

Periodicity of Operation and Shrimp Catch from Different Harvesting Methods in Traditional Farms at Vypeen Island

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Harvesting of shrimps in filtration farms is being done periodically through sluice gate and other fishing methods like gill net, cast net, drag net and hand picking. Six seasonal and six perennial prawn filtration farms were selected for studying the periodicity of operation and shrimp catch from different harvesting methods employed in traditional filtration shrimp farms at Vypeen island. The average catch from all the gears operated in the seasonal farm was 408.1 kg.ha⁻¹ and 384 kg.ha⁻¹ during 1999-2000 and 2000-2001 respectively and the average catch from all the gears operated in perennial farm was 268.2 kg.ha⁻¹ during 1999-2000. Catch of shrimps in sluice net dominated in both the seasonal and perennial farms contributing 94 % and 71 % respectively, followed by gillnet, cast net and handpicking. The gear wise catch from seasonal and perennial farms is discussed.

Key words: Harvesting, traditional filtration farms, shrimps.

Trapping and holding shrimp and fish seed in the seasonal and perennial fields through tidal influx is a traditional culture method practised in Kerala. The seeds entering into the field are allowed to grow for a short period by feeding on the natural food available and the stock is harvested periodically through sluice gate filtration and by other fishing methods such as gill net, cast net, drag net and hand picking. The yield from paddy fields and the rate of growth of the different shrimp species have been studied by many workers (Panikkar, 1937; Menon, 1954; Gopinath, 1956; Panikkar & Menon, 1956; Raman & Menon, 1963; George *et al.*, 1968; George *et al.*, 1974; George & Brandt, 1975; Gopalan *et al.*, 1982; Verghese *et al.*, 1982; Jose *et al.*, 1987; Mathew & George, 1987; Kurup *et al.*, 1992; Mathew, 1993; Pillai & Krishnan, 1998; Chandramohan *et al.*, 1999; Purushan, 1989, 1995, 1996 a, 1996 b, and 1996 c. Unnithan, 1985, 2000; and Srinath *et al.*, 2000). Harvesting is done mostly over a period of seven or eight nights, distributed on either side of the full moon

and new moon days. In the case of perennial farms, in addition to the above, total harvest is carried out once in three months using different fishing gears. The present study was undertaken to find out the was undertaken to study the gear-wise periodicity of operation and catch from different harvesting methods employed in traditional filtration shrimp farms in Vypeen island.

Materials and Methods

Six seasonal and six perennial shrimp filtration farms in Vypeen island (Ernakulam district, Kerala) were selected for the study. Fortnightly samples of catch were taken from the sluice nets during each lunar phase from December 1999 to April 2001. Random samples from the total catch were taken when the catch obtained was more than 1 kg, otherwise, the whole catch caught by the net was used for analysis. Samples were collected from cast nets and gill nets from perennial farms during periodic harvesting done once in three months. Catch data on hand picking were also collected from these

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farms whenever it was being carried out. The shrimp production from each farm by different gears was estimated based on 10 % random sample. In the case of cast net, gill net, handpicking and sluice net, total landings of the gear were collected separately for each farm. Details were also collected from the register maintained separately for this purpose by the lessee of the respective farms. In the case of gill net the total catch is presented as catch (kg) obtained per 1000 m² of netting per hour (kg.1000 m².h⁻¹ and in kg.ha⁻¹), cast net (kg. cast h⁻¹ and kg.ha⁻¹), bag net (kg.h⁻¹ and kg.ha⁻¹) and in the case of hand picking it is given in catch in kg.h⁻¹person⁻¹. The individual length and weight of different species of shrimp caught were recorded separately and compared to assess the difference in length classes and catch of different species of shrimps landed in the respective gear. Month-wise, season-wise and species-wise catch, average yield from each farm and contribution of each gear in the total catch were also calculated.

