Acta Adriat., 29 (1/2): 145—152 (1988)

YU ISSN: 0001—5113
AADRAY

UDK: 591.1 : 639.9
Original scientific paper

EMBRYONIC AND LARVAL DEVELOPMENT OF LABORATORY REARED *DIPLODUS VULGARIS* (E. GEOFFREY SAINT-HILLAIRE, 1817) PISCES, SPARIDAE

EMBRIONALNI I LARVALNI RAZVITAK FRATRA, *DIPLODUS VULGARIS* (E. GEOFFREY SAINT-HILLAIRE, 1817) U LABORATORIJSKIM UVJETIMA

J. Jug Dujaković and B. Glamuzina

Institute of oceanography and fisheries, Split, Yugoslavia

Embryonic and larval development of laboratory spawned *Diplodus vulgaris* (E. Geoffrey Saint-Hillaire, 1817) are described and illustrated. The eggs (1.01 ± 0.02 mm) were spherical and transparent with clean chorion.

Newly hatched larvae where 2.63 ± 0.07 mm in length. Absorption of yolk sac was complete by day 5, when larvae reached 3.92 ± 0.38 mm in total length.

Distribution of mean total length as a function of time was approximated by Gompertz equation.

INTRODUCTION

Common two banded sea bream, *Diplodus vulgaris* (E. Geoffrey Saint-Hillaire, 1817) belong to the Sparidae family. The species is distributed throughout the Mediterranean and in the Atlantic from the Biscay to Morocco, Madeira and Azores, and to the Senegal in te south (Tortonese, 1978). They inhabit predominantly rocky bottoms and less frequently sandy bottoms, very rarely occur in lagoons (Tortonese, 1965). They are preferentially carnivorous preying on small crustaceans, worms and mollusks (Ara, 1937). As reported by Ranzi (1930) and Grubišić (1962) they mature in October and November, their eggs been pelagic (Raffaele, 1988). Ranzi (1930) first described their larvae but only from 5 mm in length to metamorphosis.

This paper reports on the embryonic and larval development of *Diplodus vulgaris*. The objectives of this study were to complete life history studies and to assist in the identification of planktonic stages of this species.

MATERIAL AND METHODS

Parental fish were kept in aquaria at ambient salinity, temperature and natural photoperiod. Fish were fed food predominantly composed of small

pelagic fish. In November 1986 six males and two females matured spontaneously. Eggs were fertilized with sperm from two males. Dry fertilization lasted for 10 minutes. The rest of milt was rinsed through a sieve with fresh sea water, and eggs were transferred to a glass jar. Ten minutes later fertilized eggs floating on the surface were collected and transferred to incubation tanks with constant temperature (17°C) and gentle aeration. To prevent bacterial contamination filtered sea water with streptomycin sulphate in 30 mg/1 concentration was added.

Table 1. Embryonic development of *Diplodus vulgaris* at 17°C temperature

Time Hour	Time Minutes	Stage	Description	Heart beats/ minute
0		fertilization		
1	32	2-cells	meridional first cleavage	
2	04	4-cells	second cleavage, plane perpendicular to the first	
2	30	8-cells	cleavage parallel to the second	
2	53	16-cells	cleavage parallel to the first	
3	32	32-cells		
4	43	64-cells		
5	58	morula		
10	03	blastula	visible blastocoel, germinative ring	
13	13	gastrula	gastrulation starts	
16	15	gastrula	invagination of blastomeres ends embryo stretched (head towards the vegetative pole)	
23	50	neurula	formation of neural groove starts	
25	50		formation of embryo begins, notochord	
26	10	embryo	somatic segmentation begins, formation of optic vesicles and forebrain	
28	15		optic vesicles formed, olfactory lobes differentiated	
29	00		somites clearly visible, melanophores appear along the dorsal side and oil globule	
33	30		somite differentiation completed, optic vesicles and olfactory lobules clearly visible	
40	15		cardiac contraction clearly defined	55
40	40		embryo well developed and connected with the yolk sac, head close to tail	60
50	10			67
50	10		tail lifted clear of the yolk sac	71
52	10		tail movement begins	75
53	40		tail tip almost touches the head	75
55	10		rhythmical movements every 10—12 seconds	86
57	40		very marked and frequent movements every 4—6 seconds	92
58	50	free larva	hatching begins	100
59	45		all larvae hatched	

Egg and larval development was observed under binocular microscope and photos of individual stages were taken. Microscope and ocular micrometer of binocular loupe were used for the measurement of eggs and larvae.

RESULTS AND DISCUSSION

Egg and embryonic development

Diameter of ripe *Diplodus vulgaris* eggs ranged from 0.96—1.08 mm, 1.01 mm mean and 0.02 mm standard deviation. The eggs were transparent, spherical with clean chorion. Oil globules ranged from 0.217—0.228 mm in diameter with mean 0.220 mm.

