RECORDS

ZOOLOGICAL SURVEY OF PAKISTAN

HALF-YEARLY

Volume VIII Number 1 & 2

Edited and Published
by
THE DIRECTOR
ZOOLOGICAL SURVEY DEPARTMENT
Hotel Nazli Building
Nishter Road
Karachi-3

JANUARY, JULY 1976

Zoological Survey of Pakistan

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CONTENTS

FISHES OF SIND CREEKS—1. ORDER : CLUPEIFORMES

By

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Zoological Survey Department

INTRODUCTION

No attention has been paid in the past to the taxonomy of fishes of Sind Creeks in particular, although a number of workers have made sparse references from different coasts of Arabian Sea now representing coasts of Pakistan. In this connection work of Day (1875-78, 1888 & 1889) is highly appreciable but it deals with the natural history of fishes of the whole Indian region tracing their distribution from African Coasts to Red Sea, through Indian Seas upto Malayan Archipelago and beyond upto China. In his works he has mentioned different localities of Sind and Baluchistan Coasts and added valuable notes regarding location and distribution of different species of fishes. Among others Weber and DeBeaufort (1913-62) and Smith (1953) followed Day in mentioning some localities now in Pakistan. But Dr. Rahimullah Qureshi (1952, 1955, 1957 etc.) is the first Ichthyologist who studied the fishes of Pakistan in detail. He (1955) reported 20 species of Clupeid fishes from Pakistan Coasts, 11 of which have been mentioned to occur in creeks. Later on (1957) he gave a simplified field key for identification of the fishes of this group. Misra (1962) mentioned 26 species of clupeid fishes to be occurring in the coastal waters of Sind and Baluchistan. Recently Jalil and Khaleeluddin (1972) have compiled a checklist of Marine Fishes of Pakistan which contains 30 species of Clupeid fishes but definite locations of the specimens has not been mentioned.

It is a well known fact that creeks have much importance in the marine and brackish water fisheries of Pakistan. Keeping this in mind I thoroughly surveyed main creeks of Sind in different seasons. Present paper deals with the fishes belonging to order Clupeiformes with a short note on Sind Creeks. Present work is based on personal observations and collections made by the author.

Sind Creeks :

Major part of Sind coast comprises of a net work of creeks of different depths and width with sandy or muddy bottoms and a few rocky patches at places. It has a luxurient growth of mangrooves.

The creeks that are directly connected to open sea, the sea-facing creeks, are wide and deep having strong wave action but others, the shore-facing creeks, are shallow and sheltered creeks-ideal places for young fishes. Korangi Creek, for example, is a shallow but wide curved channel meeting the land on one side and encircled by a chain of other creeks from other sides to protect it from open sea. These creeks are Gizri, Phitti and Pipri. It receives sea water through Phitti and Pipri. Gizri Creek is a shallow mass of sea water and major part of it is exposed at low tide, representing a calm water mass destitute of strong wave action. It receives sea water through Phitti Creek. Malir River and Korangi Nullah also discharge here adding silt to the calm area which settles here and the bed gradually rises. On the contrary Phitti and Pipri Creeks are big and deep masses of sea water with much wave action. Due to these creeks the Korangi Creek is protected from strong wave action and it provides much food and shelter to small and weak fishes. Similar is the case of Gharo Creek which is also a protected and

well sheltered area as compared to Wari-Khuddi and Patiani Creeks. Dabbo, Hajamro and Sisa are other large creeks that protect a number of shallow creeks from strong wave action.

Indus Delta provides another set of creeks. These Creeks get freshwater supply from different channels of the Indus River and sea water from the open sea or other creeks connected to the sea. These creeks can be termed estuarine creeks in the true sense. Keti Bunder, Turshian and Karachhan and adjoining areas constitute the estuarine creeks. For major part of the year these contain sea water with a very little mixing of freshwater but in monsoon or flood season a large quantity of freshwater is brought in resulting a considerable fall in the salinity.

Salinity of other small creeks, to some extent, is also effected due to a number of water channels that discharge there. Some of these channels contain pure freshwater released from different farms which is in excess to their needs, others are the channels to drain out the water from water-logged soils and still others are mixed in nature. Some of these channels together with the connected small creeks provide brackish environment. Leth Nullah, for example, is a narrow and shallow channel about 20 KM long originating from a small lake locally known as Merakhoro Chach and ending in a small creek. The lake receives water from a small channel that indirectly emerges from the river indus ; rain water from adjoining areas and saline sub-soilwater is also stored here. I have made a number of collections in this brackish environment and the results would be produced in a separate paper later on.

SYSTEMATIC ACCOUNT

ORDER : CLUPEIFORMES
SUBORDER : CLUPEOIDEI,
SUPER FAMILY : ELOPOIDEA
FAMILY : ELOPIDAE
GENUS : ELOPS Linn.

1. **Elops saurus** (Linn.) :

A fish of large size, generally found in deeper waters. Young specimens are often caught in large creeks and shallow creeks around estuaries.

Previous record in Pakistan :

1952 : *Elops saurus* Qureshi (Makran).
1957 : *Elops saurus* Qureshi (Pakistan).
1962 : *Elops saurus* Misra (Karachi, Sind & Makran).
1972 : *Elops machnata* Jalil & Khaleeluddin (Pakistan).

Local Name :

Kinarhal.

SUPER FAMILY : ALBULOIDEA
FAMILY : ALBULIDAE
GENUS : ALBULA

2. **Albula vulpes** (Linn.)

Small fishes are caught in creeks with other Clupeids. Sometimes large specimens are observed in local catches of large creeks.

Previous record in Pakistan :

1962 : *Albula vulpes* Misra (Karachi, Sind & Makran).

1972 : *Albula vulpes* Jalil & Khaleeluddin (Pakistan).

Local Name :

Kinarhal.

SUPER FAMILY : CLUPEOIDEA

FAMILY : CLUPEIDAE

SUBFAMILY : CLUPEINAE

GENUS : ESCUALOSA Whitley 1940

3. **Escualosa thoracata** (Val.)

It is a small fish not exceeding 102 mm. (4 inches) in length. It is abundant in creeks and caught during winter with shrimps ; sometimes also caught with large schools of sardines. Small schools are often caught in small creeks.

Previous records in Pakistan :

1922 : *Kowala thoracata* Regan (Karachi).

1952 : *Kowala coval* Qureshi (Makran).

1955 : *Clupea ilile* Qureshi (Pakistan).

1957 : *Kowala coval* Qureshi (Sind).

1962 : *Kowala coval* Misra (Pakistan).

1972 : *Kowala coval* Jalil & Khaleeluddin (Pakistan).

1973 : *Escualosa thoracata* Whitehead (Karachi-B.M.N.H. specimens).

Local Name :

Mithoo.

GENUS : SARDINELLA Val. 1847

4. **Sardinella longiceps** (Val.)

It is the famous Oil Sardine of Pakistan which appears in December in Creeks. It is more common on Baluchistan (Makran) Coast, where the fish is bulky. Large schools are observed near coasts in cold season, often enter creeks. It is abundant some year and becomes rare or almost absent for consecutive 2 or 3 years.

Previous records in Pakistan :

1878 : *Clupea longiceps* Day (Sind).

1952 : *Sardinella longiceps* Qureshi (Makran).

1955 : *Clupea longiceps* Qureshi (Pakistan).

1957 : *Sardinella longiceps* Qureshi (Pakistan).

1972 : *Sardinella longiceps* Jalil & Khaleeluddin (Pakistan).

1973 : *Sardinella longiceps* Whitehead (Sind—B.M.N.H. Specimens).

Local Name :

Tarli.

5. **Sardinella albella**

It is not so common on Sind Coast, caught with othre sardines in the cold season.

Previous record in Pakistan :

1957 : *Sardinella albella* Qureshi (Pakistan).

1972 : *Sardinella albella* Jalil & Khaleeluddin (Pakistan).

Local Name :

Tarli.

6. **Sardinella fimbriata** (Val.)

It enters creeks in cold season and is caught abundantly with other sardines, specially Oil Sardine (*S. longiceps*) and Sind Sardine (*S. sindensis*). I have observed that its population is on peak when population of Oil Sardine is on decline. It is a common sardine of Pakistan which appears in large schools and attains a small size. Recently a large catch was landed on Korangi Creek Harbour (Ibrahim Hyderi Goth Harbour). The catch contained about 70% of this sardine, 10% of Oil Sardine, 15% of Sind Sardine and 5% of other fishes.

Previous records in Pakistan :

1878 : *Clupea fimdriata* Day (Sind, Local Name only).

1957 : *Sardinella fimdriata* Qureshi (Pakistan).

1972 : *Sardinella fimdriata* Jalil & Khaleeluddin (Pakistan).

Local Name :

Kichak looar.

7. **Sardinella gibbosa** (Blkr.)

It is a small sardine, very rare in creeks. I have observed only few specimens in a very large catch of Sind Sardine from Patiani and Phitti creek.

Previous records in Pakistan :

1972 : *Sardinella gibbosa* Jalil & Khaleeluddin (Pakistan).

Local Name :

Tarli, Looar.

8. **Sardinella melanura** (Cuv.)

A small sardine caught in the creeks when Sind Sardine population is in full swing. I have observed many large catches of Sind Sardine at Korangi Creek Harbour containing 10-25% of this sardine.

Previous records in Pakistan :

1952 : *Sardinella melanura* Qureshi (Makran).

1955 : *Clupea atricauda* Qureshi (Pakistan).

1962 : *Sardinella melanura* Misra (Karachi, Sind & Makran).

Local Name :

Kichak Looar.

9. **Sardinella sindensis** (Day)

A very common sardine of Sind Coast, abundant in the creeks. Generally it appears when Oil Sardine is on decline ; its population is on peak in the month of February when other clupeids and small sardines are also observed in the large catches.

Previous records in Pakistan :

1878 : *Clupea sindensis* Day (Karachi).

1952 : *Sardinella sindensis* Qureshi (Makran).

1955 : *Clupea sindensis* Qureshi (Pakistan—Sind Creeks).

1957 : *Sardinella sindensis* Qureshi (Pakistan).

1962 : *Sardinella sindensis* Misra (Karachi, Sind & Makran).

1973 : *Sardinella sindensis* Whitehead (Karachi-B.M.N.H. Specimens).

Local Name :

Looar, Tarli.

GENUS : HERKLOTSICHTHYS Whitley, 1951

10. **Herklotsichthys punctatus** (Rupp.)

A small herring like clupeid, not so common in the Creeks.

Previous record in Pakistan :

1962 : *Harengula punctata* Misra (Sind).

Local Name :

Looar.

SUBFAMILY : ALOSINAE

GENUS : HILSA Regan 1917

11. **Hilsa kelee** (Cuv. 1829).

It is almost a common shad of creeks, caught generally in summer with Gizzard shads, Anchovies, and other clupeids. Young fishes are also caught in the winter from coastal creeks and some brackish channels. Size of the fish does not exceed 205 mm in the creeks, however, fishes upto 305 mm or more are generally caught off the creeks.

Previous records in Pakistan :

1878 : *Clupea kanagurta* Day (Sind).

1955 : *Clupea kanagurta* Qureshi (Pakistan).

1957 : *Hilsa kanagurta* Qureshi (Pakistan).

1962 : *Hilsa kelee* Misra (Karachi, Sind & Makran).

1972 : *Macrura kelee* Jalil & Khaleeluddin (Pakistan).

1973 : *Hilsa* (*Hilsa*) *kelee* Whitehead (W. Pakistan-B.M.N.H. Specimens).

Local Name :

Palli.

GENUS : TENUALOSA Fowler 1934.

12. **Tenualosa ilisha** (Ham. 1822).

Fishes of small size are readily caught with other clupeids in the creeks. It begins to ascend river Indus in February for breeding and starts returning in September. Fishes of large size (530 mm) are caught abundantly in estuaries of Indus and adjoining creeks.

Previous recoruds in Pakistan :

1878 : *Clupea ilisha* Day (Sind).

1955 : *Clupea ilisha* Qureshi (Sind).

1957 : *Hilsa ilisha* Qureshi (Pakistan).

1962 : *Hilsa ilisha* Misra (Karachi, Sind & Makran).

1963 : *Hilsa ilisha* Pillay & Rosa (W. Pakistan), (=Pakistan).

1972 : *Hilsa ilisha* Jalil & Khaleeluddin (Pakistan).

In this paper, records from freshwaters are omitted.

Local Name :

Palla.

13. **Tenualosa toli** (Val. 1847).

Immature specimens are common in certain season in creeks and caught with other clupeids. Large fishes congregate in the Bays and mouth of Indus where they bread, but never ascend the river. The sea shad attains a size larger than the river shad (*T. ilisha*).

Previous records in Pakistan :

1952 : *Hilsa toli* Qureshi (Makran).
1955 : *Clupea toli* Qureshi (Pakistan).
1957 : *Hilsa ilisha* Qureshi (Pakistan).
1962 : *Hilsa sinensis* Misra (Karachi, Sind & Makran).
1972 : *Hilsa toli* Jalil & Khaleeluddin (Pakistan).

Local Name :

Samundar Palla.

SUBFAMILY : PRISTIGASTERINAE

GENUS : PELLONA Val. 1847

14. **Pellona ditchella** Val. 1847.

It is found on the shores, also enters creeks.

Previous records in Pakistan :

1972 : *Pellona ditchella* Jalil & Khaleeluddin (Pakistan).
1973 : *Pellona ditchella* Whitehead (Sind-B.M.N.H. Specimens).

Local Name :

Tarli, Laggar Palli.

GENUS : ILISHA Richardson 1846.

15. **Ilisha elongata** (Bennett 1830).

It is among very common herrings of Pakistan. Caught abundantly in creeks in warm season.

Previous records in Pakistan :

1878 : *Pellona elongata* Day (Sind).
1952 : *Ilisha elongata* Qureshi (Makran).
1955 : *Pellona elongata* Qureshi (Pakistan).

Local Name :

Palli.

16. **Ilisha megaloptera** (Swainson, 1839).

A common herring of Sind Coast, often caught in the creeks in warm months.

Previous records in Pakistan :

1962 : *Ilisha filigera* Misra (Sind).

1972 : *Ilisha filigera* Jalil & Khaleeluddin (Pakistan).

1973 : *Ilisha megaloptera* Whitehead (W. Pakistan-B.M.N.H. Specimens).

Local Name :

Gurako.

17. **Ilisha melastoma** (Schn. 1801).

A common herring of Sind Coast, often caught in the creeks. Generally observed throughout the year but common in warm months.

Previuous records in Pakistan :

1955 : *Pellona indica* Qureshi (Sind Creeks).

1957 : *Ilisha indica* Qureshi (Pakistan).

1973 : *Ilisha melastoma* Whitehead (W. Pakistan-B.M.N.H. Specimens).

Local Name :

Palli.

GENUS : OPISTHOPTERUS Gill, 1861

18. **Opisthopterus tardoore** (Cuv. 1829).

A common herring of Pakistan, observed in the catches of Sind Creeks in cold months. Generally caught with other clupeids. It attains a length of 228 mm or more.

Previous records in Pakistan :

1878 : *Opisthopterus tartoore* Day (Guadar & Sind).

1952 : *Opisthopterus tardoore* Qureshi (Makran).

1955 : *Opisthopterus tartoore* Qureshi (Sind Creeks & Makran Coast).

1962 : *Opisthopterus tardoore* Misra (Karachi, Sind & Makran).

1972 : *Opisthopterus tardoore* Jalil & Khaleeluddin (Pakistan).

Local Name :

Koor.

FAMILY : DOROSOMATIDAE

GENUS : NEMATALOSA Regan, 1917

19. **Nematolosa nasus** (Bloch, 1795).

A common gizzard shad of the creeks found abundantly in cold months. Also observed in less numbers in other months but never caught in June and July in the creeks. Equally found in the estuarine as well as marine creeks. It attains a length of 200 mm. but specimens upto 100 mm are commonly caught in the creeks.

Previous records in Pakistan :

1917 : *Nematalosa nasus* Regan (Sind).

1952 : *Nematalosa nasus* Qureshi (Makran).

1955 : *Chatoesus nasus* Qureshi (Pakistan, Sind Creeks).

1957 : *Nematalosa nasus* Qureshi (Pakistan).

1962 : *Nematalosa nasus* Misra (Karachi, Sind & Makran).

1972 : *Nematalosa nasus* Jalil & Khaleeluddin (Pakistan).

1973 : *Nematalosa nasus* Whitehead (Sind-B.M.N.H. Specimens).

Local Name :

Daddi Palli.

GENUS : ANODONTOSTOMA Bleeker, 1849.

20. **Anodontostoma chacunda** (Ham. 1822).

It is also a common gizzard shad, caught with the above species.

Previous records in Pakistan :

1952 : *Anodontostoma chacunda* Qureshi (Makran).

1955 : *Chatoesus chacunda* Qureshi (Pakistan).

1957 : *Anodontostoma chacunda* Qureshi (Pakistan).

1962 : *Anodontostoma chacunda* Misra (Karachi, Sind & Makran).

1972 : *Anodontostoma chacunda* Jalil & Khaleeluddin (Pakistan).

1973 : *Anodontostoma chacunda* Whitehead (Karachi-B.M.N.H. Specimens).

Local Name :

Daddi Palli.

GENUS : GONIALOSA Regan, 1917.

21. **Gonialosa manmina** (Ham. 1822).

Only found in the estuarine creeks. Caught in a good number in and around Indus Delta during cold season. I could not collect a single specimen from Phitti to Patiani Creek. It attains a length upto 280 mm.

Previous records in Pakistan :

1878 : *Chatoesus manmina* Day (Sind).

1952 : *Gonialosa manmina* Qureshi (Makran).

1955 : *Chatoesus manmina* Qureshi (Pakistan, Creeks & Estuaries).

1957 : *Gonialosa manmina* Qureshi (Pakistan).

1962 : *Gonialosa manmina* Misra (Karachi, Sind & Makran).

Local Name :

Palli, Kobinga.

FAMILY : DUSSUMIERIDAE

GENUS : DUSSUMIERIA Val. 1847.

22. **Dussumieria acuta** Val. 1847.

It is the common round herring of Pakistan which attains a size up to 180 mm, but specimens caught in the creeks attain a smaller size. It is not so common in creeks, caught with sardine. I have collected a good number of this species from Gharo, Korangi and Patiani Creeks.

Previous records in Pakistan :

1878 : *Dussumieria acuta* Day (Sind).

1952 : *Dussumieria acuta* Qureshi (Makran).

1955 : *Dussumieria acuta* Qureshi (Sind Creek).

1957 : *Dussumieria acuta* Qureshi (Pakistan).

1962 : *Dussumieria hasselti* Misra (Karachi, Sind & Makran).

1972 : *Dussumieria acuta* Jalil & Khaleeluddin (Pakistan).

1972 : *Dussumieria hasselti* Jalil & Khaleeluddin (Pakistan).

Though Misra and Jalil & Khaleeluddin have reported *D. hasselti from* Pakistan, I could not collect any specimen pertaining to this species. Whitehead (1963, 1966) has synonymised *D. hasselti* with *D. acuta.*

Local Name :

Tel-tampri.

FAMILY : ENGRAULIDAE

SUBFAMILY : COILIINAE

GENUS : COILIA Gray, 1831.

23. **Coilia dussumieri** Val. 1848.

It is found abundantly in the creeks, more common in estuarine creeks. It appears in the creeks in December. It is generally caught with other clupeid fishes and shrimps. It attains a small size.

Previous records in Pakistan :

1952 : *Coilia dussumieria* Qureshi (Makran).

1955 : *Coilia dussumieria* Qureshi (Sind Creeks).

1962 : *Coilia dussumieria* Misra (Karachi, Sind & Makran).

1972 : *Coilia dussumieria* Jalil & Khaleeluddin (Pakistan).

Local Name :

Puchhri.

SUBFAMILY : ENGRAULINAE

GENUS : STOLEPHORUS Lacepede, 1803.

24. **Stolephorus commersonii** Lacepede, 1803.

It is fairly common along Sind Coast, also enters creeks. Size of this anchovy caught in Creeks is not more than 100 mm, though it reaches a length of 203mm in the sea, off creeks. It is caught with shrimps or young mullets.

Previous records in Pakistan :

1962: *Anchoviella commersonii* Misra (Sind).

1972: *Anchoviella commersonii* Jalil & Khaleeluddin (Pakistan).

Local Name :

Phyasa.

25. **Stolephorus indicus** (V. Hasselt, 1823.)

It is a small anchovy attaining a size less than 100 mm . and quite common in creeks. It is caught with shrimps.

Previous records in Pakistan :

1957: *Anchoviella indica* Qureshi (Pakistan).

1972: *Anchoviella indica* Jalil & Khaleeluddin (Pakistan).

Local Name :

Phyasa.

GENUS : THRYSSA CUV., 1829.

26. **Thryssa hamiltonii** (Gray, 1835)

It is moderately a large and bulky anchovy of Pakistan, common in creeks. It is more common in estuaries or brackish channels connected to creeks. It tends to ascend river. The size of this fish is small in Korangi Creek and adjoining areas. I have obtained this fish in both the seasons—cold and warm season.

Previous records in Pakistan :

1878: *Engraulis hamiltonii* Day (Sind).

1952: *Thrissocles hamiltonii* Qureshi (Markran).

1955: *Engraulis hamiltonii* Qureshi (Pakistan, Sea & Creek).

1957: *Thrissocles hamiltonii* Qureshi (Pakistan).

1962: *Thrissocles hamiltonii* Misra (Karachi, Sind & Makran).

1973: *Thryssa hamiltonii* Whitehead (Pakistan, B.M.N.H. Specimens).

