

IATROSCAN TLC/FID
INSTRUMENT APPLICATION

23

Analysis of Lipids by the Iatroscan
(Marine Products)

A) Samples

1) Fish lipid

1-1	Standard mixture-I	1-11	Lepidocybium flavobrunneum (muscle)
1-2	Todarodes pacificus (liver)	1-12	Lepidocybium flavobrunneum (liver&testis)
1-3	Halocynthia roretzi (muscle)	1-13	Cololabis saira (muscle)
1-4	Cultured Coho Salmon (muscle)	1-14	Cololabis saira (viscera)
1-5	Oncorhynchus Keta (muscle)	1-15	Sardinops melanosticta melanosticta (muscle)
1-6	Oncorhynchus Keta (muscle)	1-16	Sardinops melanosticta melanosticta (viscera)
1-7	Oncorhynchus Keta (ovary)	1-17	Scomber japonicus (muscle)
1-8	Navodon modestus (muscle)	1-18	Scomber japonicus (viscera)
1-9	Xiphias gladius (muscle)	1-19	Standard mixture-II
1-10	Xiphias gladius (eye)	1-20	Kastuwonuspelamis (muscle)

2) Plankton lipid

- 2-1 Copepoda (Neocalanus plumchrus)
- 2-2 Artemia

3) Lipid oxidation and hydrolysis in dried anchovy products during drying and storage.

B) Lipid components are expressed in the following abbreviations.

Component	Abbreviation
Polar lipids	PL
Phosphatidyl choline	PC
Phosphatidyl ethanolamine	PE
Phosphatidyl serine	PS
Sphingomyeline	SPM
Cholesterol	Cho
Sterols	ST
Monoglyceride	MG
Free fatty acid	FFA
Triglyceride	TG
Cholesterol acetate (Internal standard)	CA (IS)
Cholesterol ester	CE
Wax ester	WE
Hydrocarbone	HC
Diglyceride	DG

C) Mobile Phase

System-1: Hexane : Diethyl ether : Formic acid = 42 : 28 : 0.3

System-2:

1st	Hexane : Diethyl ether = 66 : 4	8 cm
2nd	Hexane : Diethyl ether : Formic acid = 55 : 15 : 0.5	8 cm
3rd	Hexane : Benzene = 30 : 30	10 cm

System-3:

1st	Chloroform : Methanol : Water = 50 : 20 : 2.5	5 cm
2nd	Hexane : Diethyl ether : Formic acid = 65 : 5 : 0.15	10 cm

System-4:

1st	Chloroform : Methanol : Water : Ammonia = 38 : 29 : 2.3 : 0.6	6 cm
2nd	Hexane : Diethyl ether : Formic acid = 60 : 10 : 0.1	10 cm

