1957– Studies on the nematode parasites of fishes and brids found in Hyderabad State. Ind. J. Helm. 8(1), 1–83.

1960– On two new species of *Procamallanus* Baylis, 1923 from India, with a key to the species. J. Helm. 34 (1/2), 129–138.

Bashirullah, A.K.M. & Hafizuddin, A.K.M 1974– Two new nematode species of *Procamallanus* Baylis, 1923 from freshwater fishes of Dacca, Bangladesh, Norw. J. Zool., 22, 53–55.

Bayils, H.A. 1923– Report on a collection of parasitic nematodes, mainly from Egypt. Part III. Camallanidae etc. Par., 15(1), 24–38.

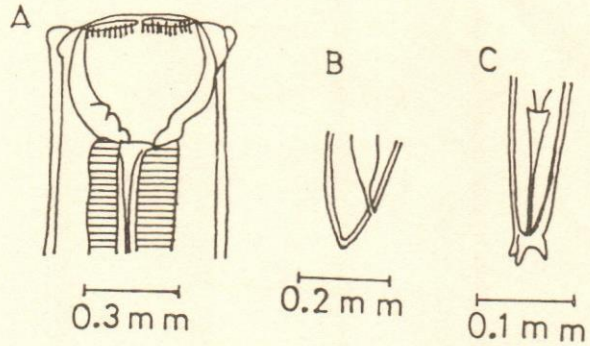
Bilqees, F.M. & Akram, M. 1982– Revision of the family Camallanidae Railliet and Henry, 1915 (Nematoda, Camallanoidea), Biologia, 28 (1), 45–60.

Campana - Rouget, Y. 1961– Nematodes de poissons, Expl. hydr. Lacs. Kivu. Edouard et Albert (1952-54). Resuitats scientifiques, Publ. Inst. r. Sci. nat. Belgique, 3 (4), 61.

| | | |
|---|---|---|
| Fornando, C.H. & Furtado, J.I. | 1963– | Helminth parasites of some Malayan Freshwater fishes. Bull. nat Mus. S' pore, 32, 45–71. |
| Furtado, J.I. & Tan, K. | 1973– | Incidence of some helminth parasites in the Malaysian catfish *Clarias batrachus* (Linnaeus). Verh. Internat Verein. Limnol. 18(3), 1674–1685. |
| Fusco, A.C. & Overstreet, R.M. | 1979– | Two camallanid nematodes from Red Sea. fishes including *Procamallanus elatensis* sp. nov. from siganids. J. nat. Hist., 13, 35–40. |
| Gupta, N. K. & Duggal, C.L. | 1973– | On one new and one already known species of the subgenus *Procmallanus* (Baylis, 1923) Ali, 1956 (Nematoda, Camallanidae) from the freshwater fish and a key to the species of the subgenus. Riv. Parasit., 34(4), 295–304. |
| Ha Ky | 1971– | (Some species of Namatoda from freshwater fishes of North Vietnam), Parasitologiya, 5(3), 241–250. |
| Karve, J.M. | 1941– | Some parasitic nematodes of fishes, I.J. Univ. Bombay Biol. Sci. N. S. 10(3), 9–42. |
| Khan D. & Yaseen T. | 1969– | Helminth parasites of fishes from East Pakistan 1. Nematodes. Bull. Dept. Zool. Univ. Panjab, 4, 1–33. |
| Khera, S. | 1955– | On some species of *Procamallanus* Baylis, 1923 from India. Ann. Esc. Nat. Ciencies Biol. Mexico, 8 (3-4) 243–252. |
| Li, H. C. | 1935– | The taxonomy and early development of *Procamallanus fulvidraconis* N. Sp. J. Par., 21(2)103–113 |
| Mawson, P. M. | 1957– | Some nematodes from fish from Heron Island Queensland. Tr. Roy. Soc. S. Aust., 80, 177–179. |
| Moravec, F. | 1974– | On some nematodes from Egyptian freshwater fishes. Vest. Cs. spol. zool. 38(1), 32–51. |
| Olsen, L. S. | 1952– | Some nematodes parasitic in marine fishes. Pub. Inst. Mar. Sci. Univ. Tex. 11 (2), 173–215. |
| Osmanov, S. O. | 1964– | (New data on the helminths of fish in Izbekistan). Vest. Kara-Kalpak Filiala AN UzbSSR, 2(16), 38–42. |
| Pande, B.P. Bhatia, B.M. & Rai, P. | 1963– | On the camallanid genus Procamallanus Baylis, 1923 in two of the freshwater fishes, Ind. J. Helm. 16(2), 105–118. |
| Petter, A. J. | 1978– | Quelques nematodes Camallanidae parasites de poisson en Malaisie, Bull, Mus. natn. Hist. nat. Paris, 3 ser., no. 515 Zool., 354, 319–330. |

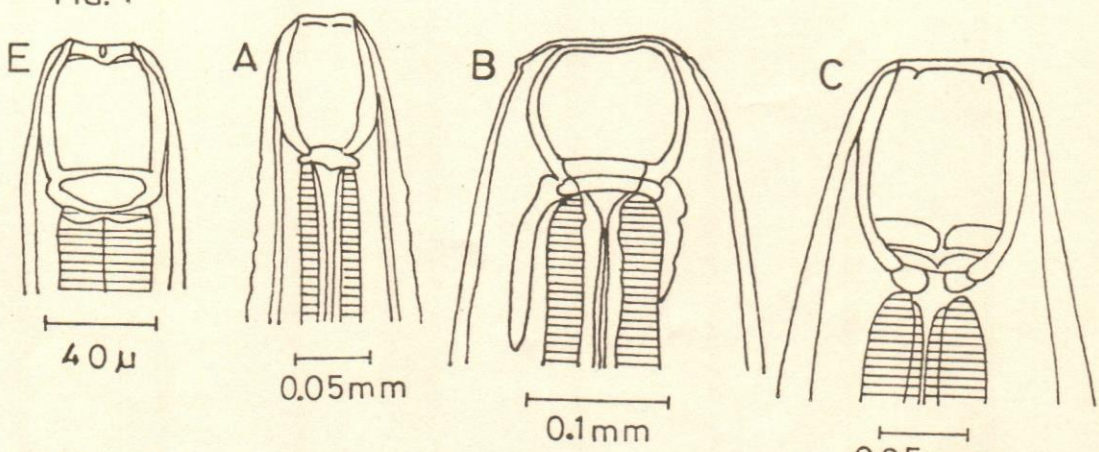
| | | |
|---|---|---|
| | 1979– | (Attempted classification of the subfamily Procamallanidae (Nematoda, Camallanidae). Ibid., ser. A 1(1), 219–239. |
| Pinto, R. M., Noronha, D. & Rolas, F.J.T. | 1976– | (New morphological and systematic findings in Brazilian *Procamallanus).* Mem. Inst. Oswaldo Cruz. 74(1) 77–84. |
| Rehana, R. & Bilqees, F.M. | 1973– | *Procamallanus wallagus* sp. n. (Nematoda, Camallandiae) from the Fish *Wallago attu* of Sind. Sind Univ. Res. J. 7(1), 13–16. |
| | 1979– | Three nematode species of the genus *Procamallanus* Baylis, 1923 including two new species from the fishes of Kalri Lake, Sind, Pakistan. Pak. J. Zool. 11(2), 281–293. |
| Skryuabina, E. S. | 1969– | (The helminth funa of the sturgeons (Acipenseridae Bonaparte 1931). Candidate Thesis, 151 p. Moskva. |
| Sood, M. L. | 1967– | One some species of the genus *Procamallanus* Baylis, 1923 from freshwater fishes of India. Proc. Nat. Acad. Sci. Ind. 37 (B), 111, 291–303. |
| Tornquist, N. | 1931– | Die nematodenfamilien Cucullanidae and Camallanidae Goteb. Kungl. Vet. och Vett.-samh. Handl. ser. B., 2(3), 441 p. |
| Vuylsteke, C. | 1964– | Vorms-Nematoda, Mission Zool. med. Maniema (Cango Leopoldville), Resultat scientifique. Zool. Wetensch., 132, 41–66. |
| Wang, P. & Ling, X. | 1975– | (Some nematodes of the suborder Camallanata from Fujian Province, with notes of their life histories). Acta Zool. Sinica, 21(4), 350–358. |
| Yamaguti, S. | 1935– | Studies on the helminth fauna of Japan. Pt. 9. Nematodes of fishes, 1. Jap. J. Zool., 6(2), 337–386. |
| | 1941– | Studies on the helminth fauna of Japan. Pt. 33. Nematodes of fishes, 11. Ibid., 9(3), 343–396. |
| | 1955– | Parasitic worms mainly from Celebes. Part 9. Nematodes of fishes, Acta Med. Okayama, 9(1), 122–133. |

FIG. 2




PLATOCAMALLANUS SP.

