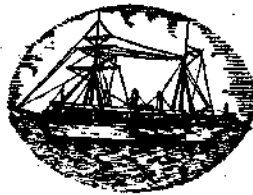


# **SYMPOSIUM ON CRUSTACEA**

**PART V**



**MARINE BIOLOGICAL ASSOCIATION OF INDIA**

**MARINE FISHERIES P.O., MANDAPAM CAMP  
INDIA**

**PROCEEDINGS**  
OF THE  
**SYMPOSIUM ON CRUSTACEA**

HELD AT  
**ERNAKULAM**  
*FROM JANUARY 12 TO 15, 1965*

**PART V**



**SYMPOSIUM SERIES 2**

**MARINE BIOLOGICAL ASSOCIATION OF INDIA**  
**MARINE FISHERIES P.O., MANDAPAM CAMP**  
**INDIA**

# AN ANNOTATED BIBLIOGRAPHY OF THE BIOLOGY AND FISHERY COMMERCIALY IMPORTANT PRAWNS OF INDIA\*

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## ABSTRACT

Prawns and shrimps constitute a very valuable fishery along both the coasts of India and their increased exploitation in recent years necessitates a full knowledge of the biology and bionomics of all the commercially important species. Details of work already done on Indian prawns are scattered throughout a wide range of scientific publications which are not readily available. Hence a compilation of all relevant previous works on the economically important species is attempted in the paper which, it is hoped, may be useful for ready reference on previous works on the subject.

While every attempt has been made to include all relevant and recent literature on the systematics of the species, it was not possible to bring in all such titles that give only passing references or very obsolete systematic notes. Brief annotations on the papers have been included although it is likely that some references that do not give a clear indication of the title or some that do not have a direct bearing on the subject would have been missed in the bibliography.

IN the fast developing fishing industry of India, prawn fisheries has gained first place in importance as an exchange earner for the country. Encouraged by the results already achieved and the great scope for further development of this fisheries, well co-ordinated research programmes are formulated and implemented by fisheries research institutions of the country. To help in these research efforts it has been felt that compilation of an annotated bibliography of the published accounts on commercially important prawns could be useful.

The present compilation deals chiefly with references pertaining to prawns and shrimps of the families Penaeidae and Palaemonidae which by and large sustain the prawn fishery of the Indian region. In order to keep the bibliography within a reasonable compass, only those references which cover the Indian region are included. Even though limited in its scope for the above reason, it is hoped that this would be useful for fresh workers entering the field of prawn fisheries research and survey of the prawn resources of this region.

1. AHMAD, NAJIR 1954. Prawn fishery of East Pakistan. *Proc. Indo-Pac. Fish. Council., Fifth Meet., Tech. Pap.* 15. A general account of the prawn fishery of East Pakistan.
2. ——— 1957. Prawn and prawn fishery of East Pakistan. *Govt. of East Pakistan, Directorate of Fisheries*, 31 pp. Systematic account, key to the identification of East Pakistan prawns—*Penaeus canaliculatus*, *P. semisulcatus*, *P. indicus*, *P. indicus* var. *penicillatus*, *Metapenaeus monoceros*, *M. lysianassa*, *M. brevicornis*, *Parapenaeopsis styliifera*, *P. sculptilis*, *P. uncta*, *Solenocera indicus*, *Alpheus euprosyne*, *Leander styliiferus*, *Palaemon mirabilis*, *P. lamerrei*, *P. dayanus*, *P. dolichodactylus*, *P. carcinus*, *P. birmanicus birmanicus*, *P. malcolmsonii* and *P. rudis* are given. Production, methods of fishing, price, preservation and curing are also dealt with.
3. AIRAN, J. W. AND ABRAHAM THOMAS 1954. Amino-acids in prawn from Bombay. *J. Univ. Bombay., Sci. Sec.*, 22 B, (5): 48-49.

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4. ALCOCK, A. 1899. A summary of the deep-sea zoological work of the Royal Indian Marine Survey Ship "Investigator" from 1884 to 1897. *Sci. Mem. med. Officers Army, India*, 11: 49 pp.
5. ——— 1901. A descriptive catalogue of the Indian deep-sea Crustacea, Decapoda, Macrura and Anomala in the Indian Museum, being a revised account of the deep-sea species collected by the Royal Marine Survey Ship "Investigator", Calcutta, India, 286 pp.  
Decapod Crustacea included in this catalogue number 117 species, belonging to *Penaeidea* (27 species), *Caridea* (58 species), *Stenopidea* (3 species), *Astacidea* (20 species) and *Thalassinidea* (9 species). This classical memoir gives tables, descriptions of species, definitions of the genera, subgenera, families, tribes and suborders under which the species are arranged.
6. ——— 1905. A revision of the "genus" *Peneus* with diagnoses of some new species and varieties. *Ann. Mag. Nat. Hist. Ser.*, 7 (16): 508-532.  
Definition of the genus *Peneus*, diagnoses of the constituent genera and tables of the species of several genera, diagnoses of 9 new species described.
7. ——— 1906. Catalogue of the Indian Decapod Crustacea in the collection of the Indian Museum. Part 3. Macrura. Fasc. 1, The prawns of the *Penaeus* group. *Indian Museum, Calcutta*, 55 pp.  
Classification, description, synonymy, keys, figures of the prawns of the *penaeus* group; table of the genera and species of the *penaeus* group given.
8. ——— AND A. R. S. ANDERSON 1894. Natural history notes from H.M. Indian Marine Survey Ship "Investigator". Series 11, No. 14. An account of a recent collection of deep-sea Crustacea from the Bay of Bengal and Laccadive Sea. *J. Roy. Asiat. Soc. Bengal*, 63: 141-185.  
96 species of crustaceans dredged from Laccadive Sea and Bay of Bengal at a depth from 91 to 1,370 F described.
9. ——— 1899. Natural history notes from H.M. Royal Indian Marine Survey Ship "Investigator". Series 3. No. 2. An account of the deep-sea Crustacea dredged during the surveying season of 1897-1898. *Ann. Mag. Nat. Hist. Ser.*, 7 (3): 278-292.
10. ——— 1899. Illustrations of the zoology of the Royal Indian Marine Surveying Steamer "Investigator" Pt. 7, Crustacea, Calcutta, India.  
*Parapeneus investigatoris*, *Benthescymus investigatoris*, *Haliporus taprobanensis*, *Alpheus shearni*, *Sergestis* sp., *Heterocarpus laevigatus* are figured.
11. ALCOCK, A., N. ANNANDALE AND A. C. MAC GILCHRIST 1907. Illustrations of the zoology of the Royal Indian Marine Survey Ship "Investigator". Part 12. Crustacea (Malacostraca), Calcutta, India.  
*Benthescymus armatus* figured.
12. ——— AND A. F. MACARDLE 1901. Illustrations of the zoology of the Royal Indian Marine Surveying Steamer "Investigator". Part 9. Crustacea, Calcutta, India.  
*Aristeus* spp., *Peneus rectacutus*, *Solenocera* (*Parasolenocera annectens*, *Sergestes bisulcatus*, *Peneus* (*Metapeneus*) *coniger*, *Eryonicus indicus*, *Calocaris alcocki*, *Engystenopus palmipes*, *Heterocarpus tricarlinatus*, *H. wood-masoni*, *Aegeon* sp., *Pandalus* (*Plestionika*) *bifurca*, *P. alcocki*, *Parapasiphaea latirostris*, *Ephyrina hoskynii*, *Psathyrocaris fragilis*, *Phye alcocki*, *Sympasiphaea annectens* are figured.
13. ——— 1905. Illustrations of the zoology of the Royal Indian Marine Surveying Steamer "Investigator". Part 10. Crustacea, Calcutta, India.  
*Heterocarpus longirostris* is figured.
14. ANNANDALE, N., 1923. Advances in our knowledge of the fauna of freshwater and brackish waters of India. *J. Asiat. Soc. Bengal*.
15. ANONYMUS 1951. Agricultural marketing in India. Preliminary guide to Indian fish, fisheries, methods of fishing and curing. *Marketing Ser.*, 66: 1-138.  
Commercially important prawns and the fishing methods are given.
16. ——— 1954. Administrative report 1953-54. *Directorate of Marine Products, Govt. of Saurashtra, Rajkot*.
17. ——— 1955. Administrative report, 1954-55. *Ibid.*
18. ——— 1956. Shrimp ground along Indian west coast. *Curr. Sci.*, 25(6): 207.  
Reports vast shrimp ground along the Malabar coast, stretching 140 miles from Beypore to Mangalore.
19. ——— 1960. India—Shrimp industry. *Comm. Fish. Rev.*, 22(5): 50-51.  
Reports fishery, landings, fishing fleets, prices, exports and taxes.
20. ——— 1961. Annual report, 1959-60. *Govt. of Maharashtra, Department of Fisheries, Part 1, Maharashtra Region*.

21. ANONYMOUS 1962. *The Wealth of India. Raw materials*, Vol. IV. *Fish and Fisheries*. Published by the Council of Scientific and Industrial Research, New Delhi: 118-124.  
Prawn fisheries, species occurring described.
22. APPANNA AND DEVADATTA 1942. Comparative studies on the nutritive value of fish and prawn muscle. *Curr. Sci.*, 11: 333-35.  
The prawns selected for the study are *Metapenaeus*, *Parapenaeus* and *Acetes*. The results show that prawn muscles constitute cheap sources of animal proteins and essential minerals such as phosphorus, calcium and iron. Proteins are found to possess high biological value and digestibility coefficient. In the prawn muscles the digestibility coefficient is as high as 87.09 when the level of intake is 10%, but is lowered to 73.22 when the intake increases to 15%.
23. BALACHANDRAN, K. K. AND A. N., BOSE 1965. Dehydration of prawns in tunnel dryers. *Fishery Technology*, 2 (1): 126-130.  
Various aspects of dehydration of prawns in a tunnel dryer described.
24. BANERJI, S. K. 1965. A note on the production trend of marine shrimps in India. *Ibid.*, 2 (1): 43-47.  
Reviews the production statistics of marine shrimps in different maritime states of India from 1950 to 1962. Discusses the status of the fishery of *Metapenaeus dobsoni* with reference to the data on catch and effort obtained from trawler operations off cochin.
25. BATE, C. S. 1881. On the Penaeidea. *Ann. Mag. Nat. Hist. Ser.*, 5: 169-196.  
Enumeration of the specimens taken during 'Challenger' expedition and description of new species. Generic and species description of many Penaeids are given.
26. ——— 1888. Reports on the Crustacea Macrura. Report on the scientific results of the voyage of H.M.S. 'Challenger' during the years 1873-1876. *Zoology*, 24, i-xc: 942 pp.  
Reports on about 2,000 specimens of Macrura collected on the 'Challenger' from various regions.
27. BHATIA, D. R. AND V. NATH 1931. Studies on the origin of yolk. VI. The crustacean oogenesis. *Quart. J. Micr. Sci.*, 74: 669-699.  
*Palaemon lamarrei* and *Paratelson spinigera* are studied. Golgi apparatus, fatty yolk, nucleolus, nucleolar extrusions, mitochondria, albuminous yolk of *P. lamarrei* are studied.
28. BHIMACHAR, B. S., 1962. Informations on prawns from Indian waters—Synopsis of biological data. *Proc. Indo-Pacif. Fish. Council.*, 10th Sess., 124-133.  
Gives a brief review of available biological information on the marine, brackish and freshwater prawns and shrimps of India. Estimates of commercial production are given with a brief outline of culture practices. A bibliography of 70 titles from 1906 to 1962 is appended.
29. ——— 1965. Life-history and behaviour of Indian prawns. *Fishery Technology*, 2 (1): 1-11. Reviews the information available on age and growth, embryonic and larval development, food habits, spawning and maturation and certain physiological aspects of commercially important Palaemonids and Penaeids of India.
30. BORRADAILE, L. A., 1910. Penaeidea, Stenopodea and Raptantia from the Western Indian Ocean. *Trans. Linn. Soc. London. 2nd Ser.*, 13 (2), B: 257-264.
31. ——— 1917. On the structure and function of the mouth parts of Palaemonid prawns. *Proc. Zool. Soc. London*.
32. CHACKO, P. I., 1944. Prawn curing in Madras. *Indian Farming*, 5 (6): 259-60.  
Fishery seasons for Madras and Colliar lake are given. Various methods of curing in Madras described.
33. ——— 1955. Prawn Fisheries of Madras State, India. *Contribution from the Marine Biological Station, West Hill, Malabar coast, No. 3, Govt. Press*, 14 pp.  
The main fishing area; bionomics of the common species that occur in Madras; statistics of prawn fisheries; prawn culture in paddy fields; crafts and gears employed in prawn fisheries; utilization and curing methods and the future of prawn fishing industry are discussed.
34. ——— 1956. Prawn fisheries of Madras State, India. *Madras Govt. Publication, Madras, India*.
35. ——— AND S. V. GANAPATI 1952. Fish culture in Paddy fields. *Ind. Com. J.*, 8: 3 pp.  
Refers to raising prawns on a large scale in rice fields along the Malabar coast.

