BIOCHEMICAL COMPOSITION OF OVULES AND FECOND EGGS OF SEA BASS (*Dicentrarchus Labrax*), SOLE (*Solea vulgaris*) AND TURBOT (*Scophthalmus maximus*)

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Studies on the overall biochemical composition of fish eggs and ovules are of interest for reaching a better knowledge of different aspects of the reproduction biology and development of fish under artificial conditions. For instance, the viability of the eggs and larvae depends of different well known factors such as the characteristics of females (Blaxter, 1969) maturity of the eggs for artificial spawning and environmental conditions especially nutrition (Bagnenal, 1979; Fontaine et Ollivereau, 1962). But even when optimal conditions for egg development seem to be realized, no fertilization or embryological development occurs. A possible explanation for this phenomenon could be variations in the biochemical composition of ovules (Konovalov, 1980). Consequently, it is important to know the average content of their reserves involved in the fertilization processes of eggs and development of embryos. But at the time, more information is available about freshwater fish species (Ginzburg, 1972) than about marine fish species.

Hereafter our purpose is to present basic data concerning biochemical composition of three marine fish species actually involved in Aquaculture attempts: Turbot (Scophthalmus maximus), Sole (Solea vulgaris) and Sea Bass (Dicentrarchus labrax).

The analysis concern ovules at the end of oogenesis from wild fishes trawled or angled along Breton coasts, and naturally spawns (at morula stage) laid by captive spawners. Spawns are either naturally fertilized eggs or unfertilized ovules. Captive spawners are all fed on the same trash fish. Ovules are laid under natural light and temperature conditions ("natural spawning season") and artificial conditions (7 months shifted spawning season)- (Devauchelle, 1980).

Several 40 g batches of ovules or eggs were rinsed with distilled water and we measured their content in water (drying at 95°C), proteins (method of Kjedahl), ashes (by oxidization at 55°C), total lipids (method of Folch and Sloane, 1957), different classes of lipids (Beninger, 1982) fatty acids (Flanzy et al., 1976), cholesterol (method of Lieberman-Burchard, 1975), phospholipids and minerals.

All the results are presentages of ovules or eggs dry weight (Tables 1, 2, 3, Figures 1, 2, 3).

	TURBOT			SOLE			SEA BASS		
% DRY WEIGHT									
WATER	66,14 σ =0,66	91,44 σ =0,99	91,57 σ =0,78	66,81 σ = 2,6	91,95 σ =0.21	92,06 σ =0,26	65,19 σ = 1,7	88,43 σ =0,9	89,06 σ =0,6
PROTEINS	74,71 σ =1,56	69,94 σ = 9,9	62,86 σ = 1	73,77 σ =0,92	62,33 σ =4,5	67,78 σ = 3,1	63,88 σ = 2,4	54,18 σ =9,8	52,64 σ = 2,6
LIPIDS	17,84 σ =1,27	17,34 σ =2,17	15,57 σ =2,13	19,09 σ =19,1	15,67 σ =0,94	13,12 σ = 1,5	26,23 σ =0,7	33,07 σ = 16	26,08 σ =4,9
ASHES	4,16 σ =0,16	10,58 σ = 6,1	11,30 σ = 6,6	5.62 σ =0,5	8,11 σ = 1,5	9,82 σ =3,9	4,19 σ =0,3	6,19 σ =0,5	6,59 σ =0,4

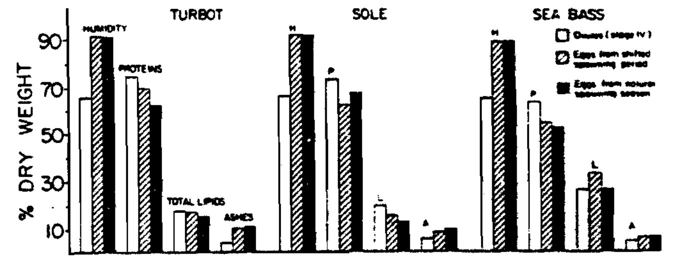

Table 1 and Figure 1: Global composition in fish ovules or eggs.

