Composition of the Edible Portion of Raw (Fresh or Frozen) Crustaceans, Finfish, and Mollusks. II. Macroelements: Sodium, Potassium, Chlorine, Calcium, Phosphorus, and Magnesium

VIRGINIA D. SIDWELL, DAVID H. BUZZELL,
PAULINE R. FONCANNON, and AUDREY L. SMITH

ABSTRACT—This report summarizes data from 128 references on sodium, potassium, calcium, phosphorus, chlorine, and magnesium levels found in the flesh of 161 commonly eaten seafoods.

INTRODUCTION

Sidwell et al. (1974) described a data bank that is being established at the Southeast Utilization Research Center, NMFS, NOAA, on the chemical and nutritional composition of seafoods. In that publication the investigators outlined the system that is being employed for the management and retrieval of the data, as well as a summary of the data on protein, fat, moisture, ash, carbohydrate, energy (calories), and cholesterol from 155 references on 154 commonly eaten seafoods.

The primary objectives for the data bank are: 1) to develop a comprehensive, systematic data retrieval system containing available information on the chemical and nutritional composition of fish and fishery products; 2) to publish as completely as possible information on the nutrients found in fishery products; and 3) to point out areas in chemical composition of fish needing further investigation.

Virginia D. Sidwell, David H. Buzzell, Pauline R. Foncannon, and Audrey L. Smith are with the Southeast Utilization Research Center, National Marine Fisheries Service, NOAA, Regents Drive, University of Maryland Campus, College Park, MD 20740.

The objective of this second report is to present a resumé of available data on sodium, potassium, chlorine, calcium, phosphorus, and magnesium in seafoods. There is a need in the medical community for information on the amounts of the various macroelements, especially sodium, found in marine animal flesh, in order to calculate sodium restricted diets.

DISCUSSION

Thus far in our literature search, we have located 128 articles that contain suitable data for the elements sodium, potassium, calcium, phosphorous, chlorine, and magnesium in 161 species of finfish, crustaceans, and mollusks that are commonly eaten throughout the world.

Each investigator reported an average figure obtained either from several determinations on a composite of fish, or from a single determination on each of a number of fish. In the latter instance, the scientist reported the average and the range of the results obtained from the analyses. These averages were used to calculate the average and standard error of the mean.

The range of values for each element in fish of the same species is sometimes quite extensive, as may be observed in Table 1. A portion of this variation is undoubtedly due to seasonal and biological differences, i.e. the size of the animal, its age, sex, degree of sexual maturity, and the amount of each given macroelement in its diet.

Part of the variation in the sodium and potassium concentrations in fish flesh may be associated with the differing analytic methods applied by the various laboratories to obtain their values. Also, freshwater fish tend to have a slightly lower sodium content than do saltwater fish. Sodium content is even higher in crustaceans and mollusks.

Calcium and phosphorous are constituents of the bones of finfish. The bones are generally removed by the analyst to prepare a sample for chemical analysis. It is very difficult to remove all of the bone and therefore the cause of some of the variability in the calcium and phosphorous content of fish of the same species may be due to how well the bone has been removed.

Many species of finfish and shellfish shown in Table 1 have only one or two values, and in many instances none, for a specific macroelement. In such cases, the few values available will give only an estimate of macroelement content; more data are needed to obtain a value which possesses any degree of reliability.

Table 1.—Composition of the edible portion of raw (fresh or frozen) crustaceans, finfish, and mollusks. II. Sodium, potassium, calcium, phosphorous, chlorine, and magnesium.

