Observations on the monsoon prawn fishery in Kerala

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The ban on trawling in Kerala from June 15th to July 30th coincides with the southwest monsoon. During the period fishermen venture into the sea with their traditional/motorised crafts and gears such as thermocol boats (Alapuzha) and Thanguvallom (Ernakulam and Thrissur). The latter is operated with outboard engines and operate up to 8 km from the shore. The thermocol boats fish very near the shore (up to 3 km). The gear operated are ring seines or *thangu vala* and gill nets. The unique phenomenon in the monsoon season known as mud-bank or 'chakara' is characterised by calm areas close to the shore. The area marked by nutrient rich water upwelled from the bottom layers to the surface favors aggregation of fishes and crustaceans and hence ideal for fishing. This plays a pivotal role in the livelihood of fishermen as it provide them opportunity to catch large quantities of fishery resources during the lean fishing period. But over the years there has been inconsistency in the appearance of mud bank with certain years having very poor mud bank formations. Erratic monsoons may be a reason for the diminishing mud banks and declining trend in the mud bank fishery (Kurup, 1979, *Mar. Fish. Infor. Serv. T&E Ser.*, 12:12-13).

The monsoon prawn fishery in Kerala including the mud bank areas was studied based on samples collected during July 2015 from different fish landing centres in the Alapuzha (Punnapra, Paravoor, Kappakadavu, Thottappally), Ernakulam (Kalamukku, Chellanam), Thrissur (Chavakkad) and Malappuram (Chettuva, Ponnani) districts. Prawn samples were collected from both mud-bank and non-mud bank areas for the study. Comparison of the sex ratio of *Metapenaeus dobsoni* and *Fenneropenaeus indicus* and maturity stages of females between mud-bank and non-mud bank samples was done. Means of total length, weight, juvenile composition, length weight relationship and gastro somatic index of males and females of mud bank and non-mud bank samples were compared using standard methods.

Prawn fishery: An estimated 17377 outboard ring seine units and 17684 non-motorized ring seines were operated during the period (Table 1). Outboard

Table 1 Effort expended (units & hours) by different gears in the districts during July 2015

District	Alappuzha		Ernakulam		Thrissur		Malappuram	
	Units	Hours(h)	Units	Hours(h)	Units	Hours(h)	Units	Hours(h)
OBGN	563	4680	901	2447	3627	8917	731	1881
OBRS	11396	25629	2720	7473	2763	4756	687	811
OBTN	_	_	_	_	4234	6288	338	676
NM	10080	15780	_	_	7387	13112	217	477
MRS	101	304	1142	3153	1446	2877	658	1315

OBGN-outboard gill net, OBRS - outboard ring seine, OBTN - Outboard trawl net, NM - Non - mechanised. MRS - Mechanised ringseine

ring seines expended maximum effort in terms of hours of operation (382669 h) followed by non-motorised ring seines (29369 h). Maximum catch per hour and catch per unit were observed in the outboard ring seines – 128.3 kg/unit and 58.3 kg/h respectively. In all the districts observed *Metapenaeus dobsoni* was the dominant species while *Parapenaeopsis stylifera* was recorded only in the Thrissur district (Table 2).

Mud bank fishery was observed in Punnapra, Kappakadavu, Paravoor, Purakkad (Alapuzha), Chavakkad (Thrissur) and Chettuva, Ponnani (Malappuram). Biological parameters of samples from different landing centres are given in Table 3. *M. dobsoni* dominated the catches followed by *F. indicus*. The dominance of *M. dobsoni* with catch of *F. indicus* and *P. stylifera*. (Regunathan *et al.*, 1972, CMFRI Bulletin: 30; Kurup, 1979, *Mar. Fish. Infor. Serv. T&E Ser.*, 12:12-13) has been reported earlier. In the present study low catches of *P. stylifera* were observed from Chavakkad in Thrissur district. The low salinity during monsoon probably triggers the migration of this marine species to deeper waters. The biological data of the species from the centres covered was analysed. Overall sex ratio (male : female) in *M. dobsoni* was 1:1.16. Females ranged in total length from 50 to 114 mm and males 53 to 97 mm. 48.7% were in the spent stage followed by 17.5% mature, 10.2% late mature, 14.9% early mature and 8.7% immature. Juveniles of females (1.7%) were more than males (0.3%). In *F. indicus* females ranged in total length from 95 to 180 mm

