

カワヤツメのカロテノイド

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Short Paper

On the Carotenoids of Arctic Lamprey*¹

β -carotene, lutein, zeaxanthin, tunaxanthin, α -doradoxanthin, β -doradoxanthin, canthaxanthin, and astaxanthin have hitherto been known as principal carotenoids in the fish.

Recently the authors revealed the presence of additional principal carotenoids of the fish, parasiloxanthin,^{1,2)} salmoxanthin,³⁾ and cynthiixanthin (alloxanthin).^{4,5)} And we also proposed the assumption that tunaxanthin might be considered as a chemical indicator of the division percichthyes.⁶⁾

The purpose of the present paper is to report the carotenoids of arctic lamprey, *Lampetra japonica* (von MARTENS), kawayatsume in Japanese, which belongs to cyclostomata and is considered the most primitive of the fish. Carotenoids from arctic lamprey (male: 8, female: 3) caught in the river Shinano, Niigata prefecture, in June, 1976, were extracted separately with acetone. The extracted carotenoids mixture was shown to be separated into three spots by TLC (silicagel G, 30% acetone in petroleum ether as solvent). The major upper spot (Rf value 0.46) was of a pink color, two major middle (0.39) and minor lowest (0.27) were of yellow. The thin layer chromatographic observations described above suggested that the principal carotenoids are ketocarotenoid and xanthophylls (corresponds to diol).

Table 1. Percentage of individual carotenoids in the integuments and eggs of arctic lamprey*¹

Fraction	mg %* ²	Integuments		Eggs
		♂	♀	
		1) 0.018	2) 0.154	0.061
Fr-1 Lutein		13.4		3.2
2 Zeaxanthin		19.9	trace* ³	30.3
3 Diatoxanthin		12.2	trace	13.6
4 Cynthiixanthin		21.0	trace	27.0
5 β -carotene-triol		1.2		3.4
6 β -carotene-tetrol		—		3.4
7 β -doradoxanthin		5.1		1.1
8 Idoxanthin		3.3		2.2
9 Astaxanthin		24.2		15.9

*1 { average body length 37.0 cm
average body weight 138 g
total weight of eggs 138 g

*2 { 1) mg \times 100/body weight
2) mg \times 100/integuments

*3 detected only in TLC

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*1 カワヤツメのカロテノイド.

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Furthermore, from these Rf values of TLC, it was found that the carotenoids of arctic lamprey are present in free form unlikely usual fish carotenoids which exist in ester form. As far as we are concerned, such finding has been obtained for only one kind of fish, Japanese catfish.¹⁾ The acetone solution containing carotenoids were saponified before separation with 10% KOH in methanol at room temperature in a nitrogen atmosphere for 24 hrs. Crude carotenoids were subjected to column chromatography according to the method which had been applied by the authors.⁴⁾ Nine fractions were collected. Identification of each fraction was carried out by means of TLC, visible light absorption maxima, epoxide test with conc. HCl in ether, allylic OH test, isomerization with iodine, reduction of ketocarotenoids with sodium borohydride, and co-TLC with authentic samples. The percentage of individual carotenoids are given in the Table 1. As shown in the Table 1, tunaxanthin proposed as a chemical indicator of the division percichthyes was not detected and zeaxanthin, diatoxanthin, cynthiixanthin and astaxanthin were found as principal carotenoids in both integuments and eggs. Fraction 8 (diketo-diol) was identified to be idocin (3,4-diketo-3',4'-dihydroxy- β -carotene)⁷⁾ by converting it to corresponding tetrol, crustaxanthin (3,4,3',4'-tetrahydroxy- β -carotene) with sodium borohydride. The occurrence of idoxanthin (before saponification) in the fish is the second example⁷⁾ and it is also interesting that the compound could be regarded as probable biosynthetic intermediate to astaxanthin via β -doradoxanthin from zeaxanthin.

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