Local Name:

Paddan.

27. **Thryssa malabarica** (Bloch, 1795)

It is a small anchovy found along coasts of Pakistan. It is common in creeks, not seen in estuarine area. Generally caught with other anchovies.

Previous records in Pakistan :

1878: *Engraulis malabaricus* Day (Sind).

1955: *Engraulis malabaricus* Qureshi (Pakistan, in Creeks).

1962: *Thrissocles malabaricus* Misra (Karachi, Sind & Makran).

1972: *Thrissocles malabaricus* Jalil & Khaleeluddin (Pakistan).

1973: *Thryssa malabarica* Whitehead (Karachi—B.M.N.H. Specimens).

Local Name :

Paddan.

28. **Thryssa mystax** (Schn., 1801)

A large and bulky anchovy that prefers estuaries and brackish area and tends to ascend river, hence more common in the estuarine creeks than Korangi creek and adjoining areas.

Previous records in Pakistan :

1957: *Thrissocles mystax* Qureshi (Pakistan).

1962: *Thrissocles mystax* Misra (Sind).

1972: *Thrissocles mystax* Jalil & Khaleeluddin (Pakistan).

Local Name :

Paddan.

29. *Thryssa purava* (Ham., 1822).

It is commonly found in estuarine creeks and brackish channels connected to creeks. It attains a size upto 300mm. but specimens caught in Korangi creek and adjoining areas are much small in size.

Previous records in Pakistan :

1878: *Engraulis purava* Day (Sind).

1952: *Thrissocles purava* Qureshi (Makran).

1955: *Engraulis purava* Qureshi (Pakistan, Creeks & Sea).

1962: *Thrissocles purava* Misra (Kaarchi, Sind & Makran).

1973: *Thryssa purava* Whitehead (Karachi, Sind—B.M.N.H. Specimens).

Local Name :

Paddan.

30. *Thryssa setirostris* (Brous., 1782)

A small anchovy which is caught in the creeks with other anchovies. It is not so common on our coast.

Previous records in Pakistan :

1972: *Thrissocles setirostris* Jalil & Khaleeluddin (Pakistan).

Local Name :

Paddan.

31. *Thryssa dussumieri* (Val., 1848)

A small anchovy which is not so common in creeks.

Previous records in Pakistan :

1962: *Thrissocles dussumieri* Misra (Sind).

1973: *Thryssa dussumieri* Whitehead (Arabian Sea, W. Pakistan).

Local Name :

Paddan.

SUBORDER: CHIROCENTROIDEI

FAMILY: CHIROCENTRIDAE

GENUS: CHIROCENTRUS Cuv., 1816.

32. *Chirocentrus Dorab* (Forsk., 1775).

A common wolf herring of Pakistan, often caught in creeks where it attains at least 300 mm. It is caught abundantly in the creeks in cold months. It is very dangerous to handle it when just captured because at that time it bites at any thing near it.

Previous records in Pakistan :

1952: *Chirocentrus dorab* Qureshi (Makran).

1955: *Chirocentrus dorab* Qureshi (Pakistan).

1957: *Chirocentrus dorab* Qureshi (Pakistan).

1962: *Chirocentrus dorab* Misra (Karachi, Sind & Makran).

1972: *Chirocentrus dorab* Jalil & Khaleeluddin (Pakistan).

Local Name :

Kerli.

SUBORDER : CHANOIDEI

FAMILY : CHANIDAE

33. *Chanos chanos* (Forsk.)

It is the famous salmon herring or milkfish which is found in deeper waters and ascends estuaries and tidal rivers. Sometimes enters creeks on Sind Coast. I have collected some young fishes from brackish channels connected to Sind Creeks. It can be easily acclimatised to freshwater and cultured.

Previous records in Pakistan :

1978: *Chanos chanos* Niazi (Sind Creeks).

Local Name :

Kinarhal.

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BIONOMICS OF PARAPENAEOPSIS SCULPTILIS HELLER AND SOME OBSERVATIONS ON THE ROSTRAL DIFFERENTIATION IN DIFFERENT SEXES.

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ABSTRACT

Length-weight relationship, seasonal fluctuation sex ratio, length frequency distribution and rostral differentiation in different sexes of *Parapenaeopsis sculptilis* have been described.

INTRODUCTION

The genus *Parapenaeopsis* includes the species that constitute the bulk of the small sized commercial prawns locally known as Kiddi.

Realizing the commercial value of *Parapenaeopsis Sculptilis* some studies on the bionomics and rostral variation have been carried out.

Very little work appears to have been done on the bionomics of the shrimp in Indo Pak subcontinent, Karim & Rehman (1977), Hussain (1974), Mahmud and Tembe (1960), Kunju (1955), Menon (1957, 1955, 1953), Chopra (1943), and Rai (1933).

MATERIALS AND METHODS

Random samples of *Parapenaeopsis sculptilis* were collected during the period November 1975 to October 1976 from the landings at Ibrahim Hydari Karachi. The collections were made thrice a week. Collected specimens were preserved in spirit. *Parapenaeopsis sculptilis* were represented in the catch throughout the year. The .length of the prawn was measured from the tip of the rostrum to the tail. Similarly, the weight was taken with the help of a balance to the nearest of a gram. Observation on percentage composition, seasonal fluctuation maximum and minimum length and differentiation in the rostrum of different sexes were also made. The lengthweight relationship was worked out with the help of a general equation of parabola.

$$W=cL^n$$

Where W=weight in grams, L=length in millimeter and C and n are constant.

RESULTS AND DISCUSSIONS

ROSTRAL DIFFERENTIATION IN DIFFERENT SEXES OF *PARAPENAEOPSIS SCULPTILIS*.

In all 1550 specimens of *Parapenaeopsis sculptilis* were observed for rostral differentiation. Of these 902 prawns bearing the female sex had their rostrum curved upwards while only 48 females had their rostrum curved downwards. This brings percentage of females having upturned rostrums to 94.9% *i.e.*, 95% as compared to the percentage of females having downcurved rostrum as only 5%,. Similarly 555 males had their rostrum curved downwards and only 45 were observed with upturned rostrum. On calculation, it was found out that the percentage of males having downcurved rostrums is 92.5% as compared to the percentage of males having upturned rostrums as 7.5% only.

Therefore, it can be concluded that those specimens of *Parapenaeopsis sculptilis* which have their rostrums curved upwards are mostly females while those having downcurved rostrums are males. (Table 1).

SEX—RATIO

A total of 1550 specimens of *Parapenaeopsis sculptilis* were collected from Ibrahim Hydari during the period November 1975 to October 1976. Of these 600 were males and 950 females, showing a ratio of 1 : 1.6

Table-II shows that the population is high during summer season and that the ratio of males and females shows that the males have out numbered females in the month of January only, whereas, in the rest of the months except May the females have either outnumbered the males or equaled them. As compared to the *Parapenaeopsis stylifera* (Karim & Rehman, 1978) the *Parapenaeopsis sculptilis* does not completely disappear from the catch, rather they remain in the shallow water round the year. (Graph-I).

LENGTH—FREQUENCY DISTRIBUTION

The length frequency distribution of *Parapenaeopsis sculptilis* is shown in Table III Graph 2. of these 600 were males ranging between 61 mm to 130 mm in length and 950 were females ranging from 71 mm to 160 mm in length showing that females attain larger sizes than the males.

86.7% of the male samples proved to be of smaller size as they ranged between 61 mm to 110 mm, whereas the percentage of small sized females was 64.5% ranging between 61 mm to 110 mm. The data also brings into account that re-relatively a higher percentage (35.48%) of female prawn attains larger aize (Table III, Graph-2).

A monthwise data of the percentage composition indicates that *Parapenaeopsis sculptilis* always remains in the shallow water but their sizes very in the catches in different month of the year. For example the percentage of prawn of length group 90 mm—100 mm is 60.4% in December. This percentage in the subsequent months records an abrupt fall in the catch. Again they show up in abundance in the month of June, to disappear again in the following months. (Graph-3).

LENGTH—WEIGHT RELATOINSHIP

To find out the length-weight relationship 1550 specimens of *Parapenaeopsis sculptiiis* were observed ranging between 6.5-15.5 cm. or 65-155 mm in length. The length-weight data were arranged according to the length group of 10 mm and the logarithms of the mid point of various groups were plotted. The resulting curve was found out to be a straight line. The relationship was established with the help of the formula.

$$W = c\,L^{n}$$

Where W=weight in grams, L=length in millimeter and C and n are constant.

TABLE I

ROSTRAL DIFFERENTIATION IN MALE AND FEMALE OF *PORAPENAEOPSIS SCULPTILIS*

Sl. No.	Length range m m	MALE			FEMALE		
		No. of individual	Rostrum upturned	Rostrum downcurved	No. of individual	Rostrum upturned	Rostrum downcurved.
1.	61—70	30	3	27	0	0	0
2.	71—80	100	4	96	20	20	0
3.	81—90	120	4	116	100	98	2
4.	91—100	140	5	135	190	185	5
5.	101—110	130	5	125	210	200	10
6.	111—120	70	6	64	100	96	4
7.	121—130	10	4	6	110	101	9
8.	131—140	—	0	0	140	125	15
9.	141—150	—	0	0	70	68	2
10.	151—160	—	0	0	10	10	0
		600	31	569	950	903	47

Total Males 600
Total Upcurved Males 31
Total Downcurved Males 569

Percentage of upcurved Males 5.2%
Percentage of dawncurved Males 8 %

Total Females 950
Total upcurved, females 903
Total downcurved females 47.

Percentage of upcurved Females 95%

Percentage of downcurved Females 5%.

The value of n was found out by applying the formula

$$n = \frac{\Sigma \text{Log } w = (N \text{ Log } c)}{\Sigma \text{Log } L}$$

and the value of Log c was calculated by using the formula

$$\text{Log } c = \frac{\Sigma \text{Log } w. \Sigma (\text{Log } L)^2 - \Sigma \text{Log } L. \Sigma (\text{Log } L. \text{Log } w)}{N. \Sigma (\text{Log } L)^2 - (\Sigma \text{Log } L)^2}$$

The relation between length and weight was calculated as follows

$$\text{Log } w = \text{Log } c + n \text{ Log } L$$

The equation relating log W to log L of male, female and combined sexes was therefore obtained as follows :

For male : Log w = — 0.7056 + 1.3475 (Log L)

For female : Log w= —0.7045 + 1.3585 (Log L)

For both sexes : Log w = —0.7034 + 1.1894 (Log L)

The above mentioned results indicates that the weight of *Parapenaeopsis sculptilis* increases at a rate slightly less than the cube of its length.

The regression of Log w against Log L was found out to be a straight line and it was obtained by plotting log of length against log of calculated weight were found to be quite equal and this indicates the precision of the length weight equation computed for expressing this relation.

The calculated weight of *Parapenaeopsis sculptilis* are shown in table IV and length-weight relationship are shown in graph 4.

SEASONAL FLUCTUATION

Prawn landings at Ibrahim Hydari Jetty during the period of study consisted of *Penaeus indicus, P. monodon, P. merguiensis , P. penicilatus, Metapenaeus affinis, M. brevicornis, Parapenaeopsis stylifera, Parapenaeopsis hardwickii* and *Parapenaeopsis sculptilis* constituted only 55% by number.

Graph 5 shows the seasonal fluctuation under study. It shows that the catch of the species under study is 14% in the month of October, November and December. The catch then records a fall of 8% in January and 4% in February while in the subsequent month *i.e.*, March it goes down to 2% only but in April the catch again increases. Then after the highest catch comes in June.

SUMMARY

Parapenaeopsis sculptilis (Heller) commonly known as tiger prawn is a species commonly found in the sea water of Pakistan. It is present in the catch in commercial quantity.

TABLE II

SEX-RATIO OF PARAPENAEOPSIS SCULPTILIS

Sl. No.	Months	Male	Female	Ratio
1.	November 1975	70	140	1 : 2
2.	December 1975	80	180	1 : 2.2
3.	January 1976	90	10	9 : 1
4.	February 1976	20	40	1 : 2
5.	March 1976	10	20	1 : 2
6.	April 1976	30	80	1 : 2.0
7.	May 1976	10	10	1 : 1
8.	June 1976	140	160	1 : 1.1
9.	July 1976	10	50	1 : 5
10.	August 1976	120	120	1 : 1
11.	September 1976	20	30	1 : 1.5
12.	October 1976	0	110	0 : 11
		600	950	111.6

TABLE III

LENGTH-FREQUENCY DISTRIBUTION OF *PARAPENAEOPSIS SCULPTILIS*

Sl. No.	Length range	Midpoint	Male	Female	Sexes Combined	Percentage
1.	61—70	65	30	0	30	5
2.	71—80	75	100	20	120	7.7
3.	81—90	85	120	100	220	14.1
4.	91—100	95	140	190	330	21.2
5.	101—110	105	130	210	340	27.7
6.	111—120	115	70	100	170	10.9
7.	121—130	125	10	110	120	7.7
8.	131—140	135	—	140	140	14.7
9.	141—150	145	—	70	70	7.3
10.	151—160	155	—	10	10	1.05
			600	950	1550	100

Rostral differentiation (*i.e.*, distinction between male and female with the help of rostrum), sex-ratio, size frequency, length frequency distribution and length weight relationship have been described.

The females in most of the month are dominant over males, whereas, the males dominate the females in the month of January only.

The females attain larger size than the males.

The dominant size group of *Parapenaeopsis sculptilis* is between 40 mm to 80 mm.

The length-weight relationship was found out from the formula $w—cL^n$ where w—weight in grams and L—length in millimeter.

The weight of prawn increases at a rate slightly less than the cube of its length.

ACKNOWLEDGEMENT

The authors are thankful to Mr. M. Farooq Ahmad, Director, Zoological Survey for the keen interest, valuable criticism and suggestions in the compilation and preparation of this paper.

TABLE IV

LENGTH—WEIGHT RELATIONSHIP OF *PARAPENAEOPSIS SCULPTILIS*

Sl. No.	Length Range	Midpoint	Log L	Number of individual			Observed weight	Cal W	Observed Weight	Cal W	Observed Weight	Cal W
				M	F	M	M	M	F	F	M&F	M&F
1.	61—70	65	0.8129	30	—	—	2.833	2.832				
2.	71—80	75	0.8751	100	20	120	3.075	2.975	3.050	3.049	3.0625	3.061
3.	81—90	85	0.9294	120	100	220	4.496	4.494	3.620	3.619	4.058	4.058
4.	91—100	95	0.9777	140	170	310	6.068	6.066	5.654	5.652	6.361	6.360
5.	101—110	105	1.0212	130	210	340	8.788	8.788	7.383	7.382	8.313	8.312
6.	111—120	115	1.0607	70	100	170	10.421	10.402	10.965	10.963	10.693	10.69
7.	121—130	125	1.0969	10	110	120	13.000	12.99	13.056	13.04	13.028	13.01
8.	131—140	135	1.1303	—	140	—	—	—	19.319	19.40	—	—
9.	141—150	145	1.1614	—	70	—	—	—	23.414	23.30	—	—
10.	151—160	155	1.1903	—	10	—	—	—	27.400	27.39	—	—

M=Male, F=Female.

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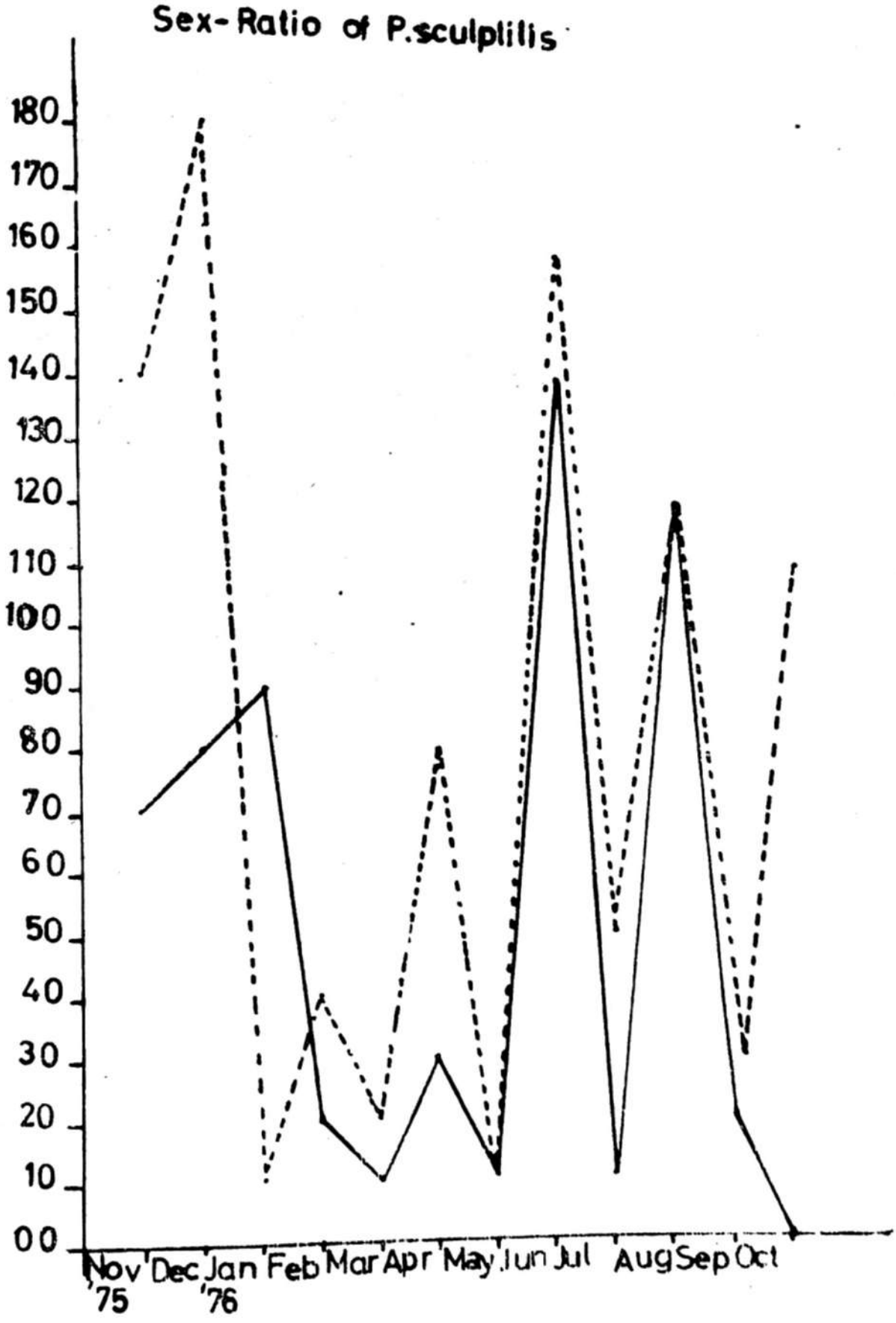
Graph - 1