36. CHACKO, P. I., ABRAHAM, J. G. AND R. KUMARI ANDAL 1953. A survey of the flora, fauna and fisheries of the Colliar lake. *Ind-Com. J.*, 8: 274-80.  
Prawns represented by *Metapenaeus monoceros*, *Penaeus carinatus*, *Palaemon malcolmsonii*, *P. scabrificulus* and *P. carcinus*. Describes the biological condition and the fishery of Colliar lake.
37. — AND R. KUMARI ANDAL 1953. Report on a survey of the flora, fauna and fisheries of the Pulicat lake, Madras State, India, 1951-52. *Contribution from the Freshwater Fisheries Biological Station, Madras*, No. 8: 20 pp.  
The results of the survey of the lake and the bionomics of the important species given. Statistics of fish landings, fisherfolk and their conditions are also appended.
38. —, MAHADEVAN, S. AND R., GANESAN 1955. A guide to the field study of the fauna and flora of Krusadi Island, Gulf of Manaar. *Contribution from the Marine Biological Station, Krusadi Island, Gulf of Manar*, No. 3: 1-15.
39. CHANDRASEKHAR, B., 1964. Note on the prawn fishing by the Training Centre boats, Mangalore. *Symposium on Prawn Fisheries in India, Society of Fisheries Technologists (India), Cochin*, 1964, p.10.  
Gives the information regarding the species available, fishing season, fishing grounds and the efficiency of trawl nets.
40. CHARI, S. T., 1948. Nutritive values of some of the West Coast marine food fishes of the Madras Province. *Indian J. Med. Res.*, 36 (3): 253-259.
41. — AND PAI, P. A., 1946. Preservation of prawns and its effects on the nutritive value. *Curr. Sci.*, 15: 342-344.  
A method of preservation of prawns (*Penaeus monodon*) by semi-drying method is enunciated. Analyses of prawns—fresh, beach dried and semi-dried are given.
42. CHIDAMBARAM, K. AND R. S. V. RAMAN 1944. Prawn and crab fishery in Madras. *Indian Farming*, 5: 454-455.  
Statistics and nutritive values are given.
43. CHOPRA, B. N., 1923. Bopyrid Isopods parasitic on Indian Decapod Macrura. *Rec. Indian Mus.*, 25 (5): 411-550.  
A resume of the previous work on the subject; list of Indian species and hosts; geographical distribution; systematic accounts of the parasites with the key for identification are given.
44. ——— 1930. Pearl-like object found in a prawn. *Nature*, 126 (3179): 502-503.
45. ——— 1931. The history and progress of the Zoological Survey of India, Crustacea. Section III. *J. Bombay Nat. Hist. Soc.*, 34 (2): 502-506.  
Deals with the history and progress of the Crustacea Section of the Zoological Survey of India.
46. ——— 1936. The cape crawfish Industry of South Africa with some observations on prawn and crab fisheries of India. *Curr. Sci.*, 4 (7): 529-533.  
The prawn fisheries of India is reviewed with suggestions for improvement on scientific and commercial lines.
47. ——— 1937. Notes on Crustacea Decapoda. *Rec. Indian Mus.*, 39.
48. ——— 1939. Some food prawns and crabs of India and their fisheries. *J. Bombay Nat. Hist. Soc.*, 41 (2): 221-234.  
The common food prawns—*Penaeus carinatus*, *P. indicus*, *Metapenaeus brevicornis*, *M. monoceros*, *Palaemon carcinus*, *P. lamarrei*, *P. rudis*, *P. malcolmsonii*, *Caridina gracillirostris*, and the mud shrimps *Macropsis orientalis*, *Potamomysis assimilis* are listed. The salient features of the bionomics and life-history, the prawn resources of Bombay and Malabar coasts, and of Chilka and Colliar lakes; the methods of fishing in different places are discussed. The need for further scientific study of prawn bionomics, fishing grounds, breeding and life-histories, migration, etc., are urged.
49. ——— 1943. Prawn fisheries in India. *Curr. Sci.*, 12 (2): 71.  
A brief account of prawn fishery of India with special reference to *Penaeus carinatus* and *Palaemon carcinus* is given.
50. ——— 1943. Prawn fisheries of India. *Proc. Indian Sci. Congr.*, 30 (2): 153-173.  
Information on the commercially important prawns and shrimps occurring in sea, estuary and backwaters of India are given. The methods employed in curing and preservation are described. Further studies of all the commercial prawns, their bionomics, morphology, food, habits, migration, reproduction, life-history, etc., are suggested.

51. CHOPRA, B. N. 1951. Handbook of Indian Fisheries. Prepared for the 3rd meeting of Indo-Pacific Fisheries Council, Madras, February, 1951.  
The article 8 deals with the Crustacean fisheries of India. Important species of prawns and shrimps are given with their distribution and general bionomics.
52. — AND K. K., TIWARI 1947. Decapod Crustacea of the Patna State, Orissa. *Rec. Indian Mus.*, 45: 213-224.  
Distribution and taxonomic notes of *Palaemon malcolmsonii*, *P. lamarrei*, *P. dayanus*, *Caridina nilotica* var. *chauhani* and *caridina weberi* prox. var. *sumatrensis* are given.
53. DAS, K. N. 1935. Developmental stages of *Palaemon lamarrei* H. M. Edw. *Proc. Indian Sci. Congr.* 22nd (Abstract).  
Descriptions of number of stages within the egg case and the free stages reared in the laboratory are given.
54. DE MAN, J. G. 1908. The fauna of brackish water ponds of Port Canning, lower Bengal. Part X. Decapod Crustacea with an account of small collection from brackish water near Calcutta and in the Dacca District, Eastern Bengal. *Rec. Indian Mus.*, 2: 211-231.
55. DESHPANDE, S. D. AND N. A. GEORGE 1965. On the effect of tickler chain on the catches landed by a 55 ft trawl net. *Fishery Technology*, 2 (1): 82-86.  
The results of the operation of trawl net with and without chain discussed. It is concluded that the attachment of tickler chain increases the shrimp catch and is probably due to the disturbance caused by moving chain attached to the foot-rope.
56. DE ZYLVA, E. R. A., 1955. The prawn fisheries of Ceylon. *Proc. Indo-Pacif. Fish. Council.*, 6th Sess.: 324-327.  
Discusses the present status of prawn fisheries of Ceylon, important gears employed, off-shore fishing, etc.
57. GANGULY, D. N. 1964. Suggestions for the scientific utilisation of the sources and production of commercially important prawns and shrimps of India. *Symposium on Prawn Fisheries in India, Society of Fisheries Technologists (India), Cochin, 1964* (Abstract only), p. 7.  
Suggestions for studying exploitation and breeding areas, selection of suitable types and size for commercial purposes, artificial culture and storage are given.
58. GEORGE, M. J. 1958. Observations on the plankton of the Cochin backwaters. *Indian J. Fish.*, 5 (2): 375-401.  
Records and seasonal variation of post-larvae of *Metapenaeus dobsoni*, *M. monoceros*, *Penaeus indicus*, *P. carinatus* and caridian larvae—*Periclimenes* sp., *Palaemon* sp., and Alpheids are given.
59. ——— 1959. Notes on the bionomics of the prawn *Metapenaeus monoceros* Fabricius. *Indian J. Fish.*, 6 (2): 268-279.  
Various aspects of the bionomics of *M. monoceros* such as growth, age, composition of catches, length-weight relationship, moulting behaviour, breeding and migration and sex ratio are dealt with.
60. ——— 1961. Studies on the prawn fishery of Cochin and Alleppey coast. *Ibid.*, 8 (1): 75-95.  
The prawn fishery at Alleppey, Narakkal and Chellanum is compared with a special emphasis on recruitment. The probable influence of mud banks on the increased prawn landings at Alleppey discussed.
61. ——— 1962. On the breeding of penaeids and the recruitment of their post larvae into the backwaters of Cochin. *Ibid.*, 9 A (1): 110-116.  
A quantitative study of postlarvae of *Metapenaeus dobsoni*, *M. monoceros*, and *Penaeus indicus* in the backwater plankton of Ernakulam for the years 1956 to 1960 is made. The breeding seasons, post-larval recruitment, the size ranges and the relationship of seasonal fluctuations in recruitment of the larvae and salinity of the water discussed.
62. ——— 1962. Observations on the size groups of *Penaeus indicus* (Milne Edwards) in the commercial catches of different nets from the backwaters of Cochin. *Ibid.*, 9 (2): 468-475.  
The backwater catches of *Penaeus indicus* from the Chinese dip net, the stake net and the cast net for the years 1955 through 1958 have been analysed and it is found that the Chinese net catches show the maximum sizes in population mean and modal lengths. The cast net catch sizes come next and stake net catches show minimum sizes. The probable factors influencing the size distribution in the catches of the same species caught in the different nets from the same area of operation are discussed.
63. ——— 1963. Note on an abnormality in the penaeid prawn, *Metapenaeus monoceros* Fabricius. *J. Mar. Biol. Ass. India*, 5 (1): 145-146.  
Records a specimen having both male and female characters externally, but only the female gonad with well-developed ovary has been observed internally.

64. GEORGE, M. J. 1964. Post-larval abundance as a possible index of fishing success in the prawn *Metapenaeus dobsoni* (Miers). *Symposium on Prawn Fisheries in India, Society of Fisheries Technologists (India), Cochin, 1964.* (Abstract only), pp. 1-2.  
For predicting the future commercial prawn fishery of the area, the post-larval abundance is correlated with measures of abundance of juveniles in the backwater fishery and adults in the marine fishery of the coast and is found that the success or failure of the fishery in a year could be foreseen in the magnitude of post-larval recruitment.
65. GEORGE, P. C. AND M. J. GEORGE 1964. On the location of a possible spawning area for the penaeid prawn, *Metapenaeus monoceros* Fabricius off Cochin. *Curr. Sci.*, 33 (8): 251-252.  
Reports the breeding area for *Metapenaeus monoceros* off Cochin in the 50-60 metre area; along with the hydrographical conditions.
66. ———, ——— AND P. VEDAVYASA RAO 1963. *Metapenaeus kutchensis* sp. nov., a penaeid prawn from the Gulf of Kutch. *J. Mar. Biol. Ass. India*, 5 (2): 285-288.  
Describes a new species of prawn from the Gulf of Kutch contributing to the commercial catches.
67. GEORGE, C. J. AND J. C. GEORGE 1944. A note on Crustacean liver oils. *J. Univ. Bombay, n.s.*, 13 B (3): 17.
68. GEORGE, J. C. AND VINOD C. SHAH 1954. A note on the muscle fat of the lobster *Panulirus polyphagus* (Herbst) and the prawn *Palaemon carcinus* (Henderson & Mattai). *Jour. Animal morphol. and physiol.*, 1 (1): 61.
69. ——— 1954. A comparative study of the chemical composition of the muscle of the lobster *Panulirus polyphagus* (Herbst) and *Palaemon carcinus* (Henderson & Mattai). *Ibid.* 1 (11): 69-70.
70. GIDEON, P. W., P. K. B. MENON, S. R. V. RAO AND K. V. JOSE 1957. On the marine fauna of Gulf of Kutch: A preliminary survey. *J. Bombay Nat. Hist. Soc.*, 54 (3): 690-706.  
The area surveyed are Okha, Beyt Dwarka and Pirotan. Refers to the occurrence of *Penaeus*, *Lucifer*, *Hippolytina* and *Alpheus*.
71. GNANAMUTHU, C. P. AND O. RAMACHANDRA REDDY 1960. A potentiometric method for observation of osmotic behaviour of prawns. *Nature*, 188 (4750): 594-595.  
The potentiometric method outlined; experiments conducted described.
72. GOPALAKRISHNAN, V. 1951. A note on the chemical composition of the penaeid prawns of Madras. *Curr. Sci.*, 20: 331.  
An estimation of the chemical composition of *Penaeus indicus*, *P. carinatus*, *Metapenaeus monoceros* and *M. dobsoni* are made and it is found that the differences due to sex are irregular and not marked.
73. ——— 1952. Food and feeding habits of *Penaeus indicus* M. Edw. *J. Madras Univ.*, 22 B (1): 69-75.  
The stomach contents of 380 specimens of *P. indicus* analysed. Although the vegetable matter and crustaceans form the bulk of food items, the presence of other animal matter indicates an omnivorous habit. A few experimental observations on feeding also have been made.
74. ——— 1953. Studies on the biology of Madras Penaeids (Ph.D. Thesis). *University of Madras, Department of Zoology.*
75. ——— 1953. Seasonal fluctuations in the fat content of the prawn *Penaeus indicus* M. Edw. *J. Madras Univ.*, 23: B 193-202.  
The seasonal fluctuations in the fat content with reference to the length groups and sexes studied and discussed. The relationship between the fat content and feeding habits surveyed.
76. ——— 1957. Studies on the biology of penaeids. *Madras University Publication*, III, 111 pp.
77. GOPALA IYER, R. 1940. Marine fauna of Madras (Fauna of sandy beach): *Handbook of Indian Sci. Congr.*, 27th Sess., Madras.
78. GOPINATH, K. 1953. Some interesting methods of fishing in the backwaters of Travancore. *J. Bombay Nat. Hist. Soc.*, 51: 466-471.  
Description of 'Prawn Junkhar' or 'Pachil' practised in the Kayamkulam and Vembanad lakes is given. Other fishing methods like fishing by listening in, fishing by virali or scare line and lure fishing are described.
79. ——— 1955. Prawn culture in the rice fields of Travancore, Cochin, India. *Proc. Indo-Pacif. Fish. Council.*, 6th Sess., 18: 419-425.  
Deals with the distribution and disposition of the prawn fields, their ecology, the preparation of the fields, various methods of fishing, species and yield and postcultural treatment of fields.
80. GOVINDAN, T. K. 1962. Some new indices of quality for ice-stored prawns. *Sci. and Cult.*, 28 (1): 36-37.  
Discusses the various aspects of the quality of prawn stored in ice and suggests that the results obtained could be used for grading the raw material.



