APPENDIX T

Median International Standards

Median International Standards

In 1982, the Food and Agricultural Organization (FAO) of the United Nations conducted a survey of standards and legal limits for metals including mercury, pesticides, and other contaminants in fishery products. This was in response to frequent inquiries from institutions and companies active in international commerce that found it difficult finding such information.

The FAO surveyed nations that were members of the FAO as well as those who were not. Most nations cooperated with the survey and, in certain other cases, the standards were drawn from other sources. The FAO took all of the responses and presented them in a report entitled "Compilation of Legal Limits for Hazardous Substances in Fish and Fishery Products" (Nauen 1983). Most of the limits were presented in a standard format and in standard units of fresh or live weight. Exceptions are clearly noted.

Nearly all of the standards for pesticides were from the United States (FDA standards). However, with the exception of mercury, the United States has no standards for trace metals in fishery products. It is this very lack of standards that makes interpretation of some of the TSMP findings difficult.

Table T-1 summarizes the standards and guidelines for metals from the FAO report. The table notes whether the standards are for freshwater fish, marine fish, shellfish, or a combination of these. When more than one standard was listed by the FAO report, those values closest to a standard for "fresh weight, edible portion" were chosen. Exceptions are clearly noted in the table. Standards for each element are arranged in ascending order. The country of origin and the approximate date of adoption are also noted.

As can be seen in Table T-1, some of the standards are not truly for edible portion, fresh weight. For example, some standards refer to canned products or protein. In the case of India, the standards are on a dry weight basis. If the Indian standards were stated in fresh weight terms, they would be approximately one fifth or one sixth of the stated standard.

Table T-1 has many striking features. One feature is that most of the standards are surprisingly similar. Another feature is the large number of countries that have standards for metals. Also, although many of these countries are less developed nations, the standards adopted by these nations do not differ from those of the more developed nations.

The standards were not summarized for mercury because there is a USFDA standard of 1.0 ppm for methyl mercury in the edible portions of fish and shellfish. This was, incidentally, the highest limit set by any nation in the FAO study. The great majority of nations have set a mercury standard of 0.5 ppm.

Median International Standards presented in Table 7 were calculated from the standards listed in Table T-1. The median standard was chosen for use for several reasons. The median is less influenced than the mean by outliers in the data. Also, direct comparisons of standards for fresh versus canned

