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Polymorphism in the Liver Esterase Pattern of the Sparid Fish *Dentex tumifrons*

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In order to analize subpopulations of yellow seabream, *Dentex tumifrons* (Temminck and Schlegel), the muscle protein and lactic acid dehydrogenase and esterase were screened by starch-gel electrophoretic method. In this paper, the polymorphism observed in the liver esterase pattern was described and analyzed genetically.

Samples examined here are as follows: 39 specimens, 98～232 mm in standard length, collected on Feb.～Aug., 1972 at Fish Market of Kochi City; 39 specimens, 101～216 mm, Jun., 1972, captured off Yaku Island of Kagoshima Prefecture; 91 specimens, 112～168 mm, Nov., 1972, captured at the East China Sea. The protein solution of the liver was prepared as described in Taniguchi et al. (1972). The starch-gel electrophoresis was carried out in a continuous buffer system: pH 8.0, 0.3 M boric acid for bridge solution; pH 8.6, 0.02 M boric acid for gel preparation. After electrophoresis, esterase activity was visualized on the gel by staining with alpha-naphthyl acetate and Fast Blue RR Salt as substrate and coupling dye.

The zones of esterase were visualized on the middle part of the anodal (Fig. 1). Each individual of yellow seabream has one or two of three different zones, 1, 2, and 3. The esterase patterns of this species are classified into 6 types on the basis of numbers and mobilities of zones: Type A with zone 1, Type AB with zones 1 and 2, Type B with zone 2, Type BC with zones 2 and 3, Type C with zone 3, Type AC with zones 1 and 3 (Fig. 2).

The patterns indicate that these phenotypes are controlled by three codominant alleles A, B, and C of a locus. The observed frequencies of six phenotypes are compared with the expected ones which are calculated for every lot according to the Hardy-Weinberg law (Table 1). Chi-square test for the observed

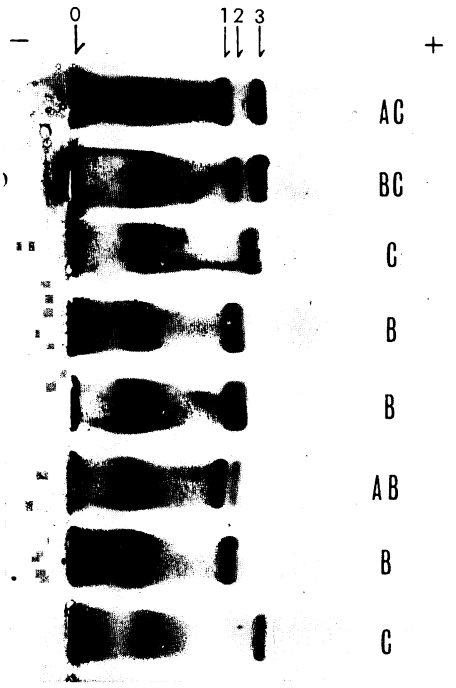

Fig. 1. Polymorphism found in liver esterase pattern of yellow seabream by starch-gel electrophoretic method. The arrow shows the origin.

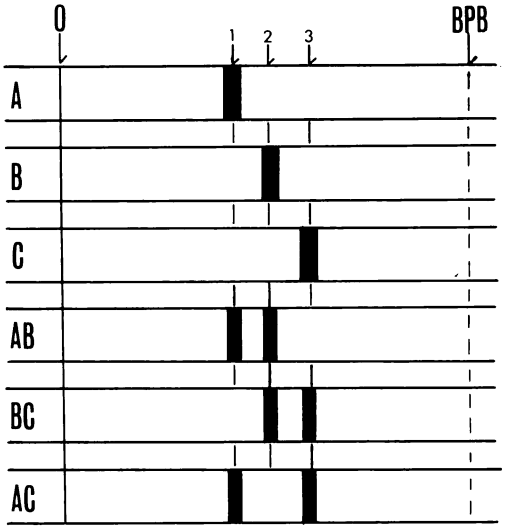

Fig. 2. Six phenotypes of liver esterase of yellow seabream by starch-gel electrophoretic method. 0: the origin, BPB: the indicator of the front.

Table 1. Distribution of phenotypes of liver esterase pattern in yellow seabream *Dentex tumifrons* from three different areas.

Area	No. of Specimens		Phenotype						Gene Frequency			x^2	Probability (3 d. f.)
			AA	AB	BB	BC	CA	CC	A	B	C		
Kochi	39	Obs.	1	1	15	13	2	7	0.06	0.56	0.37	7.02	0.05-0.10
		Exp.	0.2	2.6	12.2	16.2	1.7	5.3					
Yaku Isl.	39	Obs.	4	4	12	14	4	1	0.21	0.54	0.25	7.33	0.05-0.10
		Exp.	1.7	8.8	11.4	10.5	4.1	2.4					
East China Sea	91	Obs.	4	6	26	29	13	13	0.15	0.48	0.37	7.95	0.05-0.10
		Exp.	2.1	13.1	21.0	32.3	10.1	12.5					
Total	169	Obs.	9	11	53	56	19	21	0.14	0.51	0.35	19.47	0.01>
		Exp.	3.3	24.1	44.0	60.3	16.6	20.7					

Obs: observed value.
Exp: expected value.

and expected numbers of six phenotypes are not significant at 5% level for each lot. This agreement between two frequencies proves that the assumption of phenotype-genotype relation is reasonable.

Although Chi-square values for the observed frequencies and expected ones did not reach the significant level of 5%, χ^2 for three lots were comparatively high, 7.02～7.95 (3 d. f.). This fact may suggest that these samples examined here were collected from complex Menderian population respectively.

Fujino and Kang (1968), and Fujino (1970) investigated the subpopulations of Pacific skipjack tuna using serum esterase polymorphism, and clarified the existance of eastern Pacific and western Pacific populations.

Koehn (1972) critically referred to some of the population studies based on the esterase phenotypes of European and American freshwater eels, and pointed out that the electrophoretically-unclear phenotypes and phenotypes inconsistent with a genetic model have led to serious error of population analysis. He also suggested the existance of allelic isozyme variation responsive to local environmental condition. A high Chi-square values of observed phenotype distribution to that expected by Hardy-Weinberg (Table 1) may be due to the alternative property of esterase in response to environmental variation. However, the electrophoretic variation of esterase in yellow-seabream can be directly assigned to a genetic model above mentioned. The phenotypes of esterase may be used as a suitable genetic tag in studies of subpopulations of yellow seabream in coastal regions of Japan and its adjacent waters.

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キダイの肝臓エステラーゼ電気泳動像にみられる変異

小西芳信・谷口順彦

キダイ, *Dentex tumifrons* (Temminck et Schlegel) の筋肉蛋白, LDH, MDH, エステラーゼなどをデン

プンゲル電気泳動法により検出し，系群分析に有効な遺伝的変異を探索した．肝臓のエステラーゼ像には明瞭な変異がみられたので，その遺伝様式について検討をくわえた．この変異は原点と BPB (指示薬) の位置とのほぼ中間付近に出現する．各個体は出現位置の異なる3種のゾーンのうち1本あるいは2本を保有する．したがって，エステラーゼパターンは保有するゾーンにより A, AB, AC, B, BC, および C の 6 型に分けられる．これら6型のパターンはエステラーゼの表現型が3種の複対立遺伝子 A, B および C により決定されることを示している．遺伝子 A, B および C の頻度はそれぞれ異なる海域から得たサンプルによって異なる．これらの事実は，エステラーゼパターンがキダイの系群分析に有効な変異を含んでいることを示している．

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