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Fish biology

MATURITY AND FECUNDITY OF *DENTEX MACROPHthalmus*
(*SPARIDAE*) FROM NORTH WEST AFRICAN COAST

DOJRZEWANIE PŁCIOWE I PŁODNOŚĆ *DENTEX MACROPHthalmus*
(*SPARIDAE*) Z REJONU PÓŁNOCNO-ZACHODNIEJ AFRYKI

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The observations were made on maturity and fecundity of *Dentex macrophthalmus*. It ascertained that: the species possesses the portional spawning; the period of spawning depends from age, length and depth of waters. The fecundity was examined in relation to age, weight and length of females.

INTRODUCTION

The biology of fish species appearing in North West African Coast is getting to be of more interest. No distinct seasonal changes of environmental conditions, which may influence the cycle of fish maturity appear within this region. Therefore, the observation of the species from this region is of more importance. No exact data in this respect exists in the present literature. Such observations are of particular importance in relation to fish of *Dentex* species, which form the major yields of our bottom fishing.

This work is aimed towards the recognition of maturity and fecundity process of *Dentex macrophthalmus* (Bloch, 1791).

MATERIAL AND METHOD

The work is based on the investigation performed during 1968–1970 (Tab.1). The material analysed originated partly from the output of industrial fishing ships. Majority of

the samples were collected during the fishing voyage of trawler m/t „Murena” between 23 XII 1969 and 3 III 1970.

Table 1

Periods, regions and type of investigations

Species	Sample No	Date of sample	Geogr. position	Number of spec. exam.	
				Maturity	Fecundity
<i>Dentex macrophthalmus</i>	1	14 XII 1968	Rejon Cap Blanc	290	—
	2	13 II 1969	19°56'N–16°38'W	107	14
	3	8 III 1969	24°00'N–16°26'W	128	4
	4	10 IV 1969	20°25'N–17°20'W	274	24
	5	12 V 1969	22°30'N–17°10'W	623	11
	6	18 IX 1969	21°32'N–17°39'W	362	32
	7	23–31 XII 1969	17°40'N–19°07'N	482	14
	8	1–23 I 1970	16°09'N–19°05'N	952	23
	9	1–28 II 1970	15°50'N–18°40'N	320	13
	10	1–9 II 1970	13°30'N–14°50'N	313	—
	11	1–3 III 1970	17°40'N–17°50'N	290	—
		Razem	4141	135	
		Total			

The maturity of gonads was determined according to Maier's scale. The analysis were made for certain months of 1968–1970 only. The results obtained permitted for observation of gonads maturity in annual cycle. Due to technical reasons, no observations were possible for the subsequent months of one year. The percent participation of fish in particular stage of maturity with consideration to sex, was calculated for each month. Due to difficulties in differentiation of the young stock (stage I and neutral stage II) both stages were considered as one group.

For determination of *Dentex macrophthalmus* maturing in annual cycle were considered the species of length above 17 cm only, as not many species below this length go on spawning.

The weighing method was applied for calculation of fecundity. From various parts of ovaries in V and VI stage of maturity according to Maier's scale, three samples were taken and weighed with accuracy upto 1 g. The weight of samples was 0,5 gram. Complete roe granuls with the ovary was weighed with accuracy upto 0,01 g directly before taking the samples; this was to avoid any possible error that could arise due to drying. The roe granuls were calculated by normal proportion.

RESULTS

Maturing and spawning

The stage of maturity of *Dentex macrophthalmus* for the particular months of 1968–1970 is presented on Fig.1. The neutral stage (II) appears for this species during the whole year. The stage of gonad elongation (V) started to appear during September. In autumn and winter, the gonads reached the final stage of maturity and some fishes were already spawning. The number of specimen with ripening gonads (stage VI and VII) was largest for February and March.