System-5: Chloroform : Methanol : Water = 65 : 25 : 2

D) Reference

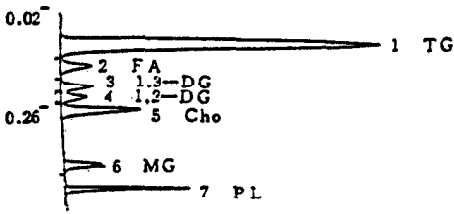
- 1) Parrish, C.C., Ackman, R.G. : Chromarod separations for the analysis of marine lipid classes by Introscan thin-layer chromatography-flame ionization detection. J. Chromatogr. 262 : 103, 1983.
- 2) Delmas, R.P., Parrish, C.C. & Ackman, R.G. : Determination of lipid class concentrations in seawater by thin-layer chromatography with flame ionization detection. Anal. Chem. 56 : 1272, 1984.
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- 4) Volkman, J.K., Everitt, D.A., Allen, D.I. : Some analyses of lipid classes in marine organisms, sediments and seawater using thin-layer chromatography-flame ionization detection. J. Chromatogr. 356 : 147, 1986.
- 5) Whittsett, J.F., Kennish, J.M., Kramer, D.E., French, J.S. : Fish oil analysis using combined thin-layer chromatography and flame ionization detection (TLC-FID). Proceedings of an International Symposium Coordinated by the University of Alaska Sea Grant College Program, Anchorage, Alaska, U. S. A., 1986.
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- 8) Goutx, M., Mutaftshiev, S., Bertrand, J-C. : Lipid and exopolysaccharide production during hydrocarbon growth of a marine bacterium from the sea surface. *Mar. Ecol. Prog. Ser.* 40 : 259, 1987.
- 9) Ohman, M.D. : Sources of variability in measurements of copepod lipids and gut fluorescence in the California Current coastal zone. *Mar. Ecol. Prog. Ser.* 42 : 143, 1988.
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- 11) Ohshima, T., Wada, S., Koizumi, C. : 1-O-alk-1-enyl-2-acyl and 1-O-alkyl-2-acyl glycerophospholipids in white muscle of bonito *Euthynnus pelamis* (Linnaeus). *Lipids* 24 : 363, 1989.
- 12) Cavaletto, J.F., Vanderploeg, H.A., Gardner, W.S. : Wax esters in two species of freshwater zooplankton. *Limnol Oceanogr.* 34 : 785, 1989.
- 13) Hayashi, K. : Wax esters in the stomach content lipids of gonatid squid *Gonatopsis borealis*. *Nippon Suisan Gakkaishi* 55 : 1463, 1989.
- 14) Ackman, R.G., McLeod, C.A., Banerjee, A.K. : An overview of analyses by Chromarod-latroscan TLC-FID. *J. Planar Chromatogr.* 3 : 450, 1990.
- 15) Umino, T., Takada, Y., Nakagawa, H. : The study for lipids deposited in the fry of red sea bream. *J. Fac. Appl. Biol. sci.*, 29 : 117, 1990.
- 16) Ohshima, T., Ackman, R.G. : New developments in Chromarod/latroscan TLC-FID: Analysis of lipid class composition. *J. Planar Chromatogr.* 4 : 27, 1991.

1) Fish lipid

1-1 Standard mixture-I

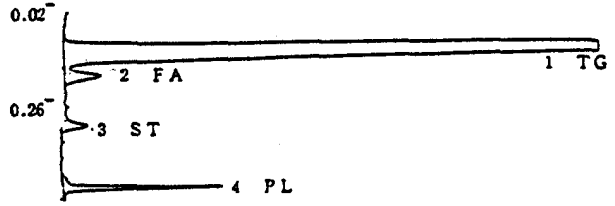
Mobile phase: System-1



NO.	NAME	RT	CAL. METHOD 00			CONC
			SF	PA	PB	
			.100000 ₁₀ +03	.100000 ₁₀ +01	.100000 ₁₀ +01	
1		0.104	13759	M	63.9639	
2		0.152	1001	M	4.6532	
3		0.204	866	M	4.0269	
4		0.231	750	M	3.4875	
5		0.264	2305		10.7151	
6		0.404	1014	M	4.7155	
7		0.459	1815		8.4375	
TOTAL			21511		100.0000	

1-2 *Todarodes pacificus* (liver)

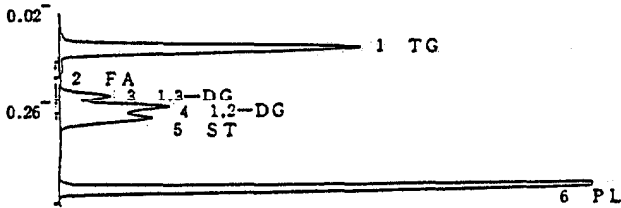
Mobile phase: System-1



NO.	NAME	RT	CAL. METHOD 00			CONC
			SF	PA	PB	
			.100000 ₁₀ +03	.100000 ₁₀ +01	.100000 ₁₀ +01	
1		0.125	46882	M	89.7584	
2		0.179	1446		2.7701	
3		0.308	957		1.8326	
4		0.464	2045	M	5.6387	
TOTAL			52231		100.0000	