Table 2. Species wise gearwise landings (kg) of prawns in the four districts

Species/District	OBGN	OBRS	OBTN	NM	MRS	Total
F. indicus						
Alapuzha	-	147976	-	5237	-	153213
Ernakulam	771	31685	-	-	2098	34554
Thrissur	17488	12895	26394	17736	81464	155977
Malappuram	1764	15470	2591	-	40768	60593
Total	**20023**	**208026**	**28985**	**22973**	**124330**	**404337**
M. dobsoni						
Alapuzha	-	858774	-	62747	-	921521
Ernakulam	5554	306747	-	-	141505	453806
Thrissur	11313	649354	587513	30077	1109163	2387420
Malappuram	-	222521	67383		327543	617447
Total	**16867**	**2037396**	**654896**	**92824**	**1578211**	**4380194**
P. stylifera						
Thrissur	-	393	5685	-	-	6078
Total	-	**393**	**5685**	-	-	**6078**

OBGN-outboard gill net, OBRS - outboard ring seine, OBTN - Outboard trawl net, NM - Non - mechanised. MRS - Mechanised ringseine

Table 3. Biological parameters of *M. dobsoni* and *F. indicus* from different landing centres

Ponnani	***F. indicus***		***M. dobsoni***	
	Male (n=40)	**Female (n=53)**	**Male (n=30)**	**Female (n=87)**
Total length (mm)	100-156	95-175	78-105	68-92
Weight (g)	5.4-48.1	6.9-31.6	3.6-11	3.5-6.2
Sex ratio (M:F)	1:0.75		1 : 2.9	
Juvenile distribution (%)	11.32	10	0	1.1
Punappra	***F. indicus***		***M. dobsoni***	
	Male (n=72)	**(n=71)**	**Male (n=390)**	**Female (n=509)**
Total length (mm)	111-162	95-180	54-96	61-114
Weight (g)	6.5-47.5	9.2-31.5	1.4-6.6	1.7-10.8
Sex ratio (M:F)	1 : 0.98		1 : 0.76	
Juvenile distribution (%)	20.8	19.7	6.9	2.8
Kappakadavu	***F. indicus***		***M.dobsoni***	
	Male (n=14)	**Female (n=11)**	**Male (n=168)**	**Female (n=103)**
Total length (mm)	125-165	103-151	53-92	50-105
Weight (g)	6-28	12.7-39.9	1.1-11.3	1.3-5.1
Sex ratio (M:F)	1 : 0.78		1 : 0.69	
Juvenile distribution (%)	-	-	-	-
Paravoor	***F. indicus***		***M. dobsoni***	
	Male (n=37)	**Female (n=43)**	**Male (n=299)**	**Female (n=149)**
Total length (mm)	105-158	108-175	66-96	68-110
Weight (g)	8.8-31.2	6.3-48	1.7-9.8	2.2-10.9
Sex ratio (M:F)	1 : 1.15		1 : 0.59	
Juvenile distribution (%)	5.5	0	0	2.7
Purakkad	***F. indicus***		***M. dobsoni***	
	Male (n=11)	**Female (n=18)**		
Total length (mm)	112-149	132-170	No sample	
Weight (g)	10.3-23.3	18.4-27.4		
Sex ratio (M:F)	1 : 0.61			
Juvenile distribution (%)	5.5	0		
Chettuva	***F. indicus***		***M. dobsoni***	
			Male (n=24)	**Female (n=111)**
Total length (mm)	No sample		63-97	75-108
Weight (g)			1.8-6.3	2.9-9.3
Sex ratio (M:F)			1 : 0.72	
Juvenile distribution (%)			4.2	1.8
Chavakkad	***F. indicus***		***M. dobsoni***	
	Male (n=11)	**Female (n = 76)**		
Total length (mm)	136-146	153-162		No sample
Weight (g)	16.5-29.2	21.3-42.6		
Sex ratio (M:F)	1: 0.77			
Juvenile distribution				

Table 4. Maturity stages (%) of prawns from different landing centres

	M. dobsoni					*F. indicus*				
Centre	**IM**	**EM**	**LM**	**M**	**SP**	**IM**	**EM**	**LM**	**M**	**SP**
Ponnani	10	-	-	2.5	87.5	1.1	4.6	11.5	25.3	57.5
Punappra	31	-	-	-	69	6.9	17.2	12.1	17.2	46.7
Kappakadavu	18.8	-	-	-	81.8	37.9	6.8	8.7	8.7	37.9
Paravoor	27.9	-	-	7	65.1	2.7	28.9	8.7	12.8	47
Purakkad	-	-	9.1	-	90.9	No sample				
Chettuva	2	4	7	30	68	No sample				

IM-Immature, EM-Early maturing, LM-Late maturing, M-Mature, SP-Spent

Table 5. Comparison of biological information of *M. dobsoni* and *F. indicus* in mud-bank and non-mud-bank areas