TABLE T-1

Antimony Arsenic Cadmium	1.0 ppm 1.0 ppm 1.5 ppm 1.5 ppm 1.0 ppm 1.0 ppm 1.0 ppm 1.0 ppm 1.4 ppm 1.5 ppm 3.5 ppm 3.5 ppm 5.0 ppm 5.0 ppm 0.1 ppm 0.1 ppm 0.2 ppm	x x x x d x d x e x x c p x x x c r	x x x x d x e x c p x x x x x x	x x x x x x x c x x x c x x x	Hong Kong New Zealand Australia Venezuela Chile India New Zealand United Kingdom Hong Kong Australia Thailand Canada Finland Zambia	1983 1971 1982 - - - - 1971 1959 1983 1982 1982 1982 1976 1980 1976
Arsenic	1.0 ppm 1.5 ppm 1.5 ppm 1.0 ppm 1.0 ppm 1.0 ppm 1.0 ppm 1.4 ppm 1.5 ppm 3.5 ppm 3.5 ppm 5.0 ppm 5.0 ppm 0.1 ppm 0.1 ppm	x x d x e x c p x x x c x x c	x x x d x e x c p x x x c	x x x x e x c x x x	New Zealand Australia Venezuela Chile India New Zealand United Kingdom Hong Kong Australia Thailand Canada Finland Zambia	1971 1982 - - 1971 1959 1983 1982 1982 1982 1976 1980 1976
Arsenic	1.0 ppm 1.5 ppm 1.5 ppm 1.0 ppm 1.0 ppm 1.0 ppm 1.0 ppm 1.4 ppm 1.5 ppm 3.5 ppm 3.5 ppm 5.0 ppm 5.0 ppm 0.1 ppm 0.1 ppm	x x d x e x c p x x x c x x c	x x x d x e x c p x x x c	x x x x e x c x x x	New Zealand Australia Venezuela Chile India New Zealand United Kingdom Hong Kong Australia Thailand Canada Finland Zambia	1971 1982 - - 1971 1959 1983 1982 1982 1982 1976 1980 1976
	1.5 ppm 0.1 ppm 1.0 ppm 1.0 ppm 1.0 ppm 1.4 ppm 1.5 ppm 3.5 ppm 5.0 ppm 5.0 ppm 0.05 ppm 0.1 ppm 0.1 ppm	x x d x e x c p x x x c	x x d x e x c p x x x x c	x x x e x c x x x	Australia Venezuela Chile India New Zealand United Kingdom Hong Kong Australia Thailand Canada Finland Zambia	1982 - - 1971 1959 1983 1982 1982 1982 1976 1980 1976
	1.0 ppm 1.0 ppm 1.0 ppm 1.0 ppm 1.4 ppm 1.5 ppm 1.5 ppm 3.5 ppm 5.0 ppm 5.0 ppm 0.05 ppm 0.1 ppm 0.1 ppm	x d x e x x c p x x x c	x d x e x c p x x x c	x x e x c x x x	Chile India New Zealand United Kingdom Hong Kong Australia Thailand Canada Finland Zambia	1959 1983 1982 1982 1976 1980 1976
	1.0 ppm 1.0 ppm 1.0 ppm 1.0 ppm 1.4 ppm 1.5 ppm 1.5 ppm 3.5 ppm 5.0 ppm 5.0 ppm 0.05 ppm 0.1 ppm 0.1 ppm	x d x e x x c p x x x c	x d x e x c p x x x c	x x e x c x x x	Chile India New Zealand United Kingdom Hong Kong Australia Thailand Canada Finland Zambia	1959 1983 1982 1982 1976 1980 1976
Cadmium	1.0 ppm 1.0 ppm 1.0 ppm 1.0 ppm 1.4 ppm 1.5 ppm 1.5 ppm 3.5 ppm 5.0 ppm 5.0 ppm 0.05 ppm 0.1 ppm 0.1 ppm	x d x e x x c p x x x c	x d x e x c p x x x c	x e x c x x x	India New Zealand United Kingdom Hong Kong Australia Thailand Canada Finland Zambia Netherlands	1959 1983 1982 1982 1976 1980 1976