1-3 *Halocynthia roretzi* (muscle)

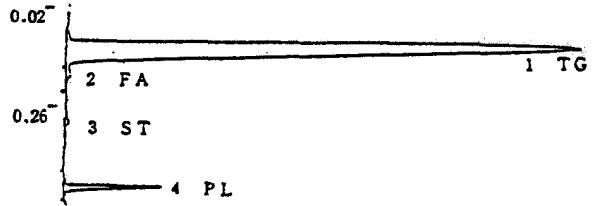
Mobile phase: System-1



NO.	NAME	RT	CAL. METHOD 00			CONC
			SF	PA	PB	
			.100000 ₁₀ +03	.100000 ₁₀ +01	.100000 ₁₀ +01	
1		0.112	25319	M	27.9972	
2		0.166	417	M	0.4616	
3		0.226	3848	M	4.2551	
4		0.261	9373	M	10.3645	
5		0.288	7287		8.0579	
6		0.465	44189	M	48.8635	
TOTAL			90434		100.0000	

1-4 Cultured Coho Salmon (muscle)

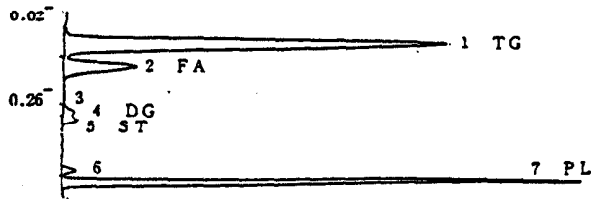
Mobile phase: System-1



NO.	NAME	RT	CAL. METHOD 00			CONC
			SF	PA	PB	
			.100000 ₁₀ +03	.100000 ₁₀ +01	.100000 ₁₀ +01	
1		0.122	61402	M	93.6922	
2		0.177	463	M	0.7073	
3		0.303	273		0.4169	
4		0.463	3397	M	5.1835	
TOTAL			65536		100.0000	

1-5 *Oncorhynchus Keta* (muscle)

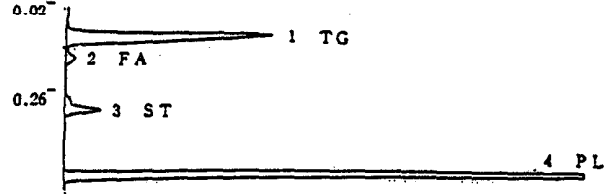
Mobile phase: System-1



NO.	NAME	RT	A OR H	MK	CONC
1		0.114	37586	M	52.6157
2		0.169	6866		9.6116
3		0.248	235	M	0.3298
4		0.285	854	M	1.1958
5		0.305	916		1.2832
6		0.437	836	M	1.1707
7		0.468	24140		33.7929
TOTAL			71436		100.0000

1-6 *Oncorhynchus Keta* (muscle)

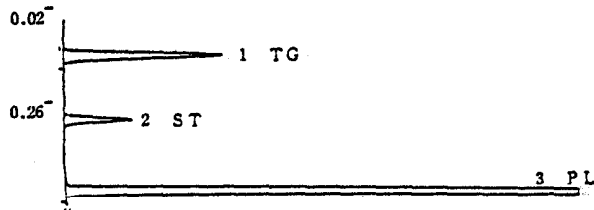
Mobile phase: System-1



NO.	NAME	RT	A OR H	MK	CONC
1		0.106	17070	M	24.7632
2		0.160	880		1.2774
3		0.293	2760		4.0051
4		0.470	48222		69.9541
TOTAL			68934		100.0000

1-7 *Oncorhynchus Keta* (ovary)