Results and Discussion

The gear wise periodicity of operation and total catch in the seasonal farms is given

in Table 1. The periodicity of operation of sluice nets increased from 21 in December 1999 to 106 operations in March 2000 and from 25 in December 2000 to 105 in March 2001, indicating maximum operations of sluice net during the month of March. In case of gill net and cast net the fishing operations commenced from February. Hand-picking is also carried out during the last few months, and also during the last few days of the season after reducing the water level or draining water completely from the pond. Maximum fishing effort using these gears is seen during the last few days of the fishing season to harvest all the shrimps from the farms. Fishes like *Mugil* spp., *Chanos* sp., *Etroplus* sp, tilapias, catfishes and a few other species of miscellaneous groups (*Ambasis* sp., *Barbus* sp. *Cyprinoides* sp., *Anchoviella* sp, *Therapon* sp., etc.) and crab (*Scylla serrata*), were also obtained in substantial quantities mainly in the perennial farms.

The shrimp catch from different harvesting methods in seasonal farms is shown in Fig. 1. The shrimp species were *Metapenaeus dobsoni*, *Fenneropenaeus indicus*, *Metapenaeus monoceros* and *Penaeus monodon* (locally called as *Thelly*, *Choodan*, *Naran* and *Kara Chemeen*, respectively).

Table 1. Periodicity of operation and catch from different harvesting systems from seasonal farms

Months	Harvesting system												GRAND TOTAL
	Sluice net			Gill net			Cast net			Hand picking			
	No. of Operations	Production operation ⁻¹ (kg)	Total (kg.ha ⁻¹)	No. of Units	(kg.1000 m ²)	Total (kg.ha ⁻¹)	No. of Units	(kg/unit)	Total (kg.ha ⁻¹)	No. of Persons	(kg. person ⁻¹)	Total (kg.ha ⁻¹)	
Dec-1999	21	28.24	11.51	0	-	0.00	-	-	0.00	-	-	0.0	11.5
Jan-2000	60	46.03	53.63	0	-	0.00	-	-	0.00	-	-	0.0	53.6
Feb-2000	80	103.91	161.42	50	2.920	3.20	-	-	0.00	-	-	0.0	164.6
Mar-2000	106	65.24	134.27	109	2.820	6.93	33	1.700	2.73	256	2.431	12.1	156.0
Apr-2000	34	25.85	17.07	0	-	0.00	7	1.400	0.30	77	3.292	4.9	22.3
Total	301	64.66	377.90	159	2.83	10.14	40	1.54	3.03	333	5.72	17.0	408.1
Dec-2000	25	25.20	12.23	-	-	0.00	-	-	0.00	-	-	0.0	12.2
Jan-2001	83	37.66	60.70	-	-	0.00	-	-	0.00	-	-	0.0	60.7
Feb-2001	91	85.65	151.34	45	1.390	1.24	7	1.600	0.48	38	1.895	1.4	154.5
Mar-2001	105	64.81	132.14	155	2.100	10.14	24	1.620	1.49	217	1.369	5.8	149.5
Apr-2001	16	22.88	7.11	-	-	0.00	-	-	0.00	-	-	0.0	7.1
Total	320	58.50	363.51	200	1.85	11.38	31	1.62	1.96	255	3.26	7.2	381.0

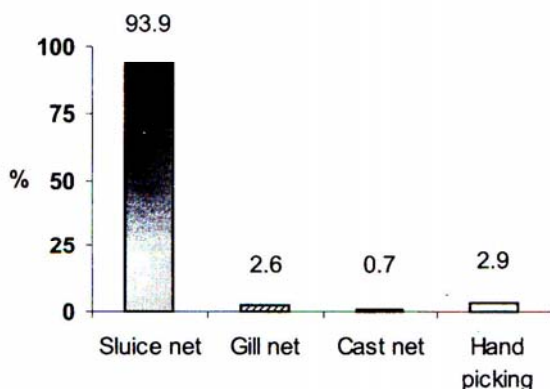


Fig. 1. Shrimp catch in % from different harvesting methods in seasonal farms

In seasonal farms, the shrimp catch dominated in the sluice net (94%) followed by gillnet and handpicking (3%) and cast net (1%) for both the years (December, 1999 to April 2000 and December, 2000 to April, 2001).