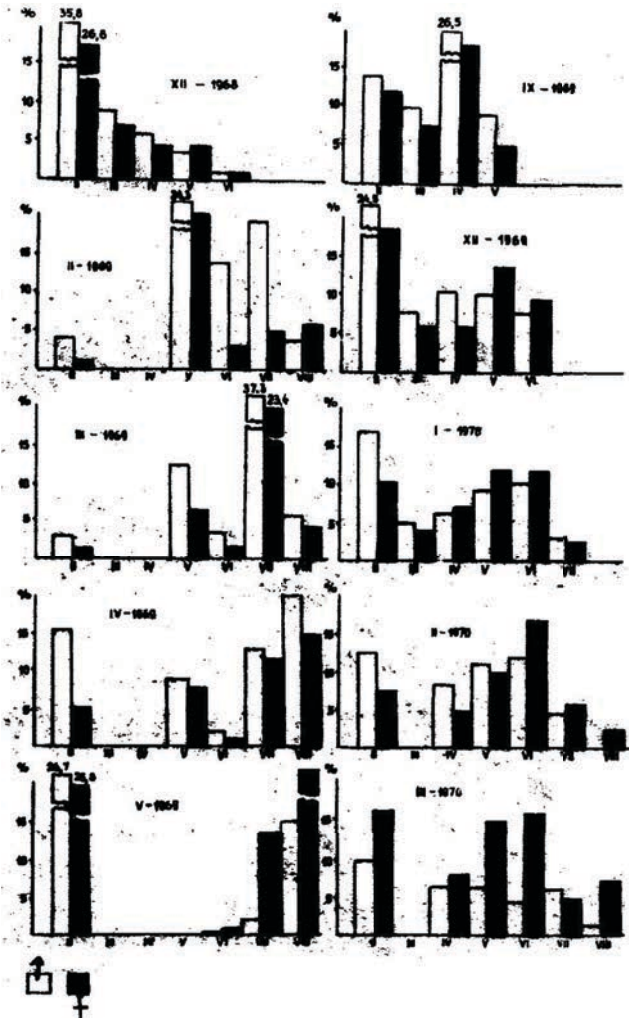


Fig. 1. Maturity of *Dentex macrophthalmus* in %

The species possesses portional spawning. Ripening specimen were encountered from December till May. It may be assumed that the spawning started already earlier probably in October, as some fishes in the V stage were encountered already in September. This is supported by the investigations of Domanevsky, et al. (1970, 1971), Stepkina (1970), Raźniewski (1970) and Woźniak (1963).

From analysis of material is noted that the periods of maturity and spawning depends from the length of specimen (Fig. 2). First, are spawning the larger and aged fishes. The participation of younger, which mature later, is increasing towards the end of spawning period.

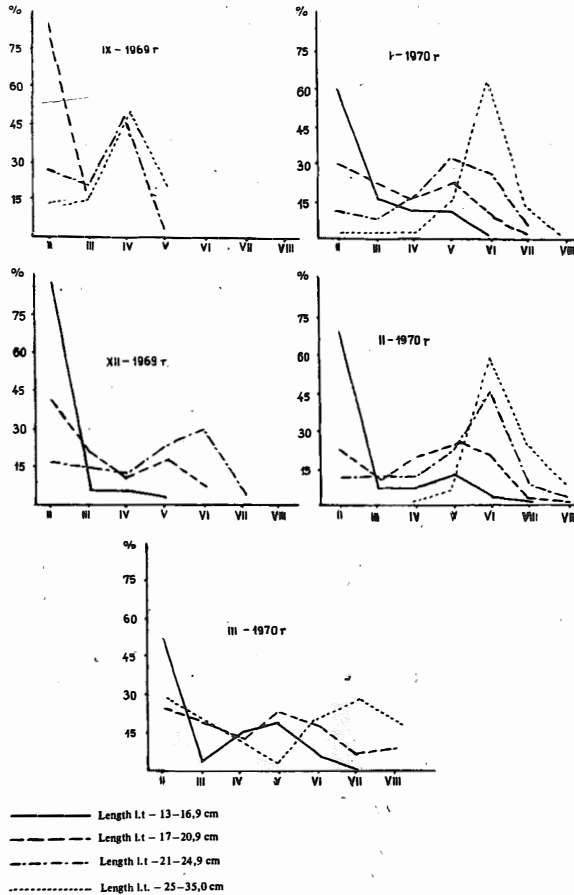


Fig. 2. Maturity-total length relationship of *Dentex macrophthalmus*

Number of the specimen with gonads in ripening stage was increasing with depth of waters within 90–150 m and was decreasing in larger depths (Tab.2). The specimen older and above 24 cm in length were spawning most numberously on depths of 130–150 m. It was noted that in Cap Blanc region this species finds most convenient spawning

Table 2

Ripening fish of *Dentex macrophthalmus* species in relation to fishing depth during
January and February 1970 (expressed in %)