Sex-Ratio of P.sculplilis
180
170
160
150
140
130
120
110
100
90
80
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60
50
40
30
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Nov '75
Dec
Jan '76
Feb
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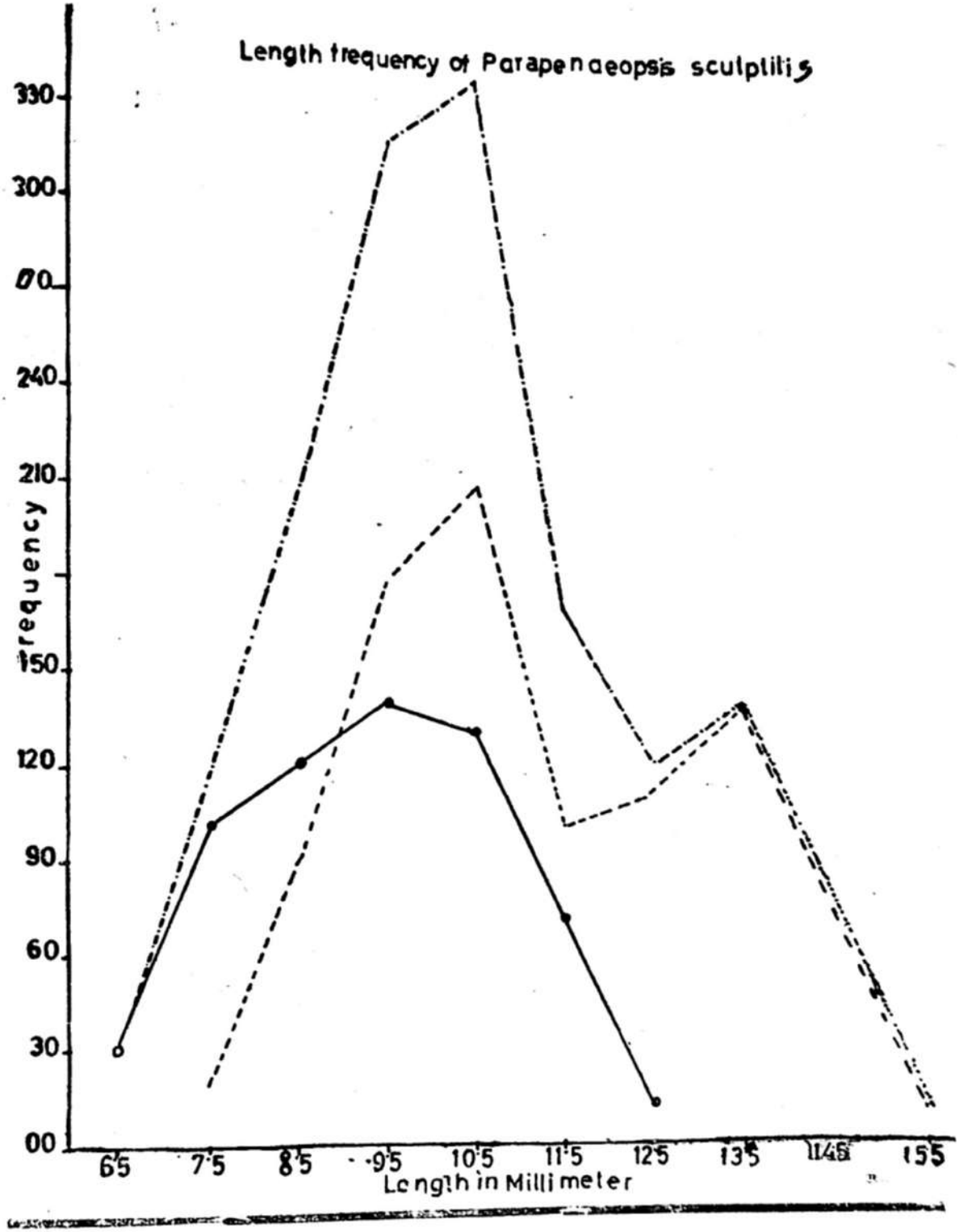
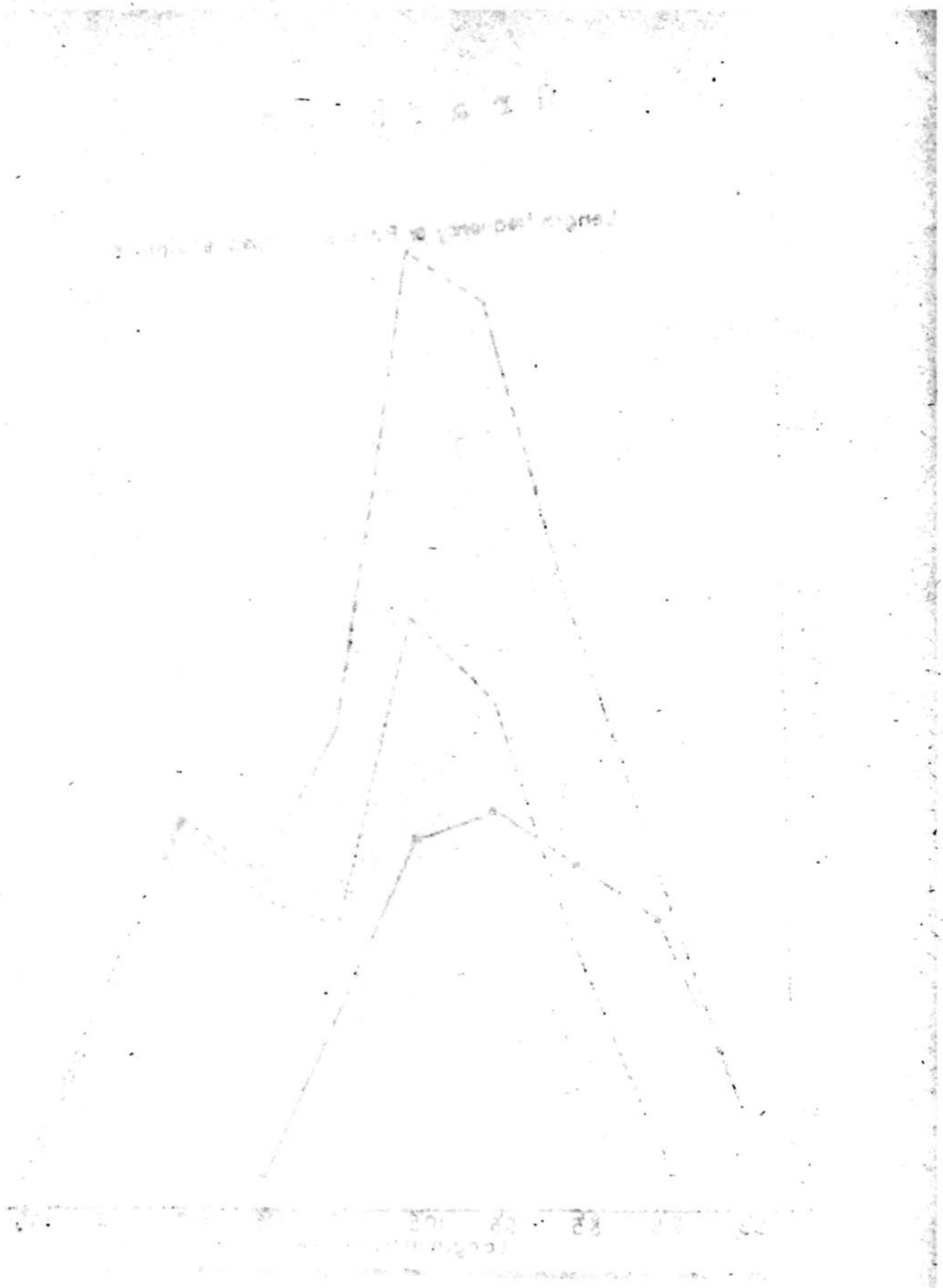
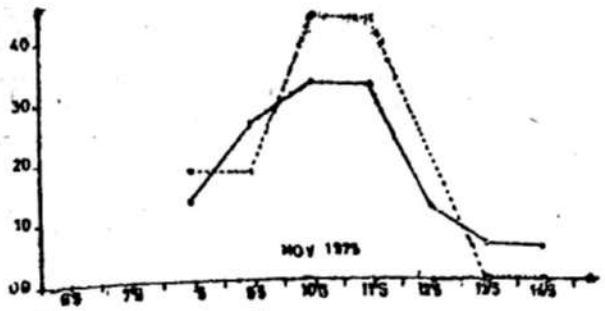
Aug
Sep
Oct

Graph - 2


Length frequency of Parapenaeopsis sculptilis
330
300
270
240
210
150
120
90
60
30
00
Frequency
6·5
7·5
8·5
9·5
10·5
11·5
12·5
13·5
14·5
15·5
Length in Millimeter



Graph - 3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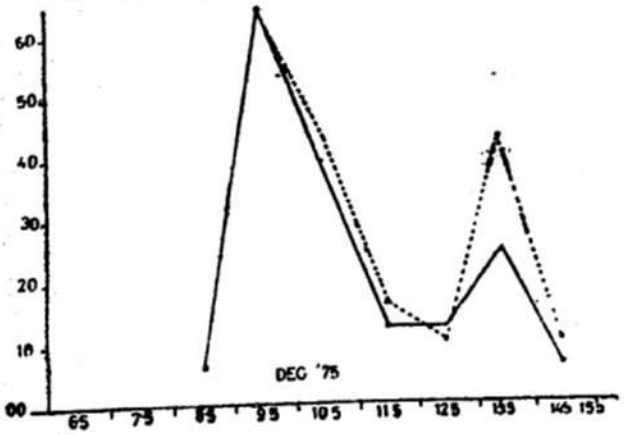
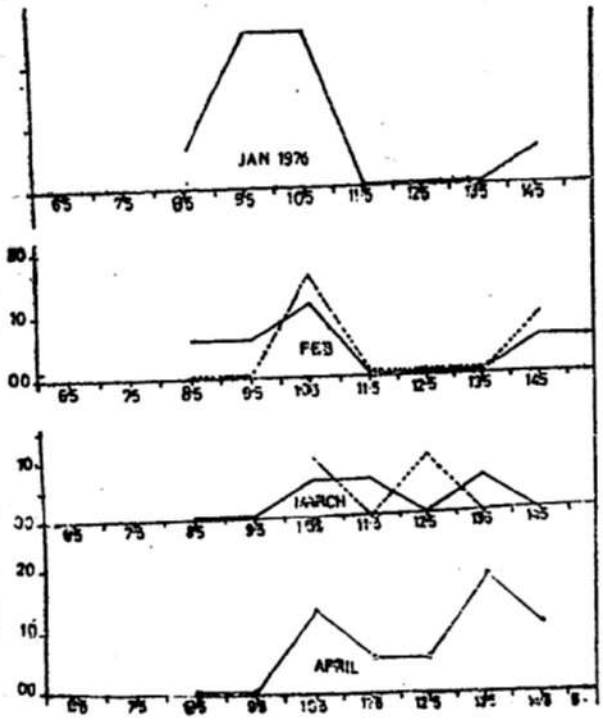

DEC '75


JAN 1976
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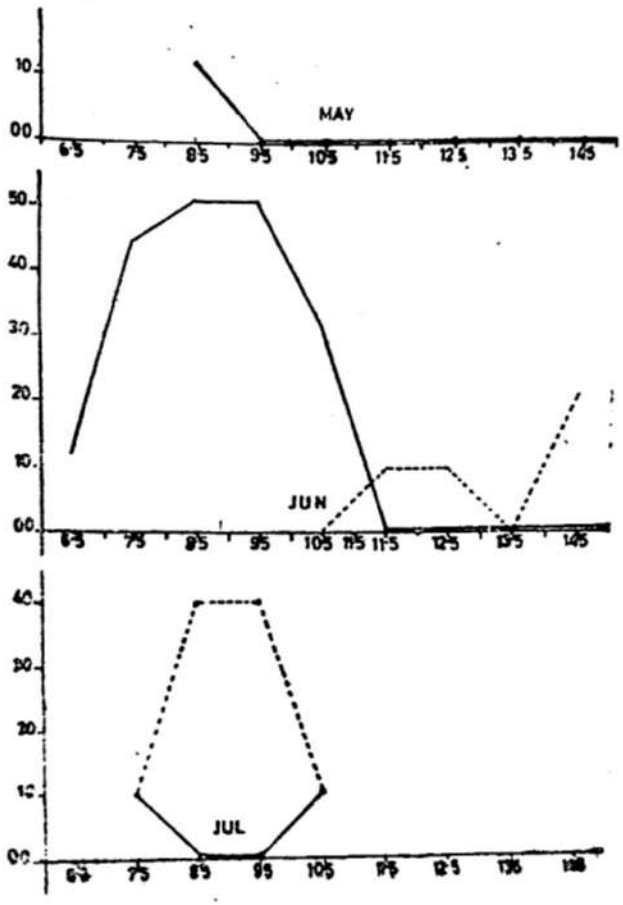
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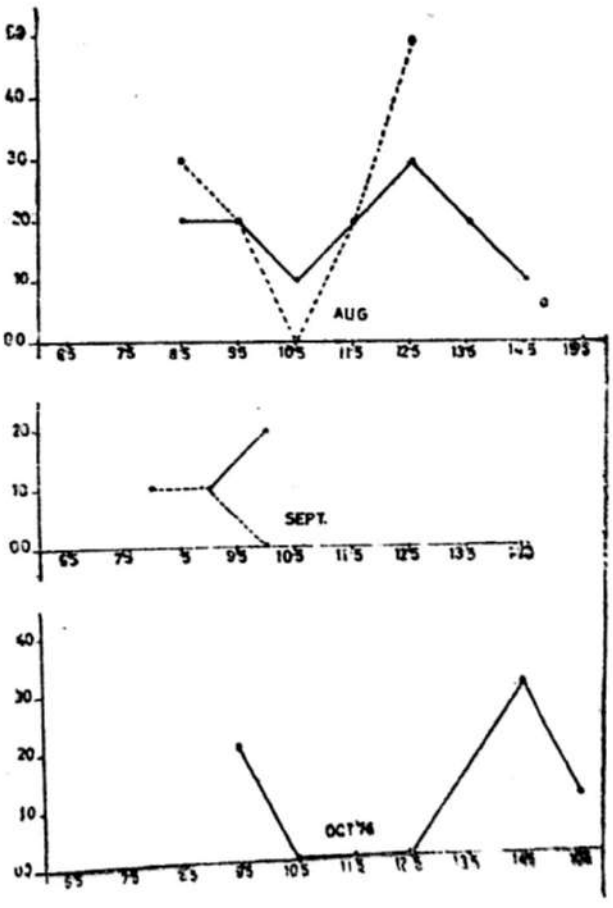
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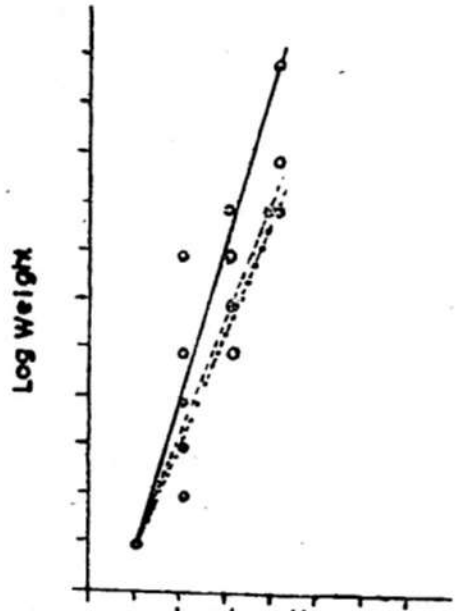
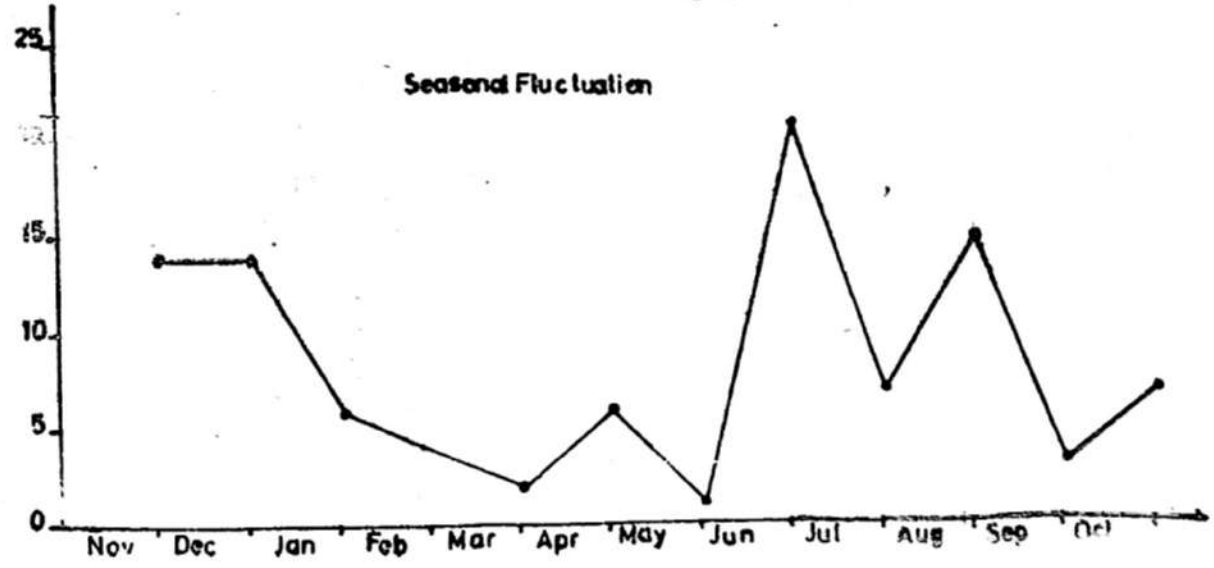
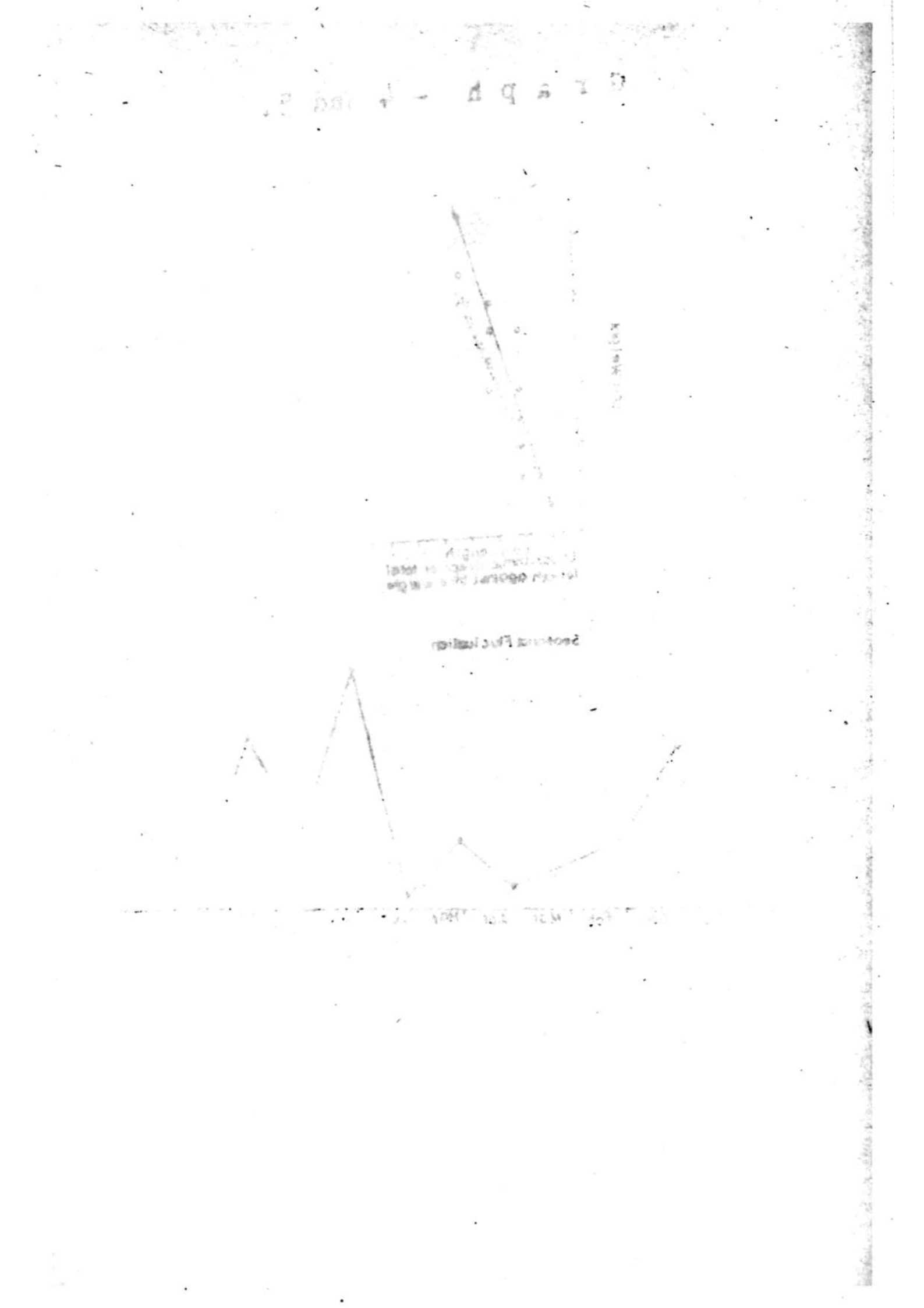
Graph - 4 and 5.



Logarithmic Graph of total length against total weight.





ON SOME AMPHIPODS OF KARACHI COAST

BY

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ABSTRACT

12 species of amphipods belonging to 12 genera and 10 families have been recorded from Karachi Coast.

INTRODUCTION

A number of authors have contributed to the knowledge of the taxonomy of amphipoda of Indian Waters. Of these Giles, (1885, 1885a, 1887, 1888, 1890); Stebbing (1904, 1907, 1908); Walker, (1904, 1905, 1909a, 1909b); Chilton, (1920, 1921, 1923) and Nayar, (1959) may be mentioned here, though there are others who have made brief references to isolated species. No work seems to have been done, to the knowledge of the author, on the taxonomy of amphipods of Northern Arabian Sea. Hence Pakistan Coast remains unexplored as regards to the distribution and forms of the indigenous amphipods.

The present study is based on the collections made by the author and the departmental staff of the Marine Biological Research Laboratory, Karachi, from time to time. The collections were made from the intertidal zone of the shore exposed on a low tide. The specimens were found either clinging to the fronds of algae or sheltered underneath the rocks. Lack of facilities prevented in making dredge collections or deep sea collections. Hence the paper comprises exclusively the littoral forms.

In all 12 species belonging to 10 families have been recorded. As a complete description of these species has already been given by the earlier workers, only the salient features are briefly recounted in this paper.

Since the idenfication of species is mainly based on the size and shape of the various appendages, all the appendages of each species were dissected out under binocular microscope and mounted on slides separately. The drawings were made with the help of Camera Lucida. In the manner of description and terminology used, the author has followed Stebbing, (1906).

SYSTEMATIC ACCOUNT

SUBORDER : GAMMARIDEA

FAMILY : LYSIANASSIDAE

1. Shoemakerella nasuta (Dana)

Salient Features :— Body compressed; coxal plates large; superior antennae short, stout and appendiculate; flagellum small of 7—10 joints; accessory flagellum, 2—4 jointed. Inferior antennae, flagellum longer than the peduncle and very large in case of males. Gnathopod-I, dactylus small not longer than 1/3 of the propodus oblong and narrow at apex. Gnathopod-II, ends into a racket shape propodus, which is rounded at the apex and has a minute dactylus at the apical margin. Uropod-I, peduncle longer than the rami. Uropod-II inner ramus dilated and abruptly constricted towards the end. Uropod-III, short, peduncle stout rami sub-equal. Telson entire.

Size :— Length 5—7mm.