FIG. 1




PROCAMALLANUS SPECIES

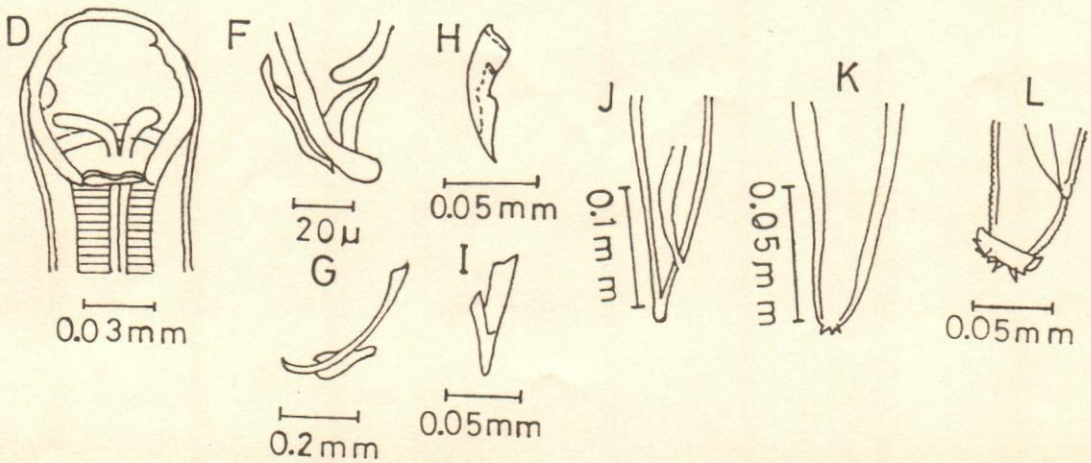


FIG. 1. (A–L) *Procamallanus* species.

A. Anterior end of female of *P. guptae* (after Arya, 1978).

B. Anterior end of male of *P. annulatus* (after Yamaguti, 1955).

C. Anterior end of female (dorsal view) of *P. bilaspurensis* (after Gupta and Duggal, 1973).

D. Head of *P. aspiculus* (after Khera, 1955).

E. Cephalic extremity of *Procamallanus* sp. (median view) (after Petter, 1978).

F. Gubernaculum and tips of both spicules (ventral view) of *P. elatensis* (after Fusco and Overstreet, 1979).

G. Gubernaculum and right spicule of *P. annulatus* (after Yamaguti, 1955).

H. Gubernaculum of *P. hindensis* (after Lal, 1955).

I. Gubernaculum of *P. magurii* (after Lal, 1965).

J. Posterior end of female (Lateral view) of *P. heteropneustus* (after Ali, 1957).

K. Tail of female of *P. laeviconchus* (Wedl, 1862) (after Moravec, 1974),

L. Caudal end of female of *P. slomei* (after southwell and Kirshner, 1937).

FIG. 2 (A–C) Platocamallanus species.

A. Anterior end of male of *P. attui* (after Pande; Bhatia and Rai, 1963).

B. Female tail (lateral view) of *P. cancilus* (after Bashirullah and Hafizuddin, 1974).

C. Posterior end of female of *P. attui* (after Pande; Bhatia and Rai, 1964).

Records Zool. Sur. of Pak. Vol. XI, 1988.

# ZOOPLANKTON ABUNDANCE IN THE COASTAL WATERS FROM IBRAHIM HYDERI TO BAKRAN, SIND COAST OF PAKISTAN.

Ishrat Ara Huda and Arshad Munir
Marine Biological Research Laboratory, Zoological Survey Department, Karachi

*Abstract : Zooplankton abundance at different depths & stations along 6 transects from Ibrahim Hyderi to Bakran were studied. Zooplankton production varied with depth and sampling stations. The area under investigation have different environments having extensive mangrove vegetation.*

During South West Monsoon total number & biomass of zooplankton was significantly greater during the end of upwelling than that of North East Monsoon. Turbidity caused by different elements has caused a reduction in light penetration diminishing the extent of photic zone and has produced a good physical condition of the plankton sample collected from 5—10 meters depth. Copepod dominated the zooplankton community. The sewage pollution does not pose a threat to the environment concerned but has produced a reduction in biomass in the economically important Marine Fauna.

## INTRODUCTION

The upwelling of the nutrients during monsoon provides a nursery ground and an ideal breeding ground along the coast for a variety of marine animals which drift towards the coast to complete their life cycle going back to sea water. Qualitative & quantitative study of zooplankton helps in understanding the dynamic relationship between various trophic levels and productivity in the sea in various regions. These information indicate the possibility of fisheries for which plankton forms the basic food.

Zooplankton abundance in 5, 10, 15 meters below hauls along 6 transect from Ibrahim Hyderi to Bakran Creek were studied. These studies will help in foretelling any alarming situation developed in these ecosystem that will affect the living resources due to different types of pollution. The correlation of data obtained shows that in a mangrove system under study there are different environments with different group of organism, Teixeira, Tundusi & Kutner (1964).

The average monthly distribution of planktonic Biomass and the relative abundance of major groups of zooplankton alongwith hydrological parameters was studied by Huda & Ahmed (1985-86) to study the zooplankton production trends of inshore waters in mangrove environment, Karachi Coast. The analyses of plankton smaples showed a wide fluctuation in quantitiative as well as qualitative composition of different groups of zooplankton from season to season as also studied by Nooruddin (1967), Moazzam (1979), Saifullah & Moazzam (1978), Banse (1984), Goswami (1985).

Research work in the Indian Ocean has been done by Vinogradov & Veronia (1961) Vinogradov (1961) during the North East Monsoon. The earlier observation was also confirmed by Khan & Khan (1973) & Khan (1977), Khan & Zubairi (1974), Smith

(1980, 1982, 1984) who have observed a sharp peak during South West Monsoon in Indian Ocean. The result here showed a bimodal cycle with higher values as studied by Nooruddin 1976.

Mangrove vegetation of Brazil have been studied by Teixeira & Kutner (1963), Teixeira et. al. (1967, 1969), Tundusi (1969) and Tundusi & Teixeira (1965, 1968).

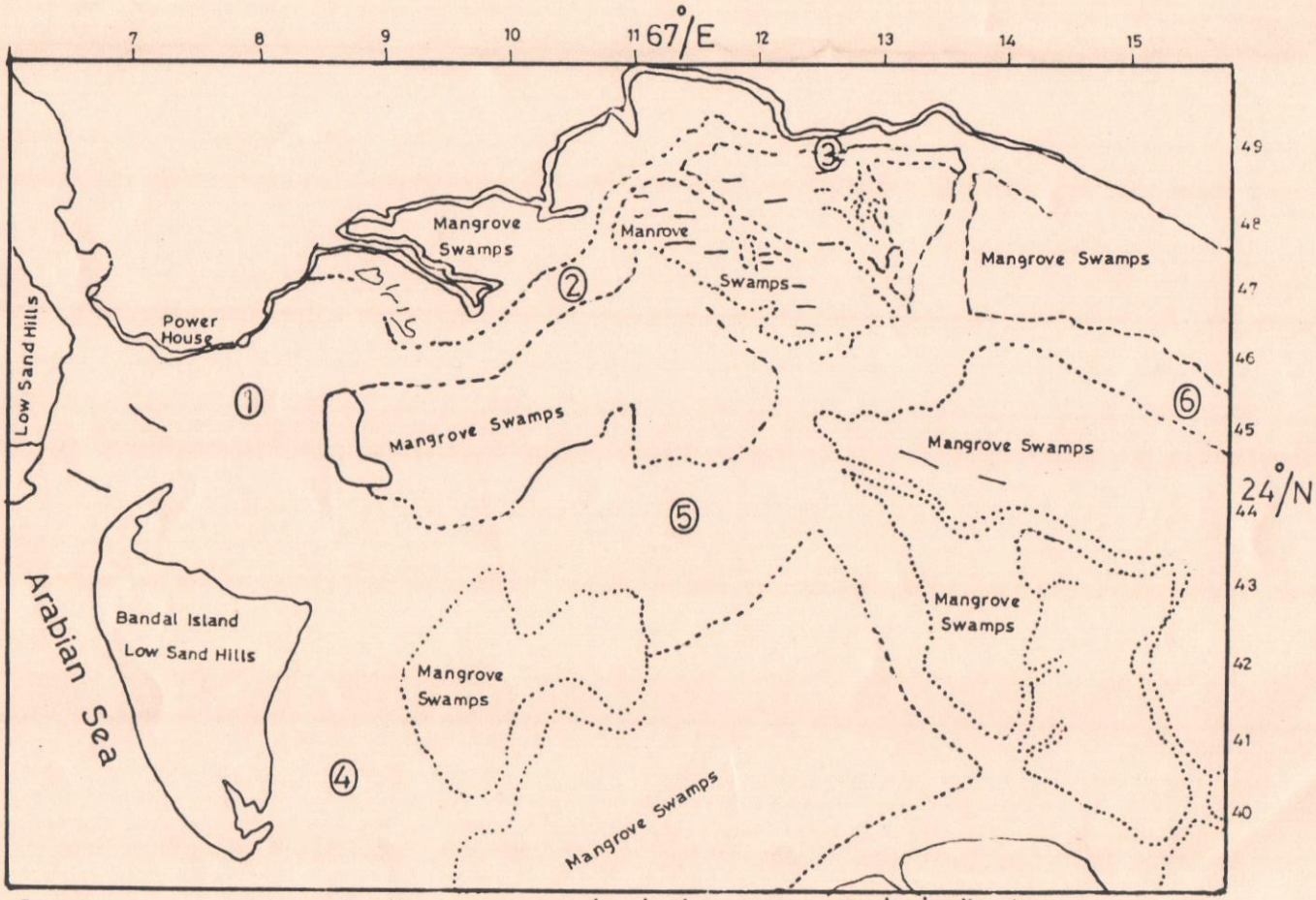
## STUDY AREA AND METHOD OF SURVEY

Monthly sampling of zooplankton was done from 6 transects viz. Korangi Creek St–I, Wagodar St–II, Rehri Creek St–III, Phitti Creek St–IV, Near Qasim Port shiproute area, St–5, Bakran St-VI. Zooplankton collection were made by lowering the net of ($.5m^2$) 344$\mu$ mm. mesh size and then hauling it slowly for 10 minutes during high tide at 5,10,15 meter depth. Salinity and temperature were taken from surface only. Planktonic biomass values were noted to determine the productivity of the sea during the period March, April, May the North East Monsoon and during the end of South West Monsoon August, September and October when upwelling of the sea brings nutrient rich water to the shore with a high biomass of marine life. The schedule was maintained to collect sample that could be compared from station to station. Zooplankton production was estimated after noting the settling volume in millimeters. An adequate of 5 ml. sample was examined for enumeration of different organisms, samples were counted with a wild M3 sterio-microscope. The average numbers of Zooplankton of 6 months data and comparative studies were performed to see its association with upwelling and inshore transport of zooplankton. The sample were then preserved in 5% neutral formalin. Among the hydrographical studies tides, extinction co-efficient, salinity, temperature & rainfall were studied with composition of zooplanton association from St–I to St–VI.