The average catch of shrimps from sluice net in the seasonal farm, was 64.66 kg.operation⁻¹ and 58.59 kg.operation⁻¹ during the two seasons. The highest catch was recorded during February, lowest being in December and April in both the years. The catch of shrimps was 377.9 kg.ha⁻¹ and 363.51kg.ha⁻¹, in the two years respectively.

Gill nets were operated only during the end of the season viz. during February and March. The average catch of shrimps was 2.83 kg.1000 m².h⁻¹ and 1.85 kg.1000 m².h⁻¹ during 1999-2000 and 2000-2001 respectively. The highest catch was recorded during March. The catch of shrimps from gill net was 10.14 kg.ha⁻¹ in 1999-2000 and it increased to 11.38 kg.ha⁻¹ in 2000-01.

Cast nets were operated only during the end of the season. The average catch of shrimps from cast net was 1.54 kg.unit⁻¹ and 1.62 kg.unit⁻¹ during 1999-2000 and 2000-01, respectively. The highest catch was recorded during March in both the years. The catch of shrimps per hectare from cast net varied from 1.96 kg.ha⁻¹ and 3.03 kg.ha⁻¹, respectively in both the years.

Similarly, hand picking was carried out during the fag end of the season. The average catch of shrimps by hand picking was 5.72 kg. person⁻¹ h⁻¹ and 3.26 kg. person⁻¹ h⁻¹ respectively for the two years and the catch rate of shrimps by handpicking was 17.0 kg.ha⁻¹ and 7.2 kg.ha⁻¹ for 1999-2000 and 2000-01 respectively.

The catch composition of different species of shrimps from seasonal farms is

Table 2. Periodicity of operation and catch from different harvesting systems from perennial farms

Months	Harvesting system											GRAND TOTAL	
	Sluice net		Gill net		Cast net			Hand picking					
	No. of Operations	Production operation ⁻¹ (kg)	Total (kg.ha ⁻¹)	No. of Units	(kg.1000 m ²)	Total (kg.ha ⁻¹)	No. of Units	(kg/unit)	Total (kg.ha ⁻¹)	No. of Persons	(kg. person ⁻¹)		Total (kg.ha ⁻¹)
Nov-1999	24	32.33	5.37	0	-	-	-	-	-	-	-	-	5.37
Dec-1999	48	44.30	15.42	0	-	-	-	-	-	-	-	-	15.42
Jan-2000	48	61.90	22.62	105	3.20	1.12	0	-	-	-	-	-	23.74
Feb-2000	48	76.10	28.38	363	2.78	11.84	197	3.57	5.6	-	-	-	45.78
Mar-2000	48	44.32	17.64	69	3.93	1.04	38	3.61	1.0	-	-	-	19.73
Apr-2000	48	35.40	13.10	252	2.63	6.98	198	3.70	5.8	-	-	-	25.85
May-2000	48	35.32	13.02	253	3.39	11.62	321	3.75	9.3	-	-	-	33.90
Jun-2000	48	78.88	29.08	117	3.38	4.65	114	4.73	4.2	-	-	-	37.91
Jul-2000	48	51.51	18.99	60	2.01	0.88	0	-	-	145	1.33	1.5	21.35
Aug-2000	48	44.62	16.45	0	-	0.00	10	1.82	0.1	897	1.69	11.6	28.21
Sep-2000	48	14.44	5.32	52	2.75	0.66	43	1.50	0.5	-	-	-	6.48
Oct-2000	48	10.40	3.83	60	0.47	0.35	27	1.23	0.3	-	-	-	4.43
Total	552	44.638	189.25	1331	3.38	39.1	948	3.621	26.7	1042	1.637	13.1	268.2

