OBSERVATIONS ON SOME ASPECTS OF BIOLOGY OF THREADFIN BREAM *NEMIPTERUS MESOPRION* (BLEEKER) FROM KAKINADA

V. SRIRAMACHANDRA MURTY

Kakinada Research Centre of C.M.F.R. Institute, Kakinada.

ABSTRACT

The length-weight rela*k>nisihiip of *N. mesoprion* can be described by the equation log **W** = **-4.650901** + 2J877071 log L. Feimafes attain first maturity at a length of 100 mm. Thfe species is a fractiiioinial spawner, releasing the ripe ova in two spawning acts editing the Single spawndlng season: December-April. It is estimated that the species attains **140, 1*5** and 205 mm at the completion of first, second and third years, respectively. The estimated growth parameters are: L <x = 219 mm, K = 0.83248 and t„ = -0.256198 years.

INTRODUCTION

As part of investigations on the resource characteristics of threadfin breams, studies on the biology of *Nemipterus mesoprton* (Bleeker) were initiated at Kakinada in 1976. The species was first reported from India only in 1976 (Murty MS) and there is no published information on any aspect of biology of this species from India. This species forms a seasonal fishery at Kakinada and the data collected from the trawl catches during January 1976-March 1980 arc utilised for the study.

MATERIAL AND METHODS

Samples were obtained at weekly intervals from the catches of trawlers operating off Kakiniada. Since this species forms a seasonal fishery at Kakinada, samples were collected as and when it occurred in the catches. Samples were brought to the laboratory for data on total length.* weight, sex and stage of maturation. Data were taken from fresh specimens only. The length-weight relationship was calculated by the method of least squares using the formula $W = a L^n$ or log W = log a + n log L (Le Cren 1951), where W =weigbt in g, L = length in mm, >a = a constant and n = exponent. While the maturation stages were allotted on the basis of macroscopic examination of fresh ovaries, ova-

As the upper caudal lobe of this species is produced amid some times the filament as broken, the total length *m* meeisuredi from the tip of snout to tip of lower caudal lobe.

diameter measurements were taken from ovaries preserved in 4% formalin. For mieasurement of ova diameters, small pieces from the middle of the ovaries Were taken; the ova Were teased out on a microslide and measured under a microscope with the help of an ocular micrometeir at a set magnification where each micrometer division (md) is equal to 0.019 mm. In taking diameter measuremenits the procedure of Clark (1934) was followed.

LENGTH-WEIGHT RELATIONSHIP

Th study is based on 295 females ranging from 83 nun and 9 g to 177 mm and 69 g and, 311 males ranging from 86 mm and 8 g to 197 mm and 106 g, collected during January 1976-March 1980. The relationship was calculated separately for the sexes and the equations are:

females : $\log W = -4.642866 + 2.87319 \log L$

males : $W = -4.65377 + 2.87966 \log L$

The significance of difference between regression coefficients of males and females was tested by analysis of covariance (Table 1) following Snedeoor and Cochran (1967). It is observed that the difference is not significant at *5%* level. Hence the data of males and females were pooled and a single equation was calculated for the species from Kakinada which is:

$\log W = -4.650901 + 2.877071 \log L.$

TABLE 1. *Comparison of regression Urns of Length-weight relationship of males and females of* N. meisoprion.

						Deviation from Regression		
	df	SX^2	SXy	$2y^2$	Reg. 0 > ' efficient	df	SS	MSS
Within								
Males	310	1.422756	4.097065	12.007835	2.87966	309	0.209648	
Females	294	1.207296	3.468791	10.304630	2.87319	293	0.338134	
						602	0.547782	0.000909
Pooled	604	2.630052	7.565856	22.312465	2.87669	603	0.547809	0.000908
		Differences between slopes				1	0.000027	0.000027
Between	1	0.333072	0.959265	2.762693				
Total	605	2.963124	8.525121	25.075158	2.877072	604	0.547771	
		Between adjusted means				1	0.000038	0.000038