Depth (m)	Cap Blanc shelf				Cap Vert shelf			
	Length in cm			No of specimens	Length in cm			No of specimens
	17.0-20.9	21.0-24.9	25		17.0-20.9	21.0-24.9	25	
90-109	18.57	15.62	4.70	27				
110-129	32.85	35.94	22.35	65				
130-149	47.14	45.31	69.41	121	23.07	8.33	1.58	16
150-169	1.44	3.13	3.54	6	21.15	13.89	4.76	11
170-189					34.61	55.55	87.30	93
190-209					21.07	22.23	6.36	23

conditions on depths of 110–150 m, while in Cap Vert region – on 150–190 m. This may be related to probability that the temperatures are optimal for this species at such depths. From our investigations and from Domanevsky's et al. (1970, 1971) is apparent that in Cap Blanc region the matured females of *Dentex macrophthalmus* migrate to deeper waters as their gonads are maturing. They return to more shallow waters after spawning.

The age composition of spawning *Dentex macrophthalmus* is presented on Fig.3. The youngest specimen participating in spawning were those of two years and the oldest of 11 and 12 years. The most numerous age group which participated in spawning formed the 3-years specimen.

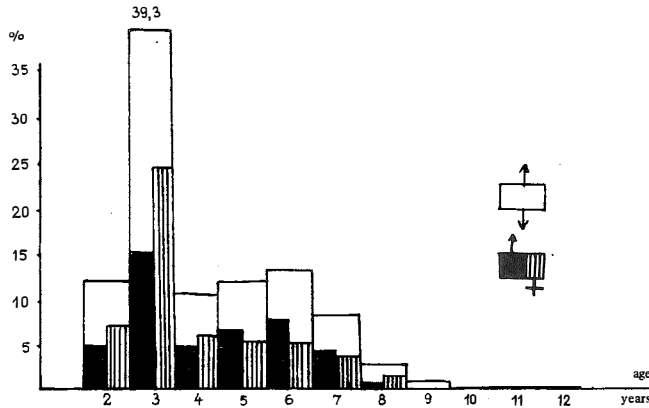


Fig. 3. Age composition of spawning population of *Dentex macrophthalmus*

Presented on Fig. 4 is the length distribution of spawning *Dentex macrophthalmus*. The smallest specimen which participated in spawning were of 13 cm in length.

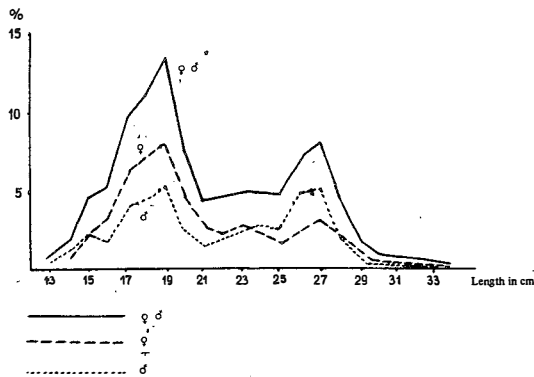


Fig. 4. Length composition of spawning population of *Dentex macrophthalmus*

Fecundity

As it appears from Fig.5, the fecundity of *Dentex macrophthalmus* increases with growth of females. The increase of fecundity is not parallel to the increase of length but overspeeds it. This complies with the formula:

$$S = kL_n$$

where

- S — absolute fecundity
- k — coefficient
- L — fish total length (l.t.)
- n — coefficient.

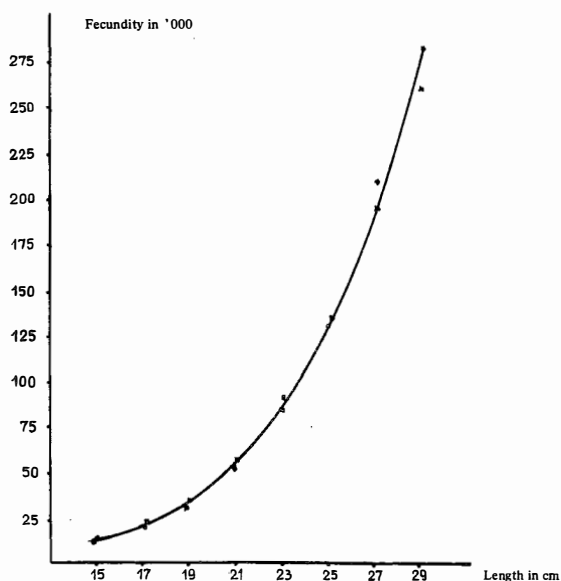


Fig. 5. Fecundity-length relationship of *Dentex macrophthalmus*

The formula corresponds graphically to parabolic curve. For calculation assumed the values:

$$k = 0,0000125$$

$$n = 5.03.$$

Observing the absolute fecundity values in relation to females weight (Fig.6) it may be noted that the fecundity is growing more evenly in relation to growth of weight than to growth of length. The direction of such growth, as shown on diagram, is near of the straight line.