81. GRAVELY, F. H., 1919. A note on the marine invertebrate fauna of Chandipore, Orissa. *Rec. Indian Mus.*, 16: 395-399.
82. HELLER, C., 1865. Reise der osterreichischen Fregatte Novara um die Erde in den Jahren 1857-58-59 unter den Befehlen des Commodore B. Von Wullerstorf—Urbair. *Zool. Theil. Zewiter Band, Crustaceen, Vienna*, 2(3): 121-123.  
Refers to 88 species obtained at the Nicobar Islands, 30 from Madras and from other places.
83. HENDERSON, J. R. AND G. MATTHAI 1910. On certain species of *Palaemon* from South India. *Rec. Indian Mus.*, 5: 277-306.  
Taxonomic notes and figures of *Palaemon carcinus*, *P. malcolmsonii*, *P. idae*, *P. sulcatus*, *P. rudis*, *P. nobilii*, *P. scabriculus*, *P. dolichodactylus* and *P. dubius* are given.
84. HORA, S. L. 1932. Mud fishing in lower Bengal. *J. Asiat. Soc. Bengal (n.s.)*: 197-205.
85. ——— 1933. Animals in brackishwater at Uttarbhag, Lower Bengal. *Curr. Sci.*, 1(12): 381-386.  
Records the occurrence of *Metapenaeus brevicornis* and *Palaemon lamarrei* in the area.
86. ——— AND K. K. NAIR 1944. Suggestions for development of saltwater bheris or Basabadha fisheries in the Sunderbans. *Fishery Dept. Pamphlet No. 1, Depart. of Fisheries, Govt. of Bengal, Calcutta*.
87. HICKLING, C. F., 1963. Expanding tropical prawn fisheries. *Fishing News International*, 2(1): 37-39.
88. IBRAHIM, K. H. 1962. On the early embryonic development of *Macrobrachium malcolmsonii* H.M. Edw. and *Macrobrachium scabriculus* Heller from river Godavari. *Sci. and Cult.*, 28(5): 232-233.  
Descriptions of egg cleavages, gastrulation and comparisons with that of *M. scabriculus* given.
89. ——— 1962. Observations on the fishery and biology of the freshwater prawn *Macrobrachium malcolmsonii* Milne Edwards of River Godavari. *Indian J. Fish.*, 9 A (2): 433-467.  
Deals with age and growth, length-weight relationship, feeding habits, sex ratio, fecundity and breeding. The effect of parasitisation on sexual development and the record of juveniles over the first anicut of Godavari and the use of this as prawn seed for stocking inland waters discussed.
90. IYENGAR, J. R., VISWESWARIAH, M. N. MOORJANI AND D. S. BHATIA 1960. Assessment of the progressive spoilage of ice stored shrimp. *J. Fish Res. Bd. Canada*, 17(4): 470-485.  
Investigations are made to discuss the findings of the results obtained by employing total bacterial plate-count method, Ph determinations, estimation of trimethylamine and total volatile nitrogen and to describe rapid tests based on use of impregnated papers and reagents as an index for the degree of shrimp spoilage. Experiments were conducted on two species, *Penaeus indicus* and *Metapenaeus monoceros* and the results obtained were discussed.
91. IYER, R. P., 1949. On the embryology of *Palaemon idae* Heller. *Proc. Zool. Soc., Bengal*, 2(2): 101-148.  
The embryology of *P. idae* from 4-celled stage to the newly hatched larva has been described in detail.
92. JOB, T. J. 1946. Report on the scheme for manufacture of semi-dried prawns from Colliar and Pulicat lakes for the period of 10 months and 9 days from 23rd May 1945 to 31st March 1946. *Madras Govt. Press*.
93. JOHN, C. C. AND C. V. KURIEN 1959. A preliminary note on the occurrence of deep water prawn and spiny lobster off the Kerala coast. *Bull. Cent. Res. Inst. Trivandrum, Ser. C.*, 7(1): 155-162.  
Reports the occurrence of *Penaeopsis philippii* and *Peurulus sewelli* and discusses the distribution and nature of the bottom.
94. JOHN, M. C. 1947. Bionomics and life-history of *Palaemon carcinus*. *Proc. Indian Sci. Congr.*, 34th Sess.: 117 (Abstract).  
The ecology, food and feeding habits, methods of offence and defence, the number of eggs produced, the period of hatching, the migration and life-history and the factors influencing it are discussed.
95. ——— 1957. Bionomics and life-history of *Macrobrachium rosenbergii* (deMan). *Bull. Cent. Res. Inst. Univ. Trivandrum, Ser. C*, 5(1): 93-102.  
The bionomics, life-history and economics of *M. rosenbergii* are given with a general discussion on the ecology of the prawn fauna of Travacore.
96. ——— 1958. A preliminary survey of the Kayamkulam lake. *Bull. Cent. Res. Inst. Univ. Kerala, Ser. C.*, 6(1): 89-109.  
Refers to *Caridina nilotica*, *C. propinqua*, *Macrobrachium idae*, *M. equidens*, *Penaeus indicus*, *P. carinatus*, *P. monodon*, *Penaeopsis affinis*, *P. dobsoni*, *P. monoceros* and *P. brevicornis*.

97. JONES, S. AND K. H. SUJANSINGANI 1954. Fish and fisheries of the Chilka lake with statistics of fish catches for the years 1948-50. *Indian J. Fish.*, 1: 256-344.  
Refers to *Penaeus indicus*, *P. carinatus*, *Metapenaeus monoceros*, *M. affinis*, *M. dobsoni*, *Palaemon rudis*, *P. malcolmsonii*. The behaviour of young prawns discussed. Export trends for the years 1948-50 and the important fishing methods are given.
98. KAMASASTRY, P. V. AND P. V. PRABHU 1961, Preparation of chitin and glycosamine from prawn shell waste. *J. Sci. and Ind. Res.*, 20 D (12): 466.  
A detailed method for the manufacture of chitin and glucosamine described.
99. KEMP, S. 1910. Notes on Decapoda in the Indian Museum. I. The species of Gennadas. *Rec. Indian Mus.*, 5 (3): 173-181.  
*Gennadas alcocki*, *G. praecox*, *G. sordidus*, *G. scutatus*, *G. bouvier*, *G. carinatus* are described and figured.
100. ——— 1913. Percysladden Trust Expedition to the Indian Ocean. Pelagic Decapoda. *Trans. Linn. Soc. London (zool)*, 16 (2): 53-68.  
Refers to *Sergestes challengerii*, *S. gardinarii*, *Lucifer acestra*, *L. reynandii*, *Gennadas scutatus*, *G. alcocki*, *Hoplophorus gracilirostris*, *H. foliaceus*, *Acanthephyra purpurea* and a key for *Notostomus* spp.
101. ——— 1913. Zoological results of the Abhor Expedition. Crustacea Decapoda. *Rec. Indian Mus.*, 8: 289-310.  
One species of *Palaemon* and 3 species of *Caridina* are recorded and described.
102. ——— 1914. Notes on the Crustacea Decapoda in the Indian Museum. II. Hippolytidae. *Rec. Indian Mus.*, 10 (2): 80-129.  
Species and different genera of the family Hippolytidae are dealt with; a key to the Indo-Pacific genera of Hippolytidae given; a synonymy list of the Indo-Pacific species is appended.
103. ——— 1915. Fauna of Chilka lake. Crustacea Decapoda. *Mem. Indian Mus.*, 5: 199-325.  
Taxonomic notes on *Pontophilus hendersoni*, *Palaemon lamarrei*, *P. malcolmsonii*, *P. rudis*, *P. scabriculus*, *Leander styliferus*, *Urocaris indica*, *Periclimenes demani*, *Ogyrides striaticauda*, *Alpheus crassimanus*, *A. malabaricus*, *A. paludicola*, *Caridina nilotica* var. *bengalensis*, *C. propinqua*, *Leptocheila aculeocaudata*, *Penaeus carinatus*, *P. indicus*, *Penaeopsis monoceros*, *P. affinis*, *P. dobsoni* and *Lucifer hansenii* are given.
104. ——— 1916. Notes on Crustacea Decapoda in the Indian Museum. *Rec. Indian Mus.*, 12 (8): 355-384.  
18 species of *Crangonidae*, ten belonging to the genus *Pontophilus*, 6 to *Aegeon* and one each to *Prinocrangon* and *Crangon* are described.
105. ——— 1916. Notes on Crustacea Decapoda in the Indian Museum. VII. Further notes on Hippolytidae. *Ibid.*, 12: 385-405.  
*Saron marmoratus*, *Spirontocaris pandaloides*, *S. rectirostris*, *Thor paschalis*, *T. discosomatis*, *T. maldiveensis*, *Hippolyte ventricosus*, *Phycocaris simulans*, *Latreutes pygmaeus*, *L. planirostris*, *L. mucronatus*, *L. porcinus*, *L. anoplonyx*, *Tozeuma armatus*, *Glestocaris paronae*, *Hyppolysmata ensirostris*, *H. (Lysmatella) prima* are described.
106. ——— 1917. Notes on Crustacea Decapoda in the Indian Museum. IX. *Leander styliferus* Milne Edwards and related forms. *Ibid.*, 13 (1-6): 355-384.  
A key for *Leander styliferus* and related species given. *L. tenuipes*, *L. annandeli*, *L. styliferus*, *L. carinatus*, *L. modestus*, *L. fluminicola*, *L. potamiscus*, *Palaemon mirabilis* are described and figured.
107. ——— 1917. Notes on Crustacea Decapoda in the Indian Museum. VIII. Genus *Acetes* M. Edw. *Ibid.*, 2: 43-58.  
*Acetes indicus*, *A. erythraeus*, *A. insularis*, *A. japonicus* are described. A key is provided for their identification.
108. ——— 1917. Notes on the fauna of the Matlah River in the Gangetic Delta. *Ibid.*, 13: 233-244.  
Crustacean fauna is represented by the species, *Palaemon mirabilis*, *Leander styliferus*, *L. tenuipes*, *Penaeopsis monoceros*, *P. brevicornis*, *Parapenaeopsis sculptilis*.
109. ——— 1918. Crustacea Decapoda of the Inle lake Basin. *Ibid.*, 14: 81-102.  
Refers to *Palaemon naso*, *P. hendersoni*, *Caridina annandelei*, *C. weberi* prox var. *sumatrensis*.
110. ——— 1920. Notes on the Crustacea Decapoda in the Indian Museum. XIV. On the occurrence of Caridean genus *Discias* in Indian waters. *Ibid.*, 19 (4): 137-143.  
*Discias exul* Kemp has been described with figures.

111. KEMPS, S. 1924. Crustacea Decapoda of the Siju Cave, Garo Hills, Assam. *Rec. Ind. Mus.*, 24(1): 41-48. Refers to *Palaemon hendersoni* and describes *P. cavernicola* Kemp., the only cave decapod found in the oriental region.
112. ——— 1925. Notes on the Crustacea Decapoda in the Indian Museum. XVII. On Various Caridea. *Ibid.*, 17(4): 249-344.  
Species of the genera *Leptocheila* (with key), *Stylodactylus* (with key), *Rhynchocinetes*, *Parapandalus*, *Heterocarpus*, *Chorotocoides*, *Chlorocurtis*, *Thalassocaris*, *Leander* (with key), *Brachycarpus*, *Palaemonetes* (with key), *Periclimenes*, *Harpilus*, *Anchistus*, *Thor*, *Phycocaris*, *Hippolyte*, *Paralatreutes*, *Gelastocaris*, *Mergula*, *Anchistiodes* and *Pontophilus* are described.
113. ——— AND R. B. S. SEWELL 1912. Notes on Decapoda in the Indian Museum. III. The species obtained by R.I.M.S.S. "Investigator" during the survey season 1910-11. *Ibid.*, 7: 15-32.  
31 species of Decapoda Crustacea belonging to the families *Penaeidae*, *Sergestidae*, *Pasiphaeidae*, *Hoplophoridae*, *Pandalidae*, *Hippolytidae*, *Crangonidae*, *Eryonidae*, *Galatheididae*, *Uroptychidae*, *Paguridae*, *Homolidae*, *Dorippidae*, *Paninidae*, *Calappidae*, *Leucosiidae*, *Gonoplacidae* and *Maiidae* are described.
114. KESTEVEN, G. L. AND T. J. JOB 1957. Shrimp culture in Asia and the Far East. A preliminary review. *Proc. Gulf. Carib. Fish. Inst.*, 10th Ann. Sess., 49-68.  
The species of shrimps that are cultivated in Asian countries are given. The habitat and the economics of the important cultivated shrimps are indicated; the extent of areas of shrimp culture in different Asian countries estimated. A description of the various aspects of 'Sugpo' cultivation in Philippines, the paddy field prawn culture of India are given. The economic status of shrimp culture in Asian countries and the problems to be attended are discussed.
115. KUNJU, M. M., 1955. Preliminary studies on the biology of the palaemonid prawn *Leander styliferus* Milne Edwards. *Proc. Indo-Pacif. Fish. Council.*, 6(3): 404-416.  
Distribution and habitat, food and feeding habits, length-weight relationship, egg carriage and ovigerous setae, breeding habits, sex ratio, parasitisation, Length-frequency distribution, fishery and fishing methods of *L. styliferus* described.
116. ——— 1960. On new records of five species of Penaeidae (Decapoda Macrura: Penaeidae) on the West coast of India. *J. Mar. Biol. Ass. India*, 2(1): 82-84.  
Records the occurrence of *Parapenaeopsis hardwickii*, *Atypopenaeus compressipes*, *Parapenaeopsis acclivirostris*, *Metapenaeopsis novaeguineae* and *Trachypenaeus curvirostris* from Bombay waters.
117. ——— 1960. Record of male *Parapenaeopsis acclivirostris* Alcock. *Ibid.*, 2(1): 127-129.  
Records of 9 males of *P. acclivirostris* and comparison with that of *P. tenellus*.
118. KURIEN, C. V. 1949. On the occurrence of Crangonids (Crustacea Caridea) in the coastal waters of Trivandrum. *Proc. Indian Sci. Congr.*, 35th Sess., 3: 194 (Abstract).  
Taxonomic notes on *Pontophilus hendersoni* and *P. parvirostris*.
119. ——— 1952. On the occurrence of Crangonids (Crustacea Caridea) in the coastal waters of Trivandrum. *Curr. Sci.*, 21: 316.  
Taxonomic notes on *Pontophilus hendersoni* and *P. parvirostris*.
120. ——— 1953. A preliminary survey of the bottom fauna and bottom deposits of the Travancore coast within the 15 fathom line. *Proc. Nat. Inst. Sci. India*, 19(6): 747-775.  
20 species of shrimps belonging to *Hippolytidae*, *Palaemonidae*, *Crangonidae*, *Penaeidae*, and *Sergestidae* are referred. Relation between the bottom animals and texture of the soil, stomach content of bottom living fishes are also studied.
121. ——— 1954. Contribution to the study of Crustacean fauna of Travancore. *Bull. Cent. Res. Inst. Univ. Travancore, Ser. C, Nat. Sci.*, 3(1): 69-91.  
Refers to systematics and distribution of shrimps belonging to the family, *Hippolytidae*, *Palaemonidae*, *Penaeidae*, *Crangonidae*, *Sergestidae* and *Mysidae*.
122. ——— 1964. On the occurrence of the deep water prawn *Penaeopsis rectacutus* (Spence Bate) off the Kerala Coast. *Curr. Sci.*, 33(7): 216-217.  
Records the occurrence and distribution of *P. rectacutus*.
123. ——— 1965. Deep water prawns and lobsters off the Kerala Coast. *Fishery Technology*, 2(1): 51-53.  
Records *Penaeopsis philippi* and *P. rectacutus* from 100-180 fathom area. Discusses their distribution, ecology and possibility of commercial exploitation.

