FATTY ACID COMPOSITION OF MANY TOOTHED PILOT WHALE OIL*

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The Many toothed pilot whale, *Peponocephala electra*, is a new genus species which was named by Nishiwaki and Norris (1966). It is not now known about the details of ecology and geographical distribution.

The purpose is minute examination of the component fatty acid of the Many toothed pilot whale oil by gas-liquid chromatography using a hydrogen ionization detector.

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MATERIAL AND METHOD

Sample used

Material is the Many toothed pilot whale which was caught in the Suruga Bay, Shizuoka Prefecture, Japan, on March 23, 1965. The oil was extracted by boiling the material with water and the properties are shown in Table 1.

The methyl ester of the fatty acids was prepared by the procedure of Sano *et al* (1965, 1966) with the following modification.

In the first place, 5.0 grams of the sample oil was soluble in 5 times of *n*-hexane and adding to 10 ml of anhydrous methanol and 2 ml of N/2 potassium hydroxide-methanol solution as catalyzer. After conducting on magnetic stirrer in nitrogen atmosphere at room temperature for 1.5 hours, the reacted solution was also added 50 ml of half-saturated sodium chloride solution. Then, crude methyl ester of fatty acids was extracted by 20 ml *n*-hexane for several times, and evaporated the solution in nitrogen atmosphere, including release of a vacuum. The next, in order to refine the crude methyl ester, it was soluted in 2 times of *n*-hexane and passed through in glass column of 2 cm diameter packed with 2.0 grams of silicic acid activated at 120°C for 1 hour. Also, column was flowed with 60 ml of ethyl ether-*n*-hexane (1 : 50). The obtained solution was evaporated in nitrogen atmosphere releasing vacuum, after the dehydration by anhydrous sodium sulfate. After all, it was obtained that 3.8 grams of refined methyl ester was no smell and colourless.

Gas-liquid chromatograph conditions

The methyl ester of fatty acids obtained from the Many toothed pilot whale

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TABLE 1. PROPERTIES OF MANY TOOTHED PILOT WHALE OIL

Appearance (at 30°C)	Yellowish orange liquid
Oil content (%)	57.0
Refractive index (at 40°C)	1.4611
Specific gravity (at 26°C)	0.9226
Viscosity (at 50°C)	0.4780
Acid value	1.7
Iodine value (Wijs)	98.7
Saponification value	225.7
Unsaponifiables (%)	0.42

oil was analyzed with a Shimadzu Gas Chromatograph Model GC-IC. The instrument was equipped with a hydrogen ionization detector. The column used was composed of 3 mm I D by 225 cm U-sharped stainless steel containing diethylene glycol succinate polyester (DEGS) supported on 30–60 mesh Shimalite. Operating conditions were as follows; column temp. 215°C, injector temp. 260°C, detector temp. 240°C, a column inlet pressure of 1.2 kg/cm^2. N_2 was used, which measured 70 ml/min.

Chromatographic peaks were identified either by comparison of retention times with those of standards or from a graph relationship (A. Seher & R. Kühnast, 1965) between logarithm of retention time and the number of carbon atoms, and also hydrogenated methyl ester was used to verify the contained fatty acids of odd-carbon chain lengths. The hydrogenation method was as follows; the *n*-hexanoate solution of the methyl ester was added a pinch of platinum black as a catalyzer. The mixture was stirred with a magnetic stirrer for 24 hours in hydrogen atmosphere at room temperature. After the hydrogenated methyl ester was filtered, gas chromatograph was operated at the same conditions.

The fatty acids were evaluated quantitively by method of Magidman *et al* (1962). All fatty acids are reported as weight percentages of the total known fatty acids present.

RESULTS AND DISCUSSION

The results obtained are as follows; as saturated fatty acids, C_8, C_{10}, C_{12}, C_{14}, C_{16}, C_{18} and C_{20}, and as unsaturated fatty acids, C_{10} monoenoic, C_{12} monoenoic, C_{12} dienoic, C_{14} monoenoic, C_{14} dienoic, C_{16} monoenoic, C_{16} dienoic, C_{16} trienoic, C_{18} monoenoic, C_{18} dienoic, C_{18} trienoic, C_{20} monoenoic, C_{20} dienoic, C_{20} tetraenoic and also odd-carbon chain lengths of C_{13}, C_{15} and C_{19}.