FAMILY : AMPELISCIDAE

2. Byblis lepta (Giles)

Salient Features :— Body slender; head of moderate siz, eyes, large situated on the anterior part of cephalon. Superior antennae a little larger than the peduncle of the inferior antennae; flagellum comprising of 10—12 slender joints. Inferior antennae nearly 2/3 of the length of the body; lateral basal joint of the peduncle a bit Shorter than the succeeding joint; flagellum 14 or 15 jointed. Mandible strong, with a slender palp; distal joint of palp comparatively shorter.

Gnathopod-I, 2nd joint long; 5th joint slender and longer than the succeeding joint, setae on both sides of the joints.

Peraeopod-2 elongated 2nd joint of 5th peraeopod descending below the 4th joint. Telson semilunar, deeply cleft.

Size :— Length 5-6mm.

3. Urothoe spinidigitus Walker.

Salient Features :— Body short and thick; coxal plates of moderate size. Superior antennae, in female the peduncle longer than the flagellum; 2nd and 3rd joint of peduncle equal; flagellum four jointed; secondry appendage two jointed. Inferior antennae, penultimate and anti penultimate joint of peduncle with a row of irregular spines on the lower margins. In males antennae-II attains the length about that of the body.

Gnathopod—I, coxal plates small; basus long; carpus broader towards the base with a row of spines; propodus shorter than the carpus; dactylus curved.

Gnathopod—II, similar to gnathopod-I in structure but a bit longer.

Peraeopod—2 with outer joints moderately expanded; dactylus simple accuminate.

Peraeopod—3 bases projecting behind with a few marginal setae, front almost straight; carpus much expanded. Telson entire clefted.

Size :— Length 4 to 5 mm.

FAMILY : LEUCOTHOIDAE

4. **Leucothoe spinicarpa** (Abildg.)

Salient Features :— Body slender; back broadly rounded. Eyes oval and moderate in size with bright red pigmentation. Superior antennae hardly reaching 1/3 the length of the body; peduncle longer than the flagellum, 1st and 2nd joints of peduncle subequal. Inferior antennae shorter than the superior; 4th & 5th joints of peduncle long and subequal; flagellum short; Development of Gnathopods into chela like structure is a characteristic of this species.

Gnathopod—I are comparatively slender; proximal part of the carpus is globular, carpal process is very narrow, spiniform and smooth. Propodus finely serrated along the inferior edge. Dactylus nearly 1/2 of the length of propodus and curved downward.

Gnathopod—II, Carpal process densly hairy and some what laminar at the tip; propodus very large, massive and oval in shape, palm some what curved and defined by an obtuse angle. Peraeopods simple. Telson long, convex above and lanceolate, uniformly tapering to acute apex.

Size :— Length about 10 mm.

FAMILY : GAMMARIDAE

5. **Quadrivisio bengalensis** Stebbing

Salient Features :— Body elongated and slender; head much longer than the first segment of parion. Coxal plates not much deep; 2nd and 3rd plates a bit produced. Eyes dark and placed near the margins of the head. Superior antennae much longer than the inferior; 2nd joint of the peduncle longer than the 1st joint in male but subequal in female. 3rd joint of small; flagellum more than 3 times longer than peduncle; accessory flagellum of 5 joints longer than the 4th and slightly curved; flagellum shorter than the peduncle Mandibles; molar process strong; palp with 3rd joint slightly longer than the 2nd, tiped with long setae.

Gnathopod—I alike in both sexes; bases long; carpus considerably larger than the propodus; strong, fringed with spines on hind margins; palm short and not overlaped by the dactylus.

Gnathopod—II Carpus cup shaped distally; propodus longer than the basus, with smooth and strong margin; palm oblique. Peraeopods I & II are slender; posterior strong with bases expanded dactylus not very large. Uropod—3; ramui unequal fringed with numerous small spines. Telson, small and not as long as broad, deeply cleft.

Size :— Length about 7 mm.

6. **Elasmopus pectenicrus** (Bate)

Salient Features :— Strongly built body, smooth, coxal plates of moderate size, 4th pair largest. Superior antennae longer than the inferior; accessory flagellum 2 jointed; peduncular joint subequal; flagellum as large as peduncle. Inferior antennae scarcely as long as the peduncle of the superior antennae; flagellum about the size of the last joint of the peduncle. Bases of the 4th peraeopod abruptly narrowing towards the distal end, inferior margin of the joint develop into a comb like structure.

Gnathopod—I, propodus and carpus subequal; palm nearly transverse.

Gnathopod—II, Stronger than the 1st; propodus oval or oblong, palm oblique.

Telson laminar and clefted with 3 apical spines on each half.

Size :— Length 5—7 mm.

7. **Talorchestia martensii** (Weber)

Salient Features :— Body robust; coxal plates larger; superior antennae about 1/3 of the length of peduncle of inferior antennae. Inferior antennae longer than the half of the body length; flagellum longer than the peduncle.

Gnathopod—I, stout with small claw and ischium, merus, carpus and propedus subequal.

Gnathopod—II, shorter than the first, carpus proximal, propodus lamellar, round at apex and bears a very minute dactylus on anterior side.

First pair of peraeopods longer than the second; the rest increase in respect of gnathopods and inferior antennae. In males inferior antennae is longer than the body; Gnathopod—II have a large ovate propodus and large dactylus; palm bears two rows of spinules.

Size :— Length about 8 mm.

FAMILY : TALITRIDAE

8. **Hyale hawaiensis** (Dana)

Salient Features :— Coxal plates are of moderate size. Superior antennae, more slender than the inferior, without any accessory appendage; nearly 1/4 of the length of the body. Flagellum 14—18 jointed, setae as long as the bread h of the joints. Inferior antennae peduncle double the length of the peduncle of superior antennae; joints oblong; setae few, as long as the breadth of the joints.

Gnathopod—I, propodus small, broad and subovate, palm oblique, carpus rounded below.

Gnathopod—II, propodus stout, ovate, palm very oblique, sparingly setose, carpus not produced below last two pairs of peraeopods subequal, setae few and not longer than the breadth of the joints.

Size :— Length about 8 mm.

FAMILY : PHOTIDAE

9. **Photis Longicaudata** (Bate & Westwood)

Salient Features :— Body slender, anterior coxal plates somewhat deeper than the corresponding segments. superior antennae slightly longer than the inferior, flagellum longer than the last two peduncluar joints. Inferior antennae, distal joint of the peduncle narrow and elongated, flagellum 5-6 jointed, setose.

Gnathopod—I, Coxal plates a little produced anteriorly; basus stout and thick, carpus as long as dactylus, propodus longer than carpus, palm oblique.

Gnathopod—II, basus long and slender, carpus a bit produced at the outer distal end; propodus about twice as long as broad; palm smooth and concave, defined by a conical protuberances; dactylus well developed and curved.

Peraeopods 1 and 2 slender, 2nd joint smaller; 4th distal end produced forward and provided with setae, 6th joint very narrow. Peraeopod 5 longer than the rest of the peraeopods. Teleson sub-triangular.

Size :— Length about 4—6 mm.

FAMILY : AMPHITHOIDAE

10. **Grubia filosa** (Savigny)

Salient Features :—Body slender and compressed; coxal plates of moderate size; eyes larger and well developed. Superior antennae, flagellum longer than the peduncle; 1st and 2nd joints of peduncle subequal; 3rd joint the shortest; flagellum 15—20 jointed. Inferior antennae, flagellum longer than the peduncle. Gnathopods subequal.

Gnathopod—I, carpus longer than the propodus; propodus as long as broad, palm straight and oblique; dactylus as long as palm.

Gnathopod—II, longer than the first, propodus well developed palm well differentiated.

First two pairs of peraeopods similar in shape but subequal. The rest increase in length successively.

Size :— Length 10 mm.

FAMILY : COROPHIDAE

11. **Corophium acherusicum** Costa

Salient Features :— Eyes small, situated at the base of the lateral lobe of the cephalon. Rostrum a little produced in females. Antennae, unequal, superior being slender and without any secondry appendages; inferior strong well developed in males. The lower margin of the 4th joint of inferior antennae is produced distally into a stout tooth, at the back of which are two small teeth.

Gnathopod—I, with third and 5th joint densely setose, the palm slightly oblique, 7th joint curved and smooth.

Gnathopod—II, 4th joint fringed with double row of long setae, 7th joint with two teeth on inner margin.

The peduncle of uropod I has a pointed triangular cone at its distal end and a row of about 7 to 8 spines on outer margin and one spine on the inner margin at the distal end. Uropod II is small in size and has one spine at the distal end on the inner side. The telson is triangular.

Size :— Length 3-4 mm.

FAMILY : PODOCERIDAE

12. **Podocerus brasiliensis** (Dana)

Salient Features :— Body slender and compressed; coxal plates not very large. Superior antennae shorter than the inferior, 3rd joint of the peduncle slightly shorter than the 2nd joint; 3rd joint bears a minute secondary appendage; peduncle longer than the flagellum. Inferior antennae robust, flagellum few jointed peduncle and flagellum fringed with setae. Inferior antennae is longer in males than the females.

Gnathopod—I, stronger in males, propodus shorter than the dactylus in males and form a broad lob in the middle; three distal joints bear strong setae.

Gnathopod—II, carpus in males scarcely produced at the distal corner, but in females it is considerably produced on the distal margin and armed with setae.

Anterior two pairs of peraeopods short, having bases broad; posterior pair of pleopods biramus, one of the rami armed with one or two hooked spines.

Telson entire with spines on the distal margin.

Size :— Length 5-6 mm.

Acknowledgement

I am indebted to Mr. M. Farooq Ahmad, Director Zoological Survey Department, Karachi for providing facilities and encouragements during the preparation of this paper.

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EXPLANATION OF FIGURES

FIG. 1. **Shoemakerella nasuta** (Dana)

Male

(*a*) Antenna 1.
(*b*) Gnathopod 2.
(*c*) Uropod 1.
(*d*) Gnathopod 1.

FIG. 2. **Bybkis lepta** (Giles)

Female

(*a*) Gnathopod 1.
(*b*) Gnathopod 2.
(*c*) Antenna 1.

FIG. 3. **Urothoe spinidigitus** Walker

Female

(*a*) Gnathopod 1.
(*b*) Gnathopod 2.
(*c*) Telson.

FIG. 4. **Leucothoe spinicarpa** Abildgaard

Male

(*a*) Gnathopod 1.
(*b*) Gnathopod 2.
(*c*) Peraeopod 1.
(*d*) Peraeopod 3.

FIG. 5. **Quadrivisio bengalensis** Stebbing

Male

(*a*) Gnathopod 2.
(*b*) Gnathopod 2.
(*c*) Antenna 1.

FIG. 6. **Elasmopus pectinicrus** (Bate)

Female

(*a*) Gnathopod 1.
(*b*) Gnathopod 2.
(*c*) Telson.

FIG. 7. **Talorchestia martensii** (Weber)

Male

(*a*) Gnathopod 1.
(*b*) Gnathopod 2.
(*c*) Peraeopod 3.
(*d*) Peraeopod 2.

FIG. 8. **Hyale hawaiensis** (Dana)

Male

(*a*) Gnathopod 1.
(*b*) Gnathopod 2.

FIG. 9. **Photis longicaudata** (Bate & Westwood)

Female

(*a*) Gnathopod 1.
(*b*) Gnathopod 2.

FIG. 10. **Grubia filosa** (Savigny)

Female

(*a*) Gnathopod 1.
(*b*) Gnathopod 2.

FIG. 11. **Corophium acherusicum** Costa

Male

(*a*) Gnathopod 1.
(*b*) Gnathopod 2.
(*c*) Antenna 2.

FIG. 12. **Podocerus brasiliensis** (Dana)

Male

(*a*) Gnathopod 1.
(*b*) Gnathopod 2.
(*c*) Antenna 1.
(*d*) Mandible.

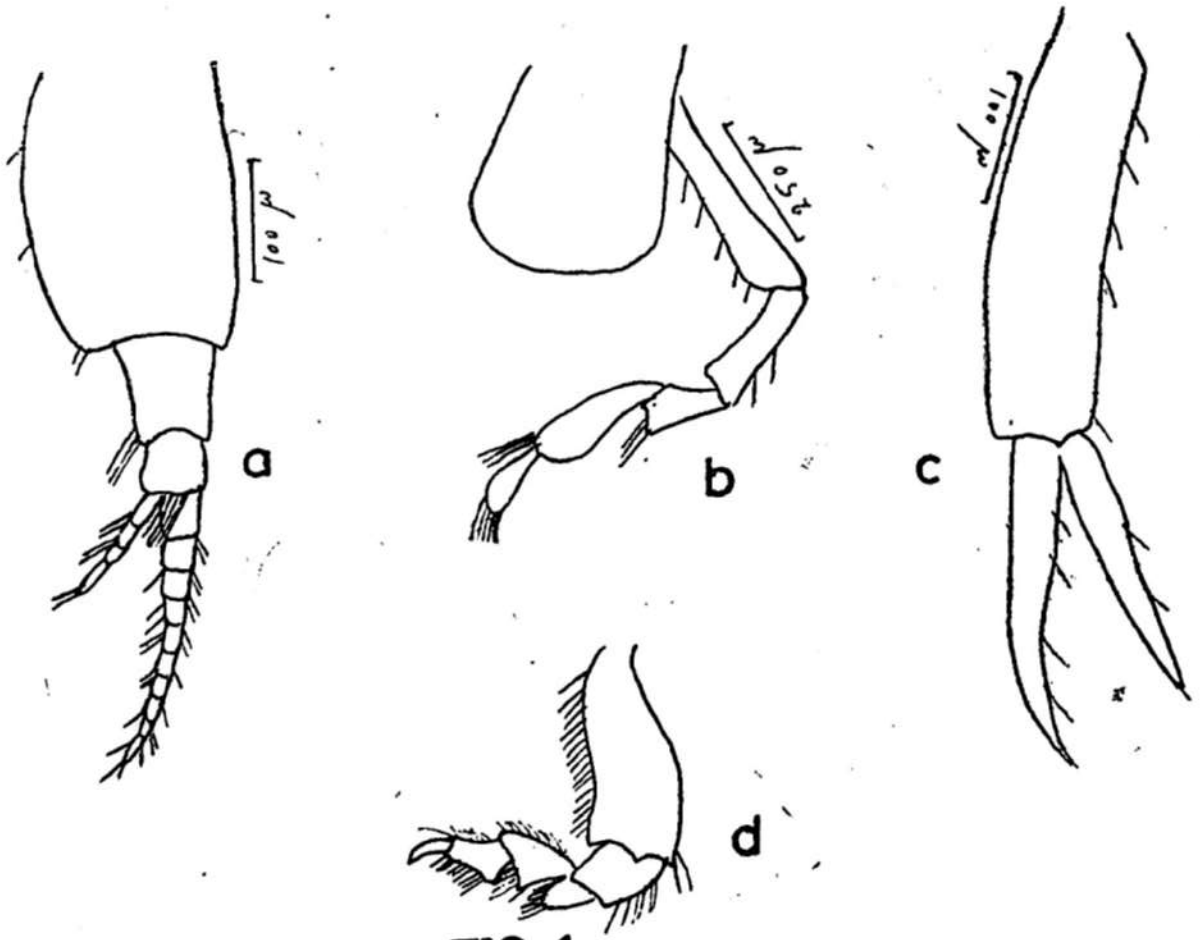
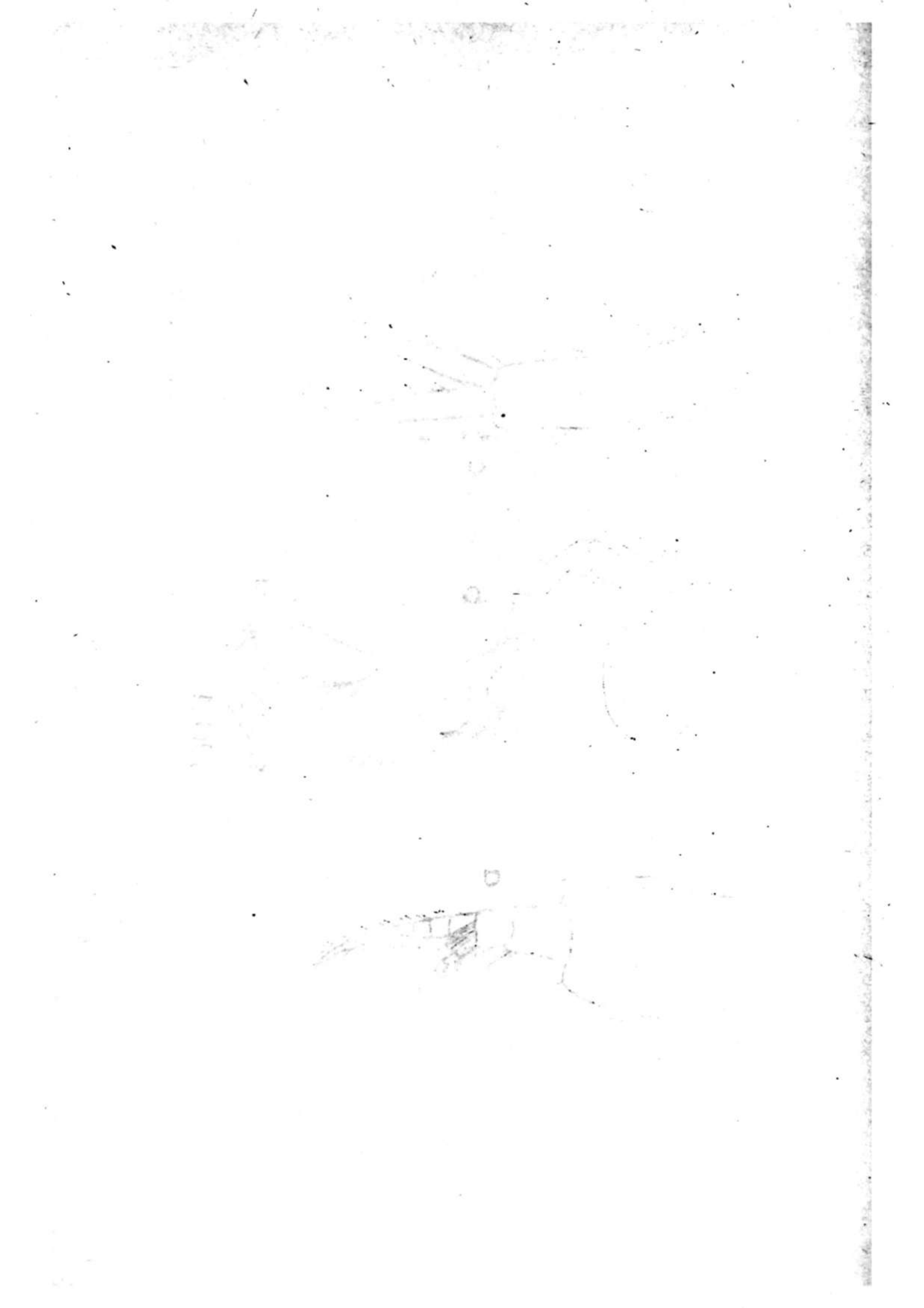
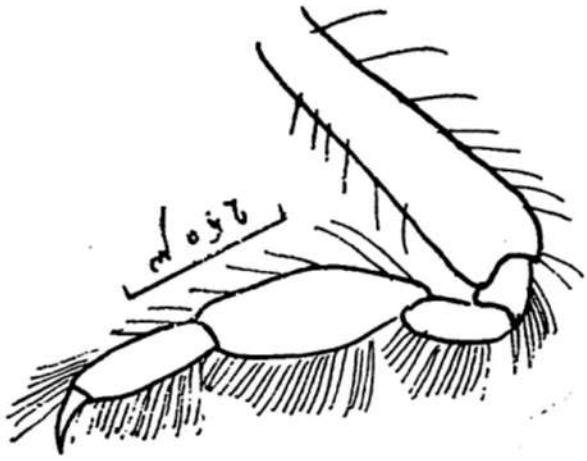


FIG_1





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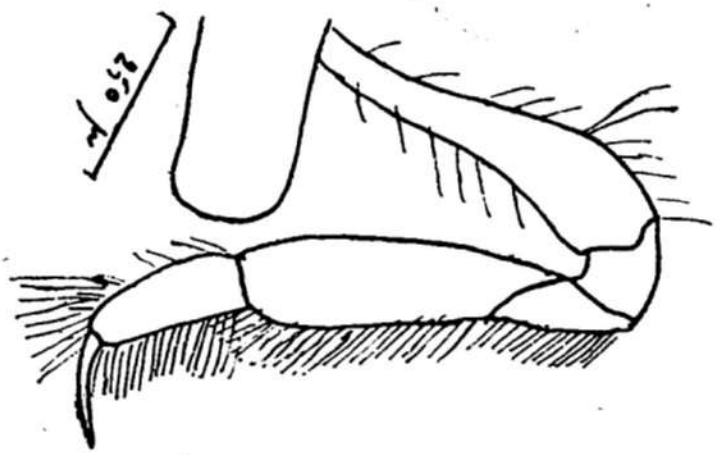

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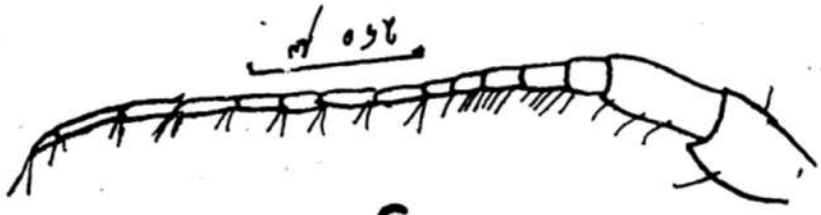