	Sodium	Potassium	Calcium	Phosphorous	Chlorine	Magnesium	References
			mg/100 g				
Abalone Haliotidae spp.			[1]27±6 [2]21—34 [3]2			[1]112±62 [2]50—175 [3]2	37, 44, 59 106
Amberjacks and Yellowtails *Seriola* spp.	[1]76±12 [2]52—90 [3]3	[1]438±158 [2]280—597 [3]2	22±6 6—35 5	[1]162±40 [2]102—253 [3]3	20 1	35±2 30—40 3	26, 44, 59, 72, 106, 109, 127
Anchovies Engraulidae spp.	115±23 70—147 3	356±51 267—511 5	194±46 20—480 9	239±18 188—349 8	[1]138±55 [2]30—214 [3]3	41±12 29—54 2	23, 24, 44, 59, 60, 72, 80, 82, 103, 125
Barracudas Sphryaenidae spp.	89±43 46—132 2	252±48 155—307 3	40±7 22—70 8	328±60 156—598 8	230 1	31±4 27—35 2	20, 22, 44, 45, 59, 61, 72, 103, 109
Basses, sea Serranidae spp.	71±8 30—112 11	332±37 138—580 13	48±7 7—140 17	205±12 150—375 20	105±15 90—135 3	24±6 10—40 4	7, 11, 20, 22, 23, 26, 34, 44, 45, 59, 61, 65, 72, 76, 103, 121, 125
Basses, temperate Percichthyidae spp.			71±61 10—132 2				11, 34, 61
Brills Bothidae spp.			30±0 30—30 2	204±0 204—204 2			44, 59
Butterfishes Stromateidae spp.	94±7 81—106 3	346±52 203—434 4	96±39 17—314 8	300±43 159—506 8			20, 22, 44, 45, 59, 61, 72, 103, 109
Butterflyfishes Chaetodontidae spp.	104±3 101—108 2	263±47 216—310 2	37±11 12—57 4	140±8 116—153 4	120 1		34, 44, 59, 80
Caesios Caesionidae spp. (in Lutjanidae)	59 1	391±127 264—519 2	35±1 34—36 4	274±97 165—565 4			44, 59, 103
Carps Cyprinidae spp.	59±6 43—105 11	295±18 174—435 17	52±6 12—182 45	318±16 165—605 54	37±10 30—45 4		4, 7, 21, 22, 37, 43, 46, 49, 50, 59, 72, 76, 80, 85, 88, 91, 92, 108, 112, 121
Catfish, air-breathing Clariidae spp.	59±2 55—63 2	309±86 147—440 3	35±6 18—51 5	231±46 116—375 5	130 1	33 1	44, 46, 47, 59, 80, 85, 91
Catfishes, sea Ariidae spp.	79±24 55—103 2	322±109 109—468 3	71±26 14—98 9	208±27 148—440 10	110 1	34 1	24, 44, 59, 60, 61, 80, 82, 86, 102
Cavefishes Amblyopsidae spp.			550 1	350 1			91
Characins Characidae spp.			173 1	266 1			45
Cichlids Cichlidae spp.	52 1	454 1	68±23 37—112 3	173±90 39—344 3			59, 61, 86
Clams, mactra Mactridae spp.			42 1	325 1			59
Clams, razor Solenidae spp.		143 1	60 1	204±6 198—210 2			11, 59
Clams, tellin Tellinidae spp.	262 1	164 1	121 1	83 1			59
Clams (species unknown)	190±10 180—200 2	137±56 35—228 3	99±9 59—144 14	156±19 90—350 14		43±11 20—70 4	5, 6, 11, 13, 15, 39, 44, 56, 59, 65, 71, 76, 106
Cockles Cardiidae spp.	200 1	197 1	167±51 116—217 2	93±15 78—122 3			44, 59, 66

Table 1, continued.