shown in Fig. 2. *M. dobsoni* was the most dominant species contributing 52% of the total shrimp catch, followed by *F. indicus* (34%), *P. monodon* (10%) and *M. monoceros* (4%). The percentage of shrimp species from different fishing methods from seasonal farms is given in Fig. 3. *P. monodon* contributed 7% of the total catch in sluice net, whereas, it contributed 36% of the total catch in both gill nets and cast nets and was 64% in the case of hand picking. This indicates that this species remains inside the ponds and are not completely harvested through the sluice net. Handpicking is an efficient method for this species, even though it burrows inside the mud. The catch of *F. indicus* in sluice net was 36%. However, in case of gill nets and cast nets, the percentage contribution of this species was 62% and it contributed 57% of the total catch by hand picking. *M. dobsoni* was the principal species contributing 53% of the total catch caught in sluice net. It contributed 1% each of the total catch in gillnet and by handpicking and it was 3% in the case of cast net. *M. monoceros* contributed 4% of the total catch in sluice net and cast net whereas it was 1% in the case of gillnets and handpicking.

In the case of *P. monodon* the percentage contribution to the total shrimp catch was more or less same in both years. The average catch from all the gear for seasonal farm was

408.1 kg.ha⁻¹ during 1999-2000 and it reduced to 384 kg.ha⁻¹ during 2000-2001. The percentage composition of *F. indicus* was less during 2000-2001. This could be attributed to disease outbreak in a few of the seasonal farms in Vypeen during the period.

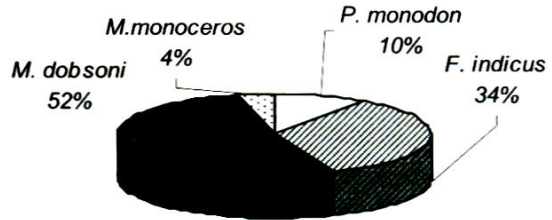


Fig. 2. Catch composition of different species of shrimps in seasonal farms

The physical characteristics such as the area of the field, size and number of sluice gates, location, etc. have no influence on the annual yield of prawn from these type of fields (Raman and Menon, 1963). The higher yield rates in the seasonal field could be attributed to the higher productivity of the fields and its close proximity to the backwaters. The stumps of the paddy help to increase the organic production (Menon, 1954) in the farm and offer better biological environment for the juvenile shrimps.

The gear wise periodicity of operation and total production in the perennial farms is given in Table 2. The periodicity of operation of sluice net was less during

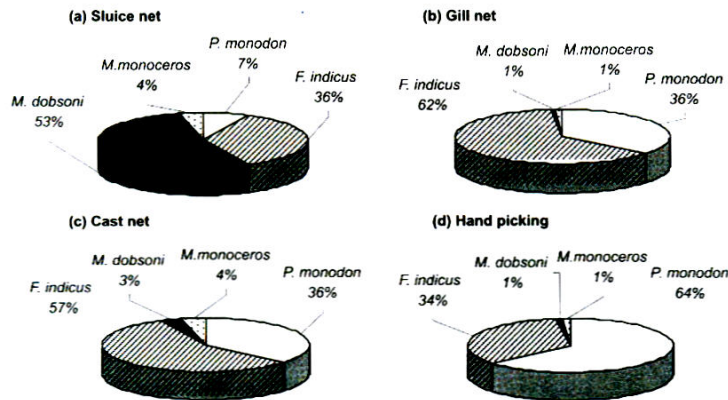


Fig. 3. Percentage of shrimp species from different fishing methods in seasonal farms

November with 24 operations and an average of 48 operations were carried out per month during the rest of the period in perennial farms. In the case of gill net, intensity of operations was maximum during February, April, May and June. In the case of cast net also, the intensity of operations was maximum during February, April, May and June indicating increased operation of these gears. In the case of handpicking, it was maximum during August which coincides with the final harvest of shrimps from the perennial farms.