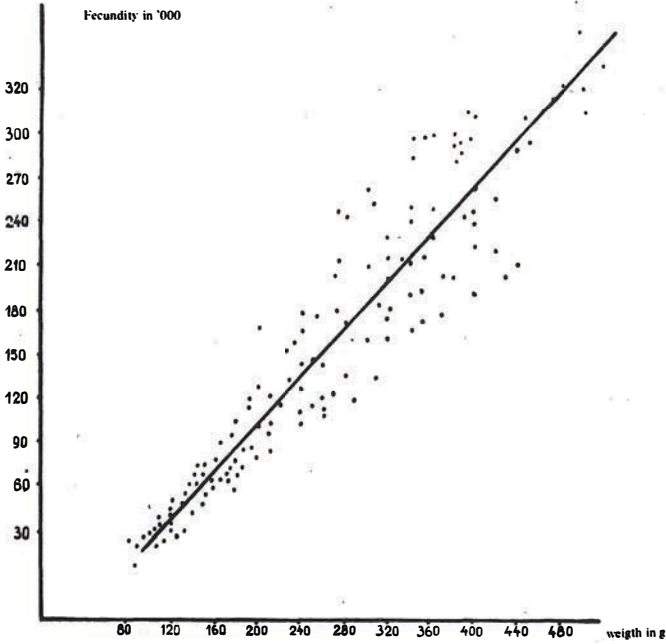


Fig. 6. Fecundity-weight relationship of *Dentex macrophthalmus*

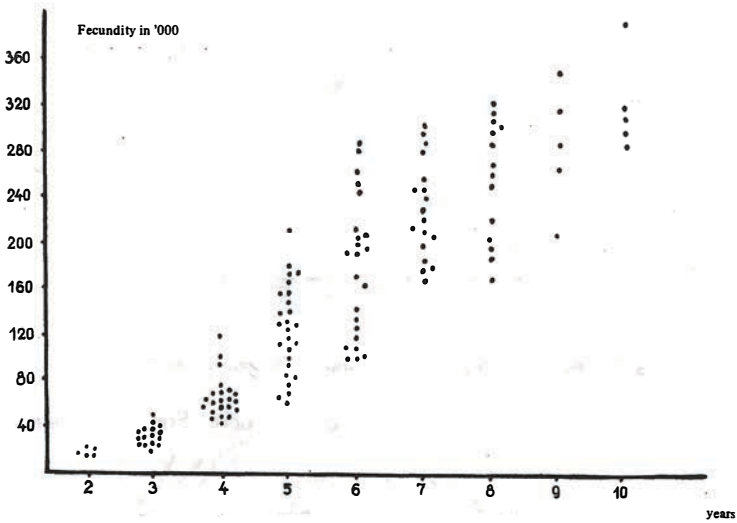


Fig. 7. Fecundity-age relationship of *Dentex macrophthalmus*

To analyse an influence of the female's condition on the fecundity, complete material examined was presented on Tab.3. The average fecundity is calculated according to increasing weight groups with application of „two-centimeter” length classes. From analysis of this data is apparent that, for the same length class, the fecundity increases

Table 3

Fecundity-length-weight relationship of *Dentex macrophthalmus*
for years 1969–1970

Length l. t. in cm	No of specim.	Weight in g										
		60–100	100–140	140–180	180–220	220–260	260–300	300–340	340–380	380–420	420–460	460–500
14–16	2	12290 (2)										
16–18	9	19580 (6)	30920 (3)									
18–20	9		31250 (9)									
20–22	13		47855 (2)	54920 (11)								
22–24	17			68155 (8)	105500 (9)							
24–26	27				93354 (6)	136223 (16)	156650 (5)					
26–28	30						191794 (5)	203620 (13)	226620 (9)	293957 (3)		
28–30	22								248330 (6)	261000 (13)	265893 (3)	
30–32	6										313122 (3)	336100 (3)

Attention: Values in brackets denote number of specimens.

distinctly with an increase of weight but, for the same weight-class, increases negligently in relation to the length. Distinctly noted is an increase of fecundity in relation to age (Fig.7). The values of fecundity are much wider in this case than for particular length and age groups.

