

**RECORDS
ZOOLOGICAL SURVEY
OF
PAKISTAN**



HALF-YEARLY

Volume VII

Number 1 & 2

**Edited and Published
BY
THE DIRECTOR**

ZOOLOGICAL SURVEY DEPARTMENT

**Hotel Nazli Building
Nishtar Road,
Karachi-3**

JANUARY, JULY 1975

PRINTED BY THE MANAGER, PRINTING CORPORATION OF PAKISTAN PRESS, KARACHI

1979



This file has been converted into PDF format in response to the growing demand of online readers. This initiative was made possible through the dedicated efforts of the Director, Mr. Altaf Hussain Khuhro, Zoological Survey of Pakistan (ZSP), Ministry of Climate Change & Environmental Coordination, Government of Pakistan, Islamabad.

Special appreciation is extended to Mr. Altaf Hussain Narejo, Zoologist, for his keen interest, commitment, and active support in the development and promotion of the Online Directory of the Zoological Survey of Pakistan.

We are also grateful to Mr. Muhammad Moazzam for his valuable contribution in providing some missing Records and reference material, which significantly supported the compilation and accuracy of this work.

© All Rights Reserved

ALBERT
COLLEGE



LIBRARY

1922

UNIVERSITY OF TORONTO

1922

EDITORIAL BOARD

1. Chairman Mohammad Farooq Ahmad, M.Sc. (Karachi),
Diploma in Fisheries (West Germany).
Director, Zoological Survey Department,
Karachi.
2. Secretary Syed Ali Ghalib, Wildlife Preservation Officer.
3. Member Syed Sabihul Hassan Zaidi, Marine Zoologist.
4. Member Jamil Ahmed, Marine Zoologist.

1941
1942
1943
1944
1945
1946
1947
1948
1949
1950
1951
1952
1953
1954
1955
1956
1957
1958
1959
1960
1961
1962
1963
1964
1965
1966
1967
1968
1969
1970
1971
1972
1973
1974
1975
1976
1977
1978
1979
1980
1981
1982
1983
1984
1985
1986
1987
1988
1989
1990
1991
1992
1993
1994
1995
1996
1997
1998
1999
2000
2001
2002
2003
2004
2005
2006
2007
2008
2009
2010
2011
2012
2013
2014
2015
2016
2017
2018
2019
2020
2021
2022
2023
2024
2025

A CHECKLIST OF MAMMALS OF PAKISTAN

BY

MOHAMMAD FAROOQ AHMAD

AND

SYED ALI GHALIB

Abstract

The mammalian fauna of Pakistan consists of 188 species comprising of 10 Orders, 36 families and 95 genera.

INTRODUCTION

The mammalian fauna, particularly the wild species have been the point of immense interest and attraction all over the world. As a result of large scale set-back to mammalian species due to sophistication of man's weapons and a modernisation desire of human race everywhere, the sometime abundant species are now on the point of extinction. In Pakistan the conditions are not much different. The Zoological Survey of Pakistan took up the big responsibility alongwith its multifarious duties, to survey, record, count, and determine the mammalian species alongwith their geographical distribution. With its meagre resources, and inadequacies of funds for research, the study of mammals has been moving with a low pace. We are still endeavouring for having a reasonably enough or reliable information about this great group of animals.

A survey of literature shows that much work had already been done on this group of animals in the Indian sub-continent. Jerdon as early as 1847, first described the Mammals of India. Afterwards, Sterndale (1884) published his work on Indian Mammals. Later Blanford (1888—91) published his Fauna of Mammalia in British India, in which he referred to the species pertaining to areas now included in Pakistan. Pocock (1939—41), Ellerman and Scot (1951), Ellerman (1961), and Prater (1965) dealt at large with Indian mammals, and discussed the biology, ecology, distribution, and identification of a large number of species also occurring in Pakistan. None of them, however, directly discussed the mammals of Pakistan.

Siddiqui (1961) of Department of Zoological Survey of Pakistan, however, prepared the first checklist of mammals of Pakistan, but he discussed only those genera and species that were present in British Museum (N. H.) London, at that time. Siddiqui (1969) further extended his studies and published a booklet on the Fauna of Pakistan, in which he included the species of Mammals, Birds, Reptiles and Amphibians recorded in Pakistan. Taber et al (1967) studied mammals of Lyallpur (now Faisalabad) region, and included 42 species in their account. Mirza (1965, 1967), Pilleri (1970-1971), Schaller (1973) and Schaller and Mirza (1971) published works on certain important mammals of Pakistan. Khan (1977 unpublished) compiled reports on the wildlife population of N.W.F.P.

and gave very useful information on some of most valued wildlife in those areas. Roberts (1977), however, dealt in more detail with the biology, ecology, distribution and other aspects of interest of the mammals of Pakistan. It is the most comprehensive account on the mammals of Pakistan, although he repeatedly commented on the lack of information about many mammalian species of Pakistan.

The present checklist is the second of its type being published by this department. The authenticity of information included here has been very carefully checked either from the published work, or has been based on the personal observation of the Research Staff of the Zoological Survey Department, Government of Pakistan, or of the Provincial wildlife authorities. In case of a number of species actual specimens have been collected and preserved in the repository of this department. In all 188 species, included in 95 genera, 36 families and 10 orders of mammalia of Pakistan are being published. A more detailed information has been provided in the geographical distribution of each species listed here, and in most of the case the status of the species has been given as endangered, rare, common, less common, uncommon, migratory, and habitat specialisations with regard to desert species, forest species, light mountain species, etc. etc. has been given.

It is expected that this publication possessing more up-to-date, and recent information on mammals of Pakistan would be useful and interesting for mammalogists and wildlife workers in this country as well as elsewhere.

A REVISED CHECKLIST OF MAMMALS OF PAKISTAN

Order : *Primates*.Family : *Cercopithecidae* :1. *Macaca mulatta villosa* True

The Rhesus Macaque.

Distribution :—Punjab (Rawalpindi District—Murree Hills Margalla Hills); N.W.F.P. (Dir Dist.—Chakdara; Swat District—Salkhosar, Fazal Bey, Miandam, Beshigram, Mankial, Kalam, Lilowni, Chakesar, Puran, Wara Kopp; Hazara District—Kaghan Valley, Paras, Shogran, Dungagali, Bagnotar, Hillan, Nathiagali, Shinkiari), Doga, Kathai; Orakzai Agency); Azad Kashmir (Muzaffarabad and Poonch Districts).

2. *Macaca mulatta mcMahonii* Pocock

The Rhesus Macaque.

Distribution :—N.W.F.P. (Dir Distt. Chitral District—Kootai, Utzun, Shishi Koh), Azad Kashmir (Muzaffarabad District).

Family : *Colobidae* :3. *Presbytis entellus entellus* (Dufresne)

The Common Langur or Hanuman Monkey.

Distribution :—N.W.F.P. (Hazara District—Sharan, Kunhar Valley, Shogran, Kaghan and Dhanial Forest; Swat District—Kalam); Azad Kashmir (Muzaffarabad District—Jhelum Valley, Mundkro forest).

Status : Endangered.

Order : *Carnivora*.Family : *Felidae*.4. *Panthera pardus saxicolor* Pocock

The Leopard or Panther.

Distribution :—Punjab (Salt Range, Kalachitta Hills and Murree Hills); N.W.F.P. (Chitral District, Hazara District—Dungagali, Nathiagali, Thandiani, Shergarh); Baluchistan (Quetta District—Sambaza; Kalat District—Gishk Hills—Takhte Suleman, Harboi Hills, Kohe Maran; Makran); Lasbela Distt.—Pab Hill; Azad Kashmir (Muzaffarabad District); Northern Area Diamir Distt.—Chilas).

Status : Endangered.

5. *Panthera pardus sindica* Pocock

The Leopard or Panther.

Distribution :—Sind (Kirthar Range).

6. *Panthera uncia* (Schreber)

The Snow Leopard or Ounce.

Distribution :—N.W.F.P. (Chitral District); Northern Area (All over the Northern Area never much below snow level from 9000'—18000'), Azad Kashmir (Muzaffarabad District).

Status : Endangered.

7. *Felis bengalensis trevelyani* (Pocock)

The Leopard Cat.

Distribution :—Punjab (Rawalpindi District—Murree Hills; Salt Range); N.W.F.P.—(Swat, Dir, Chitral Districts; Hazara Distt.—Kaghan Valley, Shogran, Dongagali; Safed Koh Mountain, Waziristan); Northern Area (All over the Northern Area below alpine pastures); Azad Kashmir (Neelum Valley); Baluchistan (Lasbela District).

Status : Endangered.

8. *Felis viverrina* Bennet

The Fishing Cat.

Distribution :—Punjab (Sutlej, Ravi Chenab rivers; Taunsa and Trimmu Head Works); Sind (Indus delta, Thatta Distt.—Kinjhar and Haleji Lakes, Sujawal, Nawabshah Distt.—Jamroo Head, Sukkar).

Status : Endangered.

9. *Felis chaus chaus* Guldenstaedt.

The Jungle Cat.

Distribution :—Baluchistan (Jhatpat area)

10. *Felis chaus prateri* Pocock

Distribution :—Punjab (Bahawalpur Mianwali, and Multan Districts, Thal, Cholistan desert); Sind (Jacobabad, Larkana, Khairpur Districts, Tharparkar District—Umerkot, Chachro; Thatta District—Indus delta; Dadu District—Kirthar range; Karachi District); Baluchistan (Mekran District—Malar, Kalatuk and Panjgur, Quetta Valley).

11. *Felis libyca ornata* Gray

The Desert Cat.

Distribution :—Punjab (Bahawalnagar District—Fort Abbas; Cholistan and Thal, Salt Range); Sind (Thatta Distt.—Mirpursakro; Larkana District—Dokri; Tharparkar District—Chachro, Umerkot, Khairpur District—Gambat; Jacobabad District; Dadu District—Kirthar Range); Baluchistan (Kharan and Chagai Districts); N.W.F.P. (Dera Ismail Khan District—Paharpur; South Waziristan—Wana).

Status : Endangered.

12. *Felis caracal schmitzi* Matschie

The Caracal.

Distribution :—Punjab (Bahawal Nagar Distt.—Phulra, Fort Abbas; Bahawalpur District—Cholistan; Sargodha District—Thal; Salt Range; Attock Distt.—Kala Chitta); Sind (Larkana District, Tharparkar District—Cutch Baluchistan (Chagai, Kharan, Makran and Kalat, Loralai Districts); N.W.F.P. (Waziristan—Tank).

Status : Endangered.

13. *Felis lynx isabellina* Blyth

The Lynx.

Distribution :—N.W.F.P. (Chitral Distt.—Broughal; Hazara District); Northern Area (Gilgit, Skardu, Astor, Hunza above 5000, Baltistan Diamir).

Status : Uncommon and Endangered.

14. *Felis manul ferruginea* Ognev.

Pallas's Cat.

Distribution :—Punjab (Rawalpindi District—Murree); N.W.F.P. (Peshawar and Chitral Districts). Baluchistan (Sibi Distt.—Ziarat).

Status : Endangered.

Family : *Viverridae* :15. *Viverricula indica bengalensis* Gray & Hardwicke

The small Indian Civet.

Distribution :—Sind (Sukkar, Thar Parkar Distts. Nagar parkar, Mithi; Larkana District—Naudero; Thatta District—Indus Delta), Punjab (Lahore, Sargodha, Multan, Bahawal Nagar, Muzaffargarh, D. G. Khan Jhang, Sargodha & Sahiwal Districts; Mianwali Distt.—Leiah; Bahawalpur Distt.—Lal Sohanran; Sahiwal Distt.—Checha Watni Forest).

Status : Rare.

16. *Paradoxurus hermapheroditus vellerosus* Pocock

The Common Palm Civet or Toddy Cat.

Distribution :—Azad Kashmir, Punjab (Lahore, Sargodha, Multan, Sahiwal, Bahawalpur, Muzaffargarh & D.G. Khan Distts.).

Status : Rare.

17. *Paguma larvata wroughtoni* Schwarz

The Himalayan Palm Civet.

Distribution :—Punjab (Rawalpindi District—Gharia, Murree); Azad Kashmir (Neelam Valley); N.W.F.P. (Swat District—Chakesar; Hazara Distt.—Dongagali).

Status : Rare and Endangered.

Family : *Herpestidae* :

18. *Herpestes edwardsi ferruginosus* Blanford

The Common Mongoose.

Distribution :—Punjab (Lahore, Rawalpindi District—Chaklala Margalla Hills; Salt Range; Cholistan); Sind (Khairpur District—Gambat; Sukkur District—Rohri, Tharparkar and Thatta Districts); N.W.F.P. (Peshawar Kohat and Bannu Districts); Baluchistan (Makran Distt.—Panjgur, Turbat, Mand, Jebri).

Status : Common.

19. *Herpestes auropunctatus auropunctatus* (Hodgson)

The Small Indian Mongoose.

Distribution :—Azad Kashmir.

Status : Rare.

20. *Herpestes auropunctatus pallipes* (Blyth)

The Small Indian Mongoose.

Distribution :—Punjab (Salt Range; Sahiwal Distt.—Khanewal; Lahore, Kasur, Sial Kot; Gujranwala, Jhelum Distts.); Sind (Sukkur, Larkana, Tharparkar, Karachi, Thatta and Khairpur Districts, Dadu District—Kirthar Range); Baluchistan (Makran District—Turbat).

Status :

Family : *Hyaenidae* :

21. *Hyaena hyaena. hyaena* (Lin.)

Striped Hyaena.

Distribution :—Sind (Larkana District, Khairpur Distt.—Takar; Dadu District—Kirthar Range, Khadeji falls, Tharparkar District—Cutch Sanghar Distt., Thatta Distt.—Makli Hills); Baluchistan, (Quetta, Laralai Distts.); Punjab (Salt Range, Cholistan area; D. G. Khan, Multan and Lahore Districts), N. W. F. P. (D. I. Khan, Chitral & Kohat Districts Waziristan).

Status : Rare.

Family : *Canidae* :

22. *Canis Lupus pallipes* Sykes

The Wolf.

Distribution :—Sind (Tharparkar Distt. Dadu District—Kirthar Range, Thatta District—Haleji); Azad Kashmir (In the barren uplands at 3600'—6000 '); Punjab (Lahore District—Renala Khurd, Sahiwal District—Khairar Lake; Cholistan), Baluchistan (Makran, Sibi, Zhob Districts); N. W. F. P. (Chitral, Swat Distts.); Northern Area (Gilgit, Baltistan Distts).

Status : Extremely rare.

23. *Canis lupus chanco* Gray

The Wolf.

Distribution :—N.W.F.P. (Chitral & Swat Districts); Baluchistan (Loralai) Distt.—Chotair; Northern Area (Gilgit District).

Status : Rare.

24. *Canis aureus aureus* Lin.

The Jackal.

Distribution :—Sind, Punjab, Baluchistan, N.W.F.P., Northern Area and Azad Kashmir.

Status : Numerous in irrigated forest plantations.

25. *Vulpes vulpes montana* (Pearson)

The Hill Fox.

Distribution :—N.W.F.P. (Chitral District—Brughal area), Northern Area (Gilgit, Baltistan, Hunza—from 3600'—6000') Azad Kashmir.

Status ;

26. *Vulpes vulpes pusilla* Blyth

The White Footed Fox.

Distribution :—Punjab (Rahim Yar Khan District—Cholistan, Attock and Rawalpindi Districts; Salt Range, Thal); Sind (Jacobabad, Khairpur, Sukkur and Tharparkar Districts); Baluchistan (Khojdar, Mand, Turbat, Sibi and Makran Coast).

Status : Common in Extensive desert areas.

27. *Vulpes vulpes griffithi* Blyth

The Red Fox.

Distribution :—Punjab (Rawalpindi District—Murree; Salt range); Sind (Dadu District—Kirthar Range); N.W.F.P. (Waziristan, Kohistan, Dir, Chitral Districts; Hazara Distt.—Dongagali; Azad Kashmir.

Status : Common.

28. *Vulpes bengalensis* (Shaw)

The Indian Fox.

Distribution :—Punjab (Lahore, Sialkot, Kasur, Bahawalnagar Districts, Sahiwal Distt.—Khanewal; Rahim Yar Khan District—Khanpur); Sind (Khairpur, Dadu, Sukkur, Tharparkar and Thatta Districts); Baluchistan (Lasbela Distt.).

Status : Common in Sind.

29. *Vulpes cana* Blanford

Blanford's Fox.

Distribution :—Baluchistan (Kharan, Kalat, Chagai Districts, Makran District—Gwadar and Turbat); N.W.F.P. (Kurram & Khayber Agencies); North Waziristan—Bajaur).

Status :

30. *Vulpes rippelli* Schinz

Riippell's Fox or Sand Fox.

Distribution :—Baluchistan (Makran Coast—Ormara).

Status : The rarest vulpes species in Pakistan.

Family : *Ursidae* :31. *Ursus arctos isabellinus* Horsfield

The Brown Bear.

Distribution :—N.W.F.P. (Swat and Chitral Districts—Turkho, Yarkun Valley; Hazara District—Siran Nullah); Northern Area (Gilgit, Punial, Gupis, Astor, Darel and Tangir Area in the bare open peaks high above the tree line; Baltistan).

Status : Endangered.

32. *Selenarctos thibetanus gedrosianus* Blanford

The Baluchistan Bear.

Distribution :—Baluchistan (Zhub District—Shingar range : Takht-i-Suleman range ; Lasbela District—Pab range, Khuzdar, Kharan Districts, Makran Coast).

Status : Endangered.

33. *Selenarctos thibetanus laniger* Pocock

The Himalayan Black Bear.

Distribution :—N.W.F.P. (Dir, Chitral District, Hazara District—Dongagali, Shogran, Barawai, Shergarh; Swat District—Gabrial, Jrandi Khwar, Beshigram, Mankial, Kalam, Malam Jabba, Lilowni, Chakaisar, Puran, Wara Kopo); Northern Area (found above 11000' in higher alpine meadows), Azad Kashmir (Muzaffarabad District—Neelum Valley).

Status :

Family : *Mustelidae* :34. *Martes foina intermedia* (Severtzov)

The Beech or Stone Marten.

Distribution :—N.W.F.P. (Chitral, Swat and Dir Districts, Hazara District—Kaghan Valley, Waziristan); Baluchistan (Quetta, Kalat and Kharan Districts); Northern Area (found at 3600'—6000').

Status : Endangered.

35. *Martes flavigula flavigula* (Boddaert)

The Himalayan Yellow Throated Marten.

Distribution :—Punjab (Rawalpindi District—Murree Hills, Margalla Hills, Attock District—Kalat Chitta Hills); N.W.F.P. (Peshawar District, Hazara District—Nathiagali, Dongagali; Chitral District, Dir, Swat Districts Safed Koh); Northern Area (Gilgit District—Chilas; Diamir District); Azad Kashmir (Upper Neelum Valley).

Status : Endangered.

36. *Mustela erminea ferghanae* (Thomas)

The Ermine or Stoat.

Distribution :—N.W.F.P. (Swat, Chitral and Hazara Districts; Safed Koh).

Status : Rare.

37. *Mustela altaica temon* Hodgson

The Pale Weasel.

Distribution :—N.W.F.P. (Chitral District, Hazara District—Kaghan Valley, Saiful Maluk); Northern Area (Gilgit, Baltistan, Skardu, Hunza).

Status : Rare.

38. *Vormela peregusna alpherakii* Birula

The Marbled Polecat.

Distribution :—Baluchistan (Quetta District, Chaman, Khojak, Pishin, Mekran District); N.W.F.P. (Kohat District—Hangu, North Waziristan, Kurram Valley).

Status : Rare and Endangered.

39. *Mellivora capensis indica* (Kerr)

The Ratel or Honey Badger.

Distribution :—Punjab (Bahawalpur District, Cholistan); Sind (Dadu District—Kirthar Range, Thatta, Tharparkar Districts); Baluchistan (Makran, Lasbela, Kalat, Chagai, Sibi, Pishin, Loralai Districts); N.W.F.P. (Waziristan).

Status : Rare species.

40. *Lutra lutra kutab* Schinz.

The Common Otter.

Distribution :—N.W.F.P. (Dir, Swat and Chitral Districts, Hazara District—Kaghan Valley); Northern Area, (Baltistan Valley, Gilgit River, Hunza River; Ishkomen River at Gakuch, Astor River, Gupis River—In all clear waters, Streams and Rivers); Azad Kashmir (Neelam Valley and Jhelum Valley).

Status : Rare and Endangered.

41. *Lutra lutra monticola* Hodgson

The Common Otter.

Distribution :—Punjab (Sutlej, Panjnad, Trimmu and other fresh water reservoirs).

Status : Rare.

42. *Lutra perspicillata sindiys* Pocock

The Smooth Indian Otter.

Distribution :—Punjab and Sind (Bahawalpur District—Lal Sohara; Marala, Panjnad Sidhnai and Trimmu Head Works Indus and its tributaries—Nara Canal, Sundari, Kinjhar and Haleji Lakes, Keti bunder, Sukkar Barrage, Tando Mohd. Khan).

Status : Rare and Endangered.

Order : *Insectivora*.

Family : *Erinaceidae* :

43. *Hemiechinus auritus collaris* (Gray)

The Longeared Hedgehog.

Distribution :—Punjab (Multan District, Bahawalpur District; Rahim Yar Khan District—Cholistan; Gujranwala District—Wazirabad); Sind (Jacobabad, Khairpur, Tharparkar, Sukkur, Hyderabad, Karachi Districts; Dadu District—Kirthar Range).

Status : Commonest species of Hedgehogs of Pakistan.

44. *Hemiechinus megalotis* (Blyth)

The Afghan Hedgehog.

Distribution :—N.W.F.P. (Waziristan); Baluchistan (Kalat District—Mas-tung; Quetta District—Sariab, Ziarat; Pishin, Kharan District).

Status : Less Common species.

45. *Paraechinus micropus micropus* (Blyth)

The Pale Hedgehog.

Distribution :—Punjab (Bahawalpur District); Sind (Khairpur District—Gambat, Hyderabad, Tharparkar, Thatta and Karachi Districts); Baluchistan (Lasbela District).

Status : Uncommon species.

46. *Paraechinus hypomelas hypomelas* Brandt

Brandt's Hedgehog.

Distribution :—Baluchistan (Khuzdar, Mekran, Sibi Districts); N.W.F.P. (Waziristan, Kurram Valley).

Status : Uncommon.

47. *Paraechinus hypomelas blanfordi* Anderson
Blanford's Lesser Lowland Hedgehog.

Distribution :—Punjab (Salt Range, Multan, Dera Ghazi Khan Districts, Sahiwal District—Khanewal); Sind (Jacobabad, Sukkur, and Larkana Districts, Dadu District, Kirthar Range); N.W.F.P. (Peshawar, Mardan, Bannu, D. I. Khan Districts).

Status : Uncommon.

Family : *Soricidae* :

48. *Suncus murinus tytleri* Blyth

The Grey Musk Shrew.

Distribution :—Punjab (Lahore, Bahawalnagar, Faisalabad, Jhelum and Sialkot Districts; Salt Range—Choa Saidan Shah, Kalar-kahar, Sakesar; Rawalpindi District—Murree); Sind (Dadu District—Sehwan; Sukkur, Jacobabad and Karachi Districts); N.W.F.P. (Mardan, Swat, Dir, Kohat, Districts; Hazara District—Manshera, Balakot).

Status :

49. *Suncus stoliczkanus subfulrus* Anderson
Anderson's Shrew.

Distribution :—Sind (Sukkur, Thatta and Karachi Districts); Punjab (Lahore District—Changa Manga, Sahiwal District—Khanewal).

Status :

50. *Crocidura russula Hermann*

Common White Toothed Shrew.

Distribution :—Punjab (Rawalpindi District—Murree Hills); Azad Kashmir.

51. *Crocidura attenuata kingiana* Anderson
Grey Shrew.

Distribution :—Punjab (Rawalpindi District—Murree).

52. *Crocidura pergrisea pergrisea* (Miller)
Pale Grey Shrew.

Distribution :—Northern Area (Shigar, Baltistan).

Status : Uncommon.

53. *Crocidura pergrisea zarudnyi* Ognev.

Distribution :—Baluchistan (Mekran District—Panjgur, Turbat and Kalat Districts).

Order : *Chiroptera*.

Family : *Pteropidae* :

54. *Rousettus arabicus* Anderson & de Winton
Fruit Bat.

Distribution :—Baluchistan (Mekran District—Panjgur, Lasbela District—Lak Bidok), Sind (Karachi District Malir; Thatta District—Makli Hills); Punjab (Lahore District).

Status : Rare and locally distributed.

55. *Rousettus leschenaulti* Desmarest
Fulvous Fruit Bat.

Distribution :—Punjab (Lahore, Sialkot Districts); N.W.F.P. (Malakand, Peshawar Districts); Azad Kashmir.

Status : Partly migratory, mainly summer visitor.

56. *Rhinopoma microphyllum* Brunnich
Larger Rat—Tailed Bat.

Distribution :—Punjab (Jhelum, Gujrat, Multan Districts; Rahim Yar Khan District—Sadiqabad); Sind (Tharparkar District—Kutch; Hyderabad, Sukkur, Karachi Districts); N.W.F.P. (Malakand Hills).

57. *Pteropus giganteus* Brunnich
Indian Flying Fox.

Distribution :—Punjab (Lahore District, Sialkot District,—Marala; Islamabad—Margalla Hills); Sind (Karachi District).

Status : Rare in Pakistan.

58. *Rhinopoma hardwickei hardwickei* (Gray)
Lesser Rat—Tailed Bat.

Distribution :—Punjab (Salt Range, Ara and Rohtas); Sind (Hyderabad District Karchat Hills; Karachi, Khairpur Districts); N.W.F.P.

Status : Less Common species.

59. *Cynopterus sphinx* Vahl
Short-nosed Fruit Bat

Distribution :—Sind (Karachi District—Malir).

Status : Uncommon.

Family : *Emballonuridae* :

60. *Taphozous perforatus perforatus* E. Geoffroy
Tomb Bat.

Distribution :—Sind (Thatta District—Jati).

Status : Uncommon.

61. *Taphozous kachhensis kachhensis* Dobson

Naked—bellied Tomb Bat.

Distribution :—Punjab (Salt Range; Multan, Bahawalpur Districts); Sind (Jacobabad District—Kashmor, Tori; Khairpur District—Kotdiji, Sukkur, Thatta Districts, Indus plain).

Status : Common and widespread species.

Family : *Megadermatidae* :62. *Megaderma lyra lyra* Geoffroy

Indian False Vampire.

Distribution :—Punjab (Lahore District, Rawalpindi District—Murree); Baluchistan, Sind (Sukkur, Karachi Districts).

Status : Rare species.

Family : *Rhinolophidae* :63. *Rhinolophus ferrumequinum poximus* Anderson

Greater Horse-shoe Bat.

Distribution :—Northern Area (Gilgit, Dir Districts); N.W.F.P. (Swat District—Kululai); Azad Kashmir.

Status : Less Common than other bat species.

64. *Rhinolophus ferrumequinum irani* Cheesman

Distribution :—Baluchistan (Kalat District—Nushki).

Status : Rare.

65. *Rhinolophus blassi* Peters

Peters' Horseshoe Bat.

Distribution :—Punjab (Lahore District).

Status : Very rare.

66. *Hipposideros bicolor pallidus* Anderson

Bicolour Leaf—nosed Bat.

Distribution :—Punjab (Rawalpindi District); Sind (Sukkur District—Gholamullah; Thatta District—Sujawal and Ghara).

67. *Hipposideros cineraceus cineraceus* Blyth

Distribution :—Punjab (Salt Range).

Status : Very rare.

68. *Asellia tridens murreiana* Anderson
Trident Leaf-nosed Bat.

Distribution :—Sind (Thatta and Karachi Districts); Baluchistan (Makran District—Panjgur and Makran Coast; Nushki).

Status : Local seasonal migrant.

Family : *Mollosidae* :

69. *Tadarida aegyptiaca sindica* Wroughton
Free-tailed Bat.

Distribution :—Sind (Jacobabad District—Kashmor and Tori, Dadu District—Bubak).

Status : Uncommon.

70. *Tadarida aegyptiaca thomasi* Wroughton

Distribution :—Sind (Dadu District—Bubak).

Family : *Vespertilionidae* :

71. *Myotis mystacinus* Kuhl
Whiskered Bat.

Distribution :—Punjab (Rawalpindi District—Murree Hills); N.W.F.P. (Hazara District—Dungagali, Kaghan Valley, Shogran; Dir District).

Status : Common in well forested location.

72. *Eptesicus nilsoni nilsoni* Keyserling & Blasius
Northern Bat.

Distribution :—Northern Area (Gilgit); Azad Kashmir.

73. *Eptesicus masutus masutus* Dobson
Sind Bat.

Distribution :—Sind (Shikarpur District); Baluchistan (Kharan District).

Status : Rare and locally distributed.

74. *Eptesicus isabellinus bottae* Peters
 Isabelline Serotine
 Distribution :—Northern Area (Astor District).
75. *Eptesicus serotinus* Schreber
 Common Serotine
 Distribution :—N.W.F.P. (Hazara District—Dungagali).
 Status : Uncommon.
76. *Nyctalus teisleri* Kuhl
 Lesser Noctule or Hairy—armed Bat.
 Distribution :—Punjab (Rawalpindi District—Murree Hills); N.W.F.P. (Swat District—Kulululai).
 Status : Seasonal Migratory.
77. *Pipistrellus mimus mimus* Wroughton
 Indian Pygmy Pipistrelle.
 Distribution :—Punjab (Rawalpindi District—Salt Range—Kalarkahar); Sind (Thatta District—Mirpur Sakro); N.W.F.P. (Malakand).
78. *Pipistrellus mimus glaucillus* Wroughton
 Distribution :—Punjab (Salt Range, Multan District); Sind (Khairpur District—Gambat; Sukkur District, Larkana District—Naudero, Karachi District—Landhi).
79. *Pipistrellus pipistrellus* Schreber
 Common Pipistrelle.
 Distribution :—Northern Area (Gilgit District).
 Status : Uncommon.
80. *Pipistrellus coromandra* Gray
 Indian Pipistrelle.
 Distribution :—N.W.F.P. (Chitral District, Swat District—Saidu Sharif; Dir District).
81. *Pipistrellus ceylonicus subcanus* Thomas
 Distribution :—Sind (Karachi, Thatta Districts); Punjab (Faisalabad District, Sahiwal District—Khanewal).
 Status : Common in Sind.

82. *Pipistrellus kuhli kuhli* Kuhl

Kuhl's Pipistrelle.

Distribution :—Sind (Jacobabad District—Kashmor, Hyderabad, Sukkur Districts, Thatta District—Mirpur Sakro; Khairpur District Gambat); Baluchistan (Makran District—Panjgur); Punjab (Faisalabad, Muzaffargarh Districts, Dera Ghazi Khan District—Rajanpur).

Status : Common.

83. *Pipistrellus babu* Thomas

Distribution :—Punjab (Rawalpindi District—Murree).

84. *Pipistrellus dormeri* Dobson

Dormer's Bat.

Distribution :—Punjab (Sialkot District).

Status : Very rare.

85. *Barbastella bucomelas* Cretz-Schmar

Asian Barbastelle or Asiatic Wide-eared Bat.

Distribution :—N.W.F.P. (Hazara District—Dungagali); Northern Area (Gilgit District—Naltar).

Status : Very rare.

86. *Scotophilus kuhli* Leach

Lesser Yellow Bat or Temminck's House Bat.

Distribution :—Punjab (Lahore District—Changa Manga).

Status : Uncommon.

87. *Nycticeius pallidus* Dobson

Yellow Desert Bat.

Distribution :—Sind (Jacobabad District—Kashmor, Larkana District—Naudero; Shikarpur, Tharparkar and Dadu Districts); Punjab (Muzaffargarh District, Sialkot District—Kalian).

Status : Rare.

88. *Otonycteris hemprichi hemprichi* Peters

Hemprich's Long-eared Bat.

Distribution :—Northern Area (Gilgit District).

89. *Murina huttoni tubinaria* Scully

Tube-nosed Bat.

Distribution :—Punjab (Rawalpindi District—Murree Hills); Northern Area (Gilgit District—Naltar Valley); Azad Kashmir.

Status : Uncommon.

90. *Plecotus auritus puck* Barrett-Hamilton

Distribution :—Punjab (Rawalpindi District—Murree).

91. *Plecotus austriacus* Fischer

Grey Long-eared Bat.

Distribution :—Punjab (Rawalpindi District—Murree Hills); N.W.F.P. (Hazara District—Shogran, Sharan, Dongagali); Northern Area (Gilgit, Astor).

Order : *Rodentia*

Family : *Sciuridae* :

92. *Petaurista petaurista albiventer* (Gray)

The Large Red Flying Squirrel.

Distribution :—Punjab (Rawalpindi District—Murree Hills, Islamabad); N.W.F.P. (Hazara District—Dungagali, Shogran, Naran); and Azad Kashmir (Neelum Valley).

Status : Confined to moist temperate forest areas.

93. *Hylopetes fimbriatus fimbriatus* (Gray)

The Smaller Kashmir Flying Squirrel.

Distribution :—Punjab (Rawalpindi District—Murree, Bhurban, Gharial); N.W.F.P. (Hazara District—Thandiani, Dongagali; Chitral, Dir and Swat Districts); Northern Area (Gilgit District), and Azad Kashmir.

Status : Commonest squirrel in the Himalayan forest.

94. *Hylopetes fimbriatus baberi* (Blyth)

Distribution :—N.W.F.P. (Hazara District—Kaghan Valley).

95. *Eupetaurus cinereus* Thomas

The Woolly Flying Squirrel.

Distribution :—N.W.F.P. (Chitral and Hazara Districts); Northern Area (Gilgit, Naltar, Hunza, Astor); Azad Kashmir.

Status : Rarer mammals in the world, confined to remote valleys of Himalayas.

96. *Funambulus pennanti* Wroughton

The Northern Five Striped Palm Squirrel.

Distribution :—Punjab (Multan, Rawalpindi Districts; Kallar Kahar Sodhi and Choan in Salt Range, Cholistan, Kala Chitta); N.W.F.P. (Kohat, Peshawar, Bannu Districts); Baluchistan (Gajar, Kalat, Mand, Turbat areas); Sind (Jacobabad District—Kashmor, Kandkot; Larkana District—Naudero; Tharparkar District, Sukkur District—Pano Aqil; Khairpur, Shikarpur Districts, Dadu District—Sehwan; Thatta District—Gharo).

Status : Very common.

97. *Marmota caudata caudata* (Jacquemont)

The Long-tailed Marmot.

Distribution :—N.W.F.P. (Swat Distt. Hazara District—Kaghan Valley); Northern Area (Baltistan, Gilgit Districts, Diamir District Astor).

Status : Usually found above the tree line.

98. *Marmota caudata aurea* (Blanford)

The Golden Marmot.

Distribution :—N.W.F.P. (Chitral).

99. *Marmota bobak himalayana* (Hodgson)

The Himalayan Marmot.

Distribution :—N.W.F.P. (Hazara, Swat and Chitral Districts); Northern Area (Skardu—Baltistan); Azad Kashmir.

Family : *Mystricidae* ;

100. *Hystrix indica* Kerr

The Indian Crested Porcupine.

Distribution :—Punjab (Salt range; Rawalpindi Distt.—Murree, Margalla Hills); N.W.F.P. (Chitral, Hazara, Bannu Districts); Sind (Tharparkar District, Mirpur, Khairpur District—Gambat); Baluchistan.

Status : Common.

Family : *Dipodidae* :

101. *Sicista concolor leathemi* (Thomas)

The Kashmir Birch Mouse.

Distribution :—N.W.F.P. (Hazara District—Kaghan Valley); Northern Area (Gilgit District, Diamir District—Astor).

Status : Confined to high altitudes.

102. *Sicista concolor flavus* (True)
Distribution :—Azad Kashmir.
103. *Allactaga elater indica* Gray
The Smaller Afghan Jerboa.
Distribution :—Baluchistan (Chagai District—Nushki, Dalbandin, Nok kundi; Kalat District—Surab, Quetta Distt.—Chaman, Pishin, Loralai).
104. *Allactaga hotsoni* Thomas
The Hotson's Five-toed Jerboa.
Distribution :—Baluchistan (Chagai District—Nok kundi, Aman Bostan; Makran District—Panjgur, Kharan District).
Status : Very rare.
105. *Jaculus blanfordi* Murray
The Greater three-toed Jerboa.
Distribution :—Baluchistan (Chagai, Dalbandin, Nushki, Kharan).
Status : Rare.
Family : *Muscardinidae* :
106. *Dryomys nitedula picta* (Blanford)
Blanford's Dormouse.
Distribution :—N.W.F.P. (Dir, Swat Distts. Kurram Valley—Khyber Agency); Baluchistan (Kalat District—Harboi Hills, Quetta Distt.—Urak Valley, Wan).
Status : Rare.
Family : *Muridae* :
107. *Calomyscus bailwardi bailwardi* Thomas
The Mouse-like Hamster.
Distribution :—Baluchistan (Kalat District—Harboi and Chiltan Hills).
108. *Calomyscus bailwardi hotsoni* Thomas
Distribution :—Baluchistan (Makran District—Gwambuk Kaul, Panjgur).
109. *Cricetulus migratorius migratorius* (Pallas)
The little grey Hamster.
Distribution :—Baluchistan (Pishin and Kalat Districts); N.W.F.P. (South Waziristan, Kurram Valley).

110. *Cricetulus migratorius fulvus* (Blanford)

The Migratory Hamster.

Distribution :—Northern Area (Gilgit District).

111. *Gerbillus dasyurus indus* (Thomas)

The Wagner's Gerbil.

Distribution:—Sind (Larkana District, Khairpur District—Gambat, Ranikot; Dadu District—Sehwan, Sukkur District—Pano Aqil); Punjab (Sahiwal, Faisalabad, Bahawalpur, D. G. Khan Districts; Salt Range); N.W.F.P. (Kasi Bridge, South Waziristan and Dera Ismail Khan Districts).

112. *Gerbillus nanus nanus* Blanford

The little Gerbil.

Distribution :—Baluchistan (Dander, Kuldar, Pasni).

113. *Gerbillus gleadowi* Murray

The little Hairy-footed Gerbil.

Distribution : Punjab (Salt Range-Chakri ; Cholistan and Thal Deserts); Sind (Sukkur District-Rohri, Tharparkar Dist.-Umarkot).

114. *Gerbillus cheesmani* Thomas

The Cheesman's Gerbil.

Distribution.—Baluchistan (Chagai Dist. -Nok kundi, Dalbandin).

Status : Very rare.

115. *Tatera indica indica* (Hardwicke)

The Indian Gerbil or Antelope-Rat.

Distribution :—Baluchistan (Khojdar, Mand, Panjgur, Turbat, Lasbela); Sind (Jacobabad, Sukkur, Shikarpur, Tharparkar, Dadu Districts); Punjab (Kallarkahar Sakesar in Salt Range, Attock District ; Islamabad Margalla Hills); N.W.F.P. (Peshawar, Bannu Districts).

116. *Meriones hurrianae* (Jerdon)

The Indian Desert Gerbil.

Distribution :—Sind (Tharparkar Dist.-Umarkot, Mirpur, Khairpur Distt.; Gambat; Karachi Distt.; Dadu Distt.-Kotri; Sukkur Dist.); Baluchistan (Makran-Dasht, Nal, Wadh, Chambar); N.W.F.P. (Kohat Distt.) and Punjab.

Status : Fairly common.

117. *Meriones persicus persicus* (Blanford)

Blanford's Jird.

Distribution :—Baluchistan (Makran and Kalat Districts).

118. *Meriones persicus baptistae* Thomas

The Persian Jird.

Distribution :—Baluchistan (Makran, Kuldur, Kalat, Turbat).

119. *Meriones libycus erythrourus* (Gray)

The Afghan Gerbil or Jird.

Distribution :—Baluchistan (Kalat, Surab, Quetta).

120. *Meriones crassus swinhoei* (Scully)

Swinhoe's Jird.

Distribution :—N.W.F.P. (Wana, South Waziristan); Baluchistan (Makran Dist.-Panjgur, Chagai Dist.-Nok kundi, Dalbandin; Loralai; Kharan & Khuzdar Districts).

Status : Uncommon.

121. *Rhombomys opimus* (Lichtenstein)

The Great Gerbil.

Distribution :—Baluchistan (Chagai Dist.-Nushki).

Status : Very rare.

122. *Alticola stoliczkanus stracheyi* (Thomas)

Stoliczka's Vole.

Distribution :—N.W.F.P. (Kurram Valley).

123. *Alticola roylei blanfordi* (Scully)

The Gilgit Vole.

Distribution :—Northern Area (Gilgit between 9000' & 10000').

124. *Alticola roylei montosa* (True)

Distribution :—N.W.F.P. (Hazara Dist., Kaghan Valley, Kohat Dist.); Northern Area (Diamit Dist.—Astor).

125. *Alticola roylei glacialis* Miller

Distribution :—Northern Area (Skardu, Baltistan District).

126. *Hyperacrius wyhnei* (Blanford)
The Murree Vole.
Distribution :—Punjab (Rawalpindi Dist.-Murree, Gharial); N. W. F. P. (Hazara Dist.-Dungagali, Shogran).
Status : Common in region where it occurs.
127. *Hyperacrius fertilis fertilis* (True)
True's Vole.
Distribution :—N.W.F.P. (Hazara Dist.-Kaghan Valley, Swat Dist.-Utrot, Ushu; Dir Dist.-Lowarai Pass); Northern Area (Gilgit District-Chilas).
128. *Ellobius fuscocapillus* (Blyth)
The Quetta Mole-Vole.
Distribution :—Baluchistan (Much near Quetta).
Status : Very rare.
129. *Apodemus flavicollis rusiges* (Miller)
The Larger Longtailed Field Mouse.
Distribution :—Punjab (Rawalpindi Dist.-Murree); N.W.F.P.(Hazara Dist.—Kaghan Valley); Northern Area (Skardu, Baltistan Dist.).
130. *Apodemus sylvaticus pentax* (Wroughton)
The Wood Mouse or Field Mouse.
Distribution :—Punjab (Rawalpindi Dist.—Gharial & Murree); N.W.F.P. (Swat, Chitral Districts, Hazara Dist.-Thandiani); Northern Area (Gilgit District).
Status : Common in sparsely populated arid mountainous regions.
131. *Rattus rattus alexandrinus* (Desmarest)
The Roof Rat.
Distribution :—Punjab (Attock Dist.); Sind (Jacobabad Dist. Kashmor; Khairpur & Sukkur Dists.); Baluchistan (Makran Coast).
Status : Common.
132. *Rattus rattus rufescens* (Gray)
Distribution :—Punjab (Rawalpindi District and Salt Range); Sind (Sukkur District-Panoaqil; Tharparkar District Umarmot).

133. *Rattus rattoides turkestanicus* (Satunin)

The Turkestan Rat.

Distribution :—Northern Area (Gilgit); Punjab (Rawalpindi Dist.—Murree, Salt Range-Sakesar, Attock Dist.); N.W.F.P. (Chitral, Dir, Swat Districts, Hazara District-Dungagali).

Status : Locally seasonal migrant.

134. *Rattus nitidus nitidus* (Hodgson):

The Himalayan Rat.

Distribution :—Punjab (Murree).

135. *Rattus norvegicus* Berkenhout

The Brown Rat or Sewer Rat.

Distribution :—Sind (Karachi District), Baluchistan (Mekran Coast-Pasni).

Status : Common in Karachi Port Area.

136. *Millardia gleadowi* (Murray)

The Sand-coloured Rat.

Distribution :—Punjab (Dera Ghazi Khan District); Sind (Karachi, Hyderabad, Tharparkar Dists.); N.W.F.P. (Kirgi Bridge, South Waziristan).

Status : Rare.

137. *Millardia meltada pallidior* (Ryley)

The Soft-furred Field-Rat or Metad.

Distribution :—Punjab (Bahawalnagar, Gujrat, Faisalabad Districts, Lahore District-Changa Manga, Sialkot District-Kalian, Salt Range); Sind (Tharparkar District-Umarkot; Thatta District-Mirpur Sakro).

Status : Fairly common.

138. *Mus musculus bactrianus* Blyth

The House Mouse.

Distribution :—Punjab (Salt Range—Rohtas, Kallarkahar, Sakesar; Jhelum Dist., Rawalpindi Dist.,-Lehtrar, Banni and Patriata near Murree, Sialkot District-Jhalar & Chakdulla; Attock Dist.); Baluchistan (Quetta, Bambier, Kach, Kalegar, Kalat, Khuzdar, Mand, Panjgur, Mustang, Surab, Turbat); Sind (Jacobabad District-Kashmor; Larkana District-Naudero; Khairpur Dist.-Gambat; Tharparkar District-Umarkot).

Status : Common.

139. *Mus musculus homourus* Hodgson
Distribution :—Azad Kashmir
140. *Mus platythrix sadhu* (Wroughton)
The Indian Brown Spiny Mouse.
Distribution :—Punjab (Lahore District) ; Sind.
141. *Mus booduga booduga* (Gray)
The little Indian Field Mouse.
Distribution :—Punjab (Rawalpindi District).
Status : Uncommon.
142. *Acomys cahirinus flavidus* Thomas
The Spiny Mouse.
Distribution :—Sind (Dadu District Laki Hills, Sehwan).
143. *Golunda ellioti myothrix* (Hodgson)
The Indian Bush - Rat.
Distribution :—Punjab (Salt Range-Dhalwal and Sakesar).
144. *Golunda ellioti watsoni* (Blanford)
Distribution :—Sind (Thatta Distt. Karachi District.-Landhi; Khairpur District—Gambat; Jacobabad, Larkana District-Naudero, Sukkur District); Baluchistan (Lasbella Distt.-Hab Valley) ; N.W.F.P.
145. *Acomys cahirinus* Desmarest
The Cairy Spiny Mouse.
Distribution :—Sind (Dadu Distt.—Kirthar Range-Karchat Hills).
Status - Very rare.
146. *Nesokia indica indica* (Gray)
The short-tailed Mole Rat or Bandicoot Rat.
Distribution :—Sind (Tharparkar District-Umarkot, Pithoro; Sukkur District-Pano Aqil; Jacobabad District Chak) ; N.W.F.P. (Chitral, Bannu & Mardan, South Waziristan, Kohat Districts); Baluchistan (Kalat, Khuzdar and Quetta Distts.) Punjab (Salt Range, Rawalpindi District, Attock Distt.—Hasan Abdal).
Status : Common in agricultural areas.

147. *Nesokia indica huttoni* (Blyth)

Distribution :—Baluchistan (Makran District-Panjgur).

148. *Bandicota bengalensis kok* (Gray)

The Indian Mole Rat.