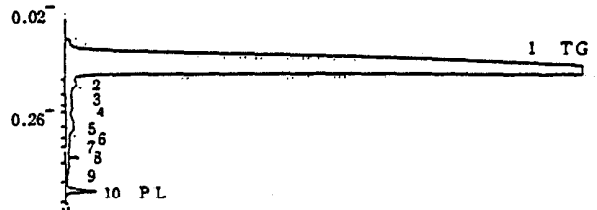
Mobile phase: System-1



NO.	NAME	RT	A OR H	MK	CONC
1		0.113	10182	M	9.9944
2		0.281	3726		3.6576
3		0.466	87971	M	86.3479
TOTAL			101880		100.0000

1-8 *Navodon modestus* (muscle)

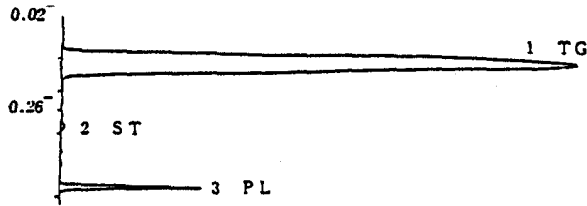
Mobile phase: System-1



NO.	NAME	RT	A OR H	MK	CONC
1		0.133	92830	M	93.1840
2		0.181	1464	M	1.4704
3		0.232	693	M	0.6959
4		0.250	393	M	0.3951
5		0.288	1030	M	1.0345
6		0.305	667	M	0.6701
7		0.335	334	M	0.3356
8		0.378	457	M	0.4593
9		0.402	479	M	0.4816
10		0.466	1268	M	1.2731
TOTAL			99620		100.0000

1-13 *Cololabis saira* (muscle)

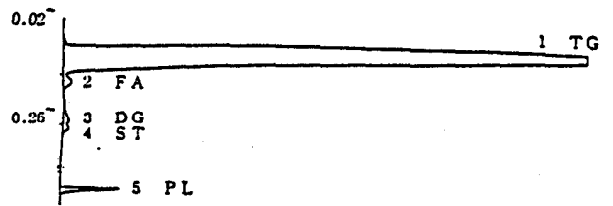
Mobile phase: System-1



NO.	NAME	RT	A OR H	MK	CONC
1		0.143	77084		94.0237
2		0.308	237	M	0.2891
3		0.461	4662	M	5.6871
TOTAL			81963		100.0000

1-14 *Cololabis saira* (viscera)

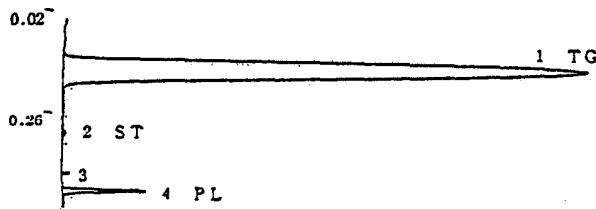
Mobile phase: System-1



NO.	NAME	RT	A OR H	MK	CONC
1		0.128	90693	M	95.8426
2		0.186	824		0.8712
3		0.286	699	M	0.7394
4		0.307	418		0.4425
5		0.467	1991		2.1040
TOTAL			94627		100.0000

1-15 *Sardinops melanosticta melanosticta* (muscle)

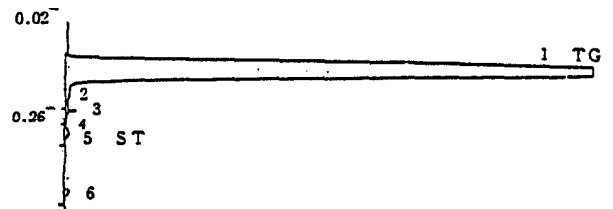
Mobile phase: System-1



NO.	NAME	RT	A OR H	MK	CONC
1		0.156	79179	M	96.1391
2		0.316	234		0.2844
3		0.418	128		0.1559
4		0.464	2817		3.4205
TOTAL			82359		100.0000

1-16 *Sardinops melanosticta melanosticta* (viscera)