124. KURIAN, G. K. 1951. A note on the eggs and first stage of larva of *Hippolysmata vittata* Stimpson. *J. Bombay Nat. Hist. Soc.*, 50 (2): 416-17.  
Number of eggs, different stages of development of eggs and description of the first stage of larva with differences from that of *Hippolysmata* sp. larva given.
125. ——— 1965. Trends in development in the prawn fishing technique in India—A review. *Fishery Technology*, 2 (1): 64-68.  
Reviews the development in prawn fishing techniques with reference to indigenous gears, dredges, beam trawls and other trawls.
126. KUMARAN, A. KRISHNA 1954. Ecdysial mechanism in a decapod, *Penaeus indicus*. *Curr. Sci.*, 23 (12): 404-405.  
Ecdysial mechanism in *P. indicus* reported and the differences from other crustaceans indicated.
127. ——— 1957. Structure and chemical nature of the cuticle in *Penaeus indicus* M. Edw. (Decapoda Crustacea). *J. zool. Soc. India*, 9 (1): 40-49.  
A detailed microscopic structure and chemical nature of the epicuticle and endocuticle of *P. indicus* described.
128. LAKUMB, N. C. 1960. Prawn fishery of Kutch, Gujarat State. The fishing Industry of Gujarat. *Souvenir Published by the Directorate of Fisheries, Gujarat State, on the Occasion of Fishery Festival, October, 1960*, 49-54.  
Production, fishery, species composition, processing of prawns, by-products and the socio-economic conditions of fishermen discussed along with suggestions for improvement.
129. LLOYD, R. E. 1907. Contribution to the fauna of the Arabian Sea with the description of new fishes and Crustacea. *Rec. Indian Mus.*, 1: 1-12.  
27 species are recorded and described.
130. LARSEN, K. 1964. Fishing off the Westcoast of India. *Fishing News International*, 3 (2): 128-131.  
Trawling for shrimp, weather, monsoons, charting of the ground off West coast of India explained.
131. LAKSHMI, A., T. K. GOVINDAN, A. MATHEW AND V. K. PILLAY 1963. Studies on frozen storage of prawns. *Proc. Indo-Pacif. Fish. Coun. Occas., Paper No. 63/2, 1963*.  
Studies on the physical, chemical and bacteriological characteristics of the raw material and frozen prawn muscle conducted and the results discussed.
132. MALHOTRA, S. K. 1960. Cytoplasmic inclusions of the neurons of Crustacea. *Quart. J. Micr. Sci.*, 101: 75.  
Recognises four kinds of cytoplasmic inclusions and discusses the results obtained by the histochemical studies.
133. MATHAI, T. JOSEPH AND R. SATHIARAJAN 1964. Stake net an indigenous gear for the capture of shrimp in the backwaters of Cochin. *Symposium on Prawn Fisheries in India, Society of Fisheries Technologists (India), Cochin, 1964* (Abstract only), p. 8.  
Deals with the design, construction and method of operation; assesses the efficiency and environmental factors influencing the catch.
134. MATHEN, CYRIAC AND D. R. CHOUHDURY 1965. Factors influencing colour production from the sugar medium used for the rapid approximation of bacterial counts in fishery products. *Fishery Technology*, 2 (1): 144-150.  
Results of the studies on the above title reported. The effect of particle size, trace elements, salt soluble protein and non-protein fractions, rate of multiplication of bacteria in the medium, surface bacteria and rate of colour production by individual strains of bacteria were studied. It is observed that best results are obtained when a sea-water homogenate is used.
135. MC GILCHRIST, A. C. 1905. Natural history notes from the R.I.M.S.S. "Investigator" Captain T. H. Heming, R. N. (retired), commanding—Series 3, No. 6. An account of the new and some of the rare Decapod Crustacea obtained during the surveying seasons, 1901-04. *Ann. Mag. Nat. Hist. Ser.*, 7 (15): 233-268.  
Prawns described are *Penaeus fissures*, *Benthesicymus armatus*, *Gennadas carinatus*, *Heterocarpus longirostris*, *Glyphocrangon longirostris*, *Calastacus longispinis*, *Iconaxiopsis spinigera*.
136. MENON, M. K. 1933. The life-histories of Decapod Crustacea from Madras. *Bull. Madras Govt. Mus., n.s. Natural History Sec.*, 3 (3): 45 pp.  
Refers to the larval forms of *Acetes erythraeus* in addition to other 3 species of decapods.
137. ——— 1937. Decapod larvae from the Madras plankton. *Bull. Madras Govt. Mus., n.s.*, 3 (5): 1-56.  
Early larval stages of *Penaeus indicus* described. Also deals with the larval forms of 15 other species of decapods.

138. MENON, M. K. 1938. Early stages of two species of *Palaemon*. *Proc. Indian Acad. Sci.*, 8(4): 288-294. Descriptions and figures of first two larval stages of *Palaemon rudis* and *P. carcinus*.
139. ——— 1940. Decapod larvae from the Madras plankton—II. *Bull. Madras Govt. Mus., n.s.*, 3 (6): 47 pp. The different larval stages of *Solenocera crassicornis*, *Lucifer hanseni*, *Lucifer* sp., *Sergestis orientalis*, *Hippolytina* sp., *Lysmata* sp. (A & B), *Alpheus* sp. are described and figured.
140. ——— 1949. The larval stages of *Prilimenes (Periclimenes) indicus* Kemp. *Proc. Indian Acad. Sci.*, 30 B: 121-133. Larval and post-larval stages are described and figured. Present knowledge of the larvae of the subgenus, *Ancylocaris* discussed.
141. ——— 1951. The life-history and bionomics of an Indian Penaeid prawn *Metapenaeus dobsoni* Miers. *Proc. Indo-Pacif. Fish. Council., 3rd meeting*: 80-93. Complete development of the species from the egg to the juvenile stage described with figures. Breeding, food of early larvae and post-larvae, growth, maturity, and migration discussed.
142. ——— 1953. Notes on the bionomics and fishery of the prawn *Parapenaeopsis stylifera* (M. Edw.) on the Malabar Coast. *J. zool. Soc. India*, 5(1): 153-162. Breeding, growth, sex ratio, parasitisation, annual migration and the fishery discussed.
143. ——— 1954. On the paddy field prawn fishery of Travancore-Cochin and an experiment in prawn culture. *Proc. Indo-Pacif. Fish. Council., 5th meet., Sec. 2*: 1-5. Area of fields under prawn fishing, yield, fishing operations, important shrimps found in the catches, growth of *P. indicus* and *M. dobsoni* are dealt with. Details of experiments in prawn farming for about two months discussed.
144. ——— 1955. Identification of marine and inshore prawns of commercial value in India. *Proc. Indo-Pacif. Fish. Council.*, 6(3): 345-347. A key for the field identification of the important prawns of India is given.
145. ——— 1955. Notes on the bionomics and fishery of the prawn *Metapenaeus dobsoni* Miers on the South-West-Coast of India. *Indian J. Fish.*, 2(1): 41-56. The paper deals with growth, sex ratio, migration and fishery of the species.
146. ——— 1957. Contributions to the biology of Penaeid prawns of the South-west Coast of India. I. Sex ratio and movements. *Ibid.*, 4(1): 62-74. The sex ratio at different periods in the life of 4 species of penaeid prawns, *Metapenaeus dobsoni*, *M. affinis*, *Peneaus indicus* and *Parapenaeopsis stylifera*, and their inshore and off-shore movements are discussed. Sexwise and year class wise average percentage contribution to the annual fishery at Narakkal are also determined.
147. ——— 1958. Prawn fisheries. *Fisheries of West Coast of India*. Edited by Dr. S. Jones. The total estimated landings of prawns and shrimps from India, brief account of the fishing grounds, composition of catches, fishing methods, seasonal variation, processing and marketing, salient features of the biology of the important species and the suggestions for future development of the fishery with mechanised fishing are given.
148. ——— 1965. Life-history of prawns—A review of recent studies with special reference to Indian species. *Fishery Technology*, 2(1): 12-18. Reviewing the studies made on the life-histories of Indian species of penaeids and palaemonids, the reference is made to the different larval stages and their characteristics. Some aspects of the bionomics especially breeding and migration are also briefly dealt with.
149. ——— AND K. RAMAN 1961. Observations on the prawn fishery of the Cochin backwaters with special reference to the stake net catches. *Indian J. Fish.*, 8(1): 1-23. Fluctuations in the stake net catches, their correlation with the rainfall, strength of tidal flow and other factors, length frequency distributions of the important species are discussed.
150. MISRA, R. K. 1958. A new approach to the study of growth gradient in the segments of the second pair of chelepeda of the Indian freshwater prawn *Palaemon hendersoni* De Man (Crustacea Decapoda, Palaemonidae). *Proc. Nat. Inst. Sci. India*, 24 B: 67-68.
151. MIYAMOTO, H., S. D. DESHAPANDE AND N. A. GEORGE 1962. Recent development in trawl fishing for shrimps with trawls from small mechanised boats on the West Coast of Peninsular India. *Proc. Indo-Pacif. Fish. Council., 10th Sess.*, 264-279. The development of trawling for shrimp on the West Coast of India reviewed. A number of experimental operations with various types of trawls, boats and engines of different h.p. were carried out and the results discussed, particularly the influence of wings and tickler chains on the shrimp catch.

152. MOSES, S. T. 1922. A statistical account of the fish supply of Madras. *Madras Fish. Bull.*, 15 (6): 131-166.  
Abundance of prawns and crabs, their seasons, landings are given.
153. NAIDU, M. R. 1939. Report on a survey of Fisheries of Bengal. *Govt. of Bengal, Dept. of Agriculture and Industries, Bengal, India.*
154. ——— 1952. Report on a survey of fisheries of Bengal. *Ibid.*
155. NAIR, S. G. 1947. The newly hatched larva of *Periclimenes (Ancylocaris) brevicarpalis* (Schenkel). *Proc. Indian Acad. Sci.*, 26: 168-176.  
Descriptions of the newly hatched larva given.
156. NAIR, M. R., K. M. IYER, P. N. APPUKUTTAN AND S. JACOB 1962. Storage characteristics of prawns held in crushed ice and chilled sea-water. *Proc. Indo-Pacif. Fish. Council.*, 10th Sess., 295-297.  
The effect of holding prawns in crushed ice (ice: Prawn = 3:1) and chilled sea-water (sea-water: prawn = 1:1) on their storage characteristics has been studied and the results discussed.
157. NATARAJ, S. 1942. A note on the prawn fauna of Travancore. *Curr. Sci.*, 11 (12): 468-469.  
*Penaeus indicus*, *P. carinatus*, *P. monodon*, *P. canaliculatus*, *Metapenaeus monoceros*, *M. affinis*, *M. dobsoni*, var. *nov.*, *Metapenaeopsis stridulans*, *M. mogiensis*, *Parapenaeopsis stylifera*, *P. maxillipedo*, *P. uncta*, *Palaemon carcinus*, *P. idae*, *P. dolichodactylus*, *P. sulcatus*, *P. dayanus*, *Palaemonetes hornelli*, *Alpheus malabaricus*, *A. paladiocolax*, *Acetes erythraeus*, *A. sibogae*, *A. dispar*, *A. serrulatus* var. *nov.* are recorded.
158. ——— 1945. On two new species of *Solenocera* (Crustacea Decapoda Penaeidae) with notes on *Solenocera pectinata* (Spence Bate). *J. Roy. Asiat. Soc. Bengal.*, 11 (1): 91-98.  
*Solenocera choprai* and *S. indicus* described with figures. Distribution and taxonomic notes on *Solenocera pectinata* given.
159. ——— 1947. Preliminary observations on the bionomics, reproduction and embryonic stages of *Palaemonidae* Heller. *Rec. Indian Mus.*, 45 (1): 89-96.  
Occurrence, habits, food and feeding habits, colour of the species, fecundity, development of the embryo in the brood, hatching, dispersal and newly hatched larva described.
160. ——— 1947. On some species of *Acetes* (Crustacea Sergestidae) from Travancore. *Ibid.*, 45: 139-147.  
Taxonomic notes on *Acetes erythraeus*, *A. sibogae*, *A. dispar* and *A. serrulatus* var. *johni* are given. Seasons of occurrence, breeding and their presence in the stomach contents of shoal fishes referred.
161. ——— 1948. Prawns of Travancore. *Sept. Rep. Dept. Res. Univ. of Travancore*: 282-285.
162. NANCY SAMUEL 1945. Some aspects of the morphology of the antennary glands of the Decapod Crustaceans. *J. Bombay Univ.*, 14 (3): 124-134.
163. NAGABHUSHANAN, R. AND R. SAROJINI 1963. Effect of low salinity on oxygen consumption in the prawn *Palaemonetes vulgaris*. *Indian J. Exp. Biol.*, 1 (4): 231-232.
164. NATH, V. 1937. Spermatogenesis of the prawn *Palaemon lamarrei*. *J. Morph.*, 61: 149-157.
165. ——— 1938. The Decapod sperm. *Proc. Indian Sci. Congr.*, 25th Sess.: 172.  
Refers to spermatogenesis of *Palaemon lamarrei*.
166. ——— 1941. The Decapod sperm. *Trans. Nat. Inst. Sci. India*, 2 (4): 87-119.  
In this paper spermatogenesis of 3 macruran, 4 anomuran and 27 brachyuran species described and a scheme of evolution of the different groups of the order Decapoda attempted.
167. ——— AND D. R. BHATIA 1930. The origin of yolk in the Crustacean egg. *Proc. Indian Sci. Congr.*, 17th Sess., 262.  
The oogenesis of the common freshwater prawn of Lahore worked out.
168. PANIKKAR, N. K. 1937. The prawn industry of the Malabar coast. *J. Bombay Nat. Hist. Soc.*, 39 (2): 343-353.  
The characteristics of the backwaters of Travancore, the prawns that inhabit backwaters, sea and freshwaters, the fishing operation in the paddy fields, curing and marketing of prawns and suggestion for improvement of prawn industry given.
169. ——— 1940. Influence of temperature on osmotic behaviour of some crustacea and its bearing on problem of animal distribution. *Nature*, 146: 366.
170. ——— 1940. Osmotic properties of the common prawn. *Ibid.*, 145: 108.