Cadmium	1.0 ppm 1.0 ppm 1.0 ppm 1.4 ppm 1.5 ppm 1.5 ppm 3.5 ppm 5.0 ppm 5.0 ppm 0.05 ppm 0.1 ppm 0.1 ppm	d x e x c p x x x x	d x e x c p x x x c	x e x c x x x	India New Zealand United Kingdom Hong Kong Australia Thailand Canada Finland Zambia Netherlands	1959 1983 1982 1982 1976 1980 1976
Cadmium	1.0 ppm 1.0 ppm 1.4 ppm 1.5 ppm 1.5 ppm 3.5 ppm 5.0 ppm 5.0 ppm 0.05 ppm 0.1 ppm 0.1 ppm	x e x c p x x x x	x e x c p x x x c	x e x c x x	New Zealand United Kingdom Hong Kong Australia Thailand Canada Finland Zambia	1959 1983 1982 1982 1976 1980 1976
Cadmium	1.0 ppm 1.4 ppm 1.5 ppm 1.5 ppm 3.5 ppm 5.0 ppm 5.0 ppm 0.05 ppm 0.1 ppm 0.1 ppm	e x c p x x x	e x c p x x x c	e x c x x	United Kingdom Hong Kong Australia Thailand Canada Finland Zambia Netherlands	1959 1983 1982 1982 1976 1980 1976
Cadmium	1.4 ppm 1.5 ppm 1.5 ppm 3.5 ppm 5.0 ppm 5.0 ppm 0.05 ppm 0.1 ppm 0.1 ppm	x c p x x x	x c p x x x c	x c x x	Hong Kong Australia Thailand Canada Finland Zambia Netherlands	1983 1982 1982 1976 1980 1976
Cadmium	1.5 ppm 1.5 ppm 3.5 ppm 5.0 ppm 5.0 ppm 0.05 ppm 0.1 ppm 0.1 ppm	x c p x x x c	c p x x x	c x x	Australia Thailand Canada Finland Zambia Netherlands	1982 1982 1976 1980 1976
Cadmium	1.5 ppm 3.5 ppm 5.0 ppm 5.0 ppm 0.05 ppm 0.1 ppm 0.1 ppm	c p x x x	c p x x x	c x x	Thailand Canada Finland Zambia Netherlands	1982 1976 1980 1976
Cadmium	3.5 ppm 5.0 ppm 5.0 ppm 0.05 ppm 0.1 ppm 0.1 ppm	p x x c	p x x c	x x	Canada Finland Zambia Netherlands	1976 1980 1976
Cadmium	5.0 ppm 5.0 ppm 0.05 ppm 0.1 ppm 0.1 ppm	x x x c	x x x c	X	Finland Zambia Netherlands	1980 1976
Cadmium	5.0 ppm 5.0 ppm 0.05 ppm 0.1 ppm 0.1 ppm	x x x c	x x x c	X	Zambia Netherlands	1976 -
Cadmium	5.0 ppm 0.05 ppm 0.1 ppm 0.1 ppm	x	x x c	X	Zambia Netherlands	1976 -
Cadmium	0.05 ppm 0.1 ppm 0.1 ppm	x c	x		Netherlands	-
Cadmium	0.1 ppm 0.1 ppm	С	С	с		-
	0.1 ppm 0.1 ppm	С	С	С	Switzerland	1000
	0.1 ppm					
		1		-	Venezuela	1002
						1000
	0.2 ppm	х	х		Australia	1982
	0.3 ppm	r	r		Finland	-
	0.5 ppm	Х			W. Germany	1979
	1.0 ppm	х			Netherlands	-
	1.0 ppm	х	х		New Zealand	1971
	2.0 ppm	х			Australia	1982
	2.0 ppm	x	х	х	Hong Kong	1983
Chromium	1.0 ppm	x	x	x	Hong Kong	1983
Copper	10.0 ppm	х	х	х	Chile	-
	10.0 ppm	d	d		India	-
	10.0 ppm	x	x		Venezuela	-
	20.0 ppm	c	c	С	Thailand	1982
	20.0 ppm		-		United Kingdom	1962
	20.0 ppm	g	g	g		
	30.0 ppm	х	х	х	Australia	1982
	30.0 ppm	х	Х	х	New Zealand	1971
	100.0 ppm	х	х		Zambia	1976
Fluoride	150.0 ppm	р	р		Canada	1979
Fluorine	10.0 ppm 25.0 ppm	x x	x x		New Zealand Zambia	1971 1976