Distribution :—Sind (Tharparkar District-Pithoro and Umarnkot).

149. *Bandicota bengalensis wardi* (Wroughton)

Distribution :—Azad Kashmir (Chakothe).

Order : *Lagomorpha*.

Family : *Leporidae*

150. *Lepus capensis tibetanus* Waterhouse

Cape Hare.

Distribution :—N.W.F.P. (Kohat District-Mariwam, Bilyamina, Shinawari, Teri, Shewaki, Darmalak, Dhoda, Gurgolot, Resi, Borraka, Kandar dam, Tanda dam ; Bannu District-Thanedarwala, Lakki ; D. I. Khan District-Chargh wali Bela, Sagu Jungle; Mardan District-Kohi Barmol, Sangao, Babozai, Badam, Biroch, Natian, Karmar, Hand ; Peshawar District-Nizam-pur Kaka Saheb, Chirat; Khyber Agency-Kurram Valley); Northern Area (Gilgit District); Baluchistan (Makran Distt. Panjgur; Kalat, Quetta, Zhob districts).

151. *Lepus arabis craspedotis* Blanford

The Arabian Hare.

Distribution :—Baluchistan (Quetta District-Pishin; Khuzdar District, Makran District-Panjgur, Sur).

Status : Rare.

152. *Lepus nigricollis dayanus* Blanford

The Indian Hare.

Distribution :— Punjab (Salt Range-Nurpur, Ara, Bahawalpur, Dera Ghazi Khan, Multan, Jhelum and Sargodha Districts); Sind (Jacobabad, Sukkur, Hyderabad & Sanghar Districts, Larkana District-Naudero, Dadu District-Sehwan, Kirthar range; Karachi District-Hub Valley); Baluchistan (Lasbela District-Hub Valley, Sibi Distt.), N. W. F. P. (Dera Ismail Khan District).

Family : *Ochotonidae*

153. *Ochotona roylei wardi* Bonhote
The Himalayan Mouse Hare
Distribution :—N.W.F.P. (Hazara, Swat, Chitral Districts), Northern Area (Gilgit District).
154. *Ochotona roylei baltina* Thomas
Royle's Pika or Indian Pika
Distribution :—Northern Area (Baltistan-Nurh, River Indus east of Skardu).
155. *Ochotona rufescens* Gray
Afghan Pika or collared Pika
Distribution :—Baluchistan (Kalat Distt.-Gishk Hills; Koh-i-Maran Range, Chiltan Hills), N.W.F.P., (Waziristan, Kurram Valley).
Status : Rare.
Order : *Perissodactyla*.
Family : *Equidae*
156. *Equus hemionus khur* (Lesson)
The Indian Wild Ass.
Distribution :—Sind (Tharparkar District near Rann of Cutch); Baluchistan.
Status : Rare & Endangered.
Order : *Artiodactyla*.
Family : *Bovidae*
157. *Ovis orientalis vignei* Blyth
The Shapu, or Urial.
Distribution :—N.W.F.P. (Khyber & Malakand Agencies, Waziristan—Kunhar river, Kohat District-Tari, Darmalak, Gurgolot, Borraka, Chitral District); Baluchistan (Quetta District-Maslakh); Northern Area (Biltistan, Gilgit District, Diamir District-Astor) ; Azad Kashmir.
158. *Ovis orientalis blanfordi* Hume
The Baluchistan Urial or Gad.
Distribution :—Sind (Dadu District-Kirthar Range); Baluchistan (Quetta, Kharan Districts, Makran District-Panjgur, Turbat, Hinglaj Hills, Lasbella District Kalat Distt.—Gishk Hills, Zambaza range, Daman Ghar range, Takhatu range, Chiltan Hills).

159. *Ovis orientalis punjabiensis* Lydekker

The Salt Range Urial.

Distribution :—Punjab (Attock Dist. Attock hills; Kala Chitta Hills; Salt Range, Sargodha, Jhelum & Mianwali districts).

Status : Rare.

160. *Ovis ammon polii* Blyth

Marco Polo's Sheep.

Distribution :—Northern Area (Hunza, Khunjerab Pass, Killick Pass).

Status : Endangered, Migratis in winter from Chinese Turkistan, Hindu Kush mountains.

161. *Pseudois nayaur* Hodgson

The Bharal or Blue Sheep.

Distribution :—Northern Area, (Baltistan-Karakoram Range, Shigar, Shinishar, Passu Valley Hunza).

Status : Rare.

162. *Capra ibex sibirica* (Pallas)

The Ibex.

Distribution :—N.W.F.P. (Swat Distt., Para Chunar, Safed Koh; Hazara District-Kaghan Forest Division; Chitral district), Northern Area (Gilgit, Baltistan, Diamir Districts); Azad Kashmir.

163. *Capra hircus blythi* Hume

The Sind Wild Goat.

Distribution :—Sind (Dadu District-Kirthar Range); Baluchistan (Makran, Lasbela, Kalat, Kharan Districts; Koh-i-Maran, Dhader, Kolwa Kupp, Hingol ranges, Shab Narani Hills).

164. *Capra falconeri cashmiriensis* Lydekker

The Pir Panjal Markhor.

Distribution :—Northern Area (Gilgit and Baltistan Districts); Pir Panjal Mountains ; N. W. F. P. (Chitral, Dir, Swat districts—Suddakh Sar, Mankial); Azad Kashmir. (Kaji Nag range, Neelam Valley).

165. *Capra falconeri falconeri* (Wagner)

The Astor Markhor.

Distribution :—Northern Area Diamir District-Astor, Chilas, Baltistan Distt., Ishkomal, (Gilgit District—Karga Nullah, Naltar Valley).

166. *Capra falconeri jerdoni* Hume

The Suleman Markhor.

Distribution :—Punjab (Dera Ghazi Khan District-Suleman Range; Kala Bagh); N.W.F.P. (Dera Ismail Khan District, Swat District-Mankial, Karakar, South Waziristan, Chitral, Bannu Districts); Baluchistan (Quetta District-Suleman Range, Murdar, Takhatu, Zarghun, Kalophat, Philgarh, gurchani Hills Zhob Distt.—Toba Kakar range).

Status : Rare and endangered.

167. *Capra falconeri megaceros* Hutton

The Kabul Markhor.

Distribution :—N.W.F.P. (Hills on Northern edge of Peshawar District, Swat district-Murghazar hills; Chitral, Parachinar, Bannu Distts., Malakand Agency—Khanori Hills; Kurram Valley; Mardan Distt.—Sakra range).

168. *Capra falconeri chiltanensis* Lydekker

The Chiltan Markhor.

Distribution :—Baluchistan (Quetta Distt.—Chiltan Range, Koh-i-Maran, Takatu, Zarghum, Murdar Hills).

169. *Hemitragus jemlahicus jemlahicus* (H. Smith)

The Himalayan Tahr.

Distribution :—Northern Area (Hunza and Nagar); Pir Panjal Mountain.

Status : Endangered.

170. *Nemorhaedus goral goral* (Hardwicke)

The Grey Goral.

Distribution :—Punjab (Islamabad—Margalla hills, Rawalpindi Distt.—Murree Foot Hills); N.W.F.P. (Hazara District—Serikot, Haripur Forest Division, Bagomar Valley; Swat District—Murghazar, Kingargali, Jangdara Dosari, Karakar, Puran Amnawar, Dandikot, Khujoorj; Malakand Agency—Khanori Hills; Pashawar Distt.—Cherut Hills); Azad Kashmir (Neelum Valley).

Status ; Rare.

171. *Gazella gazella bennetti* (Sykes)

The Chinkara or Indian Gazelle.

Distribution :—Sind (Khairpur, Sukkur, Tharparkar Districts, Dadu District—Kirthar Range); Baluchistan (Khuzdar District—Gajar, Kharan District—Gwazgi; Mekran District—Turbat, Panjgur, Dasht; Zhob Distt.); Punjab (Cholistan; Salt range; Dera Ghazi Khan, Muzaffargarh, Jhelum & Mianwali Districts; Attock District—Kalachitta Hills, Rawalpindi District—Potwar).

Status : Rare.

172. *Gazella subgutturosa cistanica* Lydekker

Goitred Gazelle.

Distribution :—Baluchistan (Nushki, Chagai Distt.—Nushki; Quetta Distt.—Chaman, Zarghum; Makran, Kalat & Kharan Districts).

Status : Rare and endangered.

173. *Antelope cervicapra cervicapra* (Linn.)

The Black Buck or Indian Antelope.

Distribution :—Punjab (Bahawalnagar Distt.—Fort Abbas, Cholistan); Sind (Tharparkar Distt.).

Status : Vagrant in the border areas, rare & endangered.

174. *Boselaphus tragocamelus* (Pallas)

The Nilgai, or Blue Bull.

Distribution :—Punjab (Lahore District—Chhangamanga; Kasur District, Indian border from Bajwat to Sulemanki; Bahawal Nagar, Distt.), Azad Kashmir (Mirpur District—Rakh Vatala; Lower Jhelum Valley).

Status : Straggler.

Family : *Cervidae*:

175. *Cervus elaphus hanglu* Wagner

The Kashmir Stag or Hangul.

Distribution :—Northern Area (Straggler in Gilgit District) and Azad Kashmir (Neelum Valley).

Status : Endangered.

176. *Axis porcinus porcinus* (Zimmermann)

The Hog-Deer.

Distribution :—Punjab (Sahiwal Distt.—Pirawala Forest. Bahawalpur Distt.—Jamal Din Walli, Riverine Areas of Muzaffargarh District, Dera Ghazi Khan District-Gahazi Ghat; Lahore District-Batapur; Attock District); Sind (Thatta, Dadu, Nawabshah Districts, Hyderabad District-Rajhari Forest Reserve, Sukkur District-Kethi Shahu Forest Reserve, Jacobabad District-Kandkot; Larkana & Sanghar Districts); N.W.F.P. (D. I. Khan District), Baluchistan (Quetta District-Pishin; Sibi District-Harnai).

Status : Rare and endangered.

177. *Muntiacus muntjak vaginalis* (Boddaert)

The Muntjac, or Barking Deer.

Distribution :—Punjab (Islamabad-Margalla Hills); Azad Kashmir (Jhelum Valley-Sagian, Sapalahi, Nawan, Malkal).

Status : Rare and endangered.

178. *Moschus moschiferus moschiferus* Linn.

The Musk Deer.

Distribution :—N.W.F.P. (Hazara District-Kaghan Forest Division; Dir District-Komrat; Swat District-Kalam; Chitral District, Kurrum Agency); Northern Area (found above 11000' in Betula & Rhododendron Forests; Gilgit, Distt.-Kargah Village) Diamir Distt.-Chilas, Darel, Astor, Baltistan, and Azad Kashmir.

Status : Rare & endangered.

Order : *Artiodactyla*.Family : *Suidae* ?179. *Sus scrofa cristatus* Wagner

The Indian Wild Boar.

Distribution :—N.W.F.P. (Peshawar, Mardan, Bannu, D. I. Khan Districts Chitral Valley), Punjab (Rawalpindi Distt.—Murree Foot Hills, Margalla Hills; Attock Distt.—Kalachitta Hills; Bahawalpur, Mianwali Distts; Lahore Distt.—Chhangamanga; Gujranwala, Muzaffargarh Distt; Saltrange); Sind.

Order : *Pholidota*.Family : *Manidae* :

180. *Manis crassicaudata* Gray

Indian Pangolin or Scaly Anteater.

Distribution :—Punjab (Salt Range; Sialkot, Jhelum, Gujrat, Attock Distt. Sind (Hyderabad, Tharparkar, Larkana, Jacobabad, Karachi & Sukkur District, Dadu District-Kirthar Range); Baluchistan (Makran, Lasbela, Quetta & Sibi Districts); N.W.F.P. (Peshawar, Mardan, Kohat Distts.).

Order : *Cetacea*.Family : *Balaenopteridae*181. *Balaenoptera musculus* Linn.

Blue Whale.

Distribution :—Sind and Baluchistan Coasts.

182. *Balaenoptera physalus* Linnaeus

The Common Rorqual.

Distribution :—Baluchistan Coast.

Family : *Platanistidae*183. *Platanista indi* Blyth

The Indus Dolphin.

Distribution :—Punjab (River Chenab-between Panjnad and Trimmu Barrage ; River Sutlej-Sulemanki Head Works); Sind (River Indus-Between Guddu, Sukkur & Kotri Barrages).

Status : Endangered.

Family : *Physeteridae* :184. *Physeter catodon* Linn.

Sperm Whale.

Distribution :—Sind & Baluchistan Coasts.

Family : *Delphinidae*185. *Sotalia plumbea* Cuvier

Plumbeous Dolphin.

Distribution :—Sind (Karachi Coast, Creeks at Indus mouth) ; Baluchistan (Makran Coast—Gwadar; Lasbela Distt.—Somiani Bay).

186. *Tursiops aduncus* (Ehrenberg)

Red Sea Bottlenosed Dolphin.

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

Family : *Phocaenidae* :187. *Neomeris phocaenoides* (Cuvier)

Little Indian Porpoise.

Distribution :—Sind (Karachi Coast, Kuddi, Mull, Khai, Dubla Creeks); Baluchistan (Makran District-Hingol river's estuary Creeks and Inlets all along Makran coast; Lasbela District-Sonmiani Hor).

Family : *Platanistidae*188. *Platanista gangetica* (Lebeck) :

Gangetic Dolphin.

Distribution :—Punjab (River Indus upto Head Ganda singh wala); Sind (River Indus); N.W.F.P.

Status : Rare.

REFERENCES

1. Blanford, W.T. 1888-91 .. Fauna of British India—Mammalia.
2. Ellerman, J.R. & Morrison—Scot, T.C. 1951 .. Checklist of Palaearctic and Indian Mammals 1758 to 1946. British Museum (Natural History).
3. Ellerman, J.R. 1961 .. The Fauna of India—Mammalia, Vol. 3. Rodentia (Parts 1 & 2). Zoological Survey of India, Calcutta.
4. Roberts, T. J. 1977 .. The mammals of Pakistan. Ernest Benn Limited, London.
5. Jerdon, T. C. 1874 .. The Mammals of India. John Wheldon, London.
6. Khan, Y. M. 1977 .. Wildlife Population Census, N. W. F. P. (Unpublished report).
7. Pocock, R.I. 1939-41 .. Fauna of British India Mammalia Vol. I Primates, Carnivora, Vol. II Carnivora.
8. Prater, S.H. 1965 .. The Book of Indian Mammals.
9. Siddiqi, M.S.U. 1961 .. A checklist of Mammals of Pakistan with particular reference to the Mammalian collection in the British Museum (Natural History), London. Biologia, Vol. 7, No. 2.
10. Siddiqi, M.S.U. 1969 .. Fauna of Pakistan. Agriculture Research Council, Government of Pakistan, Karachi.
11. Sterndale, R.A. 1884 .. Natural History of the Mammalia of India & Ceylon, Thacker & Spink, Calcutta.
12. Taber, R.D., Sheri, A.N & Ahmad, M.S. 1967 .. Mammals of the Lyallpur Region—West Pakistan. Journ. Mammalogy, Vol. 48, No. 3. PP. 392—407.

A CHECK-LIST OF ELASMOBRANCH FISHES OF PAKISTAN.

BY

M. FAROOQ AHMAD

&

M. SADIQ NIAZI

INTRODUCTION

The first consolidated work on fishes of the Indian region is from F. Day (1878—88, 1889) in which he mentioned only sixteen species of elasmobranch fishes from different localities now in Pakistan. Among others, Zugmayer (1913) reported 12 species and Garman (1913) 3 species from Mekran Coast. Murray (1884—1887) reported 2 species and many others like Gunther (1883), Lloyd (1906, 1908 & 1909), Englehardt (1912) and Whitley (1936) reported one species each from different localities in Pakistan. Misra (1969) reported 61 species from Pakistan. Among Pakistani workers M.R. Qureshi (1952, 1953, 1955) described 33 species, and Jalleel and Khaleeluddin (1972) reported 58 species. The present checklist is based on the previously reported fishes as well as personal observations during inshore and offshore faunistic surveys. It contains 83 species of elasmobranch fishes consisting of 3 Orders 16 Families and 40 Genera. *Isurus guntheri* and *Raja reversa* are endemic species whereas *Chaenogaleus balfouri*, *Centroscyllium ornatum*, *Himantura favus*, *Rhinoptera sewelli* and *Narcine brunea* are restricted to the north of the Equator in Indian Ocean. The remaining species have a wide range of distribution being found in the Indo-Pacific, Mediteranian, Atlantic and Arcaic Oceans either both sides of the Equator or any side of it. But, however, *Sphyrna mokarran*, *Carcharhinus ellioti*, *Gymnura micrura*, *Amphotistius imbricata*, *Himantura bleekeri*, *Rhinoptera adspersa* and *Narke dipterygia* are found to be restricted to the north of the Equator in the Indo-Pacific region. *Scyliorhinus capense*, *Centroscyllium ornatum*, *Heteroscymnoides marleyi* and *Raja reversa* are bathypelagic and the remaining species are pelagic or littoral in the Indian Ocean.

Under each species references are given which contain localities of Pakistan in the description or distribution of the species. Simplified keys are also given in the beginning.

**SIMPLIFIED KEYS TO ORDERS, FAMILIES & SPECIES OF ELASMO-
BRANCH FISHES OF PAKISTAN**

Key to orders of Class Elasmobranchii:

- | | | |
|---|--------|---------------------|
| 1. Gill openings lateral, two dorsals (Super-order; Selachoidei) | 5 | |
| Gill openings ventral, dorsals absent, if present located on tail or reduced to spines (Super-order; Batoidei) | 3 | |
| 2. Anal fin present | Order: | LAMNIFORMES |
| Anal fin absent | Order: | SQUALIFORMES |
| 3. Electric organs present between head and pectorals | | |
| Order; TORPEDINIFORMES (Torpidinidae) | | |
| 4. Electric organs absent | Order: | RAJIFORMES. |

Key to Families of Order Lamniformes.

- | | | |
|--|---|------------------------|
| 1. Nictitating membrane present or vestigial (Super-order: scyliorhinoidei) | 2 | |
| Nictitating membrane absent (Super-Order Lamnoidei) | 4 | |
| 2. Head with lateral expansions (Oculonarial expansion) | | Sphyrnidae |
| Head without lateral expansions | 3 | |
| 3. Anal fin before second dorsal fin. | | Scyliorhinidae |
| Anal fin opposite second dorsal fin. | | Carcharhinidae. |
| 4. Nasoral grooves present | | Orectolobidae. |
| Nasoral grooves absent | 5 | |
| 5. Second dorsal & anal fins large | | Odontaspidae. |
| Second dorsal & anal fins small | | Lamnidae. |

Key to Families of Order Squaliformes.

- | | | |
|--------------------------------|--|--------------------|
| 1. Dorsals with a spine | | |
| Dorsals without spine | | Squalidae. |
| | | Delatiidae. |

Key to Families of Order Rajiformes.

- | | | |
|---|---|-------------------|
| 1. Rostrum much produced, saw-like | | |
| Rostrum not saw-like | 2 | Pristidae. |
| 2. Tail not whip-like, without spines, two small dorsals | | 6 |
| Tail whip-like, dorsals reduced to spines | 3 | |

3. Head distinct from disc, with a prominent snout 4
- Head not distinct from disc, without prominent snout. **Dasyatidae.**
4. With horn-like cephalic flippers ... **Mobulidae.**
- Without horn-like cephalic flippers ... 5
5. Snout in single lobe ... **Myliobatidae.**
- Snout in two separate lobes ... **Rhinopteridae.**
6. Disc triangular, elongate, tail strong, depressed, caudal well developed. 7
- Disc rhomboid, tail weak, caudal rudimentary or absent **Rajidae.**
7. First dorsal fin above pelvics ... **Rhynchobatidae.**
- First dorsal fin far behind pelvics ... **Rhinobatidae.**

Key to Species of Family Orectolobidae

1. Tail without lateral keels & pits, nasoral grooves & cirri present (Sub-Orectolobini) 2
- Tail with lateral keels & pits, nasoral grooves present, cirri absent (Sub-family: Rhineodontini, Genus: Rhincodon) *Rhincodon typus* Smith
2. First dorsal behind pelvics, dermal ridges on back (Genus: *Chiloscyllium*) ... 3
- First dorsal opposite pelvics, without dermal ridges ... 4
3. With three dermal ridges on back ... *Chiloscyllium indicus* (Gmel.)
- With one dermal ridge on back ... *Chiloscyllium griseum* M&H.
4. Caudal fin long (Genus: *Stegostoma*) ... *Stegostoma varius* (Seba)
- Caudal fin short (Genus: *Nebrius*) ... 5
5. Second dorsal fin longer than anal fin *Nebrius concolor* Rupp.
- Second dorsal fin smaller than anal fin *Nebrius ferrugineus* (Lesson)

FAMILY ODENTASPIDAE

Only one genus: *Carcharias* and one species. *Carcharias triacanthatus* Day is represented in the fish fauna of Pakistan.

Key to Species of Family Lamnidae,

1. Caudal fin very large, lateral keel, on tail absent
(Sub-family; Alopiini, Genus; *Alopias*)... *Alopias vulpinus* (Broun)
2. Caudal fin normal, lateral keel on tail present
(Sub-Family; Lamnini, Genus; *Isurus*) ... 2
2. Lateral line keeled from behind eye over gill opening to side of tail ... *Isurus guntheri* (Murray)
- Lateral line keeled only along the side of tail ... *Isurus glauca* (M. & H.)

Key to Species of Family Scyliorhinidae.

- f. Base of anal distinctly longer than base of second dorsal, head depressed *Scyliorhinus capense* (Smith)**
- Base of anal equal to base of second dorsal, head subcylindrically compressed *Atelomycterus marmoratum* (Bonn)
- **a: Labial folds on lower jaw only. ... *Scyliorhinus capense* (Smith)
- b: Labial folds on both jaws
- c: First dorsal smaller than second; nasal cirri well developed *Halaelurus alcockii* (Garman).
- d: Dorsals subequal, nasal cirri rudimentary *Halaelurus guagga* (Alc.)

Key to species of the Family Carcharbinidae.

1. Spiracle present 2
- Spiracle absent. 4
2. Caudal pit absent. (Genus; *Mustelus*) *Mustelus manazo* Blkr.
- Caudal pit present 3
3. Teeth monomorphous, lower serrated on both edges. (Genus; *Galeocerdo*) *Galeocerdo cuvier* (Le Sueur)
- Teeth dimorphous, lower smooth or finely serrated. (Genus; *Chaenogaleus*) *Chaenogaleus balfouri* (Day)**

**Teeth dimorphous... Genus; *Chaenogaleus* & *Hemipristis*.

- a: Lower teeth erect, smooth *Chaenogaleus balfouri* (Day)
- b: Lower teeth curved inward, finely serrated. ... *Hemipristis elongatus* (Klunz.)

4. Teeth polyserial in bands (Genus; *Triaenodon*)... *Triaenodon obesus* (Rupp.)
 Teeth monoserial not in bands ... 5
5. Teeth with smooth edges ... 6
 Teeth with roughened edges ... 10
6. Teeth with swollen bases. (Genus; *Physodon*)... *Physodon mulleri* M.&H.
 Teeth without swollen bases ... 7
7. Teeth with erect cusps (Genus; *Aprionodon*)... *Aprionodon acutidens* ††
 (Rupp.)
 ††a: Second dorsal larger than anal fin. *Aprionodon acutidens*
 (Rupp.)
 b: Second dorsal smaller than anal fin. *Aprionodon brevipinna*
 (M. & H.)
8. Labial fold extending to upper jaw ... *Scoliodon walbeehmi* Blkr.
 Labial fold not extending to upper jaw ... 9
9. Second dorsal posterior to anal base ... *Scoliodon sorrakowah* (C).
 Second dorsal over and of anal base ... *Scoliodon palacerrah* (C.)
10. Teeth serrated at their bases only in the upper
 jaw. (Genus; *Hypoprion*) ... 11
 Teeth serrated both on bases and cusps in the
 upper jaw ... 12
11. Labial folds present, teeth in 27/27 rows..... *Hypoprion macloti* M.&H.
 Labial folds absent, teeth in 29-32/27-29 rows. *Hypoprion hemiodon*
 M.&H.
12. First dorsal fin near the pelvic (Genus: *Prionace*)... *Prionace glaucus* (Linn.)
 First dorsal fin near pectoral or in between
 pectoral and pelvics. (Genus: *Carcharhinus*) 13
13. Second dorsal fin smaller than anal fin ... 14
 Second dorsal fin equal to anal fin or both
 subequal 15
14. Second dorsal and anal origins opposite..... *Carcharhinus limidatus*
 (M.&H.)
 Second dorsal origin behind anal origin..... *Carcharhinus sorrah*
 (M.&H.)

15. Preoral length distinctly less than width of mouth, all fins tipped black 16
Carcharhinus dussumieri (M.&H.)
 Preoral length more than width of mouth, second dorsal black-tipped, other fins white-edged
16. Front rear corner of second dorsal more than twice as large as vertical height & notable slender
Carcharhinus falciformes (M.&H.)
 Front rear corner of second dorsal short
Carcharhinus spaltanzani (Lesuer.)
17. Teeth in lower jaw not serrated, first dorsal black tipped
Carcharhinus menisorrah (M. & H.)
 Teeth in lower jaw serrated, first dorsal not black-tipped
Carcharhinus bleekeri (Doumeril)
18. Eye 3 in snout, 6-7 in interorbital
Carcharhinus elliorti (Day).
 Eye 4-5 in snout, 9-10 in interorbital.....
Carcharhinus commersoni (M.&H.)
 Eye 8 in snout, 14 in interorbital.....
Carcharhinus gangeticus (M&H)

Key to species of Family Sphyrnidae.

1. A groove along the front edge of head ... 2
 No groove along the front edge of head. *Sphyrna mokarran* (Rupp).
2. Oculonarial expansions short ... 3
 Oculonarial expansions long..... *Sphyrna blochii* (C.)
3. Anterior margin of oculonarial expansions curved 4
 Anterior margin of oculonarial expansions straight *Sphyrna zygaena* (L.)
4. Front of jaws level with front margin of the eyes, teeth smooth edged.....
Sphyrna lewini Griffith
 Front of jaws well behind the level of eyes, teeth slightly serrated.....
Sphyrna tubes (V.)

Family : SQUALIDAE

Single Species *Centroscyllium ornatum* (Alc.)

Family: DELATIDAE

Single species *Heteroscymnoides marley* Fowler

Key to Species of Family Rhinobatidae.

- | | | | | |
|--|-----|-----|---|--|
| 1. Snout not expanded at tip | ... | ... | 2 | |
| Snout expanded at tip | ... | ... | | <i>Rhinobatos thouin</i>
(Anonymous) |
| 2. Eye diameter more than 4 in snout | | | 3 | |
| Eye diameter upto 4 in snout | | | | <i>Rhinobatos annandalei</i>
(Norman)** |
| **a: Series of spines in the middle line
of back | | | | <i>Rhinobates annandalei</i>
(Norman) |
| b: Minute tubercles in the middle line
of back | | | | <i>Rhinobatos lionotus</i>
(Norman) |
| 3. Nostrils short, 2-3 in mouth width, internarial
and nostril about equal | | | | <i>Rhinobatos granulatus</i>
(C.):** |
| Nostrils moderately long, less than 2 in mouth
width, nostril 2-2.5 in internarial | | | | <i>Rhinobatos typus</i>
(Benn.) |
| **a: Snout very long, narrow, rostral ridges
approximated for greater part of their
length | | | | <i>Rhinobatos granubatus</i>
(C.) |
| b: Snout short, broad, rostral ridges more
or less separated throughout their
length | | | | <i>Rhinobatos obtusus</i>
(M.&H.) |

Key to Species of Family Rhynchobatidae.

- | | | | | |
|---|--|--|--|--|
| 1. Snout long, triangularly pointed, first dorsal
larger than second | | | | <i>Rhynchobatus djiddensis</i>
(Forsk.) |
| Snout short, broadly convex or rounded,
dorsals subequal | | | | <i>Rhynchobatus ancylostomus</i>
Schn. |

Key to Species of Family Pristidae

- | | | | | |
|---|-----|-----|---|-------------------------------------|
| 1. Rostral teeth 17-20 on each side, first dorsal
origin in front of pelvic fin..... | | | | <i>Pristis microdon</i>
Latham. |
| Rostral teeth 23-35 on each side, first dorsal
origin behind or opposite pelvic origin | | | 2 | |
| 2. Subcaudal lobe well developed, pointed | | | | <i>Pristis cuspidatus</i>
Latham |
| Subcaudal lobe absent | ... | ... | 3 | |
| 3. First dorsal origin opposite pelvic origin..... | | | | <i>Pristis Pectinatus</i>
Latham |
| First dorsal origin behind pelvic origin. | | | | <i>Pristis zysron</i> Blkr. |

Family: RAJIDAE

Raja reversa Lloyd

- a: Interdorsal a notch..... *Raja reversa* Lloyd
- b: Interdorsal wide.....C.
- c: A single row of spines on tail, interdorsal equal first dorsal base... *Raja Johannis davisi* Alc.
- d: Three rows of spines on tail, interdorsal much wider than the dorsal bases..... *Raja powellii* Alc.

Key to Species of Family Dasyatidae,

- 1 Disc twice as broad as long, tail short (Genus: *Gymnura*) 2
- Disc about as long as or longer than broad, tail long 3
2. Tail about as long as length of disc.... *Gymnura poecilura* (Shaw)
- Tail less than half the length of disc.... *Gymnura micrura* (Schn.)**
- **a: Tentacles behind spiracles.... *Aetoplatea tentaculata* (M&H)
- b. No tentacles behind spiracles.... *Gymnura micrura* (Schn.)
3. Serrated caudal spine absent (Genus: *Urogymnus*), body profusely covered with tubercles..... *Urogymnus africana* (Schn.)
- Serrated caudal spine present, body more or less smooth 4
4. Disc oval or round, tail compressed (Genus: *Taenura*).... *Taenura lymma* (Forsk.)††
- Disc quadrangular, tail filamentary .. 3
- **a: Disc oval..... *Taenura lymma* (Forsk.)
- b: Disc Circular.....C.
- c: Mouth straight, 5 oral papillae.... *Taenura meyeri* M.&H.
- d: Mouth curved, 2-3 oral papillae.... *Taenura melanospilos* Blkr.
5. Tail without a cutaneous fold (Genus: *Himantura*) 6
- Tail with a cutaneous fold 10
6. With 2 buccal processes 7
- With 4 buccal processes 9

7. Tail more than twice the length of disc, not banded *Himantura pleekeri*
Blyth
- Tail less than twice the length of disc, banded .. 8
8. Eye 6 in interorbital.....
Himantura favus (Ann.)
- Eye 3.3. in interorbital.....
Himantura walga
(M.&H.)
9. Teeth in 25-38 /25-38 rows, brown with dark spots..
Himantura uarnak
(Forsk.)
- Teeth in 13/23 rows, brown, with lighter spots..
Himantura gerrardi
(Gray).
10. Cutaneous folds above tail (Genus:Dasyatis).... *Dasyatis pastinaca* (L)
- Cutaneous folds below tail (Genus: Pastinachus) 11
- Cutaneous folds both above and below tail
(Genus: Amphotistius) .. 12
11. Cutaneous fold on tail well developed, 4 times the
length of caudal spine..... *Pastinachus sephen*
(Forsk.)
- Cutaneous fold on tail not well developed,
about as long as caudal spine,..... *Pastinachus bennetti*
(M.&H.)
12. Without buccal processes..... *Amphotistius zuge*
(M.&H.)
- With 2 busccal processes 13
13. Tail scarcely as long as length of disc..... *Amphotistius imbricata*
(Schn.)
- Tail distinctly longer than length of disc..... *Amphotistius kuhlii*
(M.H.)

Key to Species of Family Rhinopterae

1. Teeth in 9/7 rows, spiracle lateral..... *Rhinoptera adspersa*
M.&H.
- Teeth in 7/7 rows, spiracle dorsal..... *Rhinoptera javanica*
N&H.
- Teeth in 9/9 rows, spiracle dorsal..... *Rhinoptera sewelli*
Misra

Key to Species of Family Myliobatidae.

1. Caudal spine present 2
- Caudal spine absent 3

2. Snout longer than broad at base, uniform colour without spots *Aetobatus flagellum* (Schn.)
 Snout broader than long or as broad as long at base, with dark-edged white spots..... *Aetobatus ocellatus* (Khul).
3. Dorsal origin behind ends of pelvic bases *Aetobatus maculatus* (Gray)
 Dorsal origin opposite ends of pelvic bases 4
4. Blue cross bands on disc, spiracles twice eye *Aetobatus nichofii* (Schn.)
 Brown-edged ocelli on disc, spiracles about the size of eye *Aetodatus milvus* (M.&H.)

Key to Species of Family Mobulidae.

1. Mouth inferior, well behind head .. 2
 Mouth terminal, in front of head.... *Manta ehrenbergii* (M.&H.)
2. Tail less than twice the length of disc, serrated caudal spine 3
 Tail more than twice the length of disc, a serrated caudal spine..... *Mobula mobular* (Bonn).
3. Dorsal origin before pelvic origin..... *Mobula diabolus* (Shaw)
 Dorsal origin nearly opposite to pelvic origin *Mobula kuhlii* .. (M.&H.)

Key to Species of Family Torpedinidae.

1. One dorsal fin..... *Narke dipterygia* (Schm.)**
 Two dorsal fins 2
 **a: Pectorals, pelvics & eyes well developed *Narke dipterygia* (Schn)
 b: Pectorals, pelvics & eyes poorly developed *Bengalichthys impennis* Ann.
2. Origin of first dorsal opposite pelvics..... *Torpedo panthera* Olfers**
 Origin of first dorsal distinctly behind pelvics 3
 **a: Brown with mottlings & spots of light and dark *Torpedo anthera* Olfers
 b: Brown with irregular large and small spots, *Torpedo sinus persici* Olfers
3. Brown above with spots, a pair of buccal processes 4
 Uniform brown above, no buccal processes... *Narcine brunnea* Ann.
4. Tail equal to length of disc, teeth in 27/26 rows *Narcine maculata* (Shaw)
 Tail slightly shorter than length of disc, teeth in 23/21 rows *Narcine timlet* (Schm.)

SYSTEMATIC LIST

Series	..	..	..	PISCES
Class	..	..	..	ELASMOBRANCHII
Sub-Class	..	..	..	SELACHII
Order	..	..	..	LAMNIFORMES
Sub-Order	..	..	..	LAMNOIDEI
Family	..	..	..	ORECTOLOBIDAE
Sub-Family	..	..	..	ORECTOLOBINI

1. *Chiloscyllium griseum* M. & H.*Ridged-back Cat Shark*

(Mangra, Kamot).

1908—Regan—*Chiloscyllium griseum* (Karachi).1952—Qureshi, M. R.—*Chiloscyllium griseum* (Makran Coast).1953—Qureshi M.R.—*Chiloscyllium griseum* (Pakistan).1955—Qureshi, M.R.—*Chiloscyllium indicum* (Karachi, Sind and Makran Coast).1961—Misra, K.S.—*Chiloscyllium griseum* (Coast of Sind).1969—Misra, K.S.—*Chiloscyllium griseum* (Pakistan).1973—Ahmad, M.F. et. al.—*Chiloscyllium indicum* (Karachi, Sind and Makran Coast).

Status : Littoral, a common shallow water shark, very sluggish in movement, size up to 609 mm.

2. *Chiloscyllium indicus* (Gmel.) :*Ridged-back Cat Shark,*

(Mangra, Kamot).

1913—Zugmayer—*Chiloscyllium indicum* (Makran).1969—Misra, K.S.—*Chiloscyllium indicus* (Pakistan).1972—Jeleel & Khaleeluddin—*Chiloscyllium indicum* (Pak.).

Status : Littoral, a common shallow water shark, very sluggish in movement, size upto 608 mm.

3. *Nebrius concolor*, Rupp.1953—Qureshi, M.R.—*Nebrius concolor* (Pakistan).1969—Misra, K.S.—*Nebrius concolor* (Pakistan).

Status : Littoral, shallow water shark, sluggish in movement, size upto 609 mm.

4. *Nebrius ferrugineum* (Lesson)1961—Misra, K.S.—*Nebrius ferrugineum* (Coast of Sind).

Status : Littoral, sluggish in movement, a large shark, valued for its liver oil.

5. *Stegostoma varius* (Seba)

Zebra Shark

(Pussuni) :

1952—Qureshi, M.R.—*Stegostoma varium* (Makran Coast).1953—Qureshi, M.R.—*Stegostoma varium* (Pakistan).1955—Qureshi, M.R.—*Stegostoma tigrinum* (Karachi, Sind, and Makran Coast).1961—Misra, K.S.—*Stegostoma varius* (Coast of Sind).1969—Misra, K.S.—*Stegostoma varius* (Pakistan).1972—Jaleel & Khaleeluddin—*Stegostoma fasciatum* (Pakistan).1973—Ahmad, M.F. et al.—*Stegostoma fasciatum* (Karachi, Sind and Makran Coast).

Status: Littoral, shallow water shark, sluggish in movement, attains a large size, oviparous.

Sub Family.....RHINEODONTINI

6. *Rhincodon typus* Smith.

Whale Shark

(Mohr Mangra).

1952—Qureshi, M.R.—*Rhincodon typicus* (Makran Coast).1953—Qureshi, M.R.—*Rhincodon typicus* (Pakistan).1955—Qureshi, M.R.—*Rhincodon typicus* (Karachi, Sind and Makran Coast).1969—Misra, K.S.—*Rhincodon typus* (Pakistan).1972—Jaleel & Khaleeluddin—*Rhincodon typus* (Pakistan).

Status : Pelagic, large shark, attaining a length of 70 Ft. According to Qureshi (1955) a female 38 Ft. and a male 41½ Ft. have been caught in the year 1949 by fishermen of Karachi.

Family.....ODONTASPIDAE

7. *Carcharias tricuspidatus* Day
Blue Nurse Shark, Sand Shark
(Mangra).

1878—Day—*Carcharias tricuspidatus* (Karachi & Baluchistan).

1888—Day—*Odontaspis tricuspidatus* (Sind Coast).

1889—Day—*Odontaspis tricuspidatus* (Sind Coast).

1953—Qureshi, M.R.—*Carcharias tricuspidatus* (Pakistan)

1955—Qureshi, M.R.—*Odontaspis tricuspidatus* (Karachi, Sind and Makran Coast).

1961—Misra, K.S.—*Carcharias tricuspidatus* (Sind Coast).

1969—Misra, K.S.—*Carchariaas tricuspidatus* (Pakistan).

1972—Jaleel & Khaleeluddin—*Carcharias tricuspidatus* (Pakistan).

Status : Polagic, a large shark.

Family.....LAMNIDAE

Sub-Family.....ALOPIINI

8. *Alopias vulpinus* (Bonn.)

Thresher or Fox Shark

(Mangra) :

1972—Jaleel & Khaleeluddin—*Alopias vulpinus* (Pakistan).

Status : Pelagic, a large shark.

Sub-Family.....LAMNINI

9. *Isurus glauca* (M. & H.)

Mackerel shark

(Mangra) :

1953—Qureshi, M.R.—*Isurus glauca* (Pakistan).

1972—Jaleel & Khaleeluddin—*Isurus glauca* (Pakistan).

Status : Pelagic, a large dangerous man-eating shark.

10. *Isurus guntheri* (Murray) :

Great White Shark

(Mangra) :

1884—Murray—*Lamna guntheri* (Karachi).1889—Day—*Lamna guntheri* (Karachi).1913—Garman—*Isurus guntheri* (Karachi).1953—Qureshi, M.R.—*Isurus guntheri* (Pakistan).1969—Misra, K.S.—*Isurus guntheri* (Pakistan).1972—Jaleel & Khaleeluddin—*Isurus guntheri* (Pakistan)

Status : Pelagic, a large dangerous man-eating shark.

FamilySCYLIORHINIDAE

Sub-FamilySCYLIORHININI

11. *Scyliorhinus capense* (Smith)

Cape Dog Shark

(Mangra).

1972—Jaleel & Khaleeluddin—*Scyliorhinus capensis* (Pak).

Status : Bottom dweller, large lazy shark.

12. *Atelomycterus marmoratum* (Benn.)

Marbled Cat Shark

(Mangra)

1953—Qureshi, M.R.—*Atelomycterus marmoratum* (Pakistan).1961—Misra, K.S.—*Atelomycterus marmoratum* (Pakistan).1969—Misra, K.S.—*Atelomycterus marmoratum* (Pakistan).1972—Jaleel & Khaleeluddin—*Atelomycterus marmoratum* (Pakistan).

Status : Littoral, moderate sized lazy shark attaining a length of 457 mm.

Family CARCHARHINIDAE

13. *Physodon mulleri* M. & H.
Grey Shark
(Mangra)

1913—Zugmayer—*Carcharias mulleri* (Makran).

1953—Qureshi, M.R. —*Physodon mulleri* (Pakistan).

1969—Misra, K.S.—*Physodon mulleri* (Pakistan).

Status : Pelagic, moderate sized shark.

14. *Scoliodon palasorrah* (C).
Grey Dog Shark
(Gissi). Tailer

1913—Zugmayer—*Carcharias acutus* (Makran Coast).

1953—Qureshi, M.R.—*Scoliodon palasorrah* (Pakistan).

1969—Misra, K.S.—*Scoliodon palasorrah* (Pakistan).

1972—Jaleel & Khaleeluddin—*Scoliodon palasorrah* (Pakistan). Pishul

Status : Pelagic, moderate sized dog shark; small specimens are termed dog fish (Mangra) and esteemed as food locally.

15. *Scoliodon sorrakowah* (C.)
Yellow Dog Shark
(Gissi). Blusool

1913—Zugmayer—*Carcharias laticaudus* (Makran Coast).

1961—Misra, K.S.—*Scoliodon sorrakowah* (Sind Coast).

1969—Misra, K.S.—*Scoliodon sorrakowah* (Pakistan).

1972—Jaleel & Khaleeluddin—*Scoliodon sorrakowah* (Pakistan).

1973—Ahmad, M.F. et al. *Scoliodon sorrakowah* (Karachi, Sind and Makran Coast).

Status : Pelagic, small dog shark, readily eaten by the people.

16. *Scoliodon walbeehmi* Blkr.
Sharp-nosed Shark Sangan
(Gissi).

1961—Misra, K.S.—*Scoliodon walbeehmi* (Sind Coast).

1972—Jaleel & Khaleeluddin—*Scoliodon walbeehmi* (Pakistan).

1973—Ahmad, M.F. et al. —*Scoliodon walbeehmi* (Karachi, Sind and Makran Coast).

Status : Pelagic, a small dog shark, flesh palatable.

17. *Aprionodon acutidens* (Rupp.)

Black-finned Grey Shark

(Paggas, Dandan).

1878—Day—*Carcharias acutidens* (Sind).1913—Zugmayer—*Carcharias acutidens* (Makran & Gwadar).1952—Qureshi, M.R.—*Aprionodon acutidens* (Makran).1953—Qureshi, M.R.—*Aprionodon acutidens* (Pakistan).1955—Qureshi, M.R.—*Carcharias acutidens* (Karachi, Sind and Makran Coast).1969—Misra, K.S.—*Aprionodon acutidens*, (Pakistan).

Status : Pelagic, small shark.

18. *Hypoprion hemiodon* M. & H.

Long-nosed Shark

(Mangra).

1953—Qureshi, M.R.—*Hypoprion hemiodon* (Pakistan).

Status : Pelagic, moderate sized shark.

19. *Hypoprion macloti* M. & H.

Maclot's Shark

(Mangra).

1913—Zugmayer.—*Carcharias macloti* (Makran Coast).1961—Misra, K.S.—*Hypoprion macloti* (Sind & Makran Coast).1969—Misra, K.S.—*Hypoprion macloti* (Pakistan).1972—Jaleel & Khaleeluddin—*Hypoprion macloti* (Pakistan).

Status : Pelagic, a shark of moderate size.

20. *Prionace glaucus* (Linn.)

Blue Shark

(Mangra)

1972—Jaleel & Khaleeluddin—*Glyphis glaucus* (Pakistan).

Status : Pelagic, large dangerous shark.

21. *Carcharhinus bleekeri* (Dumeril)
Large Grey Shark
(Kanatyan).

1953—Qureshi, M.R. *Carcharhinus bleekeri* (Pakistan).

1969—Misra, K.S.—*Carcharhinus bleekeri* (Pakistan).

Status : Pelagic, a large dangerous shark.

22. *Carcharhinus commersonii* (Blainv.)
Large Grey Shark
(Kanatyan) :

1972—Jaleel & Khaleeluddin—*Carcharhinus longimanus* (Pakistan).

1972—Jaleel & Khaleeluddin—*Carcharhinus leucus* (Pakistan).

Status : Pelagic a large dangerous shark.

23. *Carcharhinus dussumieri* (M. & H.)
Large Grey Shark
(Kanatyan) :

1913—Zugmayer—*Carcharias dussumieri* (Makran).

1961—Misra, K.S.—*Carcharhinus dussumieri* (Sind Coast).

1969—Misra, K.S.—*Carcharhinus dussumieri* (Pakistan).

Status : Pelagic, a large shark, not supposed to be a dangerous.

24. *Carcharhinus ellioti* (Day)
Elliot's Grey Shark
(Gandan).

1878—Day—*Carcharias ellioti* (Karachi Coast).

1883—Gunther—*Carcharias murrayi* (Karachi Coast).

1888—Day—*Carcharias murrayi* (Karachi Coast).

1889—Day—*Carcharias murrayi* (Karachi Coast).

1913—Zugmayer—*Carcharias ellioti* (Makran Coast).

1913—Zugmayer—*Carcharias murrayi* (Makran Coast).

1952—Qureshi, M.R.—*Carcharhinus ellioti* (Makran Coast).

1953—Qureshi, M.R.—*Carcharhinus ellioti* (Pak. Coasts).

1955—Qureshi, M.R.—*Carcharias ellioti* (Karachi, Sind and Makran Coast).

1972—Jaleel & Khaleeluddin—*Eulamia ellioti* (Pak. Coast).

Status : Pelagic, a large fearful shark, viviparous.

Jaqri H

Soor
Cape ward

25. *Carcharhinus gangeticus* (M. & H.)

Gangese Grey Shark

(Gandan). Gussini1953—Qureshi, M.R.—*Carcharhinus gangeticus* (Pakistan).1962—Misra, K.S.—*Carcharhinus gangeticus* (Sind Coast).1969—Misra, K.S.—*Carcharhinus gangeticus* (Pakistan).*Status* : Pelagic, a large shark, often dangerous, viviparous.26. *Carcharhinus limbatus* (M. & H.)