Slopes F = 33.666, df = 602, 1 Not significant at 5%

Elevations F = 23.89, df = 603, 1 Not significant at *5%*

MATURATION AND SPAWNING

As in the case of *N. japonicus* (Munty MS) the testis in *N. mesoprion* is very small even in mature fishes thus making it difficult to study the process of maturation in males. Hence, only females are considered for this purpose. A total of 295 females ranging from 83 to 177 mm were examined. The stages of maturation are fixed following those fixed for *N. japonicus* (Marty MS) from Kakinada.

i. *Length at first maturity:* Fishes in the stages III-VII of maturation are taken as mature for this purpose. The percentage-frequency distribution of mature females in each length group are shown in figure 1. Fishes above 90 mm sihowed mature ovaries. The data show that 50% of the fish are mature at 100 mm. Henioe 100 mm is taken as the length at first miaturity of female *N. mesoprion* at Kakinada. In this connection it may be mentioned that the smallest female with running ripe ovary obtained in the present study measured 110 mm.

ii. *Spawning:* The ova-diameter-frequency distribution in mature and ripe ovaries are presented in figure 2. It may be seen that the ova are distributed around two modes (Fig. 2; A & B) in mature ovaries (st. V): one mode at 0.152 mm (7-8 m.d.) and the other at 0.418 mm (21-22 m.d.); the former group constitutes maturing translucent ova and the latter constitutes mature opaque ova. In running ripe females (fig. 2, C & D) a group of ova ace separated and form

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LENGTH OHOUPS

PIG. 1. Percentage-frequency distribution of mature female *N. mesoprion* in different length groups.

modes at 0.722 mm (37-38 m.d.) or 0.760 mm (39-40 m.d.). These constitute the ripe ova with translucent yolk and distinct oil globule. In fact, there is evidence of spawning being almost complete (fig. 2, D) by the poor representation of ripe ova in the ovary. Apparendy, the matore ova forming a mode at 0.418

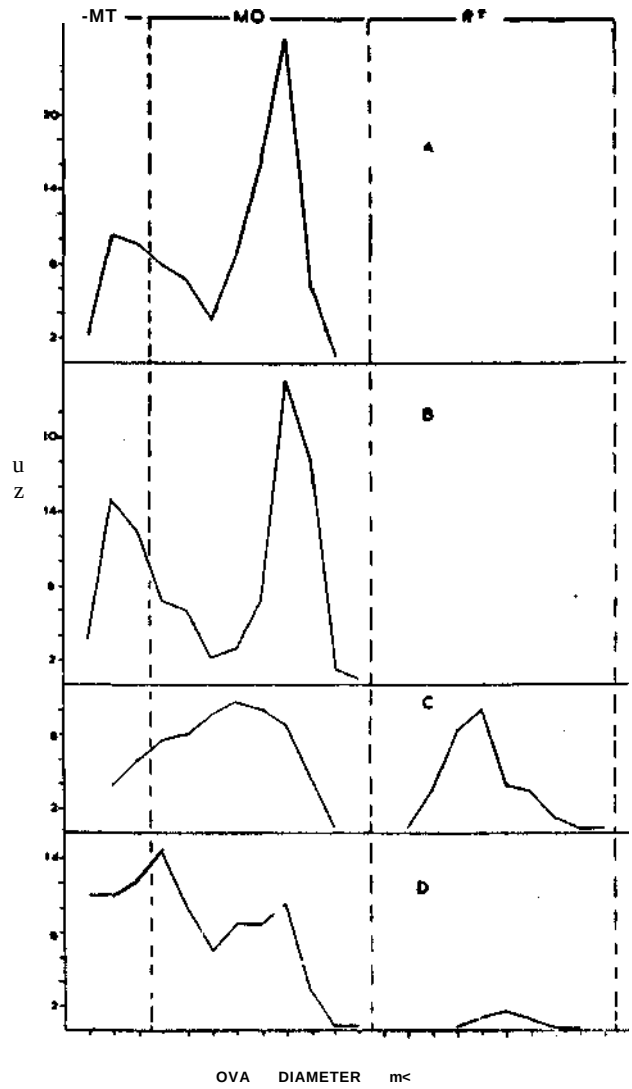


FIG. *2.* Ova-dfeimeter-fiiequecy distribution *in* mature and ripe ovariesi of *N. mesoprion:* A & B. Mature ovaries (st V) collected on 12-1-79 and 7-11-79.