International Standards for Trace Elements in Fish and Molluscs

p - in protein e - except where natural levels are higher c - in metal containers

g - recommended guideline d - dry weight basis r - revised limit (proposed)

TABLE T-1 (continued)

Element	Standard	Freshwater Fish	Marine Fish	Molluscs/ Shellfish	Country	Approximate Date of Adoption
Lead	0.5 ppm	n			Canada	1979
	0.5 ppm	р х	р		W. Germany	1979
	0.5 ppm	x	х		Netherlands	1373
	1.0 ppm	x x	x	×.	Sweden	- 1979
	1.0 ppm			x	Switzerland	1979
		с	С	C C	Thailand	1982
	1.0 ppm	С	C	C	Australia	1982
	2.0 ppm	x	X		Chile	
	2.0 ppm	x	х	х		1982
	2.0 ppm	х			Finland	1980
	2.0 ppm	х			Italy	1978
	2.0 ppm	х			Netherlands	-
	2.0 ppm	x	x		New Zealand	-
	2.0 ppm	I	I		Sweden	1979
	2.0 ppm	х	Х		United Kingdom	1980
	2.0 ppm	х	Х		Venezuela	-
	2.5 ppm	Х			Australia	1982
	5.0 ppm	d	d		India	-
	6.0 ppm	Х	Х	х	Hong Kong	1983
	10.0 ppm	Х	х		Zambia	1976
Mercury	have established	ndards for Me I standards for	rcury rang Mercury	The U.S.Fo	om to 1.0 ppm. Twen	ty-eight countrie stration have se
	have established an action level o standard is 0.5 p	ndards for Me d standards for f 1.0 ppm in th	rcury rang Mercury	The U. S. For	om to 1.0 ppm. Twen bod and Drug Admini and molluscs. The m	ty-eight countrie stration have se edian internatio
	have established an action level o standard is 0.5 p 0.3 ppm	ndards for Me d standards for f 1.0 ppm in th	rcury rang Mercury	The U.S.Fo	om to 1.0 ppm. Twen ood and Drug Admini and molluscs. The m Chile	ty-eight countrie stration have se edian internatio 1982
	have established an action level o standard is 0.5 p	ndards for Me I standards for f 1.0 ppm in th ppm.	rcury rang Mercury e edible p	The U. S. For	om to 1.0 ppm. Twen bod and Drug Admini and molluscs. The m Chile Australia	ty-eight countrie stration have se edian internatio
	have established an action level o standard is 0.5 p 0.3 ppm	ndards for Me d standards for f 1.0 ppm in th ppm. X	rcury rang Mercury le edible p	The U. S. For	om to 1.0 ppm. Twen ood and Drug Admini and molluscs. The m Chile	ty-eight countrie stration have se edian internatio 1982
Selenium	have established an action level o standard is 0.5 p 0.3 ppm 2.0 ppm 2.0 ppm	ndards for Me I standards for f 1.0 ppm in th opm. x x x x x	rcury rang Mercury e edible p x x x x	The U. S. For	om to 1.0 ppm. Twen bod and Drug Admini and molluscs. The m Chile Australia New Zealand	ty-eight countrie stration have se edian internatio 1982 1982 1971
Selenium	have established an action level o standard is 0.5 p 0.3 ppm 2.0 ppm 2.0 ppm 50.0 ppm	ndards for Me d standards for f 1.0 ppm in th ppm. x x x x x	rcury rang Mercury e edible p x x x x x x	The U. S. For	m to 1.0 ppm. Twen bod and Drug Admini and molluscs. The m Chile Australia New Zealand Australia	ty-eight countrie stration have se edian internatio 1982 1982
Selenium	have established an action level o standard is 0.5 p 0.3 ppm 2.0 ppm 2.0 ppm 50.0 ppm 100.0 ppm	ndards for Me d standards for f 1.0 ppm in th ppm. x x x x x x x	rcury rang Mercury e edible p x x x x x x x	x	om to 1.0 ppm. Twen bod and Drug Admini and molluscs. The m Chile Australia New Zealand Australia Venezuela	ty-eight countrie stration have se edian internatio 1982 1982 1971 1982 -
Selenium	have established an action level o standard is 0.5 p 0.3 ppm 2.0 ppm 2.0 ppm 50.0 ppm 100.0 ppm 150.0 ppm	ndards for Me d standards for f 1.0 ppm in th ppm. X X X X X X X X	rcury rang Mercury le edible p x x x x x x x x c	The U. S. For	om to 1.0 ppm. Twen ood and Drug Admini and molluscs. The m Chile Australia New Zealand Australia Venezuela Finland	ty-eight countrie stration have se edian internatio 1982 1982 1971 1982 - 1979