Eggs developed in a manner typical for teleosteans (Ahlstrom and Ball, 1954). Table I and plate I illustrate all changes recorded during embryonic development.

Description of larvae

Changes in length and shape of *Diplodus vulgaris* larvae during the first five days after hatching are presented in Table 2.

Table 2. Changes in length and shape, and yolk sac resorption of *Diplodus vulgaris* larvae during the first five days after hatching

Days posthatching	Number measured	Mean total length	Mean standard length	Yolk sac resorption (mean longest and shortest diameters)	
0	15	2.63	2.51	1.20	0.58
1	15	3.53	3.37	0.82	0.63
2	12	3.83	3.75	0.48	0.33
3	12	3.85	3.74	0.15	0.08
4	13	3.88	3.79	0.09	0.07
5	12	3.92	3.82	resorbed	

Larvae were 2.63 ± 0.07 mm in total and 2.51 ± 0.06 mm in standard length at hatching. The number of myomeres ranged from 33—34. Larvae were transparent. Dendritic melanophores began to concentrate near the head, anterior to the anus, ventrally and dorsally at mid-body and most at the middle of tail ventrally and dorsally. The finfold invested much of the body (Fig. 1a, Plate 2). Newly hatched larvae floated passively at the surface with yolk sac uppermost.

On the second day (34 hours after hatching) total length of larvae ranged from 3.44—3.57 mm. Dendritic melanophores were present around the remaining yolk sac and oil globule, near the eye, and at the end of the tail (Fig. 1b).

On the third day, 59 hours after hatching, total length ranged from 3.71—3.92 mm (Fig. 1c).

By the end of the fourth day the mouth was almost completely open. On the fifth day mouth, jaws, gut and anus were functional and feeding had commenced. Eye was completely pigmented and maximum mouth opening was 385—456 μm.