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FIG.2

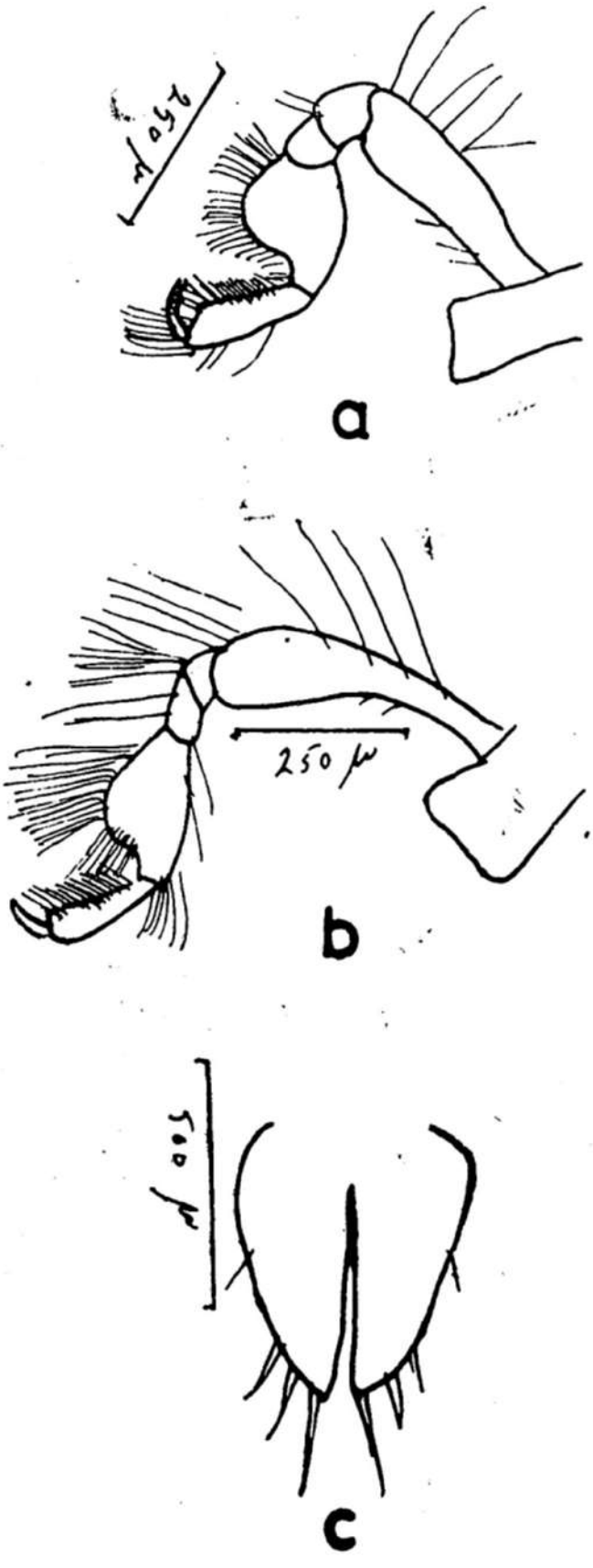


FIG_3


p
a

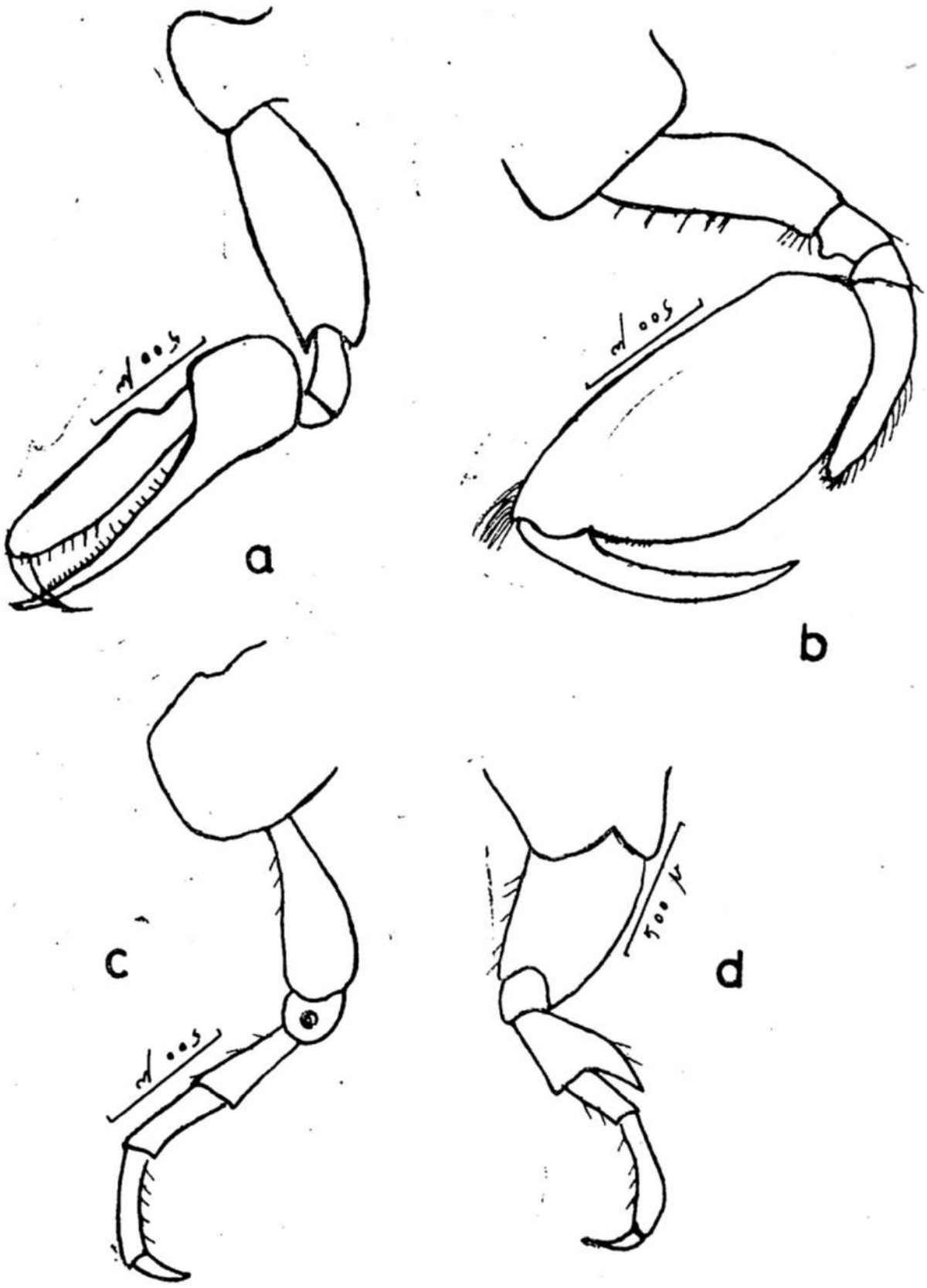
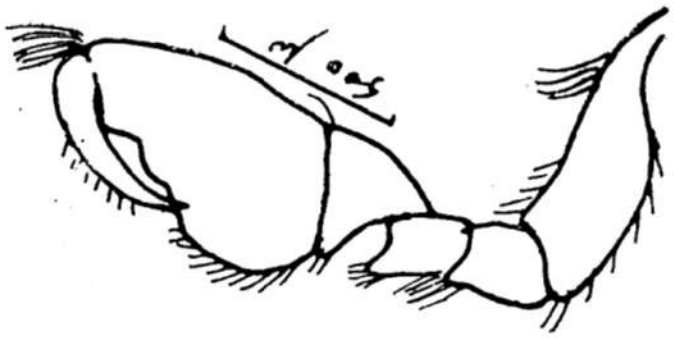


FIG.4



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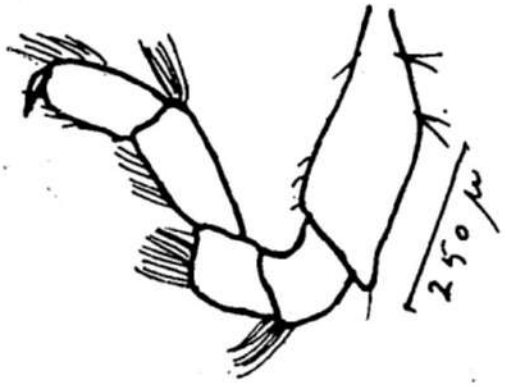

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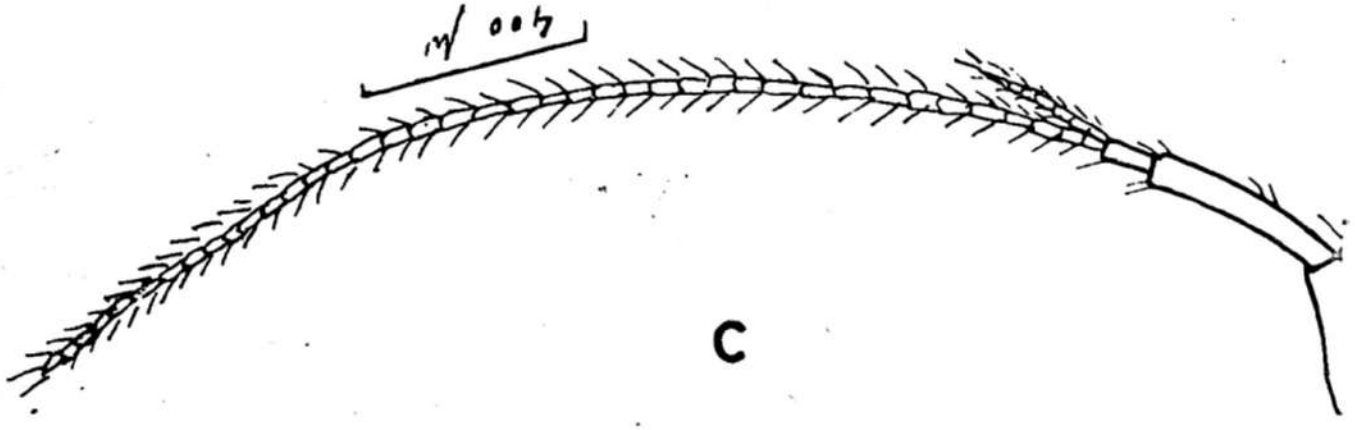

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FIG.5

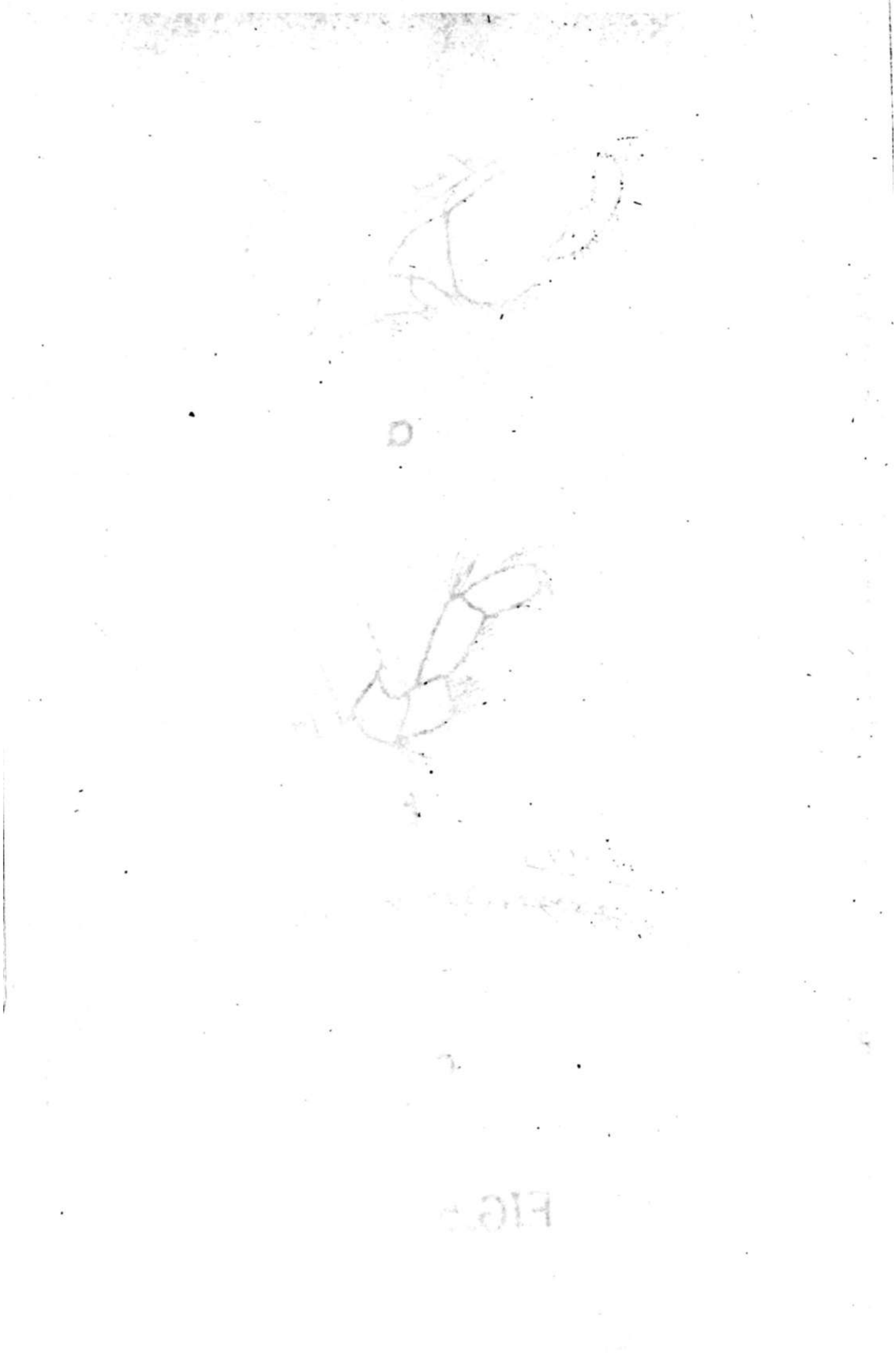

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FIG - 6

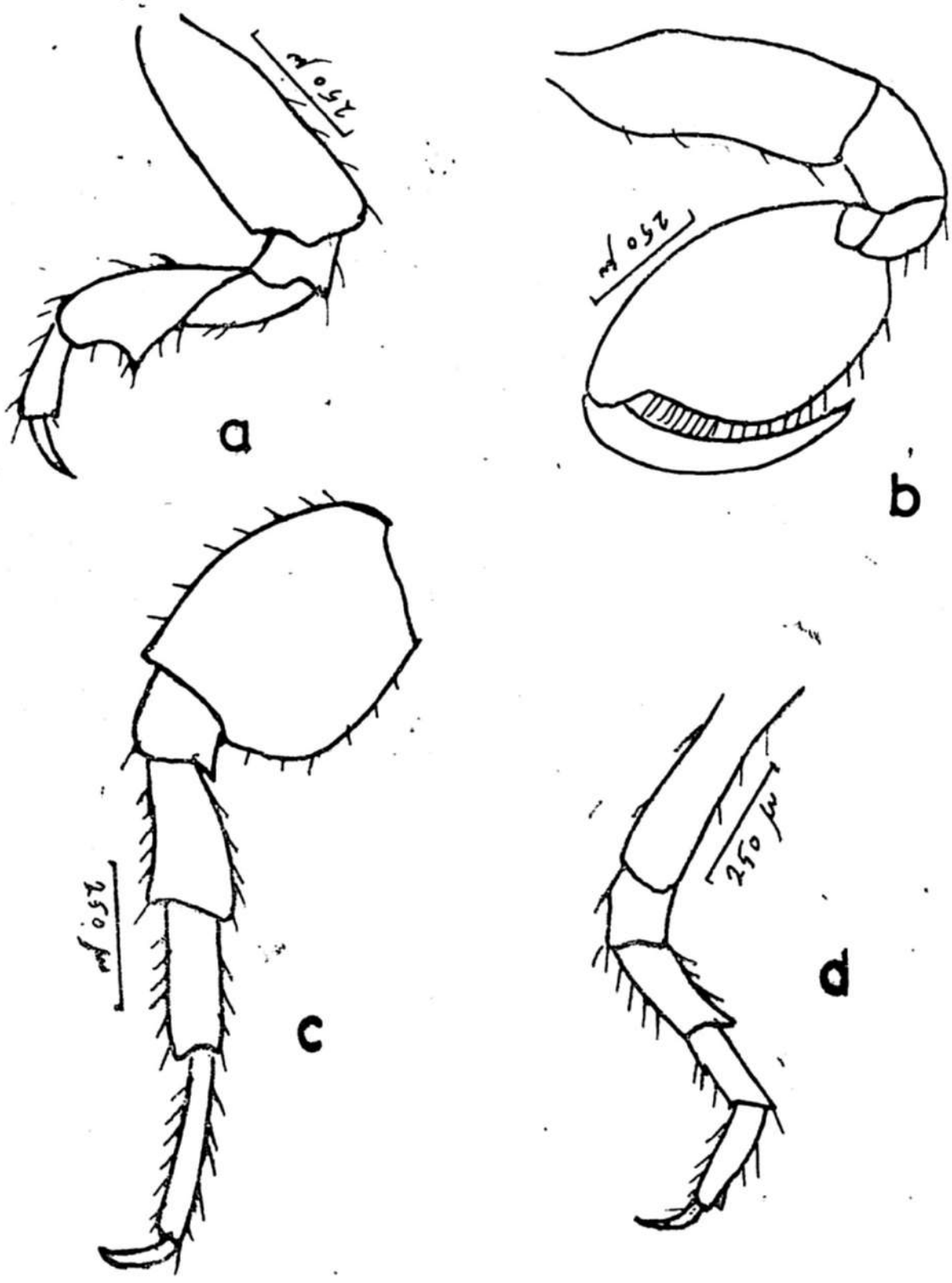
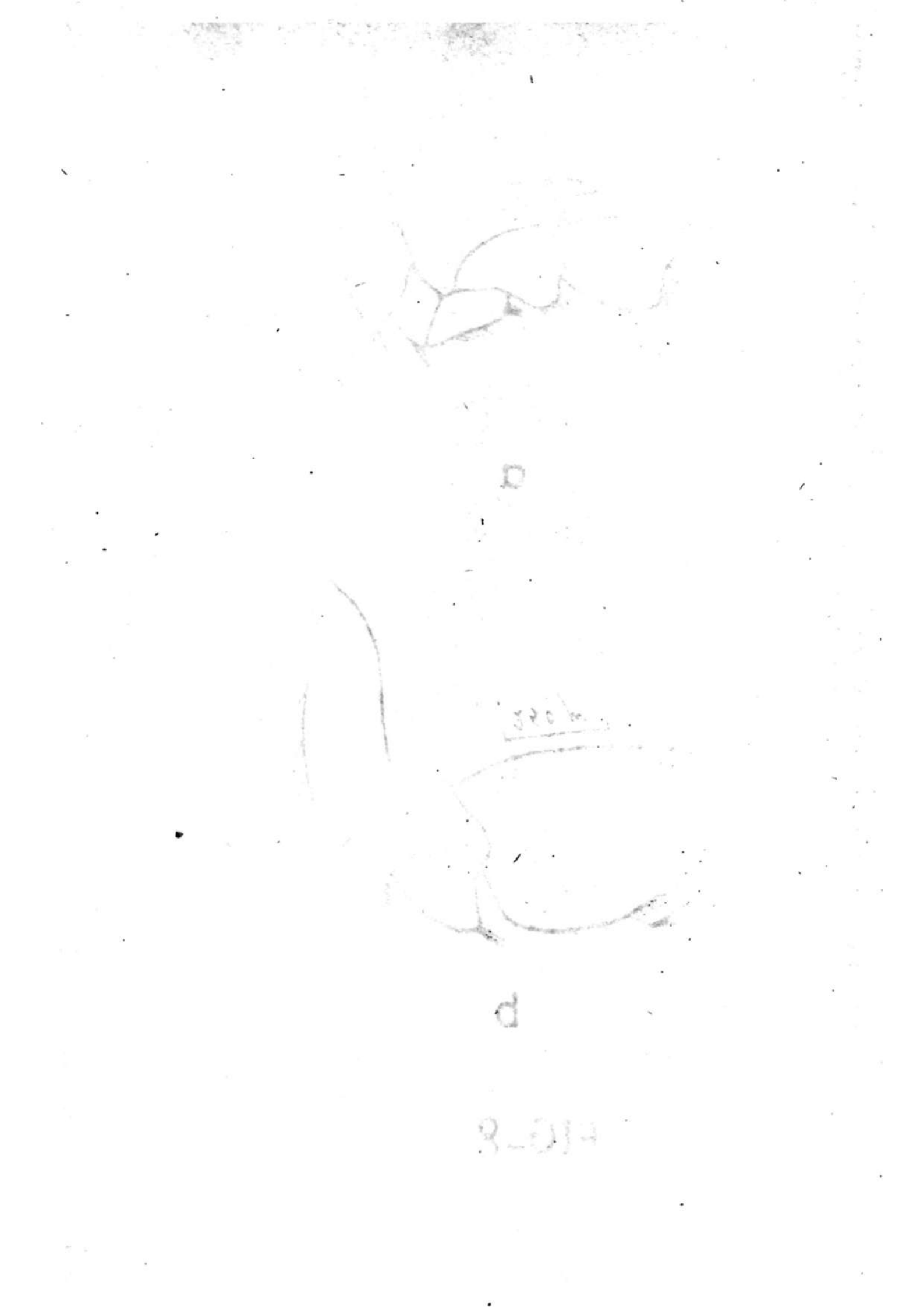