TABLE II

VARIATION OF EXTICNTION COEFFICIENT AT DIFFERENT TRANSECTS

| Months | Years | Tide | St. I | | St. II | | St. III | | St. IV | | St. V | | St. VI | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | d(m) | K | d(m) | K | (d(m) | K | d(m) | K | d(m) | K | d(m) | K |
| March | 86 | High | 3 | 0.56 | 3 | 0.56 | 4 | 0.42 | 4 | 0.42 | 2 | 0.85 | 4.5 | 0.37 |
| April | 86 | High | 3.5 | 0.48 | 4 | 0.42 | 4 | 0.42 | 4 | 0.42 | 1.5 | 1.33 | 4 | 0.42 |
| May | 86 | High | 3.5 | 0.48 | 3 | 0.56 | 3 | 0.56 | 4 | 0.42 | 1.5 | 1.33 | 4 | 0.42 |
| August | 86 | High | 4.5 | 0.37 | 3.5 | 0.48 | 4.5 | 0.37 | 5 | 0.34 | 2 | 0.85 | 4.5 | 0.37 |
| September | 86 | High | 4 | 0.42 | 3.5 | 0.48 | 4 | 0.42 | 5 | 0.34 | 2 | 0.85 | 4 | 0.42 |
| October | 86 | High | 4 | 0.42 | 3.5 | 0.48 | 3 | 0.56 | 3 | 0.56 | 2.5 | 0.68 | 4.5 | 0.37 |
| March | 87 | High | 5.5 | 0.30 | 3.5 | 0.48 | 4 | 0.42 | 3.5 | 0.48 | 2 | 0.85 | 6.5 | 0.26 |
| April | 87 | High | 5 | 0.34 | 3 | 0.56 | 3.5 | 0.48 | 4 | 0.42 | 2 | 0.85 | 6 | 0.28 |
| May | 87 | High | 5 | 0.34 | 3 | 0.56 | 5 | 0.34 | 6 | 0.28 | 2.5 | 0.68 | 4.5 | 0.37 |
| August | 87 | High | 6 | 0.28 | 4 | 0.42 | 6 | 0.28 | 5 | 0.34 | 3.5 | 0.48 | 6.5 | 0.26 |
| September | 87 | High | 6.5 | 0.26 | 5 | 0.34 | 6 | 0.28 | 5.6 | 0.30 | 2 | 0.85 | 6 | 0.28 |
| October | 87 | High | 5 | 0.34 | 5 | 0.34 | 3 | 0.56 | 3 | 0.56 | 2 | 0.85 | 5 | 0.34 |




Stations at which collection were made during monsoon to indicate Zooplankton productivity extinction coefficient, Temperature & Salinity

1. Korangi Creek. 2. Wagodar. 3- Rehri Creek. 4. Phitti Creek. 5. Near Qasim Port. 6. Bakran Creek.

TABLE I

AVERAGE PLANKTONIC BIOMASS VOLUME OF DIFFERENT TRANSECTS AT DIFFERENT DEPTHS IN MANGROVE AREAS OF KARACHI COAST 86 – 87

| Months | Tide | Depth. in m | St. I | | St. II | | St. III | | St. IV | | St. V | | St. VI | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | 86 | 87 | 86 | 87 | 86 | 87 | 86 | 87 | 86 | 87 | 86 | 87 |
| March | High | 5 | 25 | 36 | 29 | 25 | 25 | 38 | 38 | 39 | 22 | 16 | 32 | 26 |
| | | 10 | 38 | 40 | 40 | 55 | 48 | 40 | 44 | 46 | 30 | 28 | 48 | 40 |
| | | 15 | 28 | 30 | 20 | 50 | 40 | 30 | 38 | 36 | 10 | 20 | 46 | 30 |
| April | High | 5 | 34 | 36 | 24 | 40 | 28 | 32 | 62 | 40 | 24 | 20 | 50 | 35 |
| | | 10 | 38 | 49 | 35 | 40 | 38 | 48 | 68 | 48 | 26 | 22 | 52 | 50 |
| | | 15 | 38 | 20 | 28 | 20 | 30 | 38 | 42 | 30 | 25 | 12 | 40 | 28 |
| May | High | 5 | 36 | 20 | 32 | 20 | 42 | 48 | 50 | 40 | 26 | 18 | 40 | 53 |
| | | 10 | 36 | 20 | 38 | 30 | 68 | 30 | 42 | 50 | 24 | 12 | 48 | 35 |
| | | 15 | 30 | 22 | 20 | 25 | 24 | 35 | 40 | 54 | 28 | 10 | 30 | 20 |
| August | High | 5 | 50 | 45 | 45 | 50 | 62 | 68 | 70 | 60 | 40 | 38 | 60 | 55 |
| | | 10 | 68 | 65 | 70 | 50 | 68 | 52 | 70 | 38 | 40 | 38 | 68 | 70 |
| | | 15 | 50 | 30 | 30 | 45 | 24 | 30 | 45 | 60 | 35 | 32 | 80 | 72 |
| September | High | 5 | 58 | 50 | 56 | 78 | 48 | 42 | 72 | 75 | 45 | 40 | 60 | 48 |
| | | 10 | 68 | 62 | 72 | 82 | 62 | 88 | 82 | 60 | 40 | 56 | 60 | 80 |
| | | 15 | 50 | 56 | 28 | 48 | 42 | 22 | 52 | 42 | 40 | 20 | 60 | 82 |
| October | High | 5 | 46 | 49 | 48 | 42 | 50 | 32 | 58 | 50 | 39 | 41 | 50 | 46 |
| | | 10 | 53 | 32 | 35 | 40 | 35 | 36 | 85 | 78 | 30 | 35 | 36 | 52 |
| | | 15 | 32 | 30 | 25 | 36 | 30 | 38 | 38 | 48 | 20 | 20 | 30 | 32 |

