RIBOFLAVIN ASSAYS OF FISHERY PRODUCTS

By Philip M. Sautier*

Published literature on the riboflavin (vitamin B_2) content of fishery products is very limited, but there is adequate evidence that some of these products are reasonably important sources of this vitamin. Although numerous studies have been reported dealing with assay methods and results for other foodstuffs, no comprehensive studies on fishery products, with the exception of a paper by Billings et al (1941), have been published.

Table 1 - The Riboflavin Content of the Edible Flesh of Fishery Products of Southeastern Alaska

Common Name	Scientific Name	Number of Assays	Riboflavin content micrograms per 100 grams	
			Range	Average
Clams--butter	Saxidomus giganteus	2	246-292	269
cockle	Cardium corbis	2	150-162	156
horse	Schizothaerus nuttalli	2	96-100	98
little neck	Paphia staminea	2	170-178	174
mud	Mya arenaria	2	221-265	243
Cod--grey	Gadus macrocephalus	6	141-170	158
ling	Ophiodon elongatus	2	28-50	39
kelp (Alaska greenling)	Hexagrammos octogrammus	1		44
Crab--dungeness	Cancer magister	2	16-24	20
Eulachon	Thaleichthys pacificus	1		43
Flounder--arrow-tooth halibut	Atheresthes stomias	1		52
Dover sole	Microstomus pacificus	1		57
English sole	Parophrys vetulus	2	32-60	44
flathead sole	Hippoglossoides classodon	2	48-53	51
petrale sole	Eopsetta jordani	1		49
rex sole	Errex zachirus	1		47
rock sole	Lepidopsetta bilineata	1		37
starry flounder	Platichthys stellatus	1		43
Halibut	Hippoglossus hippoglossus	11	36-62	47
Halibut cheeks		1		98
Herring	Clupea pallasii	20	181-272	217
Mussels	Mytilus edulis	1		249
Octopus	Octopus bimaculatus	1		40
Rockfish--black	Sebastodes species	2	123-182	153
brown	" "	1		90
red	Sebastopyr ruberrimus	2	72-132	111
Sablefish	Anoplopoma fimbria	2	98-77	88
Salmon--red	Oncorhynchus nerka	5	40-90	72
pink	" gorbuscha	5	36-68	46
chum	" keta	5	48-72	59
silver	" kisutch	5	90-123	109
king	" tschawytscha	7	152-256	231
Shrimp--pink	Pandalus borealis	1		142
side stripe	Pandalopsis dispar	1		133
Trout--cutthroat	Salmo clarkii	1		93
Dolly Varden	Salvelinus malma	2	37-38	38
rainbow	Salmo irideus	1		203
steelhead	" gairdnerii	1		200

To help fill the need for such information about the fishery products of Alaska, this article presents a summary of assays for riboflavin made with 45

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species or varieties of fish, shellfish, and other marine animals. Because t number of samples of each type is very small, the values reported here are on indicative, and until corroborated by further results, should not be consider as being necessarily representative. There are, undoubtedly, variations due season, sex, size, or other factors, and losses might occur if the product we cooked or processed.

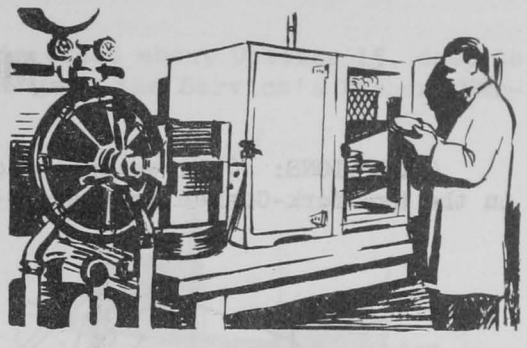
Table 2 - Riboflavin Content of Miscellaneous Raw Fishery Byproducts of Southeastern Alaska