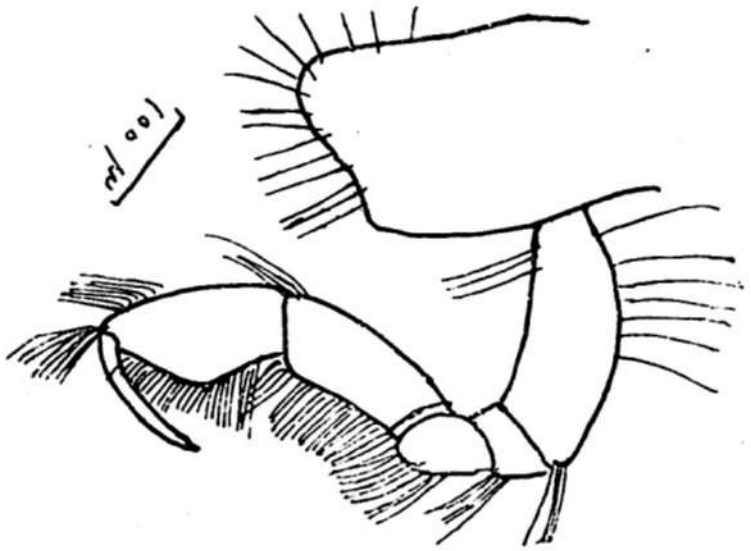
FIG-7

a

b

FIG-8





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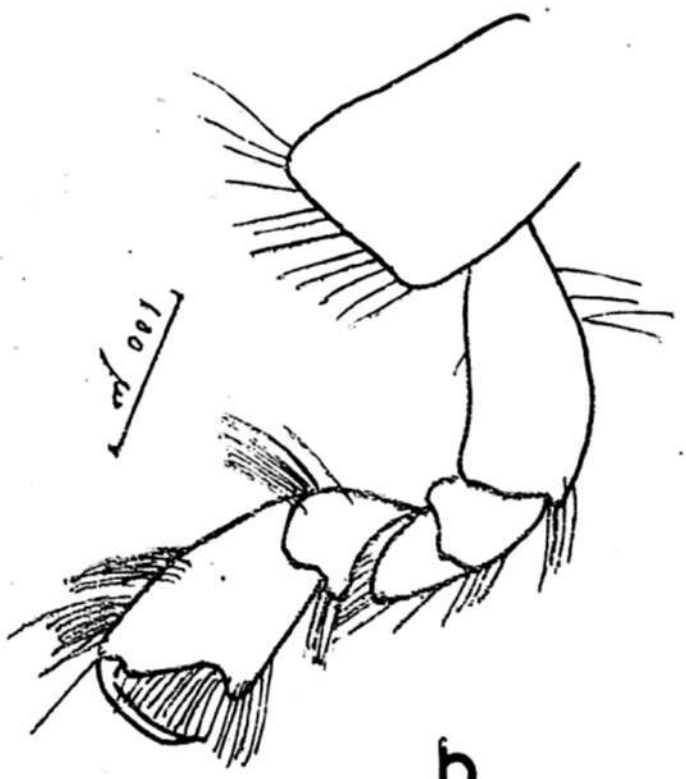

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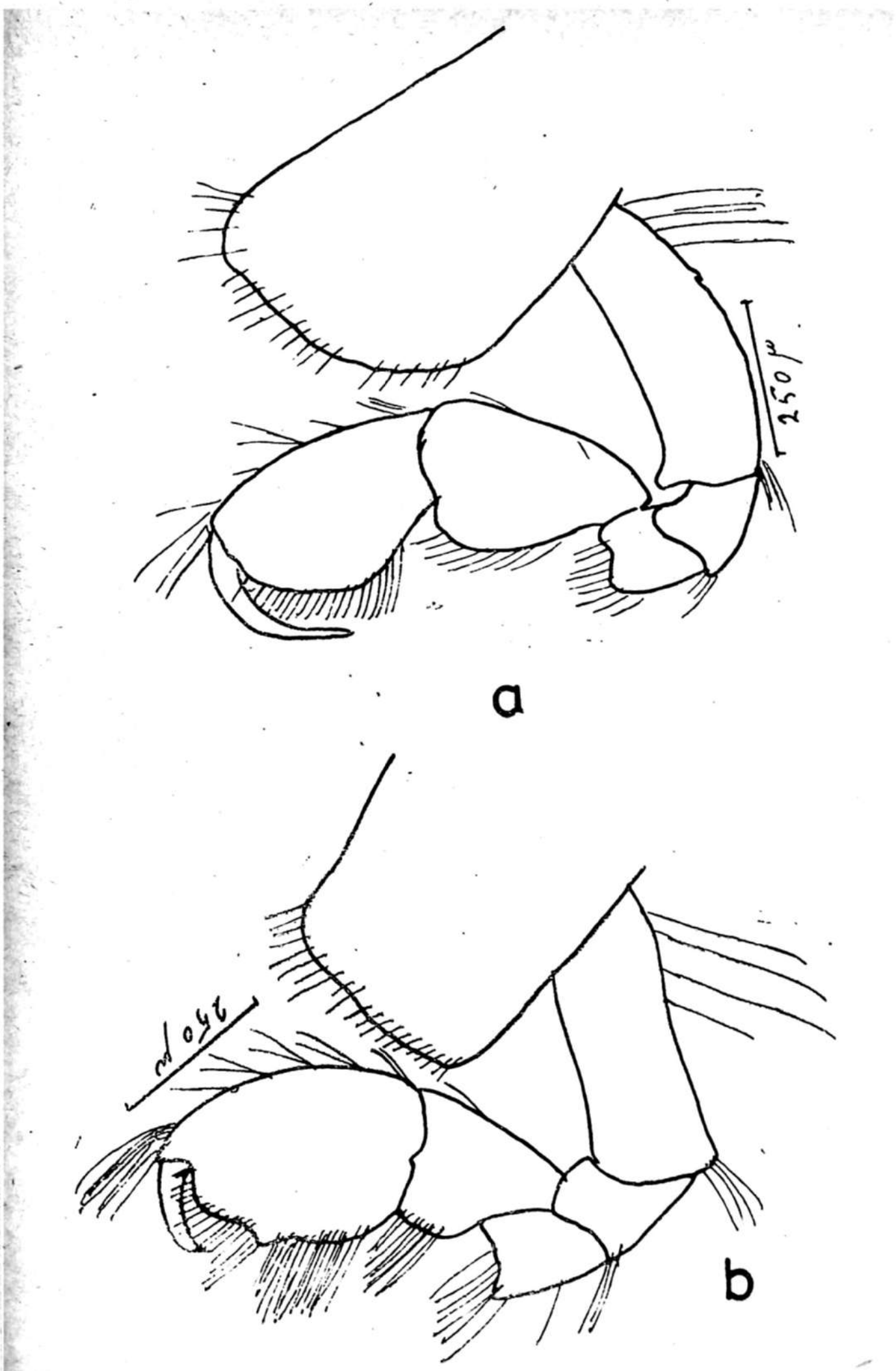
FIG-9



FIG—10

a

b

c

FIG-11

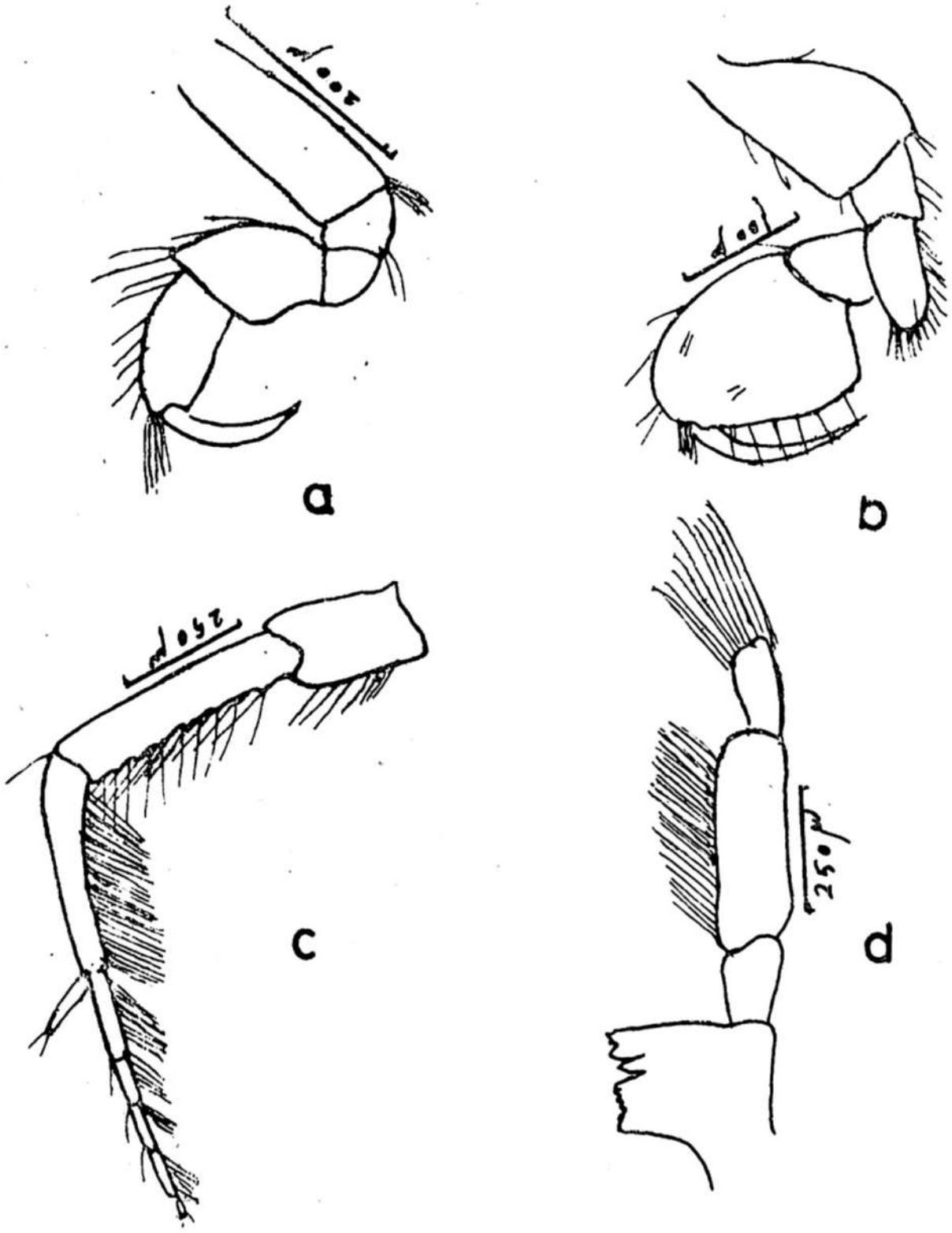


FIG-12

A CHECKLIST OF THE REPTILES OF PAKISTAN

By

Syed Ali Ghalib, Hafizur Rahman,
Fahmida Iffat and Syed Ali Hasnain

Zoological Survey Department

ABSTRACT

This checklist is based upon the study of 18 families, 79 genera and 166 species of Reptiles distributed throughout Pakistan.

INTRODUCTION

A large number of workers have contributed to the knowledge of the herpetology of the Indo-Pak subcontinent, of these Minton (1962, 1965, 1966, 1970); Mertens (1969, 1970, 1971); Siddiqi (1969); Khan & Mirza (1976 & 1977) may be mentioned here who exclusively worked out the reptiles of Pakistan.

Siddiqi (1969) reported 53 species from Pakistan. Khan & Mirza (1976 & 1977) dealt with only Turtles, Crocodiles and Lizards and reported 90 species from Pakistan. Mention must be made of Minton (1962, 1965,1966, 1970) an outstanding work, in which he made a comprehensive study on the biology, ecology, distribution of the reptiles of Pakistan and described 133 species, a major proportion of the species actually inhabiting this region.

The Present checklist is based on the study of Reptilian collections present in the Zoological Survey Department and informations gathered from the literatures published by the earlier workers on the subject and the personal observations made by the authors during the faunistic surveys throughout the country. The authors have given a detailed distribution and the status of each species which has not been touched in detail by the earlier workers.

In this paper an attempt has been made to give an upto date knowledge of the reptiles of Pakistan. In all 166 species belonging to 79 genera and 18 families have been listed.

FAMILY : DERMOCHELIDAE

1. **Dermochelys coriacea** (Linn.)
   Leatherback Sea Turtle.

   Distribution : Sind (Karachi Coast).

   Status : Endangered.

FAMILY : CHELONIIDAE

2. **Chelonia mydas japonica (Thunberg)**
   Indian Ocean Green Turtle

   Distribution : Sind (Karachi Coast); Baluchistan (Coastal areas).

   Status : Endangered.

3. **Caretta caretta gigas**
The Logger head Turtle

Distribution : Coastal areas of Sind and Baluchistan.

Status : Endangered.

4. **Lepidochelys olivacea olivacea** (Esch.)
Pacific Ridley Turtle

Distribution : Sind (Karachi Coast—Sandspit, Hawks Bay).

Status : Less common and endangered.

5. **Eretmochelys imbricata bissa** (Ruppell)
Pacific Hawksbill Turtle.

Distribution : Sind and Baluchistan (Coastal Water).

Status : Rare Wanderer in Pakistan.

FAMILY : EMYDIDAE

6. **Kachuga smithi** (Gray)
Brown River Turtle

Distribution : Sind, Indus River, Dadu, Sanghar, Larkana, Thatta, Hyderabad Districts; Jacobabad District—Canal near Tori, Ghouspur; Sukkur District—near Sukkur Barrage); Punjab (Sialkot District—Marala Headworks ; Bahawalpur District —Taunsa Barrage); N.W.F.P. (D.I. Khan District—Bed of River Indus).

Status : Commonest species of fresh water turtles in Pakistan.

7. **Kachuga tecta tecta** (Gray)

Indian Sawback Turtle

Distribution : Sind (Dadu District—Manchar Lake, Bubak; Hyderabad District—Saidabad).

8. **Hardella thurgi** (Gray)
Brahminy River Turtle

Distribution : Sind (Indus valley in Dadu, Hyderabad, Sanghar, Sukkur, Thatta District; Punjab (Muzaffargarh District--Taunsa Barrage).

9. **Geoclemys hamiltonii** (Gray)
Spotted Pond Turtle

Distribution : (Indus valleys in Dadu, Tharparkar, Hyderabad District and Jacobabad District); Punjab (Kasur District—Balloki Headworks; Gujranwala District—Qadirabad; Muzaffargarh District—Taunsa Barrage.)

Status : Rare

FAMILY : TESTUDINIDAE

10. **Testudo horsfieldii** (Gray)
Afghan Tortoise

Distribution : Baluchistan (Kalat, Quetta Districts; Sibi District—Kowas; Lasbela District—Pab Hills).

Status : Rare

11. **Testudo elegans** Schoepff
Indian Star Tortoise

Distribution : Sind (Karachi District; Tharparkar District—Nagar Parkar, Kutch).

Status : Rare

FAMILY : TRIONYCHIDAE

12. **Trionyx gangeticus** Cuvier
Indian Softshell Turtle

Distribution : Sind (Indus Valley in Dadu, Hyderabad, Sanghar, Thatta, Jacobabad Districts); Punjab (Multan & Vihari Districts, Muzaffargarh District—Taunsa Barrage; Lahore, Sahiwal Districts); N. W. F. P. (Mardan, D.I. Khan Districts; Peshawar District—Canal near Charsada).

Status : Common

13. **Chitra indica** (Gray)
Narrow-headed Softshell Turtle

Distribution : Sind (Indus near Thatta).

Status : Very rare

14. **Lissemys punctata punctata** (Lacepede)
Indian Flapshell Turtle (Common)

Distribution : Sind (Indus drainage in Dadu, Hyderabad, Sanghar, Sukkur, Thatta, Jacobabad Districts); Punjab (Rawalpindi, Lahore Districts, Dera Ghazi Khan District—Link Canal); N.W.F.P. (D. I. Khan District).

Status : Common

FAMILY : CROCODYLIDAE

15. **Crocodylus palustris palustris** Lesson
Snub-nosed Crocodile

Distribution : Sind (Indus Valley in Sanghar, Thatta Districts; Karachi District—Manghopir); Punjab (Multan, Bahawalpur Districts); Baluchistan (Makran District—Hingol and Dasht Rivers), Lasbela District—Hab River, Diwana).

Status : Endangered

1. Miran Gwam near Turbat
2. Bishulee sont Sur
3. Sont Sor.

FAMILY : GAVIALIDAE

16. **Gavialis gangeticus** (Gmelin)
Gavial

Distribution : Sind (Sanghar District—Nara Canal).

Status : Endangered

FAMILY : GEKKONIDAE

17. **Eublepharis macularius** (Blyth)

Fat-tailed Gecko

Distribution : Throughout Pakistan (collected from N.W.F.P., Baluchistan).

Status : Common

18. **Alsophylax tuberculatus** (Blanford)
Baluch Rock Gecko

Distribution : Sind; Baluchistan (Lasbella, Chagai, Kharan, Sibi Districts).

Status : Common

19. **Stenodactylus orientalis** Blanford
Sind Sand Gecko

Distribution : Sind (Tharparkar, Dadu, Sanghar, Khairpur, Thatta Districts); Baluchistan (Lasbela District—Sonmiani Beach, Naka Kharan, Miani Hor; Makran District—Near Hingol River).

Status : Common in tracts of fine, loose Sand.

20. **Stenodactylus lumsdenii** Boulenger

Distribution : Recorded from Baluchistan (Chagai District—Nushki).

Status : Very rare

21. **Stenodactylus maynardi** Smith
Whiptailed Sand Gecko

Distribution : N.W.F.P.; Baluchistan (collected from Chagai District).

Status : Rare

22. **Teratoscincus scincus** (Schlegel)
Turkestan Plate-tailed Gecko

Distribution : N.W.F.P.; Baluchistan (collected from Chagai District—Nushki; Kharan District).

Status : Fairly Common

23. **Teratoscincus microlepis** Nikolsky
Baluch Plate tailed Gecko

Distribution : Baluchistan (Chagai District—Nushki; Kharan District).

Status : Fairly Common

24. **Gymnodactylus scaber** (Heyden)
Keeled Rock Gecko

Distribution : Punjab (Salt range); N.W.F.P. (Waziristan); Baluchistan (Lasbela District); Sind (Dadu, Sanghar, Tharparkar Districts).

Status : Fairly Common

25. **Gymnodactylus montiumsalsorum** Annandale
Salt Range Rock Gecko

Distribution : Punjab (Salt Range).

Status: Uncommon

26. **Gymondactylus fedtscheankoi** Strauch

Turkestan Rock Gecko

Distribution : Baluchistan.

Status: Uncommon

27. **Gymnodactylus kachhensis kachhensis** Stoliezka
Warty Rock Gecko

Distribution: Baluchistan (Lasbela District); Sind (Kutch, collected from Karachi, Thatta, Dadu Districts).

Status : Common

28. **Gymnodactylus kachhensis watsoni** Murray
Quetta Rock Gecko

Distribution : Baluchistan (Lasbela, Kalat, Quetta Districts); N.W.F.P. (Swat, Mansehra Districts); Punjab (Attock District).

29. **Gymnodactylus chitralensis** Smith

Distribution: N. W. F. P. (Chitral, Abbottabad Districts).

Status : Uncommon

30. **Gymnodactylus stoliczkai** Steindachner
Karakoram Rock Gecko

Distribution : N. W. F. P. (Chitral, Swat Districts).

Status : Rare

31. **Agamura persica** (Dumeril)
Blunt-tailed Spider Gecko

Distribution : Baluchistan (collected from Kalat and Lasbela Districts); Sind (Cape Monze near Karachi); N.W.F.P. (Waziristan).

Status : Common

32. **Agamura femoralis** Smith
Sharp-tailed Spider Gecko

Distribution : Baluchistan (Chagai, Kharan Districts).

Status : Rare

33. **Agamura agamuroides** (Nikolsky)
Nikolsky Spider Gecko

Distribution : Baluchistan (Lasbela District).

Status : Rare

34. **Tropiocolotes helenae** (Nikolsky)
Banded Dwarf Gecko

Distribution : Baluchistan (Lasbela, Chagai, Kalat); Sind (Karachi, Thatta, Tharparkar Districts).

Status : Common in desert habitat.

35. **Tropiocolotes depressus** Minton and Anderson
Mountain Dwarf Gecko

Distribution : Baluchistan (Quetta, Sibi Districts)

Status : Rare

36. **Tropiocolotes persicus euphorbiacola** Minton, S. C. Anderson & J.A. Anderson.

Distribution : Sind (Thatta District); Baluchistan (Lasbela District).

Status : Fairly Common

37. **Tropiocolotes persicus persicus** (Nikolsky)

Distribution : Baluchistan (Chagai District).

Status : Rare

38. **Hemidactylus brooki** Gray
Spotted Indian House Gecko

Status : Rare

Distribution : Throughout the country.

Status : Common

39. **Hemidactylus persicus** Anderson
Persian Gecko

Distribution : Sind (collected from Dadu, Karachi, Thatta Districts); N. W. F. P. (Waziristan); Baluchistan (Collected from Lasbela, Sibi Districts).

Status: Common in desert and oasis habitat

40. **Hemidactylus turcicus turcicus** (Linnaeus)
Mediterranean Gecko

Distribution : Sind (Dadu District-Sehwan, Ghora Bari; Karachi, Thatta Districts) Baluchistan Quetta District).

Status: Fairly common

41. **Hemidactylus triedrus triedrus** (Daudin)
Blotched Gecko

Distribution : Sind (Karachi District, Indust Delta); Baluchistan (Lasbela District).