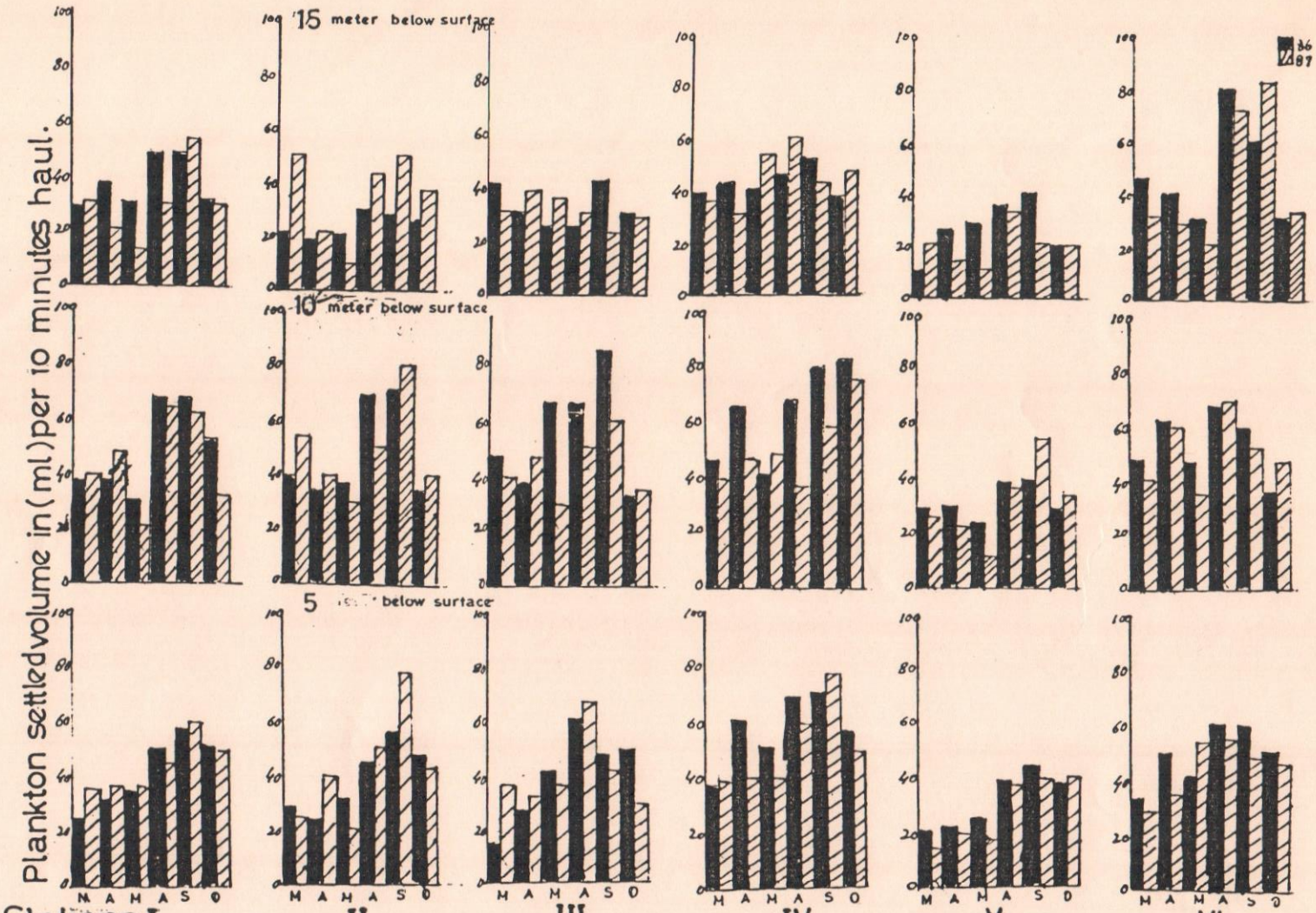



Fig:I Average Planktonic Biomass Volume at six different Transects

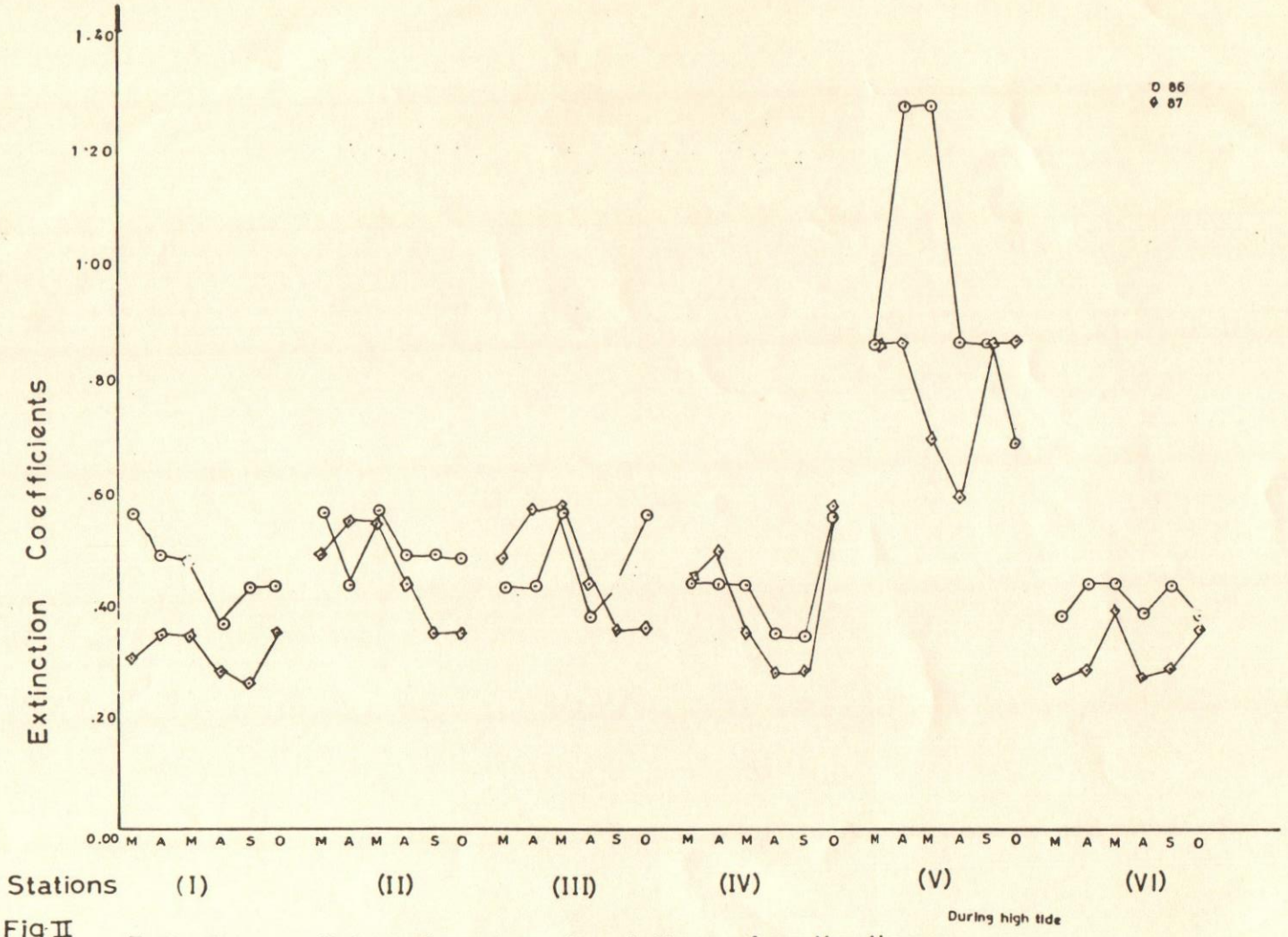



Fig-II Extinction coefficient found in the stations of collection

TABLE III

MEAN MONTHLY SALINITY & SURFACE TEMPERATURE 1987

| Months | Salinity (O/00) STATIONS | | | | | | Surface Temperature $0^C$ STATIONS | | | | | | Rainfall |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | I | II | III | IV | V | VI | I | II | III | IV | V | VI | |
| March | 36 | 36 | 37 | 37 | 37 | 38 | 24 | 24 | 24.5 | 24.5 | 24.5 | 24.5 | 0 |
| April | 36 | 36 | 36.5 | 36 | 36 | 38 | 23 | 24 | 24 | 24 | 24 | 24 | 0 |
| May | 38 | 38 | 38 | 38 | 38.5 | 38.5 | 38.5 | 36 | 36 | 37 | 36 | 37 | 0 |
| August | 36 | 35.6 | 36 | 36 | 37 | 38 | 29 | 29 | 29.5 | 29.5 | 26.5 | 29 | 0 |
| September | 36 | 35.6 | 35 | 36 | 35 | 38 | 29 | 28 | 28 | 29.5 | 28 | 28 | 0 |
| October | 35 | 40 | 40 | 40 | 40.5 | 40.5 | 30 | 30 | 30 | 30.5 | 30.5 | 30 | 0 |

## RESULT & DISCUSSION

Highest values of zooplankton Biomass (Table I Fig. I) was observed at 10 meter depth 88 ml per 10 minutes haul in St-III in 1987. Zooplankton Biomass values were on higher side during the end of upwelling season at all the stations and at all depths. Bimodal peaks were observed as studied by Nuruddin (1967), Moazzam (1979), Banse (1982) Huda & Ahmed (1985, 1986). Lowest planktonic biomass values were at 15 meters depth per 10 minutes haul in March, 1987 and at St-V, during the North East Monsoon season. Two peaks were recorded, one in April 68 ml. at St-IV at 10 m. depth and the other 88 ml. in September 1987 at 10 m. depth.

The highest numbers and more abundant zooplankton at 5–10 m, group, observed in the sample, were Mysidacean, Copepods, Chaetognatha, Sergestids, lucifers, decapod larvae, & fish eggs. Molluscs were always present in swarm. Hydromedusae, siphonophores, cladocera & salps were recorded from 10–15 m, zone in fairly large numbers. Other groups present were in small numbers.

Adult to immature copepoda dominated the zooplankton sample at all transects and at all months. Goswami (1985). Highest 173400 & lowest 76000 average counts were obtained during the year 1987. The copepod population consisted of Temora, Calanus, Eucalanus, Acrocalanus, Paracalanus, Pseudodiaptomous Acartia and Oithona.

Mangrove ecosystem of Karachi coast is truely an upwelling ecosystem during the South West Monsoon and as exceptional compared with other upwelling areas. The zooplankton counted in between 5–10 m. depth in both years showed similar pattern. In both years higher biomass were observed in the vicinity of Station II, III and VI in September after the influence of South West Monsoon. In terms of biomass zooplankton 1986 and 1987 were similar in relative standing stock during upwelling. Biomass was on the lower side in the vicinity of St-IV.

Transparency was measured by lowering a white secchi disc (30 cm in diameter) into the water and noting the depth at which it disappeared. The depth at which it disappeared was converted to extinction coefficient according to Pools and Atkins (1929) formula :

$$K = \frac{1.7}{d}$$

where "K" is the extinction coefficient and 'd' secchi disc readings in meters. The secchi disc readings were low at all stations because of dissolved coloured substances due to pollution & high values of zooplankton.

The water of this area is very turbid Table-II, Fig. II due to coloured pigment of mangrove swamps on St-II, III & VI and due to the industrial discharge in St-I and due to ship discharge on St-V where extinction coefficient were on higher side. Stations IV & VI seems to be some what better for the productivity of zooplankton as the biomass were on higher side. The salinity ranged between 36–40% $_{o}$ and shows an inverse correlation with planktonic biomass values. Temperature ranged from 24–30°C while there was no rainfall during the period. Zooplankton Biomass was highest when the salinity decreased to some extent.