Small Black-tipped Grey Shark

(Muggach, Kanatyan). Gussini1952—Qureshi, M.R.—*Carcharhinus limbatus* (Makran Coast).1953—Qureshi, M.R.—*Carcharhinus limbatus* (Pakistan).1955—Qureshi, M.R.—*Carcharias limbatus* (Karachi, Sind and Makran Coast.)1961—Misra, K.S.—*Carcharhinus limbatus* (Makran Coast).1969—Misra, K.S.—*Carcharhinus limbatus* (Pakistan).1972—Jaleel & Khaleeluddin—*Carcharhinus limbatus* (Pakistan).*Status* : Pelagic, a large shark, yields plenty of liver oil.27. *Carcharhinus menisorrhah* (M. & H.)

Large Grey Shark

(Gussi). Gussini1952—Qureshi, M.R.—*Carcharhinus menisorrhah* (Makran).1955—Qureshi, M.R.—*Carcharias menisorrhah* (Karachi, Sind & Makran Coast).1953—Qureshi, M.R.—*Carcharhinus menisorrhah* (Pakistan).1961—Misra, K.S.—*Carcharhinus menisorrhah* (Karachi, Sind & Makran Coast).1969—Misra, K.S.—*Carcharhinus menisorrhah* (Pakistan).*Status* : Pelagic, large shark, viviparous.

28. *Carcharhinus sorrah* (M. & H.)
Small Grey Shark
(Kanatyan).

Kanatiyan

1953—Qureshi, M.R.—*Carcharhinus sorrah* (Pakistan).

1961—Misra, K.S.—*Carcharhinus sorrah* (Sind Coast).

1969—Misra, K.S.—*Carcharhinus sorrah* (Pakistan).

Status : Pelagic, moderate size, viviparous.

29. *Carcharhinus spallanzani* (LeSueur)
Large Black-tipped Grey Shark
(Kanatyan,).

Barkali

1952—Qureshi, M.R.—*Carcharhinus melanopterus* (Makran).

1953—Qureshi, M.R.—*Carcharhinus melanopterus* (Pakistan).

1955—Qureshi, M.R.—*Carcharias melanopterus* (Karachi, Sind & Makran Coast).

1961—Misra, K.S.—*Carcharhinus melanopterus* (Karachi, Sind and Makran Coast).

1969—Misra, K.S.—*Carcharhinus spallanzani* (Pakistan).

1972—Jaleel & Khaleeluddin—*Carcharhinus spallanzani* (Pakistan).

Status : Pelagic, a large dredged shark, liver oil is exceedingly rich in vitamin contents, viviparous.

30. *Carcharhinus falciformes* (Q. & G.)
Large Grey Shark
(Mangra).

Kanali

1972—Jaleel & Khaleeluddin—*Carcharhinus falciformes* (Pakistan).

Status : Pelagic, large shark, viviparous.

31. *Chaenogaleus balfouri* (Day)
Balfor's Grey Shark
(Loan).

LSM

1952—Qureshi, M.R.—*Hemigaleus balfouri* (Makran Coast).

1953—Qurashi, M.R.—*Hemigaleus balfouri* (Pakistan).

1955—Qureshi, M.R.—*Hemigaleus balfouri* (Karachi, Sind & Makran Coast).

1969—Misra, K.S.—*Chaenogaleus balfouri* (Pakistan).

1972—Jaleel & Khaleeluddin—*Chaenogaleus balfouri* (Pakistan).

Status : Pelagic, a large shark.

32. *Galeocerdo cuvier* (LeSueur)

Tiger Shark

(Kari Mangra).

1913—Zugmaye —*Galeocerdo tigrinum* (Makran Coast).1952—Qureshi, M.R.—*Galeocerdo arcticus* (Makran Coast).1953—Qureshi, M.R.—*Galeocerdo arcticus* (Pakistan).1955—Qureshi, M.R.—*Galeocerdo rayneri* (Karachi, Sind & Makran Coast).1969—Misra, K.S.—*Galeocerdo cuvier* (Pakistan).1972—Jaleel & Khaleeluddin—*Galeocerdo cuvier* (Pakistan).*Status* : Pelagic, a large shark.33. *Mustelus manazo* Blkr.

Gummy Shark

(Kari Mangra).

1952—Qureshi, M.R.—*Myrmillo manazo* (Makran Coast).1953—Qureshi, M.R.—*Myrmillo manazo* (Pakistan).1955—Qureshi, M.R.—*Mustelus manazo* (Karachi, Sind & Makran Coast).1969—Misra, K.S.—*Mustelus manazo* (Pakistan).1972—Jaleel & Khaleeluddin—*Mustelus manazo* (Pakistan).*Status* : Littoral, sluggish, large shark.34. *Triaenodon obesus* (Rupp.)

Light Tip Shark

(Loan).

1978—Day—*Triaenodon obtusus* (Karachi).1889—Day—*Triaenodon obtusus* (Karachi).1913—Garman—*Triaenodon obtusus* (Makran Coast).1952—Qureshi, M.R.—*Triaenodon obtusus* (Pakistan).1955—Qureshi, M.R.—*Triaenodon obtusus* (Karachi, Sind & Makran Coast).*Status* : Pelagic, a small shark.

Family.....SPHYRNIDAE

35. *Sphyrna blochii* (C.)
Arrow-headed Hammer-head Shark.
(Julia Mangra, Doka)
- 1952—Qureshi, M.R.—*Sphyrna blochii* (Mekran Coast).
1953—Qureshi, M.R.—*Sphyrna blochii* (Pakistan).
1955—Qureshi, M.R.—*Zygaena blochii* (Karachi Sind & Makran Coast).
1961—Misra, K.S.—*Sphyrna blochii* (Karachi, Sind & Makran Coast).
1969—Misra, K.S.—*Sphyrna blochii* (Pakistan).
1972—Jaleel & Khaleeluddin—*Sphyrna blochii* (Pakistan).
1973—Ahmad, M.F. et. al.—*Sphyrna blochii* (Karachi, Sind and Makran Coast).
- Status : Pelagic large shark, fear-less, liver yields a considerable amount of oil.
36. *Sphyrna mokarran* (Rupp.)
Grey Hammer-head Shark
(Julia Mangra, Doka)
- 1887—Murray—*Zygaena dissimilis* (Karachi).
1888—Day—*Zygaena mokarran* (Karachi).
1889—Day—*Zygaena mokarran* (Karachi).
1913—Zugmayer—*Zygaena mokarran* (Karachi).
1969—Misra, K.S.—*Sphyrna mokarran* (Pakistan).
1972—Jaleel & Khaleeluddin—*Sphyrna mokarran* (Pakistan).
- Status : Pelagic, a large shark, often dangerous.
37. *Sphyrna tudes* (V.)
Squat-head Hammer-head Shark
(Julia Mangra, Doka).
- 1913—Zugmayer—*Zygaena tudes* (Makran Coast).
1952—Qureshi, M.R.—*Sphyrna tudes* (Makran Coast).
1953—Qureshi, M.R.—*Sphyrna tudes* (Pakistan).
1955—Qureshi, M.R.—*Zygaena tudes* (Karachi, Sind & Makran Coast).
1961—Misra, K.S.—*Sphyrna tudes* (Karachi, Sind & Makran Coast).
1969—Misra, K.S.—*Sphyrna tudes* (Pakistan).
1972—Jaleel & Khaleeluddin—*Sphyrna tudes* (Pakistan).
1973—Ahmad, M.F. et. al.—*Sphyrna tudes* (Karachi, Sind and Makran Coast).

Status : Pelagic, a large shark, often dangerous.

38. *Sphyrna zygaena* (L)
Round-head Hammer-head Shark
(Bodher-Buther).

1952—Qureshi, M.R.—*Sphyrna zygaena* (Makran Coast).
1953—Qureshi, M.R.—*Sphyrna zygaena* (Pakistan).

1955—Qureshi, M.R.—*Zygaena malleus* (Karachi, Sind and Makran
(Coast).

1961—Misra, K.S.—*Sphyrna zygaena* (Makran Coast).

1969—Misra, K.S.—*Sphyrna zygaena* (Pakistan).

1972—Jaleel & Khaleeluddin—*Sphyrna zygaena* (Pakistan).

Status : Pelagic, a large fearless shark, yields considerable amount of liver oil.

39. *Sphyrna lewini* (Griffith)
Hammer-head Shark
(Buther).

1972—Jaleel & Khaleeluddin—*Sphyrna lewini* (Pakistan).

Status : Pelagic, a large dangerous shark.

Order..... SQUALIFORMES

Sub-OrderSQUALOIDEI

Family.....SQUALIDAE

40. *Centroscyllium ornatum* (Alc.)

Spiny-dogfish.

1896—alcock—*Centroscyllium ornatum* (North Arabian Sea = 23°N
66°E likely off Indus Delta at
the depth of 600 fms.

Status : Bathypelagic, small spiny dogfish.

Family.....DALATIIDAE

41. *Heteroscymnoides marleyi* Fowler.

1972—Jaleel & Khaleeluddin—*Heteroscymnoides marleyi* (Pakistan).

Status : Bathypelagic, small dogfish.

Super Order..... BATOIDEI

Order..... RAJIFORMES

Family.....RHINOBATIDAE

42. *Rhinobatos annandalei* (Norman)
Annandales Shovel-nose Ray
(Kair, Siree, Matyabyllia).

1972—Jaleel & Khaleeluddin—*Rhinobatos annandalei* (Pakistan).

Status : Littoral, small ray, bottom dweller, oviparous.

43. *Rhinobatos granulatus* (C.)

Granulated Shovel-nose Ray
(Kair, Siree, Matyabyllia).

Guitar fish

1652—Qureshi, M.R.—*Rhinobatos granulatus* (Makran Coast).

1953—Qureshi, M.R.—*Rhinobatos granulatus* (Pakistan).

1955—Qureshi, M.R.—*Rhinobatos granulatus* (Sind, Karachi and
Makran Coast).

1961—Misra, K.S.—*Rhinobatos granulatus* (Makran Coast).

1961—Misra, K.S.—*Rhinobatos armatus* (Karachi, Sind and Makran
Coast).

1969—Misra, K.S.—*Rhinobatos granulatus* (Pakistan).

1972—Jaleel & Khaleeluddin—*Rhinobatos granulatus* (Pakistan).

1973—Ahmad, M.F. et. al—*Rhinobatos granulatus* (Karachi, Sind and
Makran Coast).

Status : Littoral, large ray, bottom dweller.

44. *Rhinobatos thouin* (Anonymous)

Spotted Shovel-nose Ray
(Kair, Siree, Matyabyllia)

1952—Qureshi, M.R.—*Rhinobatos thouiniana* (Makran Coast).

1953—Qureshi, M.R.—*Rhinobatos thouiniana* (Pakistan).

1955—Qureshi, M.R.—*Rhinobatos thouiniana* (Karachi, Sind & Makran
Coast).

Status : Littoral, small ray, bottom dweller.

45. *Rhinobatos typus* (Benn).

Grey Shovel-nose Ray,
(Kair, Matyabyllia).

1969—Misra, K.S.—*Rhinobatos typus* (Pakistan).

Status : Littoral moderate size, bottom dweller.

Family _____ RHYNCHOBATIDAE

46. *Rhina ancylostomus* Schn.Mud Skate,
(Matyabyllia).

snout nose mud skate

- 1953—Qureshi, M.R.—*Rhina ancylostoma* (Pakistan).
 1961—Misra, K.S.—*Rhina ancylostomus* (Sind Coast).
 1969—Misra, K.S.—*Rhina ancylostomus* (Pakistan).
 1972—Jaleel & Khaleeluddin—*Rhina ancylostomus* (Pakistan).

Status : Littoral, large ray, bottom dweller, scavenger of shallow water, flesh good eating, ovo-viviparous.

47. *Rhynchobatus djiddensis* (Forsk.)White Spotted Guitar-fish,
(Mucho).

- 1952—Qureshi, M.R.—*Rhynchobatus djiddensis* (Makran).
 1953—Qureshi, M.R.—*Rhynchobatus djiddensis* (Pakistan).
 1955—Qureshi, M.R.—*Rhynchobatus djiddensis* (Karachi, Sind & Makran Coast).
 1961—Misra, K.S.—*Rhynchobatus djiddensis* (Sind Coast).
 1969—Misra, K.S.—*Rhynchobatus djiddensis* (Pakistan).
 1972—Jaleel & Khaleeluddin—*Rhynchobatus djiddensis* (Pakistan).
 1973—Ahmad, M.F. et. al.—*Rhynchobatus djiddensis* (Karachi, Sind and Makran Coast).

Status : Littoral, large ray, bottom dweller, famous angling fish.

Family.....PRISTIDAE

48. *Pristis cuspidatus* LathamPointed Sawfish,
(Khara Mangar) :

- 1952—Qureshi, M.R.—*Pristis cuspidatus* (Makran Coast)
 1953—Qureshi, M.R.—*Pristis cuspidatus* (Pakistan).
 1955—Qureshi, -M.R.—*Pristis cuspidatus* (Karachi, Sind and Makran Coast).
 1961—Misra, K.S.—*Pristis cuspidatus* (Karachi, Sind & Makran Coast.)
 1969—Misra, K.S.—*Pristis cuspidatus* (Pakistan).
 1972—Jaleel & Khaleeluddin—*Pristis cuspidatus* (Pakistan).

Status : Littoral, very large fish, feared by local fisherman, flesh much esteemed, liver yields considerable oil, ascends river, euryhaline.

49. *Pristis microdon* Latham
Small Toothed Sawfish,
(Liaro).

1961—Misra, K.S.—*Pristis microdon* (Sind Coast).

1969—Misra, K.S.—*Pristis microdon* (Pakistan).

1972—Jaleel & Khaleeluddin—*Pristis microdon* (Pakistan).

Status : Littoral, a large fish, ascends estuaries & fresh water bottom dweller, feared by the local fishermen, liver yields considerable oil, euryhaline.

50. *Pristis pectinatus* Latham.
Brown Sawfish
(Khara Mach, Liaro).

1969—Misra, K.S.—*Pristis pectinatus* (Pakistan).

Status : Littoral, a large fish, ascends freshwater, good eating feared by the local fishermen, euryhaline.

51. *Pristis zysron* Blkr.
Green Sawfish
(Khara Mangar, Wakhan)

1889—Day—*Pristis zysron* (Sind & Makran Coast).

1952—Qureshi, M.R.—*Pristis zysron* (Makran Coast).

1953—Qureshi, M.W.—*Pristis zysron* (Pakistan).

1955—Qureshi, M.W.—*Pristis zysron* (Karachi, Sind & Makran Coast)

1969—Misra, K.S.—*Pristis zysron* (Pakistan).

1972—Jaleel & Khaleeluddin—*Pristis zysron* (Pakistan).

Status : Littoral, large sawfish, feared by the local fishermen.

Family.....RAJIDAE

52. *Raja reversa* Lloyd
Skate.

1906—Lloyd—*Raja reversa* (Arabian Sea off Baluchistan Coast).

1908—Lloyd—*Raja reversa* (Arabian sea off Baluchistan Coast)

1909—Lloyd—*Raja reversa* (Arabian sea off Baluchistan Coast)

1913—Garman—*Raja reversa* (Arabian Sea off Baluchistan Coast).

Status : Bathypelagic, of moderate size.

53. *Taenura lymma*
 Ribbon -tail Ray.
 (Pittan).

1972—Jaleel & Khaleeluddin—*Taenura lymma* (Pakistan).

Status : Littoral, large sting ray, bottom dweller.

54. *Amphotistius imbricata* (Schn).
 Scaly Sting Ray
 (Kutti).

1952—Qureshi, M.R.—*Dasyatis (Amphotistius) imbricata* (Makran).

1953—Qureshi, M.R.—*Dasyatis (Amphotistius) imbricata* (Pak).

1954—Qureshi, M.R.—*Trygon walga* (Karachi, Sind & Makran Coast).

1972—Jaleel & Khaleeluddin.—*Amphotistius imbricata* (Pakistan).

1973—Ahmad, M.F. et. al—*Amphotistius imbricata* (Karachi, Sind and Makran Coast).

Status : Littoral, small sting ray, bottom dweller.

55. *Amphotistius kuhlii* (M. & H.)
 Blue-spotted Sting Ray
 (Chitti Pittan).

1952—Qureshi, M.R.—*Dasyatis (Amphotistius) kuhlii* (Makran Coast).

1953—Qureshi, M.R.—*Dasyatis (Amphotistius) kuhlii* (Pakistan.)

1955—Qureshi, M.R.—*Trygon kuhlii* (Karachi, Sind & Makran Coast).

1961—Misra, K.S.—*Dasyatis (Amphotistius) kuhlii* (Karachi Sind and Makran Coast).

1969—Misra, K.S.—*Dasyatis (Amphotistius) kuhlii* (Pakistan).

Status : Littoral, large sting ray, bottom dweller.

56. *Amphotistius zugei* (M. & H.)
 Pale edged Sting Ray
 (Kutti, Pittan).

1952—Qureshi, M.R.—*Dasyatis (Amphotistius) zugei* (Makran Coast).

1953—Qureshi, M.R.—*Dasyatis (Amphotistius) zugei* (Pakistan).

1955—Qureshi, M.R.—*Trygon zugei* (Karachi, Sind & Makran Coast)

1969—Misra, K.S.—*Dasyatis (Amphotistius) zugei* (Pakistan).

1972—Jaleel & Khaleeluddin—(*Amphotistius zugei* (Pakistan).

Status : Littoral, large sting ray, bottom dweller.

57. *Himantura bleekeri* (Blyth)
Whip-tail Sting Ray
(Gadum, Shaukoo).

1952—Qureshi, M.R.—*Dasyatis (Himantura) bleekeri* (Makran Coast).
1953—Qureshi, M.R.—*Dasyatis (Himantura) bleekeri* (Pakistan).
1955—Qureshi, M.R.—*Trygon bleekeri* (Karachi, Sind and Makran Coast).
1961—Misra, *Dasyatis (Himantura) bleekeri* (Karachi, Sind & Makran Coast).
1969—Misra, K.S.—*Dasyatis (Himantura) bleekeri* (Pakistan).
1972—Jaleel & Khaleeluddin—*Himantura bleekeri* (Pakistan).
1973—Ahmad, M.F. et. al.—*Himantura bleekeri* (Karachi, Sind and Makran Coast).

Status : Littoral, very large sting ray, bottom dweller.

58. *Himantura favus* (Annandale)
Reticulated Sting Ray
(Chitti Pittan).

1972—Jaleel & Khaleeluddin—*Himantura favus* (Pakistan).

Status : Littoral, a large sting ray, bottom dweller.

59. *Himantura gerrardi* (Gray)
Brown Sting Ray
(Pittan).

Geerards' sting ray

1969—Misra, K.S.—*Dasyatis (Himantura) gerrardi* (Pakistan).

Status : Littoral, a large sting ray, bottom dweller.

60. *Himantura uarnak* (Forsk.)
Marbled Sting Ray
(Hangoor, Acho-pittan).

~~longtailed ray~~
longtailed ray

1952—Qureshi, M.R.—*Dasyatis (Himantura) uarnak* (Makran Coast).
1953—Qureshi, M.R.—*Dasyatis (Himantura) uarnak* (Pakistan).
1955—Qureshi, M.R.—*Trygon uarnak* (Karachi, Sind & Makran Coast).
1961—Misra, K.S.—*Dasyatis (Himantura) uarnak* (Karachi, Sind and Makran Coast).
1969—Misra, K.S.—*Dasyatis (Himantura) uarnak* (Pakistan).
1972—Jaleel & Khaleeluddin—*Himantura uarnak* (Pakistan).
1973—Ahmad, M.F.-et. al.—*Himantura uarnak* (Karachi, Sind and Makran Coast).

Status ; Littoral, large sting ray, bottom dweller, serrated spine capable of inflicting painful wound.

Dasyatis jenkinsii (Annandale, 1909)
bottom ray

61. *Himantura walga* (M. & H.)
Tuberculated Sting Ray
(Kutti).

1969—Misra, K.S.—*Dasyatis (Himantura) walga* (Pakistan).

Status : Littoral, small sting ray, bottom dweller, serrated spine capable of inflicting painful wound.

62. *Pastinachus bennetti* (M. & H.)
Frill-tail Sting Ray
(Pittan).

1952—Qureshi, -M.R.—*Dasyatis (Pastinachus) bennetti* (Makran coast).

Status : Littoral, a large sting ray, bottom dweller, serrated spine capable of inflicting painful wound.

63. *Pastinachus sephen* (Forsk.)
Frill-tail Sting Ray
(Shankush-Pittan).

frill tail sting ray
serrated tail

1913—Zugmayer—*Trygon sephen* (Makran Coast).

1952—Qureshi, M.R.—*Dasyatis (Pastinachus) sephen* (Makran Coast).

1953—Qureshi, M.R.—*Dasyatis (Pastinachus) sephen* (Pakistan).

1955—Qureshi, M.R.—*Trygon sephen* (Karachi, Sind & Makran Coast).

1961—Misra, K.S.—*Dasyatis (Pastinachus) sephen* (Karachi, Sind and Makran Coast).

1969—Misra, K.S.—*Dasyatis (Pastinachus) sephen* (Pakistan).

Status : Littoral, a large sting ray, bottom dweller.

64. *Urogymnus africana* (Schn.)
Thony Sting Ray
(Pittan).

1952—Qureshi, M.R.—*Urogymnus africana* (Makran Coast).

1953—Qureshi, M.R.—*Urogymnus africana* (Pakistan).

1955—Qureshi, M.R.—*Urogymnus asperrimus* (Karachi, Sind and Makran Coast).

1969—Misra, K.S.—*Urogymnus africana* (Pakistan).

1972—Jaleel & Khaleeluddin—*Urogymnus africana* (Pakistan).

Status : Littoral, large sting ray, bottom dweller.

Taenium melano spila
(Bleeker, 1853)
Frill tail ray
Limp: German-

65. *Gymnura micrura* (Schn.)
Short-tail Butterfly Ray
(Kutta, Thappa).

- 1913—Zugmayer—*Pteroplatea micrura* (Makran Coast).
1952—Qureshi, M.R.—*Gymnura (Gymnura) micrura* (Makran Coast).
1953—Qureshi, M.R.—*Gymnura (Gymnura) micrura* (Pakistan).
1955—Qureshi, M.R.—*Pteroplatea micrura* (Karachi, Sind & Makran Coast).
1969—Misra, K.S.—*Gymnura (Gymnura) micrura* (Pakistan).
1972—Jaleel & Khaleeluddin—*Gymnura micrura* (Pakistan).
1973—Ahmad, M.F. et. al.—*Gymnura micrura* (Karachi, Sind and Makran Coast).

Status : Littoral, large butterfly ray, bottom dweller.

66. *Gymnura poecilura* (Shaw)
Long-tail Butterfly Ray,
(Thappa).

spotted butterfly ray

- 1955—Qureshi, M.R.—*Pteroplatea micrura (partim)* (Karachi, Sind and Makran Coast).
1969—Misra, K.S.—*Gymnura (Gymnura) poecilura* (Pakistan).
1972—Jaleel & Khaleeluddin—*Gymnura poecilura* (Pakistan).

Status : Littoral, large, bottom dweller.

Family.....MYLIOBATIDAE

67. *Aetomylus nichofii* (Schn.)
Nichof's Eagle Ray
(Karunj).

- 1952—Qureshi, M.R.—*Aetomylaeus nichofii* (Makran Coast).
1953—Qureshi, M.R.—*Aetomylaeus nichofii* (Pakistan).
1955—Qureshi, M.R.—*Myliobatis Sp.* (Karachi, Sind and Makran Coast).
1961—Misra, K.S.—*Aetomylus nichofii* (Karachi, Sind and Makran Coast).
1969—Misra, K.S.—*Aetomylus nichofii nichofii* (Pakistan).
1972—Jaleel & Khaleeluddin—*Aetomylus nichofii* (Pakistan).

Status : Littoral, large eagle ray, bottom dweller.

68. *Aetomylus milvus* (M. & H.)
Ocellated Eagle Ray
(Karunj).

1961—Misra, K.S.—*Aetomylus miivus* (Sind Coast).

Status : Littoral, small eagle ray, bottom dweller.

69. *Aetomylus maculatus* (Gray)
White-spotted Eagle Ray
(Karunj).

1953—Qureshi, M.R.—*Aetomylus maculatus* (Pakistan).

Status : Littoral, small eagle ray, bottom dweller.

narinari Euphrates, 1790

70. *Aetobatus flagellum* (Schn.)
Spotted Eagle Ray
(Shankchil).

Chander

1952—Qureshi, M.R.—*Aetobatis narinari* (Makran Coast).

1953—Qureshi, M.R.—*Aetobatis narinari* (Pakistan).

1955—Qureshi, M.R.—*Aetobatis narinari* (*partim*) (Karachi, Sind and Makran Coast).

1961—Misra, K.S.—*Aetobatis flagellum* (Karachi, Sind & Makran Coast)

1969—Misra, K.S.—*Aetobatis flagellum* (Pakistan).

1972—Jaleel & Khaleeluddin—*Aetobatis flagellum* (Pakistan).

1973—Ahmad, M.F. et. al.—*Aetobatis narinari* (Karachi, Sind and Makran Coast).

Status : Littoral, large eagle ray, viviparous.

71. *Aetobatus ocellatus* (Khjl.)
Ocellated Eagle Ray
(Sankachil, Kuddukoto).

1955—Qureshi, M.R.—*Aetobatis narinari* (*Partim*) (Karachi, Sind and Makran Coast).

1969—Misra, K.S.—*Aetobatus ocellatus* (Pakistan).

Status : Littoral. a large eagle ray, causing damage to oyster bed, viviparous

72. *Myliobatis cervus* Smith
Bull Ray
(Pittan).

1972—Jaleel & Khaleeluddin—*Myliobatis cervus* (Pakistan).

Status : Littoral, large bull ray, males much smaller, serrated spines capable of inflicting painful wound.

Family.....RHINOPTERIDAE

73. *Rhinoptera adpersa* (M. & H.)
Tuberculated Cow Ray
(Pittan).

1969—Misra, K.S.—*Rhinoptera adpersa* (Pakistan)

Status : Littoral, large cow ray.

74. *Rhinoptera javanica* (M. & H.)
Javanese Cow Ray
(Pittan).

1878—Day *Rhinoptera javanica* (Karachi Coast).

1961—Misra, K.S.—*Rhinoptera javanica* (Sind Coast).

1969—Misra, K.S.—*Rhinoptera javanica* (Pakistan).

1972—Jaleel & Khaleeluddin—*Rhinoptera javanica* (Pakistan).

Status : Littoral, large cow ray.

75. *Rhinoptera sewelli* Misra

1965—Ahmed, M.F.—*Rhinoptera sewelli* Misra (Pakistan).

Status : Littoral, large cow ray.

76. *Mobula diabolus* (Shaw), (1804)
Lesser Devil Ray
(Karunj).

1952—Qureshi, M.R.—*Mobula diabolus* (Makran Coast).

1953—Qureshi, M.R.—*Mobula diabolus* (Pakistan).

1955—Qureshi, M.R.—*Dicerobatis eregodoo* (Karachi, Sind & Makran Coast).

1961—Misra, K.S.—*Mobula diabolus* (Karachi, Sind and Makran Coast).

1969—Misra, K.S.—*Mobula diabolus* (Pakistan).

1972—Jaleel & Khaleeluddin—*Mobula diabolus* (Pakistan).

Status : Pelagic, large devil ray.

- X 77. *Mobula kuhlii* (M. & H.)
Kuhl's Devil Ray
(Karunj).

1969—Misra, K.S.—*Mobula kuhlii* (Pakistan).

Status : Pelagic, small devil ray.
brevirostris (Walbaum, 1792)

78. *Manta ehrenbergii* (M. & H.)
Manta ray *Korey*
(Karunj).

1936—Whitely—*Indomanta tombazii* (Cape Monze, Karachi Coast).

1969—Misra, K.S.—*Manta ehrenbergii* (Pakistan).

1972—Jaleel & Khaleeluddin—*Manta birostris* (Pakistan).

Status : Pelagic, large Manta, probably viviparous ascends estuaries.

Order.....TORPEDINIFORMES

Family.....TORPEDINIDAE

79. *Narcine brunnea* Annandale
Brown Electric Ray
(Mithan).

1972—Jaleel & Khaleeluddin—*Narcine brunnea* (Pakistan).

1973—Ahmad, M.F. et. al.—*Narcine brunnea* (Karachi, Sind and Makran Coast).

Status : Littoral, small electric ray, bottom dweller.

80. *Narcine timlei* (Schn.)
Spotted Electric Ray
(Ghido).

1953—Qureshi, M.R.—*Narcine timlei* (Pakistan).

1955—Qureshi, M.R.—*Narcine timlei* (Partim) (Karachi, Sind and Makran Coast).

1969—Misra, K.S.—*Narcine timlei* (Pakistan).

1972—Jaleel & Khaleeluddin—*Narcine timlei* (Pakistan.)

1973—Ahmad, M.F. et. al.—*Narcine timlei* (Karachi, Sind & Makran Coast.).

Status : Littoral, small electric ray, bottom dweller.

81. *Narcine maculata* (Shaw).
Spotted Electric Ray
(Ghido).

1952—Qureshi, M.R.—*Narcine indica* (Makran Coast).

1953—Qureshi, M.R.—*Narcine indica* (Pakistan).

1955—Qureshi, M.R.—*Narcine timlei* (*partim*) (Karachi, Sind and Makran Coast).

Status : Littoral, small electric ray, bottom dweller.

82. *Torpedo panthera* (Olfers).
Shock Fish
(Ghido).

Torpedo sinus persici Olfers 1931

1912—Englehardt—*Torpedo zugmayeri* (Gwadar Coast).

1969—Misra, K.S.—*Torpedo panthera* (Pakistan).

1972—Jaleel & Khaleeluddin—*Torpedo marmorata* (Pakistan).

Englehardt, 1912.

Status : Littoral, small electric ray, sluggish, timid, bottom dweller.

83. *Narke dipterygia* (Schn.)
Numb-fish
(Mithan).

1913—Zugmayer—*Asterape dipterygia* (Makran Coast).

1952—Qureshi, M.R.—*Narke dipterygia* (Makran Coast)

1953—Qureshi, M.R.—*Narke dipterygia* (Pakistan).

1955—Qureshi, M.R. *Asterape dipterygia* (Karachi, Sind & Makran Coast).

1969—Misra, K.S.—*Narke dipterygia* (Pakistan).

1972—Jaleel & Khaleeluddin—*Narke dipterygia* (Pakistan).

1973—Ahmad, M.F. et. al.—*Narke dipterygia* (Karachi, Sind and Makran Coast).

Status : Littoral, small electric ray, bottom dweller.

84. *Heteronarce mollis* — ?

REFERENCES

- Ahmad, M.F. et. al. .. 1973 Marine Fauna suppl. Rec. Zool. Sur' Pak. Vol. IV (1 & 2) : 22-26.
- Annandale, N. .. 1909 Report on the fishes taken by the Bengal fisheries Steamer "Golden Crown" Mem Indian Mus. Vol. 2 : 1-58, pls. 1-4, figs 1-10
- Bigelow, N.B. & Schroeder, W.C. 1948 Sears Foundation for Marine Research Fishes of the Western Atlantic - Sharks and Rays.
- Chaudhuri, B.L. .. 1915 Fauna of the Chilka Lake. Fish. Part 1. Mem Indian Mus., Vol. 5 ; 403-439, Figs-11.
- Day, F. .. 1878-88 The fishes of India : a natural history of the fishes of India, Burma and Ceylon. London.
- Day, F. .. 1889 The Fauna of British India, including Ceylon and Burma, Fishes. London, Vol. 1.
- Fowler, H.W. .. 1941 Contribution to the biology of the philippine Avchipelago and adjacent regions. Elasmobranchii and Holocephalii. Bull. U.S. nat. Mus. Washington (100) 13 pp. i-x, 1-510, figs. 1-12.
- Gunther, A .. 1870 Catalogue of the fishes of the British Museum, London, Vol. 8, pp. i-xxv 1-549.
- Herre, A.W. .. 1953 Check list of Philippine fishes. Elasmobranchii and Holocephalii. Fish and Wildlife Service, U.S. Deptt. of the Interior, Washington, Res. Report 20 pp. 1-54.
- Hora, S.L. .. 1922 Fauna of the Chilka Lake. Fish. Part V. Mem, Indian Mus., Vol. 5 : 739-769, figs. 22-35.
- Hora, S.L. and Mukerji, D.D. 1936 Notes on fishes in the Indian Museum. xxvii. On two collections of fish from Maungmagan, Taroy District, Lower Burma, Rec. Indian Mus., Vol. 38 ; 15-39, pls. 1-2, figs. 1-6.
- Jalil, M. and Khaleeluddin, M. 1972 A check list of marine fishes of west Pakistan, Marine Fisheries Department, Government of Pakistan, Karachi.
- Jenkins, W.T. .. 1912 Observation on the shallow water fauna of the Bay of Bengal made on the Bengal fisheries Steamer trawler "Golden Crown" 1903-1909. Rec. Indian Mus., Vol. 7 : 51-63.
- Latham, J. .. 1794 Anessay of the various species of sawfish Trans. Linn. Soc., London, Vol. 2 : 273-282, pls. 26-27.
- Lloyd, R.E. .. 1907 Contribution to the fauna of the Arabian Sea, with descriptions of new fishes and crustacea. Rec. Indian Mus., Vol. 1 : 1-12.
- Lloyd, R.E. .. 1908 On two new species of Eagle Rays (Myliobatidae), with notes on the skull of the genus Ceratoptera. Rec. Indian Mus., Vol. 2 : 175-180, pls. 4, 5, 10, figs. 1-3.
- Lloyd, R.E. .. 1909 A description of the deep-sea fish caught by the R. I. M. S. ship "Investigater" since the year 1900, with supposed evidence of mutation in Malthopsis. Mem. Indian Mus., vol. 2, : 139-180, figs. 1-8.

- Misra, K. S. 1949 A check list of the fishes of Indian Burma and Ceylon. I. Elasmobranchii & Holocephali. Rec. Indian Mus., Vol. 45 : 1-46.
- Misra, K.S. 1952 An aid to the identification of the fishes of India, Burma and Ceylon. I Elasmobranchii and Holocephali. Rec. Indian Mus., Vol. 49 : 87-137, figs. 1-25.
- Misra, K.S. & Menon, M.A.S. 1958 On the distribution of the Elasmobranchii and chimaeras of the Indian region in relation to the mean annual isotherms. Rec. Indian Mus., Vol. 53-73-88, figs. 1-2.
- Misra, K.S. 1961 An aid to the identification of the common commercial fishes of India and Pakistan. Rec. Indian Mus., Vol. 57 ; 1-320 figs. 1-198.
- Misra, K.S. 1969 The Fauna of India and the adjacent countries. Fishes, 2nd. ed., Vol. 1. Elasmobranchii and Holocephali, Zool. Sur. India, Calcutta.
- Munro, I. S. R. 1955 The marine and fresh water fishes of Ceylon Ceylon, pp. i-xvi, 1-349, pls. 1-56, figs. 1-19.
- Norman, J.R. 1926 A Synopsis of the Rays of the family Rhinobatidae, with a revision of the genus Rhinobatus. Proc. Zool. Soc. London, Vol. 2 : 941-982, figs. 1-30.
- Norman, J.R. 1939 Fishes. Sci. Rept. John Murrya Exped., London, Vol. 7 : 1-116, figs. 1-41.
- Pillay, S. N. 1929 A list of fishes taken in Travancore from 1901-1915. J. Bombay nat. His. Soc., Vol. 33: 347-379.
- Qureshi, M.R. 1952 Fishes of Mekran Coast. Agri. Pak; Vol. 3 : 237-247.
- Qureshi, M.R. 1953 A field Key to the identification of fishes. I. Elasmobranchii (Selechoidei), Sci. Pak Vol. 1 : 1-18.
- Qureshi, M.R. 1953 A field Key to the identification of fishes. II. Elasmobranchii (Batoidei). Agri. Pak., Vol. 4 : 216-234.
- Qureshi, M.R. 1955 Marine Fishes of Karachi and the Coasts of Sind and Mekran., Central Fisheries Deptt., Ministry of Food & Agriculture, Government of Pakistan Karachi. pp. 1-80
- Regan, C.T. 1908 A revision of the sharks of the family Orectolobidae. Proc. Zool. Sec. London, pp. 347-364.
- Regan, C.T. 1908 A synopsis of the sharks of the family Squalorhinidae. Ann. Mag. nat. hist., (8) 1 : 453-465
- Setna, S.B. and Sarangdhar, P.N 1946 Selachina fauna of the Bombay waters. Proc. nat. Inst. Sci, Calcutta, Vol. 12 : 243-259, figs. 1-21.
- Sewell, R.B.S. 1912 Notes on the deep Sea fish obtained by the R.I.M.S. "Investigator". during the survey season 1910-11. Rec. Indian Mus., Vol. 7:1-14, figs. 1.
- Smith, J.L.B 1961 The sea Fishes of South Africa, Grahams own.

A CHECKLIST OF BRACHYURA OF KARACHI COASTS, PAKISTAN.

M. A. Khan and M. Farooq Ahmad, Department of Zoology, University of Karachi and Zoological Survey Department, Government of Pakistan, Karachi.

ABSTRACT

This paper deals with 51 species of Brachyuran Crabs belonging to 30 genera and 12 families. Their dimensions, Colour, Localities and recorded distributions are given.

INTRODUCTION

Brachyuran fauna of intertidal coast and coastal waters of Karachi has not so far been extensively explored. There are only five reports on the Brachyura of Karachi, i.e. Kohli (1922), Ahmad et al (1973), Karim (1973), Khan (1975 : 1977). Karachi Coasts abound in diversity of species and are immensely promising to the Carcinologists, therefore, this checklist would be of great help for the research workers.

What about
Hashmi's
Alcock

Brachyura of the Indian waters are reported by de Man (1887), Henderson (1893) and others. Alcock (1895-1901) published extensively on the Indian Brachyura; his observations were based on collections of IMS "Investigator". Later on Kemp et. al (1921), Kemp (1919 ; 1923) and Chopra (1933 ; 1935 and 1937) contributed to it. These reports deal mostly with the Brachyura of East coast of India, Bay of Bengal and Bombay state (See e. g. Chhappgar (1956).

This checklist is based on collections of past several years from various localities of Karachi coast as shown in Fig I.

SYSTEMATIC ACCOUNT

Tribe : DROMIACEA

Subtribe : DROMIIDEA

Family : DROMIIDAE

GENUS : *Dromia* Fabricius

1. *Dromia dormia* (Linnaeus)

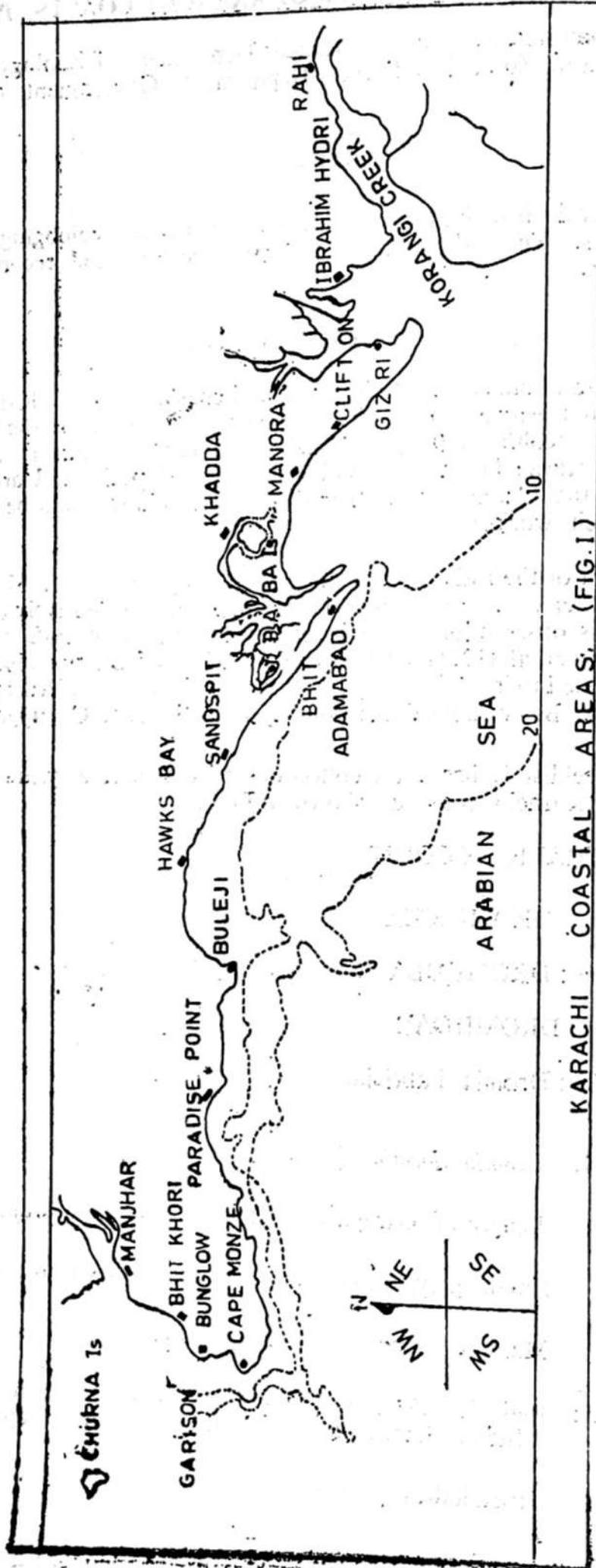
Dimensions : Length of Carapace 42. mm., Breadth of Carapace 50 mm.

Colour : Harsh grey, fingers of the chelipeds pinkish brown.

Locality : Manora Island and Korangi Creek.

Distribution : Red Sea, Persian gulf, South Africa, Mauritius, both coast of India, Laccadives and Maldives, China, Japan.

Genus : *Pseudodromia* Stimpson



KARACHI COASTAL AREAS (FIG. 1)

2. *Pseudodromia integrifrons* Henderson

Dimensions : Length of Carapace 8 m.m. Breadth of carapace 6 m.m.

Colour : Greyish orange, chelae with white stripes.

Locality : Manora Island and Buleji.

Distribution : Tuticorin, Bombay State.

Tribe : OXYSTOMATA

Family : CALAPPIDAE

Sub-family : CALAPPINAE

Genus : Calappa Fabricius.

3. *Calappa lophas* (Herbst)

Dimensions Length of Carapace 60 m.m. Breadth of carapace. 91 m.m.

Colour : Pinkish, fingers of the Chelepedes yellowish.

Locality : Hawkes bay, Manora Island.

Distribution : East coast of India, Bombay, Andamans, Ceylon, Laccadives, Persian gulf, Tanzania, Thailand, Japan, Celebes, Australia.

Sub-family : MATUTINAE

Genus : Matuta Milne-Edwards

4. *Matuta lunaris* (Forskal)

Dimensions : Length of carapace 39 m.m. Breadth of carapace 36. m.m.

Colour : Yellow with violet stripes.

Locality : Manora Island, Sandspit, Hawkes bay and Bhit Kori.

Distribution : Polynesia, Red Sea, Bay of Bengal, Bombay State.

5. *Matuta planipes* Fabricius

Dimensions : Length of carapace 30 m.m. Breadth of carapace. 25 m.m.

Colour : Bright yellow with Wavy red lines.

Locality : Manora Island, Clifton, Gizri, Bhit, Capemonze and Manjhar.

Distribution : Bay of Bengal, Andamans, Burma, Both coast of India, South Africa, Singapore, Thailand, China, Japan, Java, Celebes, Australia.

Family : LEUCOSIIDAE

Sub-family : LEUCOSIINAE

Genus : Leucosia Fabricius.

6. *Leucosia pubescens* Miers

Dimensions : Length of carapace 20 m.m. Breadth of carapace 17 m.m.
 Colour : Salty blue, chelipeds with brownish bends.
 Locality : Manora Island and Buleji.
 Distributions : Persian gulf, Both coast of India, Andamans, Thailand, Hongkong, Australia.

7. *Leucosia sima* Alcock.

Dimensions : Length of carapace 12 m.m. Breadth of carapace 13.5 m.m.
 Colour : Chocolate brown.
 Locality : Buleji and Paradise point.
 Distribution : Bombay State.
 Genus : *Philra* Leach.

8. *Philyra globosa* (Fabricius).

Dimensions : Length of carapace 17 m.m. Breadth of carapace 17 m.m.
 Colour : Sandy brown with bluish tinge.
 Locality : Kcrangi Creek and Sandspit.
 Distribution : Both coast of India.

9. *Philyra corallicola* Alcock

Dimensions : Length of carapace 8.5 m.m Breadth of carapace 9.25 m.m.
 Colour : Sandy brown.
 Locality : Sandspit and Hawkes bay.
 Distribution : Malabar coast, Bombay State.
 Sub-family : ILIINAE
 Genus : *Arcania* Leach.

10. *Arcania septemspinosa* (Fabricius).

Dimensions : Length of carapace 21 m.m. Breadth of carapace 22.5 m.m.
 Colour : Patchy red.
 Locality : Manora Island.
 Distribution : Andamans, Persian gulf, South Africa, Red Sea, Malaya, Hongkong, Bombay State.

Family : DORIPPIDAE
 Sub-family : DORIPPINAE
 Genus : Dorippe Fabricius

11. *Dorippe astuta* Fabricius

Dimensions : Length of carapace 12 m.m. Breadth of carapace 11.5 m.m.

Colour : Ashy grey.

● Locality : Korangi Creek and Manora Island.

Distribution : Andamans, China, Bombay State.

Tribe : BRACHYGNATHA

Sub-tribe : OXYRHYNCHA

Family : HYMENOSOMIDAE

Genus : Elamena Milne-Edwards.

12. *Elamena cristatipes* Gravely

Dimensions : Length of carapace 6.5 m.m. Breadth of carapace 5.0. m.m.

Colour : Rocky grey.

Locality : Manora Island.

Distribution : Gulf of Manaar, Travancore, Bombay State.

Family : MAIIDAE

Sub-family : ACANTHONYCHINAE

Genus : Menaethius Milne-Edwards.

13. *Menaethius monoceros* Latreille

Dimensions : Length of carapace 23 m.m. Breadth of carapace 22 m.m.

Colour : Lemon Yellow.

Locality : Korangi Creek, Baba Island and Bhit Island.

Distribution : Red Sea, Persian Gulf, East coast of Africa, Indo-pacific region, Japan, Both coast of India.

Sub-family : PISINAE

Genus : Hyastenus White.

14. *Hyastenus planasius* (Adams and White)

Dimensions : Length of carapace 25 m.m. Breadth of carapace 20.5 m.m.

Colour : Ashy grey.

Locality : Manora Island.

Distribution : Ceylon, Mergui, Travancore, Singapore, Bombay State.