The shrimp catch from different harvesting methods in perennial farms is shown in Fig. 4. In perennial farms too the shrimp catch was dominant in the sluice net (70%). However, the contribution of shrimps in gill net (15%), cast net (10%) and hand picking (5%) was higher when compared to seasonal farms. This was mainly due to comparatively larger size of the perennial farms and as harvesting by filtration alone was not sufficient use of other gear was more pronounced than that of the seasonal farms.

Sluice nets were operated throughout the year. The average catch of shrimps from sluice net in the perennial field, was 44.6 kg.operation⁻¹. The highest catch was recorded during June and the lowest during October. The average catch of shrimps in sluice net from perennial farms was 189.25 kg.ha⁻¹, during 1999-2000.

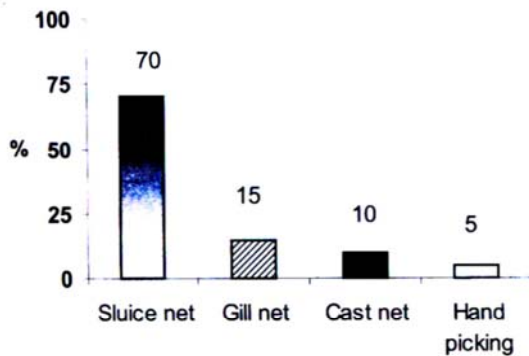


Fig. 4. Shrimp catch in % from different harvesting methods in perennial farms

Gill nets were operated during most of the months with higher periodicity during February, April and May coinciding with the final harvesting periods. The average catch of shrimps from gill net was 3.38 kg.1000 m² h⁻¹. The highest catch was recorded during March. The average catch of shrimps in gill net from perennial farms was 39.1 kg.ha⁻¹.

Cast nets were also operated for the final harvest along with gill nets. The average catch of shrimps from cast net was of 3.6 kg.unit⁻¹. The highest catch was recorded during June. An average catch of 26.7 kg.ha⁻¹ was obtained in cast nets during the period of study.

Hand picking was carried out only during the end of the season, as in the case of seasonal farms. The catch of shrimps by hand picking was 1.63 kg.person⁻¹h⁻¹.

The catch composition of different species of shrimps from the farms is shown in Fig. 5. Unlike in the case of seasonal farms, *F. indicus* is the most dominant species contributing 53% of the total shrimp catch, followed by *M. dobsoni* (43%), *M. monoceros* (3%) and *P. monodon* (1%).

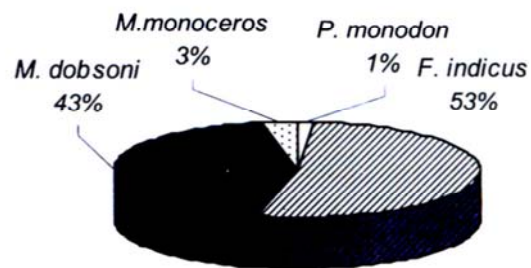


Fig. 5. Catch composition of different species of shrimps in perennial farms

George (1974) estimated the percentage composition of shrimp catch as *P. monodon* (0.7%), *M. monoceros* (4.0%), *P. indicus* 34.5% and *M. dobsoni* 60.4%. In the earlier study Pillai and Krishnan, (1998) noted 65.1% of *P. indicus* which is more or less similar to the results obtained during the previous study