	Sodium	Potassium	Calcium	Phosphorous	Chlorine	Magnesium	References
			mg/100 g				
Cods Gadidae spp.	82±1 60—180 10	364±17 270—465 11	16±2 9—20 7	212±31 9—240 8	228±173 55—400 2	23±3 20—25 2	7, 11, 15, 21, 26, 27, 37, 39, 59, 65, 66, 68, 69, 71, 76, 95, 104, 107, 113, 121
Crabs, blue *Callinectes sapidus*		188 1	94±11 71—133 5	152±30 38—205 5		30±5 12—38 5	54, 81, 128
Crabs, deep sea *Neptunnis* spp.		134 1	174±10 20—202 3				33, 44
Crabs, Jonah *Cancer borealis*	276 1	279 1	96 1	12 1		45 1	55
Crabs, king *Paralithodes camtschatica*		55 1	160 1				59
Crabs, Samoan *Scylla serrata*			118±45 53—290 5	209±65 130—402 4			33, 44
Crabs, Tanner *Chionoecetes tanneri*	120 1	520 1	140 1	220 1		130 1	26
Crabs, Miscellaneous spp.	262±78 95—453 4	233±63 111—322 3	94±22 29—120 4	233±40 171—350 4	117 1	48 1	22, 29, 59, 65, 107
Crayfish Miscellaneous spp.	121±61 60—182 2	302±35 239—500 7	39±5 16—58 8	239±36 101—560 11	280 1	60±20 40—80 2	11, 26, 31, 44, 56, 57, 59, 60, 71, 73, 76, 97
Croaker Sciaenidae spp.	109±27 70—160 3	259±45 180—336 3	42±8 18—89 8	232±43 125—444 8	178±68 110—246 2	30 1	10, 26, 44, 59, 72, 76, 82, 97
Cusk *Brosme brosme*			20 1	220 1			107
Cusk eels and brotulas Ophidiidae spp.			66 1	345±200 145—545 2	110 1		45, 72
Cutlassfishes Trichiuridae spp.	94 1	330 1	75±47 13—214 4	301±90 160—542 4	100 1	25 1	24, 53, 59, 72, 109
Cuttlefish Miscellaneous spp.		239±35 204—273 2	27 1	143 1			59, 76
Dace Cyprinidae spp.		270 1					37
Dagol *Chorinemus toloo*			16 1	424±26 398—449 2	750 1		72, 97
Damselfishes Pomacentridae spp.				728 1	140 1		72
Dolphins Coryphaenidae spp.	170±72 98—242 2	370 1	15 1	143 1			59, 127
Dories Zeidae spp.	60 1	241±90 151—330 2	40 1	181±51 130—231 2	70 1	20 1	26, 72, 76
Drepanes Drepanidae spp.	88 1	373 1	57±18 30—90 3	183±27 149—235 3			44, 59, 61
Drums Sciaenidae spp.	67±5 51—84 7	273±8 226—301 8	37±12 16—57 3	113±88 25—200 2		24 1	21, 61, 83, 109, 112, 121, 125
Eels, conger Congridae spp.	50 1	241±41 200—282 2	71±31 20—50 4	270±40 180—390 5	100 1	20 1	26, 59, 61, 72, 125

Table 1, continued.

	Sodium	Potassium	Calcium	Phosphorous	Chlorine	Magnesium	References
			mg/100 g				
Eels, freshwater Anguillidae spp.	79±3 76—81 2	362±118 214—712 4	62±25 15—188 4	293±52 196—501 5	64±7 40—80 5	22±4 16—30 3	25, 59, 61, 66, 71, 72, 76, 106
Eels, moray Muraenidae spp.	25 1	165 1	41±22 19—63 2	251±141 83—532 3	57±33 24—90 2	15 1	44, 80, 90
Eels, pike conger Muraenesocidae spp.	88 1	490 1	70±43 27—112 2	243±38 205—280 2			59, 97
Eels, snake Ophichthidae spp.	62±24 38—86 2	358±44 314—401 2	43±8 14—140 20	274±27 95—509 21	95 1	34 1	3, 4, 11, 44, 46, 49, 52, 59, 80, 88, 91
Eels, spiny Notacanthidae spp.	50 1	270 1	34±10 22—55 3	248±74 174—322 2	223 1	27 1	46, 49, 80
Eels, swamp Flutidae spp.	116 1	172 1	40±10 30—50 2	126±33 93—158 2			59
Featherbacks *Notopterus* spp.	40±6 34—45 2	190±71 119—260 2	73±18 40—180 7	317±39 161—450 8	106 1	32 1	46, 49, 59, 80, 85, 91, 92
Flatheads Percophididae spp.	66±26 40—91 2	291±101 190—392 2	44±13 18—79 4	204±28 174—260 3		19±9 10—27 2	26, 44, 59, 109
Flounders, left eye Bothidae spp.	100±32 54—160 3	220 1	63 1	313±66 185—401 3	235±5 230—240 2	44 1	7, 59, 66, 67, 83
Flounders, right eye Pleuronectidae spp.	61±7 35—99 12	316±22 157—394 11	27±3 17—36 6	182±29 116—250 4		24±5 10—31 4	17, 21, 22, 66, 76, 101, 107, 109, 119, 121, 125
Flounders Unknown spp.			17 1	175 1	176 1	49 1	11, 71, 108
Flyingfishes and halfbeaks Exocoetidae spp.	85±14 70—112 3	407±81 250—516 3	94±37 30—229 5	260±72 140—614 6	90 1	20 1	26, 44, 59, 72
Gillrakers Chirocentridae spp.			22 1	1,150 1			97
Goatfishes Mullidae spp.	59±8 40—74 4	316±5 311—320 2	72±17 23—97 4	246±33 170—340 6	143±3 140—150 3	30 1	44, 59, 72, 80, 125, 127
Gobies Gobiidae spp.	92±30 50—150 3	294±58 250—360 3	92±47 15—370 7	324±47 151—554 9	178±72 106—250 2	28 1	44, 45, 59, 72, 80, 91, 97, 97, 103
Goosefishes Lophiidae spp.		297 1	13±6 7—19 2	334±132 180—597 3	370 1		59, 72, 125
Greenlings Hexagrammidae spp.	58±2 52—62 8	411±17 352—478 7	34±12 12—55 3	173±8 165—180 2		18 1	7, 13, 21, 59, 68, 69, 109, 113, 121
Grunts Pomadasyidae spp.	71±1 70—72 2	230±30 200—260 2	55±27 9—268 9	194±21 110—285 8	500 1	10 1	22, 26, 34, 37, 44, 59, 61
Guitarfishes Rhinobatidae spp.			11±2 9—12 2	257 1		24 1	59, 109
Gurnards, flying Dactylopteridae spp.	80 1	300±14 260—320 4	65±20 22—104 4	179±27 130—222 3		21±1 20—22 2	26, 59, 76, 109, 125
Haddock *Melanogrammus aeglefinnus*	57±2 49—67 8	342±26 299—434 5	19±3 10—30 5	208±46 164—318 9		24 1	3, 7, 11, 19, 21, 35, 60, 66, 71, 76, 81, 102, 107, 121
Hagfishes Myxinidae spp.	136 1	114 1	4 1	160 1	141 1	26 1	90