Status : Rare

42. **Hemidactylus leschenaultii** Dumeril and Bibron
Bark Gecko

Distribution : Sind (Sanghar, Jacobabad Districts; Thar desert); Baluchistan (Lasbela District-Bela).

Status : Not very common

43. **Hemidactylus flaviviridis** Ruppell
Yellow bellied House Gecko

Distribution : Throughout Pakistan (at elevation below 900 meter).

Status : Most common.

44. **Hemidactylus frenatus** Dumeril and Bibron
South Asian Wall Gecko.

Distribution : Sind (Karachi District; Thatta District-Gharo, Mirpur Sakro).

Status: Rare.

45. **Teratolepis fasciata** (Blyth)
Sind Broad-tailed Gecko

Distribution : Sind (Thatta, Hyderabad Districts)

Status: Rare

46. **Ptyodactylus homolepis** (Blanford)

Distribution : Sind (Shikarpur District, Hills of Northern and Western Sind).

Status: Rare

47. **Pristurus rupestris**
Dwarf Rock Gecko

Distribution : Baluchistan (Makran District); Sind (Karachi District).

Status :

FAMILY : AGAMIDAE

48. **Calotes versicolor** (Daudin)
Indian Garden Lizard

Distribution : Throughout the country except in arid habitat.

Status: Common.

49. **Sitana ponticeriana**

Distribution : Sind (Tharparkar District).

Status: Rare

50. **Uromastyx asmussi** (Strauch)

Distribution : Baluchistan.

Status: Rare

51. **Uromastyx hardwicki** Gray
Indian Spiny-tailed Lizard

Distribution : Sind; N.W.F.P; Baluchistan; Punjab (In arid and semiarid habitat with clay soil).

Status: Common

52. **Agama nupta nupta** deFilippi
Large Scaled Rock Agama

Distribution : Sind (collected from Karachi District); Baluchistan (Chagai, Kalat, Khuzdar Districts, Quetta District-Bolan Pass, Kowas).

Status: Common

53. **Agama nupta fusca** (Blanford)
Yellow Headed Agama

Distribution : Sind (Karachi District-Khadeji Fall); Baluchistan (Lasbela District-Diwana and Pab Hills).

Status : Fairly common

54. **Agama melanura melanura** (Blyth)
Black Rock Agama

Distribution : Baluchistan (collected from Lasbela District); Punjab (Salt Range; Attock District); Sind.

Status : Common

55. **Agama melanura lirata** (Blanford)

Distribution : Sind (Kirthar Range); Baluchistan (Lasbela District); Hab Chowki.

56. **Agama tuberculata** (Hardwicke and Gray)
Kashmir Rock Agama.

Distribution : N.W.F.P. (Hazara District-Kaghan, Swat River).

Status: Fairly Common in its habitat

57. **Agama himalayana himalayana** (Steindachner)
Himalayan Rock Agama

Distribution : N.A. (Gilgit District); N.W.F.P. (Chitral District); Azad Kashmir.

Status : Common in its habitat

58. **Agama cuacusica caucasia** (Eichwald)
Northern Rock Agama

Distribution : N.W.F.P. (Waziristan); Baluchistan (Mountain from Kalat to Ziarat).

Status : Common

59. **Agama agilis isolepis** Boulenger
Brilliant Agama

Distribution: Sind (collected from Karachi, Dadu, Sanghar, Thatta Districts); Baluchistan (Lasbela, Quetta, Khuzdar, Chagai Districts); Punjab (Mianwali, Jhang Districts); N.W.F.P. (Waziristan).

Status: Common in desert habitat.

60. **Agama agrorensis** (Stoliczka)

Distribution : Reported from Punjab; N.W.F.P. (Chitral District); Azad Kashmir.

Status : Vulnerable

61. **Agama megalonyx** (Gunther)
Afghan Ground Agama

Distribution: Baluchistan (Quetta, Kalat Districts); Sind (Dadu District Kirthar Range).

62. **Agama minor** Hardwicke & Gray

Distribution : Sind (Sanghar, Tharparkar Districts); Punjab (Jhang District—Rabwah).

Status : Rare

63. **Agama ruderata baluchiana** Smith
Baluch Ground Agama

Distribution : Baluchistan (Quetta, Sibi Districts).

Status : Rare

64. **Agama rubrigularis** (Blanford)
Red throated Agama

Distribution : Sind; Baluchistan (Sibi District—Kolpur, Maeh, Dadhar).

Status: Rare

65. **Phrynocephalus scutellatus** (Olivier)
Gray Toad Agama

Distribution : Baluchistan (Most of the desert basin; Lasbela District—Ormara; Chagai District—Nushki).

Status: Common.

66. **Phrynocephalus euptilopus** Alcock & Finn.

Distribution : Reported from Baluchistan.

Status: Very uncommon

67. **Phrynocephalus leuteoguttatus** Boulenger
Yellow Speckled Toad Agama

Distribution : Baluchistan (Chagai District-Nushki; Lasbela District)—

Status : Common

68. **Phrynocephalus clarkorum** S. Anderson & Leviton

Distribution : Baluchistan.

Status: Very rare

69. **Phrynocephalus ornatus** Boulenger
Striped Toad Agama

Distribution : Baluchistan (Chagai District—Nushki, Kharan District).

Status: Fairly common

70. **Phrynocephalus maculatus** John Anderson
Black tailed toad Agama

Distribution : Baluchistan (Chagai District—Nushki).

FAMILY: CHAMAELEONIDAE

71. **Chamaeleo chamaeleon zeylanicus** Laurenti
Indian Chamaeleon

Distribution : Sind (Thar Desert; collected from Tharparkar District—Nabisar, Chachro).

Status: Rare

FAMILY: SCINCIDAE

72. **Mabuya macularia** (Blyth)
Bronze Grass Skink)

Distribution : Sind (Badin, Hyderabad, Thatta Districts); Baluchistan (Lasbela District—Bela).

Status: Common

73. **Mabuya dissimilis** (Hallowell)
Striped Grass Skink

Distribution : Sind (Karachi, Dadu, Thatta, Shikarpur Districts); Punjab (Rawalpindi, Attock, Bahawalpur Districts); N. W. F. P. (Waziristan); Baluchistan (Sibi District).

Status : Common

74. **Eumeces taeniolatus** (Blyth)

Yellow bellied Mole Skink

Distribution: Throughout Pakistan (exclusive of high mountain and Sandy desert).

Status : common in arid lowlands.

75. **Eumeces schneiderii blythianus** (John Anderson)
Orange-tailed Skink

Distribution : Sind (Arid coastal plain of Karachi); Baluchistan (Makran Coast, Lasbela District).

Status : Rare

76. **Chalcides ocellatus** (Forskal)
Ocellate Skink

Distribution: Baluchistan (Makran Coast); Sind (Karachi).

Status : Rare.

77. **Ablepharus pannonicus** (Lichtenstein)
Mediterranean Dwarf Skink

Distribution: Baluchistan (Quetta, Chagai Districts); Sind (Karachi).

Status : Rare

78. **Ablepharus grayanus** (Stoliczka)
Earless Dwarf Skink

Distribution: Throughout Pakistan in Arid and Semiarid lowlands.

Status : Common

79. **Riopa punctata** (Linn)
Dotted Garden Skink

Distribution: Punjab (Lahore District); N.W.F.P. (Hazara District); Sind.

Status : Rare

80. **Liolopisma himalayanum** (Gunther)
Himalayan Ground Skink

Distribution : N.W.F.P. (Hazara District—Kaghan Valley; Chitral District); Azad Kashmir.

Status: Fairly Common

81. **Liolopisma ladacensis** (Gunther)
Glacier skink

Distribution : N. A. (Baltistan District); Azad Kashmir.

Status : Uncommon

82. **Ophiomorus tridactylus** (Blyth)
Indian Sand Swimmer

Distribution : Sind (collected from Dadu, Karachi, Districts); Baluchistan (collected from Chagai, Quetta, Lasbela Districts) ; Punjab (Jhang District).

Status : Common in tracts of fine loose sand

83. **Ophiomorus raithmai** S. Anderson & Leviton

Distribution : Sind (Karachi, Dadu, Sanghar Districts); Baluchistan (Lasbela District).

Status : Very rare

84. **Ophiomorus blanfordi** Boulenger

Distribution : Baluchistan (Makran Coast).

Status : Rare

85. **Ophiomorus brevipes** (Blanford).

Distribution : Baluchistan (Sandy areas near Pak-Iran Border).

Status : Extremely rare

86. **Acanthodactylus cantoris cantoris** Gunther
Indian Fringe-toad Sand Lizard

Distribution : Sind, Punjab, Baluchistan, N.W.F.P.

Status : Common in sandy habitat

87. **Acanthodactylus cantoris blanfordii** Blanford
Makran Fringe Toad Sand Lizard

Distribution : Baluchistan.

Status : Rare

88. **Acanthodactylus mircropholis** Blanford
Yellow tailed Sand Lizard

Distribution : Baluchistan (Lasbela, Kalat Districts).

Status : Rare

89. **Eremias velox persica** Blanford
Persian Steppe Lacerta

Distribution : N.W.F.P. (Waziristan); Baluchistan (Quetta, Kalat, Sibi, Chagai Districts).

Status : Common

90. **Eremias acutirostris** (Boulenger)
Reticulate Desert Lacerta

Distribution : Baluchistan (Chagai District-Nushki).

Status : Uncommon

91. **Eremias scripta** (Strauch)
Cospian Desert Lacerta

Distribution : Baluchistan (Chagai District-Nushki, Galangar).

Status : Rare

92. **Eremias guttulata watsonana** Stoliczka
Longtailed Desert Lacerta

Distribution : Throughout the country. Collected from Sind (Hyderabad, Sanghar Districts); Baluchistan (Quetta, Kalat, Sibi, Lasbela Districts); N.W.F.P. Waziristan, D. I. Khan Districts).

Status : Common

93. **Eremias brevirostris** (Blanford)
Shortnosed Desert Lacerta

Distribution : Baluchistan (Lasbela District).

94. **Eremias aprosceles** (Alcock & Finn)

Distribution: Reported from Baluchistan.
Status: Extremely rare

95. **Eremias fasciata** Blanford

Distribution : Reported from N.W.F.P. (Waziristan, Wana, D.I. Khan Districts); Baluchistan (Kharan District).

Status : Extremely rare

96. **Ophisops jerdonii** Blyth
Punjab Snake eyed Lacerta

Distribution : N.W.F.P. (Swat, Mansehra Districts); Punjab (Lahore, Districts); Baluchistan (Sibi, Lasbela, Kalat Districts); Sind (Tharparkar, Thatta, Karachi, Dadu Districts).

Status: Common

97. **Ophiosops elegans** Menetries

Distribution : Punjab (Mianwali District-Kalabagh).

Status : Extremely rare

FAMILY : VARANIDAE

98. **Varanus bengalensis** (Daudin)
Indian Monitor

Distribution: Throughout Pakistan.

Status : Fairly common

99. **Varanus griseus koniecznyi** Mertens
Indian Desert Monitor

Distribution: Sind; Punjab (in arid lowlands); Baluchistan.

Status: Endangered

100. **Varanus griseus caspius** (Eichwald)
Transcaspian Desert Monitor

Distribution: Sind; Baluchistan.

Status: Rare & Endangered

101. **Varanus flavescens** (Gray)

Distribution: Punjab; Sind (Larkana, Thatta Districts).

Status: Very rare & endangered

FAMILY : TYPHLOPIDAE

102. **Typhlops braminus** (Daudin)
Brahminy Blind Snake

Distribution: Throughout Pakistan : collected from Sind (Karachi, Thatta Districts); Punjab (Sargodha, Faisalabad, Lahore Districts; Gujranwala-Hafizabad).

Status : Common

103. **Typhlops porrectus** Stoliczka
Slender Blind Snake

Distribution: Sind (Karachi in urban area; Thatta District); Punjab (Lahore District); N.W.F.P.

Status: Common

FAMILY : LEPTOTYPHLOPIDAE

104. **Leptotyphlops macrorhynchus** (Jan)
Beaked Thread Snake

Distribution: Sind (Karachi, Indus Valley); Baluchistan (Quetta District).

Status: Rare

105. **Leptotyphlops blanfordi** (Boulenger)
Sind Thread Snake

Distribution: Sind (Thatta District-Indus Delta) ; N.W.F.P. (Peshawar, Dir Districts); Baluchistan (Sibi Distt.) Punjab.

Status : Rare

FAMILY : BOIDAE

106. **Python molurus molurus** (Linnaeus)
Indian Python

Distribution: Sind (Indus Delta; collected from Thatta District—Haleji Lake, Tharparkar District).

Status : Endangered

107. **Eryx johnii johnii** (Russell)
Indian Sand Boa

Distribution : Throughout Pakistan. Sind (Recorded from Karachi, Hyderabad, Sanghar, Nawabshah, Thatta, Tharparkar Districts); Baluchistan (Lasbela District); (Punjab Sargodha District—Rabwah, Ahmedpur, Sial and Chund; Lahore, Gujranwala, Faisalabad Districts ; Jhang District Sangla Hill).

Status : Very common

108. **Eryx conicus** (Schneider)
Sand Boa

Distribution : Sind (collected from Karachi, Hyderabad, Sanghar, Thatta District).

Status : Common

109. **Eryx tataricus** (Lichtenstein)
Tartary Sand Boa

Distribution : Baluchistan (collected from Chagai District).

Status : Rare

110. **Coluber ventromaculatus** (Gray)
Glossy bellied Racer

Distribution : Throughout the country. Collected from Sind (Karachi, Thatta, Sanghar, Larkana Districts); Baluchistan (Lasbela District—Hab Chowki); Punjab (Bahawalpur, Lahore Districts).

Status: Common in arid & semiarid habitat

111. **Coluber rhodorachis** (Jan)
Cliff Racer

Distribution : Throughout the country exclusive of upper Indus basin & Thar desert. Collected from Sind (Karachi, Dadu, Thatta Districts); Baluchistan (Lasbela District—Hab Chowki, Gandrani Caves ; Sibi District—Ziarat) ; N. W. F. P. (Peshawar District); Punjab (Sargodha District—Darapathan).

Status : Common

112. **Coluber karelini** Brandt
Spotted Desert Racer

Distribution : Baluchistan (Quetta District)—Pishin area near Hannah; Chagai District—Nushki).

Status : Rare

113. **Coluber fasciolatus** Shaw
Banded Racer

Distribution : Sind (Larkana, Hyderabad, Thatta District).

Status: Rare

114. **Coluber ravergieri** Menetries
Mountain Racer

Distribution : Baluchistan (Kalat, Quetta, Loralai District); N.W.F.P. (Chitral District).

Status : Rare

115. **Sphalerosophis atriceps** (Fischer)
Royal Snake

Distribution : Sind (Nawabshah District—Moro; Karachi District; Thatta District—Jungshahi, near Jherruck); Baluchistan (Quetta, Lasbela, Sibi District).

Status : Fairly common

116. **Sphalerosophis diadema diadema** (Schlegel)
Eastern Diadem Snake

Distribution: Baluchistan (Lasbela District; Quetta District near Pishin); N.W.F.P. (Swat, Hazara Districts) ; Punjab (Sargodha District—Rabwah; Jhang District—Ahmadpur Sial; Rawalpindi, Lahore, Faisalabad District).

Status : Fairly Common

117. **Sphalerosophis diadema schirazianus** (Jan)
Persian Diadem Snake

Distribution : Baluchistan (Quetta, Lasbela Districts).

Status : Rare

118. **Sphalerosophis arenarius** (Boulenger)
Redspotted Diadem Snake

Distribution : Sind, (West of Indus, collected from Dadu & Karachi Districts); Baluchistan (Lasbela District).

Status : Common

119. **Ptyas mucosus** (Linnaeus)
Dhaman

Distribution : Sind (Dadu, Hyderabad, Badin, Thatta Districts ; Indus Valley and delta); N.W.F.P. (Chitral District; Hazara District—Balakot) ; Punjab (Faisalabad District).

Status : Common

120. **Elephe helenae** (Daudin)

Distribution : Reported from Sind (Karachi District).

Status: Very Rare

121. **Eirenis persica** (J. Anderson)
Dark Headed Dwarf Racer

Distribution : N.W.F.P. (Swat, Bannu, Mardan Districts; Waziristan, Malakand Agency); Sind, Baluchistan (Chagai, Lasbela District).

Status: Rare

122. **Lytorhynchus maynardi** Alcock & Finn.
Maynard's Awl Headed Snake

Distribution : Baluchistan (Chagai District—Nushki).

Status : Rare

123. **Lytorhynchus paradoxus** (Gunther)
Sind Awl Headed Snake

Distribution : Sind (Thar Desert; Tharparkar District—Umerkot; Sanghar, Hyderabad District); Punjab (Mazaffargarh, Lahore Districts; Ahmedpur Sial; Chak Bhadur, Plantation).

Status : Common

124. **Lytorhynchus ridgewayi** Boulenger
Afghan Awl Headed Snake

Distribution : Baluchistan (Sibi District—Ziarat at 8000'; Sibi District—Kolpur; Quetta District, Chak Bhadur Plantation).

125. **Dendrelaphis tristis** (Daudin)
The Indian bronzeback Snake

Distribution : Recorded from Sind.

Status: Very rare

126. **Lycodon striatus striatus** (Shaw)
Northern Wolf Snake

Distribution : Sind (Karachi, Hyderabad, Jacobabad, Thatta Districts); Baluchistan (Quetta District; Lasbela District—Bela, Hab Chowki).

Status : Common

127. **Lycodon striatus bicolor** (Nikolsky)
Golden spotted wolf Snake

Distribution : Baluchistan; N.W.F.P. (Waziristan).

Status : Rare

128. **Lycodon travancoricus** (Beddome)
Travancore Wolf Snake

Distribution: Sind (Hyderabad District).

Status : Very rare

129. **Oligodon taeniolatus** (Jerdon)
Streaked Kukri Snake

Distribution : Sind (Dadu District-Amri; Karachi, Thatta Districts); Punjab (Jhelum, Rawalpindi Districts); N.W.F.P. (Mansehra District); Baluchistan (Lasbela District-Pab Hills, Bela Valley).

Status: Common

130. **Oligodon arrensis** (Shaw)
Russet Kukri Snake

Distribution : Sind (Larkana, Thatta Districts); N. W. F. P. (Bannu District).

Status : Rare

131. **Natrix tessellata**

Distribution: Reported from N.W.F.P. (Chitral District).

Status: Very rare

132. **Macropisthodon plumbicolor**

Distribution: Reported from Sind.

Status: Very rare

133. **Xenochrophis piscator piscator** (Schneider)
Checkered Keelback

Distribution: Sind (Hyderabad, Dadu, Badin, Thatta, Jacobabad, Sanghar Districts); Baluchistan; Punjab (Jhang District ; Ahmed Pur Sial, Kot Amir Shah); N.W.F.P.; Azad Kashmir (Muzaffarabad District).

Status: Very common

134. **Xenochrophis cerasogaster** (Cantor)
Dark Bellied Marsh Snake

Distribution: Sind (Indus Delta; Dadu, Hyderabad, Sanghar, Badin Districts).

Status: Common

135. **Amphiesma stolata Stolata** (Linnaeus)
Striped Keel back

Distribution: Sind (Thatta District); N.W.F.P. (Peshawar District); Punjab (Sargodha, Faisalabad, Sheikhupura District).

Status: Common

136. **Boiga trigonata trigonata** Schneider
Indian Gamma Snake

Distribution: Throughout the country exclusive of higher mountain. Sind (Hyderabad, Karachi, Thatta, Badin Districts); Punjab (Faisalabad, Sargodha, Attock, Rawalpindi Districts); Baluchistan.

Status: Common in coastal plain in desert scrub and in oasis & urban habitat.

137. **Boiga trigonata melanocephalus** (Annandale)
Dark Headed Gamma Snake

Distribution: Baluchistan.

Status: Rare

138. **Telescopus rhinopoma** (Blanford)
Indian Desert Cat Snake

Distribution: N.W.F.P. (Waziristan-Kirgi & Jandola); Baluchistan (Miranshah, Kacha Jhana, Tochi Valley)

Status: Rare

139. **Psammophis schokari** (Forskal)
Afro Asian Sand Snake

Distribution : Sind (Dadu, Hyderabad, Karachi, Thatta, Sanghar, Tharparkar Districts); Baluchistan (Chagai District-Nushki; Lasbela District-Pab Hills, Hab Chowki, Noka Kharari); Punjab.

Status: Common

140. **Psammophis lineolatus** (Brandt)
Steppe Ribbon Snake

Distribution: Baluchistan (Quetta District).

Status: Rare

141. **Psammophis condanarus** (Merrem)
Inidan Sand Snake

Distribution: Sind (Recorded from Indus Delta; Thatta, Jacobabad Districts); Punjab (Recorded from Lahore District.)

142. **Psammophis leithi** gunther
Pakistan Ribbon Snake

Distribution : Sind (Karachi District-Malir, Landhi, Hawkes Bay Beach; Thatta District-Bhuro, Mirpur Sakro, Dabeji; Sanghar District); Baluchistan (Kalat, Lasbela District); N.W.F.P.

Status: Common

143. **Enhydris Pakistanica** Mertens
Sind River Snake

Distribution : Sind (Indus Delta; Thatta District-Jati, Shah Bunder).

Status: Rare

144. **Cerberus rhynchops**

Distribution: Reported from Sind (Indus Delta).