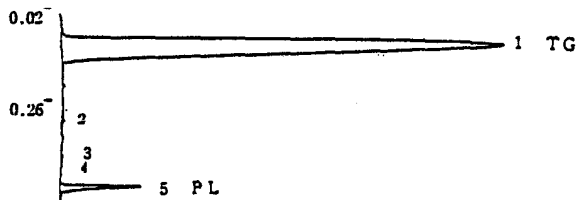
Mobile phase: System-1



NO.	NAME	RT	A OR H	MK	CONC
1		0.144	89093	M	98.0491
2		0.196	533	M	0.5871
3		0.246	277	M	0.3055
4		0.280	112	M	0.1232
5		0.309	441	M	0.4858
6		0.457	408	M	0.4490
TOTAL			90866		100.0000

1-17 *Scomber japonicus* (muscle)

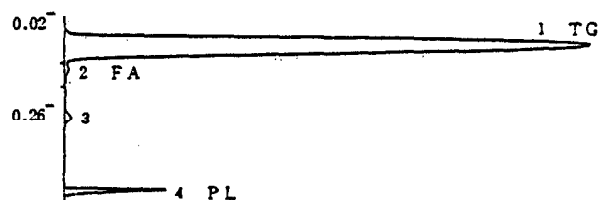
Mobile phase: System-1



NO.	NAME	RT	A OR H	MK	CONC
1		0.110	60287		94.3280
2		0.284	386	M	0.6052
3		0.354	102	M	0.1606
4		0.382	150	M	0.2358
5		0.463	2984		4.6701
TOTAL			63912		100.0000

1-18 *Scomber japonicus* (viscera)

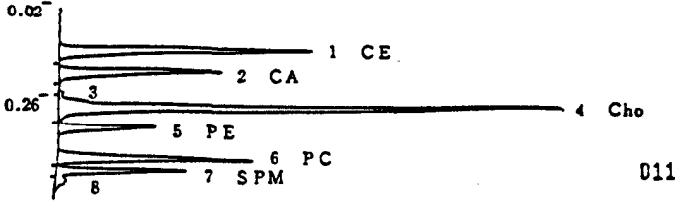
Mobile phase: System-1



NO.	NAME	RT	A OR H	MK	CONC
1		0.100	75524	M	93.7879
2		0.148	512	M	0.6361
3		0.273	782		0.9711
4		0.461	3708		4.6048
TOTAL			80526		100.0000

1-19 Standard mixture-II

Mobile phase: System-3

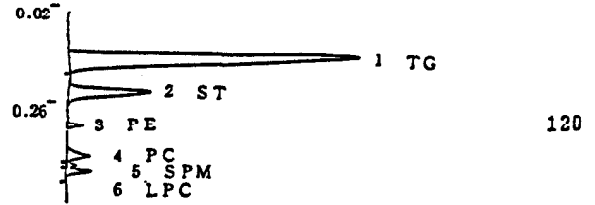


CAL. METHOD 00
SF PA PB
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NO.	NAME	RT	A OR H	MK	CONC
1		0.133	7016	M	20.0892
2		0.188	4480	M	12.8289
3		0.236	122	M	0.3518
4		0.280	13111	M	37.5392
5		0.329	2309		6.6114
6		0.412	4772	M	13.6645
7		0.441	2688	M	7.6966
8		0.463	425		1.2181
TOTAL			34927		100.0000

1-20 Kastuwonuspelamis (muscle)

Mobile phase: System-4

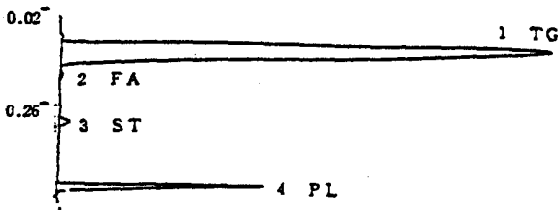


CAL. METHOD 00
SF PA PB
.100000e+03 .100000e+01 .100000e+01

NO.	NAME	RT	A OR H	MK	CONC
1		0.146	29232	M	74.5960
2		0.228	6443		16.4435
3		0.316	600		1.5335
4		0.395	1521	M	3.8835
5		0.418	372	M	0.9504
6		0.433	1016	M	2.5927
TOTAL			39187		100.0000