Table 1, continued

	Sodium	Potassium	Calcium	Phosphorous	Chlorine	Magnesium	References
			mg/100 g				
Halibut Pleuronectidae spp.	64±3 36—112 46	398±8 318—475 34	23±8 13—30 4	216±14 192—253 4	88 1	23 1	7, 11, 12, 21, 27, 59, 60, 66, 68, 71, 93, 102, 107, 109, 111, 121
Herrings Clupeidae spp.	103±15 49—183 10	348±47 25—512 10	142±35 21—460 17	324±21 134—742 42	173±42 108—291 4	38±8 30—46 2	7, 11, 18, 22, 23, 24, 27, 29, 32, 56, 59, 60, 61, 65, 66, 68, 69, 71, 72, 76, 87, 94, 107, 125
Jacks Carangidae spp.	68±8 54—89 4	431±44 340—550 4	45±8 16—93 11	237±37 150—565 10		34±4 30—37 2	20, 26, 44, 59, 61, 109
Kingfishes *Menticirrhus* spp.	85±2 83—87 2	250 1					83
Lampreys Petromyzontidae spp.		183 1	10 1				59, 76
Lings *Molva* spp.			20 1	200 1			107
Lizardfishes Synodontidae spp.	70 1	390±124 266—513 2	30±9 13—49 4	291±56 201—445 4	110 1	29 1	44, 59, 72, 103, 109
Loaches *Misgurnus anguillicaudatus*		496 1	28 1	402 1			59
Longaray Ambassidae spp.			67 1	150 1			44
Lumpfishes and snailfishes Cyclopteridae spp.	69 1	485 1	56 1	203 1	33 1		59
Mackerels Scombridae spp.	90±14 30—252 15	320±27 136—471 16	58±11 5—343 35	267±25 148—778 33	105±39 35—170 3	30±3 25—40 4	9, 11, 21, 22, 24, 26, 34, 36, 39, 44, 45, 53, 59, 62, 66, 71, 72, 76, 78, 81, 88, 97, 103, 106, 107, 108, 121, 124, 125, 127
Minnows Cyprinidae spp.			140 1	180 1			59
Mojarras Gerreidae spp.	107 1	404 1	65±34 6—122 3	231±40 191—312 3			44, 45, 59
Mullet Mugilidae spp.	73±6 52—100 7	303±11 259—356 7	40±8 11—99 16	258±21 140—436 19	131±21 120—152 2	29±2 25—33 5	1, 7, 21, 24, 26, 34, 44, 46, 53, 59, 60, 61, 72, 76, 80, 81, 88, 91, 92, 97, 103, 109, 121, 127
Mussels Mytilidae spp.	91±30 11—140 4	327±107 121—480 3	105±30 71—164 3	145±15 102—170 4			19, 24, 26, 59, 66, 71, 75
Needlefishes Belonidae spp.	79 1	397±1 396—397 2	72±26 21—98 3	251±50 121—362 4	140 1		44, 59, 72, 76, 88
Nemipterids Nemipteridae spp.	88 1	500 1	57±27 15—135 4	198±12 173—210 3		28 1	44, 59, 109
Octopuses Mixed spp.	363 1	232 1	28±8 12—39 3	109±25 66—151 3			59, 60
Oysters Ostreidae spp.	160±78 73—618 4	248±111 90—570 4	98±16 39—210 14	153±14 76—265 14	42 1	32±7 12—230 6	11, 15, 22, 26, 39, 44, 56, 57, 59, 60, 71, 65, 76, 81, 95, 126
Parrotfishes Scaridae spp.			54±18 36—90 3	167±23 143—213 3			44, 45, 59