Status : Very rare

145. **Achrochordus granulatus**

Distribution : Reported from Sind (Coastal area); Baluchistan (Makran Coast).

FAMILY : HYDROPHIDAE

146. **Hydrophis cyanocinctus** Daudin
Annulated Sea Snake

Distribution: Sind (Karachi District-Coastal areas); Baluchistan (Lasbela District-Ormara, Makran Cost-Pasni, Shimal Bandar);

Status: Common

147. **Hydrophis spiralis** (Shaw)
Yellow Sea Snake

Distribution: Sind (Thatta District-Indus Delta, Karachi Coast).

Status: Common in coastal water

148. **Hydrophis lapemoides** (Gray)
Persian Gulf Sea Snake

Distribution: Baluchistan (Makran Coast); Sind (Karachi District-Hawkes Bay).

Status : Rare

149. **Hydrophis caerulescens** (G. Shaw)
Many toothed Sea Snake

Distribution: Sind (Karachi District-Korangi Creek).

Status: Rare

150. **Hydrophis mamillars** : (Daudin)
Bombay Sea Snake

Distribution: Sind (Karachi District); Baluchistan (Lasbela Disrict-Sonmiani Beach).

Status : Rare

151. **Enhydrina schistosa** (Daudin)
Beaked Sea Snake

Distribution: Sind (Karachi District-Coastal area; Thatta District -Creeks); Baluchistan (Lasbela District-Sonmiani Beach; Makran Coast).

Status: Common

152. **Praescutata viperina** (Schmidt)
Viperine Sea Snake

Distribution: Sind (Karachi District-Coastal areas; Thatta District-Kuba Bandar); Baluchistan (Makran Coast-Pasni).

Status: Common

153. **Astrotia stokesi** (Gray)
Large headed Sea Snake

Distribution : Sind (Karachi District Coastal Water).

Status: Vulnerable

154. **Lapemis curtus** (Shaw)
Short Sea Snake

Distribution: Sind (Karachi District-Manora); Baluchistan (Makran Coast).

Status: Common

155. **Microcephalophis gracilis gracilis** (Shaw)
Common Small Headed Sea Snake

Distribution : Sind (Karachi District-Coastal area; Thatta District-Khara Coast); Baluchistan (Lasbela District-Kalmat Bay).

Status: Common

156 **Microcephalophis cantoris** (Gunther)
Cantor's Small Headed Sea Snake
Distribution: Sind (Karachi District-Coastal Water).
Status: Rare

157. **Pelamis platurus** (Linnaeus)
Pelagic Sea Snake
Distribution: Sind (Karachi Coast); Baluchistan (Makran Coast-Gwadar, Pasni).

Status: Common

FAMILY : ELAPIDAE

158. **Bungarus caeruleus** (Schneider)
Indian Krait
Distribution: Sind (Karachi, Hyderabad, Jacobabad, Thatta, Tharparkar Districts); Punjab (Rawalpindi, Faisalabad, Sargodha, Lahore Districts; Gujranwala District-Hafizabad); N.W.F.P. (Peshawar District).

Status: Common

159. **Naja naja naja** (Linnaeus)
Indian Cobra
Distribution: Sind (Karachi, Thatta, Badin, Hyderabad, Sanghar, Khairpur, Dadu Districts); Baluchistan (Lasbela, Sibi Districts); Punjab (Rawalpindi, Faisalabad, Sargodha, Multan, Vihari, Jhang Districts; Sutlej Valley).

Status: Common

160. **Naja naja oxiana** (Eichwald)
Oxus Cobra
Distribution: N.W.F.P.; Punjab; Baluchistan (Kach).
Status ; Uncommon

FAMILY : VIPERIDAE

161. **Vipera russelii russelii** (G. Shaw)
Russell's Viper
Distribution: Sind (Thatta, Jacobabad, Karachi Districts).
Status : Common

162. **Vipera lebetina obtusa** Dwigubsky
Levantine Viper
Distribution: N.W.F.P. (Waziristan); Baluchistan (Quetta, Sibi Districts).
Status : Rare

163. **Pseudocerastes persicus** (Dumeril & Bibron)
Persian Horned Viper
Distribution: Baluchistan (Chagai, Lasbela, Kalat Districts).

Status: Common

164. **Eristocophis maemahoni** (Alcock & Finn.)
Leaf Nosed Viper

Distribution: Baluchistan (Kharan, Chagai Districts; Desert basin region).

Status: Common

165. **Echis carinatus** (Schneider)
Saw scaled Viper

Distribution: Sind; Punjab (Sargodha, Faisalabad, Mianwali, Muzaffargarh, Multan Districts).

Status: Common

166. **Agkistrodon himalayanus** (Gunther)
Himalayan Pit Viper

Distribution: Throughout Himalayan region in Pakistan.

Status: Common in habitat

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SOME ASPECTS OF INTERNAL ANATOMY OF *PARAPOECILOCORIS INTERRUPTUS* (WESTWOOD), (PENTATOMOIDEA: SCUTELLERIDAE, SCUTELLERINAE) WITH A NOTE ON ITS SYSTEMATIC POSITION

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ABSTRACT

Aspects of internal anatomy of *parapoecilocoris interruptus* (Westwood) are studied with reference to alimentary organs, male and female reproductive organs and scent and salivary apparatus in order to review the disputed generic status of the present taxon and its systematic position within the tribe Scutellerini.

INTRODUCTION

Distant (1902) included *interruptus* (Westwood) under the genus *poecilocoris* Dallas but Kirkaldy (1909) following Schouteden (1904) placed it under a distinct subgenus *Parapoecilocoris* Schouteden. Recently Ahmad and Mushtaq (1977) on the basis of external morphological characters have considered P. *interruptus* distinct from other species of the genus *poecilocoris*. The alimentary organs of *Poecilocoris lewisi* Distant and *P. splendidulus* Esaki were examined and described without illustrations by Miyamoto (1961) and the spermatheca of *P. latus* Dall. by Kumar (1962) and in addition to above of *Poecilocoris* sp. and that of the present species by Ahmad and Mushtaq (1977) but other aspects of internal anatomy such as male and female reproductive organs and scent and salivary apparatus of any representative of the genus *Poecilocoris* or of *Parapocilocoris* were unknown in the literature. To fill this gap and considering the fact that internal anatomy of only a few Scutellerines and indeed of only a few representatives of the entire family Scutelleridae is known in the literature (Moizuddin and Ahmad 1979) with many representatives of utmost economic importance (Ahmad and Moizuddin 1978 and Moizuddin and Ahmad 1979) the present work was under taken.

MATERIAL AND METHODS

Specimens of *Parapoecilocoris interruptus* (Westwood) were collected on *pines* (*Pinus wallichiana* A.B. Jackson) and wild plant *Olea glandulifera* Wall, at 5,000 ft. from Murree in upper Punjab and from Salkhala in Muzzafarabad, Azad Kashmir. The specimens were brought to Karachi and were reared to run a colony in Laboratory. The internal anatomical studies were carried in freshly killed specimens. Dissections were made in tap water under binocular microscope. For description, diagrams and meaurements the conventional procedures specially those of Moizuddin and Ahmad (1978) were generally followed.

RESULTS

Alimentary organs.—(Fig. 1).—The alimentary organs include alimentary canal and a pair of salivary glands opening through principal salivary ducts independently into the salivary pump .Alimentary canal comprising a thin tube, modera-

tely elongated, greyish, anterior bulubs region short; midgut-1 a greatly enlarged, elongated sac, deep yellowish medially slightly compressed on left side, posterior portion slightly bulging; midgut-2, a narrow moderately elongated tube, light yellowish, at the junction of midgut-1, constricted, emerging, from midgut-1 running on left side and passing underneath, posteriorly opening into a saclike midgut-3 on right side; midgut-3 an oval-shaped thick bladder, concolourous with midgut-1; midgut-4, a compact elongated tube with four rows of gastric caeca, whitish creamyirregularly convoluted, placed on posterior portion of midgut-1; pylorus well developed, dark creamy, placed in close contact with posterior margin of midgut-1, medially broad, laterally elongated and from which two pairs of separate malpighian tubules arising, rectum bladderlike greyish, short, medially bulging, tapering at both ends.

Salivary glands in two pairs ; each consisting of a principal gland, a principal salivary duct, an accessory gland and an accessory salivary duct; anterior and posterior lobes of principal glands finger-like lobules; accessory gland like a thick tube, posteriorly convoluted; accessory duct thort, thin and convoluted.

Male reproductive organs.—(Fig. 2).—With a pair of kidneyshaped broad testes having seven follicles, placed close together in compact condition but each separated through septa, whitish creamy, posteriorly narrow; a pair of long tubular vasa deferentia, anteriorly at the junction of testis slightly swollen, whitish; two pairs of mesadene accessory glands, thick tubules, irregularshaped, whitish and shinning, located at the junction of vasa and vesicula seminales; a pair of Vesicula seminales, anteriorly slightly swollen and ovalshaped, posteriorly narrow, long tubelike whitish; a median globular bulbus ejeculatorius, anteriorly round, posteriorly narrow; two pairs of ectadene accessory glands, elongated tubelike convoluted and coiled, covering most of the area, whitish, located at the lateral region of bulbus ejaculatorius; a common ductus ejaculatorius, tubelike thick, medially curved, opening directly into inflatory vesicle of the aedeagus, located within pygophore.

Female reproductive organs.—(Fig. 3).—These consisting of a pair of elongated ovaries with seven ovarioles, thick tubelike, anteriorly elongated, posteriorly globular, creamy, opening into a broad calyx; a pair of lateral oviduct, short and broad; a pair of accessory glands, short tubuleslike, narrow, whitish; a common median oviduct, saclike thick whitish, opening into the genital chamber beneath spermatheca; latter, flaskshaped, with short duct, median dilation well developed, apical bulb with two flanges and a pump region.

Scent apparatus.—(Fig. 4-5).—With a pair of milky white, elongated leaflike glands, passing beyond posterior margin of reservoir; latter large blood red, saclike, medially slightly constricted, posteriorly bilobed; a thin, whitish, irregular tube touching the edge of reservoir representing accessory gland; a pair of elongated semimembranous tubular vestibules, opening on either side through ovoid aperture or ostiole; a pair of valvular apparatus, with well developed outer and a short lunate inner arm, representing the external fold of the internal disc of infolded lateral ducts of reservoir, valvular mechanisum same as described by the present authors (1979).

DISCUSSION

Kumar (1962) with reference to *poecilocoris latus* Dall. described the spermatheca having a thinwalled median dilation bearing some ornamentations and elongated and curved apical bulb, but in *parapoecilocoris interruptus* the ornamentation in the median dilation is lacking. Ahmad and Mushtaq (1977), have

also separated *parapoecilocoris* from *Poecilocoris* on the basis of a large number of characters specially those of male and female genetalia.

Moizuddin and Ahmad (1979) described curved ductus ejaculatorius, elongated apical bulb of spermatheca and elongated glands of scent gland apparatus reaching posterior margin of reservoir in *Scutellera fasciata* Panz also of the tribe Scutellerini, sharing with *P. interruptus* but the later species differs in having anteriorly broad and posteriorly narrow testes, two pairs of long and coiled ectadenia and threadlike completely attached accessory glands (female reproductive organs) in comparison to anteriorly narrow and posteriorly broad testes, one pair of short tubular form of ectadenia and shorter tubular accessory glands in the former species. Similarly Kumar (1962) in *Chrysocoris stolli* Wolff although noted elongated apical bulb similar to that in present findings but he observed posterior part of the duct enclosed in a broad cylindrical covering which was found lacking presently.

P. interruptus although shares with *solenostethium rubropunctatum* a member of the tribe Elvisurini the same number of testicular follicles and ovarioles and well developed reservoir of scent gland apparatus but the above characters of testes and ectadenia readily separate the two tribes.

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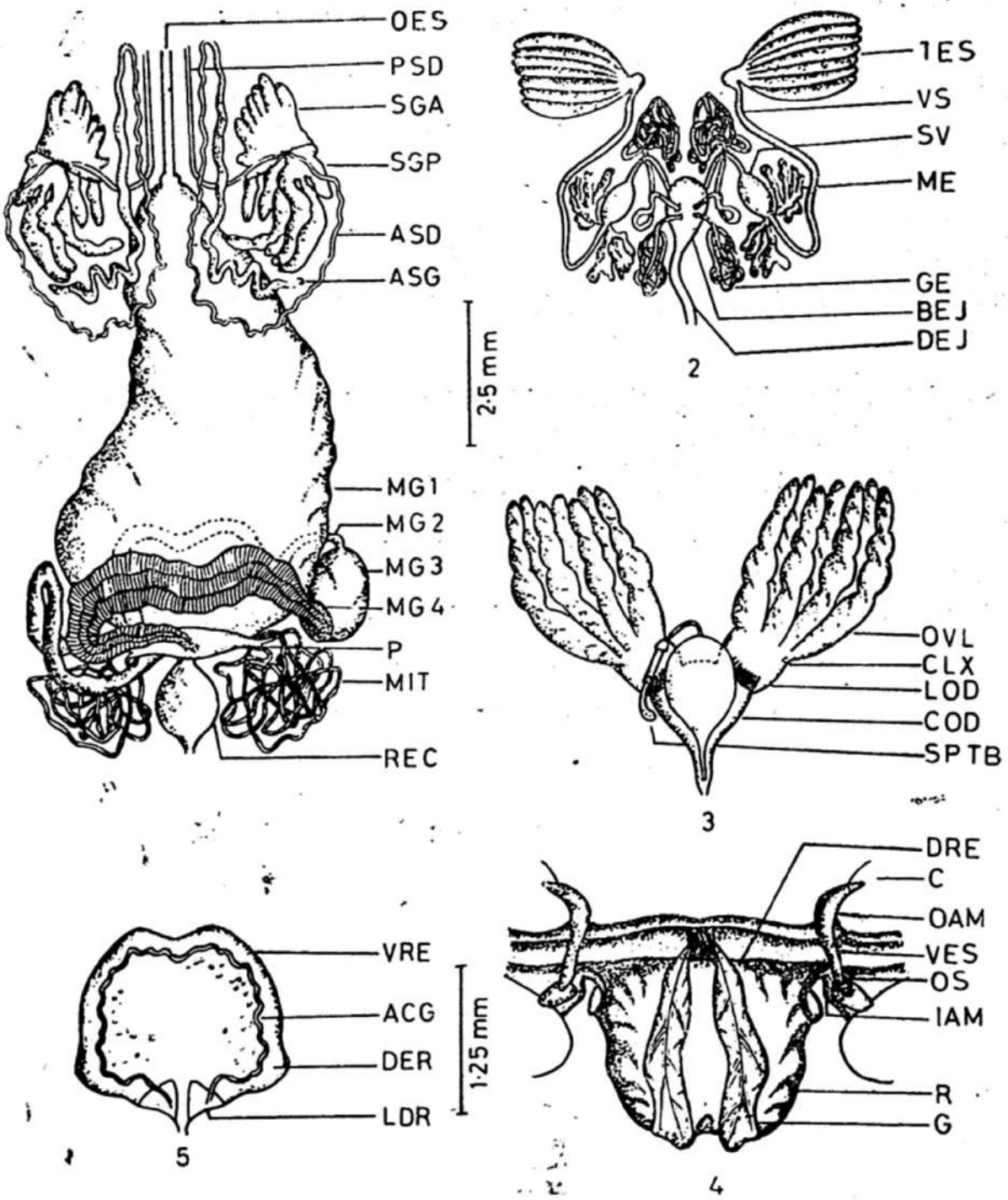

Figs. 1—4 *Parapoecilocoris interruptus* (Westwood) ; 1, Alimentary Organs including salivary glands ; 2, Male reproductive Organs ; 3, Female reproductive organs ; 4, Scent apparatus, entire, dorsal view ; 5, scent reservoir, showing accessory gland, ventral view.

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KEY TO THE LETTERING

ACG	Accessory gland
ASD	Accessory salivary duct
ASG	Accessory salivary gland
BEJ	Bulbus ejaculatorius
C	Coxal cavity
CLX	Calyx
COD	Common oviduct
DEJ	Ductus ejaculatorius
DER	Ventral depression of the reservoir
DRE	Duct of the reservoir
GE	Accessory gland (Ectadenia)
GL	Gland
IAM	Inner arm of valvular apparatus
LDR	Lateral duct of reservoir
LOD	Lateral oviduct
ME	Accessory gland (Mesadenia)
MG_1	$Midgut_1$
MG_2	$Midgut_2$
MG_3	$Midgut_3$
MG_4	$Midgut_4$
MIT	Malpighian tubules
OAM	Outer arm of valvular apparatus
OES	Oesophagus
OS	Ostiole
OVL	Ovariole
P	Pylorus
PSD	Principal salivary duct
R	Reservoir

REC	Rectum.
SGA	Anterior lobe of principal salivary gland.
SGP	Posterior lobe of principal salivary gland.
SPTB	Spermathecal bulb
SV	Seminal vesicle
TES	Testis
VES	Vestibule
VRE	Reservoir, ventral view
VS	Vas deferense.

COMPARISON BETWEEN THE GROWTH RATE OF A HERBIVOROUS FISH *PUNTIUS CONCHONIUS* (HAMILTON) AND A CARNIVOROUS FISH *CHANDA NAMA* HAMILTON.

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ABSTRACT

Growth rate of nearly two similar size of fishes *Puntius conchonius* (Hamilton) (herbivorous) and *Chanda nama* (Hamilton) (Carnivorous) was measured to see that in which mode of feeding fish show better growth.

INTRODUCTION

Studies on the productivity by herbivorous fish are sparse in comparison to the Carnivorous fish production (Chapman, 1967, Hensen & Waters, 1974).

Herbivorous fishes are often an important link, between primary producers and other trophic levels. They are also an important source of protein especially for the people of those countries which are facing the problem of malnutrition due to the scarcity of cattle. According to Naiman (1976) rate of the growth of a herbivorous fish is approximately ten times faster than that of a carnivorous fish. Although only a small amount of the assimilated energy is invested for growth compared to that of for respiration and maintenance by the herbivorous fish but the calories intake is so high that even this small fraction invested in growth results in high annual production. It appears that water bodies containing heavy growth of plants like Haleji Lake are more suitable for the production of herbivorous fish.

MATERIAL AND METHODS

The fishes were caught by hand net and brought in plastic bags to the laboratory for growth experiments. The experiments were carried out in six rectangular jars containing 500 ml. water. Fishes were starved in tap water for about 24 hours to clear their gut. Herbivorous fish (*Puntius conchonius* Hamilton) was fed on algal food, *Spirogyra fuellebornei* and a carnivorous fish (*Chanda nama* Hamilton) was fed on *Macrobrachium lamerrie* (Prawn). Each experiment and its control were replicated twice. A group of four fishes was used in each experiment. The algal material and the prawn were dried in air and were crushed later to powder form. The food weighing three percent (3%) of the total weight of fishes was fed in each experiment. The water of each experimental jar was aerated twice daily. At the biginning of experiment both the length and weight of fishes were measured in centimeters and grams respectively. The fishes were weighed before and after experiments on a electrical balance in a beaker containing a known quantity of water (Ahmed, 1965). Each experiment was continued for a period of 15 days.

TABLE I

SHOWING THE GROWTH OF A HERBIVOROUS FISH (*PUNTIUS CONCHONIUS* HAMILTON)

Name of the feeding material.	Initial weight of fishes in gms.	Final weight of fishes in gms.	Difference in weight gms.	Percentage increase or decrease in weight gms.	Initial measurement of length in cms.	Final measurement of length in cms.	Difference in length cms.	Percentage increase or decrease of length cms.
Spirogyra fuellebornei ..	1.8	2.2	0.4	22.2+	5.1	5.5	0.4	3.9+
Control	0.6	—	—	Nil	3.1	—	—	Nil

TABLE II

SHOWING THE GROWTH OF A CARNIVOROUS FISH (*CHANDA NAMA* HAMILTON)

Name of the feeding material.	Initial weight of fishes in gms.	Final weight of fishes in gms.	Difference in weight gms.	Percentage increase or decrease in weight gms.	Initial measurement of length in cms.	Final measurement of length in cms.	Difference in length cms.	Percentage increase or decrease of length cms.
Macrobrachium lamerrie (Prawn) ..	1.1	1.3	0.2	18.2+	4.1	4.3	0.2	2.6+
Control	0.9	—	—	Nil	3.8	—	—	Nil

RESULTS AND DISCUSSION

No mortality was recorded during the experiments. *Puntius conchonius* which was fed on *Spirogyra fuellebornei* increased 22.2% in weight and 3.9 % in length (Table I) while *Chanda nama* which was fed on *Macrobrachium lamerrie* (Prawn) increased 18 2% in weight and 2.6% in length (Table II). The results of these two experiments indicate that the growth of herbivorous fish (*Puntius conchonius*) was better than carnivorous fish (*Chanda nama*).

Naiman (1976) observed that the ingestion rate of a herbivorous pup-fish (*Cyprinodon nevadensis*) lacking stomach is high compared to carnivorous fish having well developed stomach. In the present study, we also noted that the herbivorous fish (*Puntius conchonus*) lacking stomach grow more rapidly than the carnivorous fish (*Chanda nama*) containing well developed stomach. It shows that the stomachless fish consumes more food than a fish having stomach. Kinee (1960) also recorded high ingestion rate for the herbivorous fish.

Chapman (1967) also recorded in a warm desert stream that the annual production of herbivorous fish is approximately ten times greater than the carnivorous fish in natural waters. It seems that the abundant food supply and short digestion process due to the absence of stomach allows a herbivorous fish to directly exploit the primary energy source *i.e.* plants and helps to account for the high annual production rate.

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