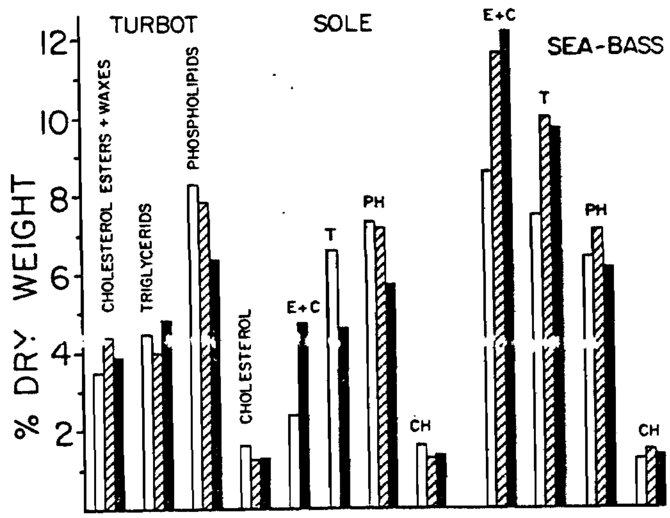

Figure 2: Lipids and different classes of lipids ovules and eggs.

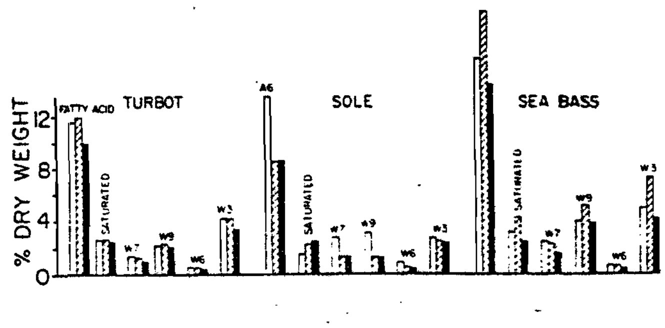

Figure 3: Fatty acids contents in fish ovules or eggs.

		% DRY WEIGHT			ppm DRY WEIGHT			
		CALCIUM (Ca)	PHOSPHORES (P)	MAGNESIUM (Mg)	ZINC (Zn)	COPPER (Cu)	IRON (Fe)	MANGANESE (Mn)
TURBOT		0.396 (σ = 0.071)	1.17 (σ = 0.03)	0.39 (σ = 0.03)	20 4 (σ = 14)	70.2 (σ = 23.9)	16.3 (σ = 3.2)	31 (σ = 0)
TURBOT		1.8 (σ = 1.3)	0.59 (σ = 0.16)	1.78 (σ = 2.11)	19 5 (σ = 50.4)	67.1 (σ = 177.6)	56.6 (σ = 41.5)	0
TURBOT		2.8 (σ = 1.6)	0.67 (σ = 0.41)	4.07 (σ = 0.64)	16 4 (σ = 50.3)	50 (σ = 111.8)	48.8 (σ = 27)	0
SOLE		0.316 (σ = 0.1)	1.15 (σ = 0.08)	0.72 (σ = 0.28)	96.8 (σ = 11.1)	0	44.2 (σ = 9.6)	0
SOLE		0.929 -	- -	1.02 -	- -	0	0	0
SOLE		0.854 (σ = 0.35)	1.11 (σ = 0.06)	0.99 (σ = 0.08)	88.3 (σ = 36.4)	0	94.3 (σ = 26)	0
SEA BASS		0.246 (σ = 0.09)	1.14 (σ = 0.05)	0.39 (σ = 0.05)	13 6 (σ = 8.15)	30.2 (σ = 15.6)	58.4 (σ = 7)	0
SEA BASS		1.115 (σ = 0.54)	0.68 (σ = 0.25)	0.83 (σ = 0.21)	138.4 (σ = 69.7)	17.8 (σ = 1.5)	63.25 (σ = 36)	0
SEA BASS		1.580 (σ = 0.74)	0.95 (σ = 0.02)	0.97 (σ = 0.16)	134 (σ = 22)	24.8 (σ = 7.2)	62.3 (σ = 22)	0

Table 2: Mineral contents in fish ovules or eggs.