Table 1, continued.

	Sodium	Potassium	Calcium	Phosphorous	Chlorine	Magnesium	References
				mg/100 g			
Perches Percidae spp.	63±3 50—80 3	264±13 210—324 12	30±0 30—30 2	168±29 110—230 4		20±0 20—20 2	7, 11, 21, 26, 37, 43, 76, 112, 121
Perches, climbing Anabantidae spp.	43±7 35—64 4	323±50 195—438 4	68±22 13—131 5	228±38 159—390 7	101±5 96—106 2	34±2 32—35 2	44, 59, 80, 85, 91, 92
Periwinkles Littorinidae spp.		102 1					66, 76
Pickerels Esocidae spp.					606 1		72
Pikes Esocidae spp.	52 1	329±50 174—590 7			227 1	175±27 148—202 2	7, 11, 37, 71, 76
Plaice Pleuronectidae spp.	91±8 83—98 2	312±18 277—333 3	20 1	220 1		25 1	17, 65, 66, 76
Pomfrets Bramidae spp.		517 1	132±109 23—240 2		223±83 140—305 2		59, 72, 92
Porgies Sparidae spp.	77±6 40—110 12	291±29 156—488 13	44±6 15—123 20	291±25 117—580 27	119±13 90—190 8	27±3 20—31 3	7, 11, 20, 21, 26, 44, 59, 72, 76, 83, 103, 109, 121, 125
Puffers Tetraodontidae spp.		347 1	18 1	138 1			59
Rays, eagle Myliobatidae spp.				179 1	275 1		24
Rays, electric Torpedinidae spp.					671 1		72
Rays, stingray Dasyatidae spp.	156±23 133—179 2	294±58 236—352 2	19±3 9—25 7	129±11 99—170 7		38 38 1	19, 44, 59, 61, 97, 108
Roaches Cyprinidae spp.		270 1					37
Sablefishes Anoplopomatidae spp.	56 1	358 1	77 1	187 1			13, 113
Salmon, Australian Arripidae spp.	57±6 50—60 3	240±6 230—250 3	37±3 30—40 3	183±29 150—240 3		27±3 20—30 3	26
Sanddab Citharichthys spp.	397 1	220 1	25 1	110 1		44 1	35, 45
Sandfishes Trichodontidae spp.			61 1	184 1			59
Sandlances Ammodytidae spp.		377 1					76
Sardines Clupeidae spp.	90±6 60—128 10	218±73 25—420 5	134±19 28—380 21	350±28 39—580 27	138±7 115—164 6		16, 20, 24, 39, 44, 53, 58, 59, 61, 71, 72, 81, 89, 97
Sauries Scomberesocidae spp.	60 1		22±0 22—22 2	190±0 190—190 2		50 1	39, 59, 105
Sawfishes Pristidae spp.			54 1	238 1			60
Scad and mackerel Carangidae spp.	71±7 53—94 5	487±127 360—614 2	46±8 12—71 9	279±63 115—680 10	86±29 28—120 3	24±8 20—37 3	19, 20, 24, 32, 44, 53, 59, 60, 61, 72, 106, 109, 127

Table 1, continued.