171. PANIKKAR, N. K. AND R. G. IYER 1937. Brackishwater fauna of Madras. *Proc. Indian Acad. Sci.*, **6B**: 284-337.  
92 species of invertebrates and 56 species of vertebrates are recorded. Environmental conditions, vertical and regional distribution, breeding and the general problems on the biology of animal life in the brackishwater discussed.
172. PANIKKAR, N. K., 1941. Osmoregulation in some palaemonid prawns. *J. Mar. Biol. Assn., U.K.*, **25**: 317-379.
173. ——— 1946. Further observations on the osmoregulation of some crustacea. *Proc. Indian Sci. Congr. 33rd Sess.*, **3**: 118.  
The paper deals with the results of the experiments conducted on the osmoregulation of palaemonid prawns.
174. ——— 1948. Osmoregulation in Penaeid prawns. *Proc. Indian Acad. Sci. Congr., 35th Sess.*, 192-193.  
Osmotic behaviour of *Metapenaeus monoceros*, *Penaeus carinatus* and *P. indicus* studied and the results of cryoscopic data and their significance on the distribution of these species with the general problems of osmoregulation discussed.
175. ——— 1948. Penaeid prawns breeding in freshwater. *Curr. Sci.*, **17**(2): 58.  
With reference to Chacko's (1947) paper, the author discusses the breeding of penaeids and their tolerance to salinity.
176. ——— 1951. Physiological aspects of the adaptation to estuarine conditions. *Proc. Indo-Pacif. Fish. Council., 2nd meet., Sec. B.*, 168-175.  
Important prawns of the family Penaeidae and Palaemonidae found in the estuarine habitats listed. Gives a brief account of the physical features of estuarine habitat, temperature and salinity, adjustments to low salinities, adaptation without osmoregulation, hyper and hypo osmotic regulation, active regulation of chlorides and transport of ions, adaptation of freshwater invertebrates and vertebrates entering estuaries, temperature and osmotic regulation, osmotic regulation and reproduction, influence of calcium and biochemical adaptations.
177. ——— 1952. Possibilities of further expansion of fish and prawn culture practises in India. *Curr. Sci.*, **21**(2): 29-33.  
Refers to the prawn culture practice in the rice fields of Travancore-Cochin.
178. ——— AND IYER, R. G. 1939. Observations on breeding in brackishwater animals of Madras. *Proc. Indian Acad. Sci.*, **25, 9B**(16): 343-364.  
Different types of breeding and breeding seasons are described.
179. ——— AND VISWANATHAN, R. 1948. Active regulation of chloride in *Metapenaeus monoceros* Fabricius. *Nature*, **10**(4082): 137-138.  
Changes in the chloride content of the blood is studied by employing the micro-modification of the Volhard titration. The results obtained were presented and discussed.
180. ——— AND MENON, M. K. 1955. Prawn fisheries of India. *Proc. Indo-Pacif. Fish. Council.*, **6**(3): 328-344.  
A general review of the prawn fisheries in India—the fishing grounds, the species caught, the fishing methods, seasonal variations, technology and marketing, salient features of the biology of the commercial species, are discussed with suggestions for exploratory fishing up to a depth of 30-40 fathoms and expansion of prawn fishing.
181. PANTULU, V. R. 1965. Inland prawn fisheries resources of India and their development. *Fishery Technology*, **2**(1): 54-58.  
The magnitude and disposition of the inland prawn fisheries resources have been described with suggestions for organised survey of resources and researches on culture practices.
182. PATWARDHAN, S. S. 1935. On the structure and mechanism of the gastric mill. The structure of the gastric mill in the Natantous Macrura-Caridea. *Proc. Indian Acad. Sci.*, **11B**.  
18 types of caridea are examined. A complete account of the foregut of *Palaemon malcolmsonii* and a comparative account of the same in the remaining types is given. The salient features and the differences found in different species are discussed.
183. ——— 1937. *Palaemon*. *Indian Zool. Mem.*, **6**: 120 pp.  
In this monograph a complete account of the anatomy is given. The bionomics, distribution are discussed. Useful directions for practical work are included.
184. PARAMESWARAN, R. 1953. On the female reproductive system of *Palaemon idae*. *J. zool. Soc. India*, **5**: 227-234.  
The anatomy and histology of the reproductive system described.
185. PEARSON, J. 1905. Report on the Macrura collected by Professor Herdamm, at Ceylon in 1902. *Report to the Government of Ceylon on the Pearl Oyster Fisheries of Gulf of Mannar*, **4**: 65-92.

186. PER SANDVEN 1959. The Indo-Norwegian Project in Kerala, Norwegian Foundation for assistance to under-developed countries, Oslo.  
Gives an account of the organisation; administration and the various activities of the Project in Kerala, especially in relation to exploration of shrimp resources.
187. PILLAI, N. K. 1950. The larval stages of *Periclimenes (Ancyllocaris) grandis* Stimpson. *Bull. Cent. Res. Inst., Univ. of Travancore, Ser. C, 1*: 27-39.  
Different larval stages described and figured.
188. ——— 1955. Pelagic Crustacea of Travancore. I. Decapod larvae. *Ibid.*, 4: 47-101.  
Various larval stages of the species belonging to *Pasiphaeidae*, *Pandalidae*, *Alphidae*, *Hippolytidae*, *Palaemonidae* and *Processidae* are described.
189. PILLAI, V. K., A. LAKSHMY, T. K. GOVINDAN, CYRIAC MATHEN AND H. KRISHNA IYER, 1965. A survey of the microbiological quality of commercial frozen prawn products. *Fishery Technology*, 2(1): 115-125.  
The paper presents the results of a bacteriological survey carried out on large samples over a period of three years and concludes the majority of samples had bacterial load well within the limits prescribed for such products.
190. PILLAY, T. V. R., 1948. Marine Fisheries of Kodinar in Kathiawar. *J. Bombay Nat. Hist. Soc.*, 48(1): 47-61.  
A general survey of the fishing industry of Kodinar area given. Fishing crafts, nets, methods of fishing, catch composition, by-products are dealt with.
191. ——— 1954. The ecology of a brackish water *bheri* with special reference to fish cultural practices and biotic interaction. *Proc. nat. Inst. Sci. India*, 20: 399-427.  
A detailed description of the topography, salinity, depth, chief micro and macro fauna given. The culture practices of fish and prawns, the ecology of the important fauna, their food relationship are given. Possible means of increasing production are discussed.
192. ——— 1958. Land reclamation and fish culture in the deltaic areas of West Bengal, India. *Prog. Fish. Cult., F. W. S.*, 20(3): 99-103.
193. PILLAI, P. R. P. 1957. Pests of stored fish and prawns. *Bull. Cent. Res. Inst. Kerala, Trivandrum, Ser. C.*, 5(3): 1-79.  
The pests that attack stored prawns in Kerala given. The nature and extent of the damage, the experiments conducted on pest control and the results obtained are discussed.
194. PRADHAN, M. J. 1965. A preliminary account and review of the simple methods for determining the operational parameters of fishing gear, underwater, with notes on its application. *Fishery Technology*, 2(1): 69-81.  
An account and review of the simple methods for determining the operational parameters of fishing gear, underwater, such as tilt of otter boards, vertical height of net, its horizontal spread, angle of divergence at bottom, spread between wing tips, angle of inclination of danleons, butterfly, slope of legs and sweep line has been given.
195. PRASAD, K. N. 1961. Decapoda crustacea from the fuller's earth deposits of Kapurdi, Rajasthan. *Indian Min. (Calcutta)*, 15: 435.
196. QURESHI, M. R. 1949. Prawn fisheries of Sind, West Pakistan. *Sind Observer*.
197. ——— 1955. Shrimp fisheries of Pakistan. *Proc. Indo-Pacif. Fish. Council.*, 6th Sess.: 359-362.  
A general account of the shrimp fisheries, fishing grounds, fishing gears and boats, catch statistics, seasonal variations, processing and marketing, distribution of shrimps and a list of the species recorded from the commercial catches given.
198. RAI, B. S. 1964. Some aspects of shrimp processing. *Symposium on Prawn Fisheries in India, Society of Fishery Technologists (India), Cochin, 1964*, p. 17.  
Experiments carried out on semi-drying of small-sized prawns are presented.
199. RAI, H. S. 1933. Shell fisheries of Bombay Presidency. *J. Bombay Nat. Hist. Soc.*, 36(4): 884-897.  
Species of economic value along the Bombay coast, their migration, movement, breeding and food are described. The distribution, value of yields, nets, methods of fishing, processing and suggestions for further development discussed.
200. RAJAGOPAL, M. V. 1965. Effect of different media on the determination of number of micro-organisms in frozen prawns (shrimp). *Fishery Technology*, 2(1): 151-154.  
Changes in the medium for total bacterial count have been suggested and the reasons for the same discussed.



201. RAJYALAKSHMI, T. 1943. Report of the fisheries of Madras. *Dept. of Industries and Commerce, Madras.*
202. ——— 1960. Observations on the embryonic and larval development of some estuarine Palaemonid prawns. *Proc. Nat. Inst. Sci. India*, 26 B (6): 395-408.  
An account of the embryonic development, hatching and structure of the early larvae of *Palaemon malcolmsonii*, *P. rudis*, *P. scabriculus* and *P. mirabilis* is given. A comparison between different species described, shows certain difference in size, time taken for development and hatching and the time of appearance or functioning of various embryonic structures. Differences in the nature of chromatophores and their arrangement in the first stage larvae of all the species studied have been described and the salient features of variation in morphometric characters that distinguish larvae are described. The second stage larva of *P. mirabilis* is described in detail.
203. ——— 1961. Larval development of *Palaemon lamarrei* H.M. Edw. and *Leander fluminicola* Kemp. *J. zool. Soc. India*, 13 (2): 220-237.  
An account of the structure of the 4 stages in the development of *P. lamarrei* and first three stages and 5th stage in that of *L. fluminicola* are given. A comparison with the larvae of similar types of development made.
204. ——— 1961. Studies on maturation and breeding in some estuarine Palaemonid prawns. *Proc. Nat. Inst. Sci. India*, 27 B (4): 179-188.  
An account of the studies on ova maturation, fecundity, spawning, breeding period is given.
205. ——— 1962. Key for the identification of some commercially important prawns of India. *Publication of Central Inland Fisheries Research Institute, Barrackpore.*  
Key for the important species of *Penaecidae* and *Palaemonidae* given.
206. ——— 1961. Observations on the biology and fishery of *Metapenaeus brevicornis* (M. Edw.) in the Hooghly estuarine system. *Indian J. Fish.*, 8 (2): 383-401.  
Deals with the fishery, growth, migrations, spawning, etc.
207. ——— 1964. The prawn fishery of Hooghly estuarine system. *Symposium on Prawn Fisheries in India, Society of Fisheries Technologists (India), Cochin, 1964*, p. 18.  
Trend of distribution of 7 species of prawns in the estuarine system studied. Regulations in mesh sizes of bag nets to improve the fishery suggested.
208. RAO, K. P., 1958. Oxygen consumption as a function of size and salinity in *Metapenaeus monoceros* Fabr' from the marine and brackish water environments. *J. Exp. Biol.*, 35 (2): 307-313.  
The oxygen consumption in relation to the salinity medium has been studied in a marine and brackish water population of *M. monoceros*. The results obtained were presented and the reasons for difference discussed.
209. RAO, S. N. AND A. G. VASAN 1961. Some aspects of prawn drying in Kerala. *Proc. Indo-Pacif. Fish. Council. Occas. Paper* 61.
210. RAO, R. MALLIKARJUNA 1965. Breeding behaviour in *Macrobrachium rosenbergii* (De Man). *Fishery Technology*, 2 (1): 19-25.  
Different aspects of the mating behaviour and its pattern discussed.
211. RAO, S. NAGARAJA 1964. A note on the prawn fisheries of Kakinada. *Symposium on Prawn Fisheries in India, Society of Fisheries Technologists (India), Cochin, 1964.*  
Deals with the composition of catches, fishing season, gear employed, and disposal of catches. The results of the exploratory fishing conducted off Kakinada discussed.
212. ROY CHOUDHURY, R. L., 1964. Some considerations in the selection of sizes of shrimp trawlers. *Ibid.*, 1964, p. 5.  
Factors affecting the length of voyage are discussed briefly and it is found that the cost of indices are least for vessels between 40 to 45 feet length.
213. RAMAN, K. 1964. On the location of a nursery ground of the giant prawn *Macrobrachium rosenbergii* (de Man). *Curr. Sci.*, 33 (1): 27-28.  
Breeding period, occurrence of larvae, nursery ground described.
214. RAMAMURTHY, S. 1963. A note on the prawn fishery of Kutch. *J. Mar. Biol. Ass. India*, 5 (1): 146-148.  
List of species, composition of catch, fishery of Kutch area, distribution of the species discussed.
215. ——— 1963. A note on the prawn fishery of Adesar Camp. *Ibid.*, 5 (2): 318-320.  
Fishing season, estimation of landings, composition of catch, growth, maturity and sex composition are studied.