Genus : Doclea Leach

15. *Doclea gracilipes* Stimpson

Dimensions : Length of carapace 38 m.m., Breadth of carapace 35 m.m.

Colour : Dark green.

Locality : Buleji and Manora Island.

Distribution : Hongkong, Mergui, Andamans, Gulf of Mannar, Ceylon, Bombay State.

Family : PARTHENOPIDAE

Sub-family : PARTHENOPINAE

Genus : Lambarus Leach.

Sub-genus : Platylambrus Stimpson.

16. *Lambrus (Platy-lambrus) prensor* Herbst.

Dimensions : Length of carapace 30 m.m. Breadth of carapace 37 m.m.

Colour : Pink, fingers of the chelipeds brown.

Locality : Manora Island and Korangi Creek.

Distribution : Andamans Island, Singapore, Ceylon, Both coast of India.

Sub-tribe : BRACHYRHYNCHA

Family : PORTUNIDAE

Genus : Scylla De Haan

17. *Scylla serrata* (Forsk.)

Dimensions : Length of carapace 140 m.m. Breadth of carapace 207 m.m.

Colour : Uniformly dark greenish-grey.

Locality : Ibrahim Hydri.

Distribution : Indo pacific region, Red Sea, East coast of Africa, India, Japan, Australia, Tahiti, Newzealand.

Genus : Portunus De Haan.

18. *Portunus pelagicus* (Rathbun)

- Dimensions : Length of carapace 57 m.m. Breadth of carapace 167 m.m.
 Colour : Light blue to dark green with white patches.
 Locality : From Karachi Coastal waters (Caught in fishing nets).
 Distribution : Red Sea, Mediterranean, Zanzibar, Mozambique, Madagascar, India, Persian Gulf, Ceylon, Singapore, Philipines, Australia, Newzealand, Tahiti, China Sea, Japan.

19. *Portunus sanguinolentus* (Rathbun)

- Dimensions : Length of carapace 43. mm., Breadth of carapace 76 m.m.
 Colour : Dark greenish grey with three blood red spots, ringed with white, on the carapace.
 Locality : From Karachi coastal waters (Caught in the fishing nets).
 Distribution : Hongkong, Andamans, India, Ceylon, Persian Gulf, Red Sea, Japan, Hawaii, Australia.
 Genus : Charybdis De Haan
 Sub-genus: Goniosoma Milne-Edwards.

20. *Charybdis (Goniosoma) cruciata* (Herbst)

- Dimensions : Length of carapace 44 m.m, Breadth of carapace 63 m.m.
 Colour : Purplish brown.
 Locality : From Karachi coastal waters (Caught in the fishing nets).
 Distribution : India, South Africa, China, Japan, Australia.

21. *Charybdis (Goniosoma) lucifera* (Fabricius)

- Dimensions : Length of carapace 38 m.m. Breadth of carapace 58 m.m.
 Colour : Greenish brown with two large white spots on either side of branchial region.
 Locality : From Karachi coastal waters (Caught in the fishing nets also collected from intertidal rocky pools of Manora Island.)
 Distribution : India, Ceylon Java, Thailand.

22. *Charybdis (Goniosoma) callinassa* (Herbst)

- Dimensions : Length of carapace 18 m.m. Breadth of carapace 25 m.m.
 Colour : Dirty white to light grey.
 Locality : Buleji and Manora Island.
 Distribution : India, Thailand, Sumatra.

23. *Charybdis (Goniosoma) annulata* (Fabricius)

Dimensions : Length of carapace 32 m.m. Breadth of carapace 52 m.m.

Colour : Flesh coloured with light greenish tinge on the chelipeds.

Locality : Cape Monze, Buleji and Manora Island.

Distribution : India, Ceylon, Tahiti, Thailand.

24. *Charybdis (Goniosoma) orientalis* (Dana)

Dimensions : Length of carapace 32 m.m. Breadth of carapace 45 m.m.

Colour : Mottled greyish brown with fingers of the chelipeds dark red.

Locality : Manora Island.

Distribution : India (both coth coasts.)

Sub-genus : *Goniohellenus* Milne-Edwards.

25. *Charybdis (Goniosoma) hoplites* (Wood-Mason)

Dimensions : Length of carapace 21 m.m. Breadth of carapace 35 m.m.

Colour : Dirty white.

Locality : Buleji and Manora Island.

Distribution. West coast of India, Bay of Bengal.

Genus : *Thalamita* Milne-Edwards.

26. *Thalamita crenata* Milne-Edwards.

Dimensions : Length of carapace 41 m.m. Breadth of carapace 59 m.m.

Colour : Uniformly greenish grey with pinkish claws.

Locality : Cape-Monze and Buleji.

Distribution : Andamans, India, Red Sea, Persian Gulf, East Coast of Africa, Singapore, Japan, Australia, Newzealand, Samoa.

27. *Thalamita prymna* (Herbst)

Dimensions : Length of carapace 38 m.m. Breadth of carapace 55 m.m.

Colour : Greyish pink with pink claws having black tips.

Locality : Manora Island and Buleji.

Distribution : Bay of Bengal, India, Red Sea, Andamans, Malayia, Japan, Australia, New Caledonia, Tonga Island, Samoa.

Family : XANTHIDAE

Sub-family: XANTHIANE

Genus : Atergatis De Haan

28. *Atergatis integerrimus* (Lamarck)

Dimensions : Length of carapace 62 m.m. Breadth of carapace 95 m.m.

Colour : Brick red, whitish pits. On the carapace, fingers black with whitish tips.

Locality : Manora Island, Buleji and Paradise point.

Distribution : From Japan to Zanzibar.

29. *Atergatis floridus* (Rumph)

Dimensions : Length of carapace 39 m.m. Breadth of carapace 56 m.m.

Colour : Yellowish pink.

Locality : South Africa, Red Sea, Andamans.

Distribution : Laccadives, Thailand, Philippines, Australia, Japan, India.

30. *Atergatis roseus* (Ruppell)

Dimensions : Length of carapace 19 m.m. Breadth of carapace 27 m.m.

Colour : Dark pink with white margin along the carapace.

Locality : Manora Island.

Distribution : India (Madras and Bombay State).

Genus : Leptodius Milne-Edwards.

31. *Leptodius exgratus* (Milne-Edwards).

Dimensions : Length of carapace 21 m.m. Breadth of carapace 29 m.m.

Colour : Dirty grey, fingers of the chelipeds black with whitish tips.

Locality : Bhit Khori, Cape-Monze, Buleji and Manora Island.

Distribution : Bay of Bengal, Persian gulf, Polynesia, Australia, Malaysia, Ceylon, India, Maldives and Laccadives, Red Sea.

32. *Leptodius crassimanus* Milne-Edwards.

Dimensions : Length of carapace 27 m.m. Breadth of carapace 44 m.m.

Colour : Dirty yellow fingers of chelipeds dark brown.

Locality : Manora Island, Buleji, Cape Monze and Paradise point.

Distribution : Andamans, Australia, India.

33. *Leptodius euglyptus quadrispinosus* Chhapgar.

Dimensions : Length of carapace 9 m.m. Breadth of carapace 15 m.m.

Colour : Pink carapace with a white longitudinal band from anterior to posterior, fingers of the chelipeds brownish black.

Locality : Manora Island, and Buleji rocks.

Distribution : India (Bombay State).

Genus : *Etisus* Milne-Edwards.

34. *Etisus laevimanus* Randall

Dimensions : Length of carapace 29 m.m. Breadth of carapace 40 m.m.

Colour : White with orange patches, fingers of chelipeds black.

Locality : Cape-Monze, Manora Island and Buleji.

Distribution : Persian gulf, Laccadives, Andemans, Singapore, Mauritius, Celebes.

Sub-family: ACTAEINAE

Genus : *Actae* De Haan.

35. *Actae savignyi* (Milne-Edwards).

Dimensions : Length of carapace 13 mm. Breadth of carapace 19 m.m.

Colour : Light red, fingers of the chelipeds black with whitish tips.

Locality : Buleji, Manora Island and Paradise point.

Distribution : Persian gulf, Red sea, India, Ceylon, Maldives and Laccadives, Malayia, Hongkong, Australia, Newzealand, Malacca.

Sub-family: OZIINAE.

Genus : *OZIUS* Milne-Edwards.

36. *Ozius rugulosus* Stimpson.

Dimensions : Length of carapace 48 m.m. Breadth of carapace 67 m.m.

Colour : Violet, fingers of the chelipeds black.

Locality : Manora Island and Buleji.

Distribution : India, Ceylon, Andamans, Nicobars, Australia, Tahiti, New Caledonia.

Sub-family: PILUMNINAE

Genus : *Pilumnus* Leach.

37. *Pilumnus vespertilio* (Fabricius)

Dimensions : Length of carapace 24 m.m. Breadth of carapace 30 m.m.

Colour : Greyish white.

Locality : Paradise point, Buleji and Manora Island.

Distribution : Andamans, Tavey, Mergui, India.

38. *Pilumnus longicornis* Hilgendorf

Dimensions : Length of carapace 12 m.m. Breadth of carapace 15 m.m.

Colour : Light pinkish red, fingers of the chelipeds brown.

Locality : Manora Island.

Distribution : Thailand, Seychelles, India.

Sub-family : ERIPHINAE

Genus : *Eriphia* Latreille.

39. *Eriphia laevimana smithi* Macleay.

Dimensions : Length of carapace 50 m.m. Breadth of carapace 64 m.m.

Colour : Dull maroon, fingers of the chelipeds chocolate brown with white tips.

Locality : Manora Island and Buleji.

Distribution : India.

Family : PINNOTHERIDAE

Sub-family: PINNOTHERINAE

40. *Pinnotheres placunae* Hornell and South-well.

Dimensions : Length of carapace 6 m.m. Breadth of carapace 7 m.m.

Colour : Off white.

Locality : Korangi Creek. (From mantle cavity of bivalve *Placuna placenta*)

Distribution : India, Okha.

Family : OCYPODIDAE

Sub-family: OCYPODINAE

Genus : *Ocypoda* Fabricius.

41. *Ocypoda ceratophthalma* (Pallas)

Dimensions : Length of carapace 29 m.m., Breadth of carapace 33 m.m.
 Colour : Whitish, inner borders in the arm of chelipeds scarlet red.
 Locality : Sandspit, Cape-Monze (Sandy, burrowing).
 Distribution : Tahiti to East coast of Africa.

42. *Ocypoda cordimana* Desmarest

Dimensions : Length of carapace 23 m.m. Breadth of carapace 24 m.m.
 Colour : Grey.
 Locality : Clifton and Cape-Monze.
 Distribution : Tahiti and Japan to Red Sea.

43. *Ocypoda rotundata* Miers

Dimensions : Length of carapace 43 m.m. Breadth of carapace 49 m.m.
 Colour : White.
 Locality : Clifton, Manora Island and Cape-Monze.
 Distribution : India, Persian Gulf.
 Genus : *Gelasimus* Latreille

44. *Gelasimus annulipes* Latreille

Dimensions : Length of carapace 10 m.m. Breadth of carapace 18 m.m.
 Colour : Chocolate brown.
 Locality : Baba Island, Bhit Island and Korangi Creek.
 Distribution : Both coast of India.

45. *Gelasimus marionis* (Desmarest)

Dimensions : Length of carapace 17 m.m. Breadth of carapace 27 m.m.
 Colour. Blackish brown, claws white.
 Locality : Baba Island, Bhit Island and Korangi Creek.
 Distribution : From Samoa and Fiji Islands to East coast of Africa and the Red Sea.

46. *Gelasimus marionis nitidus* Dana.

- Dimensions : Length of carapace 18 m.m. Breadth of carapace 28 m.m.
 Colour : Brown with white claws.
 Locality : Baba Island, Bhit Island and Korangi Creek.
 Distribution : From Samoa and Fiji Islands to East coast of Africa and Red Sea.

47. *Gelasimus dussumieri* Milne-Edwards

- Dimensions : Length of carapace 21 m.m., Breadth of carapace 34 m.m.
 Colour : Chocolate brown, chelipeds redish yellow.
 Locality : Baba Island, Bhit Island and Korangi Creek.
 Distribution : Mergui, Andamans, Nicobars, India.

Sub-family : MACROPHTHALMINAE

Genus : *Macrophthalmus* Latreille

48. *Macrophthalmus crinitus*. Rathbun

- Dimensions : Length of carapace 10 m.m. Breadth of carapace 12 m.m.
 Colour : Greyish.
 Locality : Manora Island and Buleji.
 Distribution : Mergui, Singapore, Amboina, India.

Family : GRAPSIDAE

Genus : *Grapsus* Lamarck.

49. *Grapsus strigosus* (Herbst)

- Dimension : Length of carapace 31 m.m. Breadth of carapace 34 m.m.
 Colour : Dark redish brown.
 Locality : Manora Island, Paradise point and Buleji.
 Distribution : East coast of Africa to Polynesia.

Genus : *Metopograpsus* Milne-Edwards.

50. *Metopograpsus messor* (Forsk.)

- Dimensions : Length of carapace 15 m.m., Breadth of carapace 19 m.m.
 Colour : Dark bottle green with transverse markings.
 Locality : Paradise point, Buleji and Manora Island.
 Distribution : Red Sea to Australia.

51. *Metopograpsus maculatus* Milne-Edwards

- Dimensions : Length of carapace 23 m.m. Breadth of carapace 28 m.m.
 Colour : Dark green without transverse marking.
 Locality : Paradise point, Buleji and Manora Island.
 Distribution : East Indies to Persian Gulf.

REFERENCES

- Ahmad, M.F. et al 1973 Marine Fauna Supplement. Rec. Zool. Surv. Pak., Vol. IV, No. 1 & 2.
- Alcock, A. 1895 Materials for a Carcinological Fauna of India, No. 1. The Brachyura Oxyrhyncha. Journ. As. Soc. Bengal IXIV, pt 11, No. 11, pp.175-289, pls iii—v
- 1896 Materials for a Carcinological Fauna of India. No. 2. The Brachyura Oxystomata. Journ. As. Sec. Bengal IXV, pt. 11, No. 11, pp. 134—296, pls. vi—viii.
- 1899 Ibid. No. 4. The Brachyura Cyclometopa. Part 11. Revision of the Cyclometopa with an account of the families Portunidae, Cancridae and Corystidae. Journ. As. Soc. Bengal ixvii, pt. 11, No. 1, pp. 1—104.
- 1901 Catalogue of the Indian Decapod Crustacea in the collection of the Indian Museum, pt. 1, Brachyura. Fasc. 1. pp. 1,—80, pls. A & i—vii.
- Chhapgar, B. F. 1956 On the Marine crabs (Decapoda-Brachyura), of Bombay State, J.B.N.H.S. Vol. 54 (3) pp. 399—439.
- 1956 Ibid. J.B.N.H.S. Vol. 54, (3), pp. 439—549.
- Chopra, B. 1933 Further notes on decapod crustacea in the Indian Museum on the decapod crustacea collected by the Bengal pilot service of the mouth of river Hughli. Rec. Ind. Mus, xxxv, pp. 25—52.
- 1935 Ibid. Brachygnatha (Oxyrhyncha and Brachyncha) Rec. Ind. Mus. xxxvi. pp. 463—514.
- 1937 On three collection of crabs from Tavoy and Mergui Archipelago. Rec. Ind. Mus. xxxix, pp. 377—434.
- de Man, J.G. 1887 Report on the Podophthalmus Crustacea of the Mergui Archipelago collected for the Trustees of the Indian Museum Parts. i—v. Journ. Linn. Soc. London (Zool) ii, pp. 1—212.
- Henderson, R. 1893 A contribution to Indian Carcinology Trans. Linn. Soc. Lond (Zool), (2) V. pp. 325—409.
- Karim, S. I. 1973 An addition to the crab Fauna of Pakistan., Rec. Zool. Surv. Pak., Vol. V, No. 1 & 2, pp. 33—40.
- Khan, M.A. 1975 Portunidae of Pakistan Journ. Agri. Pak., Vol. xxvi (3) pp. 377—392.
- 1977 Xanthidae (Crustacea-Decapoda-Brachyura) from Karachi, coasts. Biologia (Pak), Vol. 23 (2), pp.179—187.
- Kohli, G.R. 1922 Brachyura of Karachi coast. Proc. Lahore Phil. Soc. iij, pp. 81—85.

NEW RECORD OF *OSTEOGENEIOSUS MILITARIS* (LINN.) (FAMILY :
TACHYSURIDAE) FROM PAKISTAN AND SYSTEMATIC POSITION
OF *O. STHENOCEPHALUS* DAY.

By

MOHAMMAD SADIQ NIAZI

ZOOLOGICAL SURVEY DEPARTMENT

INTRODUCTION

Osteogeneiosus militaris (Linn.) has so far been reported in Indian Ocean from Bombay to Malay Archipelago by various workers like Linnaeus (1758) Val. (1840), Cantor (1849), Gunther (1864), Day (1878 & 1889), Weber and De Beaufort (1913), Fowler (1941), Munro (1955) and Misra (1962). Type locality as given by Linn. (1758) is Asia (Indian Seas). According to Day (1878 & 1889) the fish is distributed in seas, estuaries and tidal rivers of India to Malay Archipelago. Munro (1955) has reported it from marine and fresh water of Sri Lanka (Ceylon). Misra (1952) described it from coasts of Travancore-Cochin, Coromandal, Orisa, Sri Lanka (Ceylon), Malay Archipelago and Siam and considered it to be a marine fish that ascends tidal rivers and estuaries. No worker, so far, has reported it from Pakistan coast. The author collected this fish from Dabbo and Phitti Creeks of Sind (Pakistan). Present paper deals with the description of *Osteogeneiosus militaris* (Linn.). Systematic position of *O.sthenocephalus* Day has also been discussed.

OSTEOGENEIOSUS MILITARIS (LINN.)

- 1758 : *Silurus militaris* Linnaeus, Syst. Nat., 1, ed. 10. P. 305.
- 1849 : *Arius militaris* Cantor, J. Asiat. Soc. Bengal, Vol. XVIII, 1849, PP. 1241.
- 1864 : *Osteogeneiosus militaris*, *O.valenciennesii*, *O.macrocephalus* Gunther, Cat. Brit. Mus. Fish., Vol. V. P. 181.
- 1878 : *Osteogeneiosus militaris*, *O.sthenocephalus* Day, Fish. India., P. 469.
- 1889 : *Osteogeneiosus militaris*, *O.sthenocephalus* Day. Fauna Brit. India, Fishes, Vol. 1, P. 190.
- 1913 : *Osteogeneiosus militaris* Webber & De Beaufort, Fishes of Indo-Australian Archipelago Vol. II PP. 329.
- 1941 : *Osteogeneiosus militaris* Fowler, Bull. U.S. nat. Mus., 100, Vol. 13, P. 771.
- 1955 : *Osteogeneiosus militaris*, *O.sthenocephalus* Munro, Mar. Fresh water Fish. Ceylon, Canberra P. 52.
- 1962 : *Osteogeneiosus militaris* Misra, Rec. Ind. Mus., Vol. 57(1-4) P. 176.

DESCRIPTION

Head 4.2—4.7, depth 4.8—6.1, Caudal fin 5.3—6 and anal ray 6.4—7.4 in total length of body. Eye diameter 7.5 in head length, 2.5 to about 3 diameters from end of snout and 4—4.3 apart. Width of head 1.3 in its length, equals to its length behind the angle of mouth in small specimens but less in large ones; width of the gape of mouth 2—2.3 in head length. Width of occipital process 3—3.3 in its length. Upper surface of head smooth with a few granulations in the posterior half. Barbels, maxillary, one pair, semi-osseous, generally longer

than head. Palatine teeth in two crescentic patches converging anteriorly. Dorsal spine as long as head excluding snout. Pectorals reaching half way to ventrals, the spine stronger than the dorsal but much smaller. Lateral line is slightly bent behind dorsal in small specimens but it is almost straight in large ones.

DISTRIBUTION

Pakistan : Coasts of Sind (Phitti Creek, Dabbo Creek); Sri Lanka; India: Coasts of Bombay, Travancore-Cochin, Coromandal, Orisa; Malay Archipelago; Siam.

Remarks :

The fish is common in the waters of Malay Archipelago, and has been reported upto the coasts of Bombay. But due to newly report of the fish from the coast of Sind (Pakistan) its distribution is found to be extended upto Sind (Pakistan).

The works of previous ichthyologists like Gunther (1864) Cantor (1849) Day (1878, 1889) and Weber and De Beaufort (1913) reveal that the fish is highly variable. Head and depth of the fish in total length as calculated by various workers is given in table I which shows a remarkable variation. Similar is the case with other characters like eye (its position and diameter in head), occipital process, caudal fin, Anal rays etc.

SYSTEMATIC POSITION OF O.STHENOCEPHALUS DAY.

Osteogeneiosus militaris (Linn.) is a highly variable species, showing a wide range of morphometric characters. Bleeker (1846) erected a number of allied independent species viz., *O. macrocephalus*, *O. longiceps*, *O. ingluvies*, *O. gracilis*, *O. blochii* and *O. valenciennesi* from Batavia. Later on he (1853) erected another new species *O. cantoris* from River Hoogly. In 1862 he reported *O. militaris* (Linn.). Day (1878) also recognized *O. militaris* from Indian waters but he erected a new species *O. sthenocephalus* from Burma. But Gunther (1848) on the other hand realized the fact and reduced the list to three i.e. *O. militaris* (Linn.), *O. valenciennesi* Blkr., and *O. macrocephalus* Blkr. In fact he synonymized *O. cantoris* Blkr. with *O. militaris* Blkr., *O. gracilis* Blkr. and *O. blochii* Blkr. with *O. macrocephalus* Blkr. Weber and De Beaufort (1913) further reduced the list and brought all species of Bleeker and Gunther under the synonymy of *O. militaris* (Linn.). Similar is the view of Fowler (1941). They, however, did not touch Day's species *O. sthenocephalus*. Munro (1955) followed Day and accepted *O. sthenocephalus* Day together with *O. militaris* (Linn.). Misra (1962) followed the pattern of Weber and De Beaufort (1913) recognizing only *O. militaris* (Linn.) from Indian waters and leaving *O. sthenocephalus* Day in the dark. So far *O. sthenocephalus* Day is concerned no other worker except Munro (1955) has recognized it or collected it from different localities in Indian Ocean. Day has based his new species on a single specimen captured from Moulmin (Burma) and even he could not add any specimen to his solitary fish. Day's solitary fish, therefore, seems to possess exceptionally a narrow head and flat snout. According to Day (1878), "the fish differs from the preceding species (i.e. *O. militaris*) in having a much narrower head, deeper anal fin and flatter snout". According to Munro (1955) it "differs from the preceding species (*O. militaris*) in having a shorter and more slender head and longer rays". Such exceptions, in fact, are common in fishes and S. R. Pillay (1962) has considered *Mugil klunzingeri* Day as an exceptionally broad specimen of *Mugil carinatus* Val.

The differentiating characters of *O.sthenocephalus* Day, as indicated by Day (1878, 1889) and followed by Munro (1955) to separate it from the allied species *O.militaris* (Linn.) are the relative measurement of head, caudal fin, height of body in total length and of eye in head length, position of eye in the head, greatest width of the head, width of the occipital process, median longitudinal groove and upper surface of the head. These can be arranged as shown in table II.

From Gunther's descriptions (1864)—table III—it is obvious that Bleeker's species are more or less variable forms of the original species *O.militaris* (Linn.), and *O.sthenocephalus* Day falls within the range of the characters of Bleeker's species that have been synonymized by Weber & De Beaufort (1913) and Misra (1962). *O.sthenocephalus* Day, though a variable form of *O.militaris* (Linn.), resembles with *O.macrocephalus* Gunther and *O.valencinnesii* Gunther in morphometric character. But I think like Bleeker's species, *O.sthenocephalus* is also a synonymous species of *O.militaris* (Linn.). In fact variations are generally met within systematics of fishes which have resulted a number of new species but these have been synonymized by various authorities. S. R. Pillay's work (1962) is a good example.

ACKNOWLEDGEMENT

My thanks are due to Mr. M. Farooq Ahmed, Director of the Department for confirmation of the species and going through the manuscript and valuable criticism on the subject.

REFERENCES

- | | | |
|--------------------------------------|---------|--|
| CANTOR, T. | 1849 | Catalogue of Malayan Fishes. J. Asiat. Soc. Bengal, Vol. XVIII, P. 1241. |
| DAY, F. | 1878-88 | The Fishes of India: a natural history of the fishes of India, Burma and Ceylon P. 469. |
| DAY F | 1889 | Fauna of British India, Fishes, Vol. I. P. 190. |
| FOWLER, H. W. .. | 1941 | Contribution to the biology of the Philippine Archipelago and adjacent regions. Bull. U. S. nat. Mus., 100, Vol. 13, P. 772. |
| GUNTHER, A. .. | 1864 | Catalogue of the Acanthopterygian fishes in the collections of the Indian Museum, Vol. V., P. 181. |
| MISRA, K. S. .. | 1962 | An aid to the identifications of the common commercial fishes of India and Pakistan. Rec. Ind. Mus. Vol. 57(1-4) P. 176. |
| MUNRO, I.S.R. .. | 1955 | The Marine and Fresh water Fishes of Ceylon, Canberra. |
| PILLAY, S.R. .. | 1962 | J. Bombay nat, Hist. Soc. Vol. 59, P. 550. |
| WEBER, M. & DE BEAU-FORT, L.F. | 1913 | The Fishes of the Indo-Australian Archipelago, Leiden. Vol. 2, P. 329. |

TABLE I

Showing Relative Measurement of Head and Depth of the Fish as given by various workers

Worker	Head in T.L.	Depth in T.L.
Cantor (1849)	4.5	—
Gunther (1864)	4.5—4.66	6—6.75
Day (1878—1889)	4.25—4.5	5.5—6.5
Weber & De Beaufort (1913)	3.2—3.4	5.25—6
Fowler (1941)	3.75—3.88	4.8—5.2
Munro (1955)	4.25—4.5	—
Misra (1961)	4.2—4.5	5.5—6.5
Author	4.2—4.7	4.8—6.1

TABLE II

Comparison of *O. militaris* Day and *O. stenocephalus* Day

S. No.	Character	<i>O. Militaris</i> Day	<i>O. Stenocephalus</i> Day
1.	Head in T. L.	4-1/4—4-1/2	4-3/4
2.	Caudal fin in T.L. ..	7-1/2	5-1/2
3.	Height of body in T. L. ..	5-1/2—6-1/2	7-1/2
4.	Eye diameter in Head length	7	6-1/2
5.	Position of eye in head ..	2 diameters from end of snout and 4 apart.	2 diameters from end of snout and 3 apart.
6.	Greatest width of the head	equals the length of head behind the angle of the mouth.	equals half its length.
7.	Occipital process ..	2-1/2 times as long as wide at its base.	3 times as long as wide at its base.
8.	Median longitudinal groove	It is of moderate width, not extending so far as its base.	it is rather wide and does not extend quite its base.
9.	Upper surface of head ..	almost or quite smooth, a few granulation generally present between the posterior end of the median longitudinal groove and the base of occipital process.	with a few granulation between the posterior end of the median longitudinal groove and the base of the occipital process.
10.	Barbels	rather longer than head	as long as head.
11.	Anal fin	highest anteriorly, where its height is equal to half the length of the head.	as deep as the head (excluding the snout) is long.

TABLE III
 Comparison of the three species of *Osteogeneiosus* from Gunther (1864) with *O. sthenocephalus* from Day (1878 and 1889)

S. No.	Characters	<i>O. militaris</i>	<i>O. valenciennesii</i>	<i>O. macrocephalus</i>	<i>O. sthenocephalus</i>
1.	Anal Rays	.. 20—23	20—22	19—21	
2.	Head in T. L.	.. 4.5—4.66	4.33—4.73 (or 4.75)	4	4.25
3.	Depth of body in T. L.	.. 6—6.75	6.25—6.75	6.5—7.5	7.5
4.	Eye in the interorbital space	.. 1/4 or eyes 4 diameters apart.	1/3—2/7 or eyes 3—3.5 diameters apart.	2/5 or eyes 2.5 diameters apart.	3 diameters apart.
5.	Interorbital space	.. more than 1/2 of the head length.	less than 1/2 of the head length.		
6.	Head	.. distinctly granulated above, depth 2/3 of the length.	scarcely granulated above, depth a little more than 1/2 of the length.	scarcely granulated above, depth 1/2 of the length.	scarcely granulated above, depth 1/2 of the length.
7.	Occipital process	.. not quite thrice as long as broad.	not quite thrice as long as broad.	thrice as long as broad.	thrice as long as broad.
8.	Barbels	.. extend beyond the end of the head.	extend to or beyond the root of the pectoral.	extend to the root of the pectoral.	as long as head.

EGGS AND NYMPHAL SYSTEMATICS OF *COPTOSOMA CRIBRARIUM*
(FABR.) (PENTATOMOIDEA : PLATASPIDAE) WITH A NOTE ON
OTHER PLATASPIDS AND THEIR PHYLOGENY.

MOHAMMAD MOIZUDDIN

ZOOLOGICAL SURVEY DEPARTMENT, KARACHI

AND

IMTIAZ AHMAD

DEPARTMENT OF ZOOLOGY, UNIVERSITY OF KARACHI, KARACHI

ABSTRACT

Eggs and nymphal systematics of *Coptosoma cribrarium* (Fabr.) of the family Plataspidae are studied and compared with those of the other plataspids reported in the literature to date in order to ascertain their taxonomic value.

INTRODUCTION

Coptosoma cribrarium (Fabr.) has been known as a pest of bean in Indo Pakistan subcontinent; also reported infesting agathi, red gram, indigo and cluster bean plants (Aiyar 1913); is widely distributed particularly in lower Sind and both adults and nymphs damage leaves, stems, twigs and flowers of bean throughout the year (Ahmad and Moizuddin 1975a, 1975b, 1976 and 1977). Kershaw (1910) incompletely described the structure of eggs and duration of instars; Aiyar (1913) made a tentative observation on life history; Leston and Scudder (1956) did not include this family in their larval key; Cobben (1968) studied the structure of eggs on unidentified *Coptosoma* spp. and more recently Ahmad and Moizuddin (op. cit.) have investigated quantitative life cycle of the present species, but nymphal information is lacking to date. An attempt is presently made to fill this gap in our knowledge.

Material and Methods :

The specimens were collected from various fields of bean plants (*Dolychos lablab*) in the Malir garden near Karachi and a successful colony was maintained in the nearby field at Karachi University Campus. Experimental material was derived from the eggs deposited in laboratory; first stage nymph was taken after it hatched from egg, second, third, fourth and fifth stages were confirmed by the presence of exuviae; to determine the moulting one nymph was kept in one test tube; fresh leaves, twigs or fruits of bean plant were provided and changed daily during the period. The nymphs were studied on cotton ball dipped in glycerine under Leitz binocular microscope and the diagrams were made using ocular grid on graph papers to the given scales. All measurements are given in mm.

RESULTS

Egg. (Figs. 1—3).

Laid in batches; cup shaped, creamy; foreside attached to substratum, aft side slightly concave, posterior pole blunt, convex; aeromicropylar processes usually 13 (minimum 11 and maximum 16) arranged in a ring round the anterior pole as minute knobs; opercular cap pushed anteriorly at eclosion. Small irregular egg burster present as ochraceous minute tooth (Fig. 3).

First Nymphal stage (Fig. 4): Body broadly oval; newly hatched testaceous, late stage light greenish. Head almost triangular, entire; obtuse cephalad to tylus, flat caudad to neck; clypeus and paraclypei subequal, on both sides, one hair laterally, one hair dorsally on clypeus, five hairs laterally, two hairs dorsally on paraclypei eyes rufescent; labium straight, ochraceous, unicolorous, apex reaching fifth abdominal segment; antennae four-segmented, olivaceous, unicolorous, small fine hairs present. Thorax entire; protergum subquadrate, longer than mesotergum; metatergum short; protergum light greenish, meso- and metaterga ochraceous; on both sides two hairs laterally, five hairs dorsally on protergum; one hair laterally, two hairs dorsally on each meso- and metaterga, no hairs on dorsum; legs entire, olivaceous, unicolorous, small fine hairs present, tarsi two segmented, apical tarsal claws with basal teeth. Abdomen ovate, entire, medially elevated for presence of reservoir; dorsal abdominal scent gland ostioles appearing as white lateral slits on rectangular plates between tergites 3-4 and 4-5, ostioles lying in two parallel longitudinal lines; mid-dorsal plates between tergites 2-3, 5-6, 6-7 and 7-8, small, concolorous with meso- and metaterga, two hairs dorsally cephalad to each mid-dorsal plate, one hair laterally on each side on mid-dorsal plates between tergites 3-4, 4-5 and 6-7; abdominal connexiva distinct, membranous, one long hair laterally on each connexivum, one short hair dorsally between each connexivum; small hairs on dorsum of abdomen present. One small circular ochraceous spots marking spiracle on each ventral sternite from II-VII, two circular ochraceous spots marking trichobothria posterior to spiracle on sternites III-VII.

Second Nymphal stage (Fig. 5): Shape as in first stage; colour light greenish; number of hairs on clypeus and paraclypei as in first stage; labium slightly passing 4th abdominal segment; antennae becoming ochraceous, unicolorous, meso- and metaterga concolorous with protergum; pro- and mesoterga almost subequal, metatergum short; on both sides, two hairs laterally on both pro- and mesoterga; small punctures and puncta developed. Mid-dorsal plates between tergites 3-4 and 4-5 increased in size, medially reflecting luteous for presence of reservoir; one hair dorsally, three hairs laterally on each connexivum; hairs on dorsum of abdomen increased.

Third Nymphal stage (Fig. 6): Laterally and dorsally number of hairs increased on clypeus and paraclypei, labium reaching third abdominal segment; protergum greatly developed; latero-cephaled almost rounded, mesotergum laterally curved, metatergum reduced, on both sides, laterally, five hairs on protergum, four hairs on mesotergum, dorsally number of hairs increased; ochraceous punctures and puncta distinct; scutellum and metathoracic wing pads developed in late stage, covering lateral border of metanotum. Dorsal abdominal scent gland ostioles between tergites 3-4 and 4-5 distinct; five hairs laterally on each connexivum, dorsally number of hairs increased; small ochraceous punctures and puncta developed.

Fourth Nymphal stage (Fig. 7): Hairs increased in number and thickness; labium reaching on to mid of 2nd abdominal segment; pro- and mesoterga almost subequal, on both sides laterally ten hairs on protergum, five hairs on mesotergum; scutellum and metathoracic wing pads well developed reaching on to 2nd abdominal segment; ochraceous punctures and puncta well developed. Laterally abdomen more greenish; mid-dorsal plates between tergites 3-4 and 4-5 deep ochraceous, medially at caudad; six hairs laterally on each connexivum.

Fifth Nymphal stage (Fig. 8): Colour bright greenish; hairs numerous; labium slightly passing hind coxae; on both sides, laterally, twelve hairs on protergum, six hairs on mesotergum; metathoracic wing pads increased in length,

reaching onto 3rd abdominal segment; ochraceous punctures and puncta increased in number; laterally wing pads light ochraceous. Medially abdomen much elevated; deep luteous; mid-dorsal plate between tergite 6-7 reduced to almost triangular shape; eight or nine hairs laterally on each connexivum.

KEY TO VARIOUS NYMPHAL STAGES OF *COPTOSOMA CRIBRARIUM*
(FABR.)

1. Length not more than 1.68 mm, scutellum and metathoracic wing pads not yet developed.....First and second stages 2
- Length more than 2.28 mm, scutellum and metathoracic wing pads making their appearance.....3
2. Length not more than 0.85 mm, one hair laterally on each connexivum, labium reaching 5th abdominal segment.....First stage.
- Length more than 0.89 mm, but not more than 1.68 mm, three hairs laterally on each connexivum, labium slightly passing 4th abdominal segment.....second stage.
3. Scutellum and metathoracic wing pads extended only on to lateral border of metathorax, five hairs laterally on each connexivum.....Third stage.
- Scutellum and metathoracic wing pads extended to 1st abdominal segment.....4
4. Wing pad extended on to second abdominal segment, six hairs laterally on each connexivum, labium reaching on to middle of second abdominal segment.....Fourth stage.
- Wing pads extended on to 3rd abdominal segment, 8 or 9 hairs laterally on each connexivum, labium slightly exceeding hind coxae.....Fifth stage.

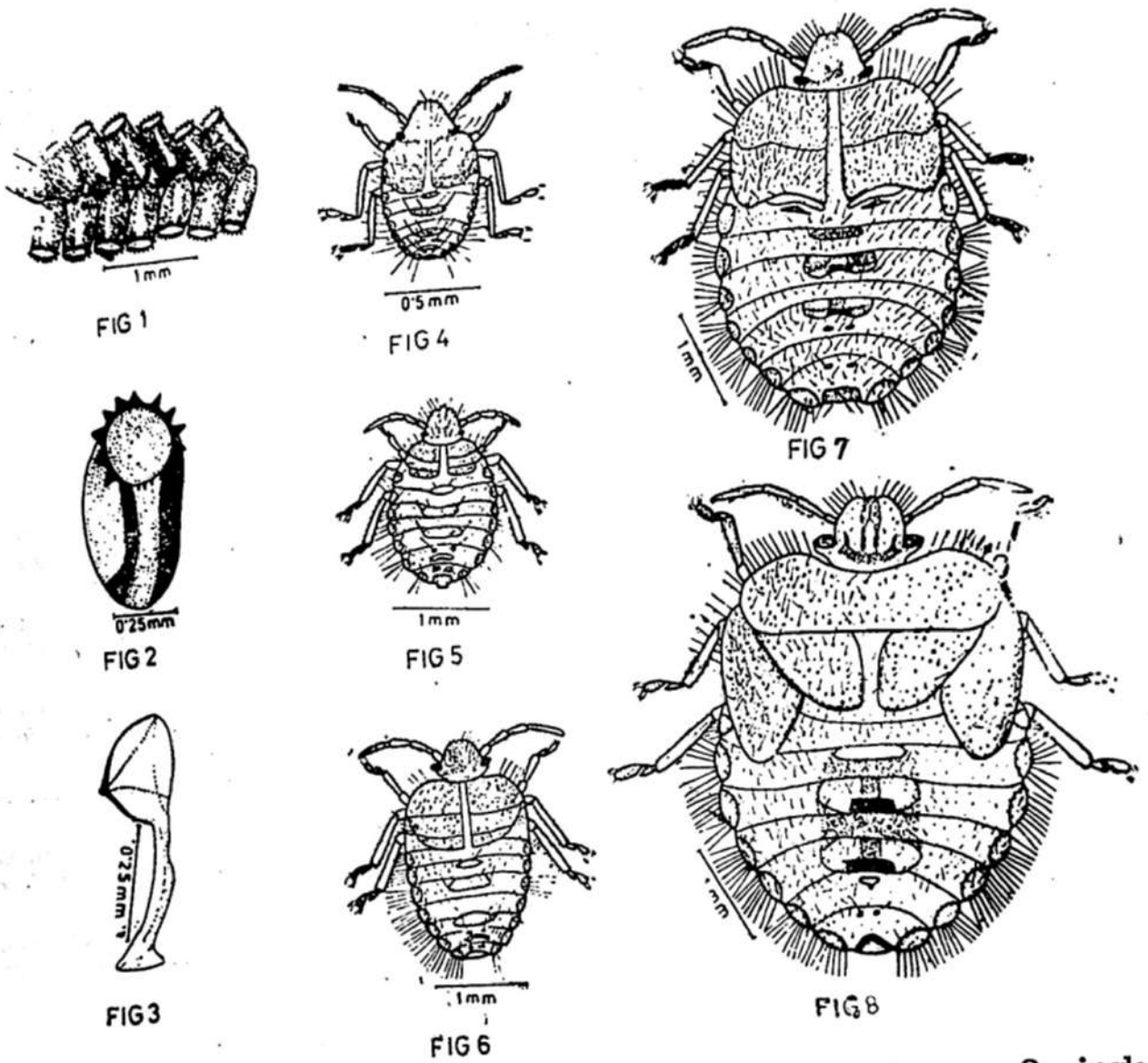


Fig. 1—8: *Coptosoma crivarium* (Fabr.). 1, cluster of eggs; 2, single egg showing aeromicropylar processes; 3, egg burster; 4—8, 1-Vth nymphal stages.

TABLE I

Coptosoma cribrarium. Average nymphal measurements in mm.

INSTARS

		I	II	III	IV	V
Total length		0.82	1.48	2.37	3.53	4.35
Width of head excluding eyes ..		0.32	0.41	0.51	0.62	0.74
Humeral width		0.40	0.70	0.90	1.13	1.35
Abdominal width		0.54	1.02	1.55	2.23	3.19
Length of Labium		0.66	0.84	1.23	1.68	2.05
Length of antennal segments	1 ..	0.06	0.06	0.14	0.26	0.26
	2 ..	0.10	0.13	0.20	0.35	0.44
	3 ..	0.10	0.13	0.20	0.30	0.40
	4 ..	0.18	0.21	0.28	0.36	0.44

DISCUSSION

Cobben (1968) with reference to five unnamed *Coptosoma* spp. from Ivory coast noted 30 to 45 aeromicropylar processes in eggs in contrast to 13 an average number in *C. cribrarium* in the present study. Probably this character is specific.

The members of the families Plataspidae and Pentatomidae although resemble in having ventral abdominal trichobothria on sternites III—VII, close and posterior to spiracle, but the members of the former differ in having two pairs of dorsal abdominal scent gland ostioles. Leston and Scudder (1956) and Decoursey and Allen (1968) have observed three pairs of scent gland ostioles in the nymphs of the pentatomids they studied. This probably confirms the position held by Pendergrast (1957), Miyamoto (1957, 1961), Leston (1958a, 1958b), Kumar (1962) and Cobben (1968) for treating the group of an independent family within the superfamily pentatomoidea, and particularly of Leston (op. cit) to place the family within Lower Pentatomoidea.

ACKNOWLEDGEMENTS

The authors wish to express their gratitude to Mr. Mohammad Farooq Ahmad, Director, Zoological Survey Department, for providing research facilities. The present work in part was financially supported by ARC—USDA Research Project A-ENT-37 (FG-Pa-181).

REFERENCES

AIYAR, T. V. R. (1913)

On the life history of *Coptosoma cribrarium* (Fabr.) *J. Bomb. Nat. Hist. Soc.*,
22 : 412—415.

AHMAD, I. and MOIZUDDIN, M. (1975a).

Some aspects of internal anatomy of *Coptosoma cribrarium* (Fabr.) (Pentatomoidea : Plataspidae) with reference to Phylogeny. *Folia Biologica*. 23(1) : 53—63.

(1975b).

Scent apparatus morphology of bean plataspid *Coptosoma cribrarium* (Fabr.) (Pentatomoidea : Plataspidae) with reference to phylogeny. *Pakistan J. Zool.* 7(1) : 45—49.

(1976).

Biological control measures of bean plataspids (Heteroptera : Pentatomomorpha) in Pakistan *Proc. ent. Soc. Kar.* 6 : 85—86.

(1977).

Quantitative life-history of bean Plataspid, *Coptosoma cribrarium* (Heteroptera : Pentatomoidea). *Pak. J. Sc. Ind. Res.*, 20(6):366—370

COBBEN, R. H. (1968).

Evolutionary trends in Heteroptera, Part I—Eggs, Architecture of the Shell, gross embryology and eclosion., Centre for Agricultural publishing and documentation, Wageningen.

DECOURSEY, R. M. and ALLEN, R. C. (1968).

A generic key to the nymphs of the Pentatomoidea of the Eastern United States (Hemiptera : Heteroptera). The University of Connecticut Occasional Papers, *Bio. Sc. Ser.* 1(3) : 141—151.

KERSHAW, J. C. (1910).

On the metamorphoses of two Coptosomine, Hemiptera from Macao. *Annales De La Soc. Entom. De Belgique*. 54: 69—73.

KUMAR, R. (1962).

Morpho-taxonomic Studies on the genitalia and Salivary glands of some Pentatomidae. *Ent. Ts. Ag.*, 83 : 44—84.

LESTON, D. (1958a).

Higher Systematics of Shield-bugs. *Proc. 10th Int. Cong. Ent. Montreal* 1956: 325 (Abstract).

LESTON, D. (1958b).

Chromosome number and the systematics of Pentatomomorpha (Hemiptera)
Int. Cong. Ent. 10 Montreal 1956, 2 : 911—8.

LESTON, D. and SCUDDER, G. G. E. (1956).

A key to larvae of the families of British Hemiptera-Heteroptera. *Entomologist* 89 : 223—231.

MIYAMOTO, S. (1957).

List of Overiole numbers in Japanese Heteroptera. *Sieboldia* 2 : 69—82.

MIYAMOTO, S. (1961).

Comparative morphology of alimentary organs of Heteroptera with the phylogenetic considerations. *Sieboldia* 2 : 197—259.

PENDERGRAST, J. G. (1957).

Studies on the reproductive organs of the Heteroptera with a consideration of their bearing on classification. *Trans. R. ent. Soc. Lond.* 109(1) : 1—63.

SOME ASPECTS OF INTERNAL ANATOMY OF *COPTOSOMA*
NOUALHIERI MONT (PENTATOMOIDEA : PLATASPIDAE) WITH
 REFERENCE TO PHYLOGENY.

MOHAMMAD MOIZUDDIN

ZOOLOGICAL SURVEY DEPARTMENT, KARACHI

AND

IMTIAZ AHMAD

DEPARTMENT OF ZOOLOGY, KARACHI UNIVERSITY, KARACHI

ABSTRACT

Alimentary organs including salivary glands, male and female reproductive organs and scent apparatus of *Coptosoma noualhierii* Mont. are described and compared with those of *C. cribrarium* (Fabr.) and other plataspids reported in the literature to date and in this light the phylogenetic value of these characters are evaluated.

INTRODUCTION

Nuorteva (1954, 1956) and Southwood (1955), in their studies on salivary glands of Heteroptera did not include any member of this family. Pendergrast (1957) with reference to internal male and female reproductive organs of Heteroptera included only one species and held that the results were unsatisfactory for the specimen was old. Miyamoto (1957) describing the ovariole numbers of Heteroptera included only two species and in 1961 working on the comparative alimentary organs and salivary glands of Heteroptera described only two species. Kumar (1962) studying the salivary glands and male and female reproductive organs of the super family Pentatomoidea did not include any member similar to McDonald (1966) who in his North American Pentatomoidea could not include one. Ahmad and Moizuddin (1975a and 1975b) more recently described various aspects of internal anatomy of *C. cribrarium* (Fabr.). Presently a comparison of the above aspects is made within various plataspids reported in the literature to ascertain the phylogenetic significance of these characters.