C & D. Ripe (st VI) ovaries collected on 12*1-79.

MT: Maturing translucent ova, MO: Mature opaque ova. RT: Ripe translucent ova wMi oil glubule.

mm in mature ovaries (fig. 2, A & B) have undergone the process of maturation and reached the modal diameters of 0.722 mm and 0.760 mm (Fig. 2 C & D) in ripe ovaries. In ripe ovaries (**St. VI)** a mode can also be seen in the mature opaque ova at **0.418** mm **(21-22 m.d.)** (Fig. 2, **D)** or at **0.342** mm **(17-18** m.d.) (Fig. 2, C). These modes are the same as those representing mature ova in stage V (Fig. 2A & B). Since the time taken for the maiture ova in stage V to become ripe (St. **VI)** and be released is generally short, it is reasonable to state that *N. mesopriort* is a fractional spawner releasing ripe ova in two batches during the single spawning season. A similiar situation is obtained in a related species *N. japonicus* from Kakinada (Murty, MS).

For purpose of determining spawning season only females above the length at first maturity are taken into consideration. Since data are not available continuously in all months in different years, the data pertaining to the corresponding months of different yearis are pooled and the monthly percentage-frequency distribution of individuals in different stages of maturation are shown in Table 2. It is observed that fishes in stage V occur during February-March and November-December whereas those in ripe condition (St. VI) occur during January-March and December. Though the data are not quite adequate to determine the spawning season correctly it appears that this species spawns in the sea off Kakinada during December-April period with peak during January. The fact that ripe oozing females occur in the catches in considerable numbers during certain months indicates that *N. mesopriort* spawns in the present trawling ground off Kakinada.

TABLE 2. *Monthly percentage frequency distribution of adult females in different stages oj maturation of* N. mesoprion.

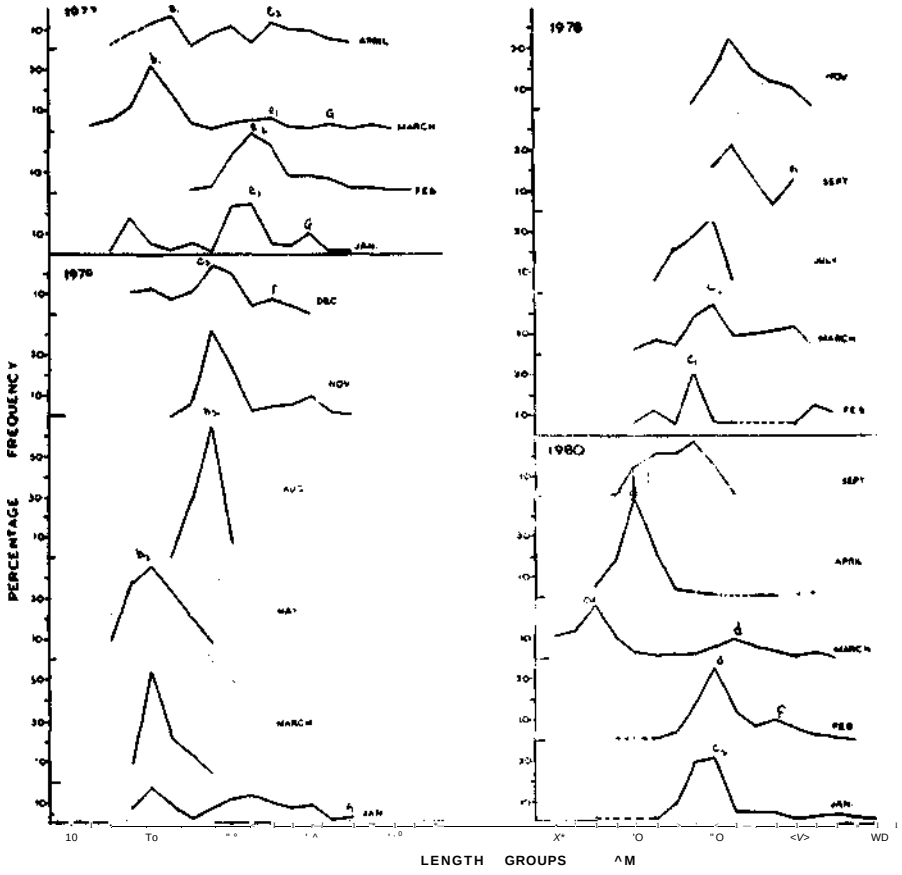
Months	No. examined	11	**III**	IV	V	VI	**VII**
January	77	5.2	26.0	39.0	—	**27.3**	2.5
February	77	3.9	61.0	23.4	2.6	7.8	1.3
March	25	16.0	36.0	36.0	8.0	4.0	
April	13	62.0	31.0	7.0	—		
September	4	25.0	75.0	—	—		
November	39	20.5	30.8	46.2	2.6	—	
December	24	4.2	45.8	33.3	4.2	4.2	8.4