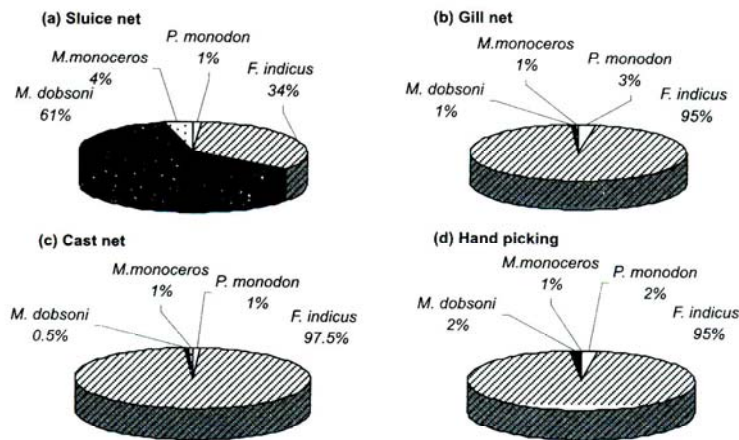


Fig. 6. Percentage of shrimp species from different fishing methods in perennial farms

indicating supplementary stocking of wild and hatchery seeds in the farms.

The percentage composition of the total shrimp catch from different fishing methods is depicted in Fig. 6. Average contribution of *P. monodon* was 0.8% in sluice net. The percentage catch of *P. monodon* was less as compared to seasonal farms. This could be due to stocking of this species in the seasonal farms. The catch in gill nets ranged from 0.3 to 1.7%, in cast net 0.1 to 0.3% and by hand picking 0.4 to 0.7% of the total shrimp catch. *F. indicus* ranked second in the order of abundance as in the case of seasonal farms. The average percentage contribution of the species in sluice net was 23.9. The contribution from gill nets, cast nets and handpicking was quite substantial forming 13.9, 9.7 and 4.8%, respectively. *M. dobsoni* was the main species as in the case of seasonal farms contributing to 43% of the sluice net catch. In the case of other gear the contribution of this species was less than 0.1% which is similar to the catch trends in the seasonal farms. *M. monoceros*: contributed only a meager percentage of the total shrimp catches in the sluice net. Average percentage contribution of this species was 2.9. The percentage contribution of this species in gill net, cast net and hand picking

was very less, contributing to 0.1 or less in the total shrimp catch of different gears. The average production from all the gears for perennial farm was 268.2 kg.ha⁻¹ during 1999-2000.

As the perennial farms are of much larger in size and deeper compared to the seasonal farms, the shrimps in the perennial farms are not easily caught by filtration alone. Therefore, other fishing gears such as gill net and cast net will have to be operated periodically to completely harvest the shrimp.

References

- Chandramohan, K., Benakappa, S. and Anjanayappa, H.N. (1999) Pokkali fisheries of Kerala, bane or boon? *Seafood Export J.* **39**, pp 13-15
- George, K.V. (1974) Some Aspects of Prawn Culture in the Seasonal and Perennial Fields of Vypeen Island. *Indian J. Fish.*, **21**, pp 1-9
- George, M.J., Mohamed, K.H. and Pillai, N.N. (1968) Observations on the paddy fields prawn filtration of Kerala, India, *FAO, Fish Rep.* **57**, pp 427-442