1-9 *Xiphias gladius* (muscle)

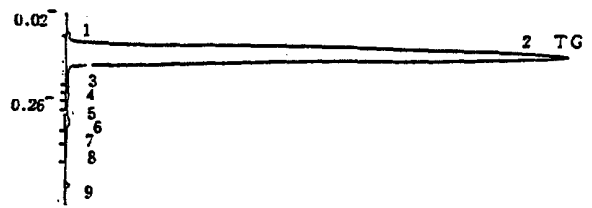
Mobile phase: System-1



CAL. METHOD		00				
		SF	PA	PB		
		.100000 ₁₀ +03	.100000 ₁₀ +01	.100000 ₁₀ +01		
NO.	NAME	RT	A OR H	MK	CONC	
1		0.123	65013		88.3756	
2		0.176	279		0.3802	
3		0.302	619		0.8422	
4		0.466	7652	M	10.4018	
TOTAL			73565		100.0000	

1-10 *Xiphias gladius* (eye)

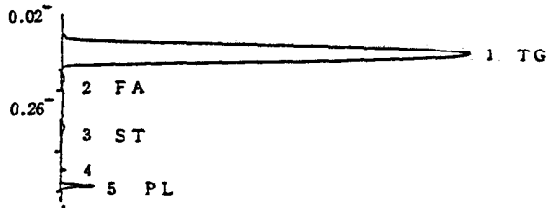
Mobile phase: System-1



CAL. METHOD		00				
		SF	PA	PB		
		.100000 ₁₀ +03	.100000 ₁₀ +01	.100000 ₁₀ +01		
NO.	NAME	RT	A OR H	MK	CONC	
1		0.075	178	M	0.2462	
2		0.128	70614	M	97.3114	
3		0.208	169	M	0.2334	
4		0.228	211	M	0.2918	
5		0.258	164	M	0.2268	
6		0.305	453	M	0.6252	
7		0.337	177	M	0.2445	
8		0.371	226	M	0.3115	
9		0.466	369		0.5087	
TOTAL			72565		100.0000	

1-11 *Lepidocybium flavobrunneum* (muscle)

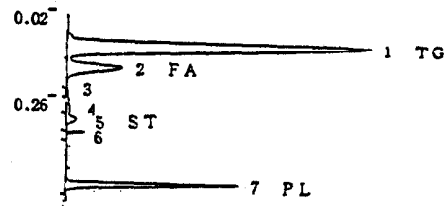
Mobile phase: System-1



CAL. METHOD		00				
		SF	PA	PB		
		.100000 ₁₀ +03	.10	00 ₁₀ +01	.100000 ₁₀ +01	
NO.	NAME	RT	A OR H	MK	CONC	
1		0.124	69369	M	97.2736	
2		0.187	316	M	0.4437	
3		0.315	394	M	0.5527	
4		0.426	134		0.1882	
5		0.466	1099	M	1.5415	
TOTAL			71212		100.0000	

1-12 *Lepidocybium flavobrunneum* (liverstestis)

Mobile phase: System-1

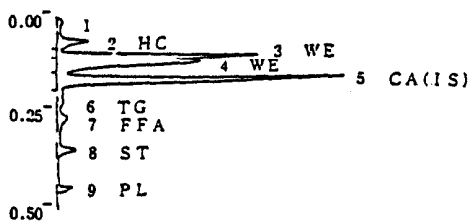


CAL. METHOD		00				
		SF	PA	PB		
		.100000 ₁₀ +03	.100000 ₁₀ +01	.100000 ₁₀ +01		
NO.	NAME	RT	A OR H	MK	CONC	
1		0.106	30980	M	70.9277	
2		0.161	4743	M	10.8612	
3		0.216	115	M	0.2636	
4		0.260	255	M	0.5839	
5		0.293	759	M	1.7390	
6		0.326	239	M	0.5479	
7		0.466	6579	M	15.0663	
TOTAL			43672		100.0000	