No data for May-August and October.

AGE AND GROWTH

For purpose of study of age and growth, data on the length-frequency distribution collected during January 1977-September 1980 are used. A total of 2386 specimens ranging from 32 to 215 mm were examined. The monthly length-frequency distribution of iV. *mesoprion* in different years are shown in figure 3. It may be seen that data are available for only a few months in different years. This is mainly due to the fact that this species forms a seasonal fishery during

January-March and during other months it becomes scarce in the catches (Murty MS). Even during the short periods for which data are available, the modes in the monthly length-frequency distribution do not show clear-cut progression making the estimation of age difficult. However, an attempt is made here to estimate the growth rate and age by foilowinig the modal progression (wherever possible) during short intervals of one to four months. This has been done deliberately, in spite of the limitations involved because there is no information on age and growth of this species from India. It may be seen from figure 3, that



FIG, 3. Monthly length-frequency distribution of *N. mesoprion* in different years.

the mode (a) at 50 mm in March 80 can be traced to 70 mm in April 80 giving a growth of 20 mm in one month. The mode (bl) at 70 mm in March 77 is traceable to 80 mm in April 77 giving a growth rate of 10 mm per month; another mode (b2) also at 70 mm in May 79, can be traced to 100 mm in August 79, in three months, giving an average growth rate of 10 mm per month. The mode at 100 mm (el) in February 78 can be traced to 110 mm in March 78; similarly, the mode at 100 mm (cl) in December 79 can be traced to

110 mm in January 80 thus giving a growth rate of 10 mm per month. The mode at 110 mm (d) in February 80 has progressed to 120 mm in March 80 with a growth rate of 10 mm per month. Tfa^tniode (e1) at. 120 mm in February '77 can be traced to 130 mm in March 77 and the mode (e2) at 120 mm in February 77 to T30 mm in April 77,"thus giving a monthly growth rate of 5 mm. The mode at 130 mm in December 79 Of) is traceable to 140 mm in February 80 giving a growth of 10 mm in two months. Similarly the mod© at 150 mm (g) in January 77 cainbe traced to 160 mm in March 77 giving a monthly growth rate of 5 mm and the mode (h) at 150 mm in septejnber 78 is traceable to 170 mm in_January 7a; (in four months) with a growth rate of 5 mm per month. Beyond 170 mm, the modal progression is_not traceable.

From the above observations *k* may be summarised that the'monthly growth rates are 20 mm between 50 and 70 mm length, 10 mm between 70 and 120 mm, and 5 mm between 120 and 170 mm length. Since a growth of 20 mm is observed between 50 and 70 mm in one month, the fishes forming a mode at 50 mm can be reasonably taken as two months old (at a growth rate of 25 mm|month). It may thus be taken that *N. mesoprion* off J^akinada obtains a length of 140 mm at the completion of one year and 170 mm ait the completion of one-and-^half year.