## CONCLUSION

From the above studies it may be concluded that the high turbidity & large amount of coloured substance of inshore waters has caused a reduction in light penetration thus diminishing the extent of photic zone and the surface solar radiation has reduced to some extent. This probably accounts for the good physical condition of the plankton sample collected from 5m to 10m depth. There is an increase of plankton biomass from St-I to St-VI with exception to St-V where biomass showed a decrease in volume which is from near ship route to Qasim Port. Station I is subjected to industrial pollution, and Station II to sewage pollution, at Station III & IV the influence of pollution is somewhat reduced. The biomass values of zooplankton were low near ship route to Qasim Port area (Table-I, Fig. I) and the extinction coefficient were also on higher side than industrial polluted area. These areas are also subjected to higher industrial pollution. At Bakran area again the biomass value were on higher sides as the area is subjected only to sewage pollution. All these studies conclude that contamination of sea water by industrial and sewage pollution does not seem to pose a serious threat to the environment concerned as that of the ship disposal but has produced a reduction in biomass in the economically important marine fauna. During the Southwest Monsoon total numbers of biomass of zooplankton was significantly greater during the upwelling than that of north east monsoon. The correlation of data obtained shows that a mangrove system under study has therefore different environments with different groups of organism.

## ACKNOWLEDGEMENT

The authors are thankful to Mohammad Farooq Ahmed, Director, Zoological Survey Department for providing facilities and encouragement during the period of these investigations. Thanks are also due to Mohammad Akram for critically reviewing the manuscript.

## LITERATURE CITED

Banse, K. 1984. Overview of the hydrography and associated biological phenomena in the Arabian Sea off Pakistan. Pages 271–303 in B. U. Haq and J. D. Milliman eds. Marine Geology and Oceanography of the Arabian Sea and Coastal Pakistan. Van Nostrand Reinhold Co. New York.

Goswami S.C. 1985. Secondary production & zooplankton abundance in the coastal waters from Vengurla to Maple, West Coast of India. Indian J. Marine Sciences 14, 85–92 National Institute of Oceanography, Dona Paula Goa 403004.

Khan, M. A. 1973. Distribution of displacement volume and numbers of zooplankton in Manora channel during South West monsoon, 1973. Jour. Sci. Unvi. Kar. 3: 30–34.

Khan, M.A. 1974. Seasonal distribution of Biomass and number of zooplankton in Manora channel during 1975-77. Biologia. Vol. 25: No. 182-203.

Khan, M. A. & Zubairi, A. A. 1974. Distribution of settled volume and number of zooplankton in Manora channel during South West Monsoon 1974. Jour. Sci. Unvi. Kar. Vol. 4: 32-35.

Krishnamurthy, K. 1961. Daily variation in marine plankton from Porto Novo, south India. J. Zool. Soc. India. 13(1) : 180–187.

Moazzam, M. 1979. Abstract. Seasonal distribution of plant pigments in a near shore environment at Karachi. Winter Meeting of the American Limnological Oceanography Society. Corpus Christi.

Nooruddin, 1967. An account of the zooplankton of Karachi coast with a note on their seasonal variations, fluctuations and distribution. Agriculture Pakistan. 18: 197–224.

Saifullah, S. M. and M. Moazzam, 1978. Species composition and seasonal occurrence of centric diatoms in a polluted marine environment. Pakistan J. Bot. 10: 53–64.

Smith, S. L. 1980. South West Monsoon of 1979 : Chemical and Biological Response of Somali Coastal waters. Science. Reprint Series 1 August Vol. 209, pp. 597-600.

Smith, S. L. 1982. The northwestern Indian Ocean during monsoon of 1979. Distribution, abundance, and feeding of zooplankton, Deep-Sea Res. 29 : 1331-1335.

Smith, S. L. 1984. Biological Indication of Active upwelling in the north Western Indian Ocean in 1964 and a comparision with Peru and Northwest Africa. Deep-Sea Res. 31. P. 951–967.

Teixeira, C. and M. B. Kutner, 1963. Plankton studies in a mangrove environment. 1. First assessment of standing stock and principal ecological factors. Bot. Inst. Oceanogr. Sao Paulo 14 : 101–124.

Teixeira, C. J. Tundusi and J. Santoro Yeaza. 1967. Plankton studies in a mangrove environment. IV Size fractionation of the phytoplankton. Biol. Inst. Oceangr. Sao Paulo 16: 39–42.

Teixeira, C. J. Tundusi and J. Santoro Yeaza. 1969. Palnkton studies in a mangrove environment. VI. Primary production. Zooplankton standing stock and some environmental factors. Int. Rev. Ges. Hydrobiol. 54: 289–301.

Tundusi, J. 1969, Plankton studies in a mangrove environment - its bilogy and primary production. Pages 485 - 494 in Lagunas Costeras, un Simposio. Men. Simpl. Int. Lagunas Costeras UN AM-UNESCO, Nov. 28-30, 1967. Mexico.

Records Zool. Sur. of Pak, Vol. XI, 1988.

# BIRDS OF KARACHI UNIVERSITY CAMPUS, KARACHI-SIND

Zakia Khanum and Manzoor Ahmed
Department of Zoology, University of Karachi.

## INTRODUCTION

Karachi sea coast, mangrove forests and numerous small and medium fresh water lakes have traditionally been the sites of great attraction for migratory birds visiting the Indo-Pakistan subcontinent from various parts of the world. After the tremendous human activity initiated after the establishment of Pakistan in 1947, there has emerged considerable greenery in and around Karachi proper. It has also increased the abundance of bird species both in number and kind. The new campus of the University of Karachi, established in 1952, became the centre of activity in 1960. All sorts of road-side plantation, house hold vegetation and lawns and trees in educational departments have made the campus an oasis in nearly barren areas around. During the last nearly ten years, there have been witnessed a large number of bird species both resident and migratory visiting the campus area all over the year.

In order to prepare a list of bird fauna of the campus, as a part of over-all study of bird fauna of karachi, we made continuous study of birds from various parts including nursery, residential areas, areas with wild growth all around the limits of the campus during the two years (1985-87) and observed 57 species of various groups in the campus. Of these 40 (70%) were of resident species, 6 of migrants (10.5%) spending the winter in the campus area, 5 (8.7%) of local migrants, 2 of passage migrants (3.5%) and 4 (7%) of summer visitors. The identification of species has been made with the help of keys prepared by Khanum et al (1980), Baker (1922-31) and Ali and Ripley (1968-74). The species recorded during this study are listed below :

I. Order Ciconiiformes
Family Ardeidae

1. *Bubulcus ibis coromandus*, Cattle egret, Resident

II. Order Falconiformes
Family Accipitridae

2. *Milvus migrans govinda*, Pariah kite, Resident
3. *Aquila rapax vindhiana*, Tawny eagle, Resident
4. *Elanus caeruleus vociferus*, Black-winged kite, Resident

III. Order Galliformes
Family Phasianidae

5. *Francolinus pondicerianus mecranensis*. Baluchistan grey partridge, Resident

IV. Order Charadriiformes
Family Charadriidae

6. *Vanellus indicus indicus,* Red-wattled lapwing, Resident
7. *Tringa stagnatilis,* Marsh sandpiper, Winter visitor

V. Order Columbiformes
Family Columbidae

8. *Columba livia neglecta,* Blue rock pigeon, Resident
9. *Streptopelia decaocto decaocto,* Indian ring dove, Resident
10. *Streptopelia senegalensis cambayensis,* Indian little brown dove, Resident
11. *Streptopelia tranquebarica tranquebarica,* Indian red turtle dove, Resident

VI. Order Psittaciformes
Family Psittacidae

12. *Psittacula krameri borealis,* Northern roseringed parakeet, Resident

VII. Order Cuculiformes
Family Cuculidae

13. *Eudynamys scolopacea scolopacea,* Indian koel, Resident
14. *Centropus sinensis sinensis,* Common crow-pheasant, Resident

VIII. Order Apodiformes
Family Apodidae

15. *Apus affinis affinis,* Indian house swift, Resident

IX. Order Coraciiformes
Family Coraciidae

16. *Coracias benghalensis benghalensis,* Northern roller or Blue Jay, Resident

Family Upupidae

17. *Upupa epops epops,* European hoopoe, Resident

Family Meropidae

18. *Merops orientalis beludschicus,* Sind small green bee-eater, Resident

19. *Merops superciliosus persicus,* Blue-cheeked bee-eater, Passage migrant

X. Order Passeriformes
Family Alaudidae

20. *Galerida cristata chendoola,* Indian crested lark, Resident

21. *Alauda gulgula inconspicua,* Turkestan small skylark, Resident and locally migratory

22. *Mirafra erythroptera sindiana,* Sind redwinged bush lark, Resident

Family Hirundinidae

23. *Hirundo obsoleta pallida,* Pale crag martin, Resident

24. *Hirundo rustica rustica,* Western swallow, locally migratory

Family Laniidae

25. *Lanius excubitor lahtora,* Indian grey shrike, Resident

26. *Lanius vittatus vittatus,* Indian bay-backed shrike, Resident

27. *Lanius schach erythronotus,* Rufous-backed shrike, Resident

Family Oriolidae

28. *Oriolus oriolus kundoo,* Indian golden oriole, Resident, rarely winter straggler

Family Dicruridae

29. *Dicrurus adsimilis albirictus,* North Indian black drongo, Resident

Family Sturnidae

30. *Acridotheres tristis tristis,* Indian myna, Resident

31. *Sturnus roseus,* Rosy pastor, Migratory,winter visitor

Family Corvidae

32. *Corvus splendens zugmayeri,* Sind house crow, Resident

Family Campephagidae

33. *Pericrocotus ethologus flavillaceus,* West himalalyan longtailed minivet, Winter straggler