	Sodium	Potassium	Calcium	Phosphorous	Chlorine	Magnesium	References
			mg/100 g				
Scallops Pectinidae spp.	182±19 163—200 2	278±58 162—340 3	78±38 40—115 2	270±38 210—340 3		30±10 20—40 2	11, 19, 26, 65, 66, 71, 76
Scorpionfishes Scorpaenidae spp.	65±2 45—94 32	366±12 269—432 19	18±3 15—20 2	229±64 60—327 4	75±5 70—80 2		7, 21, 27, 59, 79, 107, 111, 113, 120, 121
Sculpins Cottidae spp.	55 1	332 1					19
Sea chubs Kyphosidae spp.	50 1	268±42 226—310 2	38±2 36—40 2	335±79 227—488 3	240 1	20 1	11, 26, 103
Sea Cucumbers Mixed species				67 1	14 1		59
Searobins Triglidae spp.					296 1		72
Seatrout Sciaenidae spp.	59±0 59—60 3	305±12 280—317 3	40 1	120 1			21, 26, 127
Shad Clupeidae spp.	69±15 54—98 3	274±56 162—330 3	108±16 22—127 6	203±28 39—323 11	216±40 140—276 3	41 1	11, 21, 45, 53, 59, 61, 72, 76, 91, 97, 109, 121
Sharks, dogfish Squalidae spp.	100 1	223±49 174—272 2	13±3 7—16 3	253±27 176—300 4		20 1	53, 59, 65, 66, 76, 105
Sharks, hammerhead Sphyrnidae spp.			20±5 15—25 2	163±45 118—208 2		20 1	44, 97, 106
Sharks, mackerel Lamnidae spp.			13 1	161±54 107—214 2	150 1		72, 97
Sharks, requiem Carcharhinidae spp.	70 1	290 1	34±8 5—59 7	204±58 150—309 9	150 1	27±17 10—44 2	9, 26, 44, 45, 59, 72, 106
Sharks, sand tiger Odontaspididae spp.	79 1	549 1	68±48 9—164 3	211±26 141—288 5	140 1		24, 34, 59, 72
Sharks, thresher Alopiidae spp.				349 1	120 1		72
Sheathfishes Siluridae spp.			49 1	152 1			59
Shrimps and Prawns Mixed species	132±22 45—220 7	248±40 118—410 8	142±18 16—550 45	239±21 127—912 44		54±11 23—111 7	9, 14, 15, 22, 24, 26, 27, 29, 39, 44, 45, 56, 59, 60, 61, 65, 66, 71, 73, 81, 85, 91, 97, 98, 100, 107, 108, 110, 125
Siganids Seganoidae spp.	76 1	450 1	41±0 41—41 2	122±0 122—122 2			44, 59
Silversides Atherinidae spp.				105 1			60, 66
Skates Rajidae spp.	97±7 90—103 2	303±42 250—387 3	67±3 64—70 2	199±50 131—296 3	210 1	30	19, 26, 59, 72, 76
Smelts Osmeridae spp.	156±25 80—214 5		317±200 50—750 3	245±55 190—680 3	112±13 86—137 4	24 1	11, 39, 43, 59, 63, 66, 71, 95
Snails Mixed species	91±18 68—146 4	179 1					44, 59, 61, 76

Table 1, continued.