MATERIAL AND METHODS

Specimens of *Coptosoma noualhierii* were collected on *Xanthium strumarium* from Islamabad. The specimens were brought to Karachi University laboratory and were reared to run the colony. The internal anatomical studies were done on freshly killed specimens. Dissections were made in tap water under Leitz binocular microscope. After removing the overlying viscera the structures were clearly visible. All the diagrams were made using ocular grid on graph papers to the given scales and the measurements were taken by ocular micromillimeter graticule.

RESULTS

Detailed description of various aspects of internal anatomy of *C. cribrarium* (Fabr.) has already been given by Ahmad and Moizuddin (1975a and 1975b) and a comparative account of *C. noudhieri* Mont. is given as under to evaluate some of these characters of phylogenetic significance.

Alimentary organs (Figs. 1, 2).

Oesophagus moderately long, midgut-1 prominent oblong, anteriorly narrow, posteriorly broad; medially constricted, yellowish in colour; midgut-2 short and broad, whitish in colour; ligament short; midgut-3 oval, spongy, concolorous to midgut-1; midgut-4 elongated, tubular, two rows of gastric caeca present, whitish in color, posterior portion in male gradually narrowing into a fine ligament to connect with pylorus and in female enlarging to form a conical thick walled midgut-5; latter light violet in colour, transverse lines present, pylorus short, bladder-like, laterally elongated; malpighian tubules two paired, long, separated from each other; rectum well developed, bladder-like medially bulging, tapering at both ends, opening to exterior through anus.

Salivary glands :

Principal glands moderately thick, milky white; anterior lobe short; posterior lobe elongated; principal salivary duct short; accessory salivary duct simple, uncoiled; accessory salivary gland, slightly thick, moderately long, extending backwards onto the posterior region of the salivary gland.

Male reproductive organs (Fig. 3)

Testes kidney-shaped, covered with light orange pigmented sheath (scrotum); follicles seven, entirely separated by septalike partitions; vasa deferentia long, narrow, coiled tubes, whitish in colour; accessory glands (mesadenia) tubular, each gland distally dividing into two elongated tubes; vesicula seminales moderately long, globular, thick tube, anteriorly and posteriorly tapering; bulbus ejaculatorius thick, globular, anteriorly round, posteriorly constricted; accessory glands (ectadenia) tubular, simple, thick, whitish in colour.

Female reproductive organs (Fig. 3)

Ovaries elongated, white; ovarioles seven; lateral oviducts short and broad, whitish in colour, anteriorly slightly narrow at calyces whitish in colour; accessory glands in the form of small, fine filaments; common oviduct broad, posteriorly constricted and narrow; spermatheca or sperm receiving sac flaskshaped, medium in size, duct short, apical bulb with proximal and distal flanges.

Scent apparatus (Figs. 5—6)

Glands Palm-like, thinly membranous, whitish in colour, reaching 1/2 of the reservoir; latter large, bladder-like, membranous, medially bulging and slightly constricted, posteriorly bilobed, light orange in colour, reaching onto 5th abdominal sternum; accessory gland thick complex, many-lobed, whitish in colour; vestibules semi-membranous, shining, greyish elongated tubes, distally slightly broad; ostioles, short and narrow; valvular apparatus semilunate, outer arm broadly 'V'-shaped.

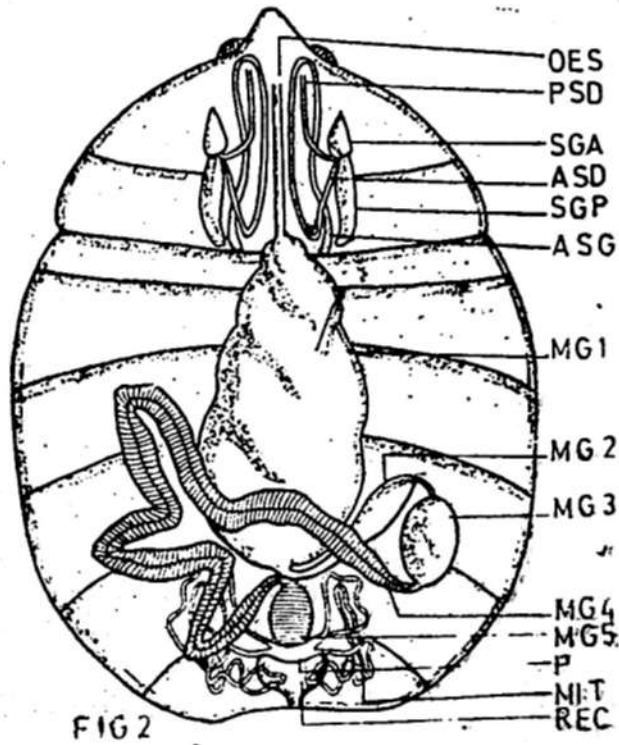
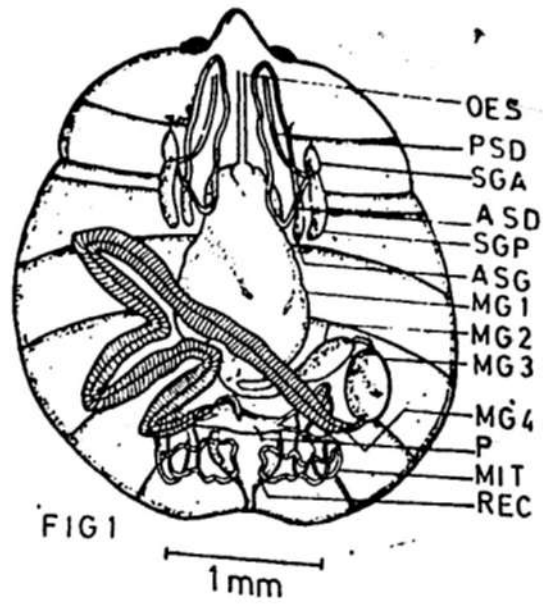
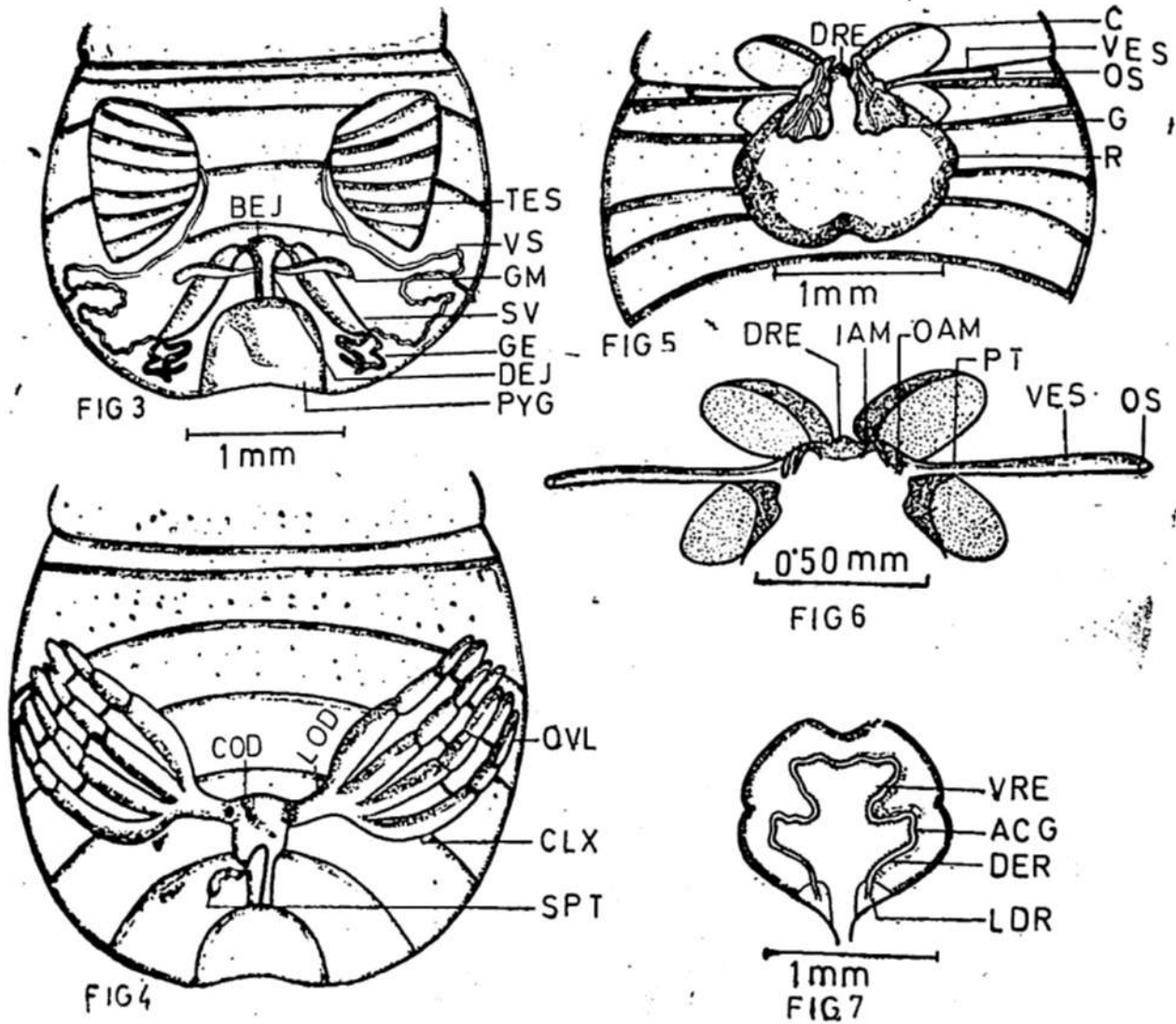


Fig. 1 and 2 : *Coptosoma nouathieri* Mont. Male and Female alimentary organs including salivary glands.



Figs. 3—7: *Coptosoma noualhieri* Mont. 3, Male reproductive organs; 4, Female reproductive organs; 5, Scent apparatus, entire, dorsal view; 6, Scent apparatus, showing lateral ducts of the reservoir, valvular apparatus and vestibules, enlarged dorsal view; 7, Scent reservoir, showing accessory gland, ventral view.

Coptosoma noualhieri Mont. 1901. *Ann. Hist. Nat. Noua* 1: 10. Pl. 1, fig. 3. (Type locality: Noua, New Caledonia.)

DISCUSSION

Miyamoto (1957), Balduf (1964) and Ahmad and Moizuddin (1957 a) similar to the present findings listed seven testicular follicles and seven ovarioles in each testis and ovary of the species they studied. Ahmad and Abbasi (1971) have considered seven ovarioles or seven testicular follicles a generalized feature in the members of the lower Pentatomoidea and also in some rather primitive pentatomids.

Miyamoto (1961) on the basis of alimentary organs has commented that two rows of gastric caeca on fourth midgut is characteristic through out the family Plataspidae. He regarded this character as advanced although in Cydnidae also belonging to the lower Pentatomoidea (Leston 1958a, b) not only is the same feature described in the above mentioned studies as primitive but also the author held that two rows of gastric caeca in dinidorids is primitive.

Similarly, simple and relatively short accessory ducts of salivary glands are considered advanced by the above author while a similar feature in Cydnidae is considered by him to be primitive; while on the other hand Southwood (1955) has described the simple structure of accessory glands and their ducts in the species of the families Aradidae and Peismidae as primitive.

Miyamoto (1961) also considered the ligaments between various portions of the midgut as an advanced feature of this family but a similar character has been described, by him in the species of the families Urostylidae and Lygaeidae which are regarded generally primitive by all heteropterists (Sweet and Slater 1961, Schaefer 1966, Kumar 1971).

According to Ahmad and Abbasi (1971), smaller pump region of the spermatheca, lack of median dilation of the spermathecal duct and absence of ectodermal sac also appear among other generalised features.

Similarly large sacciform reservoir, short connecting ducts of the glands and simple valvular apparatus in present studies and in *C. cribrarium* (Ahmad and Moizuddin 1957b) are the characters relating Plataspidae to the lower pentatomoids viz. Acanthosomatidae, Cydnidae etc.

Leston (1958a, 1958b) included Plataspidae together with Urostylidae, Acanthosomatidae, Tessartomidae and Scutelleridae in his lower Pentatomoidea on the basis of large number of characters including Karyotypes.

The present studies and those of Ahmad and Moizuddin (op. cit) show remarkably convoluted, complex and manylooped accessory gland extending anteriorly to the edges of the reservoir, with its posterior margin emarginated and bilobed in the middle which separate Plataspidae from the members of Cydnidae and Acanthosomatidae and also reflect specialization of the group to a particular habitat, similar to their enormous development of scutellum.

A comparative statement of the above characters in table 1 clearly throws light on the importance of the characters and suggests a study of a much broader spectrum covering most of the members of the group in order to evolve a natural classification of the group.

TABLE 1

Comparative account of alimentary organs, male and female reproductive organs and scent apparatus.

	<i>C. noualhierii</i> present studies	<i>C. cribrarium</i> (Ahmad & Moizuddin: 1975a, b)	<i>C. punctissimum</i> and <i>C. biguttula</i> (Miyamoto 1961)
Alimentary organs and Salivary glands			
1. Midgut-3	.. .. Almost oval-shaped	Elongated medially bulging	Elongated and thick in <i>C. punctissimum</i> and not shown in <i>C. biguttula</i> .
2. Midgut-4	.. .. Uniform, posteriorly narrow	Uniform, posteriorly slightly narrow	Posteriorly broad in <i>C. punctissimum</i> and posteriorly remarkably constricted in middle in <i>C. biguttula</i> .
3. Midgut-5	.. .. Oval-shaped	Elongated oval	Elongated in both the species.
4. Principal glands	.. .. Thick and short	Thick and well developed	Thick and well developed in both the species.
Reproductive organs			
<i>Male</i>			
1. Seminal vesicle	.. .. Posteriorly narrow and elongated	Posteriorly narrow and short.	Posteriorly, thick and uniform.
2. Mesadene glands	.. .. Simple, elongated tubes	Coiled and bunch-like tubes	Coiled and thick tubules.
3. Bulbus ejaculatorius	.. .. Uniform, single	Medially constricted to form second bulb.	Almost uniform, single.
4. Ectadene glands	.. .. Uniform, simple tubules	Coiled, milky-white filaments arising posteriorly.	Irregular; simple tubules.
<i>Female</i>			
1. Genital Chamber	.. .. Posterior to genital chamber round bulbs absent.	Posterior to genital chamber round bulbs present.	—
2. Accessory gland	.. .. Present	Absent.	—
Scent apparatus			
1. Glands	.. .. Elongated reaching 1/2 of the reservoir.	Much elongated exceeding 1/2 of the reservoir.	—
2. Reservoir	.. .. Uniform, anteriorly broad.	Medially bulging and constricted.	—
<i>Coptosoma</i> sp. (Pendergrast 1957)			

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.
GM	..	Accessory gland (Mesadenia).
IAM	..	Inner arm of valvular apparatus.
LDR	..	Lateral duct of reservoir.
LOD	..	Lateral oviduct.
MG ₁	..	Midgut ₁
MG ₂	..	Midgut ₂
MG ₃	..	Midgut ₃
MG ₄	..	Midgut ₄
MG ₅	..	Midgut ₅
MIT	..	Malpighian tubules.
OAM	..	Outer arm of valvular apparatus.
OES	..	Oesophagus
OS	..	Ostiole.
OVL	..	Ovariole.
P	..	Pylorus.
PSD	..	Principal salivary duct.

PT	.. Proximal part of vestibule.
PYG	.. Pygophore.
R	.. Reservoir.
RE	.. Rectum.
SGA	.. Anterior lobe of principal salivary gland.
SGP	.. Posterior lobe of principal salivary gland.
SPT	.. Spermathecal bulb.
SV	.. Seminal vesicle.
TES	.. Testis.
VES	.. Vestibule.
VRE	.. Reservoir, ventral view.
VS	.. Vas deferens.

ACKNOWLEDGEMENTS

The authors wish to express their gratitude to Mr. Mohammad Farooq Ahmad, Director, Zoological Survey Department for providing research facilities. The present work in part was financially supported by ARG—USDA Research Project A—17—ENT—37 (FG —Pa—181).

AHMAD I. & ABBASI Q. T. (1971)

Functional morphology and histology of the male and female reproductive organs of red pumpkin bug, *Coridius janus* (Fabr.) (Heteroptera: Dinidoridae) with its bearing on the phylogeny, *Pakistan J. Zool.*, 3(1): 37—51.

AHMAD, I. & MOIZUDDIN, M. (1975 a)

Some aspects of internal anatomy of *Coptosoma cribrarium* (Fabr.) (Pentatomoidea: Plataspidae) with reference to phylogeny. *Folia Biologica* 23(1): 53—63.

AHMAD, I. & MOIZUDDIN, M. (1975b)

Scent apparatus morphology of bean plataspid *Coptosoma cribrarium* (Fabr.) (Pentatomoidea: Plataspidae) with reference to phylogeny. *Pakistan J. Zool.* 7(1): 45—49.

BALDUF, N. V. (1964)

Number of ovaries in the Heteroptera (Insecta) *Proc. Ent. Soc. Washington*. 66(1): 2—5.

KUMAR, R. (1962)

Morpho-taxonomic studies on the genitalia and salivary glands of some Pentatomoidea. *Ent. Ts. Ag.*, 83 : 44—84.

KUMAR, R. (1971)

Morphology and relationships of the Pentatomoidea (Heteroptera), 5. Urostylidae. *Amer. Midl. Nat.*, 85 : 63—73.

LESTON, D. (1958a)

Higher systematics of shield-bugs. *Proc. 10th Int. Congr. Ent., Montreal, 1956* : 325 (Abstract).

LESTON, D. (1958b)

Chromosome number and the systematics of *Pentatomomorpha* (Hemiptera). *Proc. 10th Int. Congr. Ent., Montreal 1956*, 2 : 911—918.

McDONALD, F. J. D. (1966)

The genitalia of North American *Pentatomoidea* (Hemiptera : Heteroptera). *Quaest. Ent.*, 2 : 7—150.

MIYAMOTO, S. (1957)

List of ovariole numbers in Japanese *Heteroptera*, *Sieboldia*, 2 : 69—82.

MIYAMOTO, S. (1961)

Comparative morphology of alimentary organs of *Heteroptera* with the phylogenetic consideration, *Sieboldia*, 2 : 197—259.

NUORTEVA, P. (1954)

Studies on the salivary enzymes of some bugs injuring wheat kernels, *Ann. ent. Fenn.*, 20 : 102—124.

NUORTEVA, P. (1956)

Studies on the comparative anatomy of the salivary glands in four families of *Heteroptera*. *Ann. ent. Fenn.*, 22 : 45—54.

PENDERGRAST, J. G. (1957)

Studies on the reproductive organs of the *Heteroptera* with a consideration of their bearing on classification *Trans. R. ent. Soc. Lond.*, 109 : 1—63.

SCHAEFER, C. W. (1966)

The morphology and higher systematics of the *Idiostolidae* (Hemiptera: Lygaeidae). *Ann. ent. Soc. Amer.*, 59: 602-613.

SOUTHWOOD, T. R. E. (1955)

The morphology of the salivary glands of terrestrial *Heteroptera* (Geocorisae) and its bearing on classification. *Tijdschr. Ent.*, 9: 77-84.

SWEET, M. H. & SLATER, J. A. (1961)

A generic key to the nymphs of North American *Lygaeidae*. *Ann. ent. Soc. Amer.*, 54: 333-340.

From the Journal of the Entomological Society of America, Vol. 54, No. 3, 1961, pp. 333-340.

WATSON, J. D. (1966)

The genera of North American *Lygaeidae* (Hemiptera: Lygaeidae). *Ann. ent. Soc. Amer.*, 59: 1-100.

WATSON, J. D. (1967)

Key to the genera of North American *Lygaeidae* (Hemiptera: Lygaeidae). *Ann. ent. Soc. Amer.*, 60: 1-100.

WATSON, J. D. (1968)

The morphology and higher systematics of the *Lygaeidae* (Hemiptera: Lygaeidae). *Ann. ent. Soc. Amer.*, 61: 1-100.

WATSON, J. D. (1969)

The morphology and higher systematics of the *Lygaeidae* (Hemiptera: Lygaeidae). *Ann. ent. Soc. Amer.*, 62: 1-100.

WATSON, J. D. (1970)

The morphology and higher systematics of the *Lygaeidae* (Hemiptera: Lygaeidae). *Ann. ent. Soc. Amer.*, 63: 1-100.

WATSON, J. D. (1971)

The morphology and higher systematics of the *Lygaeidae* (Hemiptera: Lygaeidae). *Ann. ent. Soc. Amer.*, 64: 1-100.

BIONOMICS OF PARAPENAEOPSIS STYLIFERA (H. MILNE EDWARDS)

By

S. I. KARIM AND HAFIZUR RAHMAN

ABSTRACT

Length—weight relationship, seasonal fluctuation, sex-ratio, maturity and breeding, length frequency distribution and migration of *Parapenaeopsis stylifera* have been described.

INTRODUCTION

Prawns have a high potential of protein and as such they are ranked among the best food class and sold in the market at a considerable high price and are a good source of Foreign Exchange. Prawns are locally classified into Jaira, Kalri, and Kiddi and they include the following :—

1. *Penaeus indicus* (H. Milne Edwards).
2. *Penaeus merguensis* de Man.
3. *Penaeus penicellatus* Alcock.
4. *Penaeus monodon* Fabricius.
5. *Penaeus semisulcatus* de Haan.
6. *Penaeus japonicus* Bate.
7. *Metapenaeus stebbingi* Nobili.
8. *Metapenaeus affinis* (H. Milne Edwards).
9. *Metapenaeus monoceros* Fabricius.
10. *Metapenaeus brevicornis* (H. Milne Edwards).
11. *Parapenaeopsis stylifera* (H. Milne Edwards).
12. *Parapenaeopsis sculptilis* (Heller).

The study in this paper is confined only to *Parapenaeopsis stylifera* but data regarding others have also been compiled and will be published in due course.

Parapenaeopsis stylifera owing to its small size is placed among Kiddi. But their small size is compensated by the huge landing every year. As such *Parapenaeopsis stylifera* constitutes one of the most commercially important species of Karachi waters. Looking at the economic value of *Parapenaeopsis stylifera* an attempt has been made to study their bionomics i.e. seasonal fluctuation, length and weight relationship, size frequency, sex-ratio, breeding season, maturity, migration, etc.

Very little work appears to have been done in the literature to date especially in the Indo-Pak subcontinent. Hussain (1974), Mahmud and Tembe (1960), Menon (1957), (1955), (1953), Chopra (1943) and Rai (1933).

MATERIALS AND METHODS

Random samples of *Parapenaeopsis stylifera* were collected from November, 1975 to October, 1976 from Ibrahim Hyderi, Fish Harbour, Karachi. The collections were made thrice a week. Collected specimens were preserved in spirit. *Parapenaeopsis stylifera* were dominantly present in the catch for about five months. The lengths of the Prawn were measured from tip of the Rostrum to the tail. Similarly, the weights were measured with the help of a balance to the nearest of gram. Percentage composition, seasonal fluctuation, breeding, migration & minimum & Maximum lengths were also worked out. The length—weight relationships were worked out with the help of a general equation of Parabola.

$$W = cL^n \text{ after Lagler.}$$

where W = weight in gram, L = length in millimeters and c and n are constant.

RESULTS AND DISCUSSIONS

Length Weight Relationship :

The length—weight relationship was established from the measurement of 1225 Prawns varying between 50 mm to 140 mm in total length. All the Prawns were weighed in a balance after carefully drying out excess of moisture on the body of the animals.

The regression of Log W against Log L was found to be a straight line and therefore the relationship was established with the help of the formula.

$W = cL^n$ where W = weight in grams, L = length in millimeters and c and n are constant.

The length weight data were arranged according to length group of 10 mm and the logarithms of the mid point of various groups were plotted. The resulting curve was found to be a straight line. The value of n was found out by applying the formula :

$$n = \frac{\sum \log W - (N \cdot \log c)}{\sum \log L}$$

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

$$\log c = \frac{\sum \log W \cdot \sum (\log L)^2 - \sum \log L \cdot \sum (\log L \cdot \log W)}{N \cdot \sum (\log L)^2 - (\sum \log L)^2}$$

The relation between length and weight was therefore obtained as follows :

$$\log W = \log c + n \log L.$$

The relation between length and weight of the species was calculated as follows :

$$\log W = \log c + n \log L.$$

$$= -1.438 + 2.087 L.$$

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

The straight line was obtained by plotting log of length against log of calculated weights. The observed and calculated weights were found to be quite equal and this indicates the fitness of the length weight equation computed for expressing this relation, Graph-I.

The calculated weight for *Parapenaeopsis stylifera* are shown in Table-I and the length—weight relationship are shown in graph-I.

SEASONAL FLUCTUATION

Prawn landing at Ibrahim Hyderi Jetty during the period of study brings into account the fact that the catch consisted of *Penaeus indicus*, *Penaeus monodon*, *Penaeus merguensis*, *Penaeus penicellatus*, *Metapenaeus affinis*, *Metapenaeus brevis*, *Metapenaeus monoceros*, *Parapenaeopsis stylifera*, *Parapenaeopsis sculptilis* & *Parapenaeopsis hardwickii*. Of these *Parapenaeopsis stylifera* constitute 50.6% and the rest 49.4%.

Graph II shows the seasonal fluctuation of the species under study. It shows that the catch of the species under study is 76% in November. The catch records a fall of about 20% in December, but in the subsequent month (January) it again rises to 76%. From then onwards the percentage of catch starts falling until in the month of May it disappears totally from the catch. It is in the month of September that animals show up again in abundance. Since then the percentage of catch goes on rising, and dominates the catch for about five months.

SEX-RATIO

One thousand two hundred and twenty five specimens of *Parapenaeopsis stylifera* were studied. Of these 322 were males and 903 females, showing a ratio of 1 : 2.8.

Table-II shows that the population is high during winter season and that the ratio of the female is greater than male, whereas in summer season the population is very poor, there is only occasional appearance during the months—April to June, Graph-III. Graph IV shows distribution of maximum and minimum sizes.

MATURITY AND BREEDING

Parapenaeopsis stylifera reaches to maturity at the length ranging between 70 mm. to 80 mm. and it is at this stage that the animals show presence of lush green eggs which can be seen from the dorsal surface without removing the shell.

The percentage of berried female carrying the eggs were 100% in the month of October. The same decreases by about 22% in the month of December. Therefore, it can be concluded that the breeding is at the peak during October, November and December, Graph-V.

LENGTH FREQUENCY DISTRIBUTION

Length frequency distribution of *Parapenaeopsis stylifera* is shown in Table-III, Graph-VI. Out of 1225 Prawns, 322 were male ranging from 50 mm. to 130mm. in length and 903 were female ranging from 50 mm. to 140 mm. in length showing that females attain larger sizes than the males.

99% of the male comprised small sized group ranging between 50mm. to 100 mm. in length, while 95.7% of the female constitute small sized group ranging between 50 mm. to 100 mm. in length. On the contrary only 0.6% of the male Prawns and 4.7% of the female Prawns constitute big sized group confirming that *Parapenaeopsis stylifera* are small sized Prawn and that few of them reach to a greater length, Graph-VI. It was observed that not a single male specimen of *Parapenaeopsis stylifera* of the length group of 130 mm. to 140 mm. was caught.

It is evident from the length frequency curves of *Parapenaeopsis stylifera* that after moving towards shore water the animal undergoes a period of growth and then migrate towards the deeper water. This can be confirmed from the Graph-VII which shows the fluctuation in the catch of the said Prawn. For instance the percentage of *Parapenaeopsis stylifera* ranging between 90 mm. to 100 mm. in the month of November is 40.9% whereas the percentage recorded of the same size group in the next month is 35% showing a reduction of 5% in the catch. Again in the subsequent months the percentage of the same size group records a fall of more than 26%. But it is interesting to note that the animal does not completely go off the catch. They however make an irregular appearance from May onward until in the month of September they show off again to dominate the catch for several months of the year.

The study on length frequency distribution confirms with that of Menon and the study of frequent appearance confirms with Tembe.

MIGRATION

Table II and Graph VI show that *Parapenaeopsis stylifera* move from deeper water to shore water at the on set of the winter season and remains in the picture as long as April. They go back to the deeper water as soon as the winter is over thus causing a depletion in the catch. The study on migration from shallow water to deeper water and back confirms with the study of M. K. Menon 1953.

SUMMARY

Parapenaeopsis stylifera is a member of small sized Prawn, locally known as Kiddi.

It is the most dominant species in the winter catch of Prawn at Karachi.

It comes towards shore in winter and go back to deeper water as soon as the season is over.

The breeding period extends for about eight months.

The females are always dominant in the commercial catch even when the number is declining in the catch.

The females attain larger size than the males.

The dominant size group, *Parapenaeopsis stylifera* is between 90 mm. and 100 mm.

The length-weight relationship was found out from formula $W = CL^a$ where W = weight in grams and L = length in millimeter.

TABLE-I

Length-weight Relationship of Parapenaeopsis Stylifera

S. No.	Length (L)	Log L	Weight (W)	Log w	Log L X Log w	(LogL) ²	Calc. Log w	Cal. w.
1.	5.5	0.7404	1.531	0.1850	0.136974	0.54819216	0.185048838	1.531
2.	6.5	0.8129	1.809	0.2578	0.20956562	0.66080641	0.257699999	1.809
3.	7.5	0.8751	2.411	0.3822	0.33446322	0.76580001	0.382199999	2.411
4.	8.5	0.9294	3.573	0.5531	0.51405114	0.86378436	0.569430649	3.573
5.	9.5	0.9777	4.809	0.6820	0.6667914	0.95589729	0.682069371	4.807
6.	10.5	1.0212	5.155	0.7122	0.72729864	1.04284944	0.712233539	5.153
7.	11.5	1.0607	8.229	0.9154	0.96757054	1.12508449	0.915468747	8.228
8.	12.5	1.0969	15.500	1.1903	1.30564007	1.20318961	1.190388653	15.50
9.	13.5	1.1303	17.350	1.2393	1.40078079	1.27757809	1.239493551	17.350

TABLE-II

Sex Ratio of Parapenaeopsis Styliifera

Months				Male	Female	Ratio
November, 1975	..	..	..	52	232	1 : 4.4
December	..	..	..	138	351	1 : 2.5
January 1976	..	..	..	84	168	1 : 2
February	..	..	..	21	41	1 : 1.9
March	..	..	..	5	20	1 : 4
April	..	..	..	3	4	1 : 1.3
May	..	..	..	Absent	Absent	—
June	..	..	..	0	1	0 : 1
July	..	..	..	5	15	1 : 3
August	..	..	..	0	1	0 : 1
September	..	..	..	4	2	1 : 0.5
October	..	..	..	10	68	1 : 6.8
			Total	322	903	1 : 2.8

TABLE-III
Length Frequency Distribution

Length Range	Male	%	Female	%	Sexes combined	%
5.00 — 6.00 ..	3	.9	4	.4	7	0.5
6.1 — 7.00 ..	17	5.2	12	1.3	29	2.3
7.1 — 8.00 ..	85	26.3	29	3.2	114	9.1
8.1 — 9.00 ..	163	50.6	188	20.8	351	28.6
9.1 — 10.00 ..	46	14.2	378	41.8	424	34.6
10.1 — 11.00 ..	6	1.8	255	28.2	261	21.3
11.1 — 12.00 ..	1	0.3	34	3.7	35	2.7
12.1 — 13.00 ..	1	0.3	2	0.2	3	.24
13.1 — 14.00 ..	0		1	0.0	1	.08
	322	100%	903	100%	1225	100%

TABLE-III
Length Frequency Distribution

Length Range	Male	%	Female	%	Sexes combined	%
5.00 — 6.00 ..	3	.9	4	.4	7	0.5
6.1 — 7.00 ..	17	5.2	12	1.3	29	2.3
7.1 — 8.00 ..	85	26.3	29	3.2	114	9.1
8.1 — 9.00 ..	163	50.6	188	20.8	351	28.6
9.1 — 10.00 ..	46	14.2	378	41.8	424	34.6
10.1 — 11.00 ..	6	1.8	255	28.2	261	21.3
11.1 — 12.00 ..	1	0.3	34	3.7	35	2.7
12.1 — 13.00 ..	1	0.3	2	0.2	3	.24
13.1 — 14.00 ..	0		1	0.0	1	.08
	322	100%	903	100%	1225	100%

The increases in length which causes maturity is the stimulus for movement towards shallow water.

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

ACKNOWLEDGEMENT

The authors are grateful to Mr. Mohammad Farooq Ahmad, Director, Zoological Survey Department for providing research facilities, valuable suggestion, criticism and encouragement.

REFERENCES

- Ahmad, M. & Qureshi, A. H. .. 1962 Fisheries Gears of Makran Coast, Agric. Pak. Vol. XIII, No. 2.
- Hussain, A. .. 1974 Study on sex-ratio length frequency And length and weight relation of *Penaeus merguensis* De Man 1888. agric. Pak. Vol. XIV, No. 1.
- Kunju, M. M. .. 1955 Preliminary studies on the Biology of the Palaemonid Prawn, *Leander styliferus* Milne-Edward in West Bengal, India, Proceeding Indo-Pacific Fisheries Council 6th session, pp. 404—415, Fig. 3, Table-4.
- Lagler, F. K. .. 1952, 1956 Freshwater Fishery Biology WMC Brown Company Publishers Dubuque Iowa 2nd Edition, Pp. 420, Fig. 172.
- Menon, M. K. .. 1953 Notes on the Bionomics and Fishery of the Prawn *Parapenaeopsis stylifera*, J. Zool. Soc. India, 5(1), 153—62.
- 1955 Notes on the Bionomics and Fishery of the Prawn *Parapenaeopsis stylifera*, South West Coast of India. Indian J. Fish. 1(2), 41—56.
- 1957 Contribution to the Biology of *Penaeid* Prawn of the South West Coast of India sex-ratio and movement, Ibid, 4(1), 62—74.
- Panikar, N. K. and Menon, M. K. .. 1955 Prawn Fisheries of India, Indo Pacific Fish Council, 6th session, 1955 (1956), 328—344.
- Qureshi, M. R. .. 1955 Shrimp Fisheries of Pakistan F.A.O. Report. Proceeding Indo Pacific Fisheries Council 6th session, pp. 359—362.
- Shaikh Mahmud, F. S. and (Miss) Tembe, V. B. .. 1950 The seasonal fluctuation and variation in Abundance of the commercially important species of Bombay Prawn with a brief note on their size, state of Maturity an Sex-ratio. Indian Jour. of Fisheries, Vol. 7(1), pp. 69—81.

REFERENCES

1955 ...

1957 ...

1958 ...

1959 ...

1960 ...

1961 ...

1962 ...

1963 ...

1964 ...

1965 ...

1966 ...

1967 ...

1968 ...

1969 ...

1970 ...

1971 ...

1972 ...

1973 ...

1974 ...

1975 ...

1976 ...

1977 ...

1978 ...

1979 ...

1980 ...

1981 ...

1982 ...

1983 ...

1984 ...

1985 ...

1986 ...

1987 ...

1988 ...

1989 ...

1990 ...

1991 ...

1992 ...

1993 ...

1994 ...

1995 ...

1996 ...

1997 ...

1998 ...

1999 ...

2000 ...

2001 ...

2002 ...

2003 ...

2004 ...

2005 ...

2006 ...

2007 ...

2008 ...

2009 ...

2010 ...

2011 ...

2012 ...

2013 ...

2014 ...

2015 ...

2016 ...

2017 ...

2018 ...

2019 ...

2020 ...

2021 ...

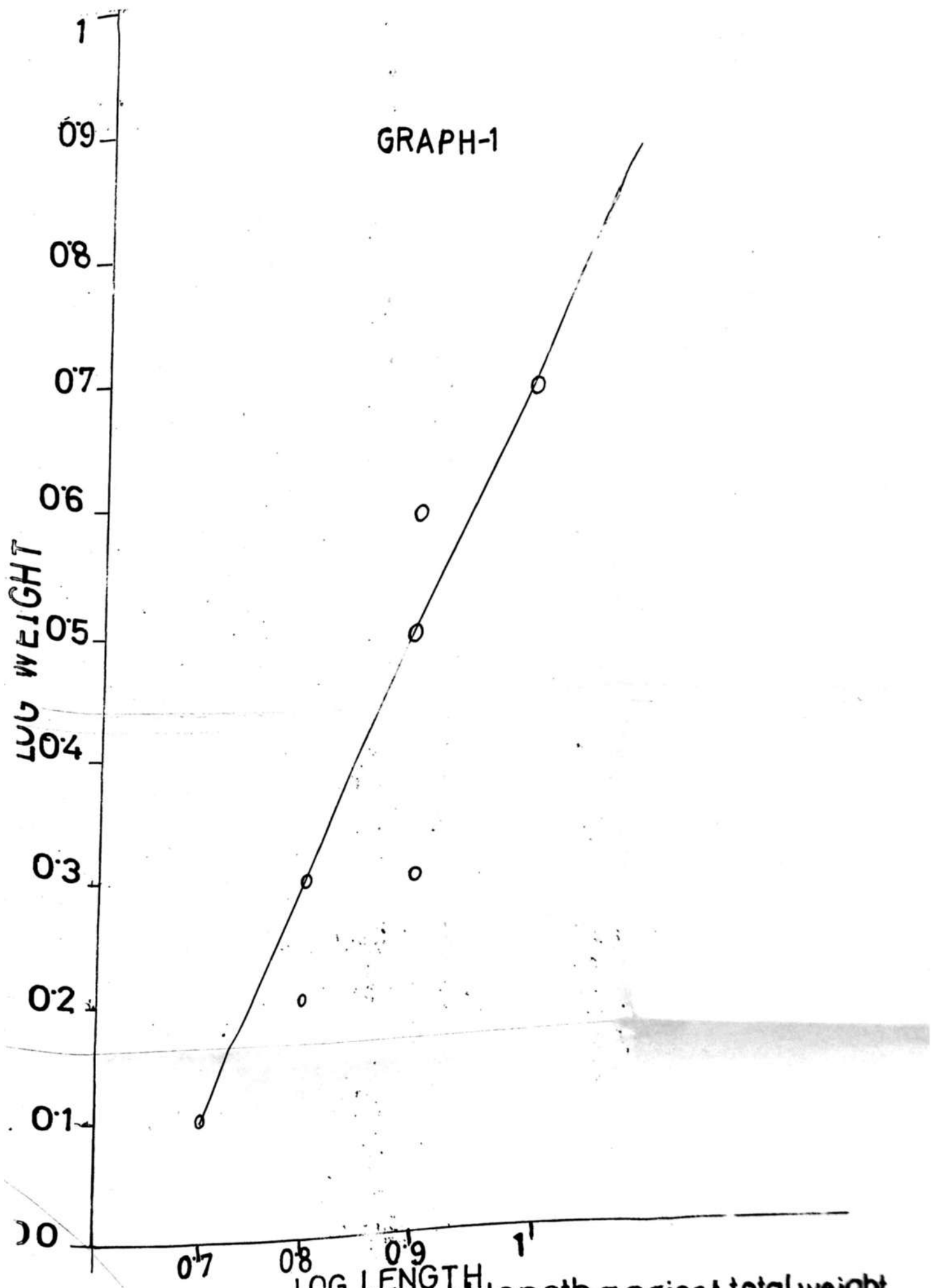
2022 ...

2023 ...

2024 ...

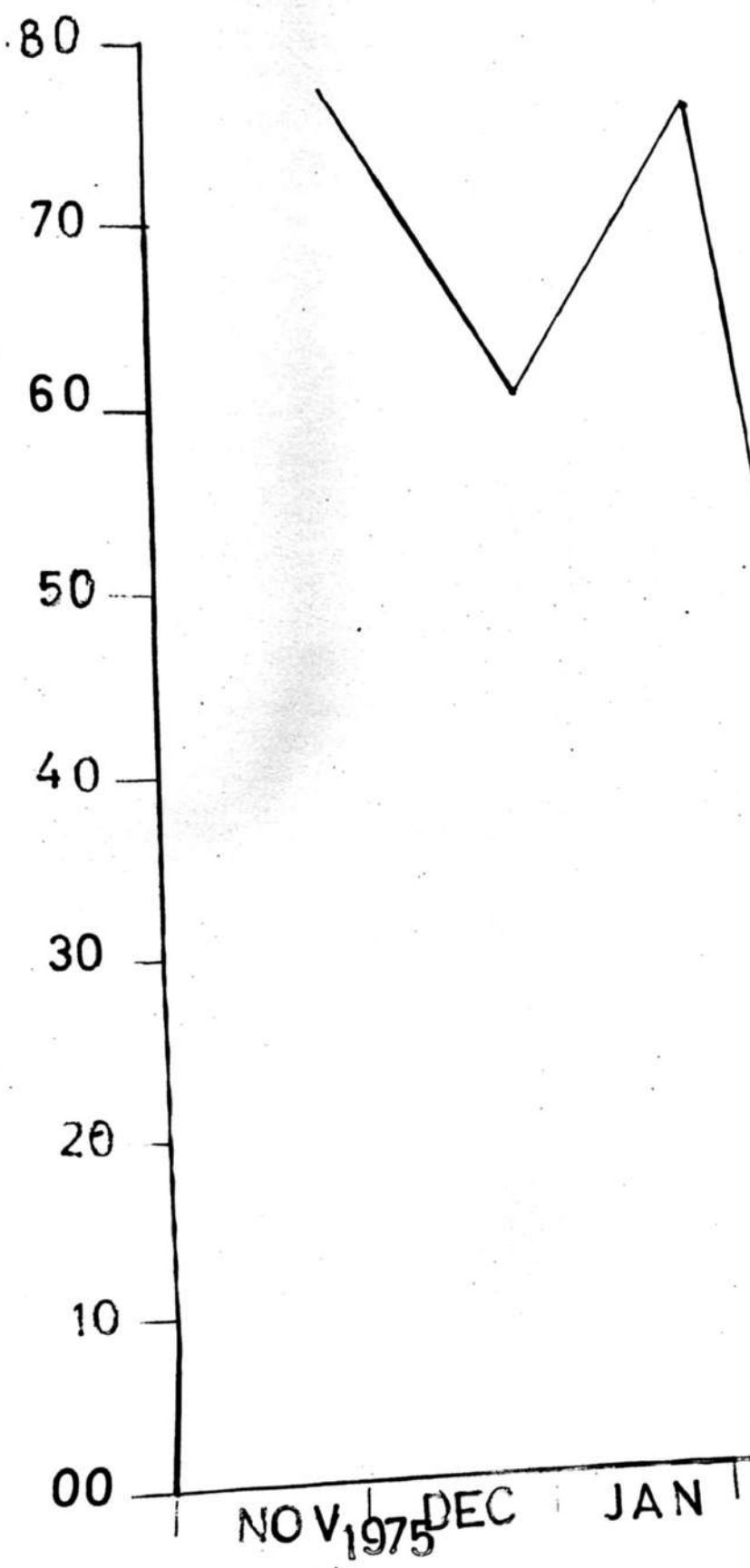
2025 ...