216. REDDY, A. R. 1935. On the modus operandi of certain ossicles in the gastric armature of Decapod Crustacean. *Curr. Sci.*, 4: 34-37.
217. ——— 1935. A note on the variations in the gastric armature of some South Indian Decapod Crustaceans. *Proc. Indian Sci. Congr.*, 22nd Sess., 313.  
The gastric armature of 6 decapods studied. The variation found were correlated with the nature of food. The peculiar nature of the gastric armature of *Penaeus* and the graded series of complexities among the decapods studied are discussed.
218. ——— 1935. On the structure, mechanism and development of the gastric armature in Stomatopoda with a discussion as to its evolution in Decapoda. *Proc. Indian Acad. Sci.*, 1(10): 650-675.  
The nature of evolution of gastric armature in decapods in relation to habits and habitats discussed. The trend of evolution in Decapoda traced.
219. SAROJINI, S. 1961. The androgenic organ in some Indian Crustacea. I. *J. zool. Soc., India*, 13 (2): 188-193.  
The androgenic gland in 13 species of decapod crustacea belonging to 11 genera has been described with reference to its shape, size, position and morphology.
220. SATYANARAYANA, A. V. V., G. K. KURIAN AND R. S. NAIR, 1962. Commercial prawn trawling gear of Cochin (India). *Proc. Indo. Pacif. Fish. Council.*, 10th Sess., 226-263.  
The designs of prawn trawling gears used by the mechanised fishing boats at Cochin are described.
221. SATYANARAYANA, A. V. V., 1965. Note on the size groups of prawns landed by shrimp trawls of four different cod-end-meshes. *Fishery Technology*, 2(1): 87-92.  
The results of the investigation on the above subject indicate that small-sized prawns of mean length 77.15 mm. were captured by the net having 23.38 mm. cod-end at 5-6 fathoms depth, medium prawns of mean length 105.22 mm. was caught in 25.21 mm. and 19.88 mm. cod-end at 8 fathoms depth and big-sized prawns of mean length 117.98 mm. were caught in 21.29 mm. cod-end. The relation of length on breadth of prawn is also worked out.
222. SEWELL, R. B. S., 1926. Fauna of Chilka lake, Crustacea, Decapoda. *Mem. Indian Mus.*, 5: 771-852.
223. ——— 1934. A study of the fauna of the salt lakes, Calcutta. *Rec. Indian Mus.*, 36.
224. SHAIKHMAHMUD, F. S. AND N. G. MAGAR 1956. Bacteriological study of Bombay prawns (*Parapenaeopsis stylifera* M. Edw.). *J. Sci. & Indust. Res.*, 15 C (7): 174-176.  
Bacterial flora on *Parapenaeopsis stylifera* studied. 40 isolates obtained from the different parts of the body of the prawn are examined for their tolerance to salt and temperature, and for their biochemical characteristics. The proteolytic types of bacteria are responsible for the spoilage of prawns.
225. ——— 1957. Studies on the nutritive value of Bombay prawns. Part I. Chemical composition of prawns. *Ibid.*, A 16 (1): 44-46.  
5 species of prawns from the Bombay coast are analysed for their fat, protein, glycogen, lactic acid, mineral and vitamin contents. The results obtained are presented and discussed.
226. ——— 1961. Studies on the nutritive value of Bombay prawns. II. Chemical composition and nutritional constituents of penaeid prawns. *Ibid.*, 20 D (4): 157-158.  
The protein, fat, glycogen, mineral and vitamin contents of *Acetes indicus*, *Penaeus carinatus*, *P. indicus*, *Metapenaeus monoceros*, *M. brevicornis*, *Parapenaeopsis sculptilis*, *P. maxillipedo* and *Solenocera indicus* are studied and the variations and differences found are discussed.
227. ——— 1961. Studies of prawn spoilage. II. Handling and storage of prawns. *J. Bombay Univ.*, 29 (3 & 5): 16-21.  
The spoilage rates of prawns stored at 0° C. under different conditions, the maximum 'hold life' for these conditions, the effects of different temperatures are studied.
228. ——— 1961. Studies on the prawn spoilage. II. The role of pH in determining the quality of prawns. *Ibid.*, 29 (3 & 5): 22-26.  
The spoilage pattern and the seasonal changes in the pH value and the bacterial count studied.
229. ——— 1961. Studies of prawn spoilage. III. Conditions affecting the quality of prawns. *J. Sci. & Indust. Res.*, 29 (3 & 5): 23-30.  
Gives a general account of the conditions affecting the quality of prawns and offers some suggestion for improvement.
230. ——— 1961. Studies of prawn spoilage. IV. Study of the spoilage and standard quality of prawns in relation to different species, sizes and sex. *Ibid.*, 29 (3 & 5): 31-38.  
Experiments were designed to study the spoilage and standard quality of 5 varieties of prawns. The results obtained are given and discussed.

231. SHAIKHMAHMUD, F. S. 1965. Evaluation of chemical tests for the quality of prawns. *Fishery Technology*, 2(1): 102-108.  
The results of the study to determine the value of physical, bacteriological and chemical tests used to find out and compare the indices of quality of prawns stored at 0° C. and 18° C. discussed.
232. ——— 1965. Preservation of prawns with chemicals. *Ibid.*, 2(1): 109-114.  
The preservation of prawns with boric acid, dipotassium hydrogen phosphate, sodium bisulphite, ascorbic acid, citric ascorbic acid mixture, acronise pd, ferromycin and penicillin are investigated and the results discussed.
233. ——— AND V. B. TEMBE 1958. Study of Bombay prawns. The reproductive organs of *Parapenaeopsis stylifera* (M. Edw.). *J. Bombay Univ.*, 27(3): 99-110.  
The reproductive organs of the prawn studied anatomically and histologically. The important differences found from other Decapods given.
234. ——— 1960. Study of Bombay prawns. The seasonal fluctuation and variation in abundance of the commercially important species of Bombay prawns with a brief note on their size, state of maturity and sex ratio. *Indian J. Fish.*, 7(1): 69-81.  
The seasonal fluctuation, abundance, size, maturity, sex ratio of Bombay prawns studied.
235. ——— 1961. A brief account of the changes in the developing ovary of penaeid prawn, *Parapenaeopsis stylifera* (M. Edw.) in relation to maturation and spawning cycle. *J. Bombay Univ.*, 29(3 & 5): 62-77.  
The general pattern of ovarian development, macroscopical and microscopical changes in the ovary development, the different maturity stages, the breeding season studied.
236. SHARIFE, A. T. 1959. Shrimp trawling along the Malabar coast during the years 1955 and 1956. *Indian Fish. Bull.*, 6(3): 40-43.  
The potential shrimp ground along the inshore belt from Tanur to Mangalore and the increased landings along the whole Malabar coast from January to April mentioned.
237. SIVALINGAM, S. AND J. C. MEDCOF 1955. The study of Wadge Bank trawl fishery. *Fish. Res. Statn., Ceylon, Progress Report I.*
238. SRINIVASAN, R. AND N. SABAPATHY 1964. Prawn processing practices and experiments in Madras State. *Symposium on Prawn Fisheries in India, Society of Fisheries Technologists (India), Cochin, 1964.*  
Experiments conducted on the canning preservation of prawns using brine pack, oil pack and 'masala' pack and the scope for prawn processing industries in Madras discussed.
239. SRIVATSA, K. R. 1953. A survey and comparative analysis of the prawn (shrimp) fishery of the Gulf of Kutch in Saurashtra in Western India. *Govt. of Saurashtra Publication, Saurashtra, India.*
240. SUBRAHMANYAM, C. B. 1963. A note on the annual reproductive cycle of the prawn *Penaeus indicus* (M. Edw.) of Madras coast. *Curr. Sci.*, 32(4): 165-166.  
The breeding activities of the species as indicated by the gonad index appears to be pronounced in the month of May, July, August and September and a lesser activity in March.
241. ——— 1965. On the unusual occurrence of penaeid eggs in the inshore waters of Madras. *J. Mar. biol. Ass. India*, 7(1): 83-88.  
An unprecedented quantity of penaeid eggs reported and these were referred to *Penaeus indicus*. Eggs and three naupliar stages are described.
242. SUBRAMANYAM, M. 1965. Lunar, diurnal and tidal periodicity in relation to the prawn abundance and migration in the Godavari estuarine systems. *Fishery Technology*, 2(1): 26-33.  
The results of the investigations conducted to study the lunar, diurnal and tidal periodicity in abundance and migration of prawns based on the stake net catches presented.
243. TAGORE, PRADIP 1965. Prawn fishing by M.F.V. Jeenga in Bombay waters. *Ibid.*, 2(1): 59-62.  
The design and construction of the M.F.V. Jeenga and the gears used are described. The abundance and seasonal catches of prawn in area 18-72 in Bombay region discussed.
244. TEMBE, V. B. AND F. S. SHAIKHMAHMUD 1955. Maturation in *Parapenaeopsis stylifera* (Crustacea). *Proc. Indian Sci. Congr.*, 42nd Sess., 287.  
Maturity stages classified; study of intraovarian eggs indicates that the species breeds continuously.

245. TIWARI, K. K. 1947. On a new species of *Palaemon* from Banares with a note on *Palaemon lanchestri* de Man. *Rec. Indian Mus.*, 45 (4): 333-345.  
*Palaemon choprai* described; *P. lanchestri* recorded and taxonomic notes appended.
246. ——— 1947. Preliminary descriptions of two new species of *Palaemon* from Bengal. *Ibid.*, 45 (4): 329-331.  
*Palaemon villosimanus* and *P. kempi* described.
247. ——— 1952. Diagnosis of new species and sub-species of the genus *Palaemon* Fabricius (Crustacea, Decapoda). *Ann. Mag. Nat. Hist. Ser. 12*, 5: 27-32.  
Diagnostic characters and distribution of 8 new species and 3 sub-species of *Palaemon* are given.
248. ——— 1955. Distribution of Indo-Burmese freshwater prawns of the genus *Palaemon* Fabricius and its bearing on the *Satpura hypothesis*. *Bull. Nat. Inst. Sci. India*, 7. *Symposium on Organic Evolution*: 230-239  
Distributional record of 30 species of *Palaemon* given. Based on their distribution, origin of the genus, their migration to freshwaters, the distributional anomalies of freshwater prawns and their similarities to that of torrential fishes and other groups of animals discussed. The existing distribution of this group of prawns explained on the basis of *Satpura hypothesis*.
249. ——— 1955. Trend of evolution in the *Hendersoni* group of species of *Palaemon* Fabricius (Crustacea Decapoda). *Ibid.*, 189-197.  
A comparative morphological study of the *Hendersoni* group which contains 9 species and sub-species given and it has been indicated that their ancestry can be traced back to a generalised common form resembling *P. hendersoni*. The main lines along which evolution appears to have taken place in this group discussed.
250. ——— 1958. New species and sub-species of Indian freshwater prawns. *Rec. Indian Mus.*, 53 (1 & 2): 297-300.  
Diagnostic characters and distribution of 3 new species of *Palaemon* and 2 sub-species are given.
251. ——— 1961. Occurrence of freshwater prawn *Macrobrachium latimanus* (Von Martens) in India and Ceylon. *Crustaceana*, 3 (2): 98-104.  
Taxonomic notes and distribution of *M. latimanus* given.
252. ——— 1963. Lower tertiary penaeid shrimps from Kapurdi (Barmer District, Rajasthan, India), *Ibid.*, 5 (3), 205-212.  
Description of 2 new species of *Penaeus* from the fuller's earth quarry at Kapurdi given. This is the first record of fossil penaeids from tertiary beds and a fossil penaeid being recorded from India.
253. ——— 1964. Geographical distribution of the marine and estuarine representatives of the family Palaemonidae Crustacea Decapoda, Caridea) with special reference to the sub-family Pontoniinae. Paper submitted to the seminar on 'Marine Science' sponsored by the Indian National Committee on Oceanic Research.
254. VELANKAR, N. K. AND T. K. GOVINDAN 1958. A preliminary study of the distribution of non-protein nitrogen in some fishes and marine invertebrates. *Proc. Indian Acad. Sci.*, 47 B (4): 202-209.  
The distribution of non-protein nitrogen in some fishes, crustaceans, and molluscs studied. The significance of the results from the comparative aspects and in the processing discussed.
255. ——— 1960. Trimethylamine oxide content of marine prawns occurring in the backwaters and in the sea off Cochin. *Ibid.*, 52 B (4): 111-115.  
Trimethylamine oxide content of marine and backwater prawns determined and the results obtained were discussed in relation with the habitat. The use of this test for spoilage suggested.
256. ——— (1959, 1960). Preservation of prawns in ice and assessment of their qualities by objective standards. *Indian J. Fish.* (1959), 6 (2): 306-321.  
Observations are made on the trimethylamine, total volatile nitrogen, acid-soluble orthophosphate and free amino-acid nitrogen contents and bacterial counts of some Indian prawns and the results obtained are presented and discussed.
257. ———, ———, P. N. APPUKUTTAN AND K. MAHADEVA IYER, 1961. Spoilage of prawns at 0° C. and its assessment by chemical and bacteriological tests. *Ibid.*, 8 (1): 241-251.  
Investigations on the development of spoilage products of prawns held at 0° C. are carried out and the results of these studies reported.
258. ———, ———, K. MAHADEVA IYER AND P. N. APPUKUTTAN 1961. Spoilage of un-iced prawns and its assessment by objective standards. *J. Sci. & Ind. Res.*, 20 D (5): 189-191.  
Spoilage of prawns of Cochin is studied by following the changes in TMA, TVN, VAN and bacterial counts. The results of the observation are given.