34. *Pericrocotus erythropygius erythropygius,* White bellied minivet, Winter straggler

Family pycnonotidae

35. *Pycnonotus leucogenys leucotis,* White-eared bulbul, Resident

36. *Pyconontus cafer humayuni,* Central Indian red-vented bulbul, Resident

Family Muscicapidae

37. *Turdoides striatus sindianus,* Sind jungle babbler,Resident

38. *Turdoides caudatus caudatus,* Common babbler, Resident

39. *Turdoides earlei sonivius,* Western striated babbler, Resident

40. *Orthotomus sutorius guzuratus,* Indian tailor bird, Resident

41. *Acrocephalus stentoreus brunnescens,* Indian great reed warbler, Resident

42. *Prinia socialis stewarti,* Northern ashy wren-warbler, Winter straggler

43. *Prinia gracilis lepida,* Indian streaked wren-warbler, Resident

44. *Prinia buchanani,* Rufous fronted wren warbler, Resident

45. *Sylvia curruca blythi,* Siberian lesser white-throat, Migratory, Winter visitor

46. *Erythropygia galactotes familiaris,* Rufous chat, Winter visitor

47. *Saxicolides fulicata cambaiensis,* Brown-backed indian robin, Resident

48. *Oenanthe picata,* Pied chat, Locally migratory

49. *Saxicola caprata bicolor,* Northern pied chat, Resident, partial migrant

50. *Turdus ruficollis atrogularis,* Black-throated thrush, Migratory, Winter visitor

Famil Nectariniidae

51. *Nectarinia asiatica brevirostris,* Sind purple sunbird, Resident

Family Motacillidae

52. *Motacilla alba dukhunensis,* Indian white wagtail, Migratory, Winter visitor

Family Ploceidae

53. *Passer domesticus indicus,* Indian house sparrow, Resident

54. *Passer pyrrhonotus,* Sind jungle sparrow, Resident

55. *Estrilda amandava amandava,* Red munia, Resident

56. *Lonchura malabarica malabarica,* White-throated munia, Resident

57. *Ploceus philippinus philippinus,* Indian baya, Resident

## ACKNOWLEDGEMENTS

The study presented here was carried with the help of a grant of research received from the University of Karachi, Karachi, Pakistan.

## REFERENCES

Ali, S. and S. D. Ripley (1968-74) Handbook of the birds of India and Pakistan, 10 vols. Oxford Univ. Press. Bombay, India.

Baker, E. C. S. (1922-31) Fauna of British India: Birds 8 vols., Taylor and Francis London, U.K.

Khanum, Z., M. F. Ahmed and M. Ahmed 1980. A check list of birds of Pakistan with illustrated key to their identification. Rec. Zool. Surv. Pakistan. 9 (1–2): 138 pp.

Records Zool. Sur. of Pak. Vol. XI, 1988

# TRUE IDENTIFICATIONS OF AQUATIC BIRDS IN CAPTIVITY IN THE ZOOLOGICAL GARDEN

Zakia Khanum and Manzoor Ahmed
Department of Zoology, University of Karachi, Karachi.

## INTRODUCTION

The Zoological garden, Karachi is holding a rich collection of birds of Pakistan as well as some imported from other countries. Unfortunately some of the enclosures bear labels of old names, which have now become obsolete. As visitors of all categories keep on coming to the zoo and the administration do not have any ornithologist on their staff, it was considered worthwhile to determine their true identification in the light of recent literature. The 34 species listed below are all of aquatic birds identified with the help of keys of Khanum et al (1980), Baker (1922-31) and Ali and Ripley (1968-74) Recent works of Ahmed and Ghalib (1986) and Khanum and Ahmed (1987) also proved very helpful in this study.

## LIST OF BIRDS

I. Order Pelecaniformes
Family Pelecanidae

1. *Pelecanus onocrotalus*, White or rosy pelican
2. *P. philippensis philippensis*, Grey or spotted billed pelican
3. *P. philippensis crispus*, Dalmatian pelican

II. Order Ciconiiformes

Family Ardeidae

4. *Bubulcus ibis coromandus*, Cattle egret
5. *Egretta intermedia intermedia*, Median egret
6. *E. gularis schistacea*, Indian reef heron
7. *Nycticorax nycticorax nycticorax*, Night heron
8. *Ardea cinerea rectirostris*, Eastern grey heron
9. *A. purpurea manilensis*, Eastern purple heron

Family Ciconiidae

10. *Mycteria leucoephala*, Painted stork
11. *Ciconia ciconia ciconia*, White stork

Family Threskiornithidae

12. *Threskiornis melanocephalus,* White ibis

13. *Plegadis falcinellus falcinellus,* Glossy ibis

14. *Platalea leucorodia,* Spoonbill

**Fimily Phoenicopteridae**

15. *Phoenicopterus roseus,* Flamingo

III. Order Anseriformes

**Family Anatidae**

16. *Anser cygnoides,* Swan goose

17. *A. anser rubrirostris,* Eastern greylag goose

18. *A. fabalis fabalis,* Western bean goose

19. *Cygnus olor,* Mute swan

20. *C. atratus,* Black swan

21. *Cairina moschata,* Muscovy duck

22. *Anas platyrhynchos,* Mallard

23. *Anas acuta,* Pintail

24. *A. crecca crecca,* Common teal

25. *Aix galericulata,* Mandarin duck

26. *Aix sponsa,* Wood duck or Carolina duck

IV. Order Gruiformes
Family Gruidae

27. *Anthropoides virgo,* Demoiselle crane

28. *Grus grus lifordi,* Eastern common crane

29. *Balearica pavonina pavonina,* Crowned crane

**Family Rallidae**

30. *Fulica atra atra,* Coot

31. *Porphyrio porphyrio poliocephalus,* Indian purple moorhen

V. Order Charadriiformes
Family Laridae

32. *Larus hemprichii*, Sooty gull

33. *Larus argentatus heuglini*, Yellow-legged herring gull

34. *Chlidonias leucoptera*,, White-winged black tern

## ACKNOWLEDGEMENTS

The authors are thankful to the Unversity of Karachi for the grant provided for research on birds of Karachi. The presnnt study is a part of the same.

## REFERENCES

Ahmed, M. F. and S. A. Ghalib 1986 Field guide to the ducks, geese and swans of Pakistan. Zool. Surv. Dept., Govt. Pakistan, 32 pp.

Ali, S. and S. D. Ripley (1968-74) Handbook of the birds of India and Pakistan, 10 vol. Oxfored Univ. Press, Bombay, India.

Baker, E. C. S. (1922-31) Fauna of British India : Birds, 8 vol. Taylor and Francis, London.

Khanum, Z., M. F. Ahmed and M. Ahmed 1080 A check list of birds of Pakistan with illustrated keys to their identification. Rec. Zool. Surv. Pakiatan. 9 (1-2) 138 pp.

Khanum, Z. and M. Ahmed 1987 Interesting birds of Pakistan. Bur. Compos., Compil. and Transl. Univ. Karachi, Pakiatan, 200 pp.

Records Zool. Surv. of Pak., Vol. XI, 1988.

# POPULATION STATUS OF INDUS DOLPHIN IN THE RIVER INDUS ABOVE SIND.

Mohammad Sadiq Niazi* and Mirza Mohammad Azam
Zoological Survey Department, Karachi.

## INTRODUCTION

Indus Dolphin *(Platanista minor)*, is basically the inhabitant of the Indus river system between foothills of the Salt Range and the Indus Delta (Pilleri, 1975), where it is widely but thinly distributed (Pilleri & Zbinden, 1973-74 . Roberts, 1977) Pilleri & Bhatti, 1978; Pilleri & Pilleri, 1980; Khan, 1980-86 and Niazi, 1985). It has been decreasing rapidly and regularly since last a few decades from its original habitat due to human induced stresses such as damming of the river and killing (Pilleri, 1975). It has been exterminated from the Chenab and the Sutlaj rivers during early 70s (Roberts, 1977). The population between Chashma and Jinnah Barrages and Sukkur and Kotri Barrages are on the verge of extinction (Niazi, Khan & Niazi, in press).

Very little attention has been paid to population surveys of the dolphin in the Punjab. As a matter of fact Kasuya & Nishiwaki (1975), Roberts (1977) and Pilleri and Pilleri (1980) have surveyed fractions of the occupied stretch of the river. The authors initiated the work in 1983 and carried out several survey trips in the preceeding years. Present paper deals with the brief results regarding the population status of the blind dolphin of Pakistan above Sind.

## POPULATION

Extensive survey of October-November, 1987 revealed the population of the Indus Dolphin to be 104. Only 3 individuals were observed between Jinnah and Chashma barrages, 39 in the river stretch between Chashma and Taunsa barrages and 62 between Taunsa and Guddu barrages.

During 1985 three different surveys were conducted. In the first survey (April, 1985), 61 dolphins were observed in 112 kilometers stretch of the river (spread over 9 selected parts) with a population density of 1.84 kilometers of river per dolphin (km R/D). The count increased to 73 in the second survey (August, 1985) and decreased by one in the third survey (September-October, 1985) in the same area with the densities of 1.57 and 1.55 kms R/D respectively.