Portion Assayed	Sample	Number of Assays	Riboflavin content micrograms per 100 gram Range	Average
Liver:				
	Salmon--red	2	1630-2380	2005
	pink	3	730-1243	954
	chum	2	930-1050	990
	silver	3	950-1090	1000
	king	9	1260-2040	1815
	Lingcod	2	1170-1220	1195
	Grey cod	8	790-1540	1170
	Sablefish	1		890
	Arrow-tooth sole	1		876
	English sole	2	806-972	889
	Flathead sole	1		733
	Grayfish (Squalus suckleyi)	5	314-720	573
Roe:				
	Herring	4	660-1210	829
	Salmon--red	2	755-800	777
	pink	2	600-620	610
	chum	2	800-1090	960
	silver	2	580-630	605
	king	2	620-750	685
Heads:				
	Salmon--pink	1		163
	king	1		222
	Halibut	4	88-114	99
	Lingcod	1		73
	Red rockfish	2	72-98	85
Milt:				
	Herring	2	360-470	415
Entire viscera:				
	English sole	1		702
	Herring	4	1290-2320	1580
Miscellaneous:				
	King salmon backbones (from filleting)	1		173
	Shrimp waste (includes heads, tails, small shrimp, etc.)	1		225

All of the samples were obtained from the lakes, beaches, or coastal waters of Southeastern Alaska and were assayed fresh, or after a short period of frozen storage. Table 1 (shown on p. 19) lists the riboflavin content of only the portion of the flesh ordinarily considered edible. Tables 2 (above) and 3 (shown on p. 21) cover materials or species not ordinarily eaten. However, only raw material was analyzed; no canned or cooked products are included.

The assay method followed is a modification of a procedure reported by Andrews (1943). The sample is mixed with 2 percent acetic acid, and autoclaved for 15 minutes at 15 pounds steam pressure. The mixture is cooled, the pH is adjusted to a value of 4.3 to 4.5 with 1 N. NaOH, the proteinaceous material is allowed to settle, and the supernatant is filtered. Two equal portions of the filtrate are used for fluorometric determinations in the manner proposed by Hodson and Norris (1939).

One milliliter of water is added to the first portion, and the flourescence is measured (this value is referred to as A). To the second portion is added 1 milliliter of a water solution containing 1 microgram of riboflavin per milliliter. The flourescence of this sample is then determined (this value is referred to as B). To either or both of these samples is then added a small quantity of sodium hydrosulfite crystals to stop the flourescence of the riboflavin. The residual flourescence is then determined (this value is referred to as C). The weight of riboflavin in micrograms in the first portion is equal to (A-C)/(A-B).



The absence of other substances that flouresce in the same wave length as riboflavin and are also inhibited by sodium hydrosulfite was demonstrated by comparative assays, using the above method and the microbiological method of Snell and Strong (1939).

The data of Table 1 indicate that 100 grams of the raw edible portion of Alaskan fishery products contained from 16 to 292 micrograms of riboflavin. A normal serving portion would originally contain about 25 to 450 micrograms of riboflavin as compared to a recommended allowance for men of about 2,000 micrograms daily.

Table 3 - Riboflavin Content of Miscellaneous Marine Products of Southeastern Alaska

Common Name	Scientific Name	Number of Assays	Riboflavin content micrograms per 100 grams	
			Range	Average
Octopus (whole tentacle)	Octopus bimaculatus	1		43
Sea cucumber	Stichopus californicus	2	87-93	90
Shrimp (whole)	Pandalus borealis	1		250
Starfish--orange	Pisaster giganteus	1		69
brown	" ochraceus	1		43
purple	" "	1		42
twenty ray	Pycnopodia helianthoides	1		32
Hair seal liver	Phoca richardii richardii	1		1381
Steller sea lion--flesh	Eumetopias jubata	1		132
liver		1		943
blubber		1		34

The analyses reported in Tables 2 and 3 show that, in many cases, the waste portions are considerably richer in riboflavin than the parts generally eaten by man. These data should be of interest to animal feeders who use fishery byproducts.

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