259. VELANKAR, N.K. AND K. MAHADEVA IYER 1961. On the qualitative distribution of amino-acids in different species of prawns. *Ibid.*, 20 C (2): 64-65.  
The free amino-acids of prawns, lobsters and crabs are examined and the results presented.
260. VELANKAR, N. K. 1965. Biochemical aspects of the spoilage of prawns. *Fishery Technology*, 2 (1): 98-101.  
Certain biochemical aspects of prawn spoilage discussed.
261. VENKATARAMAN, R., A. SRINIVASAN AND A. G. VASAN 1953. Preservation of semi-dried prawns. *J. Sci. & Ind. Res.*, 12 A (10): 473-474.  
The results of the experiments conducted on processed prawn discussed.
262. — AND — 1954. Manufacture and preservation of semi-dried prawns. *Indian Farming*, N.S., 10 (3): 22-23.  
Importance of prawns, methods of preservation, 4 types of manufacture of dried prawns, storage, nutritive value, direction for use and by-products are discussed.
263. — AND A. G. VASAVAN 1953. Semi-drying. A novel method of preserving and packing prawns. *J. Indian Com.*, 8 (3): 284-286.
264. —, S. T. CHARI AND A. SRINIVASAN 1955. Some aspects of preservation of prawns in Madras. *Proc. Indo-Pacif. Fish. Council.*, 6 (3): 434-438.  
Various methods of curing and preservation described. The nutritive value of different prawns and the methods of capture and transportation are given.
265. — AND S. A. BEATTY 1961. The role of technological laboratory in the rapid development of fish processing industry in India. *Ibid.*, 9 (3), 89-94.  
The problems connected with the process of prawns and their distribution discussed.
266. —, P. S. SAMBANDA MURTHY AND S. MAHADEVAN 1958. Some preliminary observations on the prawn catches off Finakayal near Tuticorin. *Proc. Indian Sci. Congr.*, 45th Sess., 3 : 374.  
Prawn fishery, sex composition, biometrical values, hydrography of the ground described.
267. VELU, M. 1964. Design aspects of mechanical gear handling accessories for prawn fishery. *Symposium on Prawn Fisheries in India, Society of Fisheries Technologists (India), Cochin, 1964.*  
Six types of designs of trawl winches are described.
268. WOOD-MASON, J., 1892. Illustrations of the Zoology of H.M. Indian Marine Surveying Steamer "Investigator" Part I. Crustacea, Calcutta, India.  
*Acanthephyra* spp., *Pasiphae* spp., *Aristaeopsis* spp., *Aristaeomorpha* spp., and *Aristaeus* sp. are figured.
269. — AND A. ALCOCK 1891. Natural history notes from H. M. Indian Marine Surveying Steamer "Investigator" Commander R. F. Hoskyn, R. N. Commanding, No. 21. Notes on the results of the last seasons deep sea dredging. *Ann. Mag. Nat. Hist.*, Ser. 6 (7): 186-202.
270. — 1891. Natural history notes from H.M. Indian Marine Surveying Steamer "Investigator" Commander R. F. Hoskyn, R. N. Commanding, Ser. 2, No. 1. On the results of the deep sea dredging during the season 1890-91. *Ibid.*, Ser. 6 (8): 268-286.
271. — 1894. Illustrations of the Zoology of H.M. Indian Marine Surveying Steamer "Investigator" under the command of A. Carpenter, R. N. and of Commander R. F. Hoskyn, R. N., *Crustacea* 2, VI-VIII.  
*Glyphocrangon* spp., *Pentacheles* spp. are figured.
272. — 1895. Illustrations of the Zoology of H.M. Indian Marine Surveying Steamer "Investigator" under the command of A. Carpenter, R. N. and of Commander R. F. Hoskeyn, R. N., *Crustacea*, IX-XV.  
*Crangon* spp., *Sergestes hamifer*, *Prinocrangon onmatosteres*, *Alpheus* sp., *Glyphocrangon* sp., *Pentacheles* sp. and *Psathyrocaris* sp. are figured.
273. WILKES, S. N., 1956. The Indian shrimp industry. *Fish. Bull. (F.A.O. Publ.)*.

## SUPPLEMENT

274. ANONYMOUS 1965. Prawn fishery of Gujarat. Location of new prawn grounds off Veraval. *Fishery Technology*, 2 (1): 48-49.  
Potential prawn fishing ground off veraval reported. Suitability of gear and composition of catch given. Possibility of better prawn grounds in deeper areas indicated.

275. BALACHANDRAN, K. K. AND A. N. BOSE 1964. Dehydration of prawns by rotary dryers. *Proc. Indo-Pacif. Fish. Council., 11th Sess., Sec. II*: 272-277.  
The use of rotary drum dryer for drying, deshelliling and deveining of prawns discussed.
276. BANERJI, S. K. AND M. J. GEORGE 1967. Size distribution and growth of *Metapenaeus dobsoni* Miers and their effect on the trawler catches off Kerala. *Proceedings of the Symposium on Crustacea*, Marine Biological Association of India, 1965, Part II: 634-648.  
The paper discusses the role played by the size distribution in influencing the catch and abundance. The instantaneous mortality rate was also found out from the approximate formulae of Holt-Beverton.
277. BENSAM, P. AND K. N. RASACHANDRA KARTHA 1967. Notes on the eggs and early larval stages of *Hippolytina ensirostris* Kemp. *Ibid.*, 1965, Part II: 736-743.  
Gives an account of three different stages of the eggs and three early larval stages.
278. CHAUDHURI, D. R. AND K. K. BALACHANDRAN 1965. Preliminary studies on blanching of prawn. *Fishery Technology*, 2 (1): 139-143.  
The paper represents results on the studies undertaken to find out the causes of irregular drained weight conditions in commercial canned prawn samples.
279. DESHPANDE, S. D., V. C. GEORGE AND T. M. SIVAN 1964. Experiments and fishing with shrimp trawls. On the effectiveness of Beam trawl net. *Proc. Indo-Pacif. Fish. Council., 11th Sess., Sec. II*: 191-193.  
Particulars of the design, construction of each net and method of assembly of 3.04 m. and 1.52 m. beam trawls operated simultaneously from a single wrap are given. The results obtained were discussed.
280. GEORGE, M. J. 1964. On the occurrence of *Metapenaeus burkenroadi* Kubo (Family: Penaeidae, Crustacea Decapoda) in Indian waters. *J. Mar. biol. Ass. India*, 6 (2): 313-314.  
Reports the occurrence of *M. burkenroadi* from Cochin.
281. GEORGE, M. J., K. RAMAN AND P. KARUNAKARAN NAIR 1963. Observations on the off-shore prawn fishery of Cochin. *Indian J. Fish.*, 10 A (2).  
Species composition, seasons of abundance, size distribution, age and growth, maturity, sex ratio, and the general fishery discussed.
282. GEORGE, M. J. 1963. Post-larval abundance as a possible index of fishing success in the prawn *Metapenaeus dobsoni* (Miers). *Ibid.*, 10 A (1), 135-39.  
The abundance of postlarvae in the backwater is correlated with the measures of abundance in the backwater and inshore fishery and shown that success or failure of the fishery in a year could be foreseen in the magnitude of the recruitment of post-larvae.
283. ——— 1966. On a collection of penaeid prawns from the off-shore waters off the South-west Coast of India. *Proceedings of the Symposium on Crustacea*, Marine Biological Association of India, 1965, Part I: 337-346.  
13 species of penaeid prawns are reported.
284. ——— 1967. Mark recovery experiments in Crustaceans. *Ibid.*, 1965, Part IV: 1284-95.  
The various methods used in marking studies of prawns, lobsters and crabs are described and the typical movements elucidated so far are described.
285. ——— AND P. VEDAVYASA RAO 1966. On some decapod crustaceans from the South-west Coast of India. *Ibid.*, 1965, Part I: 327-336.  
8 caridean and 3 penaeid prawns are reported.
286. ——— 1967. Distribution of sex ratios of penaeid prawns in the trawl fishery of Cochin. *Ibid.*, 1965, Part II: 698-700.  
Sex ratio data of four penaeid prawns are studied and their movements discussed.
287. GEORGE, M. J. AND K. C. GEORGE 1964. On the occurrence of the caridean prawn *Thalassocaris lucida* (Dana) in the stomach of *Neothunnus macropterus* (Temminck and Schlegel) from the Arabian sea. *J. Mar. biol. Ass. India*, 6 (1): 171-172.  
Records the occurrence of *T. lucida* off Quilon, in the Arabian sea.
288. ——— AND K. H. MOHAMED 1966. An assessment of marine prawn fishery resources of Kanyakumari District, South-west Coast of India. *Proc. Indo-Pacif. Fish. Council., 12th Sess.*  
The prawn fishery of Kanyakumari District which accounts for about 500 tonnes of prawns a year is exclusively constituted by large-sized first and second year classes of a single species of penaeid prawn—*Penaeus indicus*. Fishing season, growth rates and recruitment to the fishery are discussed.

289. GOVINDAN, T. K. 1962. Studies on Ice-stored prawns. *Indian J. Fish.*, 9 B(1): 7-15.  
The results of the quantitative study made on major changes taking place in prawns stored in ice discussed.
290. GOPALAKRISHNAN, T. S. AND D. R. CHAUDHURI 1965. Investigation on sanitational aspects (microbiological) of prawn processing factories. *Fishery Technology*, 2 (1): 131-138.  
Methods for cleaning the utensils and equipments in prawn processing factories and peeling centres suggested.
201. GNANAMUTHU, C. P. 1965. Changes in volume of a prawn moulting in hypotonic sea-water. *Curr. Sci.*, 34 (2): 53-54.
292. ——— 1965. Hydrostatic pressure of body fluids in relation to osmoregulation in brackishwater prawn. *Indian J. Exp. Biol.*, 4: 271-272.
293. ——— 1966. Changes in volume of a brackish water prawn in different media. *Proc. Indian Acad. Sci.* 64 B (2) : 96-109.  
The changes in volume in *Metapenaeus monoceros* in different media and the part played by the gut discussed.
294. GNANADOSS, D. A. S. 1965. Standardisation and mass production of shrimp trawlers and other fishing boats in India. *Fishery Technology*, 2 (1): 93-95.  
The paper deals with the existing fishing crafts, new vessel types, boat building programmes, their standardisation and mass production in India.
295. JONES, S. 1967. The Crustacean fishery resources of India. *Proceedings of the Symposium on Crustacea*, Marine Biological Association of India, 1965, Part IV: 1328-40.  
The present status of crustacean fisheries in India discussed.
296. KAGWADE, P. V. 1967. Prawn catches by mechanised vessels in the trawling grounds of Bombay and Saurashtra. *Ibid.*, 1965, Part IV: 1348-81.  
The relative abundance in the regional, seasonal and depth-wise distribution of prawns in Bombay and Saurashtra waters discussed.
297. KUNJU, M. M. 1967. Observation on the prawn fishery of the Maharashtra coast. *Ibid.*, 1965, Part IV.  
The magnitude of fishery, species and size composition, relative abundance of various species of the Maharashtra coast are given.
298. KAMASTRY, P. V. AND B. VIJAY 1964. Chemical and bacteriological quality of prawns transported from Ratnagiri to Bombay. *Symposium on Prawn Fisheries in India, Society of Fisheries Technologists (India), Cochin*, 1964, p. 17.  
Results of the study on organoleptic, chemical and bacteriological quality of the prawns transported from Ratnagiri to Bombay discussed.
299. LEKSHMY, A. (MISS), T. K. GOVINDAN AND V. K. PILLAI 1962. Studies on the quality of dry prawn. *Indian J. Fish.*, Sec 9 B(1): 1-6.  
The effect of moisture variation on the quality and shelf life of the products during storage are studied.
300. ——— 1962. Storage characteristics of frozen prawns in relation to quality assessment. *Ibid.*, 9 B(1): 58-70.  
Freezing trials were carried out with the fresh prawns (*P. indicus*) stored for different periods in ice. The changes in chemical and bacteriological characteristics of the frozen products during storage have also been followed. It is observed that these characteristics are subjected to wide fluctuations as a result of the initial storage in ice. The implication of these changes in quality assessment of the products discussed.
301. MOHAMED, K. H. 1961. Penaeid prawns in the commercial shrimp fisheries of Bombay with notes on species and size fluctuations. *Proceedings of the Symposium on Crustacea*, Marine Biological Association of India, 1965, Part IV: 1408-18.  
Species composition, size frequencies, recruitment and spawning season of important prawns of Bombay area studied.
302. PANIKKAR, N. K. 1966. Fishery resources of the Indian ocean. *Curr. Sci.*, 35(18): 451-455.  
Refers to the prawn fisheries of India and the potential prawn grounds in the Indian ocean.
303. QURESHI, S. AND T. A. HASHMI, 1965.\* Shrimp fisheries of West Pakistan. *Proceedings of the Symposium on Crustacea*, Marine Biological Association of India (Abstract of Papers), p. 73.  
The paper deals with the taxonomy of the marine shrimps; length-weight relationship, growth rate, breeding season, sex ratio of *Panacus merguensis*; fishing crafts, fishing grounds and exports and foreign markets.

\* The paper was subsequently withdrawn.