	Sodium	Potassium	Calcium	Phosphorous	Chlorine	Magnesium	References
			mg/100 g				
Snake mackerels Gempylidae spp.	101±21 80—122 2	360 1	70 1	270 1		59±19 40—78 2	26, 29
Snappers Lutjanidae spp.	78±10 33—150 11	285±27 125—373 9	32±5 14—65 10	248±42 120—527 10	220 1	24±4 20—28 2	7, 11, 20, 21, 22, 26, 34, 44, 45, 59, 60, 71, 72, 81, 83, 102, 110, 121, 127
Snooks Centropomidae spp.	71±3 66—80 4	308±63 193—477 4	33±6 14—54 8	191±31 89—400 10		25±5 20—30 2	24, 26, 34, 44, 59, 60, 82, 85, 91
Slimys and Soapies Leinognathidae spp.	146±16 130—162 2	344±65 218—437 3	42±6 19—52 6	272±79 148—554 5			44, 53, 59, 103
Soles Pleuronectidae spp.	85±4 56—163 27	344±12 253—475 20	21±6 12—32 3	249±98 105—436 3		31 1	7, 21, 61, 68, 81, 103, 111, 119, 121
Soles Soleidae spp.	80 1	220±28 168—262 3	29±7 18—47 4	271±27 230—349 4	80 1	25±3 20—30 3	26, 65, 72, 76, 109, 125
Spadefishes Ephippidae spp.	94±4 90—98 2	331±39 292—370 2	61±9 37—74 4	223±20 191—280 4		40 1	26, 44, 45, 59
Squids Mixed species	176 1	275±20 246—313 3	50±11 10—109 8	221±41 153—420 6		20 1	44, 45, 59, 76, 106, 125
Squirrelfishes Holocentridae spp.	70 1						127
Stargazers Uranoscopidae spp.					357 1		72
Sturgeons Acipenseridae spp.					466 1		72
Suckers Catostomidae spp.	53±1 50—59 8	313±9 292—344 7	15 1	165 1			7, 21, 34, 112, 121
Sunfishes Centrarchidae spp.	116 1					38 1	95, 103, 127
Surgeonfishes Acanthuridae spp.	91±31 60—122 2	327±111 192—546 3	38±12 21—45 4	324±90 169—503 4			44, 59, 103, 127
Swordfishes Xiphiidae spp.	102 1	342 1	13 1	228 1	130 1		59, 72
Tarpons Elopidae spp.	82±0 82—82 2	426±66 360—491 2	66±9 54—92 4	211±28 113—263 5			24, 44, 59
Therapons Theraponidae spp.	83 1	345±129 216—474 2	48±4 40—59 4	280±78 193—435 3			44, 59, 103
Threadfins Polynemidae spp.			67±25 10—117 6	214±33 148—398 7			9, 24, 44, 59, 61, 97
Tilefishes Branchiostegidae spp.			40 1	217 1			59
Tonguefishes Cynoglossidae spp.		489 1	29 1	164 1			59
Triggerfishes Balistidae spp.	50±20 30—70 2	265±75 190—340 2	35±5 30—40 2	130±0 130—130 2		25±5 20—30 2	26
Trout, cisco Salmonidae spp.	108±29 38—320 9	329±19 280—358 4	12 1	206±54 152—260 2		17 1	8, 21, 37, 81, 112, 121

Table 1, continued

	Sodium	Potassium	Calcium	Phosphorous	Chlorine	Magnesium	References
				mg/100 g			
Trout, grayling *Thymallus arcticus*				142±41 101—182 2			37
Trout, salmon Salmonidae spp.	56±2 24—127 88	340±92 139—500 80	82±21 8—249 18	268±17 125—360 18	29 1	52±11 15—99 10	7, 11, 12, 14, 15, 27, 37, 38, 56, 59, 64, 68, 69, 71, 76, 77, 81, 92, 101, 105, 106, 107, 109, 111, 114, 115, 116, 121
Trouts Salmonidae spp.	43±8 26—77 6	395±30 227—555 13	23±8 12—38 3	221±23 152—315 8	100 1	29±3 26—32 2	7, 11, 37, 43, 59, 60, 66, 71, 76, 84, 105, 107, 117, 122
Trout, whitefish Salmonidae spp.	52±1 52—53 3	307±10 297—317 2		310 1	351 1		7, 29, 66, 112, 121
Tunas Scombridae spp.	66±5 31—188 44	363±7 252—518 42	30±8 6—93 12	348±44 190—760 17	162±39 35—280 5	50 1	7, 20, 21, 24, 39, 40, 44, 48, 57, 59, 61, 72, 76, 82, 107, 111, 121, 122, 127
Turbot Pleuronectidae spp.	68 1		49 1	203 1			11, 27, 60, 72, 76
Viperfish Chauliodontidae spp.	150 1	250 1	51±8 43—58 2	118 1	112 1	29±0 25—32 2	80, 81
Weevers Trachinidae spp.		213 1		423 1	50 1		72, 76
Whale, sperm *Phyester macrocephalus*		360 1					76
Whelks Mixed species		89±51 38—140 2	34 1	58 1			59, 66, 76
Whiting Sillaginidae spp.	84±34 50—118 2	326±66 260—457 3	45±11 16—71 5	169±12 130—253 5		21±1 20—21 2	24, 26, 44, 59, 71, 92, 109
Wrasses Labridae spp.	50 1	390±32 358—422 2		432±69 388—615 3	83±12 50—100 4		22, 72, 76

[1] Standard error of the mean.
[2] Range.
[3] The number of averages used.

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MFR Paper 1228. From Marine Fisheries Review, *Vol. 39, No. 1, January 1977. Copies of this paper, in limited numbers, are available from D825, Technical Information Division, Environmental Science Information Center, NOAA, Washington, DC 20235. Copies of* Marine Fisheries Review *are available from the Superintendent of Documents, U.S. Government Printing Office, Washington, DC 20402 for $1.10 each.*