CONCLUSIONS

1. *Dentex macrophthalmus* possesses portional spawning distributes in time. It spawns during winter (XII–III).
2. Larger and older specimen spawn as first, the smaller spawn later. The youngest specimen participating in spawning were of two years.
3. The fecundity of *Dentex macrophthalmus* grows in relation to an increase of size. The rate of growth is faster than length increase and is proportional to an increase of weight.

REFERENCES

- Domanevsky L.N., 1970: Biology and distribution of the main commercial fishes and peculiarities of their fishing by trawl on the ahelf from Cape Spartel to Cape Verde. ICES. Rapports et Procés-verbaux des Réunions. 159: 223–226.
- Domanevsky L.N., Stepkina M.V., 1971: Osobiennosti biologii bolseglazogo zubana *Dentex macrophthalmus* Bloch rajona Centralno-Vostocnoj Atlantiki. Voprosy Ichtiologii. 11,3/68: 438–446.
- Stepkina M.V., 1970: Sparovyje severo-zapadnogo poberezja Afriki. Rybnoje Chozjajstvo. 6: 8–10.
- Raźniewski J., 1970: on the occurence of Spawning Fish over the shelf of the East Tropical Atlantic. ICES. Rapports et Procés-verbaux des Réunions. 159:199–201.
- Woźniak St., 1963: Some Observations of Spawning Fish over the Shelf of the East Tropical Atlantic. ICES. Annales Biologiques. 20:113–114.

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Dojrzewanie płciowe i płodność *Dentex macrophthalmus* (*Sparidae*) z rejonu północno-zachodniej Afryki.

Maturity and fecundity of fish of *Dentex macrophthalmus* (*Sparidae*) from N.W. African coast.

SPIS TABEL

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3. Zależność płodności od długości i ciężaru u *Dentex macrophthalmus* w latach 1969–1970.
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DOJRZEWANIE PŁCIOWE I PŁODNOŚĆ *DENTEX MACROPHTHALMUS*
(*SPARIDAE*) Z REJONU PÓŁNOCNO-ZACHODNIEJ AFRYKI

Streszczenie

W czasie rejsu na łowiska znajdujące się w rejonie północno-zachodniej Afryki oraz w oparciu o materiały dostarczone do kraju przez przemysłowe statki rybackie dokonano obserwacji nad dojrzewaniem płciowym i płodnością *Dentex macrophthalmus* (Bloch 1791).

Stwierdzono, że gatunek ten ma tarło porcyjne, rozciągnięte w czasie. Trze się on w okresie zimy. Na okres i przebieg tarła *Dentex macrophthalmus* wpływają takie czynniki jak wiek i długość osobników oraz głębokość w połączeniu z temperaturą wody. Najmniejszymi osobnikami biorącymi udział w tarle były 2-latki o długości 13 cm.

Płodność u *Dentex macrophthalmus* jest wysoka i wynosi maksymalnie ponad 300 000 ziaren ikry. Jest ona zależna od ciężaru, długości i wieku samic.

ПОЛОВАЯ ЗРЕЛОСТЬ И ПЛОДОВИТОСТЬ *DENTEX MACROPHTHALMUS* *SPARIDAE*
РАЙОНА СЕВЕРО-ЗАПАДНОЙ АФРИКИ

Р е з ю м е

Во время рейса в районы лова у северо-западной Африки, а также на основе материалов доставленных промышленными суднами в страну, проведено наблюдения половой зрелости и плодовитости у *Dentex macrophthalmus*. Установлено, что у *Dentex macrophthalmus* нерест порционный, растянутый во времени. Нерестится но в период зимы.

Срок и ход икротетания обусловлен такими факторами как: возраст и длина экземпляров а также глубина в сочетании с температурой воды. Самыми малыми представителями принимающими участие в нересте были 2-3 летние экземпляры длиной в 13 см.

Плодовитость является высокой и составляет максимально свыше 300 000 зерн икры. Величина её зависит от веса, длины и возраста самок.

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Received 22 V 1972

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