The number of the dolphins observed in the same area during 1987 survey came to 46 (see table) with a population density of 2.43 kms R/D. Thus 26 dolphins have been lost during the two years giving a loss of about 25% per year. Such a high rate of decrease in population is not a good sign for an endangered species like the Indus Dolphin.

## GROUP COMPOSITION

Indus Dolphin is apprarently a gregarious animal and lives in groups upto 10 individuals or more in healthy favourable habitat such as junctions of a by-river with main stream particularly downstream of islands, and eroded banks where plenty of

Present address : Marine Fisheries Department Fish harbour, Karachi–2.

fish and sufficiently deep moving water is available. In such areas dolphins form large schools consisting of 5 to 15 individuals and two or three groups tend to remain close to form a larger loose groups. One such loose school is found in Taunsa Barrage Sanctuary, other lives around Darya Khan Bridge (Darya Khan School). But due to its restricted environment and low intensity in the Punjab, the dolphin is not normally highly so social and it is more usual to observe solitary individuals or pairs (Roberts 1977, Niazi 1985).

A detailed study at Taunsa Barrage Sanctuary (upstream of Taunsa Barrage) revealed the presence of 3 youngs, 6 subadult females plus adult-males and 5 adult females. Here percentage of adult females is quite healthy. On the contrary Darya Khan School consisted of 4 youngs and 7 subadult females plus adult males, but surprizingly no adult females were seen. Here the group composition is quite abnormal. In other parts, too, the number of adult females is very low; in fact the dolphin population mostly consisted of immature females plus adult and subadult males. It clearly gives an impression that the dolphins are under great pressure of mortality in this area.

## DISTRIBUTION

At present the Indus Dolphin is restricted to the 1600 kms stretch of the Indus river between Jinnah and Kotri barrages. In between these two barrages the river has further dammed at four places thus dividing the main population in five isolated populations. These are :

Jinnah - Chashma Population.
Chashma - Taunsa Population,
Taunsa - Guddu Population,
Guddu-Sukkur Population,
Sukkur - Kotri Population,

First three populations lying between Jinnah and Guddu barrages are located in the Punjab Province whereas the rest, between Guddu and Kotri barrages, are found in Sind Province. Populations of the Indus tributaries have long been exterminated.

The dolphins tend to occupy a fixed area within which they move and seldom stay at any point. Three types of movements have been recognized during present studies viz. diurnal movement, seasonal movement and conditional movement. The dolphins move towards feeding places about an hour before evening. They are also seen active around there in the morning. Side channels, by-rivers and eroded banks are the attractive places where sufficient fish are available. In the other part of the day they tend to remain in the main stream playing leisurely. This regular movement between feeding and playing areas is called diurnal movement.

During seasonal movement the dolphins move towards safe areas deep into the side channels and creeks in the flood, and in the dry season they congregate in suitable areas in the narrow main stream with plenty of food, deeper water and least disturbance.

The third type of the movement is in fact modification to the above two types. If the dolphins are disturbed in a good habitat, they would disperse and move towards safer areas and rejoin when the disturbance is vanished or if during flood season they feel that flow of the water is too stormy for them, they would move towards safe areas where water flow is rather gentle. In the post-flood period they tend to remain in the main stream so as to avoid shallow stagnant water pools in the side channels and creeks.

TABLE

SHOWING COMPARISON OF INDUS DOLPHIN COUNTS IN SURVEYS OF 1985 AND 1987.

| | Sector/Subsector | Length (KM) | Distance surveyed (KM) | Sept. – Oct. 1985 Count | Nov. - Dec. 1987 Count |
|---|---|---|---|---|---|
| I | Chashma - Jinnah Barrages | 48 | 14 | 4 | 3 |
| II | 1. Downstream of Chashma Barrage upto Darya Khan Bridge | 77 | 16 | 8 | 5 |
| | 2. Darya Khan to Leiah | 102 | 11 | 6 | 6 |
| | 3. Upstream of Taunsa Barrage | 58 | 16 | 15 | 14 |
| III | 1. Downstream of Taunsa Barrage upto Ghazi Ghat. | 48 | 13 | 11 | 4 |
| | 2. Ghazi Ghat to Jampur | 56 | 16 | 13 | 5 |
| | 3. Jampur to Nishtar Ghat | 70 | 16 | 10 | 2 |
| | 4. Downstream of Nishtar Ghat | 90 | 10 | 5 | 7 |
| | | 549 | 112 | 72 | 46 |

## REFERENCES

Bhatti, M. U. and G. Pilleri, 1982. Status of the Indus dolphin *(Platanista Indi Blyth,* 1859) between Sukkur and Guddu Barrages in 1979-80. Invest. Cetacea 13 : 245–261.

Kasuya, K. and M. Nishiwaki, 1975. Recent status of the population of Indus Dolphin. Sci. Rep. Whales Res. Inst. 27 : 81–94.

Khan, K. M. and M. S. Niazi. (in press). Indus Dolphin, its distribution and population status in the Indus River. Paper read in the "Workshop on Biology and Conservation of the Platanistoid Dolphins", at Wuhan, Peoples' Republic of China (October 28–30, 1986).

Niazi, M. S. 1985,1986,1987. Population Dynamics and Group Composition of Indus Dolphin in the Punjab upto Jinnah Barrage. Annual Progress Reports for 1983, 1985 and 1986.

Pilleri, G. 1975. Die Geheimnirre der blenden Dolphine. 216 p. Halwag, Bern.

Pilleri, G. and M. U. Bhatti. 1980. Status of the Indus Dolphin Population *(Platanista indi* Blyth, 1859) between Sukkur and Taunsa Barrages. Invest. Cetacea 11 205–214.

Pilleri, G. and O. Pilleri, 1979. Precarus situation of the dolphin population *(Platanista indi* Blyth, 1859) in the Punjab upstream from the Taunsa Barrage, Indus River. Invest. Cetacea 10 : 121–127.

Roberts, T. J. 1977. The Mammals of Pakistan. Ernest Benn Ltd. London Tonbridge.

Records zool. Sur. of Pak., Vol. XI. 1988.

# WILDLIFE ESTIMATION TECHNIQUES

**Mohammad Farooq Ahmed,**
**Zoological Survey Department, Karachi.**

For those who study wildlife or wish to become a conservationist a knowledge about the size of wildlife population, their fluctuation and other related problems is a must.

There are several methods for the estimation of wildlife population and some of the commonly used techniques are described below :

1. True census
2. Estimates
3. Indices

1. True Census :

It is an actual count of all individuals present in a given area. It is done by direct count method and is applicable for larger mammals like Urial, Ibex, Wild Ass, etc. It is done by traversing along ridges, valleys and fields, from one end to the other end, carefully counting animals area by area. Each herd can be identified usually by its group composition, location and by some prominent identifiable animals in the herds, such as broken horn, cut mark, limping leg etc. Individual animals are also identified by any apparent mark on their body.

2. Estimates :

It gives an estimate of a population within the limits of assumption. From such counts or estimates one can draw conclusions about the size of a population. Absolute count is done on a sample area through various methods such as (i) Re-capture method, (ii) Strip Census, (iii) Roost counting, etc.

(i) Recapture Method :

This method has many names such as "Lincoln Index", "Peterson-Jackson Method" and "Tagging ratio". This method is considered to be the most reliable and useful for small mammals and birds. It is the most commonly used method to estimate absolute population numbers. It is based on the assessment of the total population by capturing and marking a sample, releasing it and then taking a second sample in order to find the proportion of marked to unmarked animals.

Once a sample has been marked, and a second sample taken, the total population is calculated from the formula :

$$P = \frac{S_1 \times S_2}{M}$$

Where P = total population
$S_1$ = first sample marked and released
$S_2$ = second sample captured
M = number of marked individuals captured in the second sample.,

Hence, if 30 babblers are captured and marked in the first sample ($S_1$) and 40 captured in $S_2$, of which 20 are marked, then the total population is estimated by :

$$P = \frac{30 \times 40}{20}$$
$$= 60 \text{ babblers.}$$

**Marking of animals :**

A large number of methods are used to mark different kinds of animals. For example, paint or dye marks on plumage and bands on legs are used for birds; ear tags for mammals, jaw tags for fish & reptiles, clipping of toes for reptiles (lizards) and mammals and clipping of fins for fish and aquatic mammals. Radio-active compounds are also used for small mammals.

**Assumptions :**

The re-capture method requires several assumptions :

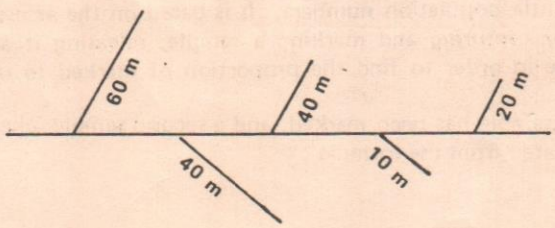
1. Marked and unmarked are equally "detectable " in the second sample ($S_2$)
2. Marked and unmarked animals are assumed to mix well in the population.
3. Losses (deaths) and gains (births) are assumed to be equal in the marked & unmarked animals and, therefore, not taken into account.

(ii) Strip Census :

This method enables us to estimate animal populations by counting animals along a pre-determined line of set lenght. The method was originally designed to estimate grouse population, but has been found equally good for open habitat species and small birds.

The strip census method entails walking on a pre-determined line, counting the animals observed along line and recording the distance at which they are seen or flushed. The average of the flushing distance is determined and used to calculate the effective width of the strip covered by the observer.