The percentages of these fatty acids are shown in Table 2.

The oil of the Many toothed pilot whale was comparatively lower acid value and unsaponifiable matter content. Therefore it seems that the oil is glyceride and content of free acids is lower too.

According to Table 2, the fatty acid of the most prominent is C_{18} monoenoic 28.1 %, and the next prominent is C_{14} monoenoic 13.8 % and also saturated C_{16} is 11.4 %. The total of these fatty acids holds really 52.3 % of all total fatty acids. The

TABLE 2. FATTY ACID COMPOSITION OF MANY TOOTHED PILOT WHALE OIL

Fatty acid No.	Weight per cent of total fatty acid
8	0.1
10	0.3
10-1	0.3
12	1.3
12-1	2.0
12-2	3.8
13	0.3
14	7.3
14-1	13.8
14-2	4.9
15	0.5
16	11.4
16-1	5.3
16-2	6.9
16-3	0.9
18	0.8
18-1	28.1
18-2	3.7
18-3	0.8
19	1.4
20	1.7
20-1	0.6
20-2	1.5
20-4	2.3

TABLE 3. A COMPARISON OF SATURATED AND UNSATURATED FATTY ACID OF MANY TOOTHED PILOT WHALE OIL

Fatty acid No.	Weight per cent of total fatty acid	
	Saturated	Unsaturated
8	0.1	—
10	0.3	0.3
12	1.3	5.8
13	0.3	—
14	7.3	18.7
15	0.5	—
16	11.4	13.1
18	0.8	32.6
19	1.4	—
20	1.7	4.4
Total	25.1	74.9

proportions of other component fatty acids are as follows; saturated C_{14} 7.3%, C_{16} dienoic 6.9%, C_{16} monoenoic 5.3%, C_{14} dienoic 4.9%, C_{12} dienoic 3.8%, C_{18} dienoic 3.7%, C_{20} tetraenoic 2.3%, C_{12} monoenoic 2.0%, saturated C_{20} 1.7%, C_{20} dienoic 1.5%, saturated C_{19} 1.4%, saturated C_{12} 1.3%, C_{16} trienoic 0.9%, saturated C_{18} 0.8%, C_{18} trienoic 0.8%, C_{20} monoenoic 0.6%, saturated C_{15} 0.5%,

saturated C_{10} 0.3%, C_{10} monoenoic 0.3%, saturated C_{13} 0.3% and saturated C_8 0.1%.

On the other hand, the proportions of total saturated fatty acids are 25.1% in preparation for 74.9% of total unsaturated fatty acids (shown in Table 3). In saturated fatty acids, C_{16} is 11.4% of the largest quantity, the next C_{14} is 7.3% and further C_{20} is 1.7%. Against these proportions, in total unsaturated fatty acids holds nearly 3 times of percentages in comparison with that of saturated fatty acids.

SUMMARY

1) The properties of Many toothed pilot whale oil were studied.

2) Fatty acid composition of Many toothed pilot whale oil was analyzed by liquid chromatograph using a hydrogen ionization detector on a DEGS column.

3) The results obtained are as follows;

Total saturated fatty acids	25.1%:
octanoic	0.1%
decanoic	0.3%
dodecanoic	0.3%
tridecanoic	0.3%
tetradecanoic	7.3%
pentadecanoic	0.5%
hexadecanoic	11.4%
octadecanoic	0.8%
nonadecanoic	1.4%
eicosanoic	1.7%
Total unsaturated fatty acids	74.9%:
C_{10} monoenoic	0.3%
C_{12} monoenoic	2.0%
C_{12} dienoic	3.8%
C_{14} monoenoic	13.8%
C_{14} dienoic	4.9%
C_{16} monoenoic	5.3%
C_{16} dienoic	6.9%
C_{16} trienoic	0.9%
C_{18} monoenoic	28.1%
C_{18} dienoic	3.7%
C_{18} trienoic	0.8%
C_{20} monoenoic	0.6%
C_{20} dienoic	1.5%
C_{20} tetraenoic	2.3%

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