Selenium	have established an action level o standard is 0.5 p 0.3 ppm 2.0 ppm 2.0 ppm 50.0 ppm 100.0 ppm 150.0 ppm	ndards for Me d standards for f 1.0 ppm in th ppm. x x x x x x x x x	rcury rang Mercury le edible p x x x x x x x x x x x x x x x x x x x	c The U. S. Fo portion of fish x	om to 1.0 ppm. Twen ood and Drug Admini and molluscs. The m Chile Australia New Zealand Australia Venezuela Finland New Zealand	ty-eight countrie stration have se edian internatio 1982 1982 1971 1982 - 1979 1979
Selenium	have established an action level o standard is 0.5 p 0.3 ppm 2.0 ppm 2.0 ppm 100.0 ppm 150.0 ppm 150.0 ppm 230.0 ppm	ndards for Me d standards for f 1.0 ppm in th ppm. x x x x x x c x x x x x x	rcury rang Mercury le edible p x x x x x x x x x x x x x x x x x x x	x	om to 1.0 ppm. Twen bod and Drug Admini and molluscs. The m Chile Australia New Zealand Australia Venezuela Finland New Zealand Hong Kong	ty-eight countrie stration have se edian internatio 1982 1982 1971 1982 - 1979
Selenium	have established an action level o standard is 0.5 p 0.3 ppm 2.0 ppm 2.0 ppm 100.0 ppm 150.0 ppm 150.0 ppm 230.0 ppm 250.0 ppm	ndards for Me d standards for f 1.0 ppm in th ppm. x x x x x x c x x c x x c x x d	rcury rang Mercury le edible p x x x x x x x x x x c x x x d	c The U. S. Fo portion of fish x	om to 1.0 ppm. Twen bod and Drug Admini and molluscs. The m Chile Australia New Zealand Venezuela Finland New Zealand Hong Kong India	ty-eight countrie stration have se edian internatio 1982 1982 1971 1982 - 1979 1977 1983 -
Selenium	have established an action level o standard is 0.5 p 0.3 ppm 2.0 ppm 2.0 ppm 100.0 ppm 150.0 ppm 150.0 ppm 230.0 ppm 250.0 ppm	ndards for Me d standards for f 1.0 ppm in th ppm. x x x x x x x c x x x c x x x d x	rcury rang Mercury le edible p x x x x x x x x x c x x x d x	C The U. S. Fo portion of fish x c x	m to 1.0 ppm. Twen bod and Drug Admini and molluscs. The m Chile Australia New Zealand Venezuela Finland New Zealand Hong Kong India Thailand	ty-eight countrie stration have se edian internatio 1982 1982 1971 1982 - 1979 1977 1983 - 1983 - 1982
Mercury Selenium Tin	have established an action level o standard is 0.5 p 0.3 ppm 2.0 ppm 2.0 ppm 100.0 ppm 150.0 ppm 150.0 ppm 230.0 ppm 250.0 ppm	ndards for Me d standards for f 1.0 ppm in th ppm. x x x x x x c x x c x x c x x d	rcury rang Mercury le edible p x x x x x x x x x x c x x x d	c The U. S. Fo portion of fish x	om to 1.0 ppm. Twen bod and Drug Admini and molluscs. The m Chile Australia New Zealand Venezuela Finland New Zealand Hong Kong India	ty-eight countrie stration have se edian internatio 1982 1982 1971 1982 - 1979 1977 1983 -
Selenium	have established an action level o standard is 0.5 p 0.3 ppm 2.0 ppm 2.0 ppm 100.0 ppm 150.0 ppm 150.0 ppm 250.0 ppm 250.0 ppm 250.0 ppm	ndards for Me d standards for f 1.0 ppm in th opm. x x x x x x c x x c x x c x x x d x x g,c	rcury rang Mercury e edible p x x x x x x c x x c x x d x g,c	c g,c g,c	m to 1.0 ppm. Twen bod and Drug Admini and molluscs. The m Chile Australia New Zealand Venezuela Finland New Zealand Hong Kong India Thailand	ty-eight countrie stration have se edian internatio 1982 1982 1971 1982 - 1979 1977 1983 - 1983 - 1982
Selenium	have established an action level o standard is 0.5 p 0.3 ppm 2.0 ppm 2.0 ppm 2.0 ppm 100.0 ppm 150.0 ppm 150.0 ppm 250.0 ppm 250.0 ppm 250.0 ppm 250.0 ppm	ndards for Me d standards for f 1.0 ppm in th ppm. x x x x x x c x x c x x c x x d x g,c x	rcury rang Mercury le edible p x x x x x x x c x x c x x d x g,c	C The U. S. Fo portion of fish x c x	m to 1.0 ppm. Twen ood and Drug Admini and molluscs. The m Chile Australia New Zealand Australia Venezuela Finland New Zealand Hong Kong India Thailand United Kingdom Australia	ty-eight countrie stration have se edian internatio 1982 1982 1971 1982 - 1979 1977 1983 - 1982 1973