		% DRY WEIGHT	10^{-5} DRY WEIGHT							
		TOTAL LIPIDIC PHOSPHORUS	LPC	SPH	PC	PS	PI	PE	DPG	AP
TURBOT										
TURBOT		0.24 (σ = 0.031)	572 (σ = 60)	501 (σ = 132)	17 940 (σ = 2390)	189 (σ = 74)	1 463 (σ = 595)	2 390 (σ = 572)	324 (σ = 68)	437 (σ = 272)
TURBOT		0.23 (σ = 0.03)	580 (σ = 84)	7 000 (σ = 2350)	17 700 (σ = 2720)	176 (σ = 49)	1 280 (σ = 672)	1 580 (σ = 822)	466 (σ = 132)	898 (σ = 806)
SOLE		0.27 (σ = 0.03)	658 (σ = 229)	1 371 (σ = 320)	19 890 (σ = 525)	246 (σ = 64)	558 (σ = 84)	3 670 (σ =1020)	632 (σ = 115)	134 (σ = 29)
SOLE		0.427 -	- -	3 766 -	28 900 -	589 -	3 177 -	5 218 -	611 -	422 -
SOLE		0.276 (σ = 0.002)	455 (σ = 11)	993 (σ = 142)	20 690 (σ = 275)	238 (σ = 51)	774 (σ = 107)	3 823 (σ = 752)	474 (σ = 51)	99 (σ = 27)
SEA BASS		0.245 (σ = 0.01)	2 158 (σ = 387)	664 (σ = 113)	18 390 (σ =1390)	326 (σ = 54)	260 (σ = 62)	2 529 (σ = 795)	115 (σ = 21)	132 (σ = 25)
SEA BASS		0.29 (σ = 0.02)	847 (σ = 277)	961 (σ = 264)	22 473 (σ =2157)	192 (σ = 80)	736 -	3 284 (σ = 623)	560 (σ = 165)	165 (σ = 74)
SEA BASS		0.22 (σ = 0.05)	396 (σ = 159	579 (σ = 20)	15 000 (σ = 319)	176 (σ = 38)	1 119 (σ = 437)	3 355 (σ = 362)	316 (σ = 129)	168 (σ = 27)

Table 3: Phosphatides in fish ovules or eggs.
LPC: Lysophosphatidylcholine; SPH: Sphingomyelin; PC: Phosphatidylcholine;
PS: Phosphatidyl Serine; PI: Phosphatidyl Inositol; PE: Phosphatidyl Ethanolamine
DPG: Diphosphatidyl Glyerol; AP: Phosphatidic acid

The main conclusions are presented below:

- Specific differences of biochemical composition of eggs and ovules appear, i.e. flatfish material contains less total lipids and fatty acids, but more proteins and minerals as compared to sea bass.

- The ovules from wild fish compared to the spawns of captive fish contain more proteins and lipids (especially cholesterol and phospholipids. On the other hand, their mineral content is lower.

- Shifted spawning season induces total lipids and mineral content decrease.

- Last of all, generally a higher total lipid content corresponds to very low viability rate of eggs.

Concerning the analyses of fatty acids (Fig. 3), we notice that saturated fatty acid rate is generally lower in ovules from wild fishes. On the other hand, poly unsaturated fatty acid seems to be more frequent in these ovules.

Mineral contents, and especially phosphorus content (Table 2) differ among different ovules or egg batches.

Phosphatides are given in Table 3 such as basic data.

All these results can be used in the future as indicators of the quality of the eggs, and consequently, indicators of the quality of larvae, as suggested by Nassour (1980) working on Salmo gairdneri. On the other hand, it is well known that the composition of diets can influence the survival and the fecundity of spawners (Hilge, 1979; Wooton, 1973). So, when there is very little information for dietary requirements of spawners, the data about general composition of eggs could be used as a guideline for formulation of spawners feedstuffs as proposed by Ketola (1980) for amino acid patterns of diets.

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