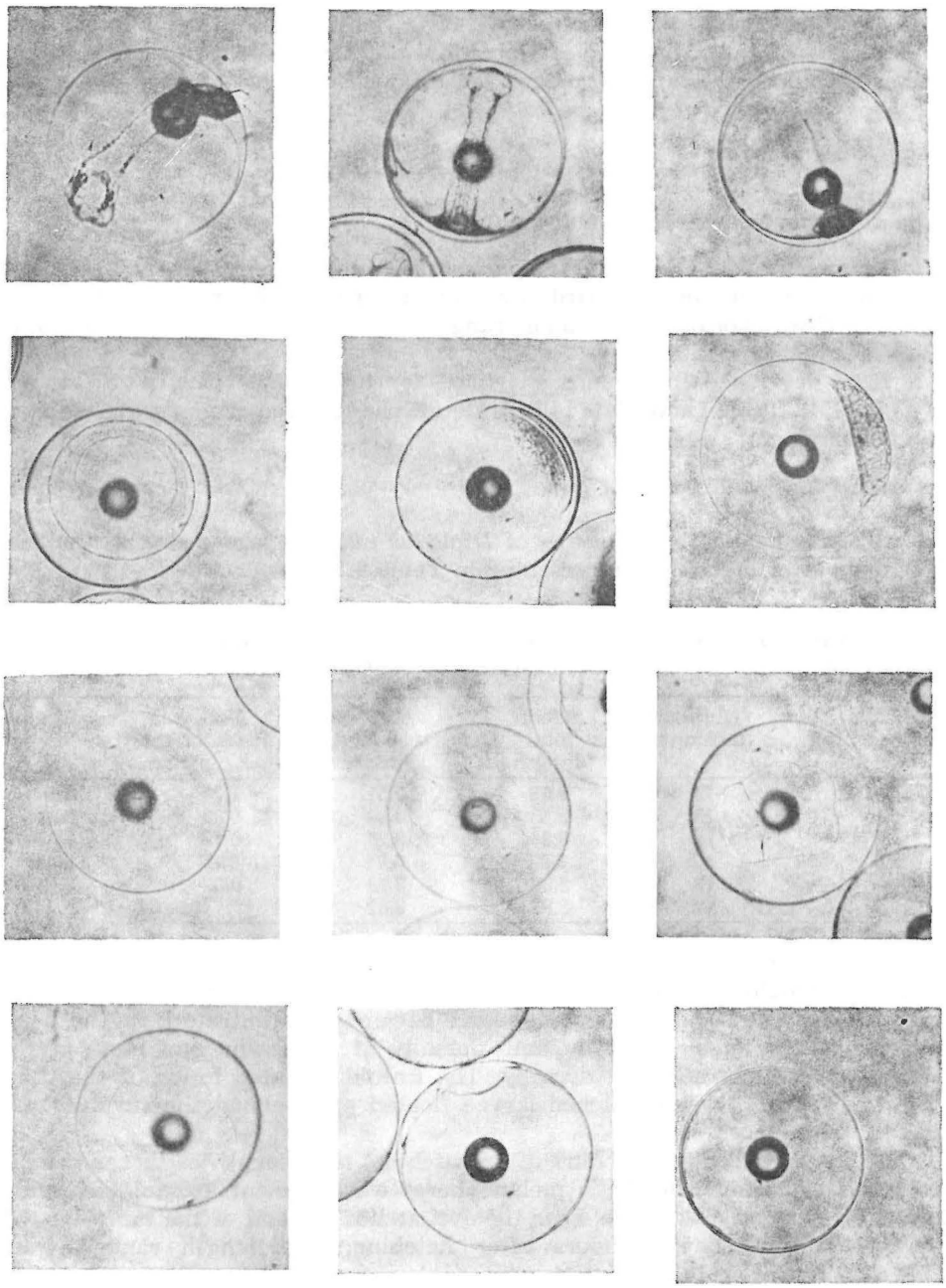

Plate 1. Developmental stages of eggs. a) fertilized egg; b) 2-cells; c) 4-cells; d) 8-cells; e) 64-cells; f) morula; g) blastula; i) gastrula; (j), (k), (l) embryogenesis

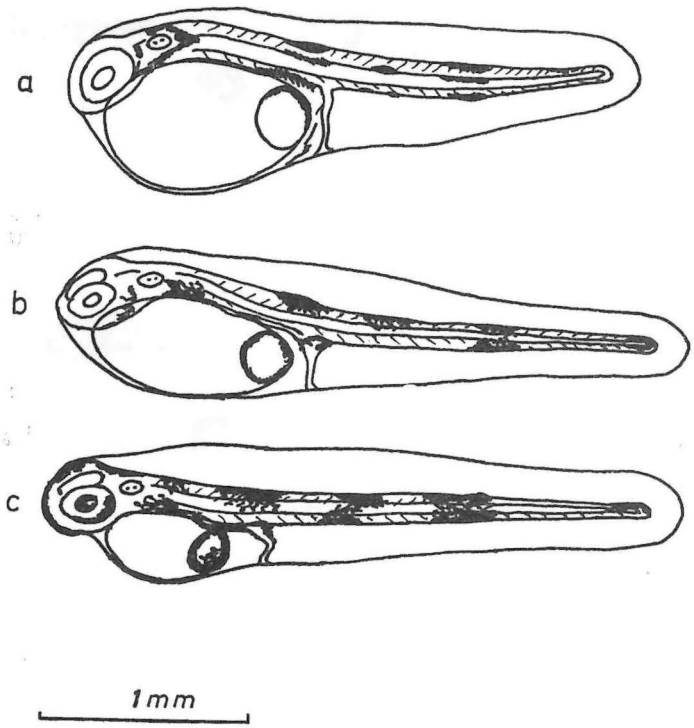

Fig. 1. Shape of *Diplodus vulgaris* larvae after: a) 1 hour, b) 34 hours and c) 59 hours

By the day 6 yolk sac resorption was complete and larva reached 3.92 ± 0.38 mm in total length.

Larval growth

Distribution of mean lengths as a function of time was approximated by Gompertz equation (Fig. 2):

$$l_t = a\, e^{-be^{-ct}}$$

where a is the asymptote, and b and c constants. Correlation coefficient was highly statistically significant:

Correlation coefficient:	0.9984
Values of constants:	c = 1.306208
	b = 0.387749
	a = 3.907922