	Mud bank		Non mud bank	
	Female	**Male**	**Female**	**Male**
M. dobsoni				
Mean Total length (mm)	90.6	76.6	93.1	78.2
Mean weight (g)	5.5	3.4	5.5	3.11
Sex ratio (M:F)		1 : 1.16*		1 : 1.3
Juvenile%	1.7	0.3	0	0
b value	2.96*	2.57*	3.03*	2.4*
Gastro Somatic Index	0.01	0.08	0.009	0.006
F. indicus				
Mean Total length (mm)	140.2	135.2	134	126
Mean weight (g)	21.7	18.4	19.4	17.7
Sex ratio (M:F)	-	1 : 1.13	-	1 : 1.04
Juvenile%	13	15.8	19	13.6
b value	3.1	3.2	3.5	3.1
Gastro Somatic Index	1.91*	1.62	1.0*	1.5

*p<0.05

Table 6. Comparison of maturity stages (%) from mud bank and non mud-bank areas

Species	**Mud bank**					**Non mud bank**				
	IM	**EM**	**LM**	**M**	**SP**	**IM**	**EM**	**LM**	**M**	**SP**
M. dobsoni	8.7	14.9	10.2	17.5	48.7*	1		1	38	60
F. indicus	22.5			1.6	75	19				81

IM-Immature, EM-Early maturing, LM-Late maturing, M-Mature, SP-Spent

and males from 100 to 162 mm, ratio of male to female being 1:1.10. Spent stages dominated (75%), mature shrimps being very meagre (1.6%). Immature shrimps formed 22.5%. Juvenile percentage was 13% in females and 15.8% in males. The Gastro Somatic Index(Ga.SI) in *M. dobsoni* ranged from 0.004 to 0.01 in females and 0.004 to 0.08 in males. In *F. indicus* the Ga.SI was 0.89 to 1.91 in females and 0.7 to 1.62 in males. In *M. dobsoni*, 85 to 96% of the gut content consisting of detritus and rest had algae

and crustacean fragments. In Ponnani, 20% of *M. dobsoni* had their gut full and in samples collected from Punnapra, 31.4% of the prawns had 1/4 filled guts and rest were with empty stomachs. In Chettuva, all *M. dobsoni* had 1/4 to 1/2 filled guts while in Kapakadavu, only 50% had full guts. In Punnapra, 34.2% of *F. indicus* sampled had empty stomachs.

Non mud-bank fishery was observed in Kalamukku and Chellanam. Female *M. dobsoni* ranged from 74 to 108 mm in total length and males from 66 to 90 mm. 60% of the prawns were in the spent stage followed by 38% mature, 1% each in immature and late mature stages. Juveniles were absent. Sex ratio was 1:1.3. In *F. indicus*, females ranged in total length from 109 to 151 mm and males from 105 to 150 mm. Male to female ratio was 1:1.04. 19% of the prawns were immature and 81% in the spent stages. Juveniles constituted 19% in females and 13.6% males. In *M. dobsoni* the Ga.SI ranged from 0.001 to 0.009 in females and 0.002 to 0.006 in males. In *F. indicus*, the Ga.SI ranged from 0.25 to 1.0 in females and 0.42 to 1.5 in males. Nearby 95% of the guts of *M. dobsoni* was dominated by detritus and rest by algae.

A comparison of prawns sampled from mud bank and non-mud bank areas was made (Table 5 & 6). In *F. indicus* there was no significant variation between the mean total length, mean weight, sex ratio, juvenile contribution and maturity stages in females and males of the two areas. Length weight relationship analysis revealed no significant difference ($p>0.5$) in the slope (b value) between the females and between the males of the mud-bank and non-mud bank samples. The gastro-somatic index showed significant variation only among the females ($p<0.05$) of the two areas, being higher in the mud bank samples.

In *M. dobsoni* there was no significant variation in the mean total length and mean weight, but significant difference in the sex ratio and maturity stages in the samples from the mud-bank and non-mud bank areas. The slope of the regression lines in the length weight relationship was significantly different deviating from the isometric value 3 in the two areas. The gastro-somatic index did not show any significant variation in females and males of the two areas ($p>0.05$).From this study it is concluded that there is not much variation in the biology of the two species sampled from the mud-bank and non-mud bank areas. During monsoon nearly 85% of the females of both the species had mature/spent gonads irrespective of their association with a mud-bank. This indicates that breeding takes place during monsoon and mature females from deeper waters migrate to nearshore areas reaffirming the necessity for trawl ban. The migration of mature females is most probably due to the strong upwelling that happens in the coastal waters during the south west monsoon.