

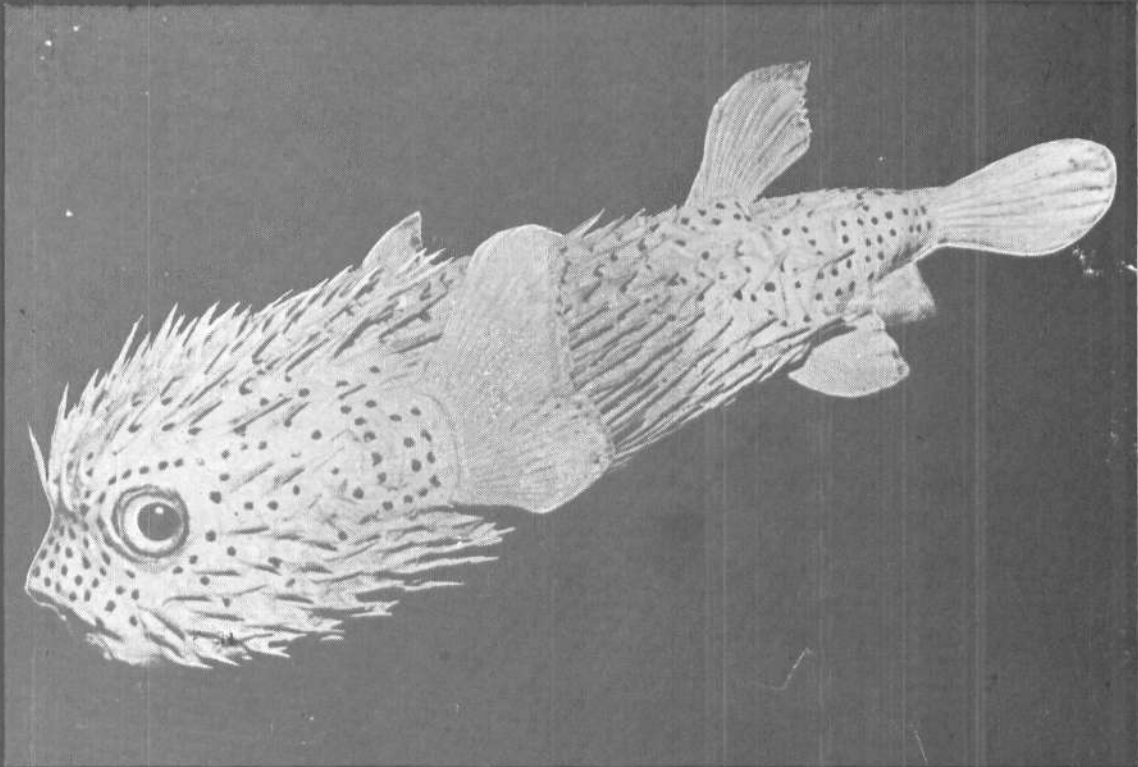


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भारतीय कृषि अनुसंधान परिषद्  
INDIAN COUNCIL OF AGRICULTURAL RESEARCH

## SHOALING OF *METAPENAEUS DOBSONI* IN THE INSHORE WATERS OF MALPE

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### Introduction

Along the Dakshina Kannada coast the monsoon months (June-August) in every year are usually observed as closed season by the mechanised fishing boats. During this time a variety of artisanal crafts and gears are operated by the local fishermen. These include *Ranibale* and *Matabale* (mini purse seines), *Kairampani* (shore seine), *Pattabale* and *Kanthabale* (gill nets) and mini trawls - all of which are operated from motorised country boats. Their catches are mainly comprised of pelagic fishes and a few demersal fishes including shrimps.

On July 28 of the 1995 monsoon season, large shoals of the *Kadal* shrimp *Metapenaeus dobsoni*, locally known as *Thembael* were seen at the surface between 10-20 m depth south of Malpe (Lat 13° 20' N; Long 74° 45' E). Shoals were sighted as dark patches on the surface and made characteristic shrimp-like jumps when disturbed. The news of the appearance of shrimp shoals spread throughout the district and most of the boat seines (mini purse seines) in the area converged to Malpe.