GRAPH-1



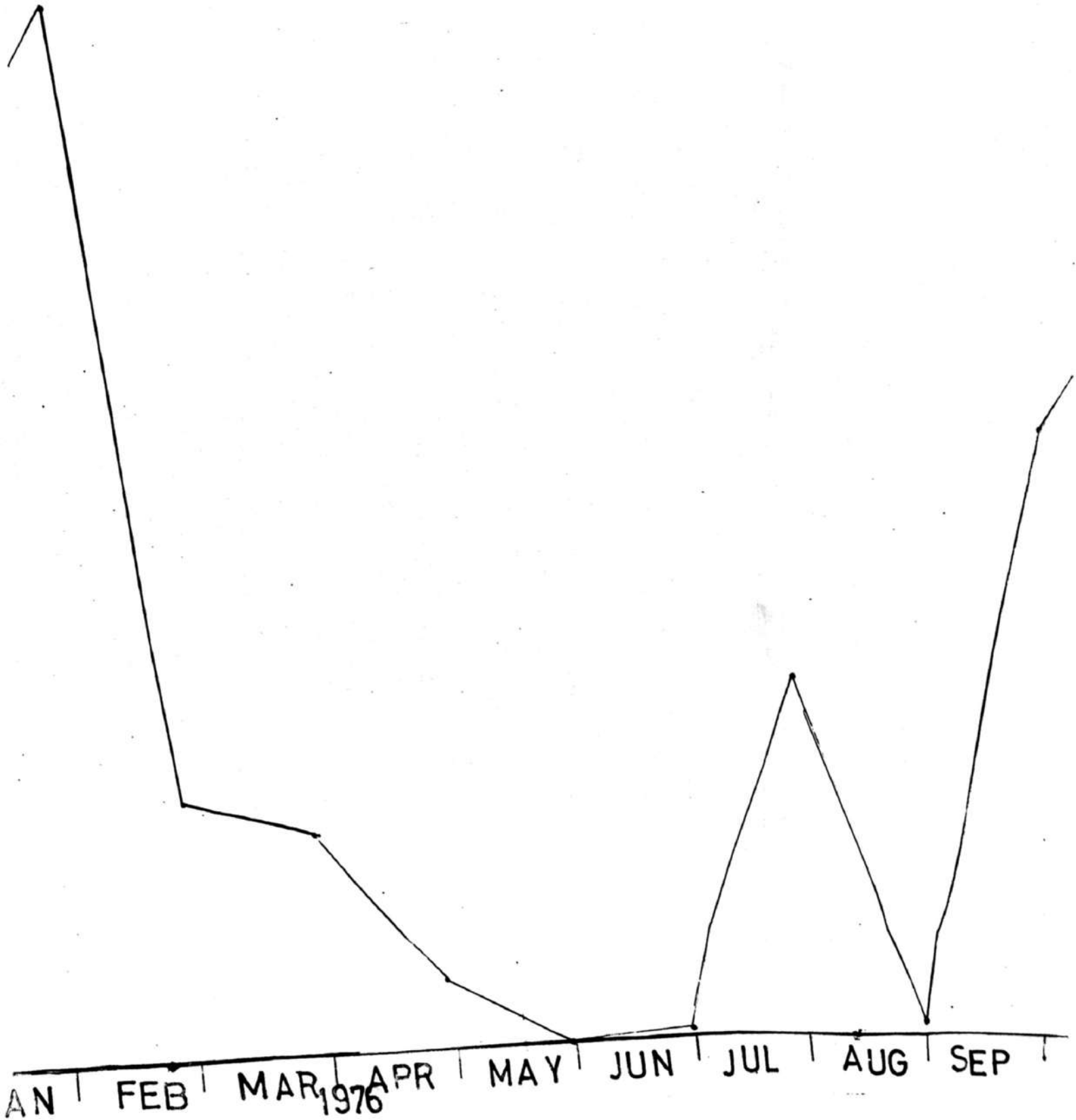
Logarithmic graph of total length against total weight of *Parapenopsis stylifera*

Percentage in Catch

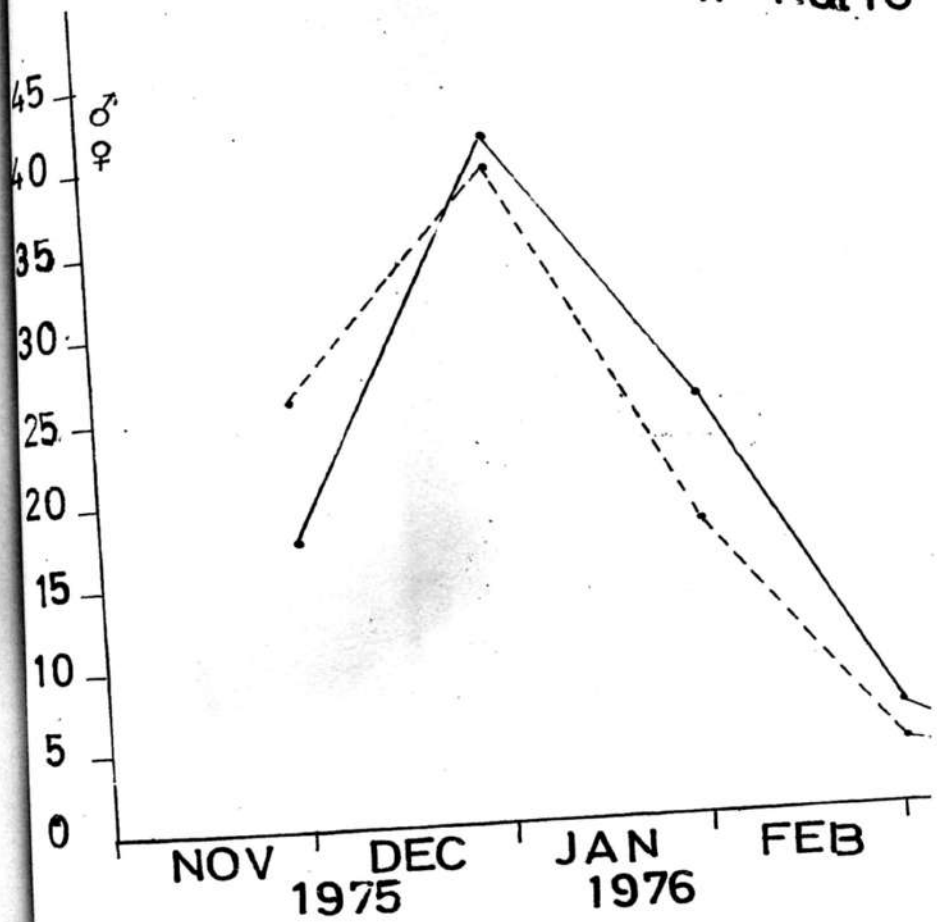


GRAPH-2

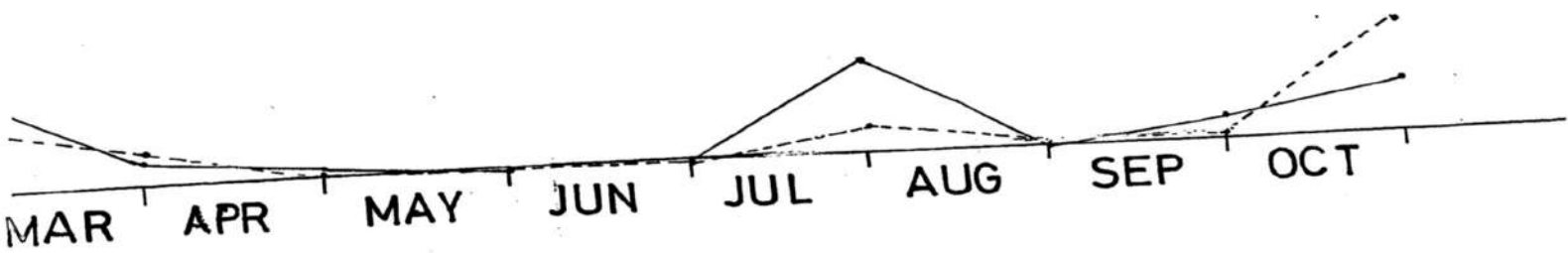
Seasonal Fluctuation of *Parapenopsis stylifera*



GRA
Sex-Ratio

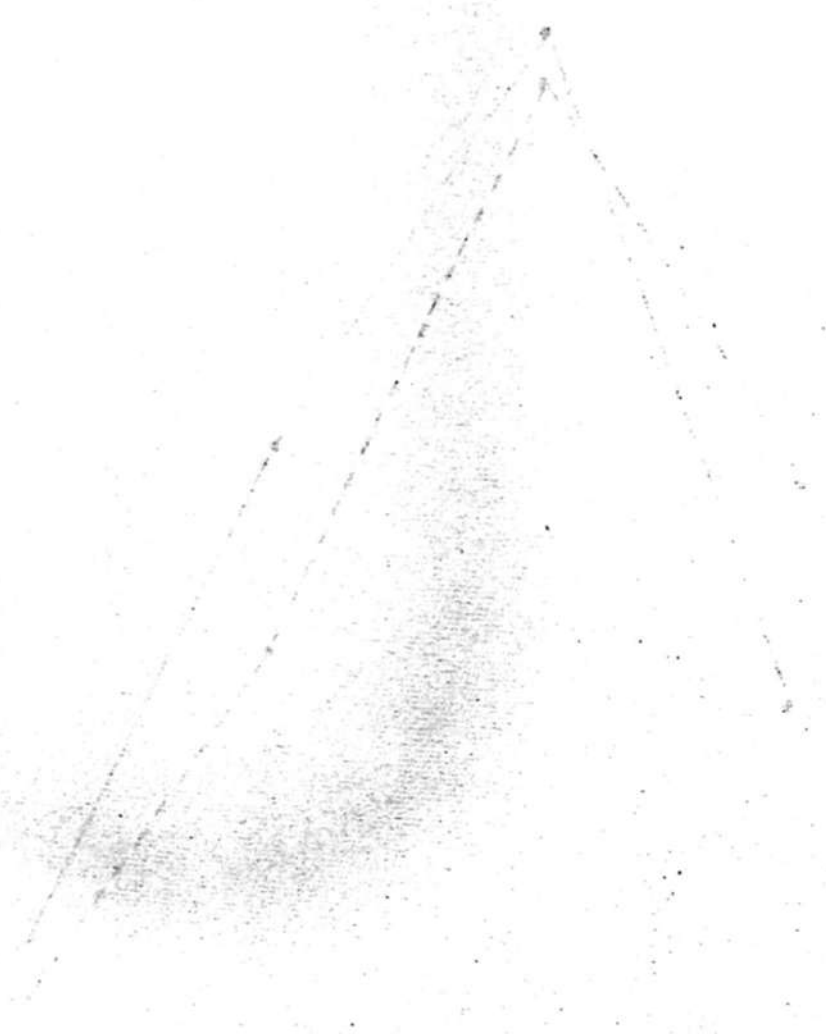


PH 3
of *Parapenaëopsis stylifera*



BRASH 3

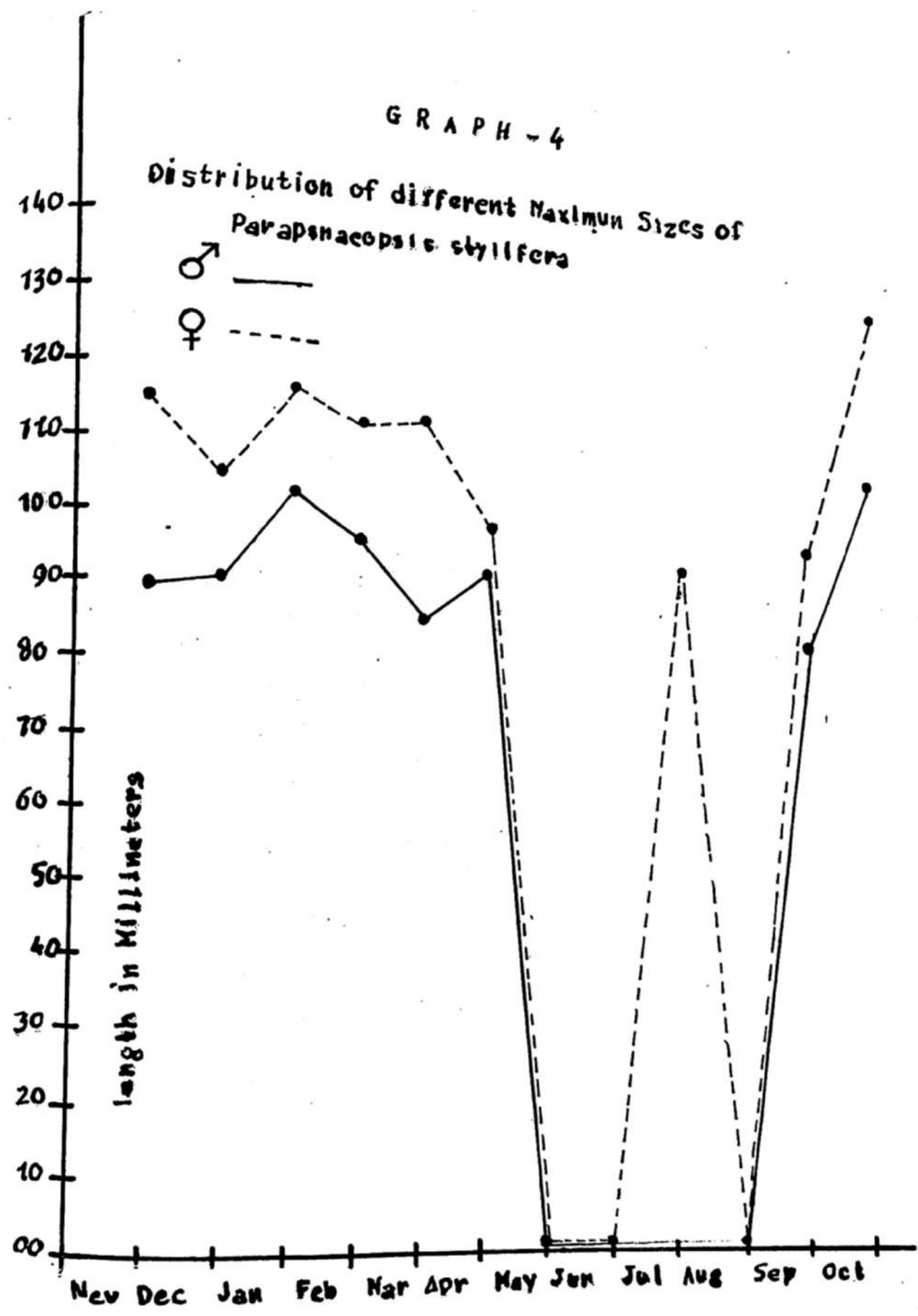
Sex-1010 of B



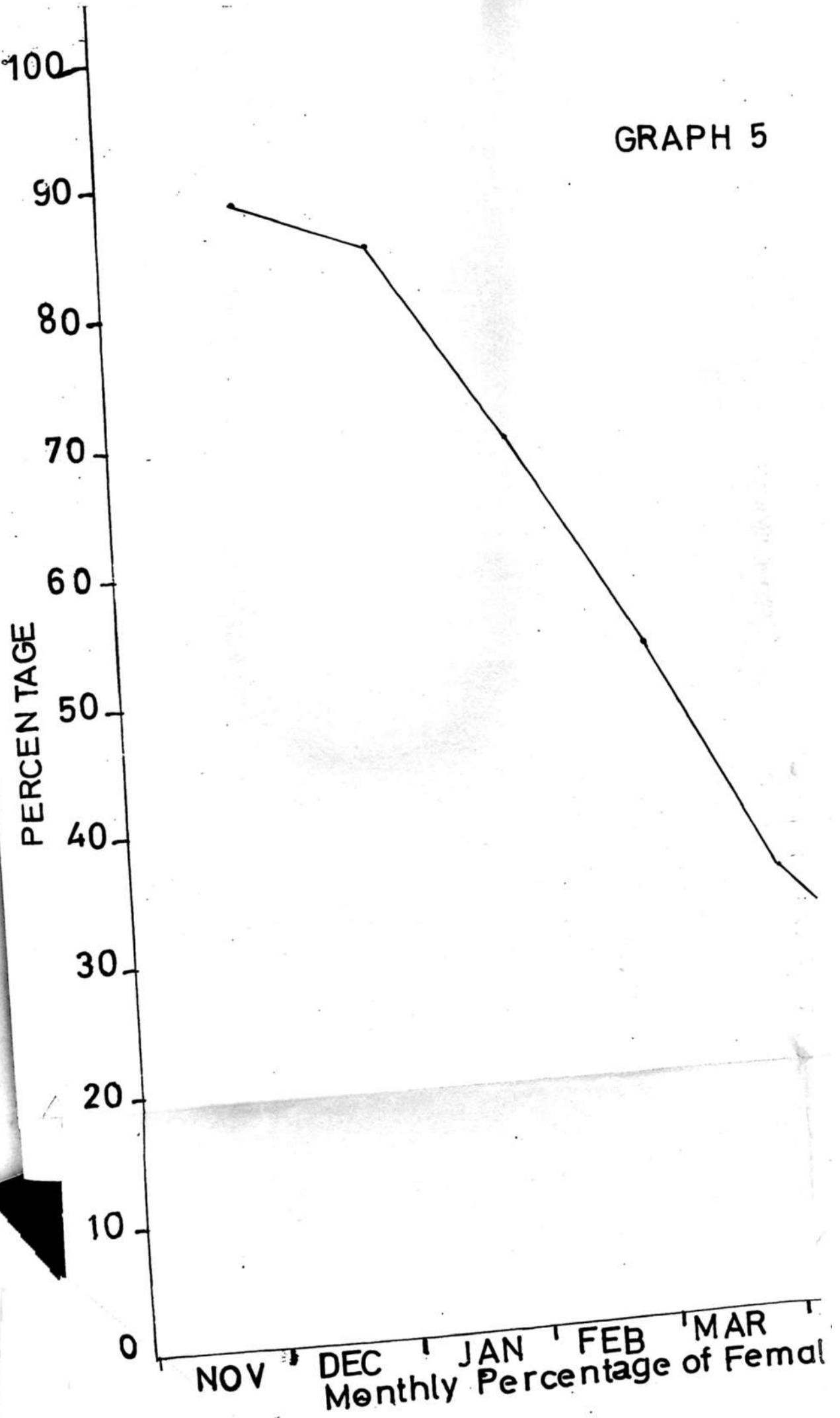
NOV DEC JAN FEB MAR
1970

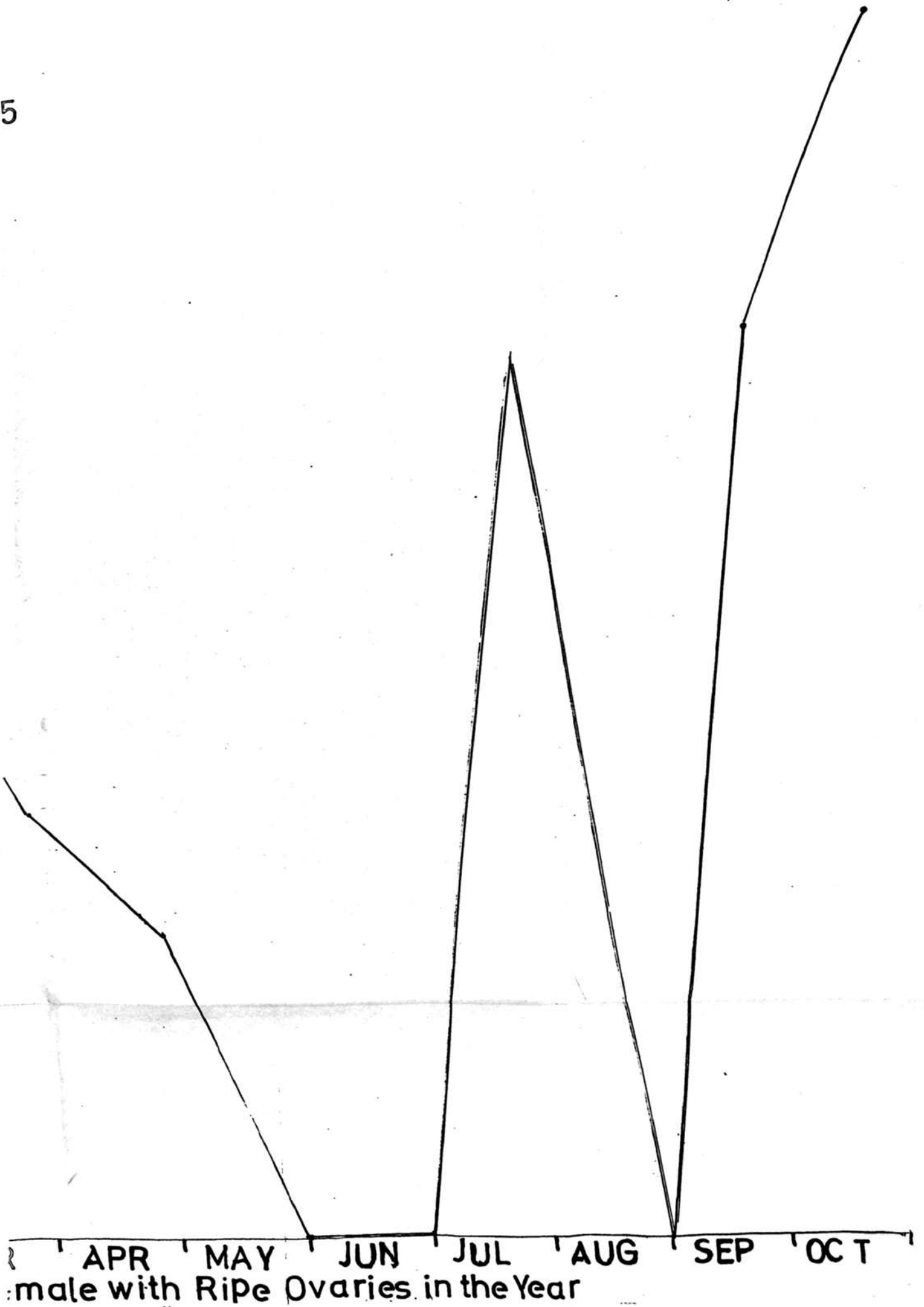
GRAPH - 4

Distribution of different Maximum Sizes of *Parapsnaecopsis stylifera*

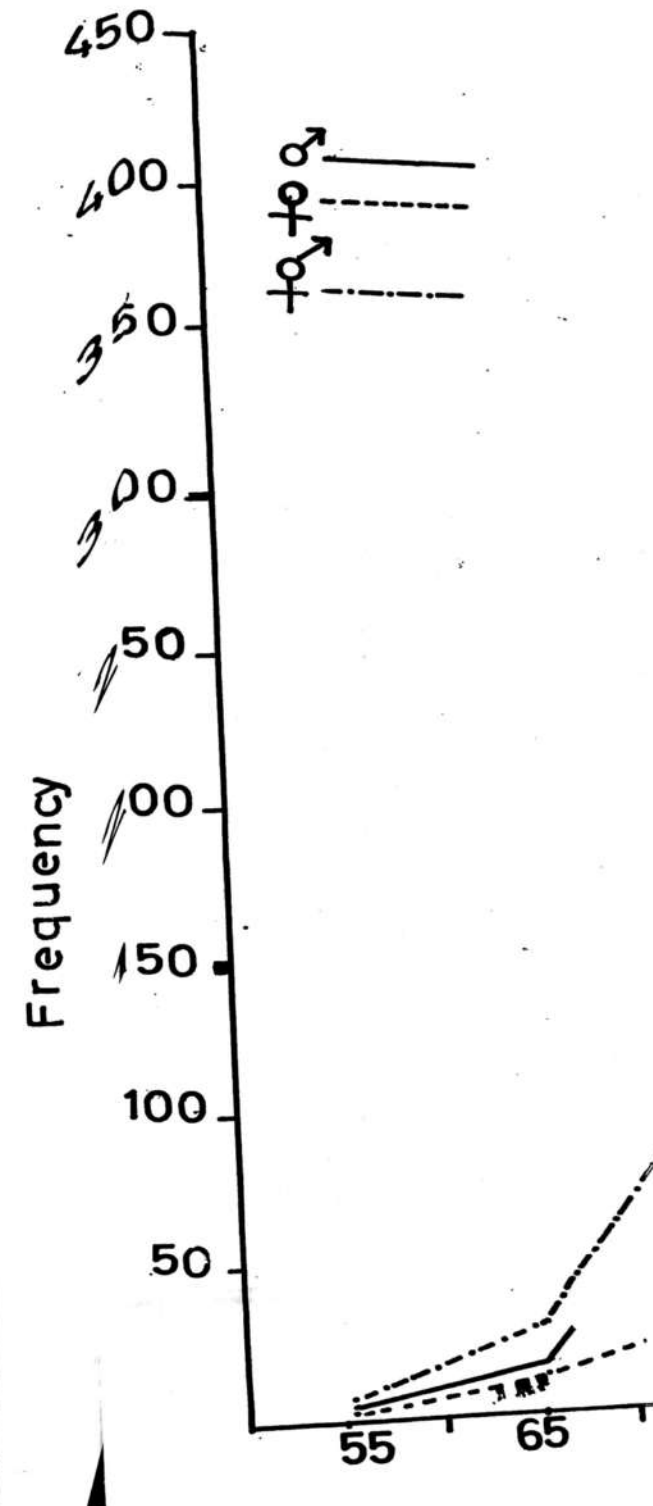
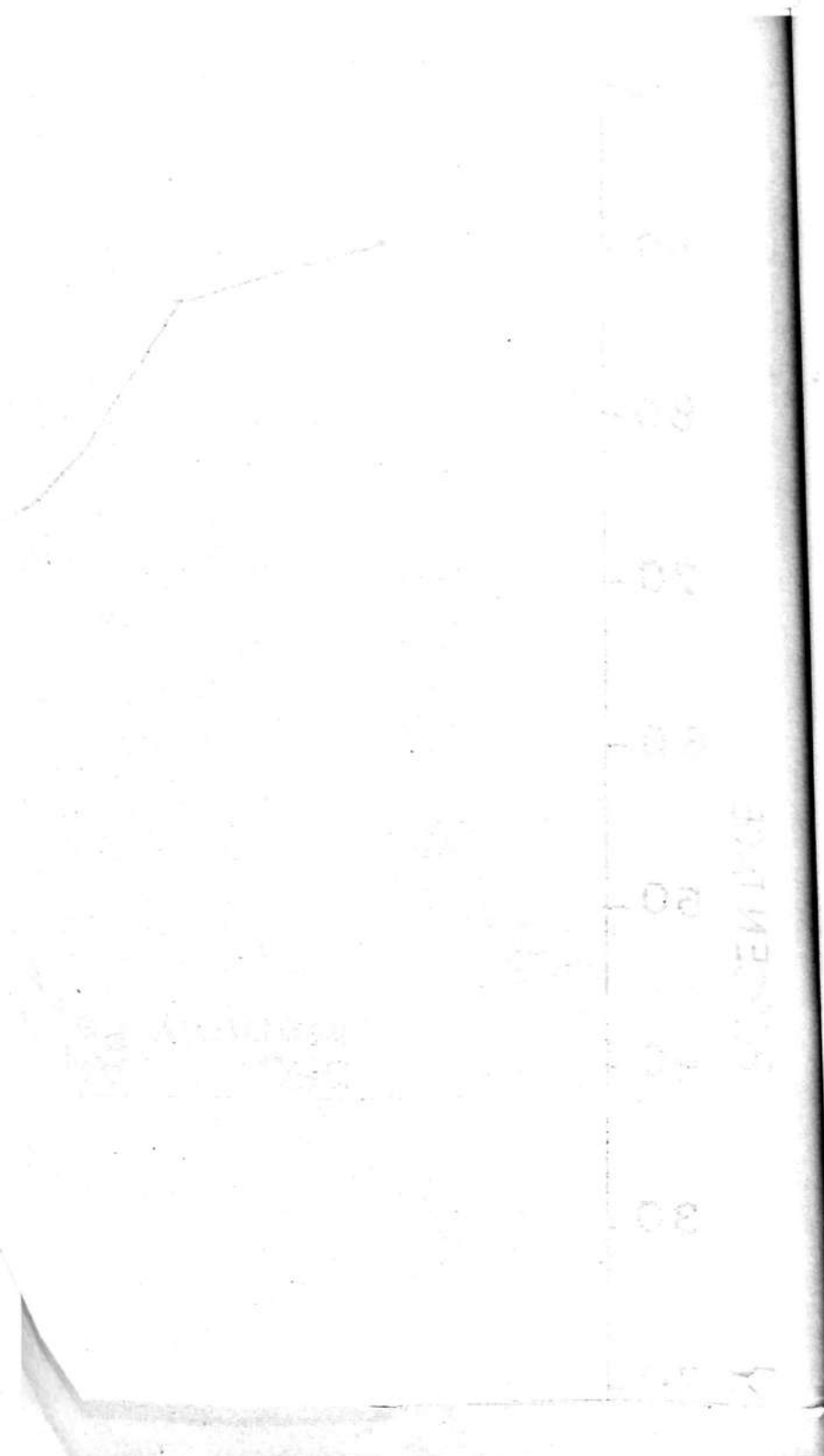