2) Plankton lipid

2-1 Copepoda (*Neocalanus plamchrus*)

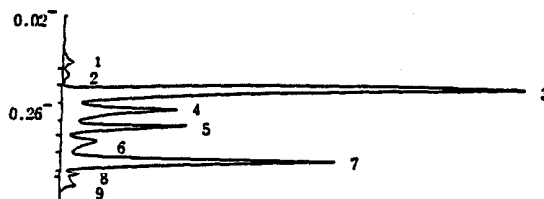
Mobile phase: System-2



NO.	NAME	RT	A	OR	H	MK	CONC
1		0.011	157	D			1.4316
2		0.063	548	D	M		4.9872
3		0.102	2548	D	M		23.1793
4		0.119	2886	D	M		26.2520
5		0.168	3831	D	M		34.8519
6		0.226	164	D			1.4983
7		0.267	340	D			3.0343
8		0.350	334	D			3.0402
9		0.453	183				1.6647
TOTAL			10994				100.0000

2-2 Artemia

Mobile phase: System-3

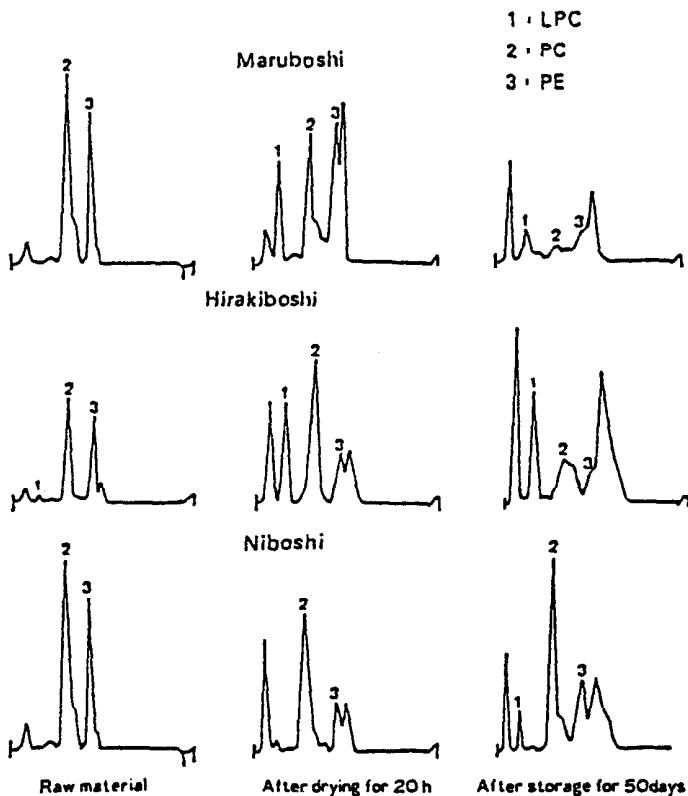


NO.	NAME	RT	A	OR	H	MK	CONC
1		0.141	544	M			1.4513
2		0.177	288	M			0.7682
3		0.222	17206	M			45.8456
4		0.274	4522	M			12.0499
5		0.316	3542	M			9.4379
6		0.351	1751	M			4.6668
7		0.413	8560	M			22.8084
8		0.438	465	M			1.2412
9		0.470	649				1.7302
TOTAL			37531				100.0000

3) Lipid oxidation and hydrolysis in dried anchovy products during drying and storage.

Mobile phase: System-5

Reference 6)



Introspect chromatograms of polar lipid fractions of anchovy products after drying and storage.