SOME OBSERVATIONS ON MORTALITY, FEEDING, GROWTH, AND SWIM BLADDER STRESS SYNDROME OF SEA BASS (*DICENTRARCHUS LABRAX* L.) LARVAE UNDER VARIED ENVIRONMENTAL CONDITIONS

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A number of questions regarding environmental requirements and responses (i.e., hypertrophic swim bladder) of sea bass larvae must be answered before their potential for aquaculture is determined. Responses to variations in light, temperature and salinity are described here. Massive mortality of larvae has been common in Mediterranean culture efforts. This mortality, associated with swim bladder malfunction, has been analysed regarding its association with individual environmental stresses.

Increasing temperature or light above ambient levels increased larval mortality, while decreasing ambient salinity from 36^{o}/oo to 25^{o}/oo decreased mortality (Tables 1 and 2). Feeding activity was depressed by increasing salinity and increased by decreasing salinity. Feeding was not stimulated by increased light intensity or elevated water temperature. Larvae filled their guts within 1-2 hours after the onset of light and required 4-6 hours to digest their meal; this allows larvae 2 feeding periods each day. The average number of Artemia nauplii per feeding was 8 in natural light with no increase in consumption with increased light intensity.

Larval growth was enhanced by both decreased salinity and increased temperature, but not by increased light (Tables 3 and 4). Swim bladder stress syndrome (SBSS) and mortality were avoided only when larvae were held at ambient temperature (12.5^{o}), natural light, and reduced salinity (25^{o}/oo). Larvae dying with distended swim bladders also had other symptoms of environmental stress--spinal abnormalities, calculi in the urinary bladders, copious mucous and opaque (edemous) tissues. Elevations of temperature and light, as well as ambient sea water (36^{o}/oo) are environmental stressors and induce SBSS (Table 4).

Optimum temperatures for sea bass growth are clearly unsuited to larval rearing, while brackish sea water (25^{o}/oo) just as clearly improves growth and survival. Light and nutritional regimes as well as water quality are other sources of environmental stress that may induce SBSS and reduce growth and survival. SBSS should not be confused with "gas bubble" disease and its most effective treatment appears to be an understanding of larval environmental requirements.

Table 1. Survival (%) of three day old ($\bar{x}$ = 4.87 mm TL) sea bass larvae at ambient conditio
elevated temperature and continuous light. G test for significant differences in
(*P < .05; **P < .01).

Interval (hrs)	Ambient 12.3° Temperature (AN)	Cyclic 12.3 + 6° Temp. (CN)	Elevated 18-19° Temp. (EN)	C
0-96	22	26	16	
**			**	
97-168	29	17	19	

Table 2. Survival (%) of 30-day old ($\bar{x}$ = 7.89 mm TL) sea bass larvae at ambient conditions
decreased salinity, increased light, and increased temperature. G test for signif
differences in mortality (*P < .05; **P < .01).

Salinity (°/oo)	Ambient Temp. and Light (AN)	Ambient Temp. Incr. Lt. (AI)	Elevated Temp. Incr. Lt. (EI)	Na
36	58	58	38	
**		**	*	
25	81	81	50	

Table 3. Variation in growth of sea bass larvae after 7 days at elevated temper
salinity.

a. Variation in total length (mm) between groups subjected to two-way
(P < .05).

Salinity $^{o}/oo$	Ambient Temp. and Light (AN)		Elevated Temp. Natural Lt. (EN)	Elevated Temp. Incr. Lt. (EI)
36	8.0		7.9	8.2
			*	
25	7.8	*	8.5	8.5

b. Percent variation in total length (mm) from ambient conditions (re

Salinity ($^{o}/oo$)	Ambient Temp. (12^{o})
36	--
25	+4% (3, 5, 4)

Table 4. Relationship of decreased salinity, increased temperature and light to (a) surviv
(b) incidence of hypertrophic swim bladder (% HSB), and (c) growth (mmTL) of 14-d
sea bass. G test was applied to determine significant differences in mortality a
of HSB; variation in growth was subjected to two-way ANOVA (*P< .05; **P< .01).

Salinity o/oo	Ambient temp. + Incr. Lt. (AI)		Ambient temp. Natural Lt. (AN)		Cyclic temp. Nat. Lt. (CN)		Ele Nat
a. Survival (%)							
36	30		30		40		
	**		**		*		
25	75		100		70		
b. HSB (%)							
36	33		33		50		
		*		**			
25	27		0		57		
c. Growth (mmTL)							
36	5.5	*	6.1		6.2	*	
25	5.4		4.9	**	6.3		