GRAPH 5

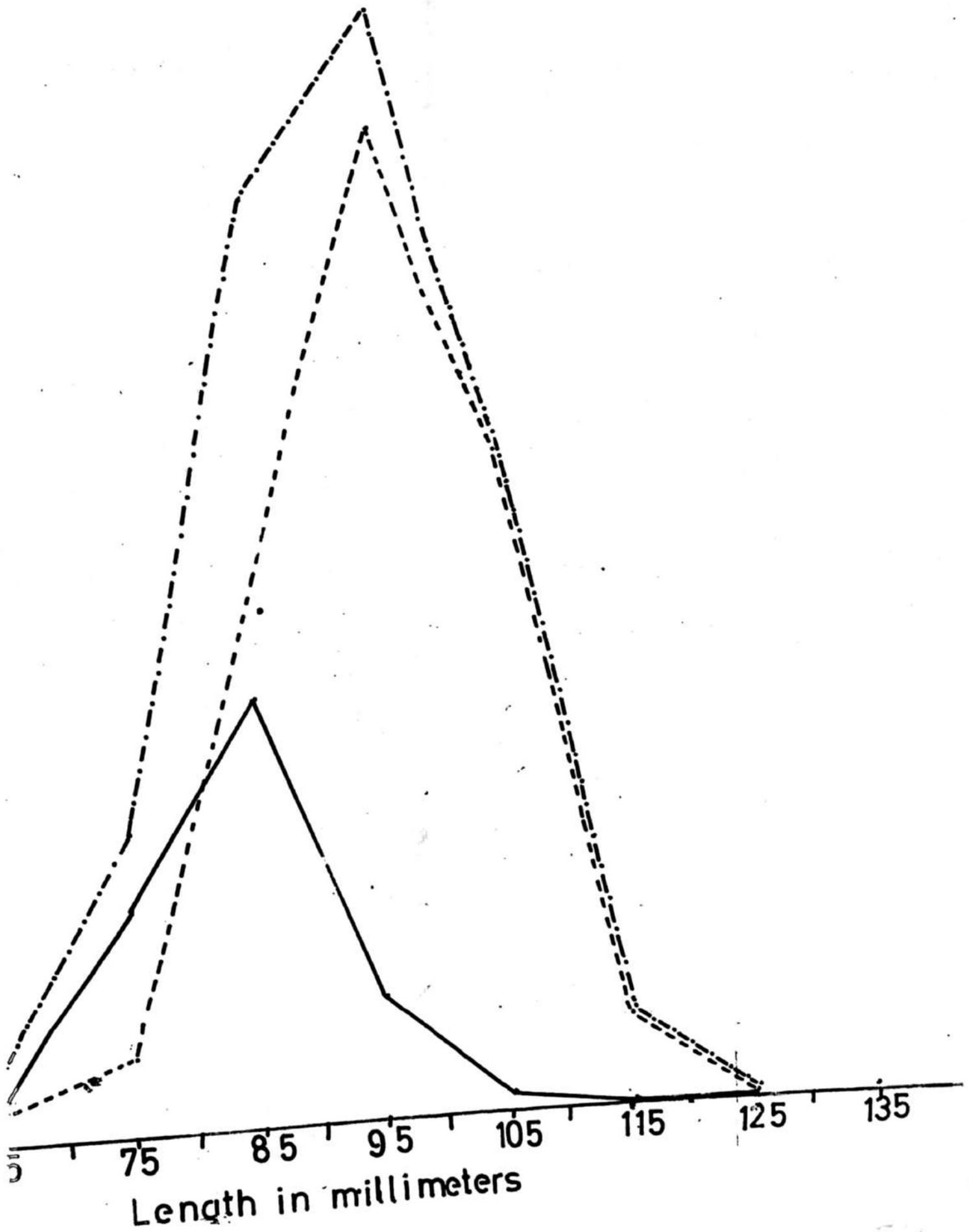




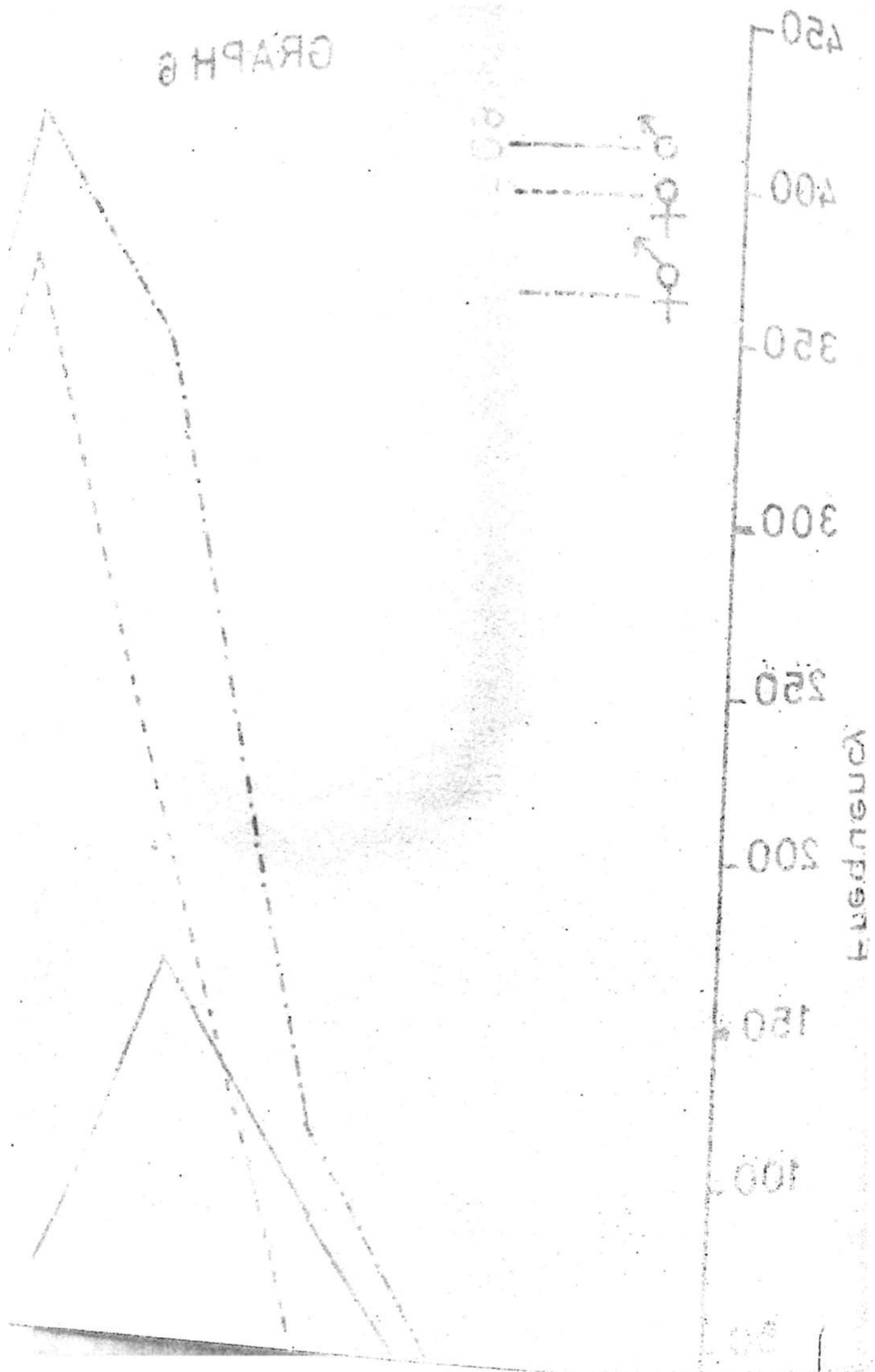
male with Ripe Ovaries in the Year



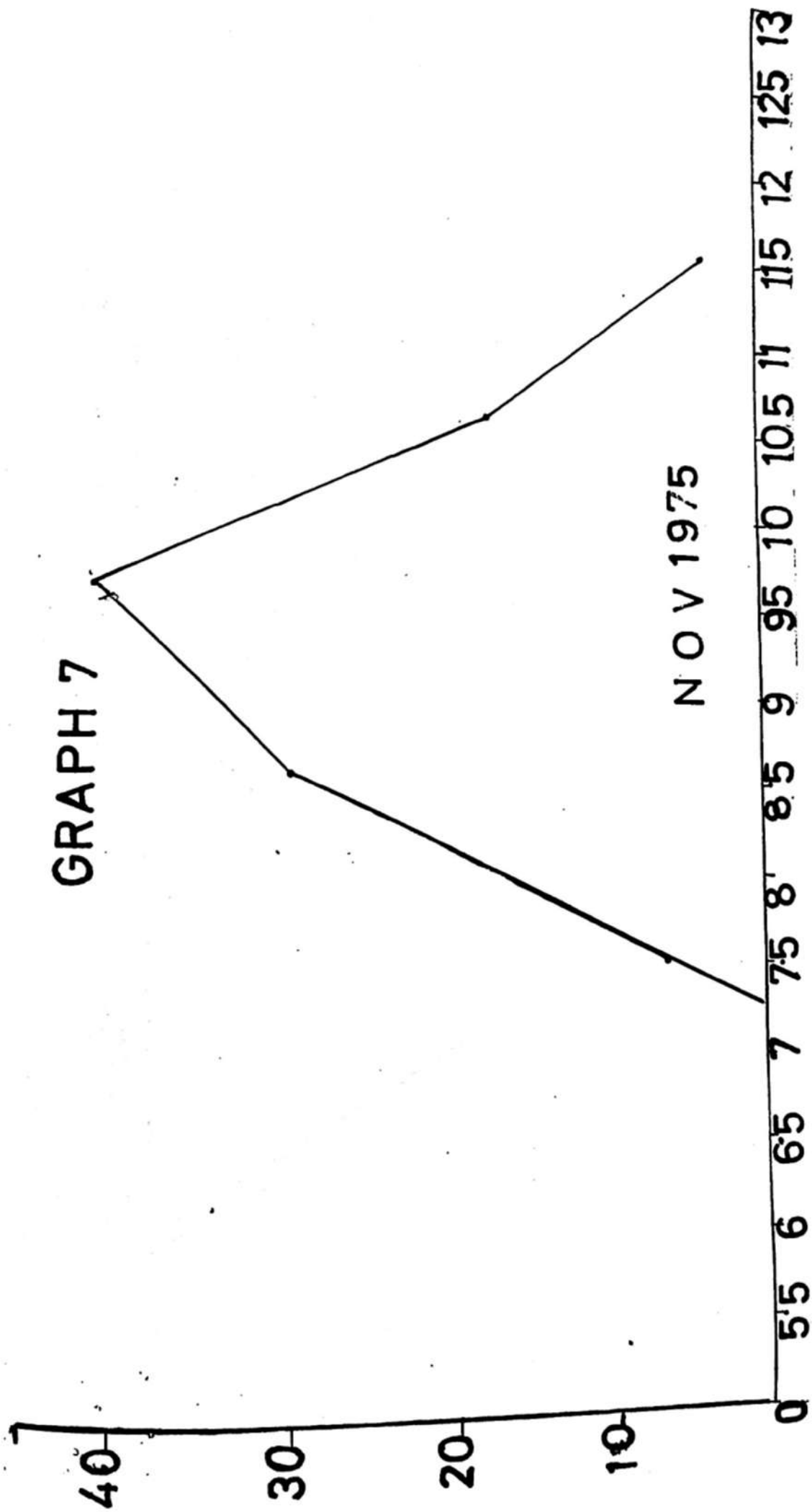
GRAPH 6



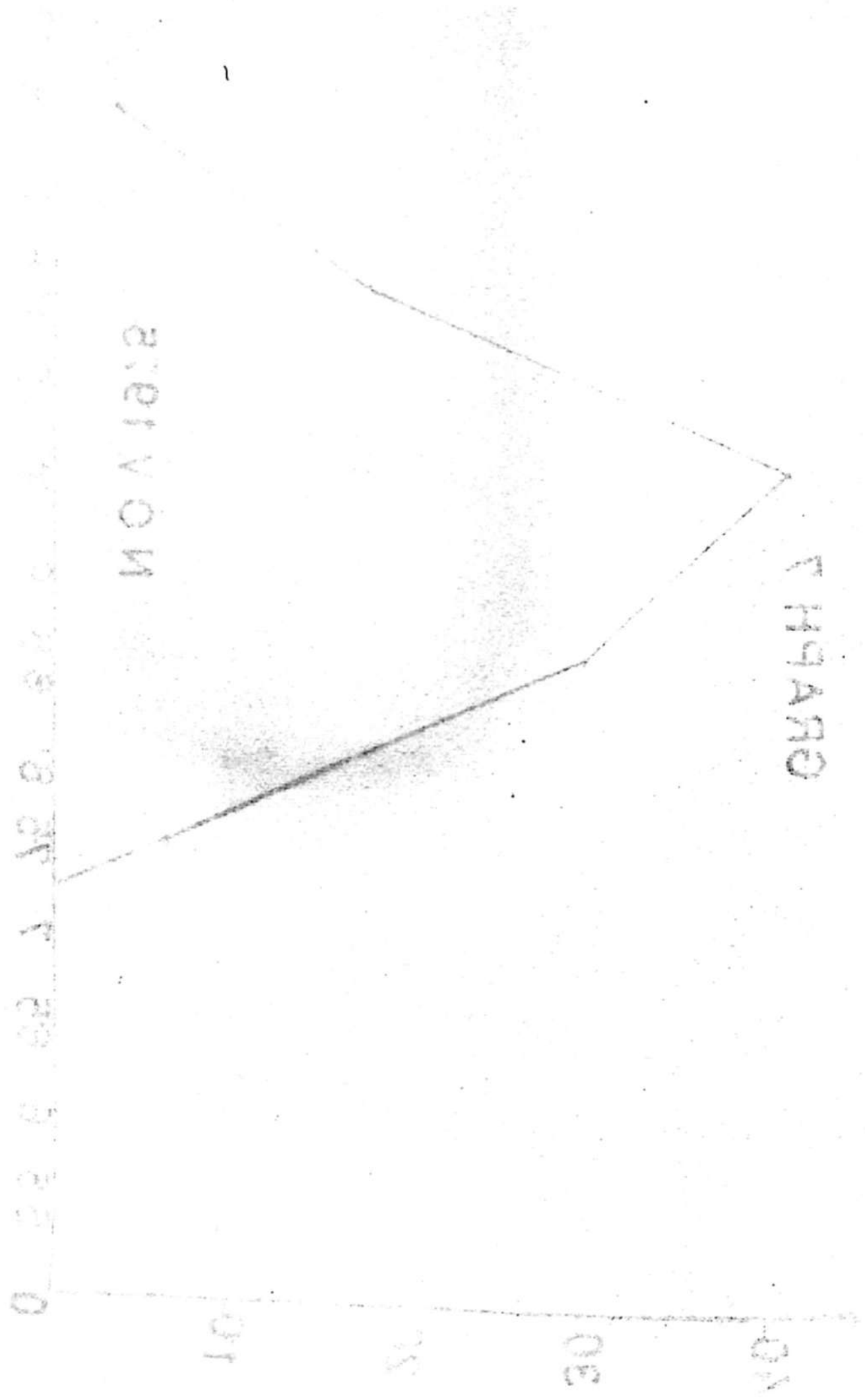
GRAPH 6

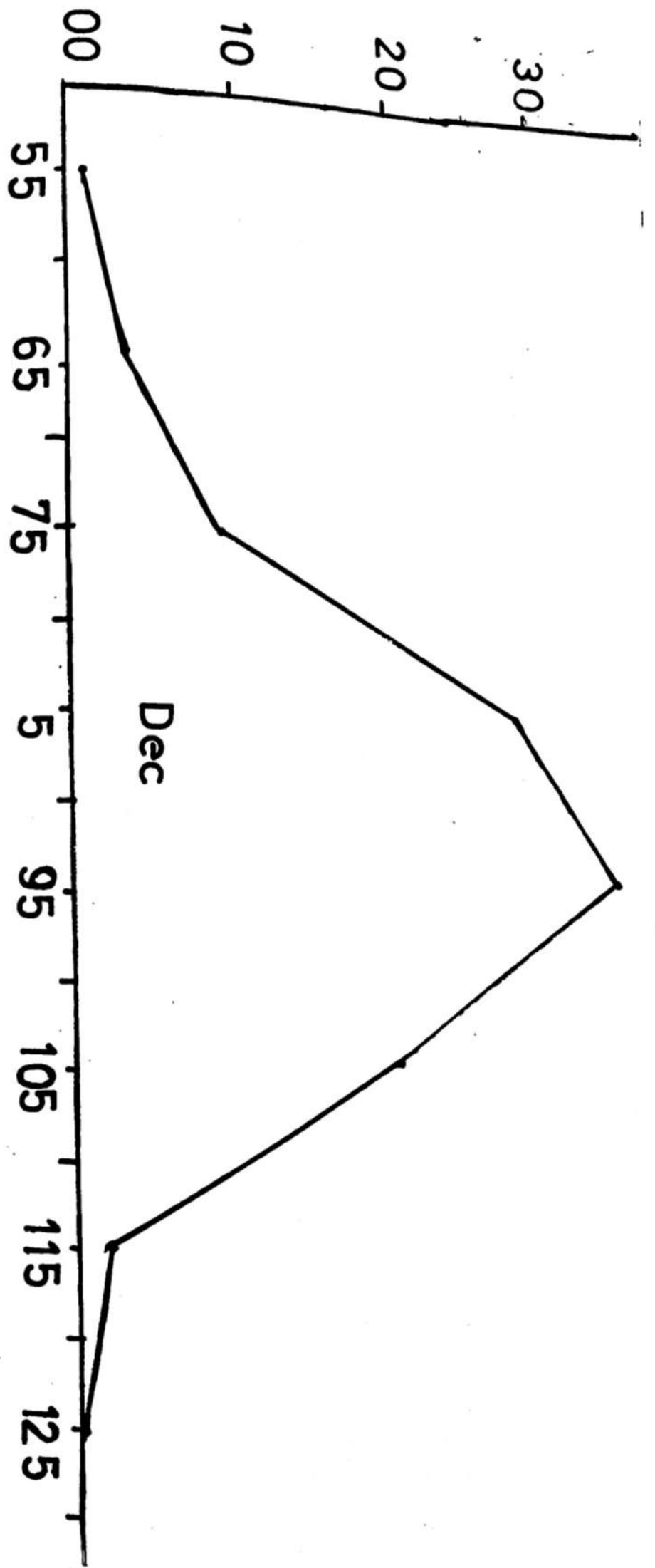


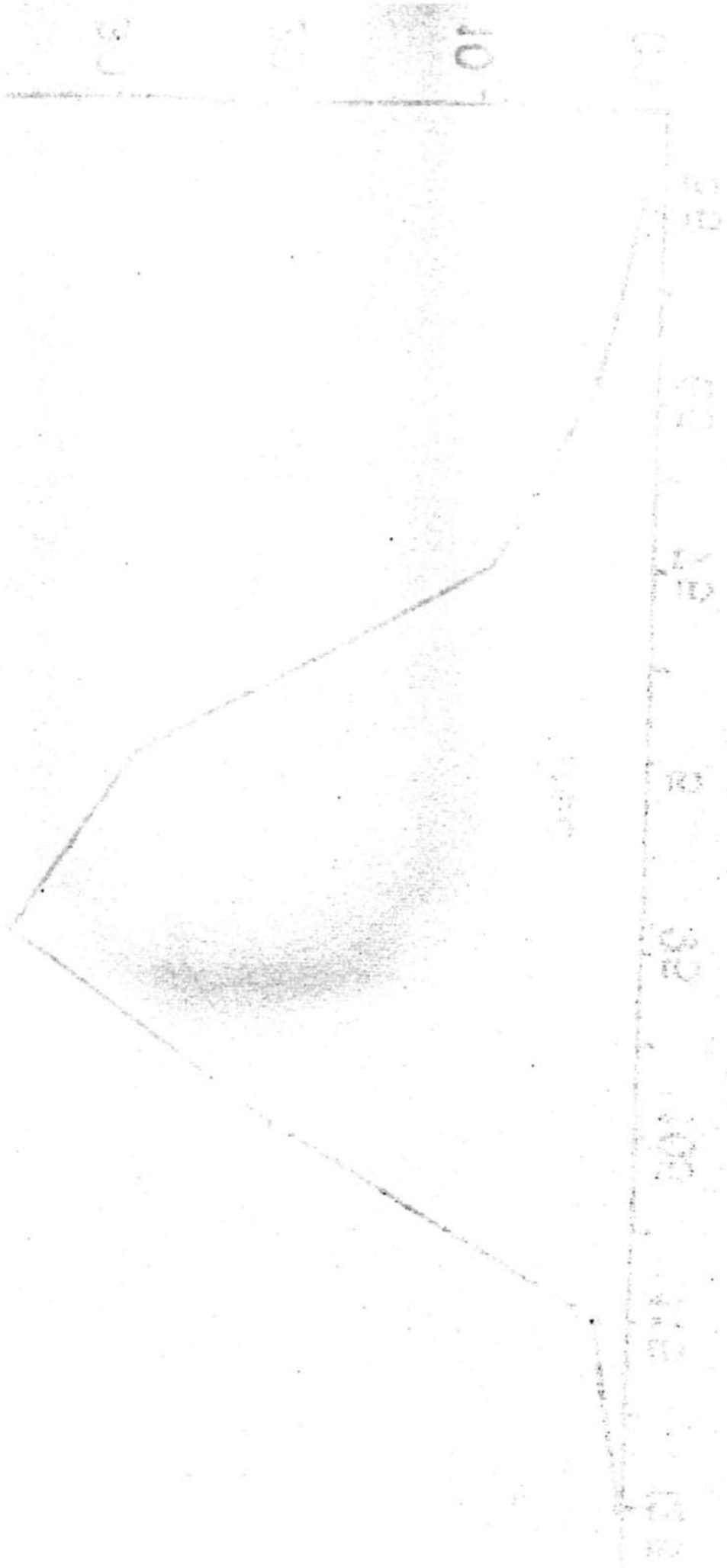
GRAPH 7



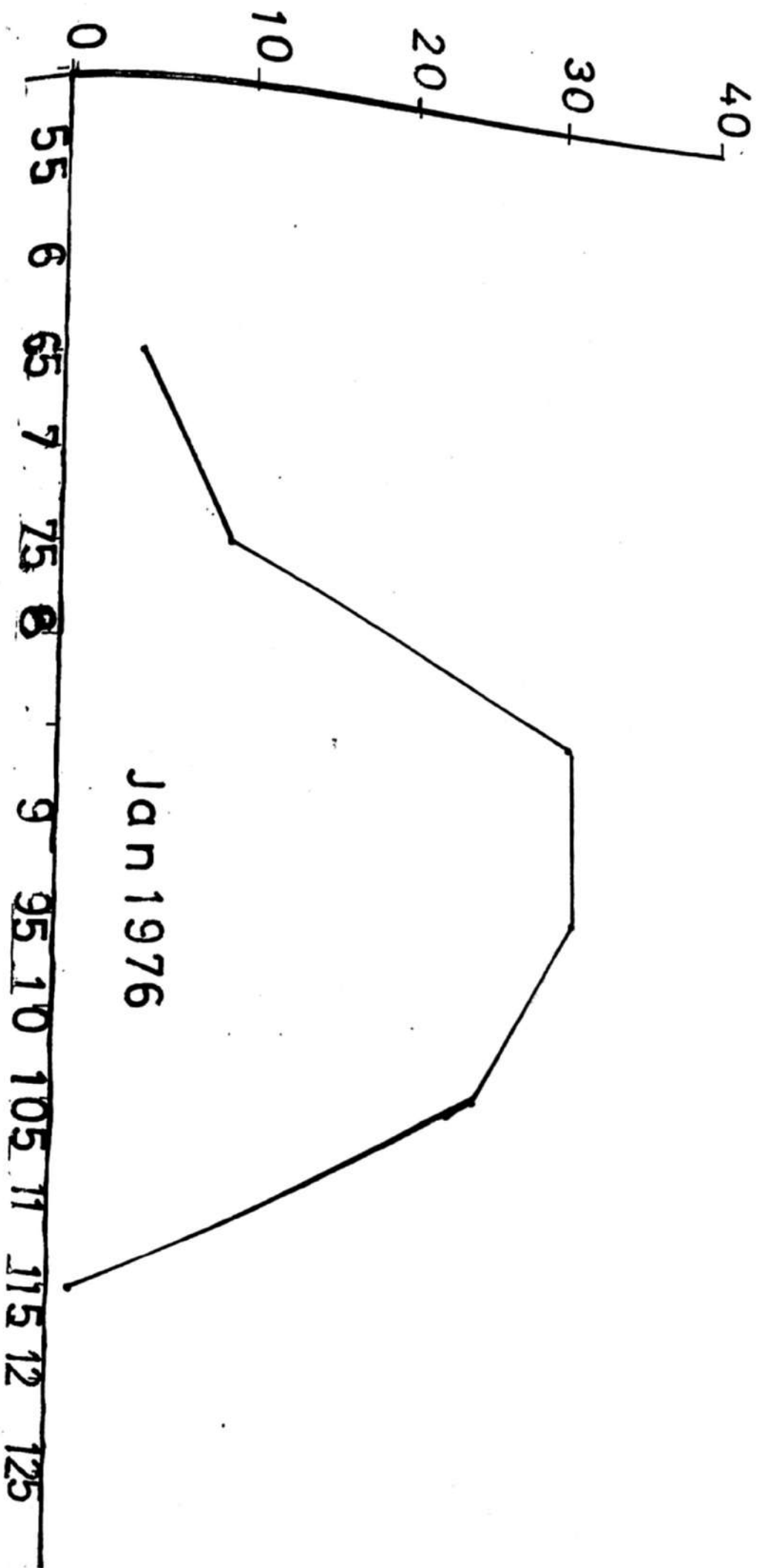
NOV 1975





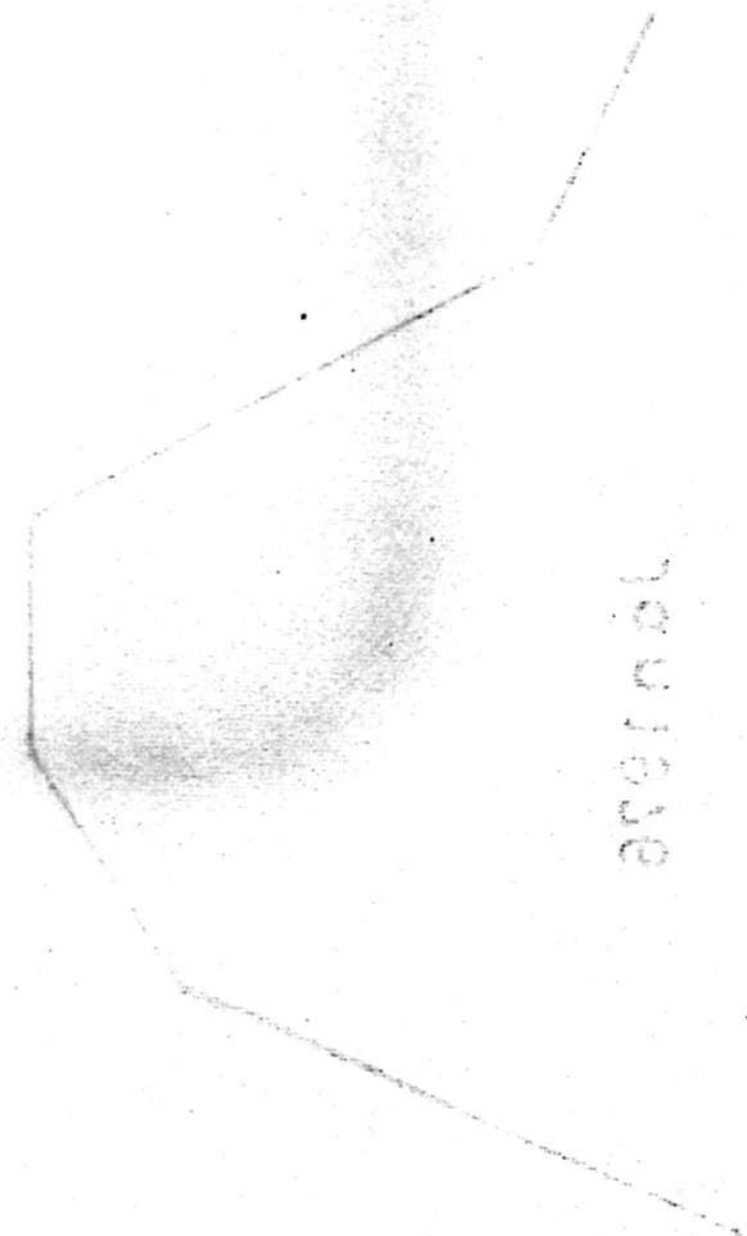


Handwritten text at the bottom of the page, possibly a signature or a note, which is mostly illegible due to fading and blurring.