Selenium	have established an action level o standard is 0.5 p 0.3 ppm 2.0 ppm 2.0 ppm 100.0 ppm 150.0 ppm 150.0 ppm 250.0 ppm 250.0 ppm 250.0 ppm 250.0 ppm 250.0 ppm	ndards for Me d standards for f 1.0 ppm in th ppm. x x x x x x x c x x c x x d x g,c x x	rcury rang Mercury le edible p x x x x x x x x c x x c x x d x g,c x x	c g,c g,c	m to 1.0 ppm. Twen ood and Drug Admini and molluscs. The m Chile Australia New Zealand Australia Venezuela Finland New Zealand Hong Kong India Thailand United Kingdom Australia New Zealand	ty-eight countrie stration have se edian internatio 1982 1982 1971 1982 - 1979 1977 1983 - 1983 - 1982 1973
Selenium	have established an action level o standard is 0.5 p 0.3 ppm 2.0 ppm 2.0 ppm 100.0 ppm 150.0 ppm 150.0 ppm 250.0 ppm 250.0 ppm 250.0 ppm 250.0 ppm 250.0 ppm 250.0 ppm	ndards for Me d standards for f 1.0 ppm in th ppm. x x x x x x c x x c x x d x g,c x x d d	rcury rang Mercury e edible p x x x x x x x c x x c x x d x g,c x x d	c g,c g,c	m to 1.0 ppm. Twen bod and Drug Admini and molluscs. The m Chile Australia New Zealand Finland New Zealand Hong Kong India Thailand United Kingdom Australia New Zealand India	ty-eight countrie stration have se edian internatio 1982 1982 1971 1982 - 1979 1977 1983 - 1982 1973 - 1982 1973
Selenium	have established an action level o standard is 0.5 p 0.3 ppm 2.0 ppm 2.0 ppm 100.0 ppm 150.0 ppm 150.0 ppm 250.0 ppm 250.0 ppm 250.0 ppm 250.0 ppm 250.0 ppm 250.0 ppm 50.0 ppm 50.0 ppm	ndards for Me d standards for f 1.0 ppm in th ppm. x x x x x c x x c x x d x g,c x x d g	rcury rang Mercury le edible p x x x x x x x c x x c x x d x g,c x d g	c c x g,c x	m to 1.0 ppm. Twen bod and Drug Admini and molluscs. The m Chile Australia New Zealand Kew Zealand Hong Kong India Thailand United Kingdom Australia New Zealand India United Kingdom	ty-eight countrie stration have se edian internatio 1982 1982 1971 1982 - 1979 1977 1983 - 1982 1973 1982 1973
Selenium	have established an action level o standard is 0.5 p 0.3 ppm 2.0 ppm 2.0 ppm 100.0 ppm 150.0 ppm 150.0 ppm 250.0 ppm 250.0 ppm 250.0 ppm 250.0 ppm 250.0 ppm 250.0 ppm	ndards for Me d standards for f 1.0 ppm in th ppm. x x x x x x c x x c x x d x g,c x x d d	rcury rang Mercury e edible p x x x x x x x c x x c x x d x g,c x x d	c g,c g,c	m to 1.0 ppm. Twen bod and Drug Admini and molluscs. The m Chile Australia New Zealand Finland New Zealand Hong Kong India Thailand United Kingdom Australia New Zealand India	ty-eight countrie stration have se edian internatio 1982 1982 1971 1982 - 1979 1977 1983 - 1982 1973 - 1982 1973

International Standards for Trace Elements in Fish and Molluscs

p - in protein
e - except where natural levels are higher
c - in metal containers
l - in liver

g - recommended guideline d - dry weight basis r - revised limit (proposed)

versus dry can be misleading. By using median standards, these misleading comparisons can be more easily avoided. In most cases, the Median International Standard is actually a standard set by one or more nations rather than an average value not actually set by any country. The median was calculated as follows. All standards or guidelines (with the exception of the Indian standards which are based on dry weight) were considered to be more-or-less equivalent. For the purposes of calculating the median, the Indian standards were divided by five. The median was calculated as the middle value of all of the standards (e.g., the fourth of seven values arranged in ascending order). In a few cases, the number of standards was even. In this event, the two mid-values were averaged (most were not different). None of the adjusted dry-weight standards from India ended up as a median or as part of a mid-value pair.

For obvious reasons, the Median International Standards can only be used to provide a general idea of what other nations have chosen to use as a standard. The range of all values is listed in Table 7 as a reminder of this. However, with the lack of American standards, Median International Standards can provide a guidepost for those responsible for interpreting trace metal findings in fish and shellfish tissue.