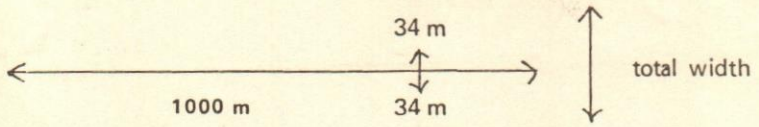
For example :




(Pre-determined line of total lenght = 1000 m i.e. 1 Km)
N. B. X = animal ; = observer.
Get average flushing distance for these animals

$$\frac{60 + 40 + 40 + 10 + 20}{5} = \frac{170}{5} = 34 \text{ m.}$$

Therefore, average flushing distance from the line (on either side) is 34 m.




Total width of strip = 34 m + 34m = 68m.
Total length of strip = 1000m.
Size = 68m x 1000 m = 68 000 Sq. m.
Birds observed = 5 birds/68000 Sq. m.
or 5 birds/6.8 ha
0.74 birds/ha

Strip census technique has another modification and this can be explained as under:

Since the count is made in a representative portion of a particular area, the population of the entire area can be estimated by applying the formula :

$$p = \frac{AZ}{2yx}$$

Where, P = population
A = total area of study
Z = number flushed
Y = average flushing distance
X = lenght of strip

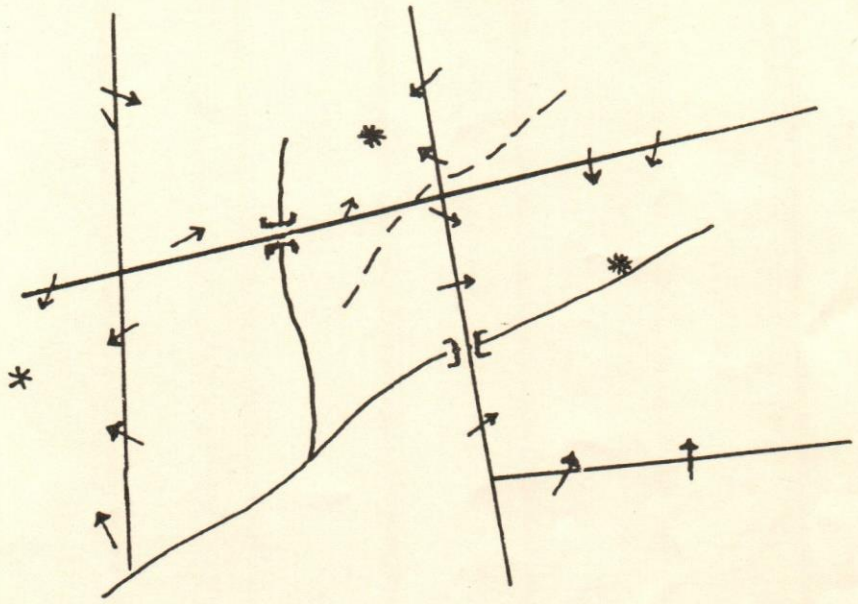
(iii) Roost Counting :

Many species of birds, outside the breeding season, roost in large flocks during the night, scattering to feed during the day, and flighting into roost about sunset. The size of these roost can sometimes be estimated by a team of observers counting birds as they arrive at the roost. Most species flying into the roost in flocks of upto 100 birds and these can be fairly accurately estimated with practice, or in some cases actually counted. Atleast 4 observers are generally necessary, stationed around the roost, and the sectors covered by each must be clearly defined in order to avoid double counting.

Roosts can be located by one or more observers moving around and taking compass bearings on the direction taken by flocks flying just before sunset. Arrows indicating these flight lines can be plotted on a suitable map of the district, and area at the convergence of the arrows reached on foot to pin point the roost.

Only roosts of moderate size (100–10000) can be counted in this way.

(iv) Demometric Technique :



←—Direction of flocks. * Position of roosts

- - - Boundry between feeding areas of 2 roosts.

(iv) Demometric :-

This may be applied for estimation of increase in population per year by counting the nests of the birds e.g. we can count the nests of Weaver bird (Baya) quite easily. We know that Baya lays 2 to 4 eggs in a ciutch per year (i.e. average 3 eggs). Male alone builds nest and female alone incubates. It is, therefore, assumed that 1000 couples build 1000 nests. Of these, however, 20 per cent are wrecked due to rain etc. thus leaving 800 nests. In 800 nests, 800 x 3=2400 eggs are laid. From these are hatched 2400 x 0.75 = 1800 live nestlings. This corresponds to 1.8 live hatched nestlings per original couple and 0.9 live hatched female nestlings.

Before the nestlings are fully fledged 20% i.e. 360 die. There is, therefore, left a net total of 1440 fledglings which corresponds to 1.44 fully fledged nestling per original couple.

3. Index Method :

It simply indicates an increase or decrease in a population.

(i) Call Method (Counts of calling males)

Call method is applicable for most species of the order Galliformes such as Pheasants whose males give characteristic calls in the early morning and sometimes at other times of day. Frequency of bird's call in a particular area yield an estimate of the total number of males present. In species which pair for breeding this number can be doubled to provide an estimate of the total breeding population.

Since the early morning calling is completed very quicky just before sunrise, so it is important for the census party to count the birds before the first light appears. This menas that the spot from where counts are to be made must be chosen the previous day. Census points should be selected in such a way that birds can be heard over as wide an area as possible. A stance on top of a ridge, for instance, may allow one person to monitor the valleys on both sides.

In case several observers are involved in the census, they should try to familiarise themselves with the area the previous day and pick out boundaries between their counting zones which can be recognised in the half light when the birds are calling.

Each observer should make a sketch map of his counting zones or these should be marked on a large scale map of the area and also some permanent and conspicuous marker made on the spot, such as a blaze on a tree, so that they can be easily located for subsequent censuses of the same area. The observer should also mark the approximate position/direction of each calling bird. The calls are generally recorded for 20–25 minutes after the first call because the birds (Pheasants) alight from trees and they change their positions and the new calls are more likely to be confused as coming from the new birds.

(ii) Pellet Group Count Method :

This method is suitable generally for herbivores. Pellet group count method is done as follows :

Several circular plots say of 5 m. radius established along transect at (say 100m, 300m or so) such a distance that the centre of each circular plot is 10 meters away from the respective transect line.

All the circular plots are then cleared off of earlier pellets before starting the data collection.

The plots are observed at intervals of 11–19 days.

Size, colour, age and average number of pellets in a pellet group are taken into consideration so as to minimize the possibility of under estimating or over estimating the pellet group in a circular plot.

Using the formula

$$D = \frac{P}{tda}$$

Where D = Density
P = number of pellet group
t = number of days
d = average defecation rate
a = area of plot, the density was then calculated.

## SAMPLING

Most of the population estimate of wildlife studies fall into one of the three categories :

1. Simple random sampling
2. Systematic sampling
3. Stratified random sampling.

**Simple Random Sampling :**

Consider a simple grid of plot or quadrat. With simple random sampling, one estimates the population size, on a sample of plot randomly selected with the assistance of a random number table. The objective is to ensure that each plot has an equal probability of being selected and thereby each individual in the population has an equal probability of being counted. Estimation of total population size simply entails, dividing the number of animals counted over the sampled area by the proportion of the total area which was sampled. Thus if 1/3 of the study area was sampled, an estimate of the population on entire area is 3 times the number of animals counted on the sampled units. Since random plots may be difficiult to find or re-run under field conditions, therefore, simple random sampling may be more time consuming and less efficient than other schemes.

Systematic Sampling :

It is often easier because sampling units may be easier to locate and subsequently rediscover. Further more, if animals are randomly distributed over a study area, a systematic sample may provide a reliable estimate of density as a simple random sample. The procedure entails selecting simple units, say a plot or quadrat, at regular intervals. For example, one may wish to sample every 5th quadrat, or one may select to conduct a bird call count at stations every km . along a road.

Stratified Random Sampling :

Sampling each habitat separately at different sampling intensities. When animal distributions are very frequently associated with particular habitat types, a more accurate estimated density can be obtained by using a stratified random sample. This approach can considerably reduce one's estimate of variance if there are marked differences in density between habitats. Sampling intensity should be highest in habitats with the greatest animal density. To determine, which habitats contain the greatest density, usually requires a pilot survey or reconnaissance survey and prior familiarity with the species distribution patterns.

Two principles of sampling are appropriate for systematic or simple random smapling :

1. The greater the sampling intensity, the greater the accuracy of population estimates.
2. The more clumped on animal's distribution, the more sampling units necessary to provide reasonably accurate estimates of density.

## REFERENCES

Crandall, L. S. (1964) The Management of Wildlife Mammals in captivity. Published by New York Zoological Society.

Gaston, A. J. (1979) Methods for estimating bird population. J. B. N. H. 72 (2) : 271-283.

Giles, R.N. (1971) Wildlife Management Technique V + 663. The Wildlife Society Washington D. C.

Hyrenius, H. and Diamand, H. (1974) Demometric Techniques Applied to animal populations. Demographic Research Institute, University of Gottenburg, Sweden.

Leopold, A. (1932) Game Management. Charles Scribers Sons New York. London (1948).

Schemnitz, S. D. (1980) Wildlife Management Techniques & Manual. The Wildlife Society, Inc.

Trippen See, R. E. (1953) Wildlife Management (Fur Bearers, Waterfowl & Fish) Volume II. McGraw Hill Book Company, Inc. + 572.

—: 0 :—

PRINTED BY : PRINTING CORPORATION OF PAKISTAN PRESS KARACHI