### Catch and effort

The fishery lasted for 6 days (from 28-7-'95 to 2-8-'95) and a maximum catch of 160 t was caught on the first day (Fig. 1). On 31-7-'95 and 1-8-'95, inclement weather with strong winds forced the fishermen back to port. Subsequently

on 2-8-'95 the catch dwindled to 10 tonnes. The total catch during the period is estimated at 470 t. Almost 99% of the catch was taken by *Matabale* units and the rest by mini trawls the latter being operated at very shallow depths (less than 5 m). Around 130 *Matabale* units and 140 mini trawls were employed during peak fishing.

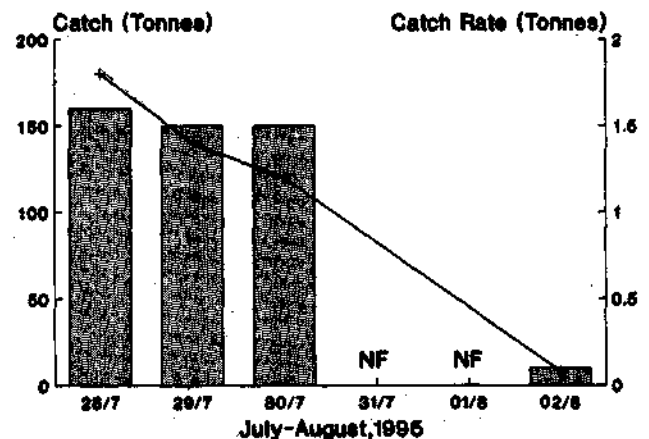


Fig. 1. Total catch and catch rate of *M. dobsoni* from 28 July to 2 August at Malpe.

Each *Matabale* unit used a variable number of 1-3 canoes as carrier boats making estimation of effort a difficult exercise. The catch rate was initially high at 1.8 t per boat and showed a declining trend with increase in number of units (Fig. 1). The price per kg of shrimp was initially Rs. 80 and by the last day of the fishery it dropped to Rs. 60. The estimated value of the fishery was Rs. 32.9 million and roughly each

Matabale unit earned on an average about Rs. 250,000 during the six days.

### Size, sex and maturity

The samples from boat seines were composed uniformly of large adults of the size range (75-120 mm TL). Males formed 55% of the population with sizes ranging from 75-100 mm (mean size 87 mm) and with a single mode at 88 mm (Fig. 2). All males were in mature state.

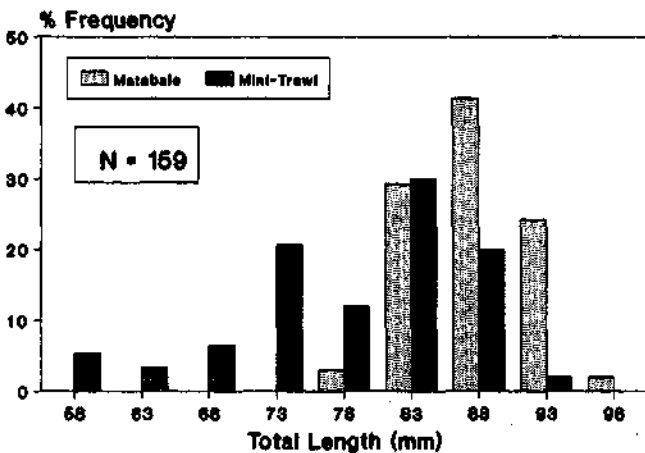


Fig. 2. Length frequency of male *M. dobsoni*.

Females formed 45% of the population having size range 85-120 mm (mean size 104.5 mm) and modal size at 108 mm (Fig. 3). Majority of the females (66%) were in late maturing and mature stages. About 14% were in spent condition and the rest (20%) were immature. Around 43% of the females had impregnated thelyca.

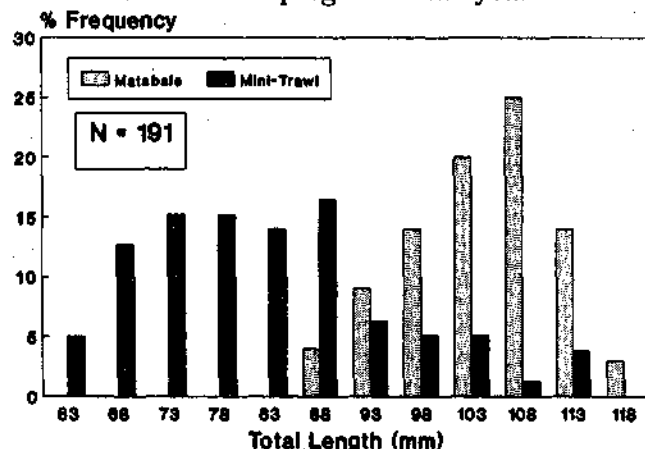


Fig. 3. Length frequency of female *M. dobsoni*.