- George, V.C. and Brandt, A.V. (1975). Gill nets, In C. Nedelec (Ed.) *FAO Catalogue of small scale fishing gear*. Fishing News Books Ltd., England. 126 p
- George, V.C., S. Gopalan Nayar and Krishna Iyer, H. (1974) Mesh regulation in back water prawn fishing gear. *Fish. Technol.* **11**, pp 117-128
- Gopalan, U.K., Purushan, K.S. Santhakumari, V. and Kunjamma, P.P.M. (1982) Experimental studies on high density, short-term farming of shrimp *Penaeus indicus* in a "Pokkali" field in Vypeen Island, Kerala. In: *Coastal Aquaculture, Part-1: Prawn Culture*. **6**, pp 151-159 Marine Biological Assoc. of India, Cochin.
- Gopinath, K. (1956) Prawn culture in the rice fields of Travancore-Cochin, India. In: *Proc. IPFC.*, **6**, pp 419-424
- Jose, M.M., Mathew, P.M. and Susheela, J. (1987) Feasibility and economic viability of selective culture of *Penaeus indicus* in Pokkali fields. In: *Proc. Nat. Symp. Estuarine Management* (Nair, N.B. Ed.) pp 379-381, Thiruvananthapuram.
- Kurup, B.M., Sebastian, M.J., Sankaran, T.M. and Rabindranath, P. (1992) Exploited fishery resources of the Vembanad Lake: Fishery based on Pokkali fields and polders. *Fish. Technol.*, **29**, pp 21-26
- Mathew, P.M. (1993) Selective culture of prawn in pokkali fields. In: *Aquaculture Development in India Problems and Prospects*, (Natarajan, P. & Jayaprakash, V. Eds.). pp 59-66, Kerala Univ., Thiruvananthapuram.
- Mathew, P.M. and George, K.M. (1987) Preliminary observations on paddy-cum-fish culture in pokkali fields. In: *Estuarine Management* (Nair, N.B. Ed.) pp 382-388, Thiruvananthapuram
- Menon, M.K. (1954) On the paddy field prawn fishery of Travancore Cochin and an experiment in prawn culture. In: *Proc. IPFC.*, **5**, pp 131-135
- Panikkar, N.K. (1937) The prawn industry of the Malabar coast. *J. Bombay Nat. Hist. Soc.*, **39**, pp 343-353
- Panikkar, N.K. and Menon, M.K. (1956) Prawn fisheries of India. In: *Proc. IPFC.*, **6**, 328 p
- Pillai, S.M. and Krishnan, L. (1998) Biology and fishery of *Penaeus indicus* from traditional fields. In: *Advances and Priorities in Fisheries Technology* (Balachandran, K.K. Iyer, T.S.G. Madhavan, P., Joseph, J. Perigreen, P.A., Raghunath, M.R. and Varghese, M.D., Eds.), pp 48-52 Society of Fisheries Technologists (India), Cochin,
- Purushan, K.S. (1995) Adaptive farming technology: A boon to sustainable shrimp production from Kerala. *Seafood Export J.* **26**, pp 5-11
- Purushan, K.S. (1996a) Challenging scenario of scientific shrimp farming in India - An overview. *Seafood Export J.* **27**, pp 17-23
- Purushan, K.S. (1996b) Sustainable shrimp production from traditional culture systems in Kerala: An improved farming practice. *Fishing Chimes*, **16**, pp 33-35
- Purushan, K.S. (1996c) Traditional methods of prawn farming in India - Different farming systems-merits and demerits evaluation of production economics and its scope for avocation and rural development. *Seafood. Export. J.* **27**, pp 11-15
- Purushan, K.S. (1989) Semi intensive shrimp farming and its relevance in Kerala. *Seafood. Export. J.* **21**, pp 9-15

- Raman, K. and Menon, M.K. (1963) A preliminary note on an experiment in paddy field prawn fishing. *Indian. J. Fish.*, **10**, pp 33-39
- Srinath, K., Sridhar, M., Kartha, P.N.R. and Mohanan, A.N. (2000) Group farming for sustainable aquaculture. *Ocean and Coastal Management* **43**, pp 557-571
- Unnithan, K.A. (1985) A guide to prawn farming in Kerala. CMFRI Spec. Publ. Cochin, India No. 21, 92 p
- Unnithan, K.A. (2000) Shrimp farming – a status review. In: *Marine Fisheries Research and Management* (Pillai, V.N. & Menon, N. G. Eds.). pp 724-746 Central Marine Fisheries Research Institute, Cochin
- Verghese, P.U., Ravichandran, P. Pillai, S.M. (1982) Growth and production of *Penaeus monodon* Fabricius in short-term field rearing experiments. Cochin (India). In: *Coastal aquaculture, Part-1 Prawn Culture*. 419 p. Marine Biological Assoc. of India, Cochin.