304. RADHAKRISHNAN, N. 1967. On the prawn resources of Karwar region. *Proceedings of the Symposium on Crustacea*, Marine Biological Association of India, 1965, Part IV: 1421-23.  
Species composition and detailed area and depth-wise analysis of prawn catches in trawling operations off Karwar studied.
305. RAMAMURTHY, S. 1967. On the prawn fishery of Gulf of Kutch. *Ibid.*, 1965, Part IV: 1424-36.  
Fishery, growth, sex ratio, breeding, migration and survival rates discussed.
306. RAMAN, K. 1967. Observations on the fishery and biology of the giant freshwater prawn *Macrobrachium rosenbergii* de Man. *Ibid.*, 1965, Part II: 649-669.  
Methods of fishing, annual trends in production, effort and catch rate, monthly fluctuations in the fishery, age and growth, maturity, breeding, fecundity and seasonal migrations are dealt with. The possibility of over-fishing problems are posed and certain conservation methods suggested.
307. RANADE, M. R. AND S. M. WAKNIS 1965. Prawn resources of Southern Maharashtra (Ratnagiri)—an outlook for a new industry. *Curr. Aff. Bull.*, 43: 6-10.  
A brief review of the origin and growth of prawn fishery of Southern Maharashtra is given together with some observations on the catches of prawns, as a result of the exploratory survey, indicating their potentiality as a fishery.
308. RAJYALAKSHMI, T. 1964. On the age and growth of some estuarine prawns. *Proc. Indo-Pacif. Fish. Council.*, 11th Sess., Sec. II: 52-83.  
Age and growth of some commercially important prawns from the Hooghly Estuary have been estimated by length-frequency method. It has been observed that in the majority of the cases each age group is bimodally distributed. Normally, females are observed to have a faster rate of growth, though the reverse situation was also observed in a few cases. Usually prawns with identical maximum sizes had identical rate of growth.
309. SEBASTIAN, A. V., A. V. V. SATYANARAYANA AND R. S. NAIR 1964. On the prawn trawling experiments conducted off Kakinada (Andhra Pradesh). *Ibid.*, 198-201.  
Presents the results of trial fishing for prawns with beam and otter trawls and results encourage large-scale exploratory fishing for prawns in the Bay of Bengal.
310. SUBRAHMANYAM, M., 1964. Fluctuations in prawn landings in the Godavari estuarine system. *Ibid.*, 44-48.  
Studies on the fluctuations in the fishery of two species of prawns in the Gautami estuary in relation to the monthly river discharges are made and the results discussed.
311. SUSAMMA JACOB, K. MAHADEVA IYER M. RAJENDRANATHAN AND V. K. PILLAI 1962. Quality studies on round, headless and peeled and deveined prawns held in ice storage. *Indian J. Fish.*, 9 B (2): 97-107.  
Presents the results of the investigations carried out on the chemical and bacteriological changes in prawns during storage in ice when held in three forms of 'round', 'headless' or 'peeled and deveined' under chemical handling conditions.
312. ANONYMOUS 1966. Notes on the development of a practical mass culturing technique of the giant prawn *Macrobrachium rosenbergii*. IPFC/C66/W.
313. GANAPATHY, P. N. AND M. SUBRAHMANYAM 1966. The prawn fishery in Godavari estuary. *J. Zool. Soc. India*, 16 (1 & 2): 11-20.  
The systematics and seasonal distribution of the prawns of the Gautami-Godavari estuary have been described. Some aspects of the biology and fishery of important estuarine prawns, craft and gear, curing methods have been dealt with.
314. GEORGE, M. J. 1967. A synopsis of biological data on penaeid prawn *Metapenaeus dobsoni* (Miers) 1878. *F.A.O. World Scientific Conference on the Biology and Culture of Shrimps and Prawns, Mexico, 12-24 June, 1967*.  
Information on the biology and fishery of the penaeid prawn *Metapenaeus dobsoni* is given briefly.
315. ——— 1967. A synopsis of biological data on penaeid prawn *Metapenaeus monoceros* (Fabricius, 1798). *Ibid.*  
Information on the biology and fishery of the penaeid prawn *Metapenaeus monoceros* is given briefly.
316. ——— 1967. A synopsis of biological data on penaeid prawn *Metapenaeus brevicornis* (H. Milne-Edwards, 1837). *Ibid.*  
Information on the biology and fishery of the penaeid prawn *Metapenaeus brevicornis* is given briefly.
317. ——— 1967. A synopsis of biological data on penaeid prawn *Metapenaeus affinis* (H. Milne-Edwards, 1837). *Ibid.*  
Information on the biology and fishery of penaeid prawn *Metapenaeus affinis* is given briefly.



318. GEORGE M.J., S. K. BANERJI AND K. H. MOHAMED 1967. Size distribution and movement of the commercial prawns of the South-west Coast of India. *Ibid.*
- A detailed study of the distribution pattern of size and abundance of the commercial penaeid prawns of the south-west coast of India, *Metapenaeus dobsoni*, *M. affinis*, *M. monoceros*, *Penaeus indicus* and *Parapenaeopsis stylifera* has been carried out. The movement of these prawns in different depth zones of the fishing grounds as seen from the analysis of data are size-oriented. With the exception of *M. dobsoni*, all the species were seen to enter the fishing grounds from deeper zones at the beginning of the season by September. They begin to move out of the fishing grounds into deeper zones from February-March onwards. *M. dobsoni* exhibits this movement in the opposite direction. The role of monsoon and upwelling in bringing about these movements is discussed.
319. —, K. H. MOHAMED AND N. NEELAKANTA PILLAI 1967. Observations on the paddy-field prawn filtration of Kerala, India. *Ibid.*
- The results of the experiments conducted to determine whether culture methods could be advantageously introduced into the existing prawn filtration practices in the paddy fields are presented. Culturing of juvenile prawns for about a month resulted in relatively better catches of large-sized prawns than could be obtained by cultivation for longer periods. The yield of prawns appeared to be better during the spring tide period associated with full-moon than that associated with the new-moon. Species composition, recruitment to the fishery, size composition and movement of juvenile prawn are discussed.
320. — AND P. VEDAVYASA RAO 1966. A new species of *Metapenaeus* (Decapoda, Penaeidae). *J. Mar. Biol. Ass. India*, 8 (1): (in Press).
- Metapenaeus alcocki*, collected from the Gulf of Kutch, is described as a new species. The diagnostic features along with comparisons with those of allied species are given.
321. — 1967. Observations on the development of the external genitalia in some Indian penaeid prawns. *Australian/New Zealand Meeting on Decapod Crustacea, Sydney, 24-28 October, 1967.*
- The development of petasma and thelycum of *Penaeus indicus*, *Metapenaeus monoceros*, *M. affinis*, *M. dobsoni* and *Parapenaeopsis stylifera* is described. The size at which fifty per cent of the males had petasmas fused was determined. A comparison of the developmental features of the different species is made and their phyletic position discussed.
322. JONES, S. 1967. The prawn fishery resources of India. *F.A.O. World Scientific Conference on the Biology and Culture of Shrimps and Prawns, Mexico, 12-24 June, 1967.*
- The growth of prawn fishing industry in India in recent years is reviewed. Prawn exports, commercially important species, the geographical areas of their fishery, maximum size attained by each species the depth in which they are fished and the nets and boats used are given. More extensive culturing of prawns is recommended.
323. JOSEPH, K. M. 1967. Exploratory trawling off the south-west coast of Mysore by M. F. V. Tarpon, November 1960—May 1965. *International Indian Ocean Expedition, News letter*, 4(4): 14 (Abstract only).
- The results of the exploratory trawling in the off-shore waters between latitudes of 12° N and 14° N. and the longitudes of 74° E and 75° E are presented. Species-wise composition of catch with special reference to prawns has been discussed. A comparative study of the productivity of different fishing centres in the area of survey and between other areas along the west and east coasts has been made. The commercial possibilities of trawl fishing in the area have been discussed.
324. KRISHNASWAMY, S. 1967. Reproductive and nutritional cycles in a few invertebrates from the east coast of India. *Ibid.*, 4(4): 18.
- Study of the gonad and hepatic index of a few invertebrates including *Penaeus indicus* has been made. *P. indicus* belongs to the group of continuous breeders. Various environmental factors influencing these are discussed.
325. KUNJU, M. M. 1967. A synopsis of biological data on the penaeid prawn *Solenocera indica* Nataraj 1945. *F.A.O. World Scientific Conference on the Biology and Culture of Shrimps and Prawns, Mexico, 12-24 June, 1967.*
- Information on the biology and fishery of *Solenocera indica* is briefly given.
326. — 1967. On some aspects of the biology of *Solenocera indica* Nataraj (Penaeidae, Sub-Fam. Solenocerinae). *Ibid.*
- Distribution, feeding, breeding behaviour, spawning period, migration, growth rates, life span and sex ratio are given.
327. MBALATHKAR, H. N. AND H. KRISHNA IYER 1966. Belly depth studies for shrimp trawls. *IPFC/C66/TECH.*

328. MENON, M. DEVIDAS 1967. "Carpe Diem". *Seafood Trade Journal* 2 (1): 99-106.  
The problem of natural environments and conditions that facilitate the growth of shrimps and other crustaceans, the difficulties these organisms face in their natural habitats by the many and varied changes and developments that take place in estuaries and backwaters by reclamations are discussed. Production, biological data of important prawns, breeding ground of prawns are also given.
329. MENON, M. KRISHNA 1967. Prawns, Shrimps and Lobsters. *Ibid.*, 151-157.  
Commercial species, life-history, growth and length of life, movements, catches and their composition are given briefly.
330. MOHAMED, K. H. 1967. A synopsis of biological data on Indian prawn *Penaeus indicus* H. Milne-Edwards 1837. *F.A.O. World Scientific Conference on the Biology and Culture of Shrimps and Prawns, Mexico, 12-24 June, 1967.*  
Information on the biology and fishery of *Penaeus indicus* is given briefly.
331. ——— 1967. A synopsis of biological data on jumbo tiger prawn *Penaeus monodon* Fabricius 1798. *Ibid.*  
Information on the biology and fishery of *Penaeus monodon* is given briefly.
332. ———, P. VEDAVYASA RAO AND M. J. GEORGE 1967. Postlarvae of penaeid prawns of south-west coast of India with a key to their identification. *Ibid.*  
The first postlarval stage of *Penaeus indicus*, *Metapenaeus monoceros*, *M. affinis*, *M. dobsoni*, and *Parapenaeopsis stylifera* is described. A comparison of their diagnostic features and a key for their identification together with a few remarks on distribution and swimming behaviour are included.
333. MOHAMED, K. H. 1967. Prawn fisheries. *Souvenir, 20th Anniversary of Central Marine Fisheries Research Institute (Government of India)*, pp. 75-81.  
Production, catch composition, fishing season processing and export biology of prawns given. Suggestions for future work are given.
334. MUTHU, M. S. 1965. On the occurrence of *Metapenaeus ensis* (De Haan) in the Bay of Bengal. *J. Mar. biol. Ass. India*, 7 (2): 465-468.  
Reports the occurrence of *M. ensis* in the Bay of Bengal and its distribution. Three additional characters that distinguish *M. ensis* from *M. monoceros* are pointed out.
335. NARAYANAN KUTTY, M. 1967. Oxygen consumption of the prawns *Penaeus indicus* Milne-Edwards and *Penaeus semisulcatus* de Haan. *F.A.O. World Scientific Conference on the Biology and Culture of Shrimps and Prawns, Mexico, 12-24 June, 1967.*  
The results of the experiments showed that oxygen consumption of *P. indicus* and *P. semisulcatus* declined sharply by about the second day of starvation. Changes in the metabolic rates due to starvation in these species are discussed.
336. PANIKKAR, N. K. 1967. Osmotic behaviour of shrimps and prawns in relation to their biology and culture. *Ibid.*  
The paper discusses the distribution of prawns and shrimps of the decapod families Penaeidae and Palaemonidae, their value in culture, existing knowledge of their osmotic properties, influence of salinity and temperature on their physiology and related problems.
337. RAO, R. MALLIKARJUNA 1967. Studies on the biology of *Macrobrachium rosenbergii* (de Man) on the Hooghly estuary with notes on its fishery. *Proc. nat. Inst. Sci. India*, 33 B.  
Age and growth, length-weight relationship and fluctuations in relative condition with size and seasons of the year, sex-ratio, breeding, food habits, identification of young and their distribution in the Hooghly estuary are given.
338. RAO, P. VEDAVYASA 1967. A synopsis of biological data on penaeid prawn *Parapenaeopsis stylifera* (H. Milne-Edwards), 1837. *F.A.O. World Scientific Conference on the Biology and Culture of Shrimps and Prawns, Mexico, 12-24 June, 1967.*  
Information on the biology and fishery of *Parapenaeopsis stylifera* is given briefly.
339. ——— 1967. Maturation and spawning of the penaeid prawns of the south-west coast of India. *Ibid.*  
Maturity stages, maturation process, minimum size at first maturity, breeding season, spawning frequencies, fecundity, salinity, temperature and spawning are given.
340. RAMAN, K. AND M. K. MENON 1963. A preliminary note on an experiment in paddy field prawn fishing. *Indian J. Fish.* 10 A (1): 33-39.  
The results of the experiments to find out the effect of variation in size and number of sluice gates, area of the field, etc., on the catch are given.

341. RAMACHANDRAN NAIR, P. V., G. LUTHER AND CLEMENT ADLOPH 1965. An ecological study of some pools near Mandapam (South India) formed as a result of the cyclone and tidal wave of 1964. *J. Mar. biol. Ass. India*, 7(2): 420-439.  
Refers to *Penaeus indicus*, *P. merguensis*, *P. semisulcatus*, *P. monodon*, *Metapenaeus affinis*, *M. dobsoni*, *M. burkenroadi*, *M. lysianassa*, *P. canaliculatus* and *Acetes* sp. The total number, size range, dominant size and total weight, salinity tolerance of the species are given. The hydrological and phytoplanktonological characteristics of the pools discussed.
342. SUBRAHMANYAM, C. B. 1965. On the reproductive cycle of *Penaeus indicus* (M. Edw.). *J. Mar. biol. Ass. India*, 7(2): 284-290.  
The external and internal structure of testes and ovary at different stages of maturity, the length at which the sexual maturity is attained, breeding season, and stages of maturity are given.
343. ——— 1963. Notes on the bionomics of the penaeid prawn *Metapenaeus affinis* (Milne-Edwards) of the Malabar coast. *Indian J. Fish.*, 10 A (1) : 11-22.  
Fishing seasons, age and growth, stomach contents, sexual maturity and breeding seasons and migration of the species discussed.
344. SUBRAHMANYAM, M. 1966. Fluctuations in the prawn landings in Chilka lake. *Proc. Indo-Pac. Fish. Coun.*, 12th Sess. IPFC/C66/TECH.
345. VENUGOPALA PILLAI, S. 1966. Some observations on the early larval stages of *Hippolytina vittata* (Stimpson). *J. Mar. biol. Ass. India*, 8(1) (in Press).  
Deals with the eggs and three larval stages of the species.
346. ——— 1966 b. Early development at larval stages of *Palaeomon tenuipes* (Henderson). *Ibid.*, 8(2), (in press).  
Descriptions of eggs and three larval stages of *P. tenuipes* are given. Differences noticed from the allied species from Indian waters are also noted.

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