In contrast, *M. dobsoni* samples from mini trawls showed smaller size range (55-115 mm TL). The sex ratio was similar to the pelagic

population with males forming 54%. Males were in sizes ranging from 55-95 mm (mean size 78.5 mm) with modes at 78 and 88 mm. The size range of females was 60-115 mm (mean size 82.5 mm) with modes at 73, 78 and 88 mm. Most females (87%) were in immature stage, 4% in late maturing and 9% in spent condition. Only 11% of the females showed impregnated thelyca.

### Hydrography

Hydrographic conditions off Malpe were typical of coastal waters during monsoon (see Table 1). The dissolved oxygen content did not differ much between the surface and bottom at 10 m depth and the salinity at 10 m station was low due to the heavy influx of rain water from the Udayavara river. The hydrographic data from FORV *Sagar Sampada* (cruise 134) which occupied stations in the same latitude during August 7 to 14 was obtained. The data indicated strong upwelling as evident from the observation of thermocline at 15-20 m depth and the oxygen minimum (0.5 ml/l) layer at a depth of 30 m.

TABLE 1. Hydrographic parameters off Malpe at 10 m depth, (surface and bottom)

Parameters	29-7-'95	1-8-'95	
	(Surface)	(Surface)	(Bottom)
Air temperature (°C)	29.00	27.00	-
Water temperature (°C)	27.20	26.70	26.20
pH	8.01	8.00	8.00
Salinity (ppt)	27.98	29.69	31.49
Dissolved oxygen (ml per l)	4.72	4.03	3.60
Alkalinity (mg per l as CaCO <sub>3</sub> )	96.94	102.04	105.10
Phosphate (µg at per l)	0.54	0.60	0.54
Nitrates (µg at per l)	1.44	0.96	0.96
Nitrites (µg at per l)	0.15	0.13	0.12
Silicates (µg at per l)	21.00	17.00	14.00

### Previous occurrences

Earlier reports show that the present shoaling of *M. dobsoni* is not an isolated event along the southwest coast of India. Since 1980, there are several reports of *M. dobsoni* shoals becoming vulnerable to capture by seine nets along Kerala-Karnataka and Goa coasts. A single instance of such shoaling has also been reported off east coast (Madras) during July, 1988 (Sankarlingam, 1989). A list of published previous occurrences along the southwest coast and their magnitude is given in Table 2.

TABLE 2. List of previous occurrences of *M. dobsoni* shoals along SW coast of India together with magnitude

Year	Month	Place	Est. catch (t)	Gear used	% Mature	Size range (mm)	Ref.
1980	Sep.	Mangalore	395	PS	NA	NA	1
1980	Sep.	Malpe	122.2	PS	NA	NA	1
1981	Sep.	Mangalore	6.6	PS	NA	NA	1
1981	Sep.	Malpe	15	PS	NA	NA	1
1981	Dec.	Kochi	0.62	PS	NA	NA	1
1982	Jan, Feb, Apr.	Kochi	114.4	PS	66	55-120	1
1982	Sep.	Mangalore	440.4	PS	67	76-120	1
1982	Sep.	Malpe	320.9	PS	42.4	86-110	1
1983	Sep.	Mangalore	1,139.5	PS	68.7	83-128	2
1983	Sep.	Malpe	297.2	PS	80.6	83-123	2
1983	Sep.	Gangolli	7.6	PS	NA	NA	2
1984	Sep.	Goa	74.8	PS	NA	NA	3
1985	May, Sep, Nov.	Goa	2.3	PS	NA	NA	3
1985	Jul.-Aug.	Ullal	61.6	MPS	>60	63-123	4
1986	Jul.-Aug.	Ullal	107	MPS	38.7	58-118	5
1995	Jul.-Aug.	Malpe	470	MPS	80	75-120	Present

PS = Purse seine.

MPS = Mini purse seines (Matabale/Ranibale).

NA = Not available.

1 = Nair *et al.* (1982); 2 = Sukumaran (1985);

3 = Kulkarni *et al.* (1987) 4 = Sukumaran (1987a);

5 = Sukumaran *et al.* (1988).