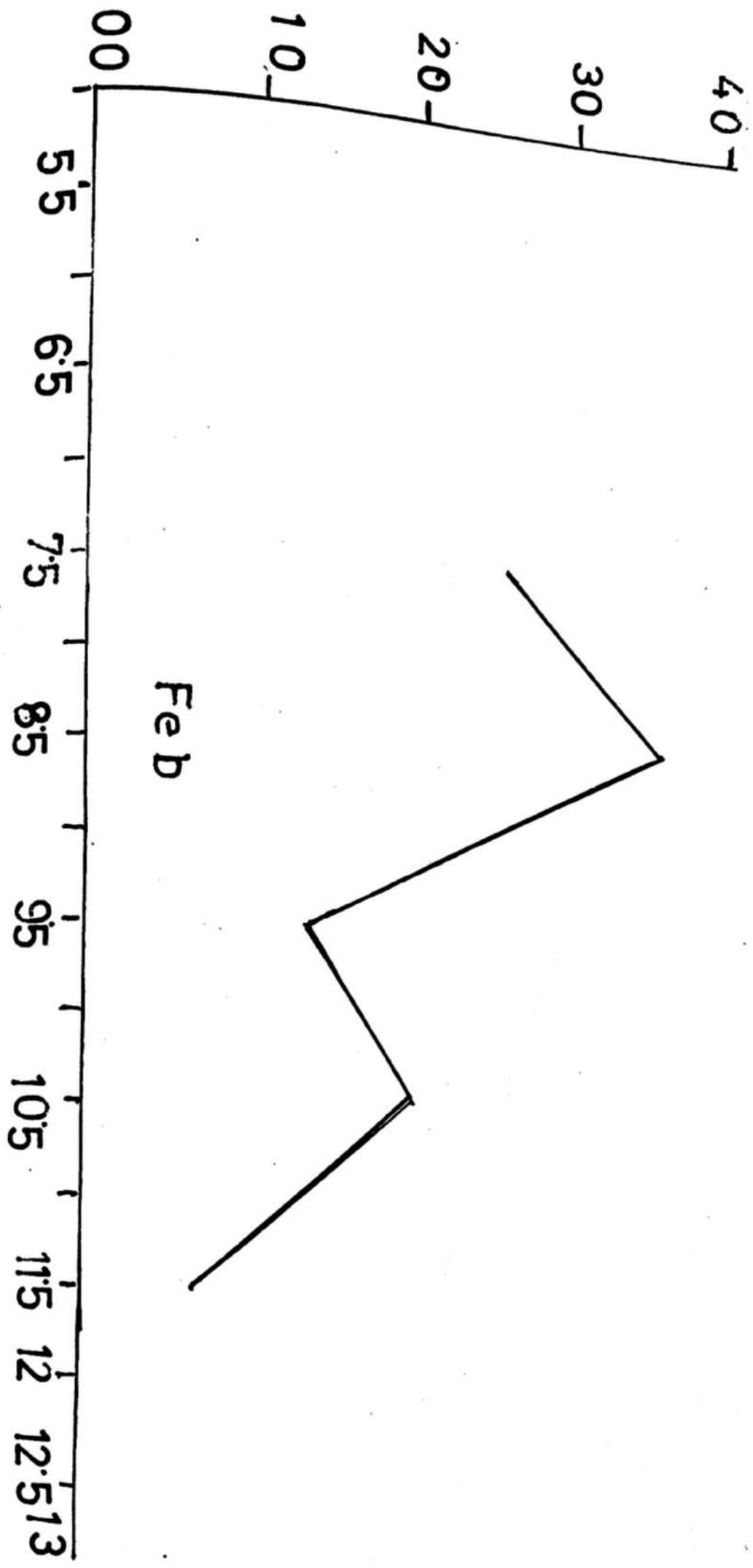


22 6 22 1 12 8 2 22 10 102 1 12 10 22

yourese



10



00

10

00

22

02

22

82

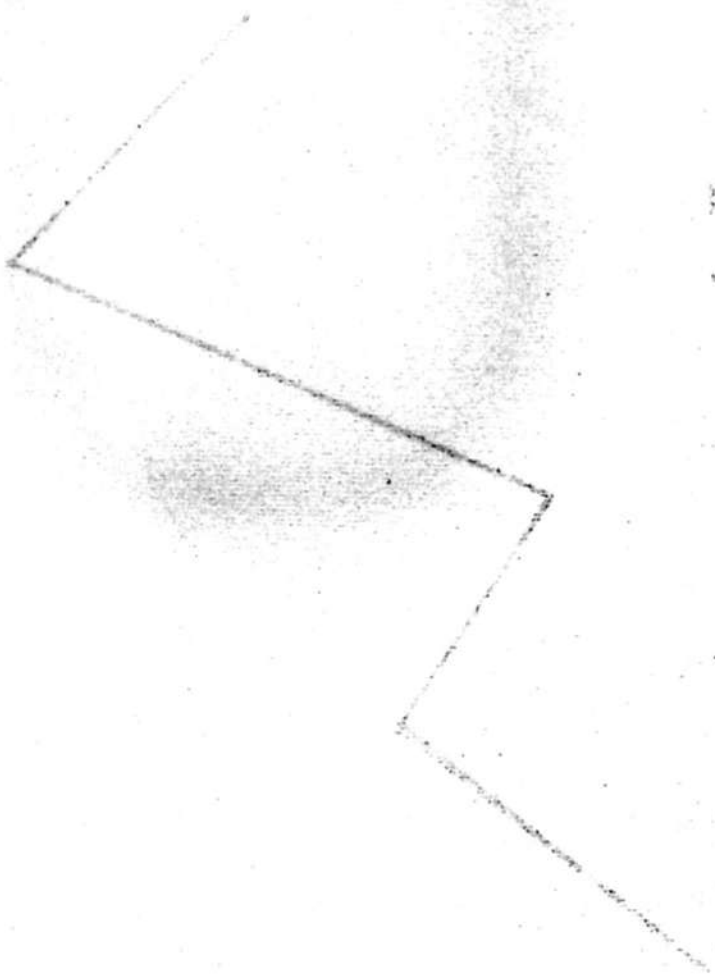
02

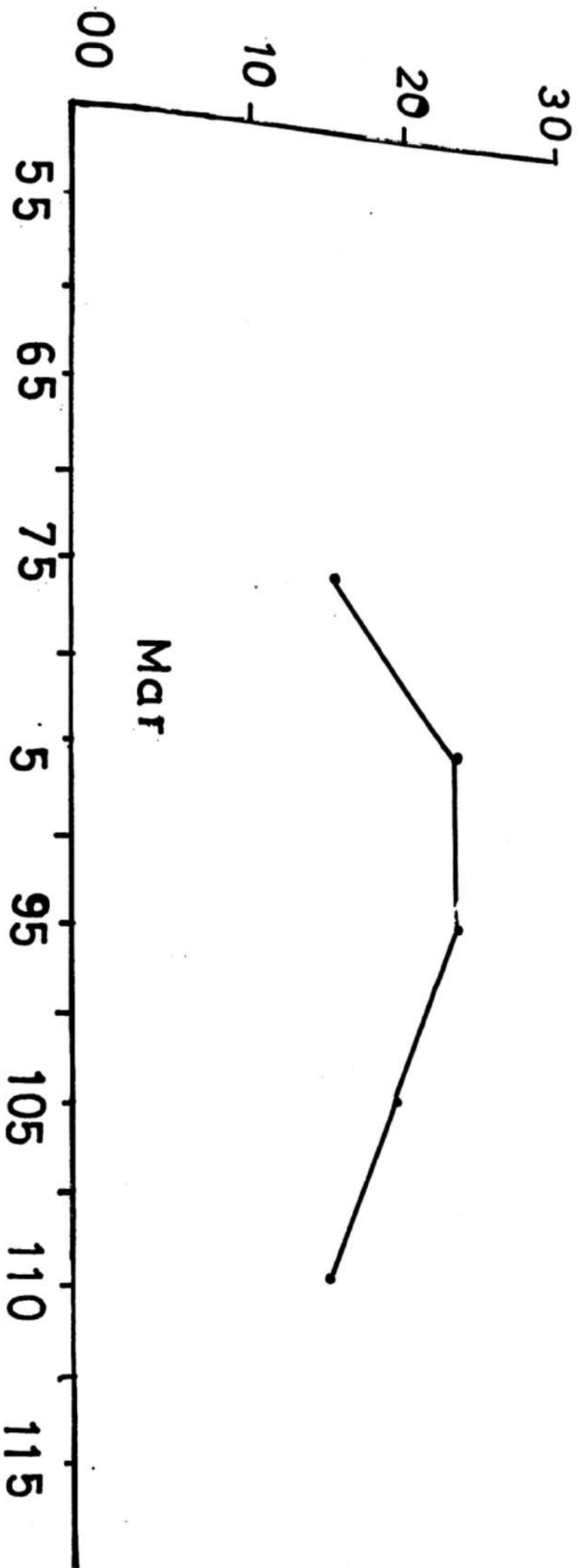
102

202

302

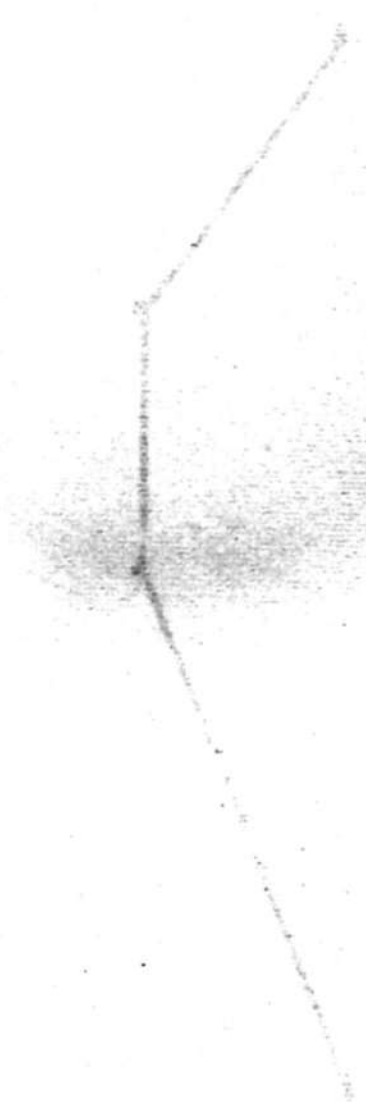
Feb

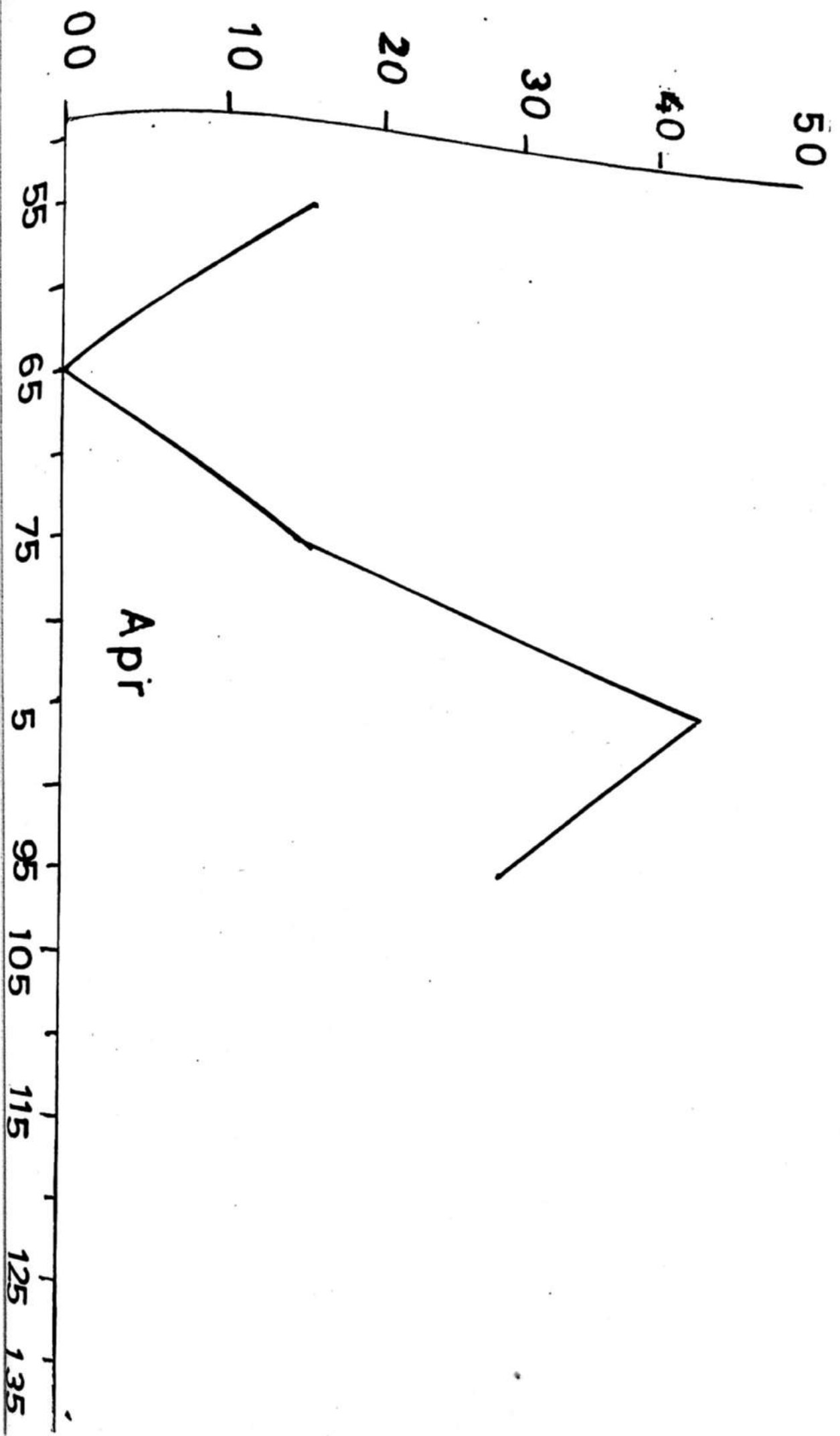




82 10 32 82 10 32 82 10 32 82 10 32 82 10 32

101



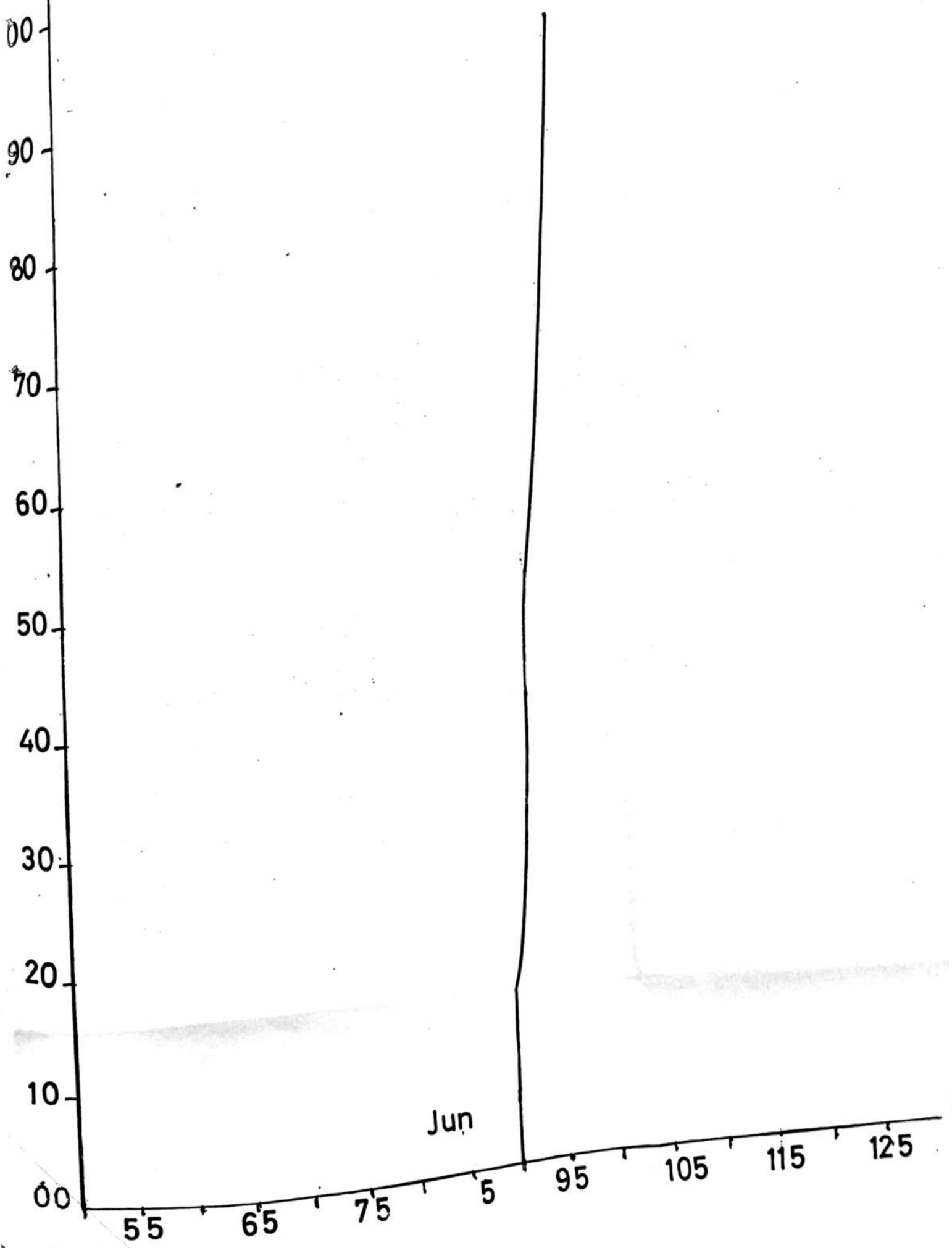


02

50



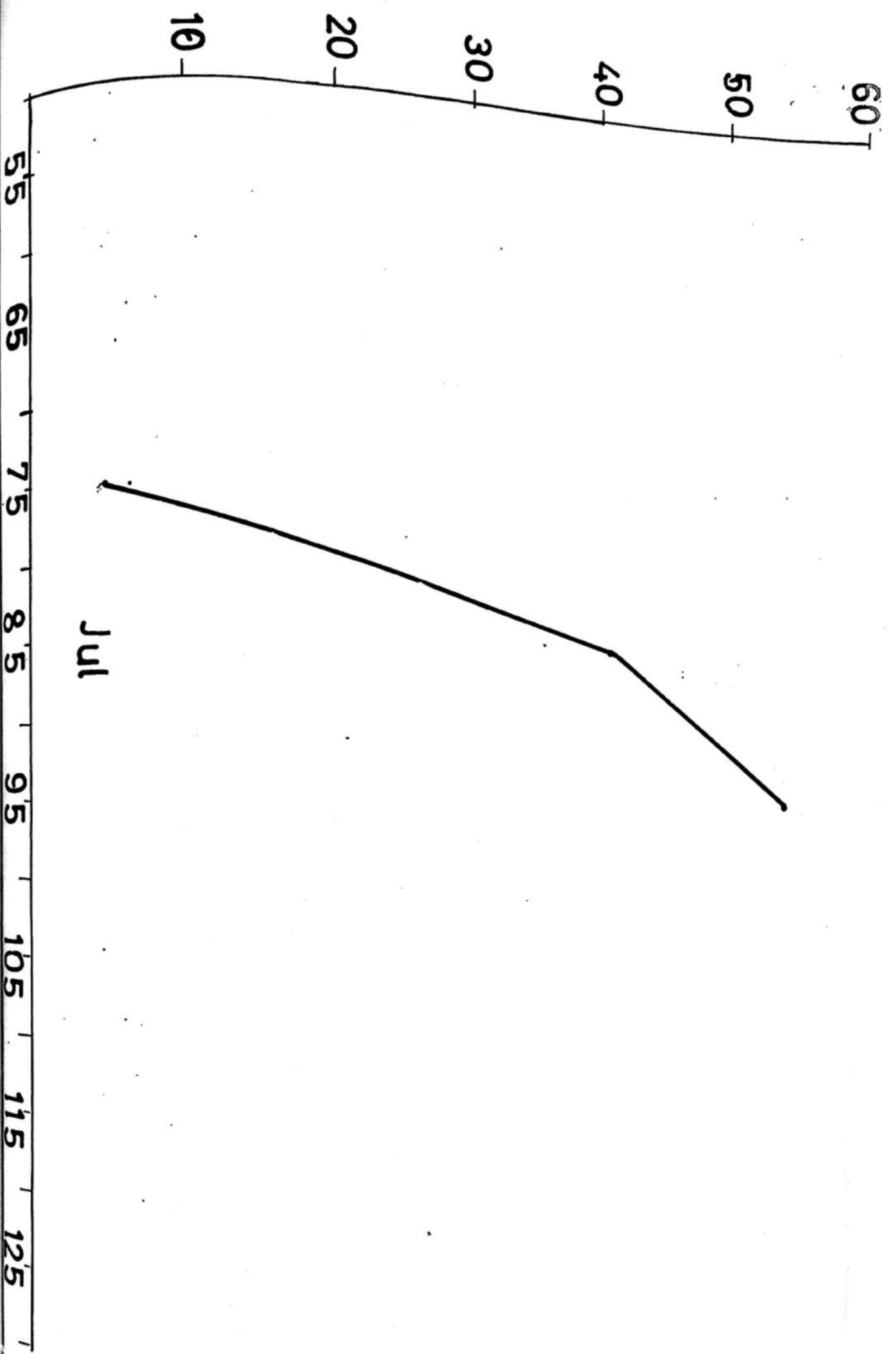
YCA

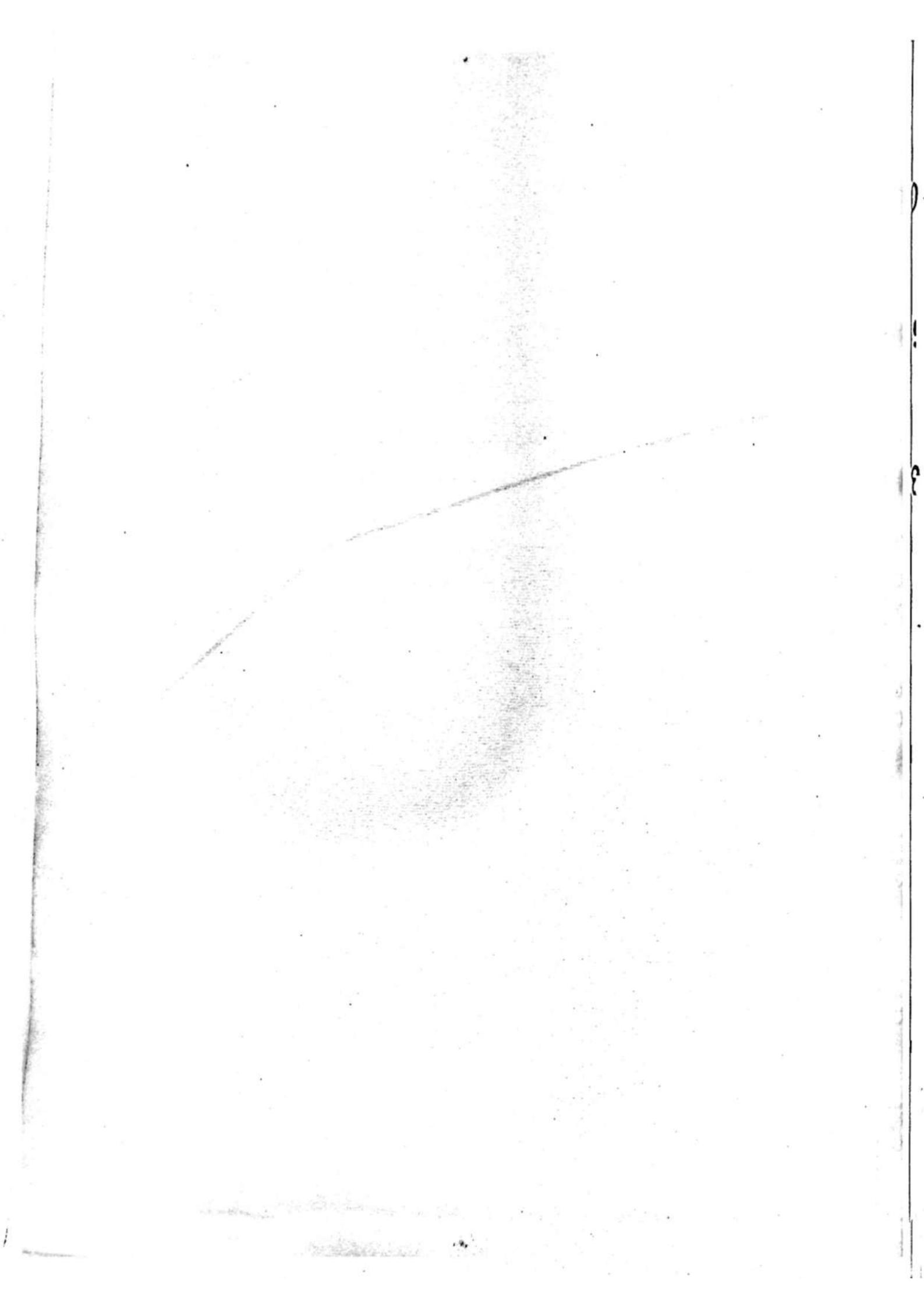


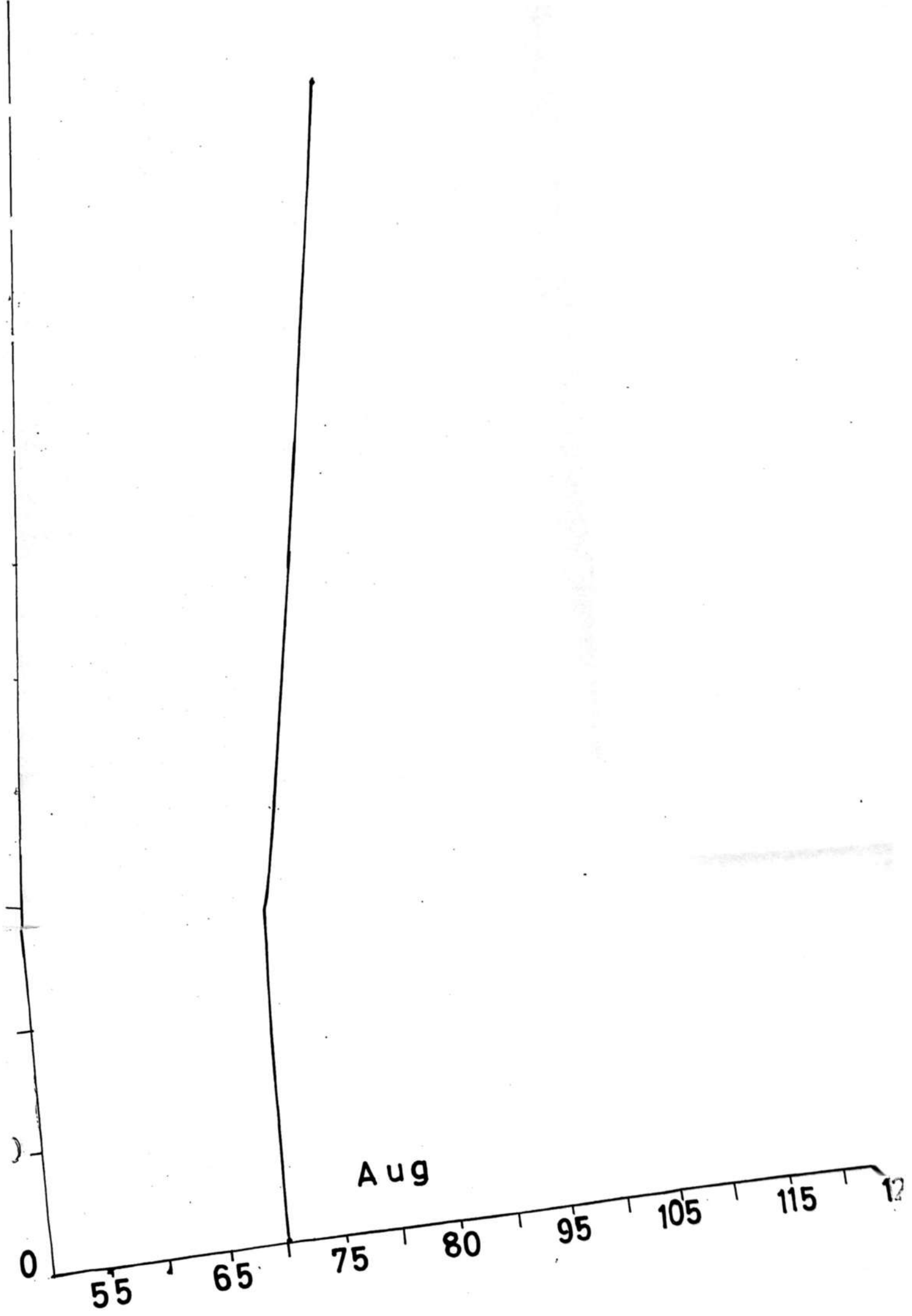
Jun

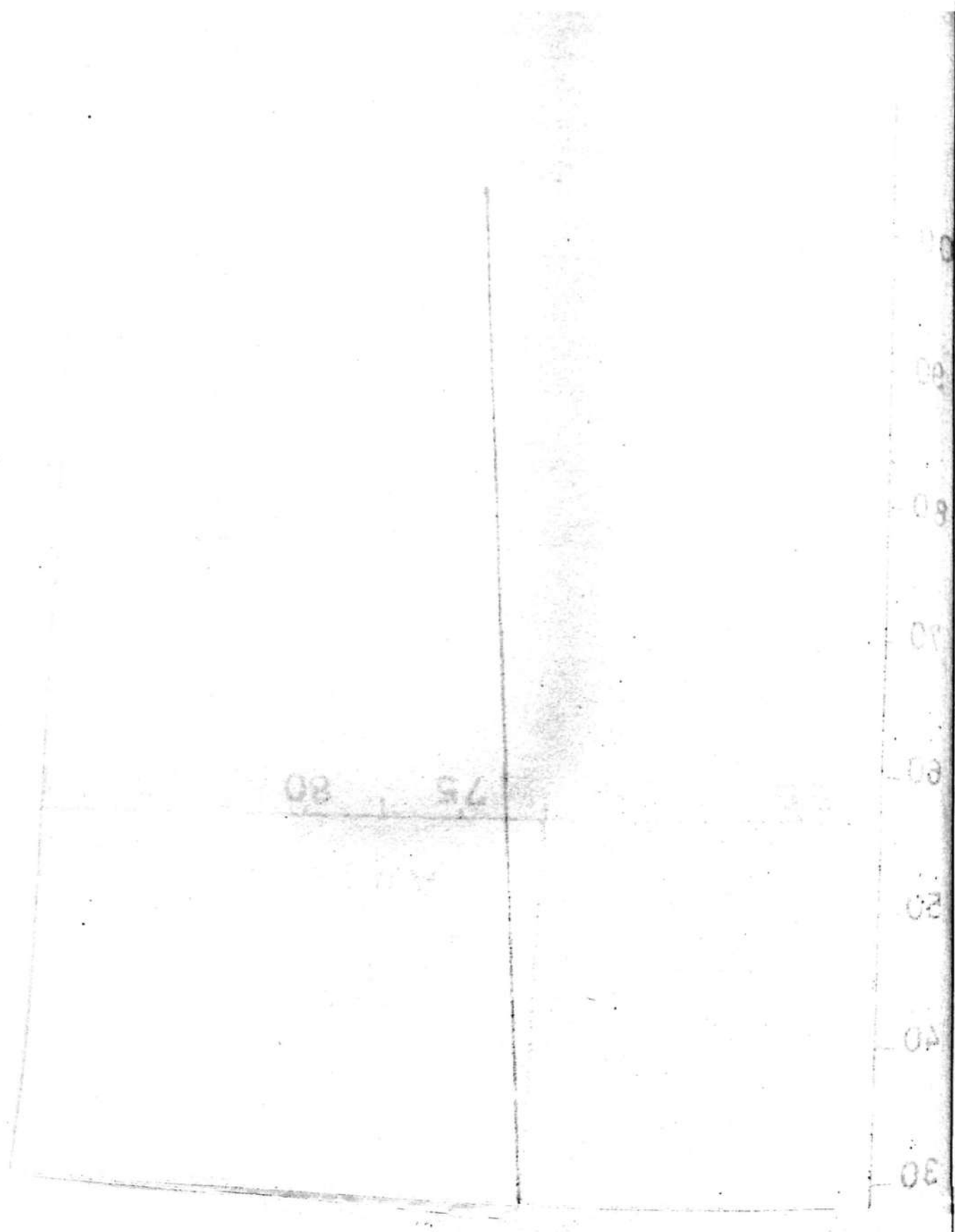
Catch Absent in May

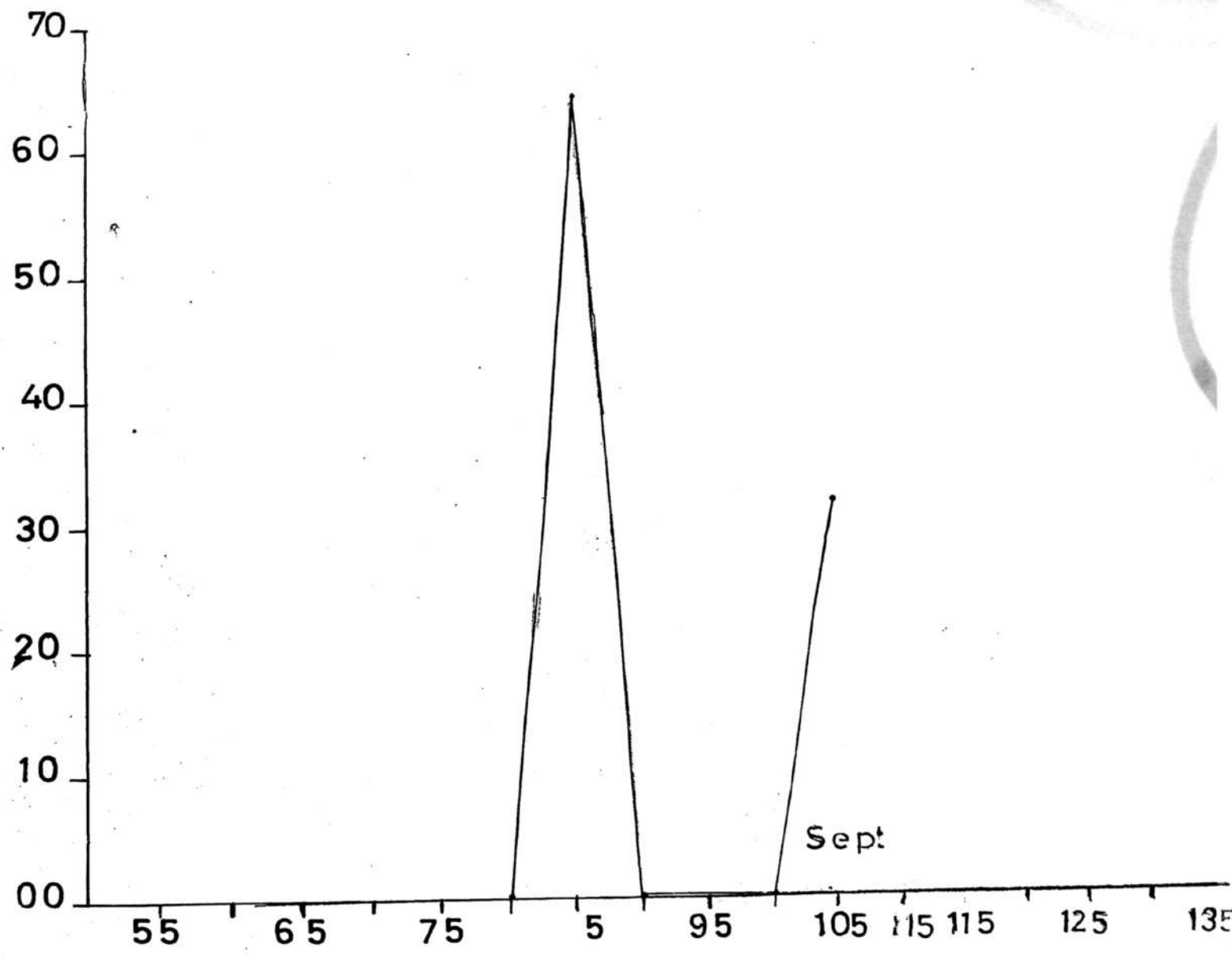
ADW

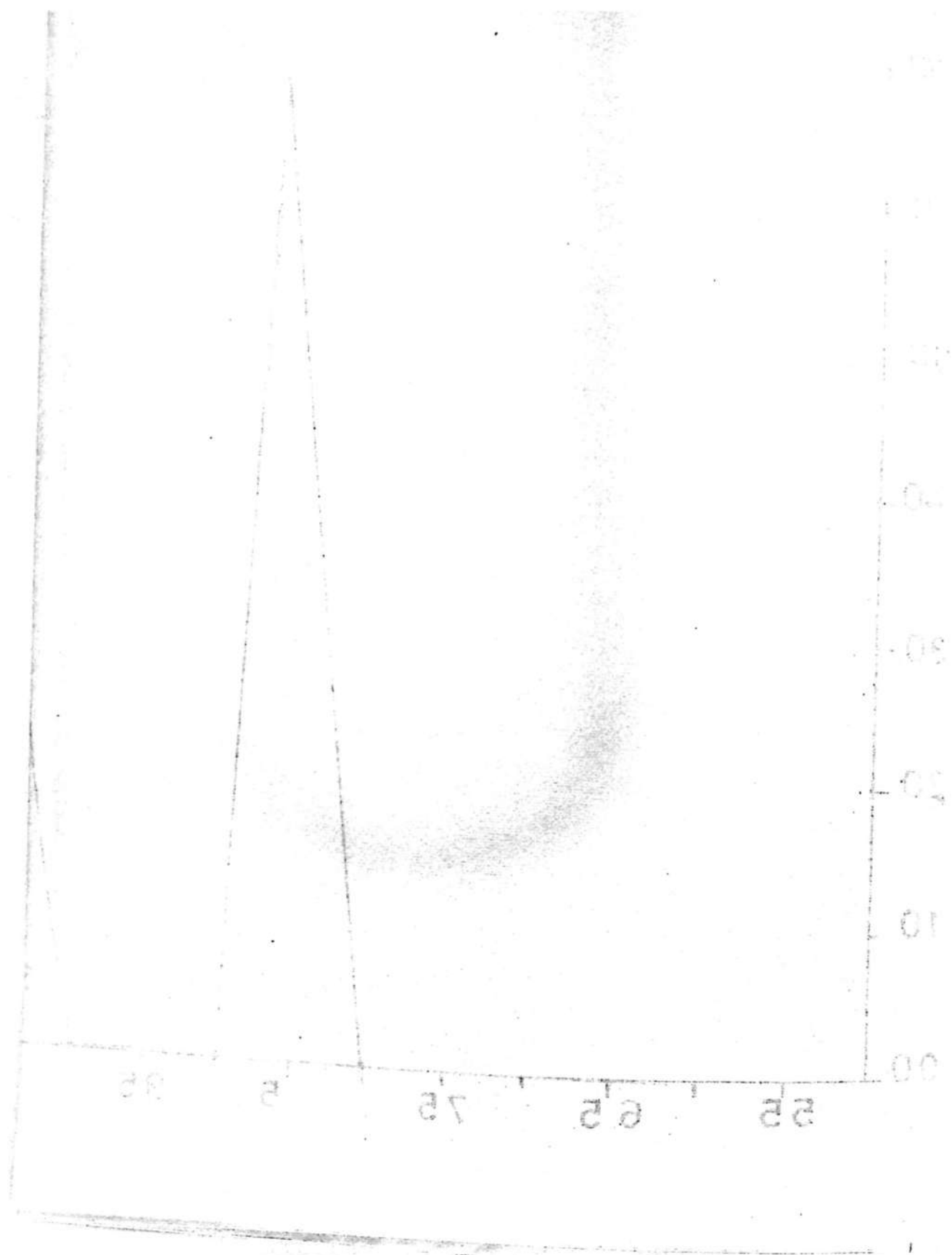


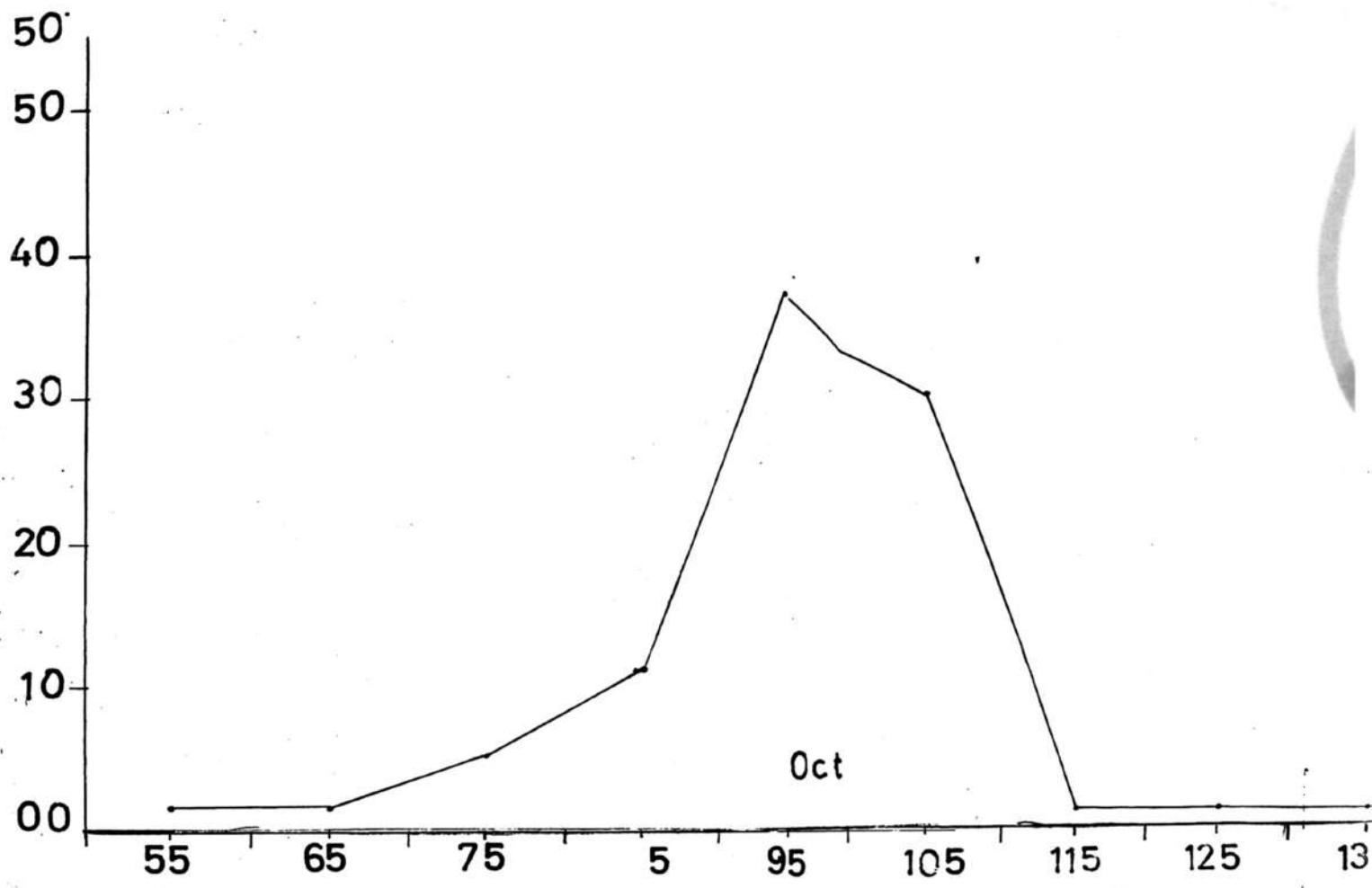


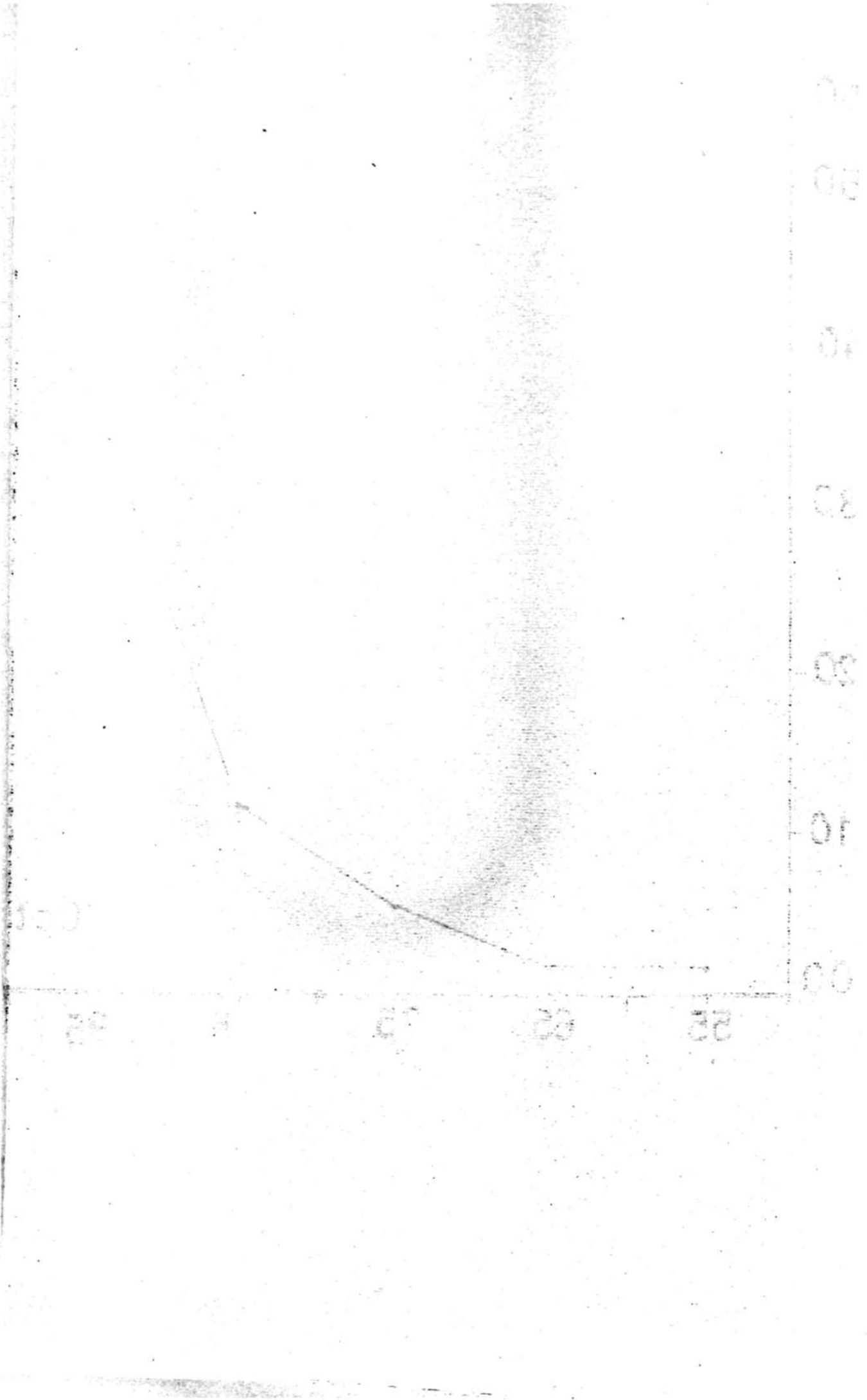












A CHECK LIST OF RICE INSECTS IN PAKISTAN WITH REFERENCE TO INTEGRATED CONTROL MEASURES IN THE LIGHT OF RECENT TRENDS¹

IMTIAZ AHMAD

DEPARTMENT OF ZOOLOGY, UNIVERSITY OF KARACHI

KARACHI

ABSTRACT

A check list of sixty six species of rice insects in Pakistan is given with reference to estimates of damage by some species and integrated control measures in practice and those in the light of recent trends are briefly discussed.

INTRODUCTION

Several authorities have noted earlier (Javed & Ahmed 1974, Ahmad 1975 & 1976) that some sixty insect pests of rice were recorded in Pakistan. Yet it is surprising that there does not exist any authentic and comprehensive check list of all rice pests in Pakistan. Gentry (1965) recorded 15 species excluding those which are considered Polyphagous & are of minor importance. Alam (1967) recorded 14 species of major & 9 species of minor importance but his list generally covered the areas now included in Bangladesh. Abbasi (1973) recorded forty four species but his list included many incorrect & invalid names and he mostly relied upon the works of earlier authors.

During various expeditions (1974—78) periodically throughout rice season to different rice fields in lower Sind, some 5000 insects were collected and taxonomically determined in the light of literature to date. Several collections were examined including insect collections at Zoological Survey department, Government of Pakistan, the old Pusa collection of undivided India, lodged at the Central department of Plant Protection, Malir Halt, Karachi, Commonwealth Institute of Biological Control Rawalpindi and Pakistan Forest Research Institute Peshawar. The estimates of losses incurred by some of the species are described and some of the integrated control measures in practice and those in the light of recent trends are briefly discussed.

RESULT

Check list of Rice Insects in Pakistan

LEPIDOPTERA

Fam. Pyralidae

1. *Tryporyza incertulas* (Walk.)
2. *Tryporyza innotata* (Walk.)
3. *Chilo suppressalis* (Walk.)

¹ Financially supported by ARC-USDA Research Project PK-ARS-139(FG-Pa-310)

4. *Niphadoses gilviberbis* (Zeller)
5. *Chiloptera polychrysa* (Meyrick)
6. *Chiloptera auricilia* (Dudgeon)
7. *Chilo partellus* (Swinhoe)
8. *Cnaphalocrocis medinalis* Guenee

Fam. Noctuidae

9. *Sesamia inferens* (Walk.)
10. *Pseudaletia unipuncta* (Haworth)
11. *Spodoptera mauritia* Boisduval
12. *Spodoptera abyssinia* Gn.
13. *Spodoptera litura* (Fabricius)
14. *Cirphis albistigma* Dudgeon
15. *Cirphis uniormus* Dudgeon

Fam. Eupterotidae

16. *Nizaga simplex* (Walk.)

Fam. Hesperidae

17. *Pelopidas mathias* (F.)
18. *Pelopidas agna* Moore

Fam. Lymamtridae

19. *Dasychira pennatula* (F.)

- 19a. *Dasychira fecuris* Hubner.

Fam. Pyraustidae

20. *Nymphula depunctalis* (Green)

Fam. Arctiidae

21. *Aimsacta lactinea* Cram.
22. *Diacrisia obliqua* (Walk.)

Fam. Nymphaliidae

23. *Melantis ismene* Cram
24. *Gunonia almana* L.

Fam. Cicadellidae

25. *Tettigella spectra* Dist.
 26. *Nephotettix virescens* (Dist.)
 27. *Nephotettix nigropictus* (Stål)
 28. *Stirellus peshawarensis* Mahmood et.al
 29. *Stirellus thattaensis* Mahmood et.al

Fam. Delphacidae

30. *Peregrinus medius* Ashmead
 31. *Sogata distincta* Dist.
 32. *Sogatella furcifera* Horvath

Fam. Derbidae

33. *Nilaparveta lugens* Dist.
 34. *Nisia atrovenosa* Lethierry

Fam. Pseudococcidae

35. *Ripersia oryzae* Green
 36. *Ripersia sacchari* Green

HETEROPTERA

Fam. Alydidae

37. *Leptocorisa acuta* (Thunb.)

Fam. Pentatomidae

38. *Scotinophara limosa* (Walk.)
 39. *Eysarcoris inconspicuus* H. Sch.
 40. *Acrosternum gramineae* (F.)

THYSANOPTERA

Fam. Thripsidae

41. *Thrips oryzae* William

DIPTERA

Fam. Chloropidae

42. *Pachydiplosis oryzae* Will.43. *Oscinella frit* L.

Fam. Anthomyiidae

44. *Atherigona indica* Mall.45. *Atherigona oryzae* Mall.

COLOEOPTERA

Fam. Chrysomelidae

46. *Dicladispa armigera* (Olive)47. *Leptispa pygmoea* Baly

Fam. Curculionidae

48. *Echinocnemus oryzae* (Mshl.)

ORTHOPTERA

Fam. Acrididae

49. *Chrotogonus concavus* L.50. *Chrotogonus* sp.51. *Chrotogonus homalodemus* L.52. *Chrotogonus trachypterus robertsi* (Kirby)53. *Cyrtacanthacris tatarica* (L.)54. *Oxya velox* (F.)55. *Oxya* sp.56. *Truxalis nasuta* (L.)57. *Acrotylus insubricus* Scop.58. *Schistocerca gregaria* (Forsk.)59. *Locusta migratoria* (L.)60. *Hieroglyphus banian* (F.)61. *Hieroglyphus nigrirepletus* L.

62. *Colemania* sp.

Fam. Gryllidae

63. *Grylloides melanocephalus* F.64. *Brachytrypes protentosus* L.65. *Acheta hispanica* F.66. *Shirakiacris shirakii* Irshad et.al

ASSESSMENT OF DAMAGES CAUSED

The author and his colleagues during their periodical surveys throughout rice season in lower Sind from 1975—1978 used sequential sampling technique (Figs. 1-5) to assess degree of infestation of stem borers. The usual symptoms "white ears" and "bores" were statistically analysed in order to help devise a reliable parameter (Afzal *et.al* 1978) and the percentage reduction in the grain weight due to borer incidence was correlated with the usual symptoms of borer incidence in order to predict losses at different stages of rice crop (Ahmad *et.al* in press). It was observed that during 1976 in the Sujawal district of lower Sind the stem borers incurred almost a total loss of the crop. During these observations another potential pest. (Fig. 3-4), *Scotinophara limosa* (Walk.) was studied causing severe damage (5-10%) to the crop near harvest. *Dicladyspa armigera* (Olive) was recorded from Punjab (Fig.7) but unlike in Bangladesh (Naqvi 1973) it was recorded as a rare species. Population studies on other plant and leaf hoppers are continued.

INTEGRATED CONTROL MEASURES

Different hymenopterous parasites were periodically collected from different rice fields throughout rice season (1975-1976) in lower Sind. The sampling was also made in those fields which were under insecticidal treatment. Some experiments on scelionid egg parasites were made in the lab specially with *Scotinopharara* eggs but these experiments were unsuccessful. The author and his colleagues located pheromone glands of yellow stem borer *Tryporyza incertulas* (Walk.) (Fig. 6) and extracts from the glands were used both in lab and in the field in preliminary experiments in bait traps with promising results. Experiments are still in progress.

DISCUSSION

Rice is one of the most important food crop and No. 2 in rank, in foreign exchange earning of Pakistan. In Pakistan it is grown on nearly four million acres under canal irrigation scheme mainly in Sind, Punjab and to a less extent in NWFP.

According to Qadri (1971) yellow and white stem borers (*Tryporyza incertulas* (Walk.) & *T. innotata* (Walk.) and Jassoid & Fulgoroid leaf and plant hoppers (*Sogatella furcifera* (Walk.) and *Sogata distincta* (Dist.) seriously effect the yield of rice in Thatta and Dadu districts in lower Sind and Larkana and Sukkur districts in upper Sind and lower Punjab. Other serious pests causing outbreaks in every 5 to 10 years include the moths of the families Crambinae (*Chilo suppressalis* (Walk.) & Noctuidae (*Spodoptera mauritii* (Bdv.), *Pseudaletia unipuncta* (Haw.) and *Sasamia inferens* (Walk.).

Javed and Ahmed (1974) have refuted Moiz's (1969) claim that in normal years damage to rice by stem borers attack varied from 2% to 10%. They have calculated the loss following the technique of Abraham *et.al* (1963) by counting "dead hearts" and "white heads" as high as 23.6% in a non epidemic year in Thatta district. In the years of serious infestation however Moiz's (op.cit.) calculation of 70% is conservative in comparison to Gentry's (1965) report of 90% and an almost a total loss of the crop reported by Javed & Ahmed (op.cit). Afzal *et.al* (1977) have used the method of sequential sampling after some modification in Nishida and Torii's (1970) technique to estimate the level of infestation by rice stem borers in lower Sind.

Considering above, Abbasi's (1973) estimate following Moiz (1969) of 5-10 millions of rupees by rice insects alone per year appears to be an under-estimate even in normal years and certainly this amount does not include the cash we spend in hard earned foreign exchange to buy pesticides to control these insects. The present author (1972) has reported that during third five year plan pesticides worth 51 crores were purchased which were hardly sufficient to protect 20% of the cash crops. The present authors and his colleagues (Afzal *et.al* 1977, 1978 Ahmad *et.al* in press) have modified the trend of conjectural assessment of losses and have used sequential sampling method in case of rice stem borer and gross sampling methods in case of black bugs of rice (*Scotinophara limosa* (Walk.) for estimating degree of infestation. Infected stems at all stages of rice crop were correlated with the percentage of reduction in the grain weight at harvest in order to develop prediction models of losses of rice crop to help check indiscriminate use of insecticides.

In the last decade several insecticides specially Dol granules (Gama BHC), Sevidol, Diazinon 50 and Endrin 2G at the rate of 30-40 lb./acre in two treatments with a gap of 30 days were employed in Bangladesh which according to (Alam, unpublished) minimised the rice borer infestation upto the extent of 63.7% to 72%. Several other insecticides including Dipterex, Dimethoate and a mixture of Dieldrin, Diazinon, Bidrin, labaycid, Folithion, Sumithion and DDVP (Vapors or Nagos) also have been employed in Pakistan.

Egg parasites especially scelionids of the genus *Asolcus* (*A.semestriatus*) have proven successful in Pakistan as well as in Iran in controlling rice feeding bugs such as *Carpocoris purpurascens* and *Aelia* sp. (Cheema *et.al* 1974) and Jawahari, personal communication). Control of *Chilo partellus* (Juarborer) by *Apanteles fulvipes* is another record of success in Pakistan (Simmonds 1969). These measures including the use of microbes are just in the beginning (Ahmad 1973) and probably would always be greatly complicated and would require an advanced knowledge as also has been suggested by Rozen (1967).

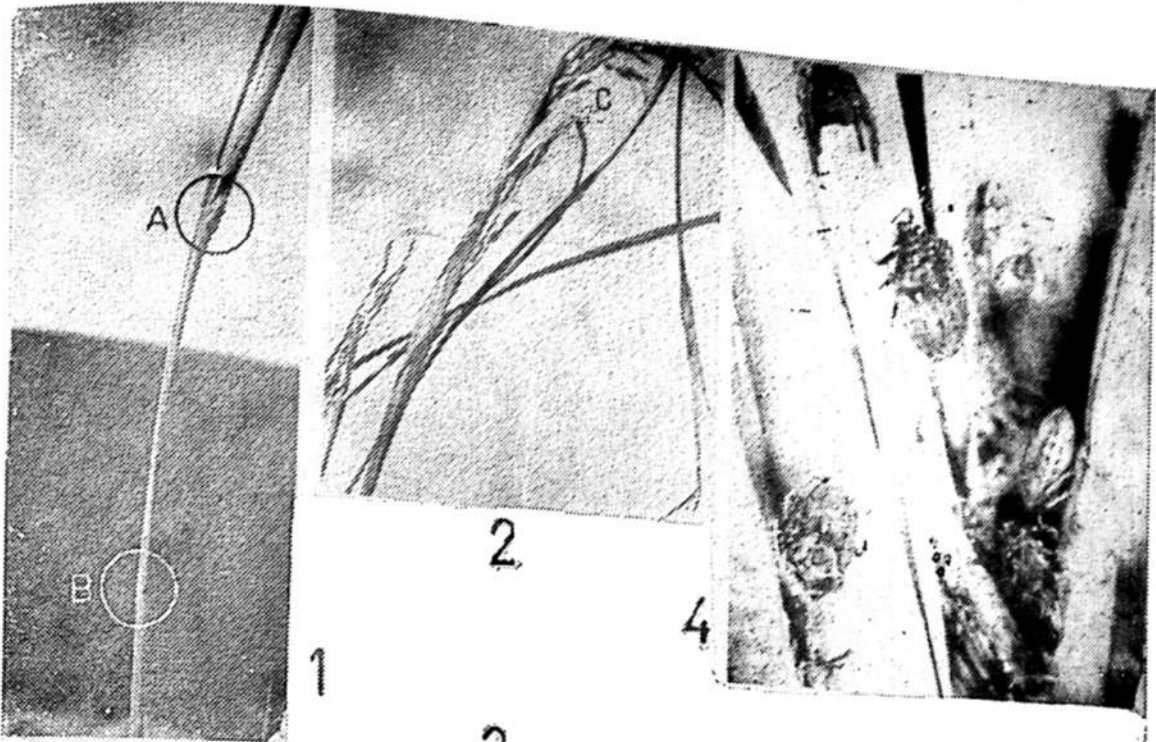
During experiments with pheromones (Jacobson 1972, Birch 1974) on yellow stem borer following the work of Dickins (1936), Shorey and Gaston (1965, 1968a and b) Jones *et.al* (1966), Sekul and Sparks (1967), Roelofs and Feng (1967), Guerra (1968), Bartell and Shorey (1969), Birch (1970 & 1974), Maclaughlin *et.al* (1972) Jacobson (1972), Calvert and Coloret (1973) and Tamaki *et.al* (1974), promising results are obtained. The crude extract at the moment, of the abdominal glands of the virgin females are being used in the trials with successful results (Ahmad 1975, 1976). These bait traps appear to have all the potentialities to be used at forecasting working stations. The details showing the result will be reported on separately.

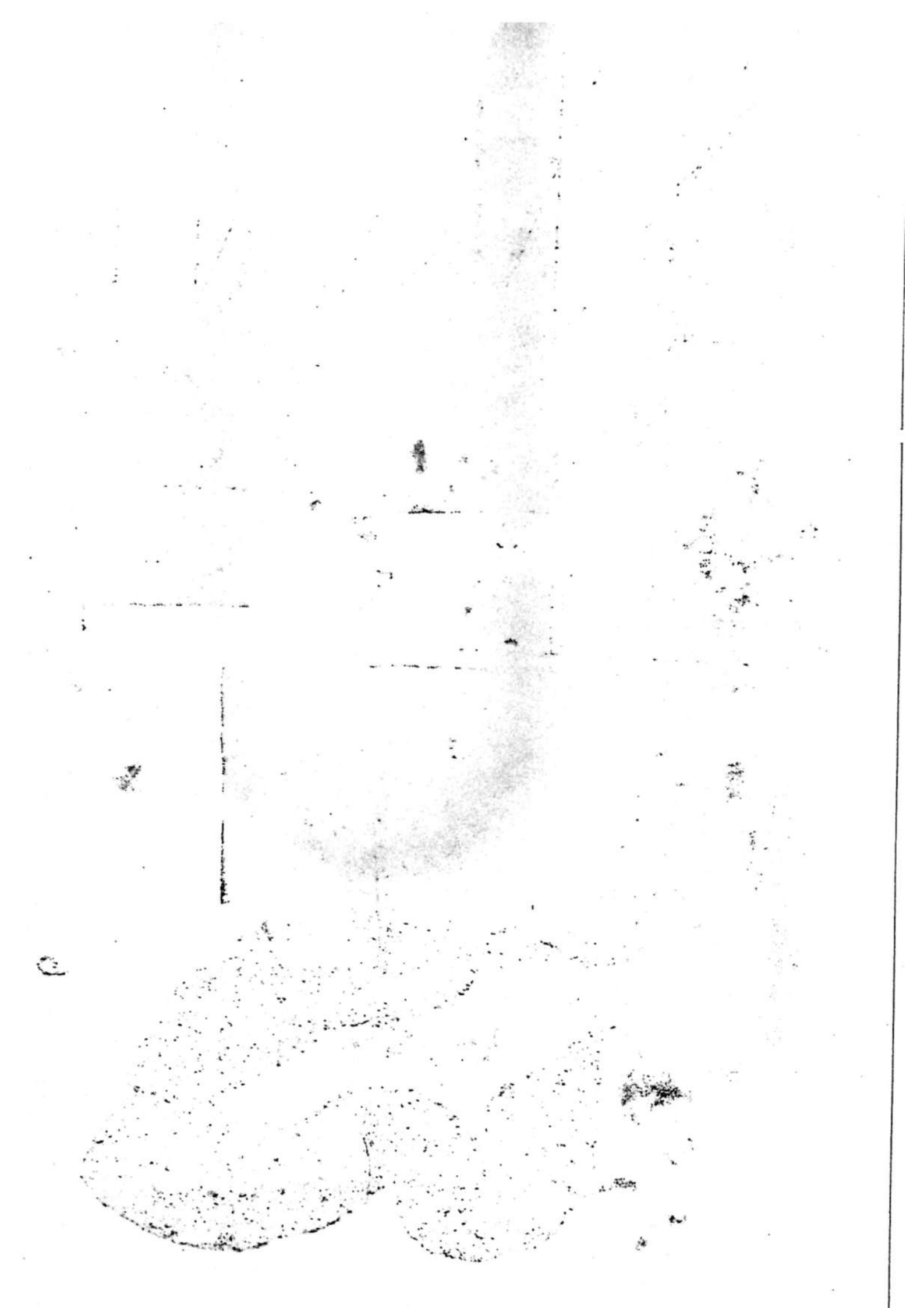
ACKNOWLEDGEMENTS

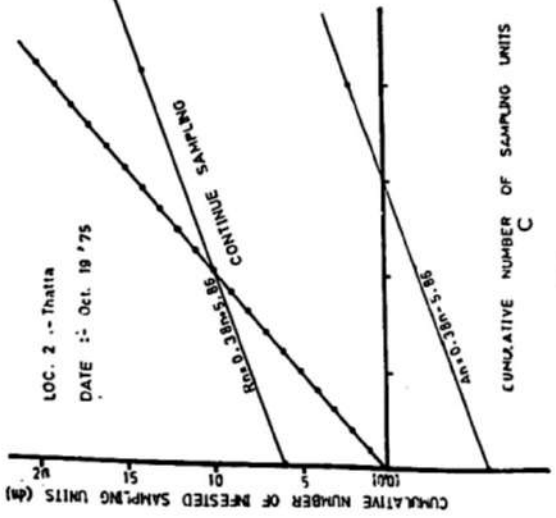
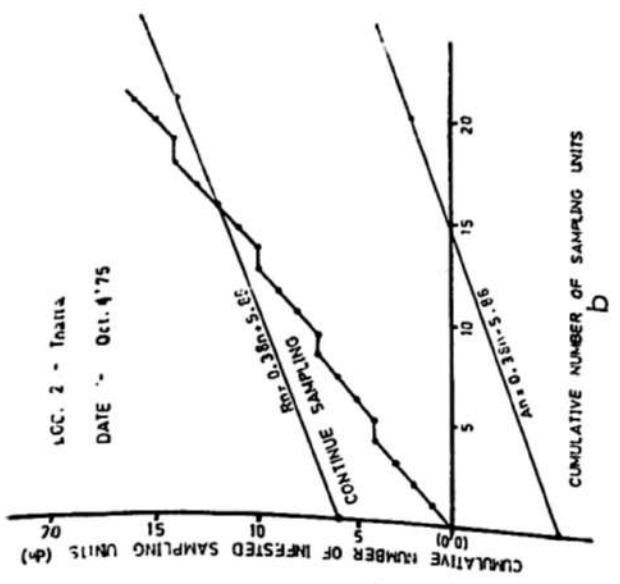
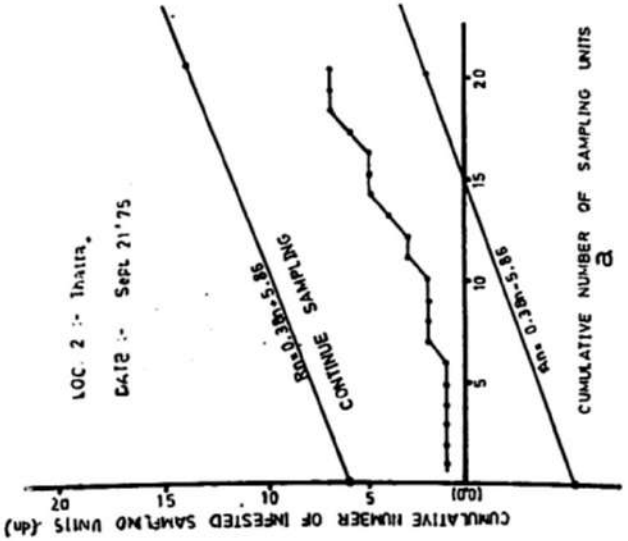
The author wishes to express his sincere gratitude to all the authorities at various insect collections in the Government organizations as well as in the Universities for their kind permission to study their material in particular Mr. Farooq Ahmad, Director Zoological Surveys, Karachi and Dr. Hafeez Ahmad, incharge, Zoological Museum, Plant Protection, Malir Halt, Karachi who extended generous cooperations and research facilities at their centres. Mr. Farooq Ahmad is also acknowledged for critically reading the manuscript.

EXPLANATION OF FIGURES

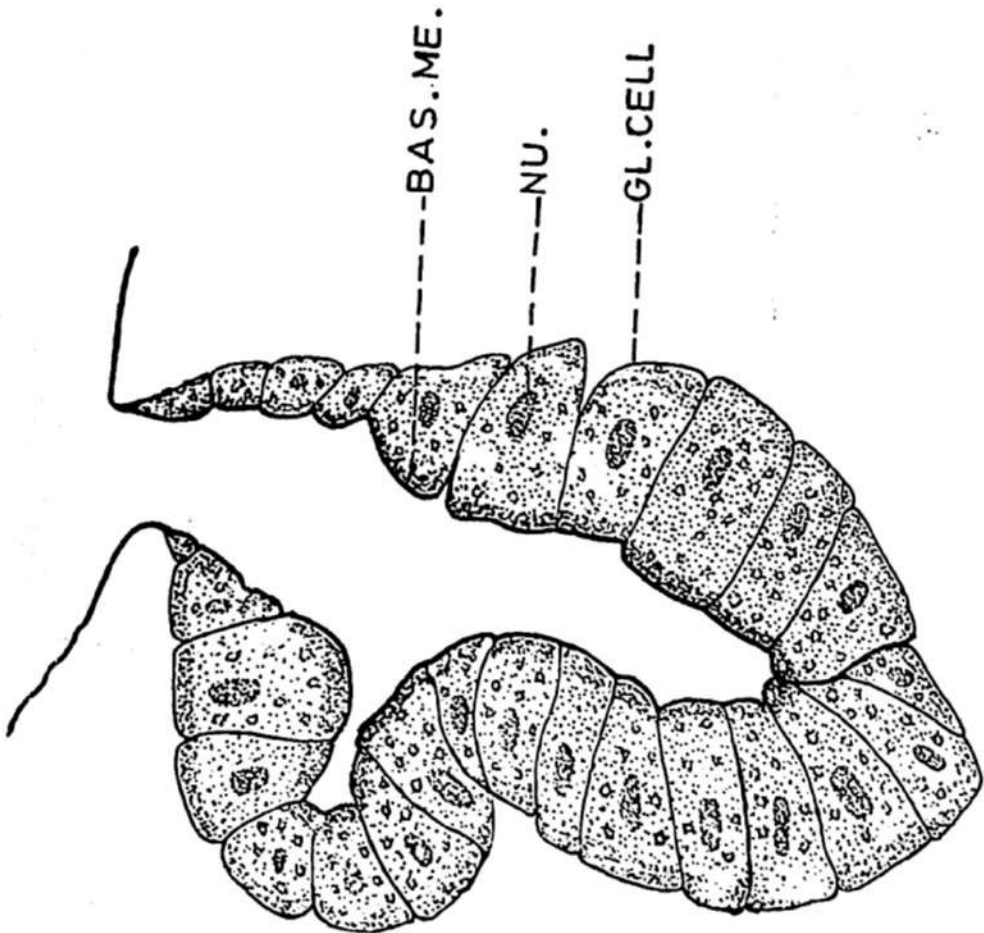
1. Rice stem with yellow rice stem borer *Tryporyz incertulas* (Walk.)
2. Rice plant, showing white head.
3. *Scotinophara limosa* (Walk.) on roots of rice plant.
4. Same, magnified.
5. (a—c) Graphs showing degree of infestation of stem borers (from Afzal *et.al* 1977)
6. Pheromone gland of female yellow stem borer *Trypporyza incertulas* (Walk.) (from Ahmad *et.al* 1978).
7. *Decladispa armigera* (Olive), dorsal view.





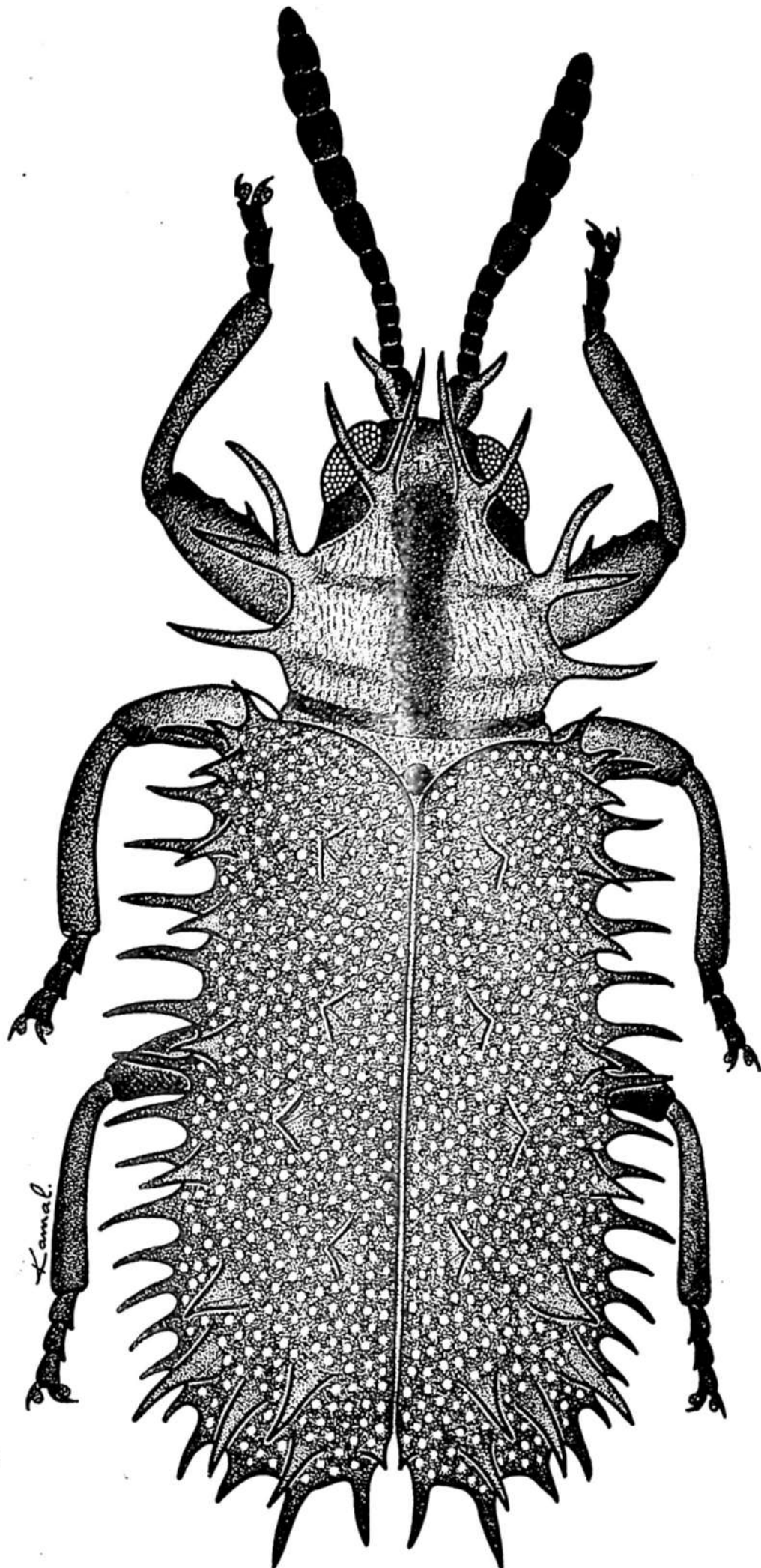


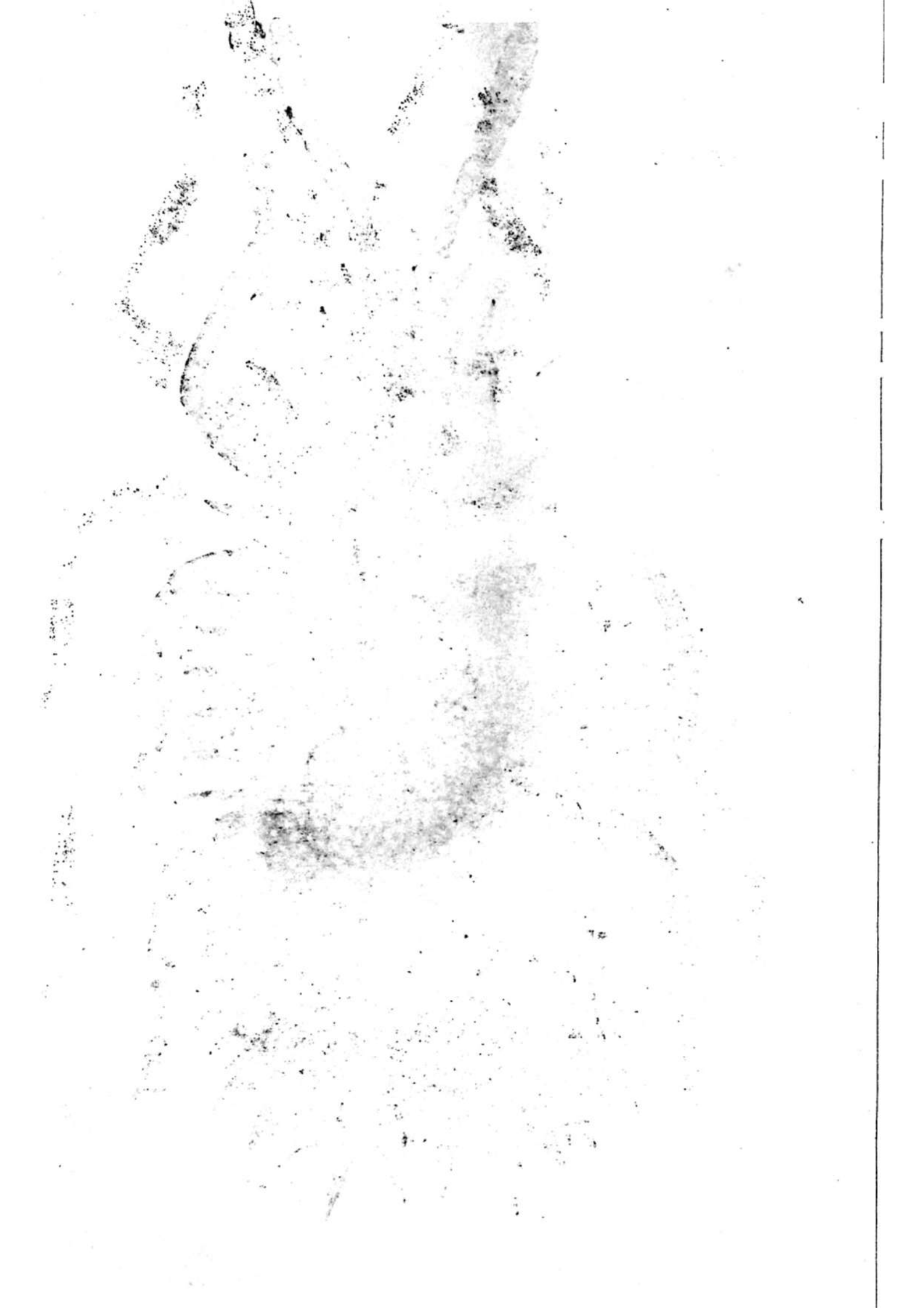
5



6







REFERENCES

- Abbasi, Q.A. 1973 Paddy pests in Pakistan. *Proc. ent. Soc. Kar.3*: 97-101
- Abraham, T.P., Israel, P. and Moorthy, v. 1963 Sampling for estimation of stem borers infestation in rice. *Ind.J.Sci.* 33: 174-85
- Afzal, M., Ahmad, I. and Matin M.A. 1977 Estimation of infestation due to paddy stem borers in lower Sind, *Chemosphere* 6 (6): 545-550.
- Afzal, M., Shaukat, S.S. and Ahmad, I. 1979 A Rapid method for the Assessment of rice stem borer Incidence. *Chemosphere* (in press).
- Ahmad, I. 1972 Scope of chemosterilization techniques against insect pest in Pakistan. *sem. Proc.ent.Soc.Kar.1*: 17 and appeared in "Alhayat" *J.Dept.Zool. Univ. Kar.* 1973-74: 19-21
- 1973 Biological control with reference to Host-Parasite relationship and ecological factors. *Proc. ent. Soc. Kar.3*: 49-54.
- 1975 Entomological research and the Economic Development of Pakistan. Read in Seminar at American Centre in Karachi and Hyderabad. *ARC. News letter.* 1978 (Feb.):1-4
- 1976 Paddy Stemborers of lower Sind with reference to new techniques of the evaluation of their damage and control. *Proc. ent. Soc. Kar.* 6:45-52.
- Alam, M.Z. 1967 Insect Pests of Rice in East Pakistan. *Proc. Symp. Inter. Rice. Res. Inst. IRRI. The Johns Hopkins Press Baltimore, Maryland.*
- Bartell. R.J. and Shorey, H.H. .. 1969 Pheromone concentrations required to elicit successive steps in mating sequence of males of the light brown apple moth, *Epiphya postvittana*. *Ann. ent. Soc. Am.* 62: 1206-7.
- Birch, M.C. 1970 Structure and function of the pheromone-producing brush organs in males of *Phlogophora meticulosa* (L.) (Lepidoptera :Noctuidae) *Trans. R. ent. Soc. Lond.*122 (3) 277-292
- Calvert, I. and Coloret, S.A. .. 1973 Reproductive maturation and pheromone release in the flour moth *Anagasta. Kuhnella* (Zeller) *J. Ent. (A)* 47: 201-9
- Cheema, M.A. Irshad, M., Murtaza, M., and Ghani, M.A. 1973 Pentatomids Associated with Gramineae and their Natural Enemies in Pakistan *Comm. Inst. Biol. Cont. Tech. Bull.* 16:47-67
- Dickins, G.R. 1936 The scent glands of certain Phycitidae (Lepidoptera). *Trans. R.ent. Soc. Lond.* 85 (14): 331-362.

- Gen try, J.W. 1965 Crop Insects of North East Africa-Southwest Asia. *ARS USDA Agri. Hand. Book.* 273: 1-210.
- Guerra, A.A. 1968 New Techniques to Bioassay the sex attractant of pink Bollworms with Olfactometers. *J. econ. Entomol.* 61(5): 1252 - 1254
- Jacobson, M. 1972 Insect Sex Pheromones. Academic Press, London.
- Javed, S. and Ahmed, M. 1974 Some remarks on the stem borer infestation of the Rice crop in the southern part of Sind. (Pakistan) in 1973. *Folia Biologica* 22 (4): 399-403.
- Jones, W.A., Jacobson M. and Martin, D.P. 1966 Sex attractant of the pink boll worm moth: Isolation, identification and synthesis. *Science* 152:1516.
- MacLaurin J.R., Gaston, K., Shorey, H.H., Hummel, H.E., & Sewart, F.D. 1972 Sex pheromones of Lepidoptera XXXIII Evaluation of the Disruptive effect of Tetradenyl Acetate on sex pheromone communication in *Pectino-phor gossypiella* J. econ. Entomol. 65 (6): 1592-3.
- Moiz, S.A. 1969 Ecology of rice stem borer, *Tryporyza incertulas* Walk. in West Pakistan. In Preliminary studies in Insect Ecology and the Sterile Male Technique *IAEA*: 147 - 156.
- Naqvi, S.N.H.(Editor) 1973 News and views *Proc. ent. Soc. Kar.* 3: 112
- Qadri, M.A.H. 1971 Change in strategy of pest control in Pakistan. Seminar on Biological control organized by Cento pest programme Meeting Karachi (Abstract published).
- Roelofs, W.L., and Feng, K.C. 1967 Isolation and bioassay of the sex pheromone of the red-banded leaf roller, *Argyrotaenia velutinana* (Lepidoptera: Tortricidae): *Ann. Entomol. Soc. Amer.* 60: 1199
- Rosen, D. 1967 Integrated Control Programs with ecological factors. *J. econ. Entomol.* 60: 1199-1203
- Sekul, A.A. and Sparks, A.N. 1967 Sex pheromone of the fall armyworm moth: Isolation, identification, and synthesis, *J. Econ. Entomol.* 60: 1270
- Shorey, H.H. and Gaston, L.K. 1965 Sex pheromones in noctuid moths. VII. Quantitative aspects of the production and the release of pheromone by females of *Trichoplusia ni* (Lepidoptera: Noctuidae) *Ann. ent. Soc. Am.* 58: 604-8.

- Shorey, H.H., Gaston, L.K., and Jefferson, R.N. 1968a Insect sex pheromones. *Adv. Pest Contr. Res.* 8: 57-126.
- Shorey, H.H., Morin, K.L., and Gaston L.K. 1968b Sex pheromones of noctuid moths. IV Timing of development of pheromone-responsiveness and other indicators of reproductive age as in males of eight species. *Ann. ent. Soc. Am.* 61:857-61.
- Simmonds, F.J., 1969 Comm. Inst. Bio. Cont. 1969: 1
- Tamaki, Y. and Yushima, T. 1974 Sex pheromone of the cotton leafworm *Spodoptera littoralis*. *L. Ins. Physiol.* 20(6): 1005-1014.