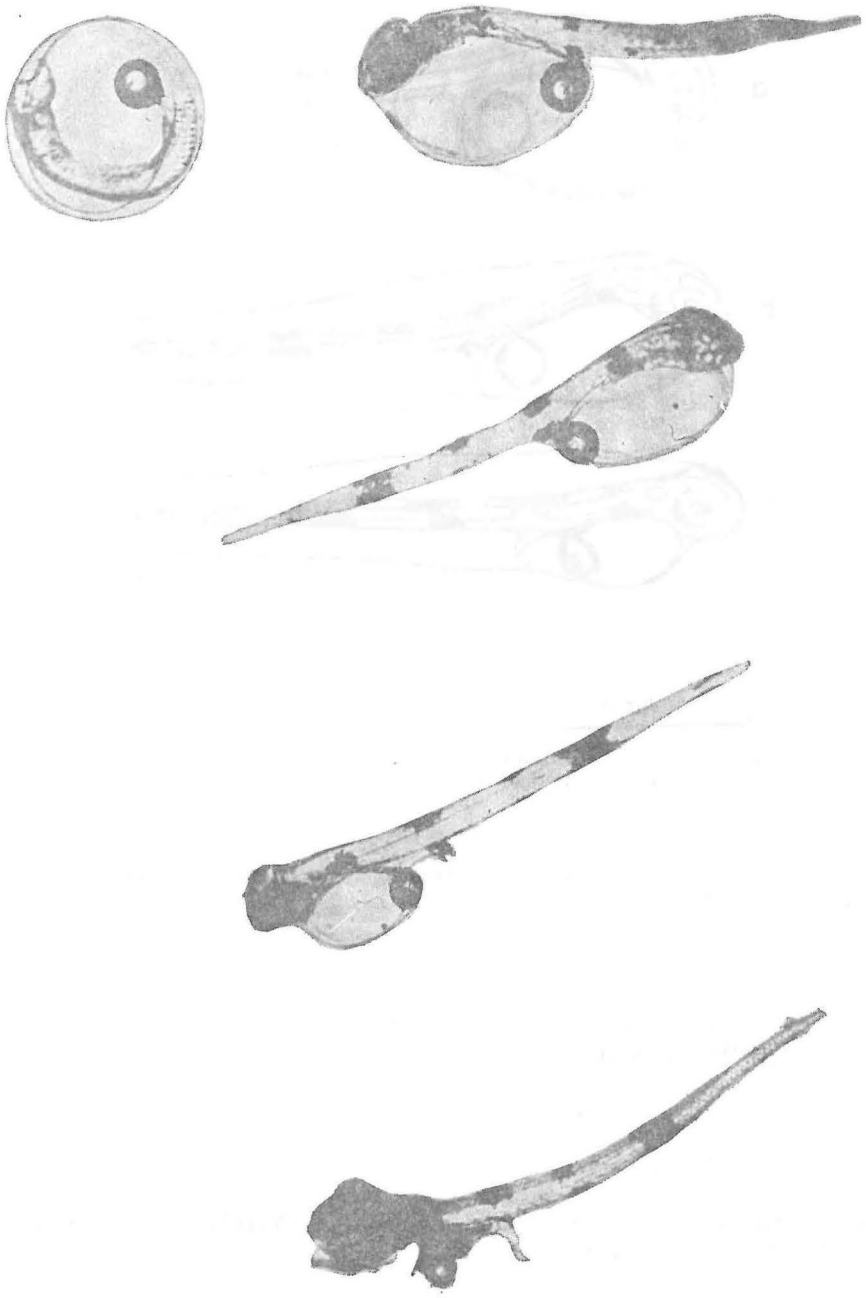

Plate 2. Developmental stages of larvae. a) embryo; b) larva after hatching; c) 1-day old larva; d) 2-day old larva; e) 5-day old larva.

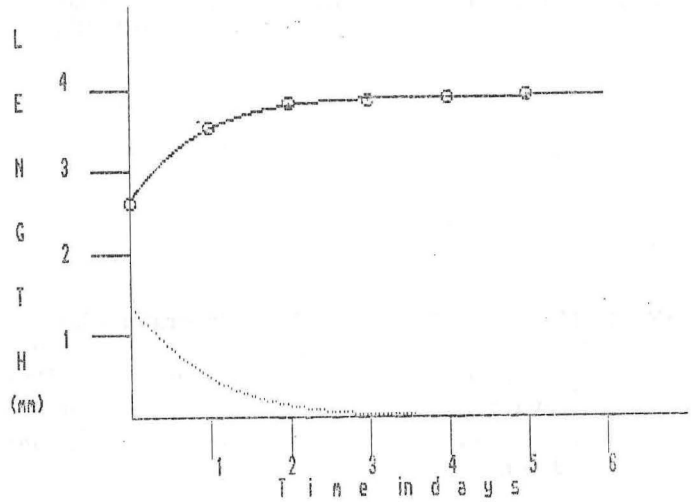

Fig. 2. Gompertz curve of larval growth of *Diplodus vulgaris* at 17°C.

ACKNOWLEDGEMENTS

We are gratèful to Dr. Slobodan Regner for his advice and for reading and commenting the manuscript.

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Accepted: July 13, 1988

J. Jug Dujaković, B. Glamuzina
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Acta Adriat., 29 (1/2) : 145—152 (1988)

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J. Jug-Dujaković i B. Glamuzina

Institut za oceanografiju i ribarstvo, Split, Jugoslavia

KRATKI SADRŽAJ

U radu je opisan i ilustriran embrionalni i larvalni razvitak fratra, *Diplodus vulgaris* (E. Geoffrey Saint-Hillaire, 1817) u laboratorijskim uvjetima.

Jaja fratra (1,01 ± 0,02 mm) su okrugla i prozirna s čistim korionom. Totalna dužina netom izvaljenih larvi iznosi 2,63 ± 0,07 mm. Resorpcija žumanjčane kesice završava peti dan, kada su larve dostigle 3,92 ± 0,38 mm.

Distribucija srednjih totalnih dužina u funkciji vremena je predstavljena Gompertz-ovom jednadžbom.