From Table 2, it can be seen that the present shoal of *M. dobsoni* is second in terms of magnitude of catch. During the 1980-'86 period, shoaling occurred almost every year with the exception of 1984 along Mangalore-Malpe coast. In Cochin *M. dobsoni* shoals were seen only in 1981 and 1982 and mainly during late post-monsoon and premonsoon months. The 1983 shoals were the largest in size and covered a wider area (Mangalore-Gangolli: ca 100 km). It is interesting to note that since 1985 with the introduction of *Matabale/Ranibale*, the shoals have been largely exploited by these mini purse seiners (MPS) during July-August itself. So much so, the purse seiners (PS) have not been able to capitalize on the shoals when they start operations in September. After 1986, there are instances of sporadic occurrences of *M. dobsoni* in PS and MPS gears, but the catches were not substantial.

It is clear that *M. dobsoni* exhibits a tendency to form large pelagic shoals during the monsoon season albeit at irregular intervals,

thus becoming liable to capture by purse seining gear (both mechanised and artisanal).

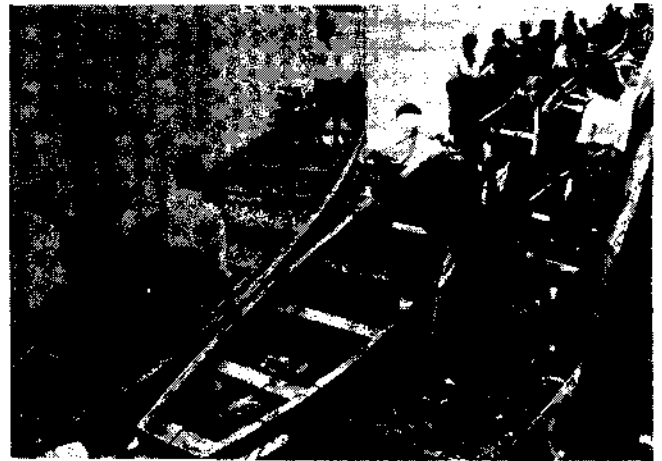


Fig. 4. *Metapenaeus dobsoni* catch being landed at Malpe Bunder by carrier boats of *Matabale* units on 29-7-'95.

#### Possible reasons for the shoaling behaviour

The questions as to why do the shrimps aggregate or shoal, and why do they ascend the water column are pertinent. Shrimps like *M. dobsoni* are demersal species exploited mainly by trawlers and generally, penaeid species do not exhibit schooling/shoaling behaviour. The only well known example of shoaling shrimp species is the Australian School prawn *Metapenaeus macleayi*, which form large shoals and is particularly susceptible to capture when schooling. The reasons for this schooling behaviour are not clear, but it is thought to be unrelated to mating or spawning (Ruello, 1977). The Indian white shrimp *Penaeus indicus* has also been reported



Fig. 5. Shrimp catch in a *Matabale* unit. Note predominance of shrimp with ripe ovaries.



Fig. 6. Shrimp heaped for auction at the landing centre.

to form shoals sporadically and during such times they have been captured by purse seiners as in Cochin (Nair and Narayanankutty, 1985).

The monsoon period along the southwest coast of India is characterised by turbulent seas, wind, strong southward current and upwelling of cold nutrient rich and oxygen deficient deep waters. The ascent of the oxygen minimum layer during this time can push shorewards many demersal finfish species like threadfin breams and crustaceans like *M. dobsoni* (James 1992). Available hydrographic data also indicate strong upwelling during August (1995) along this coast. Therefore, it is quite probable that *M. dobsoni* were pushed up into the surface layers by this physical phenomenon. Nair and Narayanankutty (1985) also attributed the appearance of surface shoals of *P. indicus* to coastal upwelling off Cochin.

Their appearance as surface shoals could be due to the ascent of the oxygen minimum water



Fig. 7. Catch packed in ice for transportation to processing houses.

which is a typical phenomenon of the southwest monsoon season along the southwest coast.

The implications of such large scale capture of a breeding population in a short period of time have been discussed by earlier workers (Nair *et al.*, 1982; Sukumaran *et al.*, 1988). They opined that since this fishery is mainly comprised of large size individuals which have reached their maximum growth and would already have spawned 2-3 times, there are no conservation problem whatsoever. In the present study a more shallow and demersal population of *M. dobsoni* caught by mini trawls had entirely different population characteristics (smaller size and year class and roughly 80% in immature stage). Therefore a close watch is needed on the behaviour of the stock in future years.

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