Weber and Jothy (1977) believed that, this species attains 50-60 mm, 125 mm and 156 mm at the completion of first, second and third years, respectively. The data for the above conclusions came from the survey of demersal fish resources carried out in the coastal waters of the South China sea bordering east Malaysia (Sarawak and Sabha) from 29th March to 1st May 1972. The length data of *N. mesoprion* obtained during the above period were analysed with the help of probability paper (Harding 1949, Cassie 1954) and the resultant normal distributions of different length groups were taken as belonging to different- age groups. These authors, however, did not take the growth rate of the species into account nor did they have data over extended periods to facilitate the study of age and growth. -\ -

The von Bertalanffy equation for growth in length (Beverton and Holt 1957) which is of the form:

$$L_t = L_\infty (1 - e^{-K(t - t_0)})$$

Where L_∞ = asymptotic length of the fish, L_t = length at age t, K = a constant equal to 1/3. of catabolic coefficient, t = age of fish and t_0 = arbitrary origin of growth curve, was fitted to the age4ength data of *N. mesoprion* from Kakinada.

The L_∞ was estimated from the Ford^Walford plot (Food 1933, Walford 1946, Beverton and Holt 1957) of L_{t+1} against L_t on 'the basis of lengths attained at intervals of 3 months. The regression line (fig. 4) was fitted by

the method of least squares. It is observed that the poinits are well represented by the straight line. The La obtained is 219 mm which is close to the maximum length (215 mm) obtained in the trawler catches at Kakiniada.

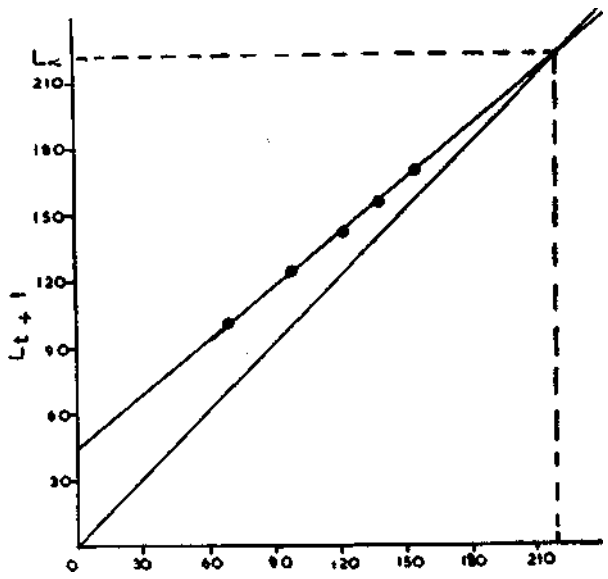


FIG. 4. Ford-Watford plot of growth to 'length of *N. mesoprion.*

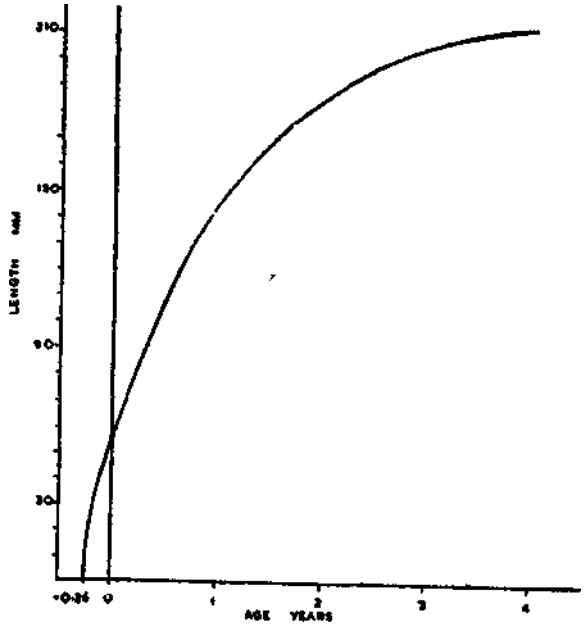


FIG. 5. Theoretical growth curve of *N. mesoprion*

The parameters K ahd t_0 were ©estimated from the equation (Beverton 1954) log e (La-L_t) = log e (Loc + kt„) - K_t and values obtained are K " 0.83248 and t_c = "0.256198 years.

The lengths at different iages calculated from the von Bertalanffy growtli equation are plotted in figure 5 which indicate that observed and caloulated lengths at different ages agree closely and that *N. mesoprion* at Kakinada attains 140, 185 and 205 mm at the completion of first, second and third years respectively.

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